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Revision 1

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STATION 12	

CONSTRUCTION SPECIFICATION FOR

VAULT CONCRETE BASIN, SHELL AND LEACHATE SUMP FOR GROUTED WASTE DISPOSAL FACILITIES GROUTED VAULT PAIR (218-E-16)

Work Order ER9090

Prepared By:

Kaiser Engineers Hanford Company
Richland, Washington

For the U.S. Department of Energy

Contract DE-AC06-87RL10900

93127601102

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Construction Specification For Vault Concrete Basin, Shell and Leachate Sump for Grouted Waste Disposal Facilities Grouted Vault Pair (218-E-16)

CHANGE CONTROL RECORD

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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 INTRODUCTION

1.1.1 Project B-714 for construction of grout disposal vaults is located near the 200-E Area in the Controlled Access Area of the Hanford Site, approximately 28 road miles north of Richland, Washington.

1.1.2 This Specification provides for construction of a pair of concrete vault structures shown on the Drawings (Vaults 102 and 103). This Specification shall also apply for construction of an additional pair of Concrete Vault Structures (Vaults 104 and 105).

1.2 STATEMENT OF WORK

1.2.1 Scope: Work consists of furnishing supervision, labor, equipment, materials, transportation and services for procurement, receiving, handling, storage, protection, fabrication, installation, inspection, and testing to provide 2 pair of concrete vault structures in accordance with these Contract Documents. Where vaults 104 and 105 are referred to as "Future" on the Drawings, include work as part of scope of Contract.

1.2.2 Work Included: Following itemization is intended to be broad in scope to identify major work elements and is not all inclusive.

1.2.2.1 Excavation.

1.2.2.2 Vault concrete basins and shells.

1.2.2.3 Leachate collection sumps.

1.2.2.4 Interior protective coating.

1.2.2.5 Exterior drainage path.

1.2.2.6 Vault hydrostatic and air leakage tests.

1.2.2.7 Diffusion barrier.

1.2.2.8 Liner for concrete basins.

1.2.2.9 Leachate detection collection and removal systems (LDCRS).

1.2.2.10 Precast prestressed concrete roof.

1.2.2.11 Site electrical and instrumentation, and conduit runs for vaults.

1.2.2.12 Transfer pit, excess water removal pits, and leachate collection pit.

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1.2.2.13 Encased piping for each vault, and pipe runs for future vaults, including cathodic protection.

1.2.2.14 Shielding backfill/diffusion barrier and temporary protective geotextile.

1.2.2.15 Furnish pipe bends with tees and prefabricated concrete pipe supports for tie-in at coordinate N40522/W45767. (Re: Drawing H-2-77611, Details 1 and 2.)"

1.2.2.16 Furnish pull wire and new sensing cable, for installation by others, from PP-10 to PP-11.

1.2.2.17 Work included but no detailed design provided.

a. Project B-714 drawings and technical specifications indicate design for construction of Vault 102 and 103. Based upon this design, Contractor shall construct Vaults 104 and 105. Prior to construction of Vaults 104 and 105, KEH will provide design (drawings and technical information) which indicate the appropriate grades, elevations, coordinates, tag, and equipment numbers, etc. The work of Vaults 104/105 is similar to Vaults 102/103.

b. Drawing H-2-77615, Zone E7 provides a plan view of piping to Vault 104/105. Install encased pipe from approximate coordinate N40450/W45768 to Vaults 104 and 105. Install encased pipe on coordinate N40265.5 from W45554 to W45458. Fab and install encased pipe similar to typical details for pipe to Vault 102/103.

c. Drawing H-2-77634 provides an electrical site plan for Vaults 101 through 105. Install electrical and instrumentation to Vault 104/105 as mirror image to Vault 102/103. Run electrical duct bank from MH-105A to coordinate W45430. Installation is similar to Vault 102/103 details.

d. Drawing H-2-77645 details a cathodic protection plan for piping. Provide an independent cathodic protection system similar to Vault 102/103 for pipe protection to Vault 104/105. Include new rectifier and circuit breaker to tie-in at Panel D-PB-01."

1.2.2.18 Deleted.

1.2.3 Work Not Included: Following work elements are part of Project but will be accomplished by others.

1.2.3.1 Pipe tie-in at coordinate N40522/W45767 including excavation and insulation.

1.2.3.2 Remove and reinstall sensing cable from PP-1 to PP-11.

1.2.3.3 Closure cover and site stabilization.

1.2.3.4 Ground water monitoring wells.

- 1.2.3.5 Run-on/run-off drainage control ditch.
- 1.2.3.6 Items shown on the Drawings to be done by others.
- 1.2.3.7 Excess water pit jumpers and water pump assemblies.

1.3 SEQUENCE OF WORK

1.3.1 Sequence shall be in accordance with Section 01310.

1.3.2 Following items of work cannot be started without written authorization from KEH. The written authorization shall be in addition to the Notice to Proceed with the individual phases.

1.3.2.1 Start work on Vaults 104 and 105.

1.3.2.2 Diffusion barrier.

1.3.2.3 Vault and catch basin.

1.3.2.4 Leachate collection pipe.

1.3.2.5 HDPE flexible membrane liner.

1.3.2.6 Asphalt coating.

1.3.2.7 Exhauster riser.

1.4 DRAWINGS

1.4.1 Drawings for construction of Vaults 102 and 103 are listed on the Schedule of Drawings and include approximate location of Vaults 104 and 105.

1.4.2 Drawings for construction of Vaults 104 and 105 will be replications of Drawings for Vaults 102 and 103 and will be delivered before authorization to proceed with construction.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01019

ITEMS FURNISHED FOR CONSTRUCTION

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 Code of Federal Regulations (CFR)

Title 30 Mineral Resources

Sub Chapter N - Metal and Nonmetal Mine Safety and Health

30 CFR 56

Safety and Health Standards -
Surface Metal and Nonmetal
Mines

1.2 SUBMITTALS: Not Used

1.3 GENERAL

1.3.1 Material and equipment furnished or made available for incorporation into the Work are set forth in this Section. Other services and utilities provided are covered in other sections of this Specification.

1.3.2 Meet the provisions of Section 9 of the Contract General Conditions for items furnished for construction.

1.3.3 Provide KEH access to offsite premises where items furnished for construction are stored before incorporation into the Work.

1.4 GRAVEL AND SAND

1.4.1 Unmined natural deposits are available at no cost from sites designated by KEH within 6 miles of Project site. KEH makes no representation that unmined materials will meet physical properties required in this Specification.

1.4.2 If Contractor elects to utilize available gravel sites he shall furnish equipment and labor required to excavate, process, load, transport, and place gravel and sand.

1.4.3 Material shall be used only for the Work covered by this Specification and no gravel or sand, processed or unprocessed, or concrete manufactured therefrom shall be transported off the Hanford Site.

1.4.4 Access to gravel sites and travel between gravel and construction sites shall be on roads designated by KEH and use shall be in accordance with Section 01500.

1.4.5 Operations at gravel sites shall meet the following requirements.

1.4.5.1 Confine removal of overburden and top soil to areas designated by KEH. Stabilize blow sand areas after surface has been disturbed with ballast or other approved method to prevent wind erosion.

1.4.5.2 Make no excavation or bank cut within 100 feet of power lines, paved roads, railroads, security fences, or other permanent structures.

1.4.5.3 Excavating and processing shall be in accordance with 30 CFR 56. Correct operations identified by KEH to be hazardous to life or property.

1.4.5.4 Explosives are prohibited articles described in Section 56 of the Contract General Conditions and shall not be brought to the Hanford Site or proposed for use without written KEH approval.

1.4.5.5 Temporary structures are permitted at gravel site for offices, storage, or repair facilities necessary for gravel removal and processing operations. No facility for habitation will be permitted.

1.4.5.6 Use of gravel sites are nonexclusive. Others may also enter to excavate material required for other work.

1.4.5.7 Upon completion of operations clear gravel site of debris, temporary structures, and equipment. Grade excavated area, properly slope banks, and stabilize to prevent wind erosion. Conditions identified by KEH as not meeting these requirements shall be corrected before final acceptance of the Work.

1.4.5.8 Right to use gravel sites may be terminated by KEH for failure to meet the requirements set forth or for abandonment of operations under this Contract. Right to use gravel site will terminate without notice upon acceptance of Work under this Contract.

1.4.6 If Contractor elects to set-up an onsite concrete batch plant he shall locate temporary facility at Pit 28 or Pit 30.

1.4.6.1 Access to Pit 28 or Pit 30 and travel between batch plant and construction site shall be on roads designated by KEH and use shall be in accordance with Section 01500.

1.4.6.2 Location of Pit 28 is approximately 6.2 road miles from the construction site.

1.4.6.2.1 Electrical power for operating the batch plant would be available from an existing overhead 13.8 KV transmission line approximately 1 mile north of Pit 28. The Contractor to furnish power lines or cable extensions, including load centers, transformers, protective equipment, disconnect switches, and fixtures for AC power from existing 13.8 KV line to batch plant site (Pit 28).

1.4.6.2.2 Raw water is available from an existing buried 10" ductile iron pipe line. The pipe line is located approximately 1 mile north of Pit 28. Routing of temporary water line will require crossing a two lane road. The

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Contractor to furnish hauling, dispensing, temporary piping and fittings approved by KEH for connection to water source. There is no potable water available at or near Pit 28.

1.4.6.3 Location of Pit 30 is approximately 5 road miles from the construction site.

1.4.6.3.1 Electrical power for operating the Batch plant would be available from an existing overhead 13.8 KV transmission line approximately 450 yards south of Pit 30. The Contractor to furnish power lines or cable extensions, including load centers, transformers, protective equipment, disconnect switches, and fixtures for AC power from existing 13.8 KV line to batch plant site (Pit 30).

1.4.6.3.2 Potable water is available from an existing buried 8" PVC pipe line. The pipe line is located approximately 1/2 mile south of Pit 30. Routing of temporary water line will require crossing Route 3 (a two lane road) and an elevated 24" steam line. The Contractor to furnish hauling, dispensing, temporary piping and fittings approved by KEH for connection to water source.

1.5 MATERIALS AND EQUIPMENT

1.5.1 Materials and equipment listed below will be furnished by KEH, for incorporation into the Work.

1.5.1.1 Structural backfill material for vaults.

1.5.1.2 2 inch stainless steel nozzles (PN 2 on reference Drawing H-2-90185).

1.5.1.3 2 inch carbon steel kickplates (PN 4 on reference Drawing H-2-30600).

1.5.1.4 Hazardous waste disposal barrels.

1.5.1.5 Short and long dowels (Ref Dwg H-2-77605, Sh 1).

1.5.1.6 Lifting bails (Ref Dwg H-2-77605, Sh 1, Detail 2 and H-2-77597, Sh 1, Detail 6).

1.5.2 Backfill material noted in subparagraph 1.5.1.1 is presently stockpiled at the Site approximately 1/2 mile from the Project. Materials noted in subparagraphs 1.5.1.2, 1.5.1.3, 1.5.1.4, and 1.5.1.5 will be delivered to the Site.

1.5.3 Furnish equipment and labor for hauling, handling, and installing backfill material.

1.5.4 Furnish other materials and equipment, shown on the Drawings or specified in the Specifications, required to complete the Work.

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PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01027

APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Not Used

1.3 FORMAT

1.3.1 Complete Form KEH-1026.00, Progress Estimate Backup, sample appended. Contractor developed substitutes for form may be used only with prior approval of KEH.

1.3.2 Complete Form KEH-0959.00, Monthly Estimate of Work Complete, sample appended, or include following in letter requesting payments.

Subtotal Value of All Pay Items Completed to date (Include all modifications)		\$X,XXX.XX
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Allowance for Material Stored on Site		
Previous Net Allowance	\$X,XXX.XX	
Minus Materials Placed	X,XXX.XX	
Plus Materials Stored	<u>X,XXX.XX</u>	
Net Allowance		<u>X,XXX.XX</u>

Subtotal Value Completed to Date		
Less Previous Payments	X,XXX.XX	
Less Other Charges from KEH	<u>X,XXX.XX</u>	
Subtotal Deductions		<u>X,XXX.XX</u>

Total payment Requested		<u>\$X,XXX.XX</u>
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Less Retainage @ _____%		<u>(X,XXX.XX)</u>
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Total payment Allowed		\$X,XXX.XX
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1.4 APPLICATION PROCEDURE

1.4.1 Payments to Contractor set forth in Section 15 of Contract General Conditions are initiated by Contractor making application for payment as follows.

1.4.1.1 Begin application for payment by completing KEH furnished form referenced in Paragraph 1.3.1. Include, as minimum, breakdown of contract price for each item listed in Section 01310 and percent complete for each item.

a. Payment for materials stored at locations other than Project site may be authorized at discretion of KEH.

1.4.1.2 Review backup sheets with KEH and adjust data.

1.4.1.3 Finalize application for payment by either completing Form KEH-0959.00 or initiating letter containing elements of Paragraph 1.3.2.

1.5 PAYMENT PROCEDURE

1.5.1 Upon receipt of application for payment, KEH will audit data and check for compliance with requirements of Section 01720. When satisfied that contract requirements are up-to-date, Form KEH-0959.00 will be prepared and signed by KEH.

1.5.2 Copy of signed Form showing amount of payment to be made will be furnished Contractor.

1.5.3 KEH will mail check to Contractor's designated address.

1.6 ADDITIONAL DATA REQUIRED

1.6.1 When processing applications for payment and preparing payment documents, KEH may require data to substantiate and justify amounts requested. Processing of payment documents may be delayed if data is not forwarded expeditiously to KEH.

1.6.2 Requests for payment for equipment or material which Contractor has received, but has not installed, shall be accompanied by invoice or other data to provide evidence that title to equipment or material is held by Contractor.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

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**KAISER ENGINEERS
HANFORD**

MONTHLY ESTIMATE OF WORK COMPLETED

Contract or P.O. No. _____ Estimate No. _____ Date _____

Name of Contractor _____

Address _____

Nature of Work _____

Initial Amount of Contract \$ _____ Total Amount of Modifications to Date \$ _____ Total Adjusted Contract Amount \$ _____

Description	Amount
Estimated Work Completed to (Date) _____	
Less: Previous Payments \$ _____	
Other Charges (Explain Below) \$ _____	
Total Deductions	(\$ _____)
Adjusted Payment Requested	\$ _____
Less Retainage @ _____%	\$ _____
Total Payment Allowed	\$ _____

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I certify that I have verified this periodical estimate dated _____ for \$ _____ and that to the best of my knowledge and belief it is a true and correct statement of work performed and that the contractor's statement of his account and amount due him is correct and just, and the quantities included in this estimate have been performed in full accordance with the terms and conditions of the corresponding construction documents.

FOR THE CONTRACTOR

KAISER ENGINEERS HANFORD COMPANY

By _____ By _____

END OF SECTION

SECTION 01040

COORDINATION

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Not Used

1.3 CONSTRUCTION ACTIVITIES

1.3.1 Coordinate construction activities to ensure efficient and orderly sequence of work, with provisions for accommodating items to be installed later.

1.3.2 As noted in Section 29 of the Contract General Conditions, other contracts may be under construction concurrently with the Work included in this Specification. Coordinate activities with other contractors for mutual benefit. Coordination meetings may be required in addition to progress meetings to keep parties informed of scheduled activities at interface points.

1.3.3 Following activities require interface with work by others.

1.3.3.1 Casing on existing monitoring well E-25-33 south of Vault 105 will be extended by KEH during backfill operations.

1.3.3.2 Install cover blocks for pits and drain seal assemblies for test fit to be witnessed by KEH. After demonstration of proper fit, remove cover blocks and plugs and store on dunnage or pallets at Project Site.

1.3.3.3 Excavation for future Vaults 106 through 111 will be performed by others during 1990. Do not store equipment or facilities east of coordinate W45400 when excavation begins. Access to vault construction area may be rerouted accordingly.

1.4 CONNECTIONS TO EXISTING SYSTEMS

1.4.1 Advance notice of work that will affect existing systems shall be given to KEH. Careful planning and scheduling of work activities is required to coordinate operations of existing systems to keep disruptions at minimum.

1.4.2 As required in subsection 50.7 of Contract General Conditions connections to existing systems shall be scheduled well in advance for work to be done. KEH will coordinate schedule with Contractor and system operators.

1.4.3 Connections to existing systems shall be accomplished during system outage not to exceed 4 hours.

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1.5 ACCESS TO WORK AFTER POSSESSION

1.5.1 As each vault is completed KEH will take possession and access will be restricted.

1.5.2 Access to warranty work set forth in Section 24 of Contract General Conditions or access to work after possession set forth in Section 20 of Contract General Conditions will be coordinated by KEH with other contractors, and users of facility. Notify KEH in advance of proposed work to minimize disruptions.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01043

JOB SITE ADMINISTRATION

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Not Used

1.3 WORKING HOURS

1.3.1 Working hours for this Contract are from 7:15 am to 3:45 pm Monday through Friday except holidays to avoid congestion at intersection of Route 4 and access road.

1.3.2 For other than normal working hours refer to Section 51 of the Contract General Conditions.

1.4 BADGE, DOSIMETER, AND ORIENTATION

1.4.1 Work being near the 200-E Area in the Controlled Access Area of the Hanford Site, the following are applicable.

1.4.1.1 Badge, dosimeter, and orientation requirements in accordance with Section 56 of Contract General Conditions.

1.4.1.2 Badges will not be provided until the Notice to Proceed letter has been signed and returned to KEH, supervisors have attended KEH safety training course, requirements of Section 55 of Contract General Conditions have been received by KEH, and Site Labor Conference and Preconstruction Meeting set forth in Section 01200 have been completed.

1.5 EVACUATION DRILLS

1.5.1 Personnel working on the Hanford Site are required to participate in emergency evacuation drills held approximately once each calendar quarter and lasting approximately 1 hour.

1.5.2 Maintain daily log or other suitable record of names of Contractor and subcontractor personnel working on the Hanford Site.

1.6 SECURITY

1.6.1 Policy and Procedures: Contractor employees are required to meet with security policy and procedures set forth in KEH-MA-6, Safeguards and Security Manual. Copies of manual will be provided to Contractor upon request after award of Contract.

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1.6.2 Security Escorts

1.6.2.1 Contractor personnel not having "5" or "3" security clearance, working within 200 East Limited Area require security escorts. Escorts are provided by KEH at no cost except as set forth in subparagraph 1.6.2.4.

1.6.2.2 Provide list of employees and vehicles to be used inside Limited Area and anticipated start and duration of utilization. Provide list 1 week before start of work for escort requirement determination. Provide weekly work schedules of employees, not later than Thursday of preceding week (minimum 24 hour notice required for changes), for KEH to provide sufficient escorts.

1.6.2.3 Escorts will be assigned from the KEH trailer located outside Limited Area near Access Gate No. 814. Personnel shall meet and transport assigned escorts from that location. Provide space within contractor vehicles to accommodate necessary personnel escorts. Minimum 1 escort is required in each vehicle.

1.6.2.4 Contractor may be charged for escorts when escorts have been requested and Contractor personnel do not show up at time and place specified. Charges will be made at rate of \$15.00 per hour for each escort for time lost waiting for Contractor personnel.

1.7 SAFETY REQUIREMENTS

1.7.1 Fire Safety

1.7.1.1 Contractor is required to address fire safety as part of construction safety plan required by Section 55 of Contract General Conditions. Incorporate following fire safety requirements into construction safety plan.

- a. Remove or shield combustible materials while welding or cutting.
- b. Maintain fire watch for period of 1/2 hour after cessation of welding, cutting, or grinding.
- c. Utilize portable shields wherever welding, cutting, or grinding.
- d. Have fully charged fire extinguishers available whenever welding, cutting, or grinding.
- e. Means to control ignition of brush fires.

1.7.1.2 See Section 01500 for off-road driving and grass fire prevention requirements.

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1.7.2 Safety Apparel

1.7.2.1 Personnel shall wear appropriate footwear in construction areas. Tennis shoes, canvas type shoes, or open toe shoes do not meet this requirement.

1.7.2.2 Hardhats shall be worn at all times.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

93127601120

SECTION 01050

SURVEY AND FIELD ENGINEERING

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Not Used

1.3 QUALITY CONTROL

1.3.1 Establishing alignment, location, and grades shall be the responsibility of a Land Surveyor registered in the state of Washington.

1.3.2 Deliver field notes, records, and documentation to KEH at 3 week intervals to review and verify procedures used and accuracy of work.

1.4 SURVEY DATA

1.4.1 Basic reference points with coordinate descriptions and bench marks with elevation identified, as shown on the Drawings, will be located by others.

1.4.2 Contractor shall be responsible for preservation of bench marks and reference points, including stakes or other markers established until removal is authorized by KEH.

1.5 PROCEDURES

1.5.1 Before initial layout, field verify horizontal and vertical data furnished. Report discrepancies to KEH before proceeding.

1.5.2 Establish adequate number of permanent reference points, to be used during construction, referenced to original control points. Record locations with horizontal and vertical data on project record documents.

1.5.3 Protect and preserve control and reference points until Work is complete. Report loss or destruction of control points to KEH. Report relocation or change in data affecting reference points.

1.5.4 Periodically verify data for control and reference points, and construction stakes to maintain construction accuracy.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01065

PERMITS

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Not Used

1.3 FEDERAL, STATE, AND MUNICIPAL LAWS, CODES, AND REGULATIONS

1.3.1 Permits or licenses to do business required by Federal, State, and Municipal laws, codes, and regulations are the responsibility of the Contractor as stated in Section 6 of Contract General Conditions.

1.4 HANFORD SITE PERMITS

1.4.1 General: Before certain types of work can be performed at Hanford, Contractor is required to have a permit. Permits are provided by KEH at no cost, however, Contractor shall furnish information required and notify KEH in advance of work which requires a permit. Contractor shall meet the requirements and restrictions set forth in each permit.

1.4.2 Excavation: Do not excavate without permit set forth in subsection 50.9 of Contract General Conditions. Post permit at Site.

1.4.3 Backfill Permit: Permit required for each element of fill and backfill and good for 5 days or duration of work element provided Work does not stop for 5 consecutive days. Complete permit form, furnished by KEH, and return to KEH for approval before starting work. Permit shall be kept at Site.

1.4.4 Welding and Cutting Permit: Welding or flame cutting requires a permit. Permit is good for duration of Contract. Provide process to be used 5 days before start of welding for KEH to furnish permit. Permit shall be kept at Site.

1.4.5 Radiation Work Permit (RWP): Permit required before entering area designed as radiation zone. Permit will be furnished by KEH and shall be posted outside zone for employee use.

1.4.6 Oversize Load Permits: In addition to a Washington State permit, obtain from KEH permits for each movement of each oversize vehicle or load within the Hanford Site. See Section 01500, subparagraph 1.6.4.3 for additional requirements.

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PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01100

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications including documents referenced therein, form a part of this Section to extent designated herein.

1.1.1.1 Federal Standards (FED STD)

FED-STD-313B Material Safety Data Sheets
Including CHG NOT 1 and 2 Preparation and Submission of

1.1.1.2 Washington Industrial Safety and Health Act (WISHA)

Washington Administrative Code (WAC)

Title 296, Labor and Industries

Chapter 296-62 WAC Occupational Health Standards--
Safety Standards for
Carcinogens

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Air Quality Test Reports: Submit test reports showing air quality supplied by respirator compressor has been tested within last 6 months and meets Grade E requirements.

1.3 APPLICATION OF COATINGS

1.3.1 During application of coatings, provide respiratory protection in accordance with manufacturers recommendations on material safety data sheets for products being applied. Supplied-air respirators will be required during application of polyurethane insulation. Respirator protection shall be in accordance with WAC 296-62-071 and Contractor shall have minimal acceptable respirator program outlined in WAC 296-62-07109.

1.3.1.1 Contractor supplied air respirators require Grade E air quality, having following characteristics, for breathing air systems.

<u>Constituent</u>	<u>Limiting Characteristics</u>
Oxygen	*ATM/19.5 - 23.5%
Hydrocarbons (condensed)	5 mg/m ³
Carbon Monoxide	10 ppm
Carbon Dioxide	500 ppm

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*Term ATM (atmospheric) denotes oxygen content normally present in atmospheric air. Numerical values denote oxygen limits for synthesized air.

1.3.1.2 Breathing air system shall be monitored for following conditions.

- a. Loss of power to compressor motor.
- b. Low pressure air receiver tank.
- c. Compressor overheating.
- d. Carbon monoxide levels in excess of requirements for Grade E air.

1.3.1.3 Provide audible and visual alarms for conditions listed in subparagraph 1.3.1.2.

1.4 CONFINED SPACES

1.4.1 Vault interior is confined space after 4 sides have been erected.

1.4.2 Requirements of WAC 296-62-145 shall be met before entering or working in confined spaces.

1.5 HAZARDOUS MATERIAL REQUIREMENTS

1.5.1 Provide listing of hazardous products anticipated for construction. Provide material safety data sheets (MSDS) for each product listed.

1.5.2 Hazardous products, whether specified or recommended and voluntarily requisitioned by Contractor, shall be governed by requirements of FED-STD-313 and Section 111 of Contract General Conditions.

1.5.3 Discard hazardous construction waste such as cleaning solvents, waste oil, and antifreeze in disposal barrels provided by KEH. The Contractor shall establish and maintain a log of the waste placed in each barrel. The log should include the type, amount, date, and person who places the waste in the barrel. Also, there should be a separate Log for each barrel, and hazardous wastes shall not be mixed. Disposal will be by KEH.

1.5.4 An area adjacent to Project site will be designated as washout area for concrete trucks. Remove hardened concrete periodically and at completion of work, and dispose of at central landfill.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Not Used

1.3 MEETING PROCEDURES

1.3.1 Representatives from KEH and Contractor, including major subcontractors, shall participate in project meetings.

1.3.2 Meeting times and locations shall be mutually agreed to by Contractor and KEH, and will be held at the Hanford Site in Richland, Washington. KEH will issue notices of meetings and prepare minutes. Meeting minutes will be distributed to project participants.

1.4 SITE LABOR CONFERENCE

1.4.1 Before starting construction onsite, Contractor and subcontractors shall attend informational conference on Hanford Site labor requirements applicable to Project. Contractor shall schedule conference with KEH and identify crafts for Project. KEH will attend and provide meeting notice to representatives from labor organizations whose members may be utilized in construction. Contractor shall conduct meeting and present proposed work plan and craft utilization. Contract General Conditions relating to labor will be reviewed.

1.5 PRECONSTRUCTION MEETING

1.5.1 Meeting will be scheduled by KEH before start of onsite work. Authorized representatives of Contractor and major subcontractors shall attend. KEH will advise others having interest in Project. Meeting will be chaired by KEH.

1.5.2 Following items, as minimum, will be incorporated into agenda for meeting.

1.5.2.1 Point of contact, key personnel (Operating Contractor, Safety, QA/QC, Acceptance Inspectors, etc) and contracts personnel.

1.5.2.2 Schedule requirements and restraints, submittals and work limitations.

1.5.2.3 Safety, construction progress meetings and frequency, and certified payrolls.

1.5.2.4 Report requirements and frequency.

1.5.2.5 Major material and equipment lists.

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1.5.2.6 Vault liner preinstallation meeting required in Section 02755, subparagraph 1.3.4.1.

1.5.2.7 Other pertinent items.

1.6 CONSTRUCTION PROGRESS

1.6.1 Meetings, held weekly at time and location determined at preconstruction meeting, will be approximately 1 hour long.

1.6.2 KEH will chair meeting and request attendance of key personnel required. Authorized representative of Contractor and pertinent subcontractors shall attend.

1.6.3 Purpose of meetings is to monitor status and provide forum for exchange of pertinent Project information. Major topics may include, but not be limited to, following.

1.6.3.1 Schedule, cost and construction status.

1.6.3.2 Design and scope changes

1.6.3.3 Submittal status, key material and equipment delivery status.

1.6.3.4 Potential problem areas.

1.6.3.5 Action item status, goals for next meeting.

1.6.3.6 Other appropriate items.

1.6.4 Minutes will be issued by KEH as promptly as possible following meeting. Action items will be identified with assigned follow-up. Issues resolved will be reported in the minutes, as well as closed action items.

1.7 DAILY STATUS

1.7.1 Informal meetings will be held each work day, at time and place determined in the field, to review scheduled activities and hold or witness points.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 This Section summarizes submittals required in Part 1 of each section of this Specification. It explains type of submittals required, and describes procedures for submittals and review.

1.1.2 Submittals required in Part 1 of each section are summarized in Schedule of Submittals. Each submittal is identified by Submittal Number, Reference Section, and Title. Submittals are required for either Review and Approval or Review for Record.

1.1.2.1 Submittals requiring Review and Approval are those which shall receive approval before procurement, fabrication, or construction is started.

1.1.2.2 Submittals requiring Review for Record are those which Contractor may proceed with procurement, fabrication, construction, or acceptance testing, but acceptance is contingent upon compliance with Drawings and Specifications.

1.1.3 Supplemental Submittals are initiated by Contractor in accordance with Section 01630 for consideration of substitute products or corrective procedures and require Review and Approval.

1.2 SUBMITTAL PROCEDURES

1.2.1 Transmit submittals for each vault to KEH by Data Transmittal form. Identify submittals by vault numbers.

1.2.2 Identify each submittal by Submittal Number, Reference Section, and Title noted in the Schedule of Submittals. Number of copies required for retention by KEH are shown in Schedule and include 2 copies to be returned to Contractor. Additional copies required for Contractor uses shall be added.

1.2.3 Review each submittal for completeness, compliance with Contract Documents, and proper identification before sending to KEH. Submittal data shall either be stamped showing review process has taken place or Data Transmittal form may be signed with statement of "Reviewed for Compliance." Submittals not stamped or signed to show review will be returned without consideration.

1.2.4 Submittals requiring Review and Approval will be stamped by KEH and marked "Approved", "Approved with Exception," or "Not Approved, Revise and Resubmit." Approval of submittals does not relieve Contractor of responsibility for errors which may be contained therein.

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1.2.4.1 Approved submittals are identified by submittal stamp with "Approved" or "Approved with Exception" box checked. "Approved" signifies general concurrence to achieve conformance with design concept of Project and compliance with requirements of Contract Documents. "Approved with Exception" signifies general concurrence with noteworthy comments or clarifications. Approval of submittals does not relieve Contractor of responsibility for errors contained therein. Approval of specific item shall not be construed as approval of system or assembly of which item is a component.

1.2.4.2 A submittal which is not approved is identified as "Not Approved, Revise and Resubmit." Submittal is considered by KEH to be technically deficient or incomplete and therefore, unacceptable. Resubmittal is required, hence fabrication, procurement, or performance of procedures shall not proceed.

1.2.4.3 Upon receipt of deficient submittal data, Contractor shall make corrections noted on transmittal and resubmit data to KEH within 10 calendar days.

1.2.5 Materials and equipment fabricated or installed without required approved submittals, or which differ from approved Drawings or vendor data are subject to rejection and replacement at Contractor's expense.

1.2.6 Delays arising out of Contractor's failure to submit in timely manner required Drawings and other related data described in Contract Documents shall not constitute excusable delays for extensions, unless excusable under other provisions of Contract. Contractor shall allow 15 calendar days for KEH review and disposition of submittals, including shop drawings and vendor information, required to be furnished by Contractor. Time period will be measured from date of receipt of submittal in KEH's office to date of return mailing to Contractor.

1.2.7 Contractor is responsible for dimensions to be confirmed and correlated at worksite.

1.2.8 Submittals for Review and Record will be reviewed and filed. Incomplete or inaccurate data will be returned to Contractor marked "Resubmit" with appropriate comments, and items procured or work performed shall be corrected. Payment for equipment will not be made unless required Certified Vendor Information (CVI) has been furnished.

1.2.9 Supplemental Submittals shall contain sufficient data required in Section 01630 to show substantial compliance with Drawings and Specifications. Substitute product submittals shall contain as minimum, outline dimensions, operating clearances, and engineering data. Identify each submittal by Specification Section number and Paragraph number or referenced Drawing number and detail. Improperly identified or incomplete submittals will be returned without consideration.

1.2.10 Procedures for performing certain items of work are required to be submitted for Review and Approval before work is commenced. Those work procedures which have been approved by KEH for work similar to that to be accomplished on Project may not need to be reapproved. Forward 1 copy of

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previously approved procedure to KEH by Data Transmittal form and identify by Submittal Number, Reference Section, Title, and either Contractor's procedure number or project number for which procedure was approved. Submittal will be reviewed by KEH and if acceptable retained for record. If previously approved procedure is not acceptable submittal will be returned with requirements for resubmittal.

1.3 SCHEDULE OF SUBMITTALS

Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
CONTRACT GENERAL CONDITIONS				
55.2	Safety Program and Job Safety Analysis	10	5 days before start of work	
55.3	Industrial Injury/Illness Experience	10		5 days before start of work and each month
55.5.1	OSHA Form No. 200 Report	10		5th work-ing day, each month
55.6	Equipment Certi-fication	10		2 days before bringing equipment onsite
SPECIAL PROJECT PROCEDURES				
01100/1.2.1	Air Quality Test Reports	10	Before equipment use	
PROGRESS SCHEDULES				
01310/1.2.1	Progress Schedules	10	30 days after notice of award	
01310/1.2.2	CPM Project Schedule	10	30 days after notice of award	
01310/1.2.3	Initial Weekly Work Schedule	7	10 days after notice to proceed	

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Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
PROGRESS SCHEDULES (Continued)				
01310/1.2.4	Subsequent Weekly Work Schedules	7	By noon each Friday	
01310/1.2.5	Start-up Schedule	10	5 days after notice to proceed	
QUALITY ASSURANCE				
01400/1.2.1	Contractor's QAP	10	5 working days after notice of award	
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS				
01500/1.2.1	Anchoring and Enclosure Methods	15	Before placing field office	
SUBMIT FOLLOWING FOR EACH VAULT				
DIFFUSION BARRIER				
02145/1.2.1	Laboratory Reports	15	Before delivery	
02145/1.2.2	Manufacturer's Data	15	Before mixing	
02145/1.2.3	Handling Procedure	15	Before delivery	
02145/1.2.4	Placing Procedure	15	Before delivery	
02145/1.2.5	Compacting Procedure	15	Before delivery	
02145/1.2.6	Geotextile Installation Procedure	15	Before installation	
02145/1.2.7	Log of Barrier Placement	15		7 days after placement

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Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
DIFFUSION BREAK				
02147/1.2.1	Laboratory Reports	15	Before delivery	
02147/1.2.2	Handling Procedure	15	Before delivery	
02147/1.2.3	Placing Procedure	15	Before delivery	
02147/1.2.4	Compaction Procedure	15	Before delivery	
02147/1.2.5	Log of Break Placement	15		7 days after placement
02147/1.2.6	Manufacturers Data	15	Before delivery	
02147/1.2.7	Installation Plan	15	Before installation	
EARTHWORK				
02200/1.2.1	Method to Prevent Damage During Excavation	15	Before excavation	
HOT-LAID ASPHALTIC CONCRETE PAVEMENT				
02512/1.2.1	Laboratory Reports	15	Before delivery	
02512/1.2.2	Handling and Placing Procedure	15	Before delivery	
LEACHATE COLLECTION SUMP LINER				
02752/1.2.1	Fabricator Drawings and Procedures	15	Before fabrication	
02752/1.2.2	Certified Material Test Reports (CMTR)	15	Before delivery	

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Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
LEACHATE COLLECTION SUMP LINER				
02752/1.2.3	Filler Material Control Procedure	15	Before fabrication	
02752/3.2.1	Procedure for Disposal of hydrotest water	15	15 days before testing	
EXTERIOR DRAINAGE PATH				
02753/1.2.1	Fabricator Drawings	15	Before delivery	
02753/1.2.2	Installation Plan	15	Before installation	
02753/1.2.3	Manufacturer's Data	15	Before fabrication	
02753/1.2.4	Surface Acceptance	15	Before installation	
02753/1.2.5	Care and Repair Instructions	15		Before accept- ance
CATCH BASIN LINERS				
02755/1.2.1	Installation Drawings	15	Before delivery	
02755/1.2.2	Installation Procedures	15	Before installation	
02755/1.2.3	Manufacturer's Data	15	Before fabrication	
02755/1.2.4	Samples	15		Upon com- pletion of fab- rication
02755/1.2.5	Certified Material Test Reports (CMTR)	15	Before delivery	
02755/1.2.6	Care and Repair Instructions	15		Before accept- ance

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Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
CATCH BASIN LINERS (Continued)				
02755/1.2.7	Certificates of Experience	15	Before notice to proceed	
02755/1.2.8	Manufacturer's Quality Control Plan	15	5 days after notice of award	
02755/1.2.9	Certification	15		Before acceptance
02755/1.2.10	Surface Acceptance	15	Before installation	
02755/1.2.11	Calibration and Testing Procedure	15	Before spark testing	
LEACHATE COLLECTION SYSTEM				
02756/1.2.1	Fabricator Drawings	15	Before delivery	
02756/1.2.2	Installation Plan	15	Before installation	
02756/1.2.3	Manufacturer's Data	15	Before fabrication	
02756/1.2.4	Care and Repair Instructions	15		Before acceptance
02756/1.2.5	Material Properties	10	Before delivery	
02756/1.2.6	Certificate of Conformance	15		At time of delivery
02756/1.2.7	Deleted			
02756/1.2.8	Deleted			
02756/1.2.9	Placement of Drainage Gravel	15	Before Placement	

Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
CAST-IN-PLACE CONCRETE				
03300/1.2.1	Form Coating Materials	15	Before use	
03300/1.2.2	Certification of Ready Mixed Concrete Production Facilities	15	Before mixing	
03300/1.2.3	Certified Test Reports for Reinforcing Steel	15	Before delivery	
03300/1.2.4	Reinforcing Steel Fabricator Drawings	15	Before delivery	
03300/1.2.5	Block Diagram	15	Before installation of forms	
03300/1.2.6	Concrete Materials, Mix Design and Mix proportions	15	Before mixing	
03300/1.2.7	Cold Weather Concreting	15	Before placement	
03300/1.2.8	Curing Procedure	15	Before mixing	
03300/1.2.9	Certificate of Conformance	15		At time of delivery
VAULT AND BASIN CAST-IN-PLACE CONCRETE				
03301/1.2.1	Formwork	15	Before installation	
03301/1.2.2	Form Coating Materials	15	Before use	
03301/1.2.3	Certification of Ready Mixed Concrete Production Facilities	15	Before mixing	
03301/1.2.4	Laboratory Test Reports	15	Before delivery	

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Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
VAULT AND BASIN CAST-IN-PLACE CONCRETE (Continued)				
03301/1.2.5	Reinforcing Steel Fabricator Drawings	15	Before delivery	
03301/1.2.6	Manufacturer's Data	15	Before delivery	
03301/1.2.7	Certified Test Reports	15	Before delivery	
03301/1.2.8	Schedule for Concrete Placement	15	Before installation of forms	
03301/1.2.9	Mix Design	15	Before mixing	
03301/1.2.10	Mix Certification	15	Before mixing	
03301/1.2.11	Control Procedures for Batching	15	Before mixing	
03301/1.2.12	Certificate of Conformance	15		At time of delivery
03301/1.2.13	Construction Joints	15	Before installation of forms	
03301/1.2.14	Weather Protection During Placement	15	Before placement	
03301/1.2.15	Curing and Protection	15	Before placement	
03301/1.2.16	Pump Concrete	15	10 days before placing concrete	
03301/1.2.17	Methods for Controlling Heat of Hydration and Thermal Gradients	15	Before placement	

Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
VAULT AND BASIN CAST-IN-PLACE CONCRETE (Continued)				
03301/1.2.18	Air Leakage Test	15	Before test	
03301/1.2.19	Manufacturer's Data	15	Before delivery	
PRECAST PRESTRESSED CONCRETE SECTIONS				
03419/1.2.1	Fabricator Drawings	15	Before delivery	
03419/1.2.2	Records of Tests	15	Before mixing	
03419/1.2.3	Concrete Materials and Mix Design	15	Before mixing	
03419/1.2.4	Certification	15		At time of delivery
03419/1.2.5	Certification of Prestressed Concrete Production Facilities	15	Before fabrication	
03419/1.2.6	Manufacturer's Quality Assurance Plan	15	5 days after notice of award	
03419/1.2.7	Calculations	15	Before fabrication	
03419/1.2.8	Verification	15		Before delivery
03419/1.2.9	Certified Test Reports	15	Before installation	
METAL FABRICATIONS				
05500/1.2.1	Fabricator Drawings	15	Before fabrication	
05500/1.2.2	Certified Material Test Reports (CMTR)	15	Before delivery	
SPECIAL PROTECTIVE COATING				
09805/1.2.1	List of Materials	15	Before delivery	

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Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
PROTECTIVE COATING FOR CONCRETE VAULT INTERIOR				
09885/1.2.1	List of Materials	15	Before delivery	
09885/1.2.2	Certified Material Test Reports (CMTR)	15	Before delivery	
09885/1.2.3	Samples	15	Concurrent with CMTR	
09885/1.2.4	Certificate of Experience	15	Before notice to proceed	
INSTRUMENTATION				
13440/1.2.1	Approval Data	15	Before delivery	
13440/1.2.2	Certified Vendor Information (CVI)	15		Before acceptance
CHEMICAL PROCESS PIPING SYSTEMS				
15493/1.2.1	Certified Material Test Reports (CMTR)	15	Before delivery	
15493/1.2.2	Certificate of Conformance	15		At time of delivery
15493/1.2.3	Weld Identification Drawings	15	Before welding	
15493/1.2.4	Filler Material Control Procedure	15	Before fabrication	
15493/1.2.5	Welding Filler Metal	15	Before welding	
15493/1.2.6	Welding Procedures and Personnel	15	Before welding	
15493/1.2.7	NDE Personnel and Procedures	15	Before welding	
15493/3.1.5.2	Procedure for Disposal of flushing water	15	15 days before flushing	

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Submittal Number Record	Submittal Title	Quantity	Review and Approval	Review For
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CHEMICAL PROCESS PIPING SYSTEMS (Continued)

15493/3.2.3.2 Procedure for Disposal of hydrotest water 15 15 days before testing

HIGH VOLTAGE DISTRIBUTION (ABOVE 600-VOLT)

16300/1.2.1 Approval Data 15 Before delivery

16300/1.2.2 Certification Vendor Information (CVI) 15 Before acceptance

SERVICE AND DISTRIBUTION (600 VOLT AND BELOW)

16400/1.2.1 Approval Data 15 Before delivery

16400/1.2.2 Vendor Information 15 Before acceptance

CATHODIC PROTECTION

16640/1.2.1 Approval Data 15 Before delivery

16640/1.2.2 Certified Vendor Information (CVI) 15 Before acceptance

16640/1.2.3 Visual Examination Procedure 15 Before examination

16640/1.2.4 Manufacturer's Instructions 15 Before installation

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01310
PROGRESS SCHEDULES

PART 1 - GENERAL

- 1.1 REFERENCES: Not Used
- 1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.
- 1.2.1 Progress Schedules: Submit schedule required in Article 1.3.
- 1.2.2 CPM Project Schedule: Submit information required in Paragraph 1.4.2.
- 1.2.3 Initial Weekly Work Schedule: Submit schedule required in Article 1.5.
- 1.2.4 Subsequent Weekly Work Schedules: Submit schedules required in Article 1.5.
- 1.2.5 Start-Up Schedule: Submit schedule required in Article 1.6.
- 1.3 PROGRESS SCHEDULES
- 1.3.1 Schedule identified in Section 5 of Contract General Conditions shall be in accordance with following.
- 1.3.1.1 Prepare schedule, in form of horizontal bar chart of suitable scale, to show percentage of Work scheduled for completion at any time with separate bar for each activity. At end of each month or at end of other periods of time specified in Contract, Contractor shall prepare and submit 1 copy of chart showing actual progress at the end of period.
- 1.3.2 Provide subschedule to define critical portions of entire schedule.
- 1.3.3 Schedule shall include construction activities, progress milestones, and include, but not be limited to, following.
- 1.3.3.1 Phase I Activities
- a. Payment and Performance Bonds.
 - b. Mobilization.
 - c. Submittals.
 - d. Produce gravel diffusion material for installation under Catch Basin for Vaults 102, 103, 104, and 105.
 - e. Furnish HDPE liners, geotextiles and drainage nets for Vaults 102 and 103.

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- f. Furnish leachate collection sump liner and riser for Vaults 102 and 103.
 - g. Foundation excavation for Vaults 102, 103, 104, and 105.
 - h. Place diffusion barrier and asphalt overlay under catch basin for Vaults 102, 103, 104, and 105.
 - i. Form, install reinforcing steel, and place concrete for leachate sump foundation for Vaults 102 and 103.
 - j. Place leachate sump and 4 inch catch basin drainage pipe and encase in concrete for Vaults 102 and 103.
 - k. Form, install reinforcing steel and place concrete for catch basin for Vault 103.
 - l. Form, install reinforcing steel and place concrete for catch basin for Vault 103.
 - m. Install liner, geotextile, 4 inch perforated pipe, and gravel for Vaults 102 and 103.
 - n. Form, install reinforcing steel, and place concrete for floor of Vault 102.

1.3.3.2 Phase II Activities

- a. Furnish HDPE liners, geotextiles and drainage nets for Vaults 104 and 105.
- b. Furnish leachate collection sump liner and riser for Vaults 104 and 105.
- c. Form, install reinforcing steel, and place concrete for leachate sump foundation for Vaults 104 and 105.
- d. Place leachate sump and 4 inch catch basin drainage pipe and encase in concrete for Vaults 104 and 105.
- e. Form, install reinforcing steel and place concrete for catch basin for Vault 104.
- f. Form, install reinforcing steel, and place concrete for catch basin for Vault 105.
- g. Install liner, geotextile, 4 inch perforated pipe, and gravel for Vaults 104 and 105.
- h. Form, install reinforcing steel, and place concrete for floor of Vault 103.
- i. Form, install reinforcing steel, and place concrete for floor of Vault 104.

j. Form, install reinforcing steel, and place concrete for floor of Vault 105.

k. Form, install reinforcing steel, and place concrete for walls of Vault 102.

l. Form, install reinforcing steel and place concrete for walls of Vault 103.

1.3.3.3 Phase III Activities

a. Form, install reinforcing steel, and place concrete for walls of Vault 104.

b. Form, install reinforcing steel, and place concrete for walls of Vault 105.

c. Apply asphalt coating to interior of Vaults 102, 103, 104, and 105.

d. Install exterior drainage path for Vaults 102, 103, 104, and 105.

e. Produce gravel diffusion material necessary to complete backfill to elevation 650.5 for Vaults 102, 103, 104, and 105.

f. Place diffusion barrier and backfill around Vault 102 and one side of Vault 103 to top of walls.

g. Place diffusion barrier and backfill around Vault 103 and one side for Vault 104 to top of walls.

h. Furnish precast prestressed concrete cover blocks for Vaults 102 and 103.

i. Set precast, prestressed concrete cover blocks for Vaults 102 and 103.

j. Form, install reinforcing steel and place concrete for 4 excess water pits, vault pit and leachate pit for Vault 102 and 103.

k. Place concrete topping over cover block of Vaults 102 and 103.

l. Perform air leakage test of Vaults 102 and 103.

m. Install roof penetration risers for Vaults 102 and 103.

n. Produce gravel diffusion material for completion of all backfill on Vaults 1-2, 103, 104, and 105.

o. Place 3 feet of diffusion barrier and temporary protective geotextile over roofs of Vaults 102 and 103.

p. Furnish prefabricated pipe spools for piping to and over
Vaults 102 and 103.

q. Furnish prefabricated pipe spools for piping to and over
Vaults 104 and 105.

r. Install incased grout feed and excess water pipe lines from
tie-in point to Vault pit for Vaults 102 and 103 including piping extension
to future vaults.

s. Install encased excess water pipe over vault from Vault pit
to 4 excess water pits and leachate collection pit to excess water pit for
Vaults 102 and 103.

t. Furnish electrical and instrumentation materials required to
complete Vaults 102 and 103. Include electrical distribution transformer at
Vault 102 and cathodic protection materials for TGE and Vaults 101, 102 and
103.

u. Complete installation of cathodic protection for pipe at TGE
and Vault 101.

v. Install cathodic protection for pipe to Vault 102/103
including piping extension for future vaults.

w. Install power pole, transformers, and electrical service to
Manhole 104.

x. Install electrical service and equipment to Manhole 102A and
Vault 102. Include 225 KVA distribution transformer.

y. Install electrical service and equipment to Manhole 103A and
Vault 103.

z. Furnish electrical and instrumentation materials required to
complete Vaults 104 and 105. Include cathodic protection materials for
Vault 104/105.

aa. Install instrumentation for Vaults 102 and 103.

bb. Apply special protective coatings and identification
markings to Vault 102 and 103.

cc. Fabricate and install cast-in-place cover blocks for excess
water pits, leachate collection pit and vault pit for Vaults 102, 103, 104,
and 105.

dd. Fabricate and install drain seal assemblies, T-handle plugs
and guard rails for Vaults 102 and 103.

ee. Furnish precast prestressed concrete cover block for Vaults
104 and 105.

1.3.3.4 Phase IV Activities

- a. Place diffusion barrier and backfill around Vaults 104 and 105 to top of walls.
- b. Set precast, prestressed concrete cover blocks for Vaults 104 and 105.
- c. Form, install reinforcing steel and place concrete for 4 excess water pits, vault pit and leachate pit for Vaults 104 and 105.
- d. Place concrete topping over cover block of Vaults 104 and 105.
- e. Perform air leakage test on Vaults 104 and 105.
- f. Install roof penetration risers for Vaults 104 and 105.
- g. Place 3 feet of diffusion barrier and temporary protective geotextile over roofs of Vaults 104 and 105.
- h. Install encased grout feed and excess water pipe lines from tie-in point to Vault pit for Vaults 104 and 105 including piping extension to future vaults.
- i. Install encased excess water pipe over vault from vault pit to excess water pits and leachate collection pit to excess water pit for Vaults 104 and 105.
- j. Install cathodic protection for pipe to Vault 104/105 including piping extension for future vaults.
- k. Install electrical service and equipment from Manhole 105A to Vault 105 and Manhole 103A to Vault 104.
- l. Install instrumentation for Vaults 104 and 105.
- m. Apply special protective coatings and identification markings to Vaults 104 and 105.
- n. Fabricate and install drain seal assemblies, T-handle plugs and guard rails for Vaults 104 and 105.
- o. Deliver project record documents for Vaults 102, 103, 104, and 105.
- p. Demobilize.

1.3.4 Schedule shall show, as minimum, accumulated percentage of completion of each activity and total percentage of work completed as of last work day of each month.

1.3.4.1 Develop an "S" curve from percentage of total work figures and superimpose on the schedule.

1.3.4.2 Show dollar value or percent of total next to each activity shown on schedule. Figures will be basis for determining progress payments described in Section 01027.

1.3.5 Activities identified in Paragraph 1.3.3 shall include other construction, procurement, testing, and documentation necessary to complete activity.

1.4 CPM PROJECT SCHEDULE

1.4.1 The CPM Project Schedule provided as attachment to Contract Documents is a preliminary schedule developed by KEH and does not include all procurement, fabrication, and construction activities necessary to complete the Work.

1.4.1.1 Basis for preliminary schedule is engineering estimates and sufficient concrete forms, equipment, and manpower to allow concurrent construction of vaults.

1.4.1.2 Some activities may be performed during inclement weather. Protect work and use construction techniques necessary to continue with construction.

1.4.1.3 Preliminary schedule allows 10 days of unusually severe weather delays to critical path activities. If unusually severe weather delays work on critical path activities notify KEH immediately.

1.4.1.4 If allowance for unusually severe weather delays is exceeded, accelerate remaining activities required to complete Milestone 3 in time specified at no additional cost.

1.4.2 Submit following to assist in development of final CPM Project Schedule.

1.4.2.1 Estimated activity durations: Additional activity durations shall be in working days and in general, not exceed 20 days.

1.4.2.2 Identify work for each activity to be performed on single, double, or triple shift, and work to be done on 5, 6, or 7 day work week.

1.4.2.3 Identify illogical sequence and relationship of activities, including finish-to-start and finish-to-finish relationships to be completed during performance of Work.

1.4.2.4 Identify manhours, crew sizes, and durations for activities on preliminary CPM Project Schedule and revised activities proposed by Contractor.

1.4.3 Upon KEH and Contractor concurrence to final CPM Project Schedule, KEH will issue 5 copies to Contractor for his use. Contractor shall perform Work in accordance with CPM Project Schedule.

1.4.4 After approval of CPM Project Schedule, changes in method of operating and scheduling shall be given KEH in writing, stating reasons.

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Upon KEH approval of proposed changes, KEH will revise CPM Project Schedule and furnish Contractor with 5 copies.

1.4.5 ~~Due to funding limitations, KEH will issue notices to proceed for specific phases of work identified in Paragraph 1.3.3. Each phase includes activities necessary to support the critical path. Certain activities, not on critical path but on preliminary CPM, are scheduled to start before release of phase in which located. However, do not start activity until Notice to Proceed with that phase is issued.~~

1.5 WEEKLY WORK SCHEDULE

1.5.1 Prepare initial and subsequent detailed schedules of next week's work. Schedule shall include following as minimum.

1.5.1.1 Work description.

1.5.1.2 Location of work.

1.5.1.3 Work involving outages, overtime, weekends, etc.

1.6 START-UP SCHEDULE

1.6.1 Prepare schedule, in form of horizontal bar chart of suitable scale, to show activities conducted during first 60 calendar days after receipt of notice to proceed. Include procurement, submittals, and construction activities.

1.7 INTERFACE SCHEDULES

1.7.1 Prepare detailed interface schedules requested by KEH for complicated tasks that require detailed planning to assure timely completion or for detailed interface with other work.

1.8 REVISIONS TO SCHEDULES

1.8.1 Whenever KEH determines there are significant variances between actual and scheduled progress, endangering completion within Contract completion time, Contractor may be required to prepare and submit revised progress schedule and revised information for CPM Project Schedule.

1.8.2 Provide narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken, or proposed, and its effect, including effect of changes on schedules of separate contractors.

1.8.3 If Contractor fails to submit progress schedule specified in Paragraph 1.3.1 within prescribed time, or updated progress schedule and CPM information specified in Paragraph 1.8.1, within requested time, KEH may withhold approval of progress payments until time Contractor submits required progress schedule and CPM information.

1.9 Deleted

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01400
QUALITY ASSURANCE

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Submit finalized QAP which incorporates company name, personnel, and any other company specific information omitted during review of technical proposal. Provide in QAP any additional clarifications and/or revisions agreed upon by KEH during technical proposal review or Step 2 surveillance.

1.3 SPECIFIC CONTRACTOR QUALITY ASSURANCE PLAN (QAP) REQUIREMENTS

1.3.1 Have documented QAP in accordance with following criteria. If QAP is based on national standard, furnish matrix which cross-references plan with corresponding requirements listed below.

1.3.1.1 General: Elements of QAP include, but are not limited to, design, procurement, materials, fabrication, installation, inspection, testing, and following.

a. Provisions for special controls, processes, test equipment, tools, and skills to attain required quality, and description of methods to ensure quality is inherent in finished work.

b. Establish and maintain documented procedures and instructions defining inspection system to be used and records to be maintained.

c. Applicable subcontracted activities.

d. Planned contract activities whether performed on or off Hanford Site.

1.3.1.2 Authority and responsibility

a. Establish and document authority and responsibility of those in charge of quality assurance system. Persons performing quality functions shall have sufficient and well defined responsibility, authority, and organizational freedom to identify quality problems and to initiate, recommend, and provide solutions.

b. Address authority to stop work or to control further operations where conditions adverse to Contract and quality requirements are identified and immediate corrective actions are required.

c. Organizational structure and responsibility shall be such that quality achievement is verified by persons or organizations not directly responsible for performing the work. Individuals or organizations

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responsible for establishing and executing QAP may delegate work to others but shall retain responsibility.

d. Employ dedicated, full-time quality assurance individual to be onsite whenever work is in progress.

1.3.1.3 Design control: (Not applicable to Contract KEH-5162 [B714]).

1.3.1.4 Procurement control

a. Include or reference appropriate technical and quality requirements, including quality assurance records, in documents for procurement of items or services. Procurement documents shall require each subcontractor and supplier to have a QAP consistent with elements of this specification section which apply to their product or service. Procurement documents shall include inspection, testing, and acceptance requirements for each specific scope of work and requirements for monitoring/evaluation of sub-contractor/supplier performance. Procurement documents shall also include requirements for reporting and approving the disposition of nonconformances. QAP controls for specific contract activity are listed by specification section as follows:

1) All contract activities in the following specification sections and listed drawings require Procurement controls, which include the qualification of sub-contractor(s) and supplier(s). However, specific designation and criteria for materials that may be procured as "Commercial Grade Items" (CGIs) in the following specification sections and listed drawings are described in Appendix A to Section 01400. All fabrication assembly, inspection, testing and similar activities, whether performed on or off site, shall be controlled by contractor(s)/supplier(s) QAP(s) which meet applicable requirements of Section 01400 1.3.

Section 03301	Vault and Basin Cast-In-Place Concrete (Includes materials referenced in other sections and part of vault concrete structure)
Section 03419	Dowel Bar Splicer System (Embedments in cover panels for excess water pit reinforcing)
Section 09885	Protective Coating for Concrete Vault Interior
Section 15493	Chemical Process Piping Systems (M-25 pipe code materials and welding filler material used to weld M-25 pipe code materials outside confines of pits) (Guides, supports, and anchor materials for M-25 piping as shown on the Dwg H-2-77599,

Sh 1, Dwg H-2-78470, Sh 1 and 2, and welding filler material used to weld guides, supports, and anchors for M-25 piping outside confines of pits) M-31 pipe code materials.

Section 16400 Service and Distribution (600 Volt and Below) (Leak Detection Instrumentation and Interlocks)

Drawings See Appendix A

2) All contract activities in the following specification sections and listed drawings require procurement of commercially available materials, components or equipment. The procurement of these items can be accomplished using standard procurement practices which include procurement through commercially available sources. Contractor shall provide all other procurement controls except the qualification of suppliers. All other fabrication, assembly, inspection, testing, and similar activities whether performed on or off-site shall be controlled by contractor(s)/supplier(s) QAP(s) which meet the applicable requirements of Section 01400 1.3.

Section 02145	Diffusion Barrier
Section 02147	Diffusion Break
Section 02200	Earthwork
Section 02512	Hot-Laid Asphaltic Concrete Pavement
Section 02752	Leachate Collection Sump Liner
Section 02753	Exterior Drainage Path
Section 02755	Catch Basin Liners
Section 02756	Leachate Collection System
Section 03300	Cast-In-Place Concrete
Section 03419	Precast Prestressed Concrete Sections
Section 05500	Metal Fabrications (Other than materials, or components that are part of vault concrete structure)
Section 09805	Special Protective Coating
Section 13440	Instrumentation (Thermocouples)

Section 15493	Chemical Process Piping Systems
Section 16300	High Voltage Distribution (Above 600 Volt)
Section 16400	Service and Distribution (600 Volt and Below) (Other than leak Detection Instrumentation and Interlocks)
Section 16640	Cathodic Protection
Drawings	Drawings not included in CGI list

b. Provide for review of and changes to procurement documents to assure items or services meet specified requirements.

1.3.1.5 Document control: Provide procedures ensuring latest approved issue of Contract Documents are used for procurement, fabrication, assembly/installation, inspection, and testing.

1.3.1.6 Control of purchased items and services.

a. Selection of suppliers based on documented evaluation of capability to provide items or services in accordance with Contract requirements.

b. QAP shall provide for following.

1) Procurement source evaluation and selection based on supplier's technical and quality capabilities.

2) Supplier performance evaluations to include conducting of source inspections of work in progress to ensure compliance to purchase requirements.

1.3.1.7 Identification and control of items

a. Document receiving activities to ensure items meet purchase requirements, including identification and markings.

b. Items accepted at receipt inspection shall have identification maintained, segregation to prevent co-mingling of similar materials inspected to different technical requirements, and controls established to ensure only correct and acceptable items are available for fabrication and installation.

1.3.1.8 Control of processes: Control processes affecting quality of items or services. Perform special processes that control or verify quality, such as those used in heat treating, welding, nondestructive examination (NDE), and testing by qualified/certified personnel using approved procedures.

1.3.1.9 Inspection

a. Perform inspections specifically required by Contract Documents and sufficient additional inspections to ensure compliance with Contract requirements.

b. Document and review inspection for compliance with Contract Documents. Documented inspections shall report true physical/functional condition of inspected activity.

c. As minimum, prepare daily report and make available for review by KEH. Report shall provide sufficient detail to describe inspections and testing performed with applicable Contract requirements referenced and results and determination of inspections and tests shown.

d. Perform verification and inspection by qualified and certified persons other than those performing or directly supervising work being inspected.

e. Identify by written practice minimum requirements for qualification and certification of inspection and test personnel.

f. Persons designated as qualified and certified to perform inspections and tests shall be knowledgeable of QAP and appropriate Contract requirements.

g. Complete required examinations and inspections, and have documentation available for review before requesting overview inspection by KEH.

1.3.1.10 Test control: Ensure test procedures include and reference test objectives and provisions for ensuring prerequisites for each test have been met.

a. Test procedures shall identify applicable and adequate instrumentation is available and used, necessary monitoring is performed and suitable environmental conditions are maintained.

b. Instead of specially prepared written test procedures, appropriate sections of related documents such as ASTM methods, supplier manuals, and equipment maintenance instructions may be used.

1.3.1.11 Calibration of measurement and test equipment (M&TE)

a. Perform calibrations at specified intervals based upon type of equipment, required accuracy, and frequency of use.

b. Maintain records and mark equipment to show calibration status.

c. When M&TE is found to be out of calibration, specify means to identify its uses since last calibration and methods to reverify acceptability of items previously tested.

d. Standards used for M&TE calibration shall have accuracy verified directly by, or through precise comparison with legal standards traceable to the National Bureau of Standards or other recognized primary standards.

1.3.1.12 Handling, storing, and shipping: Handling, storing, cleaning, packing, shipping, and preserving items shall be controlled to prevent damage/loss and to minimize deterioration.

1.3.1.13 Inspection, test, and operation status

a. Identify status of inspection and test activities either on items or in documents traceable to items.

b. Specify authority for application and removal of tags, markings, labels, and stamps.

c. Document status of ongoing fabrication, installation, inspection, and testing and make available to KEH for review.

1.3.1.14 Control of nonconforming items

a. Provide for documenting and controlling nonconforming material, parts, components, or services. Address identification, documentation, segregation, review, recommended disposition types, and notification to affected organization.

b. Be responsible for prompt detection, identification, and documentation of nonconformances.

c. Require nonconformance dispositions of "use as is" or "repair" to have technical justifications delivered to KEH for approval before effecting disposition.

d. Deliver copies of nonconformance reports to KEH at time of initiation and closeout.

e. Identify items or materials not meeting specified requirements and control to prevent inadvertent use, shipment, or intermingling with acceptable materials or items.

f. Reinspect or retest deficient items or materials to same criteria originally applied.

g. Take corrective action to prevent reoccurrence on materials or items manufactured or procured, and extend to performance of suppliers.

1.3.1.15 Quality assurance records: Define, implement, and enforce records system with written procedures, instructions, or other documentation. Records shall be legible, accurate, complete, and identifiable to appropriate item or activity and protected against damage, deterioration, or loss.

1.3.1.16 Audits

a. Verify adequacy of QAP procedures, controls, instructions, and directions by audit, using documentation and requirements applicable to areas being audited.

b. Perform audits by personnel not having direct line responsibility in areas being audited.

c. Audits shall include examination to verify quality operations and documentation are in agreement with established requirements, and to assess results of previously identified corrective actions.

d. Make documented results of audits available to KEH for review.

1.3.2 KEH may review/audit Contractor compliance with QAP and the Contract Documents.

1.4 INSPECTING AND TESTING

1.4.1 In accordance with Section 19 of Contract General Conditions, perform following.

1.4.1.1 Compaction demonstration tests required in Section 02145, subparagraph 3.3.1.1.

1.4.1.2 Compaction demonstration tests required in Section 02200, subparagraph 3.3.1.2a.

1.4.1.3 Weld examinations and documentation required in Section 02752, Paragraph 2.3.1.

1.4.1.4 Pipe coating examination required in Section 02752, subparagraph 3.1.5.3.

1.4.1.5 Hydrostatic test required in Section 02752, Paragraph 3.2.1.

1.4.1.6 NDE required in Section 02752, Paragraph 3.2.2.

1.4.1.7 Final examination and acceptance required in Section 02753, Paragraph 3.3.1.

1.4.1.8 Liner seam and repair nondestructive testing required in Section 02755, Paragraph 3.3.1.

1.4.1.9 Liner seam destructive testing required in Section 02755, Paragraph 3.3.2.

1.4.1.10 Documentation required in Section 02755, Paragraph 3.3.3.

1.4.1.11 Final examination and acceptance required in Section 02755, Paragraph 3.3.4.

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1.4.1.12 Final examination and acceptance required in Section 02756, Paragraph 3.3.1.

1.4.1.13 Quarry aggregate testing required in Section 03301, Paragraph 1.3.5.

1.4.1.14 Aggregate testing required in Section 03301, subparagraphs 2.3.2.1 and 2.3.2.2.

1.4.1.15 Water testing required in Section 03301, subparagraph 2.3.2.3.

1.4.1.16 Cement testing required in Section 03301, subparagraph 2.3.2.4.

1.4.1.17 NDE required in Section 03301, Paragraph 3.2.4.

1.4.1.18 Visual weld examination required in Section 03301, Paragraph 3.3.3.

1.4.1.19 Vault hydrostatic and air leakage tests required in Section 03301, Paragraph 3.3.4.

1.4.1.20 Testing precast prestressed concrete sections required in Section 03419, Paragraphs 1.4.1 and 3.3.1.

1.4.1.21 Test cable assemblies required in Section 13440, Paragraph 3.2.1.

1.4.1.22 Survey piping systems required in Section 15493, subparagraph 3.1.2.6.

1.4.1.23 Perform holiday testing of coating materials required in Section 15493, subparagraph 3.1.6.4.

1.4.1.24 Perform NDE required in Section 15493, Paragraph 3.2.2.

1.4.1.25 Perform leak/pressure testing required in Section 15493, Paragraph 3.2.3.

1.4.1.26 Perform compressive strength of foam testing required in Section 15493, Paragraph 3.2.4.

1.4.1.27 Test equipment and wiring required in Section 16300, subparagraph 3.3.1.1.

1.4.1.28 Test equipment and wiring required in Section 16400, subparagraph 3.3.1.1.

1.4.1.29 Test wiring systems required in Section 16400, Paragraph 3.3.2.

1.4.1.30 Test sensing cable required in Section 16400, Paragraph 3.3.3.

1.4.1.31 Test mechanical integrity of conductors to pipe required in Section 16640, subparagraph 3.3.8.3

1.4.1.32 Test conductors for continuity required in Section 16640, subparagraph 3.4.1.1.

1.4.2 In accordance with Section 19 of Contract General Condition, KEH will perform following.

1.4.2.1 Sampling and testing required in Section 02145, Paragraph 3.5.2.

1.4.2.2 Soil compaction tests required in Section 02200, Paragraph 3.4.1.

1.4.2.3 Sampling and testing required in Section 02512, Paragraph 3.2.1.

1.4.2.4 Concrete testing required in Section 03300, Paragraph 3.3.1.

1.4.2.5 Reinforcement acceptance examination required in Section 03301, Paragraph 1.4.2.

1.4.2.6 Concrete testing required in Section 03301, Paragraph 3.3.1.

1.4.2.7 Concrete plant coefficient of variation and standard deviation results required in Section 03301, Paragraph 3.3.2.

1.4.2.8 Coating inspections and tests required in Section 09805, Paragraph 3.4.1, and Section 09885, Paragraph 3.4.1.

1.4.2.9 Witness specific inspection and witness points.

1.4.2.10 Perform final acceptance inspection.

1.4.2.11 DC overpotential test required in Section 16300, subparagraph 1.4.1.2.

1.4.3 Specific Inspection and Witness Points

1.4.3.1 Adhere to inspection points required. Ensure personnel have completed inspections of and approved portions of work in accordance with Contract requirements before notifying KEH.

a. Specific inspection and witness points are defined as follows.

1) Construction inspection (H): Required for witnessing of specific construction features, before further construction is allowed to proceed.

2) Receiving (R): Special items of fabrication, equipment, or material scheduled to be delivered to Project site or other designated location which require inspection upon arrival. Notify KEH within 4 hours after arrival of item.

3) Witness (W): Selected for inspection at option of KEH. Work may proceed upon verbal release by KEH or upon expiration of 1 hour beyond scheduled time of witness.

b. H, R and W designations apply to each Vault. Except where longer notification period is specified, notify KEH at least 4 working hours before each point for onsite work. For offsite work, notify KEH at least 3 working days before each required point.

1.4.3.2 H, R, and W points are listed in Article 1.7.

1.5 OPEN ITEM DEFICIENCY AND NONCONFORMANCE REPORTING

1.5.1 KEH utilizes open items deficiencies and nonconformance reports to document deviations from Contract requirements.

1.5.1.1 Open item deficiency: Documented on open items lists available from KEH on request. Can be corrected by Contractor without additional direction. Correction shall bring item into compliance with Contract requirements, using approved rework procedures or standards without violating application specifications, codes, or standards.

1.5.1.2 Nonconformance report: Documented on nonconformance report (NCR). NCR's document deviations from Contract requirements when characteristic, documentation, or procedure renders quality of item or activity unacceptable or indeterminate. Identified by blue NCR tag, or red construction hold tag. Hold tag prohibits movement, installation, processing or further fabrication of nonconforming items pending approval of NCR disposition. NCR tag identifies nonconformance but does not preclude movement, installation, processing, or further fabrication of item. No action shall be taken to correct or alter actual condition before receipt of approved disposition. Tags are not to be removed by anyone other than agency who applied tag.

1.5.2 Contractor shall ensure its organization is represented by individuals with sufficient authority to commit Contractor to corrective action requirements identified by KEH.

1.5.3 Open Item deficiencies and nonconformances reported during performance of Contract require resolution before completion and final payment.

1.6 WELDING AND NONDESTRUCTIVE TESTING (NDT) PROCEDURE AND PERSONNEL CERTIFICATION VERIFICATION

1.6.1 Perform welding and NDT activities by certified individuals using procedures in accordance with applicable Contract requirements.

1.6.2 Welding/NDT Procedure Review: Deliver welding procedure specifications with supporting documentation, including applicable procedure qualification records (PQRs) including laboratory test reports and NDT procedures for KEH review before start of activity and be available at Project site and place of fabrication for review.

1.6.3 Welder/NDT Personnel Certification Review

1.6.3.1 Deliver welder and NDT certifications for review before start of activity. Welder certifications shall include applicable documentation

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verifying maintenance of certification in accordance with applicable code. NDT certification shall include Contractor's written practice for qualification and certification of NDT personnel. Certifications shall be available at Project site and place of fabrication for review.

1.6.3.2 KEH reserves the right to revoke welder certifications or require recertification of welders who, in the opinion of KEH, are not producing acceptable welds.

1.6.3.3 Disqualification of welders or delays due to problems with welding/NDT procedures or personnel certifications will not be considered adequate reasons for adjusting Contract price or performance time.

1.6.4 Maintain welding/NDT records when required in Specification sections.

1.7 SCHEDULE OF HOLD, RECEIVING, AND WITNESS POINTS

SITWORK

Diffusion Barrier

Off-Site*

- H - All mixing of aggregate with hydrated lime
- H - All coating of gravel for diffusion barrier for the following areas:
 - a. Under concrete basin
 - b. Adjacent to vault/basin walls
 - c. On top of vault roof
 - d. Miscellaneous areas

On-Site

- H - All compaction demonstrations
- H - All backfill operations
- H - All placement of coated gravel

Diffusion Break

Off-Site

- H - All mixing of aggregate with hydrated lime
- H - All asphalt coating of aggregate for diffusion break for the following areas:
 - a. Under concrete basin
 - b. Adjacent to vault/basin walls
 - c. Miscellaneous areas

On-Site

- H - All compaction demonstration
- H - All placement of diffusion break

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Earthwork

- H - All compaction procedure demonstrations
- H - All backfill operations

Hot-Laid Asphaltic Concrete Pavement

- Off-Site
- H - Initial batching of hot-laid asphaltic concrete
- On-Site
- H - All placement of hot-laid asphaltic concrete

Leachate Collection Sump Liner

- Off-Site
- H - Initial welding
- W - Initial dye penetrant examination of welds
- H - All completed fabrication prior to release for shipping

- On-Site
- R - Arrival of sump liner
- R - Arrival of steel riser pipe
- R - Arrival of filler material
- H - Initial welding/bolting
- W - Initial dye penetrant examination
- H - All hydrostatic testing
- W - All Holiday testing
- H - Initial installation of riser
- W - Final installation of riser
- H - Initial installation of polypropylene pipe
- H - Initial bonding of polypropylene pipe

Exterior Drainage Path

- R - Arrival of material
- H - Initial installation of membranes
- H - All repair and replacement of membrane

Catch Basin Liners

- Off-Site*
- H - Initial manufacturing of liner
- H - All manufactured material sampling
- H - Initial crating of the liner
- On-Site
- R - Arrival of liner on-site
- W - All basin liner unrolling
- W - Initial leachate collection pipe installation
- H - Initial joint preparation of liner prior to weld
- H - Initial welding (bonding) of FML liner
- W - Initial installation of liner
- H - Prior to removal of weld seams for destructive testing

- H - All FML liner repairs
- W - Initial permanent anchoring of FML liner
- H - All testing of extrusion/fusion welds and repairs

Leachate Collection System

- R - Arrival of gravel
- R - Arrival of geotextile material
- R - Arrival of leachate collection pipe
- H - Initial unrolling of geotextile
- W - Initial installation of geotextile
- W - Initial temporary anchoring
- H - Initial installation of perforated pipe
- W - All backfilling for leachate drainage gravel
- W - All compaction of leachate drainage gravel
- W - Backfill and compaction of vent gravel
- W - Flushing of gas vent tube

CONCRETE

Cast-In-Place Concrete

- H - All concrete placements
- W - All concrete repair
- H - Prior to mixing all grout

Vault and Basin Cast-In-Place Concrete

Off-Site* or On-Site

- H - Initial batching of production concrete
- H - Initial rebar splicing and/or welding

On-Site

- R - Arrival of rebar
- H - Initial rebar splice and/or welding
- W - Initial installation of embedded items
- H - Initial waterstop welding
- H - All concrete placement
- H - All hydrostatic testing
- H - All air leakage testing

Pre-Cast Pre-Stressed Concrete Sections

Off-Site*

- H - Initial fabrication
- H - Initial welding of rebar (splicing)
- H - All concrete placement

On-Site

- R - Arrival of pre-cast sections
- W - All installations of pre-cast sections

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METALS

Metal Fabrications

- W - Initial welding
- W - Initial metal fabrication installations

FINISHES

Special Protective Coating

- R - Receipt of coating material
- H - Initial priming
- H - Initial coating application

Protective Coating for Concrete Vault Interior

- R - Receipt of coating material
- H - Initial priming
- H - Initial application of second coat
- H - Initial application of final coat
- H - All Repairs

SPECIAL CONSTRUCTION

Instrumentation

- Off-Site*
- H - Initial thermocouple installation in precast prestressed concrete sections
- H - All thermocouple testing
- On-Site
- R - Arrival of instrumentation assemblies
- W - Initial instrumentation installation
- H - All electrical testing
- H - Initial welding of thermocouple tree to flange

MECHANICAL

Chemical Process Piping System

- Off-Site*
- H - Initial welding
- H - Initial nondestructive testing
- W - All Pipe cleaning
- W - All flushing
- H - All leak pressure testing
- H - Initial M-25 pipe bending
- H - Initial bending of M-31 tubing
- On-Site
- W - All pipe cleaning
- R - Arrival of piping spools

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- H - Initial welding
- H - All fit-up inspection (tie-in welds)
- H - All root pass welding (tie-in welds)
- W - All flushing
- H - Initial nondestructive testing
- H - All leak/pressure testing
- W - All Holiday testing
- W - All polyurethane foam applications
- H - Initial bending of M-31 tubing
- H - Installation of M-31 pipe code materials

ELECTRICAL

High Voltage Distribution (Above 600 Volt)

- R - Arrival of cables
- R - Arrival of equipment
- W - All electrical splicing
- W - Initial underground installation of duct banks
- H - All electrical testing

Servicing and Distribution (600 Volt and Below)

- R - Arrival of equipment enclosures and annunciators
- W - All splicing
- H - All electrical testing of cables and wires
- W - Initial exothermic welding of ground grid
- H - Final closure of all electrical enclosures

Cathodic Protection

- R - Arrival of all equipment
- H - Initial exothermic welding
- W - Initial installation of equipment and enclosures
- H - All electrical testing
- H - Final closure of all electrical enclosures

*Off-site requires 3 working days notification

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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APPENDIX A

Commercial Grade Items Listing

For applicable work identified in 1.3.1.4 (a)(1)

The listed items by Specification Section or Drawing number are considered Commercial Grade Items (CGI) and the requirements for implementing as part of the QAP include

1. If an alternate or substitute item is requested, an evaluation will be performed by KEH to determine if the substitute item meets the design criteria or function.
2. Where determined necessary by the Contractor, source evaluation and selection shall be performed.
3. CGI shall be identified in purchase order by manufacturer's published product description code or standard reference or part number.
4. CGI shall be receipt inspected in accordance with specified criteria in Contract Documents and this Appendix to determine:
 - . Damage was not sustained during shipment.
 - . Item received was item ordered.
 - . Inspection and testing is accomplished, as required, to ensure conformance with manufacturer's published requirements and specific receipt inspection criteria.
 - . Documentation, as applicable to item, is received and is acceptable.
5. Testing/Verification as required by this Appendix.
6. Document required tests/verification using approved documentation forms in contractors QAP. Submit one copy of QAP documentation in accordance with Section 01720.

Only those items listed are considered CGI. All other items, components, and materials shall be procured in accordance with the Contractor's QAP which shall be consistent with applicable elements of Section 01400, Article 1.3 and requires Contractor to perform appropriate source evaluation and selection.

SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
B-714-C2 03301 2.1.1.1	ASTM A 615, Grade 60 Reinforcing Bar	1. Dimensions	1. Visual, scale	1 bar per bundle 100% of each CMTR
		2. Tensile strength/steel grade; 60,000 psi minimum	2. Document review of manufacturer's Material Certification with trace- ability to delivered material through tag on each bundle.	
		3. Identification	3. Visual, purchase order number on each tag.	100%
		4. Finish	4. Visual, deformities, detrimental surface imperfections. Rust, seam or mill scale are acceptable if the dimensions of hand wire brushed specimen meet the above requirements.	10% of bars in bundle
2.1.1.2	Tie Wire	1. Diameter: 16 gage; 0.06" minimum	1. Measure	Free end of each roll
		2. Material: Ferrous steel	2. Test: Strongly magnetic	Each roll
2.1.1.4	Mechanical Couplers	1. Dimensions: Inside diameter and length.	1. Measure and verify with manufacturer's data for each bar size.	10%
		2. Identification: Catalog number or color code.	2. Visual: Catalog number of color on each coupler for each bar size.	100%
		3. Tensile strength per 2.1.1.4, minimum of 75,000 psi.	3. Test: Send coupler to independent test laboratory for physical verification.	One coupler per heat or lot of material received

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
		4. Chemical composition per ASTM A 519 and tensile strength per 2.1.1.4, minimum 75,000 psi	3&4 Document review of manufacturer's Material Certification traceable to delivered material via marking on each coupler	100% of each CMTR
2.1.3	Waterstops	1. Dimensions: Thk $\pm 1/32"$ 2. Tensile strength (steel grade), ASTM A 36.	Visual and measure 2. Document review of manufacturer's Material Certification with traceability to delivered material through tag or mark number of each piece.	10% 100% of each CMTR
2.1.4.1 2.1.4.2 2.1.4.3	Concrete Curing	Thickness and material type	Visual, compliance with nominal requirements of ASTM C 171.	Roll
2.1.5	Bonding Agents	03301 - 2.1.5.1, 2.1.5.2 specified values.	Manufacturer's data and ASTM reference.	Lot
2.1.9	Neoprene Bearing Pad	1. Thickness: 1/2" to 1" $\pm 1/16"$ 2. Hardness: Shore A, 50 ± 5 points Shore A, 40 ± 5 points 3. Material: Color is black	Measure Durometer test Visual	Three random locations per sheet One random location per sheet 100% of each sheet
03419 2.1.8.3	DB-SAE-Dowel Bar Splicer System manufactured by Richmond Screw Anchor Company	1. Minimum yield strength of 60, psi	1. Perform tensile test in accordance with ASTM A 370	1 splicer connection per heat of material

SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
09885 2.1.1.1 and 2.1.1.2	Nokorode 705M Coating by Lion Oil Co. Naphtha/Mineral Spirits	2. Dimensions in accordance with ASTM A 615	2. Visual, scale	1 splicer connection per 10 splicer systems
		3. Spacing and height in accordance with ASTM A 615 Paragraph 7	3. Visual, scale	1 splicer connection per 10 splicer systems
		4. Weight of material in accordance with ASTM A 615 Paragraph 10.	4. Visual, weigh	1 splicer connection per 10 splicer systems
		1. Bears label showing product name, manufacturer's name, and batch number.	1. Ensure packages bear proper label. Ensure shelf life has not exceeded 18 mo.	Each container
		2. Percent of volatile and nonvolatile materials and percent of component parts of each type of material.	2. Document review to ensure percent volatile/nonvolatile and percent of components parts listed.	100% of all list of materials
		3. Component chemical analysis and physical properties for each lot number used.	3. Document review to ensure chemical and physical analysis reported for each lot.	100% of each CMTR
		Product bears label showing type of product.	Visual: Ensure container bears label indicating type of product.	Each container

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
16300 2.1.2.1	PVC Conduit	Dimensions: Per UL 651, Schedule 40	Measure diameter with caliper. Visual: Conduit marked with Schedule 40 or measure wall thickness with caliper.	10%
2.2.5	Manhole	Identification: ARCO concrete, Catalog Number 606-7. Material: Concrete. Configuration: As shown in manufacturer's catalog.	Visual: Gray color, masonry type material. Visual: Embedded channel, pulling eyes, ring, and cover.	100%
16400 2.1.1.1	Terminal Lugs	Identification: T&B Sta-Kon Material: Metal and plastic	Visual: Identification of manufacturer on lug. Visual: Insulated sleeve, ring, or space type.	10%
2.1.2.1	Rigid Steel Conduit	Dimensions: Per ANSI C80.1- 1983	Measure diameter with caliper Visual: Conduit marked rigid metal conduit or measure wall thickness with caliper.	10%
2.1.2.1	PVC Conduit	Dimensions: Per UL 651, Type II, Schedule 40.	Same as 16300, 2.1.2.1.	10%
2.1.2.2	Rigid Steel Conduit, PVC Coated	Dimensions: Per ANSI C80.1-1983 (Type A-40).	Measure diameter with caliper. Visual: Blue PVC coating over all without any voids. Measure wall thickness with caliper.	10%
2.1.2.1	KYNAR Conduit, Schedule 80	Identification: 3" long by 1" diameter nipple. Dimensions: Per manufacturer catalog data.	Measure diameter, wall thickness, and length with caliper.	10%

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
2.1.2.3	Conduit Fittings	Dimensions: Per ANSI C80.1-1983 and UL 651.	Measure diameter with caliper. Measure wall thickness with caliper. Visual: Blue PVC coating over all for PVC-coated fittings.	10%
2.1.2.5	Watertight Fittings	Dimensions: Per ANSI C80.1-1983 and UL 651.	Measure diameter with caliper. Measure wall thickness with caliper. Visual: Blue PVC coating over all for PVC-coated fittings.	10%
2.1.4	Leak Sensing and Locating Cable	Identification: Raychem, Tracetek Catalog No. TT300-MSJ. Configuration: As described in manufacturer's catalog.	Visual: Catalog number on shipping container	100%
2.1.4.1	Leak Sensing Cable Accessories	Identification: Raychem, Tracetek Catalog No. TT300-MJC, TT300-MET, and TT300-RPT.	Visual: Catalog number on shipping container.	10%
2.1.4.2				
2.1.4.3				
2.1.5	Wiremarkers	Material: Tubular plastic.	Visual: Tubular plastic white or ivory in color.	10%
2.1.6	Nameplates	Material: Phenolic.	Visual: Phenolic, white laminated to black core.	10%
2.1.8	Wire Pulling Compound	Identification: Manufacturer, Y-ER-EAS by Electro Compound Co. or Polywater by American Polywater Corp.	Visual: Description on container Y-ER-EAS or Polywater.	100%
2.1.9.2	Conduit Protection Tape	Identification: Manufacturer, 3M, Scotchrap No. 5. Material: Plastic, black.	Visual: Catalog number on container, Scotchrap No. 50.	10%

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
2.1.11	Duct Sealing Compound	Identification: Manufacturer, Porcelain Products "Sealex" or Kerite Co. "Kerite".	Visual: Description on container, "Sealex" or "Kerite".	100%
2.2.2.1	Terminal Blocks	Identification: Manufacturer, Marathon or Buchanan. Configuration: As shown in manufacturer's catalog.	Visual: Document review to ensure purchase order and items received agree.	10%
2.2.3	Annunciator	Identification: Manufacturer, Ronan X 12 Series or similar.	Visual: Manufacturer's type label on item. Visual: 56 light boxes, "Acknowledge" and "Test" buttons in cover, horn in cover. Document review to ensure purchase order and item received agree.	100%
H-2-77637	Terminal Box Detail 3, 4, 5, and 7	Identification: Manufacturer, Hoffmann Engr Co., Catalog Number as indicated on the Drawing.	Visual: Catalog number on item. Color: Gray outer, white interior panel.	100%
H-2-78503	Terminal Box Detail 3 and 7	Identification: Manufacturer, Hoffmann Engr Co., Catalog number as indicated on the Drawing.	Visual: Catalog number on item. Color: Gray outer, white interior panel.	100%
H-2-77638, Sh 1	Conduit Spacer	Identification: Manufacturer, Carlon. Material: Plastic.	Visual: Manufacturer's name on item or shipping container	10%
H-2-78504, Sh 1	Conduit Spacer	Identification: Manufacturer Material: Plastic.	Visual: Manufacturer's name on item or shipping container	10%

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
H-2-77638, Sh 1 H-2-78504, Sh 1	Cadweld Connectors (Note 12)	Identification: Manufacturer, Erico Products Inc. Cadweld. Material: Per manufacturer's catalog data.	Visual: Manufacturer's name on items or on shipping container	
H-2-77638, Sh 1 H-2-78504, Sh 1	Tube Clamps (Note 12)	Identification: Manufacturer, Unistrut Catalog No. P2014. Material electro-galvanized steel.	Visual catalog number on item or on shipping container.	10%
H-2-77638, Sh 3 H-2-77639, Sh 1 & 2 H-2-77640 H-2-78504, Sh 3 H-2-78505, Sh 1 & 2	Unistrut P1001 Channel	Identification: Manufacturer, Unistrut Catalog No. P1001 Material: Electro-galvanized steel.	Visual: Manufacturer's catalog number on item or tag.	10%
H-2-77638, Sh 3 H-2-78504, Sh 3	Pull Box Details 5 and 14 Elevation J and K	Identification: Manufacturer, Crouse-Hinds Catalog No. WJB181206. Material: Feraloy, Hot-dipped galvanized.	Visual: Manufacturer's catalog number on item or on shipping container. Color: Silver.	100%
H-2-77638, Sh 3 H-2-77639, sh 1 & 2 H-2-77640 H-2-78504, Sh 3 H-2-78505, Sh 1 & 2	Backplates	Identification: 12 gage minimum thickness, steel. Dimensions: As shown on the Drawings.	Visual: Manufacturer's catalog number on item or on shipping container. Color: Silver. Measure: Use caliper for thickness and tape for length and width.	100%

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
H-2-77639, Sh 1 & 2 H-2-78505, Sh 1 & 2	Transformer, 3 kVA	Identification: Rating, 240/480-240 V ac 3 kVA.	Visual: Rating, 240/480-12/240 V ac, 3 kVA.	100%
H-2-77639, Sh 1 & 2 H-2-78505, Sh 1 & 2	Instrument Pull Box I-PB-102-2&I-PB-103-2 I-PB-104-2&I-PB-105-2	Identification: Manufacturer, Crouse-Hinds Catalog No. WJB241208. Material: Veraloy, hot-dipped galvanized.	Visual: Manufacturer's catalog number on item or on shipping container. Color: Silver.	100%
H-2-77639, Sh 1 & 2. H-2-78505, Sh 1 & 2	Enclosure 16" by 12" by 6"	Identification: Manufacturer, Hoffmann Engr. Co. Catalog No. A-16H12ALP. Material: 14 gage steel.	Visual: Manufacturer's catalog number on item. Color: Gray out, white interior panel.	100%
H-2-77639, Sh 1 & 2 H-2-78505, Sh 1 & 2	Horn	Identification: Manufacturer, Edwards Catalog No. 876-N5.	Visual: Manufacturer's catalog number on item or on shipping container.	100%
H-2-77639, Sh 1 & 2 H-2-78505, Sh 1 & 2	Pilot Light	Identification: Manufacturer, Square D Co. Catalog No. 9001-KT-1R6. Red Lens.	Visual: Manufacturer's catalog number on shipping container, Red Lens	100%
H-2-77639, Sh 1 & 2 H-2-78505, Sh 1 & 2	Solid-State Relay	Identification: Manufacturer, B/W Controls Catalog No. 5200-HF2-N4. Inverse operation with electrode ckt monitor. Configuration: As shown on manufacturer's catalog data. Voltage: 120 V ac input. Operability: Contacts change state when energized and deenergized.	Visual: Manufacturer's catalog number on item agrees with purchase order. Test at receipt: Energize relay and verify contact change by use of a volt-ohmmeter. Deenergize and verify contacts return to shelf position. Perform test on all contacts.	100%

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
H-2-77639, Sh 1 & 2 H-2-78505, Sh 1 & 2	Fuse Block One Pole	Identification: Manufacturer, Gould-Shawmut Catalog No. 30311R. Configuration: As shown on manufacturer's catalog data.	Visual: Manufacturer's catalog number on item or on shipping container.	100%
H-2-77639, Sh 1 & 2 H-2-78505, Sh 1 & 2	Fuse	Identification: Manufacturer, Gould Shawmut Catalog No. ATMR20. Type: Cartridge, U Class CC 600 V ac, 20 amp. Dimensions: 1-1/2" by 13/32.	Visual: Manufacturer's catalog number on item. Data on item. Measure with caliper.	100%
H-2-77639, Sh 1 & 2 H-2-78505, Sh 1 & 2	Ground Clamp Connector	Identification: Manufacturer, Penn-Union Catalog No. GM-4. Material: Bronze bolt, nut and lockwasher, and clamp.	Visual: Manufacturer's catalog number on shipping container. Metal, yellowish in color.	100%
H-2-77640	Transformer 750 VA	Identification: Rating, 240/480-120/240 V ac, 750 VA	Visual: Rating, 240/480-120/240 V ac, 750 VA	100%
H-2-77640	Enclosure 10" by 8" by 4"	Identification: Manufacturer, Hoffmann Engr. Co., Catalog No. A-1008CHNF W/PNL A-10P8. Material: 14 gage steel.	Visual: Manufacturer's catalog number on item. Color: Gray out, white inside panel	100%
H-2-77640	Fuse Block 2 Pole	Identification: Manufacturer, Gould-Shawmut Catalog No. 30312R. Configuration: As shown on manufacturer's catalog data.	Visual: Manufacturer's catalog number on item or on shipping container.	100%

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
H-2-77640	Fuse	Identification: Manufacturer, Gould-Shawmut Catalog No. ATMR3. Type: Cartridge, U Class CC, 600 V ac, 3 amp. Dimensions: 1-1/2" by 13/32"	Visual: Manufacturer's catalog number on item. Measure with caliper.	100%
H-2-77641 H-2-78507	Wire Type 1	Identification: Marking on wire THHN or THHN/THWN or XHHW, 600 V ac, #12 AWG (in any order). Insulation: Thermoplastic, 600 V ac, Nylon jacket on Types THHN and THHN/THWN XHHW-no jacket. Conductor: Solid Copper.	Visual: Marking on wire, THHN, THHN/THWN, or XHHW, 600 V ac, #12 AWG. Visual Thermoplastic with nylon jacket on Types THHN and THHN/THWN, no jacket on Type XHHW. Visual: Solid copper.	10%
H-2-77641 H-2-78507	Wire Type 2	Identification: Manufacturer, Rockbestos Type: Tray Cable (TC) Firewall III, 600 V ac. Number of conductors: As shown on Drawings.	Visual: Marked Rockbestos, Type TC, Firewall III and number of conductors as shown on Drawings.	10%
H-2-77641 H-2-78507	Wire Type 3	Identification: Material: Uninsulated galvanized steel. Size: 5/8" diameter.	Visual: Uninsulated galvanized steel. Measure using tape.	10%
H-2-77638, Sh 1 H-2-78504, Sh 1	Grounding Conductor (Note 8)	Identification: Material: Uninsulated galvanized steel. Size: 5/8" diameter.	Visual: Uninsulated galvanized steel. Measure using tape.	10%

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SPEC/DWG REF	ITEM DESCRIPTION	ACCEPTABLE VALUE, CONDITION OR TOLERANCE	METHOD OF VERIFICATION	SAMPLE SIZE
H-2-77642, Sh 1	Cable Connectors J-LDK-KP-102-1 J-LDK-LP-01-2 J-LDK-LP-01-3	Identification: Manufac- turer, ITT-Cannon Catalog No. CA-3102E-14S-7P-F80 CA-3106F-14S-7S-F80 CA-3106F-14S-7P-FIP Configuration: As shown on manufacturer's catalog data.	Visual: Manufacturer's catalog number on item.	100%
H-2-77642, Sh 2	Cable Connector J-LDK-LP-103-1	Identification: Manufac- turer, ITT-Cannon Catalog No. CA-3101E-14S-7P-F80	Visual: Manufacturer's catalog number on item.	100%
H-2-78508, Sh 1 & 2	Cable Connector J-LDK-LP-104-1 J-LDK-LP-105-1	Visual: Manufacturer, ITT- Cannon Catalog No. CA-3101E-14S-UP-F80	Visual: Manufacturer's catalog number on item.	100%

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SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 National Fire Protection Association (NFPA)

NFPA 701-1977 Standard Methods of Fire Tests for Flame-Resistant Textiles and Films

1.1.1.2 Washington State Department of Transportation (WSDOT)

M41-10-88 Standard Specifications for Road, Bridge, and Municipal Construction

1.2 SUBMITTALS: Refer to Section 01300 for procedures.

1.2.1 Anchoring and Enclosure Methods: Submit methods proposed for anchoring portable structures and enclosing underfloor area to meet the requirements of this Section.

1.3 CONSTRUCTION FACILITIES

1.3.1 First Aid: Facilities are available at Building 2719EA in the 200 East Area to provide first line medical attention.

1.3.2 Operation and Storage Areas: Confine onsite operations, including storage of materials, to laydown area designated by KEH.

1.3.3 Disposal Site for Waste: Dispose of construction material, broken asphalt, and broken concrete at Central Landfill approximately 10 road miles from Project. Site is open only during regular working hours.

1.4 TEMPORARY UTILITIES

1.4.1 Water

1.4.1.1 Construction: Available from stand pipe located outside 200E perimeter fence adjacent to the Project site. Furnish hauling, dispensing, temporary piping and fittings approved by KEH for connection to water source. Remove temporary piping, hoses, fittings, and valves before final acceptance of the Work. Stand pipe valve is not freeze protected for cold weather use. Contractor shall provide protection when used in cold weather.

1.4.1.2 Drinking: Furnish adequate drinking water that meets health and safety requirements to employees.

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1.4.1.3 Hydrostatic testing

- a. Available from transportable grout equipment (TGE) site located approximately 1/4 mile west of Project inside protected area.
- b. Furnish temporary piping and fittings approved by KEH for connection to water source.
- c. Install valve on pipe outside protected area at fence line.
- d. Piping for fill and disposal shall not leak.
- e. Contact KEH 24 hours in advance of need of water.
- f. Route pipe on west side of berm and not across existing vaults.
- g. Constantly monitor filling and disposal activities to prevent damage such as washouts or flooding.
- h. Volume of water at TGE is approximately 250 gpm at 125 psi.
- i. Piping across roadways shall permit unrestricted vehicle passage. Construct necessary ramps.
- j. Dispose of water into storm sewer located approximately 3/8 mile west of vaults inside protected area. Prior to disposal of hydrotest water, the water used in the hydrostatic testing shall be analyzed (by others) for hazardous contamination prior to dumping into the storm sewer. If analysis shows hazardous contamination, an alternative waste plan will be implemented and approved by KEH.
- k. Remove temporary piping, hoses, fittings, and valves before final acceptance of the Work.

1.4.2 Electrical Power: Temporary power 480V ac, 3 phase, will be made available at existing electrical Manhole 103 located near site. Furnish power lines or cable extensions, including load centers, transformers, protective equipment, disconnect switches, and fixtures for 240-120V ac power. Temporary power tie-in to point of supply will be provided by KEH. Notify KEH 48 hours in advance of need. Remove temporary installations upon completion of construction.

1.4.3 Telephone

1.4.3.1 Telephone system is operated by General Telephone Company of the Northwest, Inc (GTE). Upon written request, KEH will arrange for telephone service at field offices of Contractor and subcontractors, if facilities are available. KEH will charge Contractor for installation and services in accordance with charge assessed by GTE. Charges will be determined on basis of published tariffs. Information on tariffs may be obtained from DOE's Site Services Contractor, office of the Manager of the Plant Telephone and Radio, Telephone 376-6322.

1.4.3.2 Charges will be deducted from payments due Contractor. Contractor and subcontractors may use provided telephones for long distance calls necessary to the Work. Calls shall be made by valid credit card and cost not charged to Site Services Contractor or KEH.

1.4.4 Sanitary Facilities: Furnish and service chemical or other approved sanitary toilets for use of employees. Facilities shall meet the requirements of KEH which are available upon request.

1.5 ACCESS ROADS AND PARKING AREAS

1.5.1 Access to Project site will be by existing grout perimeter access road having no load restrictions located outside 200 East Area.

1.5.2 Parking: Available in vicinity of the Project outside the Limited Area.

1.5.3 Off-Road Driving: Keep off-road driving to minimum. Vehicles driving off-road or to remote locations, shall carry a minimum 10 pound ABC dry chemical portable fire extinguisher, communications equipment consisting of 2-way radio or mobil phone (CB type radios are not acceptable), and shovel. Report fires immediately to nearest Hanford Patrol, telephone 373-1780, and Hanford Fire Department, telephone 373-1311, or emergency number 811.

1.5.4 Access road to Project site is graveled for all weather use. Maintain road from pavement to Project site, including snow removal, grading, and necessary gravel for duration of Contract.

1.6 TEMPORARY CONTROLS

1.6.1 Provide plug or cap on roof penetrations and leachate riser when installation is not in progress to prevent entry of dirt and other foreign material. Cap ends if work is not to be performed on penetration within 4 hours, or, if due to environmental conditions, debris, or water can enter.

1.6.2 Dust Control: Maintain work areas to prevent hazard or nuisance to others. Accomplish dust control by sprinkling or other methods approved by KEH. Repeat sprinkling at necessary intervals to keep disturbed area damp at all times. Keep sufficient equipment on the Project job to accomplish dust control as work proceeds and whenever dust nuisance or hazard occurs. No separate or direct payment will be made for dust control and cost shall be considered incidental to and included in contract price.

1.6.3 Temporary enclosures: Plastic sheeting materials, minimum 6.5 mils thick, used to form enclosures shall have fire retardant properties meeting the requirements of NFPA 701 for small and large scale fire tests. Acceptable manufacturers Winman Corporation, St. Cloud, Minnesota; Lancs Industries, Kirkland, Washington; and Protective Plastics, Inc, Greer, South Carolina.

1.6.4 Traffic Control: Temporary traffic control and barricades in accordance with WSDOT M41-10, Section 1-07.23(3).

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1.6.4.1 Provide 3 signs with directional arrows reading as follows.

- a. ~~GROUT CONSTRUCTION SITE~~
- b. GROUT SITE - CONSTRUCTION ONLY
- c. GROUT SITE - VISITORS

1.6.4.2 Vehicle travel

a. Slow moving equipment and wide loads shall not travel on Hanford Site roads during heavy traffic periods between 6:30 and 8:00 a.m., and 3:30 and 5:30 p.m.

- b. Do not block existing roads with equipment or vehicles.
- c. Do not park on roadway shoulders.

1.6.4.3 Oversized vehicles and loads

a. Permits specified in Section 01065 are required for vehicles or loads exceeding following dimensions.

- 1) Width: 8'-6".
- 2) Height: 14 feet.
- 3) Length: Single unit, 40 feet.
Single trailing unit, 48 feet.

b. Additional requirements for vehicles and loads exceeding 8'-6" width.

1) Display oversize load sign on front of towing vehicle and rear of trailing unit.

- 2) Attach red flags to each corner.
- 3) Notify KEH 5 days before moving loads.

4) Travel between 9:00 a.m. and 2:30 p.m. unless special arrangements are made.

c. Escort vehicle requirements

1) Equip with oversize load signs and amber lights.

2) Vehicles or loads over 10 feet wide: Provide escort cars in front and rear on 2 lane highways.

3) Vehicles or loads over 14 feet wide: Provide escort car in rear on multiple lane highways.

4) Vehicles or loads over 20 feet wide: Provide escort cars in front and rear on multiple lane undivided highways.

d. Electrical escort requirements: KEH will provide qualified electrical escort when load reaches height of 14 feet or more from road surface, or when clearance of at least 6 feet cannot be maintained from overhead electrical or signal lines. Notify KEH 48 hours in advance of escort need.

1.7 FIELD OFFICE

1.7.1 Establish a field office equipped and staffed to conduct the Work. Keep copies of Drawings, Specifications, and other information pertinent to the Work at office. KEH shall have access to documents at all times. Telephone service will be made available at field office as set forth in Paragraph 1.4.3 providing service is available. Contractor may utilize existing telephones at buildings designated by KEH for local calls.

1.7.2 Anchor or tie down portable or relocatable structures, including trailers for field offices and storage, to prevent overturning or lateral movement in winds up to 70 mph, and enclose or skirt underfloor area with material that will not burn or support combustion to prevent accumulation of wind-blown debris and use of underfloor space for material storage. Complete anchoring and enclosing within 14 days of arrival onsite.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 01630

PRODUCT OPTION AND SUBSTITUTION

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.3 GENERAL

1.3.1 Products include material, equipment and systems and shall meet the requirements of the Specifications and referenced standards.

1.3.2 Material and workmanship shall meet requirements of Section 13 of the Contract General Conditions.

1.3.3 Components required to be supplied in quantity within Specification sections shall be the same and be interchangeable.

1.3.4 Do not use materials and equipment removed from existing structure, except as specifically required, or allowed, by Contract Documents.

1.4 PROCEDURES

1.4.1 Submittal of Substitution Approval Request Form 1151.00, sample appended, not required when product is specified by reference standards or by description and proposed product meets the standards.

1.4.2 Submittal of Form 1151.00 required when product is specified by naming models of 1 or more manufacturers and product not named.

1.4.3 Limitations on Substitutions

1.4.3.1 Substitutions will not be considered when indicated or implied on fabricator drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.

1.4.3.2 Substitute products shall not be ordered or installed without written acceptance.

1.4.3.3 Only 1 request for substitution for each product will be considered. When substitution is not accepted, provide specified product.

1.4.3.4 KEH will determine acceptability of substitutions based on technical requirements and cost related to substitution incurred by KEH.

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1.4.4 Requests for Substitutions

1.4.4.1 ~~Submit separate request for each substitution using Form KEH 1151.00.~~ Document request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.

1.4.4.2 Identify product by Specification Section and Article or Paragraph numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.

1.4.4.3 Attach as minimum product data specified in Section 13 of the Contract General Conditions.

1.4.4.4 Give itemized comparison of proposed substitution with specified product, listing variations, and reference to Specification Section and Article or Paragraph numbers.

1.4.4.5 Give quality and performance comparison between proposed substitution and specified product.

1.4.4.6 List availability of maintenance services and replacement materials.

1.4.4.7 State effect of substitution on construction schedule, and changes required in other work or products. If substituted product requires or necessitates revisions to structures, foundations, footings, services, systems, piping, electrical, etc, cost of engineering and construction shall be borne by Contractor. Contractor shall submit for approval drawings, calculations, and vendor data which clearly show revisions to accommodate substitution.

1.4.5 Contractor Representation

1.4.5.1 Request for substitution constitutes representation that Contractor has investigated proposed product and has determined it is equal to or superior to specified product.

1.4.5.2 Contractor shall provide same warranty for substitution as for specified product.

1.4.5.3 Contractor shall coordinate installation of accepted substitute, making changes required for work to be completed.

1.4.5.4 Contractor waives claims for additional costs related to substitution which may later become apparent.

1.4.5.5 Contractor waives claim for additional performance time resulting from product substitution.

1.4.6 Submittal

1.4.6.1 Submit 10 copies of request for substitution.

1.4.6.2 KEH will review Contractor's request for substitutions with reasonable promptness.

1.4.6.3 For accepted products, submit fabricator drawings, product data, and samples required in Section 01300.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

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From (Contractor) _____ Contract No. _____

Project _____

Description of Proposed Substitution _____

We hereby submit for consideration the following product instead of specified item for above project:

Specification No. _____ Section _____

Drawing No. _____ Section or Zone _____

Specified Item _____

Proposed Substitution _____

Attach complete technical data, including laboratory tests and samples, as applicable.

Provide detailed comparison of the significant qualities (system performance, interface requirements, size weight, durability, performance and similar characteristics, and including visual effect where applicable) for the proposed substitution of comparison with the original requirements.

Describe other changes to drawings and specifications required by proposal as outlined below and attach additional information as necessary.

Complete Each Item

A. Changes to drawing dimensions: _____

B. Effect of substitution on other systems _____

C. Outline differences between proposed substitution and specified item _____

D. Manufacturer's guarantees of proposed and specified items are:

_____ Same _____ Different (explain on attachment)

Undersigned attests function, and quality equality equivalent or superior to specified item and has reviewed General Conditions paragraph GC-13 for assignment of responsibility if the substitution is approved.

Submitted By

Signature

Address

Date

Phone

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SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 REFERENCES: Not Used

1.2 SUBMITTALS: Not Used

1.3 RECORD REQUIREMENTS

1.3.1 The nature of work at the Hanford Site requires certain documents, defined herein, be held to record construction process and administration of the Contract. KEH will assemble pertinent data for final disposition. Contractor shall prepare, preserve, and deliver project record documents to KEH required by this Contract. Documents are in addition to submittals required in Section 01300.

1.3.2 Mark project record documents to identify copies for record and to prevent use for construction. Keep record copies of construction documents in field office and make available to KEH during the progress of the Work.

1.3.3 Data required during course of construction shall be delivered to KEH and copies retained to be assembled after completion of construction of each vault structure.

1.3.4 Vault record documents, noted in Paragraph 1.4.6, shall be organized by Specification section, folded to 8-1/2 by 11 inch size, boxed, and delivered 10 days after completion of each vault. List documents included and missing in letter of transmittal.

1.4 PROJECT RECORD DOCUMENTS

1.4.1 General: Documents required for project records are itemized herein. Identify complete documents by Title or Number and segregated by each vault. Notes or markings added by hand shall be legible utilizing permanent nonsmearing marking media, such as ink or felt tip markers, in contrasting color.

1.4.2 Contract Documents: Keep 1 set in field office, apart from documents used in construction, and maintain in clean, dry, and legible condition. Legibly mark items to record actual construction, including changes to dimensions and details, manufacturer's name, catalog number, and substitute products.

1.4.3 Certified Payrolls: Each week deliver certified payrolls, required by Section 108 of the Contract General Conditions, to KEH. Progress payments will not be processed unless certified payrolls for work period have been received by KEH.

1.4.4 Daily Force and Equipment Report: Before noon each day, furnish KEH 1 copy of detailed daily force report covering labor and supervision of

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Contractor and each lower tier contractor for previous day. Report shall include general description of work performed and list major items of equipment onsite.

1.4.5 Weekly Manpower Report: Complete weekly manpower reports daily and submit weekly, before 10:00 a.m. on Monday for previous week, during performance period of the Contract. Forms will be furnished by KEH.

1.4.6 Vault Record Documents

1.4.6.1 Survey notes: Deliver notes, specified in Section 01050, to KEH.

1.4.6.2 Quality record: Deliver documents generated in accordance with Quality Assurance Plan required in Section 01400.

1.4.6.3 Soil compaction procedure: Retain Form KEH-382 completed for work required in Sections 02145 and 02200.

1.4.6.4 Backfill permit: Retain backfill permits approved for work required in Section 02200.

1.4.6.5 Soil tests: If Contractor elects to test any soil or to have independent test performed, copies of tests shall be given to KEH.

1.4.6.6 Water disposal procedure: Deliver approved procedure for disposal of water used for testing and flushing required in Section 02752, subparagraph 3.2.1.1 and Section 15493, subparagraphs 3.1.5.2a and 3.2.3.2a.

1.4.6.7 Leak/pressure testing: Provide documentation that testing required in Sections 02752 and 15493 were accomplished.

1.4.6.8 NDE documentation: Provide records of NDE required by Section 02752 subparagraph 2.3.1.4, and Section 15493 subparagraph 3.2.2.8.

1.4.6.9 Manufacturers certificate: Deliver certificate required in Section 02756, Paragraph 1.3.2.

1.4.6.10 Record drawings: Deliver drawings required in Section 02756, Paragraph 3.3.1.

1.4.6.11 Weld identification: Deliver map required in Section 03301, subparagraph 3.2.1.5.

1.4.6.12 Pour slips: After obtaining KEH approval of concrete pour slip required in Sections 03300 and 03301, give copy to KEH.

1.4.6.13 Trip tickets: Deliver to KEH with each truck load of concrete required in Sections 03300 and 03301 and retain Contractor copy until Contract closeout.

1.4.6.14 Concrete tests: If Contractor elects to test concrete or to have independent tests performed, copies of tests shall be given to KEH.

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1.4.6.15 Weld examination documentation: Provide records of visual examination required in Section 03301, Paragraph 3.3.3.

1.4.6.16 Documentation: Provide documentation required in Section 03301, Paragraph 3.3.5.

1.4.6.17 Test results: Deliver test results required in Section 13440, Paragraph 3.2.1, and 3.2.2; Section 15493, Paragraph 3.2.4; Section 16300, Paragraph 3.3.1; and Section 16640, Paragraph 3.4.1.

1.4.6.18 Test results and tabulations: Deliver test results and tabulations required in Section 16400, Article 3.3.

1.4.6.19 Product samples and manufacturer's instructions: In addition to submittal required in Section 01300 and requirements of this Section, information received by Contractor from suppliers that can document products used and how they were installed shall be forwarded to KEH for Project Records.

1.4.6.20 Pipe bend wall thickness measurements: Provide records of measurements required in Section 15493, subparagraph 3.1.1.4.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 02145
DIFFUSION BARRIER

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American Society for Testing and Materials (ASTM)

C 136-84a	Standard Method for Sieve Analysis of Fine and Coarse Aggregates
C 207-79	Standard Specification for Hydrated Lime for Masonry Purposes
C 294-86	Standard Descriptive Nomenclature for Constituents of Natural Mineral Aggregates
C 295-85	Standard Practice for Petrographic Examination of Aggregates for Concrete
C 977-88	Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
D 8-88	Standard Definitions of Terms Relating to Materials for Roads and Pavements
D 242-85	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
D 1117-80	Standard Methods of Testing Nonwoven Fabrics
D 1664-80 (1985)	Standard Test Method for Coating and Stripping of Bitumen-Aggregate Mixtures
D 1682-64 (1975)	Standard Test Methods for Breaking Load and Elongation of Textile Fabrics

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D 1777-64 (1975)	Standard Method for Measuring Thickness for Textile Materials
D 3776-85	Standard Test Methods for Mass Per Unit Area (Weight) of Woven Fabric
D 3787-80a	Standard Test Method for Bursting Strength of Knitted Goods--Constant-Rate-of-Traverse (CRT) Ball Burst Test
D 4491-85	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D 4751-87	Standard Test Method for Determining Apparent Opening Size of a Geotextile

- 1.1.1.2 Washington State Department of Transportation (WSDOT)
- | | |
|---------------|--|
| M41-01(CN)-87 | Construction Manual |
| M41-10-88 | Standard Specifications for Road, Bridge, and Municipal Construction |
| M46-01-88 | Materials Branch Laboratory Manual |
- 1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.
- 1.2.1 Laboratory Reports: Submit reports from independent laboratory showing following.
- 1.2.1.1 Proposed aggregate source will produce gravel classified as igneous or metamorphic rock in accordance with ASTM C 294. Examine aggregate in accordance with ASTM C 295.
- 1.2.1.2 Aggregate meets the requirements of Paragraph 2.1.1.
- 1.2.1.3 Liquid asphalt meeting the requirements of Paragraph 2.1.2.
- 1.2.1.4 Anti-stripping additive meeting the requirements of Paragraph 2.1.3.
- 1.2.2 Manufacturer's Data: Provide data defining physical properties of geotextile filtration and reinforcing fabrics to be supplied. As minimum, properties shall meet requirements of specified ASTM standards listed in Paragraph 2.1.4.
- 1.2.3 Handling Procedure: Submit proposed procedure defining methods used for delivering, storing, and handling to ensure requirements of

Paragraphs 1.3.1 and 3.3.1 are met. Include method for keeping coated gravel free of dirt or foreign material.

1.2.4 Placing Procedure: Submit proposed procedure defining methods used during placing and spreading to ensure requirements of Paragraph 3.3.1 are met. Include method for keeping coated gravel free of dirt or foreign material, and type and size of equipment used.

1.2.5 Compacting Procedures: Submit proposed procedures for compacting, including type and size of equipment. Include 3 separate procedures for placement under concrete basin, adjacent to vault walls, and over vault roof.

1.2.6 Geotextile Installation Procedure: Submit proposed procedure for installing geotextile as shown on the Drawings. Include placement and removal techniques of temporary protective geotextile to minimize contamination of coated gravel.

1.2.7 Log for Diffusion Barrier Placement: Submit log delineating approximate placed location and limits of each load including lift thickness. Traceability shall be tied to each batched or trucked unit of mix as delivered to Site and noted on log.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Diffusion Barrier Aggregate

1.3.1.1 Construct stockpiles in accordance with WSDOT M41-10, Section 3-02.2(6).

1.3.1.2 Remove aggregate from stockpiles in accordance with WSDOT M41-10, Section 3-02.2(7).

1.3.1.3 Mix and age aggregate, 48 hours minimum, in stockpile after treatment with anti-stripping additive in accordance with Article 2.2. Treated aggregate mixtures stored over 21 days after treatment will be examined by KEH for retreatment before use in diffusion barrier.

1.3.1.4 Hauling equipment shall meet the requirements of WSDOT M41-10, Section 5-04.3(2) with additional requirement that asphalt coated gravel be covered during transportation.

1.3.2 Geotextile

1.3.2.1 During shipment and storage, wrap geotextile in heavy-duty protective covering to prevent damage and exposure to ultraviolet light. Examine geotextile delivered to Site for damage. Set damaged geotextile aside and do not use. Removal of material identification labels from rolls will be by KEH only.

1.3.2.2 Store geotextile materials in original unopened packaging. Storage area shall protect geotextile from mud, soil, dust, debris, ultraviolet light, heavy winds, temperature extremes, and precipitation.

1.3.2.3 If geotextile is temporarily stored outdoors, place on pallet and protect from direct rays of sun under light colored heat-reflective opaque cover to provide free air flowing space between materials and cover.

1.3.2.4 Handle geotextile to ensure sound, undamaged condition.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Aggregate: Composed of crushed stone or gravel aggregates classified in ASTM C 294 as either igneous or metamorphic rocks, and meeting following requirements.

2.1.1.1 Aggregate production: In accordance with WSDOT M41-10, Section 3-01.

2.1.1.2 Grading and quality: In accordance with ASTM C 136.

a. Amounts finer than each laboratory sieve (square-openings), weight percent.

<u>Nominal Square Opening Sieve Size</u>	<u>Percent</u>
1 in.	100
3/4 in.	50 to 90
1/2 in.	20 to 55
3/8 in.	5 to 15
No. 4	0 to 5
No. 200	0 to 1

b. Deleterious materials: Particles of specific gravity less than 1.95, maximum 1 percent by weight.

c. Limits for fractured faces by percent weight: Minimum of 2 fractured faces on 75 percent and least 1 fractured face of 90 percent of material retained on 3/8 inch and above sieves, as determined by WSDOT Test Method No. 103.

2.1.2 Asphalt: Meeting requirements of WSDOT M41-10, Section 9-02.1(4) for AR-4000W liquid asphalt.

2.1.3 Anti-Stripping Additive

2.1.3.1 Diffusion barrier aggregate shall be treated with approved anti-stripping additive in accordance with Article 2.2. Requirement for use shall be determined by KEH based on temperature and pH modified ASTM D 1664 for each aggregate source.

2.1.3.2 Meet the requirements of ASTM D 242 for physical requirements, sampling, and testing.

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2.1.3.3 Shall be hydrated lime meeting chemical composition of ASTM C 207, Type N or S, or ASTM C 977 with a minimum 90 % passing the 200 sieve.

2.1.4 Nonwoven Geotextile: Long-chain synthetic polymer composed of polypropylene and contain stabilizers and inhibitors added to base plastic to make filaments resistant to deterioration due to ultraviolet and heat exposure. Geotextile shall be composed of continuous filaments held together through needle-punching. Edges of fabric shall be sealed or otherwise finished to prevent outer material from pulling away from fabric, or ravelling. Geotextile shall meet the following requirements.

<u>Property</u>	<u>Test Method</u>	<u>Values</u>
Fabric Weight (oz/sq yd, min)	ASTM D 3776	10
Thickness (mil, min)	ASTM D 1777	100
Grab Tensile Strength (lbs, min)	ASTM D 1682	300
Grab Elongation (% , min)	ASTM D 1682	30 in any principal direction
Coefficient of Water Permeability (Cm/sec, min)	ASTM D 4491	0.2
Puncture Strength (lbs, min)	ASTM D 3787	100
Tear Strength (lbs, min trapezoidal)	ASTM D 1117	100 in any principal direction
Apparent Opening Size (AOS), US Sieve	ASTM D 4751	70-140
Minimum Width (ft)	----	12

2.2 MIXES

2.2.1 Proportions

2.2.1.1 Size, grade, and quantity of materials, when proportioned and mixed shall produce mixture meeting following requirements.

a. Asphalt: Range from 2.5 to 3.0 percent by weight of total asphalt mixture. Determination of asphalt content will be in accordance with WSDOT Test Method No. 711.

b. Anti-stripping additive: 2.5 to 3 percent by weight of total dry aggregate mixture. Aggregate coating after mixing and aging in stock pile and before mixing with asphalt shall be adequate to meet the requirements of subparagraph 2.2.2.3.

c. Amount passing No. 200 sieve: 1 to 4 percent.

2.2.2 Mixing

2.2.2.1 Asphalt mixing plants: Meet the requirements of WSDOT M41-10, Section 5-04.3(1). Collect and reintroduce lime driven from aggregate during drying and heating in batch plant into product at mixing unit.

2.2.2.2 Remove aggregates from stockpiles to ensure minimum segregation when being moved to plant for processing into final mixture. Treat aggregates with anti-stripping additive in accordance with subparagraph 2.2.2.3, and store in accordance with subparagraph 1.3.1.3 before introduction to mixing process.

2.2.2.3 Anti-stripping additive: Lime treatment to meet 95 percent minimum coverage determined by visual examination. Mix lime, water, and aggregate thoroughly in pugmill or other approved mechanical mixer with the lime as specified in subparagraph 2.2.1.1(b) and water as 5 percent plus or minus 0.5 percent moisture by aggregate weight.

2.2.2.4 Heat aggregates to minimum of 260 and maximum 300 F for AR 4000.

2.2.2.5 Heat AR4000 asphalt to minimum 225 and maximum 290 F. Heat to avoid local overheating and provide continuous supply of material to mixer.

2.2.2.6 Wet mixing time: Sufficient to produce 95 percent coated particles as determined by WSDOT M46-01, Test Method No. 714.

2.2.2.7 Mix temperature not to exceed 325 F and controlled to limit drain down of asphalt.

2.2.2.8 Quantity of asphalt material shall not be reduced by quantity of anti-stripping additive.

2.2.2.9 Asphalt from each specific source or supplier shall not be blended or mixed with asphalt from other sources or suppliers.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Geotextile

3.1.1.1 Before work is started examine sheet rolls for damage from transit and storage. If damaged set aside and do not use.

3.1.1.2 During unrolling of material, visually examine surfaces. Do not use material showing defects or damage. Cut out and replace or patch defective or damaged areas.

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3.2 PREPARATION

3.2.1 Subgrade: Prepare subgrade in accordance with Section 02200, Paragraph 3.2.6, within 3 weeks before placing diffusion barrier.

3.3 INSTALLATION

3.3.1 Diffusion Barrier

3.3.1.1 Before placement, demonstrate to KEH by trial placement at Site, the procedure proposed for placing and compacting diffusion barrier. Prepare "Soil Compaction Procedure" Form KEH-382, sample appended, in accordance with printed instructions, for following areas. Forms will be furnished by KEH.

- a. Under concrete.
- b. Adjacent to vault/basin walls.
- c. On top of vault roof.
- d. Other areas requiring hand tampers or small compaction

equipment.

3.3.1.2 Keep surrounding area free of dust by watering during placing.

3.3.1.3 Stop placing and cover diffusion barrier gravel when average wind speed at Hanford weather station exceeds 25 mph or peak gusts exceed 40 mph.

3.3.1.4 Cover diffusion barrier at end of each shift, or when placement or compaction is not in progress.

3.3.1.5 Clean equipment used for hauling, placing, spreading, and compacting of dirt or gravel before handling diffusion barrier material.

3.3.1.6 Conveyers or other equipment used for placement shall not produce segregation or damage to coated gravel.

3.3.1.7 Hauling equipment shall not be allowed to be driven on diffusion barrier unless thoroughly cleaned.

3.3.1.8 Place coated gravel in layers not to exceed 6 inches nominal compacted measurement. Compact areas inaccessible to large compacting equipment by small vibratory mechanical compactors. Roll or compact until acceptable consolidation is achieved. KEH will determine type and number of passes required for particular compacting equipment used based on trial placement in subparagraph 3.3.1.1.

a. It is anticipated that desired compaction can be obtained with 6 passes of double-drum vibratory steel roller weighing at least 8 to 10 tons.

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b. Acceptable level of compaction shall be minimum of 65 percent of maximum density as determined by WSDOT Test Method 705.

~~c. Allow minimum of 4 to 12 hours interim or maximum material temperature of 140 F before placement of subsequent lifts of AR4000 mix.~~

d. Dual drive tandem wheel vibratory steel rollers are recommended.

3.3.1.9 Weather limitations for placing shall be in accordance with WSDOT M41-10, Section 5-04.3(16) except surface course shall be same as subsurface course for thickness more than 0.35 feet.

3.3.2 Geotextile

3.3.2.1 Lay to minimize tension, stress, folds, wrinkles, or creases, and to provide minimum 18 inch overlap for each joint.

3.3.2.2 Use bags of clean, washed gravel to secure material during installation. Do not use securing pins.

3.4 CONTAMINATED MATERIAL

3.4.1 Remove placed or stored material that has excess dirt or dust contamination, as determined by KEH.

3.5 FIELD QUALITY CONTROL

3.5.1 Verify placement and compaction of diffusion barrier and geotextile in accordance with Paragraph 1.2.7, and subparagraphs 3.3.1.1 and 3.3.1.8.

3.5.2 Sampling and testing of aggregate and coated gravel will be performed by KEH. Rolling and compaction requirements will be controlled based on subparagraph 3.3.1.8.

3.5.2.1 Basis of aggregate acceptance sampling shall be similar to WSDOT M41-01(CN), Section 9-5.4.

3.5.2.2 Assurance test acceptance shall be based on a running average of three acceptance tests for gradation prior to anti-stripping treatment.

3.5.3 KEH will examine equipment referenced in subparagraph 3.3.1.5 for cleanliness.

3.5.4 Samples

3.5.4.1 KEH will collect minimum 2 geotextile samples from different rolls, full roll width at least 5 foot long, from each lot.

3.5.4.2 KEH will observe stockpiled material before each day or partial days production of diffusion barrier material to verify lime coverage is in accordance with subparagraph 2.2.2.3.

3.5.4.3 KEH will collect minimum one mix acceptance test per 1000 ton or portion thereof in accordance with WSDOT M41-01(CN), Section 9-5.7.

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SOIL COMPACTION PROCEDURE

Project Number		Project Title				Date		
Contract Number		Procedure Number		Location of Demonstration				
A	REQUIREMENTS			EQUIPMENT DEMONSTRATED				
	Applicable Spec /Dwg			Type				
	Compaction Required _____ %			Manufacturer				
	Maximum Lift Size			Model				
LABORATORY SOIL TEST RESULTS								
B	<input type="checkbox"/> Non-granular Materials (WSDOT Test Method No 609)		<input type="checkbox"/> Granular Materials (WSDOT Test Method No 606-A)			<input type="checkbox"/> In-Situ		
	Maximum Density _____ Moisture % _____		<input type="checkbox"/> Density Chart Attached			Density _____		
COMPACTION DEMONSTRATION TEST RESULTS								
Formula for Percent Compaction: $\frac{\text{dry density}}{\text{max density}} \times 100 = \text{Percent Compaction}$								
No of Passes	Depth of Lift	Percent Moisture	lbs/ft ³ Dry	Maximum Density	Percent Compaction	Accept	Reject	
Observations or Comments								
TEST METHOD USED FOR DEMONSTRATION		<input type="checkbox"/> Nuclear Gage (ASTM D2922 & D3017)			<input type="checkbox"/> Other _____			
Contractor Representative						Date		
						Date		
Engineer/Constructor Inspector						Date		
						Date		

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INSTRUCTIONS

This Soil Compaction Procedure form, when approved by the Engineer/Constructor Inspector, documents witnessing and verifying the compaction procedure.

Section A is the responsibility of the Construction Contractor. It is to be completed at the time of backfill compaction demonstration and presented to the Engineer/Constructor Inspector.

Section B is completed by the Engineer/Constructor Inspector. Data entered is obtained from the agency or individual that performed testing.

Section C is completed by the Engineer/Constructor Inspector as the demonstration is performed. Using the applicable formula, the percent compaction achieved is determined and entered. Acceptance is based on the results as compared with the compaction percent required in Section A.

Section D is signed and dated by the Construction Contractor Representative acknowledging responsibility for this procedure and compliance thereto for applicable backfill operations. Section D is signed and dated by the Engineer/Constructor Inspector to signify witnessing and verification.

END OF SECTION

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SECTION 02147
DIFFUSION BREAK

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American Society for Testing and Materials (ASTM)

C 136-84a	Standard Method for Sieve Analysis of Fine and Coarse Aggregates
C 207-79 (1988)	Standard Specification for Hydrated Lime for Masonry Purposes
C 208-72 (1982)	Standard Specification for Insulating Board (Cellulosic Fiber), Structural and Decorative
C 294-86	Standard Descriptive Nomenclature for Constituents of Natural Mineral Aggregates
C 295-85	Standard Practice for Petrographic Examination of Aggregates for Concrete
C 977-88	Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
D 242-85	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
D 1664-80 (1985)	Standard Test Method for Coating and Stripping of Bitumen-Aggregate Mixtures
D 3381-83	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction

- 1.1.1.2 Washington State Department of Transportation (WSDOT)
M41-01(CN)-87 Construction Manual
M41-10-88 Standard Specification for
Road, Bridge, and Municipal
Construction
M46-01-88 Materials Branch Laboratory
Manual

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Laboratory Reports: Submit reports from independent laboratory showing following.

1.2.1.1 Proposed aggregate source will produce gravel classified as igneous or metamorphic rock in accordance with ASTM C 294. Examine aggregate in accordance with ASTM C 295.

1.2.1.2 Aggregate meets the requirements of Paragraph 2.1.1.

1.2.1.3 Liquid asphalt meeting the requirements of Paragraph 2.1.2 with submittal required for each delivered load.

1.2.1.4 Anti-stripping additive meeting the requirements of Paragraph 2.1.3.

1.2.2 Handling Procedure: Submit proposed procedure defining methods used for delivering, storing, and handling to ensure requirements of Paragraphs 1.3.1 and 3.3.1 are met.

1.2.3 Placing Procedure: Submit proposed procedure defining methods used during placing and spreading to ensure requirements of Paragraph 3.3.1 are met. Include type and size of equipment used.

1.2.4 Compacting Procedures: Submit proposed procedures for compacting, including type and size of equipment. Include separate procedures for placement under concrete basin and adjacent to walls.

1.2.5 Log for Diffusion Break Placement: Submit log delineating approximate placed location and limits of each load including lift thickness. Traceability shall be tied to each batched or trucked unit of mix as delivered to Site and noted on log.

1.2.6 Manufacturers Data: Submit manufacturers data which shall include, as a minimum, the material composition and insulating R value or thermal conductivity of the thermal board.

1.2.7 Installation Plan: Submit proposed procedure for methods of installing, attaching, joint laps and repair of damaged areas for thermal board.

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1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Diffusion Break Aggregate

1.3.1.1 Construct stockpiles in accordance with WSDOT M41-10, Section 3-02.2(6).

1.3.1.2 Remove aggregate from stockpiles in accordance with WSDOT M41-10, Section 3-02.2(7).

1.3.1.3 Mix and age aggregate, 48 hours minimum, in stockpile after treatment with anti-stripping additive in accordance with Article 2.2. Treated aggregate mixtures stored over 21 days after treatment will be examined by KEH for retreatment before use in diffusion break mix.

1.3.1.4 Handling equipment shall meet the requirements of Paragraph 3.3.1.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Aggregate: Composed of crushed stone or gravel aggregates classified in ASTM C 294 as either igneous or metamorphic rocks, and meeting following requirements.

2.1.1.1 Aggregate production: In accordance with WSDOT M41-10, Section 3-01.

2.1.1.2 Grading in accordance with ASTM C 136.

a. Amounts finer than each laboratory sieve (square-openings), weight percent.

<u>Nominal Square Opening Sieve Size</u>	<u>Aggregate Percent</u>	<u>Blended Percent</u>
5/8 in.	100	100
1/2 in.	92 to 100	92 to 100
3/8 in.	85 to 95	85 to 95
No. 4	65 to 75	65 to 75
No. 16	35 to 41	36 to 42
No. 30	25 to 31	27 to 33
No. 50	14 to 20	16 to 22
No. 200	3.5 to 7.5	6.0 to 10.5

b. Deleterious materials: Particles of specific gravity less than 1.95, maximum 1 percent by weight.

c. Limits for fractured faces by percent weight: Minimum of 2 fractured faces on 85 percent and at least 1 fractured face on 90 percent of material retained on No. 10 and above sieves, as determined by WSDOT M46-01 Test Method No. 103.

2.1.2 Asphalt: Meeting the requirements of ASTM D 3381, Grade AR-6000.

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2.1.3 Anti-Stripping Additive

2.1.3.1 Diffusion break aggregate shall be treated with anti-stripping additive in accordance with Article 2.2. Requirement for use shall be determined by KEH based on temperature and pH modified ASTM D 1664 for each aggregate source.

2.1.3.2 Meet the requirements of ASTM D 242 for physical requirements, sampling, and testing.

2.1.3.3 Hydrated lime meeting chemical composition of ASTM C 207, Type N or S, or ASTM C 977 with a minimum 90% passing the 200 sieve.

2.1.4 Thermal Board: Meeting the requirements of ASTM C 208, single or multi-ply, square edge, construction grade building board, minimum one surface with asphalt impregnated finish and maximum thermal conductivity of 0.38 Btu-in./ft² F at mean temperature of 75 F.

2.2 MIXES

2.2.1 Proportions

2.2.1.1 Size, grade, and quantity of materials, when proportioned and mixed shall produce mixture meeting following requirements.

a. Asphalt: 7.5 percent, plus or minus 0.5 percent by weight of total asphalt mixture. Determination of asphalt content will be in accordance with WSDOT Test Method No. 711.

b. Anti-stripping additive: 3 percent, plus or minus 0.25 percent by weight of total dry aggregate mixture. Aggregate coating after mixing and aging in stockpile and before mixing with asphalt shall be adequate to meet the requirements of subparagraph 2.2.2.4.

2.2.2 Mixing

2.2.2.1 Asphalt mixing plants: Meet the requirements of WSDQT M41-10, Section 5-04.3(1). Collect and reintroduce lime driven from aggregate during drying and heating in batch plant into product at mixing unit.

2.2.2.2 Remove aggregates from stockpiles to ensure minimum segregation when being moved to plant for processing into final mixture. Treat aggregates with anti-stripping additive in accordance with subparagraph 2.2.2.4 and store in accordance with subparagraph 1.3.1.3 before introduction to mixing process.

2.2.2.3 Heat aggregates to minimum of 250 F and maximum of 350 F.

2.2.2.4 Anti-stripping additive: Lime treatment to meet 95 percent minimum coverage determined by visual examination. Mix lime, water, and aggregate thoroughly in pugmill or other approved mechanical mixer with lime specified in subparagraph 2.2.1.1b and water as 5 percent, plus or minus 0.5 percent, moisture by aggregate weight.

2.2.2.5 Quantity of asphalt material shall not be reduced by quantity of anti-stripping additive.

2.2.2.6 Heat AR6000 asphalt to minimum 275 F and maximum 375 F. Heat to avoid local overheating and provide continuous supply of material to mixer.

2.2.2.7 Asphalt wet mixing time: Sufficient to produce 95 percent coated particles determined by WSDOT M46-01, Test Method No. 714.

2.2.2.8 Mix temperature: Not exceed 340 F at batch plant.

2.2.2.9 Mix temperature: Not less than 260 F at rear of laydown machine during placing.

2.2.2.10 Asphalt from each specific source or supplier shall not be blended or mixed with other asphalt sources or suppliers.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Initial placement of diffusion barrier: Verify existing surface is prepared in accordance with Section 02145.

3.1.2 Placement(s) of Diffusion Break: Check interface surfaces for cleanliness.

3.2 PREPARATION

3.2.1 Existing Surfaces: Prepare lift or layer interfaces in accordance with WSDOT M41-10, Section 5-04.3(5)A as directed by KEH.

3.3 INSTALLATION

3.3.1 Diffusion Break

3.3.1.1 Before placement demonstrate to KEH, by trial placement at site, procedure proposed for placing and compacting diffusion break. Prepare "Soil Compaction Procedure" Form KEH-382, sample appended, in accordance with printed instructions, for following areas. Forms will be furnished by KEH.

- a. Under concrete.
- b. Adjacent to vault/basin walls.
- c. Other areas requiring hand tampers or small compaction

equipment.

3.3.1.2 Keep surrounding area free of dust by watering during placing operation.

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3.3.1.3 Equipment used to mix, store, and place diffusion break shall be pre-heated before use to ~~minimum temperature required to achieve specified~~ mix, delivery, or placement temperatures.

3.3.1.4 Clean dirt or gravel from equipment used for hauling, placing, spreading, and compacting before handling diffusion break material.

3.3.1.5 Conveyors or other equipment used for placement or spreading shall not produce segregation or damage to material.

3.3.1.7 Compaction shall be only by dual drive, double drum vibratory roller except where hand or small compaction equipment is required for placement or compaction.

3.3.1.8 Compaction rolling shall be completed before cooling of in place mix to average lift mix temperature of 190 F.

3.3.1.9 Place diffusion break in layers not to exceed nominal 7 inches loose measurement unless approval of KEH is obtained. Compact areas inaccessible to large hauling equipment by small vibratory mechanical compactors. Roll or compact until acceptable consolidation is achieved. KEH will determine type and number of passes required for particular compacting equipment used based on trial placement in subparagraph 3.3.1.1.

a. It is anticipated that desired compaction can be obtained for design mix with 4 to 6 passes of double drum, vibratory steel roller weighing at least 8 to 10 tons.

b. Acceptable level of compaction shall be minimum 96 percent of maximum density determined by WSDOT M46-01 Test Method 705.

c. Longitudinal joints in diffusion break layers placed under the basin structure shall be offset a minimum of 6 inches from the layer immediately below.

3.3.1.10 Mixture load temperature at time of placement shall not vary more than 20 F from delivery temperature at vault site, except in those areas using hand placement methods the minimum temperature referenced in subparagraph 2.2.2.9 shall control.

3.3.1.11 Weather limitations for placing shall be in accordance with WSDOT M41-10, Section 5-04.3(16) except surface course shall be same as subsurface course for thickness more than 0.35 foot.

3.3.1.12 Hauling equipment shall meet the requirements of WSDOT M41-10, Section 5-04.3(2) with following additional requirements.

a. Hauling equipment shall be designed or equipped so that heat loss during transport of mix to placement site is less than 50 F from mixing temperature to delivery temperature.

b. Hauling equipment shall not be allowed to be driven on diffusion barrier or diffusion break unless thoroughly cleaned.

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c. Asphalt mix shall be covered during transportation.

3.3.2 Construction Requirements

3.3.2.1 Diffusion break placed in large areas shall be placed using asphalt paver.

a. Asphalt pavers shall be self-contained, power propelled units, provided with activated screed or strike-off assembly, heated and capable of spreading and finishing courses of mix material in widths applicable to section and thickness shown on the Drawings.

b. Screed and strike-off assembly shall effectively produce finished surface without tearing, shoving, or gouging mixture.

c. Bolt-on extensions over 1 foot in length on either side of paver shall have same equipment as rest of paver. Hydraulic extenders without screeds, augers, and vibration shall not be used except in irregular shaped and minor areas.

3.3.2.2 Hand placement or other approved methods of placing diffusion break shall be in manner to minimize segregation of material and raveling of surface. Segregated rocks on surface shall be collected and discarded from surface.

3.3.3 Thermal Board: Total thickness of layers shall be as specified on the Drawings. All joints of adjoining sheets shall be butted tightly and overlapped with subsequent layers, or covered with one thickness of additional board to seal joints. Corners and irregular surface treatments will be reviewed by KEH prior to placing diffusion material.

3.4 FIELD QUALITY CONTROL

3.4.1 Verify placement and compaction of diffusion break as specified in Paragraph 3.3.2 and subparagraph 3.3.1.1.

3.4.2 Sampling and testing of aggregate and diffusion break will be performed by KEH. Rolling and compaction requirements will be controlled based on subparagraph 3.3.1.9. Patching or repair materials shall be supplied by Contractor.

3.4.2.1 Basis of acceptance sampling shall be similar to WSDOT M41-01(CN), Section 9-5.4.

3.4.2.2 Assurance test acceptance shall be based on a running average of five acceptance tests for gradation prior to anti-stripping treatment.

3.4.3 KEH will examine equipment referenced in subparagraph 3.3.1.4 for cleanliness.

3.4.4 Samples

3.4.4.1 KEH will observe stockpiled material before each day or partial days production of diffusion break material to verify lime coverage is in accordance with subparagraph 2.2.2.4.

3.4.4.2 KEH will collect minimum one acceptance test per 1000 ton or portion thereof in accordance with WSDOT M41-01(CN), Section 9-5.7.

3.4.5 Verify installation, surface conformance, and joint details as specified in Paragraph 3.3.3.

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INSTRUCTIONS

This Soil Compaction Procedure form, when approved by the Engineer/Constructor Inspector, documents witnessing and verifying the compaction procedure.

Section A is the responsibility of the Construction Contractor. It is to be completed at the time of backfill compaction demonstration and presented to the Engineer/Constructor Inspector.

Section B is completed by the Engineer/Constructor Inspector. Data entered is obtained from the agency or individual that performed testing.

Section C is completed by the Engineer/Constructor Inspector as the demonstration is performed. Using the applicable formula, the percent compaction achieved is determined and entered. Acceptance is based on the results as compared with the compaction percent required in Section A.

Section D is signed and dated by the Construction Contractor Representative acknowledging responsibility for this procedure and compliance thereto for applicable backfill operations. Section D is signed and dated by the Engineer/Constructor Inspector to signify witnessing and verification.

END OF SECTION

KEH-0382 00R (03/89)

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SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 Washington State Department of Transportation (WSDOT)

M41-10-88

Standard Specifications for
Road, Bridge, and Municipal
Construction

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Method to Prevent Damage During Excavation: Submit procedure proposed to prevent overstressing existing structures or interrupting service to existing facilities.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 General: Obtain select soils from excavation or other designated locations. Obtain on-site approval for soils.

2.1.2 Structural Fill or Backfill: Well graded soil mixtures which may contain cobbles up to 3 inches in greatest dimension if uniformly distributed and not constituting more than 20 percent of volume of fill.

2.1.3 Plastic Sheet Marker: 6 inch wide nondetectable tape similar to "Terra Tape" manufactured by Griffolyn Co, Inc. Tape shall be imprinted with warning such as "Caution Buried Installation Below" at intervals of not more than 4 feet. Color code in accordance with the American Public Works Association uniform color code.

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Clearing and Grubbing: Clear debris and organic material from areas to be excavated and to be used for stockpile, and move to location designated by Operating Contractor.

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3.2 EXCAVATION

3.2.1 Before performing excavation, obtain excavation permit. Excavation permits will be furnished as set forth in Section 01065.

3.2.2 Locate and expose underground utilities by hand tools. Use of heavy equipment and machinery is subject to approval of KEH.

3.2.3 Shore excavations more than 4 feet deep and with sides sloped steeper than 1-1/2 horizontal to 1 vertical. Install shoring as excavation progresses and remove as backfilling is accomplished.

3.2.4 Store excavated material at stockpile area shown on the Drawings. Water stockpile to ensure dust control.

3.2.5 Wherever slopes of excavations will intersect existing underground lines or structures such as building foundations, underground piping, electrical ducts or direct buried electrical lines, install shoring or other means of support to prevent overstressing existing structure or underground lines or to prevent interrupting service to existing buildings.

3.2.6 Subgrade

3.2.6.1 Make excavations to depth shown on the Drawings. Make bottom of excavations, level, true, and free of loose material. Compact to 95 percent of maximum density before placing diffusion barrier.

3.2.6.2 If over-excavation occurs, correct by placement of backfill, compacted in accordance with subparagraph 3.3.1.2b.

3.2.6.3 Following excavation, moisten subgrade soil as required and proof roll with 2 passes of vibratory compaction equipment.

3.2.7 Existing Asphalt Pavement

3.2.7.1 Make vertical cut along rectangular lines of pavement to remain.

3.2.7.2 Remove and haul broken pavement to disposal site given in Section 01500.

3.3 INSTALLATION

3.3.1 Fill and Backfill

3.3.1.1 General

a. Backfill Permit: Do not start fill or backfill without approved permit as set forth in Section 01065.

b. Remove debris and organic matter from area to be filled or backfilled.

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c. Use only select materials for fill or backfill. Keep materials free of frozen particles, lumps, cobbles larger than 3 inches, organic matter and trash.

d. Do not place fill or backfill on frozen ground.

e. Filling or backfilling by sluicing or flooding with water will not be permitted.

f. Bring fill or backfill up evenly on sides of walls, structures and utility lines to avoid unbalanced loading.

g. Do not place fill or backfill against concrete structure or foundation wall less than 14 days after completion of structure or wall unless written permission from KEH is obtained.

3.3.1.2 Structural

a. Before placement of fill or backfill, demonstrate, to KEH by physical test at Site, that procedure proposed for installation and compaction of soils will provide degree of compaction specified. Prepare "Soil Compaction Procedure" Form KEH-382, sample appended, in accordance with printed instructions. Forms will be furnished by KEH.

b. Place backfill in accordance with WSDOT M41-10, Section 2-03.3(14)C, Method C.

c. Compaction control tests will be in accordance with WSDOT M41-10, Section 2-03.3(14)D.

3.3.2 Plastic Sheet Marker: Place continuous over buried utility lines. Place marker tape directly over line and 1 foot below finish grade. Place marker over each outside pipe of multiple lines. Place intermediate markers at maximum of 4 feet apart.

3.4 FIELD QUALITY CONTROL

3.4.1 Soil Compaction Tests: Sampling and testing of compacted fill and backfill will be performed by KEH.

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SOIL COMPACTION PROCEDURE

Project Number	Project Title	Date					
Contract Number	Procedure Number	Location of Demonstration					
REQUIREMENTS		EQUIPMENT DEMONSTRATED					
Applicable Spec./Dwg.	Type						
Compaction Required _____ %	Manufacturer						
Maximum Lift Size	Model						
LABORATORY SOIL TEST RESULTS							
<input type="checkbox"/> Non-granular Materials (WSDOT Test Method No. 609) <input type="checkbox"/> Granular Materials (WSDOT Test Method No. 606-A) <input type="checkbox"/> In-Situ Density _____ Maximum Density _____ Moisture % _____ <input type="checkbox"/> Density Chart Attached							
COMPACTION DEMONSTRATION TEST RESULTS							
Formula for Percent Compaction: $\frac{\text{dry density}}{\text{max density}} \times 100 = \text{Percent Compaction}$							
No. of Passes	Depth of Lift	Percent Moisture	Lbs/ft³ Dry	Maximum Density	Percent Compaction	Accept	Reject
Observations or Comments							
TEST METHOD USED FOR DEMONSTRATION <input type="checkbox"/> Nuclear Gage (ASTM D2922 & D3017) <input type="checkbox"/> Other _____							
Contractor Representative						Date	
Engineer/Constructor Inspector						Date	

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INSTRUCTIONS

This Soil Compaction Procedure form, when approved by the Engineer/Constructor Inspector, documents witnessing and verifying the compaction procedure.

Section A is the responsibility of the Construction Contractor. It is to be completed at the time of backfill compaction demonstration and presented to the Engineer/Constructor Inspector.

Section B is completed by the Engineer/Constructor Inspector. Data entered is obtained from the agency or individual that performed testing.

Section C is completed by the Engineer/Constructor Inspector as the demonstration is performed. Using the applicable formula, the percent compaction achieved is determined and entered. Acceptance is based on the results as compared with the compaction percent required in Section A.

Section D is signed and dated by the Construction Contractor Representative acknowledging responsibility for this procedure and compliance thereto for applicable backfill operations. Section D is signed and dated by the Engineer/Constructor Inspector to signify witnessing and verification.

END OF SECTION

KEH-0382.00R (03/89)

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SECTION 02512

HOT-LAID ASPHALTIC CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 Washington State Department of Transportation (WSDOT)
M41-10-88 Standard Specification for Road, Bridge, and Municipal Construction

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Laboratory Reports: Submit laboratory reports for following.

1.2.1.1 Asphalt: Showing that asphalt used in mix meets the requirements of AR-4000W in accordance with WSDOT M41-10, Section 9-02.1(4).

1.2.1.2 Asphalt concrete mix: Showing compliance with WSDOT M41-10, Sections 9-03.8(2) and 9-03.8(6). Include Rice density as established by WSDOT Method 705.

1.2.2 Handling and Placing Procedures: Submit procedure that defines methods to keep diffusion barrier free of dirt or foreign material during asphalt concrete pavement placement.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Asphalt: Meeting the requirements of WSDOT M41-10, Section 9-02.1(4). Grade of paving asphalt for use in asphaltic concrete mixture shall be AR-4000W.

2.1.2 Aggregate: Class "B" meeting the requirements of WSDOT M41-10, Section 9-03.8(1), (2), and (3)B.

2.1.3 Blending Sand: Meeting the requirements of WSDOT M41-10, Section 9-03.8(4).

2.1.4 Mineral Filler: Meeting the requirements of WSDOT M41-10, Section 9-03.8(5).

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2.2 MIXES

2.2.1 Proportioning of Asphalt Concrete Materials: Meeting the requirements of WSDOT M41-10, Section 9-03.8(6) Class "B" asphalt concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Construction: In accordance with following sections of WSDOT M41-10.

3.1.1.1 Asphalt mixing plants: Section 5-04.3(1).

3.1.1.2 Hauling equipment: Section 5-04.3(2).

3.1.1.3 Asphalt pavers: Section 5-04.3(3).

3.1.1.4 Rollers: Section 5-04.3(4).

3.1.1.5 Asphalt material heating: Section 5-04.3(6).

3.1.1.6 Aggregate preparation: Section 5-04.3(7).

3.1.1.7 Mixing: Section 5-04.3(8).

3.1.1.8 Spreading and finishing: Section 5-04.3(9).

3.1.1.9 Compaction: Section 5-04.3(10).

3.1.1.10 Diffusion barrier shall remain covered as specified in Section 02145, subparagraphs 3.3.1.2 and 3.3.1.4 before placing pavement.

3.1.1.11 Weather limitations: Do not place asphalt when surface temperature of diffusion barrier is less than 45 F, when average wind speed at Hanford weather station exceeds 25 mph, or peak gusts exceed 40 mph.

3.1.1.12 Keep surrounding area free of dust by watering during paving.

3.1.1.13 Stop placing and cover diffusion barrier when average wind speed at Hanford weather station exceeds 25 mph, or peak gusts exceed 40 mph.

3.1.1.14 Clean equipment used for conveying, placing, spreading, and compacting of dirt or gravel that may contaminate diffusion barrier during paving operation.

3.1.1.15 Hauling equipment will not be allowed to be driven on diffusion barrier.

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3.1.2 Patching Existing Asphalt Pavement

3.1.2.1 Prepare subgrade in area to receive asphalt patching by compacting in accordance with Section 02200, subparagraph 3.3.1.2b.

3.1.2.2 Before patch is constructed, true-up pavement cut with straight edges and vertical faces.

3.1.2.3 Place asphalt concrete to thickness required to match compacted thickness of existing pavement or to minimum compacted thickness of 1-1/2 inches, whichever is greater. Place, level, and compact to comply with adjacent paved surface.

3.2 FIELD QUALITY CONTROL

3.2.1 Sampling and testing of asphalt concrete pavement will be performed by KEH.

END OF SECTION

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SECTION 02752

LEACHATE COLLECTION SUMP LINER

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American Society of Mechanical Engineers (ASME)

1986 Edition, w/Addenda
through Dec 1988

ASME Boiler and Pressure Vessel
Code

Section IX

Qualification Standard for
Welding and Brazing Procedures,
Welders, Brazers, and Welding
and Brazing Operators

1.1.1.2 American Society for Nondestructive Testing (ASNT)

Recommended Practice
No. SNT-TC-1A
(1984 Edition)

Personnel Qualification
and Certification in
Nondestructive Testing

1.1.1.3 American Society for Testing and Materials (ASTM)

A 36-87

Standard Specification for
Structural Steel

A 53-87b

Standard Specification for
Pipe, Steel, Black and Hot-
Dipped, Zinc-Coated Welded and
Seamless

D 3350-84

Standard Specification for
Polyethylene Plastics Pipe and
Fittings Materials

1.1.1.4 American Welding Society (AWS)

AWS D1.1-88

Structural Welding Code-Steel

AWS D9.1-84

Specification for Welding of
Sheet Metal

AWS QC1-86

Standard for Qualification and
Certification of Welding
Inspectors

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1.1.1.5 American Water Works Association (AWWA)

C203-86

AWWA Standard for Coal-Tar
Protective Coatings and Linings
for Steel Water Pipelines--
Enamel and Tape--Hot-Applied

1.1.1.6 Steel Structures Painting Council (SSPC)

SSPC-SP 3-82

No. 3 Power Tool Cleaning

SSPC-SP 6-85

No. 6 Commercial Blast Cleaning

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Fabricator Drawings and Procedures: Submit drawings and procedures for fabrication, erection and installation of sump liner, riser, and plastic pipe spools. Include plans, elevations, details, sections and connections. Submittal shall show thickness, type, grade, class of metal, and fasteners. Show anchorage and accessory items where applicable.

1.2.2 Certified Material Test Reports (CMTR): Submit legible reports, certified by responsible manufacturer, showing chemical analysis and physical properties of each heat steel plate, shapes, pipe and fittings, and filler material. Submit separate certified reports for each lot of steel furnished by each supplier.

1.2.3 Filler Material Control Procedure: Submit procedure for control of filler material. Specify methods of control, by heat or lot number, from receipt of material to consumption during fabrication, and control and disposal of contaminated and partially used material.

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Welding Personnel and Procedures

1.3.1.1 Personnel and procedures for welding structural steel and steel pipe shall have been qualified in accordance with AWS D1.1 before welding. Qualification in accordance with ASME Section IX may be substituted for this requirement.

1.3.1.2 Personnel and procedures for welding sheet metal shall have been qualified in accordance with AWS D9.1 before welding. Qualification in accordance with ASME Section IX may be substituted for this requirement.

1.3.1.3 Personnel and procedures for welding steel pipe shall have been qualified in accordance with ASME Section IX before welding.

1.3.1.4 Deliver 2 copies of welding procedure specifications, procedure qualification records, and welder performance qualification test results to KEH 5 days before welding. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

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1.3.2 Qualification of Nondestructive Examination (NDE) Personnel

1.3.2.1 Visual weld examinations and appropriate documentation shall be performed by Certified Welding Inspectors (CWI) who have received certification in accordance with AWS QC1. Certified Associate Welding Inspectors (CAWI), certified in accordance with above standard, may be used to perform examinations when under immediate direction of CWI. Welding related examination documentation shall be signed, or stamped by individual performing examination. Where CAWI's are used for examinations, documentation shall be signed, or bear CAWI's stamp in addition to CWI's under whom examinations were performed.

1.3.2.2 Personnel performing other NDE shall have been certified in accordance with Contractor's written practice, which shall meet the requirements of ASNT No. SNT-TC-1A, before performing NDE. Use Level II or III personnel to interpret test results.

1.3.2.3 Deliver 2 copies of personnel certifications, written NDE performance procedures, and Contractor's written practice to KEH 5 days before examining. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Welding Material

1.4.1.1 Store separately, welding materials of different material specifications.

1.4.1.2 Store and control filler material in accordance with approved procedure.

1.4.1.3 Preserve identity from time of receipt on site until use in facility construction.

1.4.2 Sump Liner: Upon receipt examine for damage, seal openings, and store on dunnage.

1.4.3 Steel Riser Pipe: Upon receipt examine for damage.

1.4.4 Polyethylene Plastic Pipe and Fittings: Upon receipt examine for damage.

1.4.5 Deliver materials to project at time convenient for installation and store off ground. If exposed to inclement weather, protect with paper, plastic, or other weatherproof covering.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Carbon Steel Plate and Shapes: ASTM A 36, except as specified on the Drawings.

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- 2.1.2 Carbon Steel Pipe: ASTM A 53, Type S, Grade B.
- 2.1.3 Polyethylene Plastic Pipe and Fittings: ASTM D 3350, Class 355434C.
- 2.1.4 Exterior Protective Coating: Tapecoat Company "Tapecoat 20" and primer meeting the requirements of AWWA C203.

2.2 FABRICATION

- 2.2.1 Fabricate sump liner and pipe spools in accordance with the Drawings and approved submittals.
- 2.2.2 Weld plastic pipe by butt fusion method in accordance with manufacturer's recommendations.
- 2.2.3 Weld Identification: Prepare weld identification drawings which show relative position of each pressure containing weld and each weld to pressure retaining components.

2.3 SOURCE QUALITY CONTROL

2.3.1 Weld Examinations

2.3.1.1 100 percent visual examination is required for fit-up, root and cover passes as noted on page 02752-8. Examine in welded condition. Acceptance criteria shall be in accordance with AWS D1.1, Paragraph 8.15.1.

2.3.1.2 Perform 100 percent liquid penetrant (dye penetrant) examination (PT) on cover pass as noted on page 02752-8 and in accordance with AWS D1.1, Paragraph 6.7.6 and Section 8.

2.3.1.3 Fabrication of sump liner is subject to examination by KEH.

2.3.1.4 NDE documentation.

a. Document examination of pressure welds and welds to pressure retaining components for pipes and liners on NDE/Weld Record Form KEH-433 furnished by KEH (sample appended).

1) See Form KEH-433 for instructions for recording weld identification drawings, weld numbers, welder identification, welding procedure specification numbers, visual examinations, nondestructive examinations, and for noting satisfactory completion of leak testing.

b. Documentation shall be kept current and is subject to review by KEH. Prepare and certify records as work progresses.

c. Required NDE/Weld examinations shall be completed and documented before start of leak testing.

d. NDE/Weld Record information and weld identification drawings may be incorporated on single format or traveler for specific work package.

e. Deliver completed NDE/Weld Record and record weld identification drawings to KEH within 7 working days after completion of system leak testing.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Place sump liner and assemble plastic pipe in accordance with approved submittals and the Drawings.

3.1.2 Assemble plastic to steel flange joints without gasket. Use steel backing rings on plastic flanges.

3.1.3 Before sump liner and pipe is encased in concrete, hydrostatically test liner and flanged connections in accordance with Paragraph 3.2.1.

3.1.4 After concrete encasement has cured install riser in accordance with the Drawings and approved submittals.

3.1.5 Exterior Protective Coating

3.1.5.1 Complete NDE and leak testing before application of exterior protective coating.

3.1.5.2 Protect short lengths of carbon steel pipe and fittings exposed to earth backfill with specified coating.

a. Clean carbon steel surfaces to white metal by sandblasting in accordance with SSPC-SP 6. Where blasting is impracticable, as determined by KEH, clean by power wire brushing in accordance with SSPC-SP 3.

b. Heat and apply specified tape in accordance with AWWA C203, Section 3, and manufacturer instructions.

3.1.5.3 After installation, examine carbon steel pipe having field applied exterior protective coating materials.

a. Use electrical holiday detector in accordance with AWWA C203, Section 2.14.12.

b. Repair damage to coating in accordance with AWWA C203, Section 2.14.12.

3.2 FIELD QUALITY CONTROL

3.2.1 Hydrostatic Testing

3.2.1.1 Prepare written procedure for disposal of water used for testing. Deliver to KEH for approval 10 days before testing.

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3.2.1.2 Hydrostatically test sump liner and pipe flanged connections before placing concrete by applying internal pressure of 15 psig of water to entire length of plastic pipe and steel flange. Pump water out and dry liner after test. No visible standing water.

3.2.2 Perform NDE listed on back of attached NDE/Weld Record Form KEH-433 for welds.

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NDE/WELD RECORD		1. Project/W.O. No.		2. Weld Identification Dwgs.		3. Contractor	
4. WELD INFORMATION	5. VISUAL EXAMINATION			6. LIQUID PEN. / MAG. PART.	7. RADIO. LEAK TEST	9. Other:	
	Fit-up	Root Pass	Cover Pass				
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							

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INSTRUCTIONS FOR USE

The NDE/WELD RECORD form shall be used to document the nondestructive examination/testing of the piping systems listed below. Entries shall be made as work progresses, and records are subject to review by the Government's Representative at any time.

Complete the NDE/WELD RECORD as follows (number in parenthesis corresponds to block number).

- (1) Enter Project Number.
- (2) Enter Weld Identification Drawing Numbers.
- (3) Enter name of Contractor.
- (4) Enter Weld Information:
 - Weld Number
 - Welder Identification
- (5) through (9) Enter date of examination/testing in upper half of block; initial or stamp lower half of block as each weld is examined and accepted in compliance with contract requirements.
 - Welding Procedure Specification
 - Weld Filler Material (Type)

NONDESTRUCTIVE EXAMINATION/TESTING REQUIREMENTS FOR PIPING SYSTEMS

NDE/NDT METHOD	PIPE CODES	Riser & Pit Drain	Catch Basin Drain	Liner							COMMENTS
VISUAL											
Fitup		C**		C**							*Visually examine butt fusion weld on polyethylene drain pipe. Allowable reduction of pipe ID: 10 percent maximum. Maintain minimum wall thickness.
Root Pass		C**		C**							
Cover Pass		C***	C*	C***							
LIQUID PENETRANT											
Root Pass											**Paragraph 1.3.2.1 applies only for the field weld of the risers.
Cover Pass		C		C							
MAGNETIC PARTICLE											
Root Pass											***Paragraph 1.3.2.1 applies to all cover pass welds.
Cover Pass											
RADIOGRAPHIC											
Completed Weld			C,G	C,G							
LEAK/PRESSURE											
Completed Weld			C,G	C,G							
OTHER											

- Legend**
- A. Requires witnessing concurrently by the Government Representative and acceptance prior to recording.
 - B. Requires acceptance of radiographs and documentation by the Government Representative prior to recording.
 - C. Circumferential and longitudinal butt welds.
 - D. Full penetration welds on branch connections.
 - E. Attachment welds to pipe.
 - F. Tie-in circumferential and longitudinal butt welds that cannot be examined by leak/pressure test.
 - G. Other:

END OF SECTION

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SECTION 02753

EXTERIOR DRAINAGE PATH

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to the extent designated herein.

1.1.1.1 American Society for Testing and Materials (ASTM)

D 413-82 (1988)	Standard Test Method for Rubber Property--Adhesion to Flexible Substrate
D 1238-86	Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
D 1505-85	Standard Test Method for Density of Plastics by the Density-Gradient Technique
D 1603-76 (1983)	Standard Test Method for Carbon Black in Olefin Plastics
D 3083-89	Standard Specification for Flexible Poly(Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining
D 3895-80 (1986)	Standard Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis
D 4716-87	Standard Test Method for Constant Head Hydraulic Transmissivity (In-Plane Flow) of Geotextiles and Geotextile Related Products

1.1.1.2 National Sanitation Foundation (NSF)

NFS Standard 54-85 Flexible Membrane Liners

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Fabricator Drawings: Submit drawings showing details of factory and field joints.

1.2.2 Installation Plan: Submit procedures for installation of materials and components. Include list of equipment and amount of utilities required, proposed methods for laying materials and components, and method for holding material sections in place during installation.

1.2.2.1 Installer may submit alternate method of installation that provides complete coverage of vault exterior.

1.2.3 Manufacturer's Data: Provide data defining physical properties of drainage net to be supplied.

1.2.4 Surface Acceptance: Provide information required by Paragraph 3.1.2.

1.2.5 Deleted

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Pack rolls wrapped with sheet of same material in containers supported and padded to prevent damage during shipment. Pack containers for minimum handling at site. Provide label for each roll showing results of tests in subparagraph 2.1.1.2 and stating name of manufacturer, product type, thickness, manufacturers batch code, date of manufacture, and physical dimensions. Roll labels will be removed by KEH only.

1.3.2 Examine materials delivered to Site for:

1.3.2.1 Tears from operation of equipment or inadequate packaging.

1.3.2.2 Exposure to temperature extremes resulting in unusable materials.

1.3.2.3 Bonding together of adjacent layers caused by excessive heat.

1.3.2.4 Crumpling or tearing from inadequate packaging support.

1.3.3 Unload and store with minimum handling.

1.3.4 Store materials off ground on padded dunnage in secure area sheltered from mud, soil, dirt, debris, adverse weather, precipitation, ultraviolet light, heavy winds, and temperature extremes.

1.4 Deleted

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 High Density Polyethylene (HDPE) Membrane: See Section 02755, except execution shall be in accordance with this Section.

2.1.1.1 Deleted

2.1.1.2 Deleted

2.1.1.3 Deleted

2.1.2 Drainage Net

2.1.2.1 Fabricate from HDPE strands. Arrange 2 sets of strands, spaced ~~1/2 inch center to center maximum, together to form "net" or "mesh"~~ with minimum 2 strands per inch each direction. System shall meet the following requirements.

<u>Property</u>	<u>Test Method</u>	<u>Values</u>
Density (g/cm ³) (min)	ASTM D 1505	0.94
Crystallinity (%)	Differential Scanning Calorimeter	40-55
Carbon Black (%)	ASTM D 1603	1-3
Melt Flow Index (g/10 min.)	ASTM D 1238 (190 C, 2.16 KG) (190 C, 5.0 KG)	0.2-0.5 1.0-2.2
Thermal-Oxidative Stability, minutes DSC	ASTM D 3895 (160 C, 20 psi O ₂) (160 C, 800 psi O ₂)	20-175 6-36
Minimum Compressive Stress Imposed (psf)	----	7,000
Minimum Thickness (mm)	----	5
Transmissivity (m ² /sec)	ASTM D 4716	0.002*

*Normal stresses of 2000 PSF, hydraulic gradient of 0.25.

2.1.3 Geotextile: See Section 02756.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Before work is started examine material rolls for damage from transit and storage. If damaged, set aside and do not use.

3.1.2 Before installation, provide written documentation to KEH that surfaces to receive materials have been examined and are acceptable for installation.

3.2 INSTALLATION

3.2.1 Climatic Conditions: Within limits given in NSF Standard 54, Appendix C while handling or repairing sheeting material.

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3.2.2 Placing: Place fabricated pieces in position shown on approved installation drawings. Unroll, position, and smooth out folds and wrinkles. Allow sheets to relax before anchoring. Fasten material temporarily, in accordance with installer's approved procedure, to prevent wind damage until material is secured.

3.2.3 Field Seams: Overlap membrane panels 6 inches, minimum, and fasten with batten plate.

3.2.4 Extrusion Welds

3.2.4.1 Make welds using extrudate with composition identical to sheeting material. Welding equipment shall be capable of continuously monitoring and controlling temperature in zone of contact so changes in environmental conditions will not effect integrity of weld.

3.2.4.2 Where "fish mouths" occur, repair area in accordance with Paragraph 3.2.5.

3.2.4.3 "Fish mouths" are not acceptable within seam area.

3.2.4.4 Replace or repair, in accordance with Paragraph 3.2.5, membrane area showing out of tolerance injury due to excessive scuffing, or puncture.

3.2.4.5 Welds, on completion of work, shall be tightly bonded.

3.2.5 Repairs

3.2.5.1 Make repairs to membrane by applying piece of sheeting, sufficient in size to extend approximately 3 to 6 inches beyond damaged area. Make patch round or oval.

3.2.5.2 Make repairs to geogrid and geotextile in accordance with manufacturer's recommended procedures.

3.3 FIELD QUALITY CONTROL

3.3.1 Nondestructive Seam Testing

3.3.1.1 Test welds in their entirety using vacuum box.

3.3.1.2 Vacuum test for welded repairs

a. Equipment: Aluminum frame box with calibrated vacuum gage on frame, fitting with sponge gasket on bottom, sealed with transparent Plexiglass top, and connected to vacuum pump.

b. Test: Spread soap solution over seam, press box down over seam, and apply 10 inches Hg vacuum, plus or minus 2 inches, for minimum 15 seconds to each portion of seam. If defect is present, bubble will form and indicate area of repair. Test seams and repairs in their entirety.

3.3.1.3 KEH will observe testing and review results.

3.3.2 Destructive Seam Testing

3.3.2.1 Preparation: Obtain samples of field seams at beginning and end of each work day, and at 1 or more intervals during day if seaming conditions have been altered.

a. Use 10 foot long test weld for each welding machine, and mark with date, ambient temperature, and machine number.

b. Cut test weld in 2 parts, keeping 1/2 for testing and deliver remaining half to KEH.

3.3.2.2 Tests: Test samples for bonded seam strength in accordance with ASTM D 3083, and for peel adhesion in accordance with ASTM D 413.

3.3.3 Documentation

3.3.3.1 Certify test results.

3.3.3.2 Deliver documentation to KEH within 7 working days.

3.3.4 Final Examination and Acceptance

3.3.4.1 Measure overlap of seams and verify no damage has occurred to membrane.

3.3.4.2 Prepare record drawings showing field changes and repairs.

3.3.4.3 Deliver record drawings to KEH within 10 working days after completion of membrane installation.

3.3.5 Sampling: KEH will take 2 randomly selected samples for each type of drainage net supplied. Samples will be 3 feet long by full roll width.

END OF SECTION

SECTION 02755
CATCH BASIN LINERS

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American Society for Testing and Materials (ASTM)

D 570-81	Standard Test Method for Water Absorption of Plastics
D 638-87b	Standard Test Method for Tensile Properties of Plastics
D 746-79 (1987)	Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
D 751-79	Standard Methods of Testing Coated Fabrics
D 792-86	Standard Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement
D 1004-66 (1981)	Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting
D 1204-84	Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
D 1238-86	Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
D 1593-81	Standard Specification for Nonrigid Vinyl Chloride Plastic Sheeting
D 1603-76 (1983)	Standard Test Method for Carbon Black in Olefin Plastics

D 1693-70 (1980)

Standard Test Method for
Environmental Stress-Cracking
of Ethylene Plastics

1.1.1.2 Environmental Protection Agency (EPA)

EPA/530-SW-86-031

Technical Guidance Document
Construction Quality Assurance
for Hazardous Waste Land
Disposal Facility

1.1.1.3 Federal Standards (FED STD)

FED-STD-101C, Including
CHGS NOT 1, And 2

Test Procedure For Packaging
Materials

Method 2065.1

Puncture Resistance And
Elongation Test (1/8 Inch
Radius Probe Method)

1.1.1.4 National Sanitation Foundation (NSF)

NSF Standard 54-85

Flexible Membrane Liners

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Installation Drawings: Submit drawings showing lining sheet layout with proposed size, number, position, sequence of placing, and location of field seams. Include details and methods for anchoring at perimeter, making field seams, and making anchors/seals to pipes and structures penetrating lining.

1.2.2 Installation Procedures: Submit procedures for installation and testing of liner and components. Include list of equipment and amount of utilities required, proposed methods for laying liner and components, and following.

1.2.2.1 Procedures for welding seams in accordance with manufacturer's recommendations and this Section.

1.2.2.2 Method for holding liner sections in place during installation.

1.2.2.3 Method for examining liner and components, and testing joints, seams, welds, and bolt tightening.

1.2.3 Manufacturer's Data

1.2.3.1 Resin: Provide data defining physical properties of high density polyethylene (HDPE) resin to be supplied. For each resin batch, test as shown in Table 02755-I. Complete testing and submit for review before using.

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TABLE 02755-I

PHYSICAL PROPERTIES QUALITY CONTROL

<u>Property</u>	<u>Test Method</u>	<u>Values</u>
Specific Gravity	ASTM D 792	0.932 to 0.940
Melt Flow Index (gr/10 mins, max)	ASTM D 1238, Condition E	1.0

1.2.3.2 Liner: Provide data defining physical properties of high density polyethylene (HDPE) liner to be supplied. As minimum, properties shall meet the requirements of NSF Standard 54. Provide documentation of verification of physical properties of liner sheets. For each resin batch used, test using parameters defined in subparagraph 2.1.1.2 to document material properties. Complete testing and submit for review before fabrication. Submit additional copy of documentation with each panel.

1.2.4 Samples: Submit samples of lining material and field seams.

1.2.4.1 Lining material: Submit 8 inch by 10 inch samples from same batch of liner used for construction, and totaling approximately 20 sq ft.

1.2.4.2 Field seams: Submit numbered and dated samples, measuring 12 inches plus seam width in width and 18 inches in length, fabricated with materials specified for lining in accordance with approved procedures and this Section, and tested in accordance with Paragraph 1.3.5.

1.2.5 Certified Material Test Reports (CMTR): Submit materials test reports, for each item furnished by each supplier, certified by manufacturers of resins and liners, and stating that liner and extrudate are of 100 percent virgin materials. Reports shall identify items, show results of chemical analysis and physical tests and meet following requirements.

1.2.5.1 Raw materials: Table 02755-I.

1.2.5.2 Lining material: Subparagraph 2.1.1.2.

1.2.6 Care and Repair Instructions: Submit information concerning recommended care and repair procedures for liner and components. Include recommended shoe types for construction personnel, tools for cleaning and removing wind-blown sand and debris, and minimum and maximum temperatures at which cleaning, inspecting, and repair operations may be performed.

1.2.7 Certificates of Experience: Submit "Certificates of Experience" from manufacturer and installer showing qualification in accordance with Paragraphs 1.3.1 and 1.3.2. Installer shall provide list showing names, addresses, and telephone numbers for completed projects.

1.2.8 Manufacturer's Quality Control Plan: Submit quality control plan for Project. Plan shall address requirements of Paragraph 1.3.3.

1.2.9 Certification: Submit certificates of compliance in accordance with Paragraph 1.3.6.

1.2.10 Surface Acceptance: Provide information required in Paragraph 3.1.2.

1.2.11 Calibration and Testing Procedures: Submit procedures that define steps of calibration for equipment, and procedure to be followed in using equipment for spark testing HDPE liner seams.

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Manufacturer: Manufacturer shall have successfully manufactured minimum 5,000,000 square feet of similar liner material for hydraulic lining installations, and be listed by NSF as meeting the requirements for manufacturing HDPE. Material supply shall also include projects for Resource Conservation and Recovery Act (RCRA) Landfills and Surface Impoundments.

1.3.1.1 Make arrangements with manufacturer for KEH visit to plant before manufacture of lining material to verify quality control program, and during manufacture of material for Project to observe manufacturing methods and obtain raw materials and products for independent testing.

1.3.2 Qualification of Installer: Provide evidence of successfully installing at least 10 projects, and at least 5,000,000 square feet of HDPE liner. Projects shall include RCRA Landfills and Surface Impoundments. Provide qualifications of key personnel including superintendent and foreman.

1.3.3 Manufacturer's Quality Control Plan: Quality control plan to be implemented for Project shall be in accordance with EPA/530-SW-86-031. Include name of polymer resin supplier, product identification, acceptance testing, fabrication and production testing, documentation of changes, retests, and acceptance.

1.3.4 Construction Quality Assurance

1.3.4.1 Preinstallation meeting: Manufacturer and Contractor shall attend meeting, initiated by KEH, before installation of lining to review and discuss training and qualification procedures for Contractor personnel, and demonstration of making field welded seams including peel and shear tests.

1.3.4.2 Manufacturer shall provide on-site technical supervision and assistance during installation of lining.

1.3.5 Qualification of Welds: Before welding liner, provide field weld samples using same equipment and procedure to be used for welding liner. Perform nondestructive testing in accordance with Paragraph 3.3.1. Perform destructive testing in accordance with Paragraph 3.3.2. Entire seam shall pass nondestructive tests, and 2 of 3 samples shall pass destructive tests, third sample shall attain at least 95 percent of required values.

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1.3.6 Upon completion of work, and as condition of acceptance, deliver to KEH 2 copies of certificate signed by authorized agent of manufacturer of liner, and cosigned by installer, stating materials and methods used meet specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Pack fabricated pieces and rolls wrapped with sheet of same material in containers supported and padded to prevent damage during shipment. Pack containers for minimum handling at site and clearly mark with location of installation. Provide label for each roll and prefabricated piece showing results of tests in subparagraph 2.1.1.2 and stating name of manufacturer, product type, thickness, manufacturer's batch code, date of manufacture, physical dimensions, panel number or placement of prefabricated pieces according to Paragraph 1.2.1, and directions for unrolling membrane. Do not remove labels.

1.4.2 Examine lining materials delivered to Site for:

1.4.2.1 Puncture from nails or splinters.

1.4.2.2 Tears from operation of equipment or inadequate packaging.

1.4.2.3 Exposure to temperature extremes resulting in unusable material.

1.4.2.4 Bonding together of adjacent membrane layers which may be caused by excessive heat.

1.4.2.5 Crumpling or tearing from inadequate packaging support.

1.4.3 Unload and store with minimum of handling.

1.4.4 Store materials off ground on padded dunnage in secure area sheltered from mud, soil, dirt, debris, adverse weather, precipitation, ultraviolet light, heavy winds, and temperature extremes.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 High Density Polyethylene (HDPE) Liner: Add carbon black, antioxidants and heat stabilizers to resin for ultraviolet resistance and manufacturing purposes. Supply HDPE as single ply continuous sheet with no factory seams and in rolls with minimum 22 foot width. Maximize roll length to provide largest manageable sheet for fewest field seams.

2.1.1.1 Materials similar to those manufactured by Gundle Lining Systems Inc, Houston, Texas; Poly-America Inc, Grand Prairie, Texas; or National Seal Company, Galesburg, Illinois.

2.1.1.2 Lining material shall meet following physical property values.

<u>Property</u>	<u>Test Method</u>	<u>Values</u>
Thickness (mils -6 + 18)	ASTM D 1593	60**
Specific Gravity (min)	ASTM D 792	0.94
Carbon Black Content (%)	ASTM D 1603	2 to 3
Melt Flow Index (g/10 min, maximum)	ASTM D 1238, Condition E	1.0
Tensile Properties (each direction)	ASTM D 638, Type IV Specimen, 2 ipm	
Tensile Strength at Yield (lb/in width, min)		120
Tensile Strength at Break (lb/in width, min)		180
Elongation at Yield (% , min)		10
Elongation at Break (% , min)		500
Tear Resistance (lb, min)	ASTM D 1004, Die C	30
Puncture Resistance (lbs, min)	FED-STD-101, Method 2065.1	69
Low Temperature/Brittleness (F, max)	ASTM D 746, Procedure B	-40
*Dimensional Stability (max % change each direction)	ASTM D 1204, 212 F 1 hr	±2
*Environmental Stress Crack (min hours)	ASTM D 1693, Condition C (100 C)	750
Water Absorption (max % weight change)	ASTM D 570	0.1
Hydrostatic Resistance (psi, min)	ASTM D 751, Method A-1	490

*Format uses NSF 54 table for HDPE as guide. However, RCRA values for Dimensional Stability and Environmental Stress Crack have been added.

**Thickness of flow marks shall not exceed 200% of the nominal liner thickness.

2.1.1.3 Resin used for extrudate fusion welding shall be HDPE produced from and same as HDPE sheet resin. Physical properties shall be same as HDPE lining sheets.

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2.1.1.4 Liner thickness shall be at least 54 mils at any point on liners.

2.1.1.5 Fabricate liner from large pieces of sheeting to proper size and shape to fit contours of basin. Fabricate boots and sump in location where dust and other contaminants can be controlled. Keep field joints to minimum and in accordance with approved installation drawings.

2.1.1.6 Liner material will be required for EPA's method 9090 testing. There shall be no changes in formulation of liner material once testing has begun.

2.2 SOURCE QUALITY CONTROL

2.2.1 Tests

2.2.1.1 Preparation: Obtain 1 sample from preformed products from each form in use each day. Cut sample in half. Keep 1/2 for testing and deliver remaining half to KEH for testing.

2.2.1.2 Testing: Test samples for thickness, tensile strength at yield, and tensile strength at break as specified in subparagraph 2.1.1.2 except values may be reduced by 10 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Before work is started examine sheet rolls for damage from transit. If damaged set aside. Those that cannot be repaired, shall be rejected.

3.1.2 Before installation of liner, ensure surface is free of soil rocks, standing water or other debris, and provide written documentation to KEH that surfaces to receive liner have been examined and found to be acceptable for installation.

3.1.3 During unrolling of material, visually examine sheet surface. Mark and repair faulty areas in accordance with approved procedure. Document repaired areas on installation drawings by showing location and identity of repair crew.

3.2 INSTALLATION

3.2.1 Climatic Conditions: Within limits given in NSF Standard 54, Appendix C while handling, repairing, or seaming plastic sheeting material. Maximum wind 15 mph and no precipitation or fog.

3.2.2 Placing: Place fabricated pieces in position shown on approved installation drawings. Verify preformed pieces fit snugly in position to prevent undue stress. Unroll, position to minimize lineup of flow marks on adjacent sheets, and smooth out folds and wrinkles. Allow sheets to relax before seaming. Anchor liner temporarily, in accordance with installer's approved procedure, to prevent wind damage until material is secured.

Install with sufficient slack to compensate for thermal expansion and contraction from ambient temperature variations.

3.2.3 Field Seams: Do not make horizontal welds on vertical surfaces. Overlap panels 4 inches minimum. Ensure liner surface is free of dirt, dust, moisture, and deleterious materials before seaming, and climatic conditions meet the requirements of Paragraph 3.2.1. Seams in the collection trench shall be kept to a minimum.

3.2.3.1 Do not place in areas where field vacuum box testing cannot be performed.

3.2.3.2 Extrusion welding: Weld sheeting together using extrudate with composition identical to sheeting material.

3.2.3.3 Fusion welding: Weld sheeting together by producing a double seam with an enclosed space.

3.2.3.4 Welding equipment shall be capable of continuously monitoring and controlling temperature in zone of contact so changes in environmental conditions will not effect integrity of weld.

3.2.3.5 Where "fish mouths" occur, repair area in accordance with Paragraph 3.2.4.

3.2.3.6 "Fish mouths" are not acceptable within seam area.

3.2.3.7 Traverse entire surface and examine for tears, punctures, and thin spots. Replace or repair, in accordance with Paragraph 3.2.4, liner area showing out of tolerance injury. Document repaired areas on installation drawings by showing location and repair crew identity.

3.2.3.8 Welds, on completion of work, shall be tightly bonded.

3.2.4 Damage Repairs: Make repairs to liner by applying piece of sheeting, sufficient in size to extend approximately 3 to 6 inches beyond damaged area. Make patch round or oval and install using same materials and procedures used in making field joints. Do not use cutting tools while working on top of installed liner except when cutting destructive test samples.

3.2.5 Seam Repairs: Repair seam areas represented by failed samples. Area to be repaired includes failed test location and extends in both directions to location where sample passed. To reduce extent of area to be repaired, additional samples may be taken 10 feet minimum from either side of failed test location. Document failed seams on installation drawings by showing location and seaming crew identity.

3.2.5.1 Repair seam defects revealed by nondestructive testing. Retest until seam passes.

3.2.6 Vault Floor Covering: Cover portion of vault floors shown on the Drawings, coated with protective coating specified in Section 09885, with HDPE after hydrostatic testing specified in Section 03301.

3.3 FIELD QUALITY CONTROL

3.3.1 Nondestructive Testing

3.3.1.1 Test fusion welds in their entirety using air pressure test or vacuum box. Pressurize channels between seams to minimum 60 psi, indicated by calibrated gage or manometer inserted in channel. Maintain pressure for minimum 15 minutes.

3.3.1.2 Vacuum test for extrusion welded seams and repairs.

a. Equipment: Aluminum frame box with calibrated vacuum gage on frame, fitted with sponge gasket on bottom, sealed with transparent Plexiglas top, and connected to vacuum pump.

b. Test: Spread soap solution over seam, press box down over seam, and apply 10 inches Hg vacuum, plus or minus 2 inches, for minimum 15 seconds to each portion of seam. If defect is present, bubble will form and indicate area for repair. Test seams and repairs in their entirety.

3.3.1.3 High frequency spark testing

a. At location where extrusion welded seams cannot be vacuum tested, perform high frequency spark testing as approved by KEH.

b. Equipment: Equipment shall generate a high frequency alternating discharge. Keep test electrodes to minimum size.

c. Calibration: Calibrate equipment at Site, before testing, in accordance with equipment manufacturer's recommended procedures.

d. Test: Minimum test voltage shall be 10,000 volts. Testing voltage for seams shall be selected in accordance with equipment manufacturer's recommendations.

3.3.1.4 KEH will observe calibration and testing, and review results.

3.3.2 Destructive Testing

3.3.2.1 Preparation: Obtain samples of field seams at beginning and end of each work day, and at 1 or more intervals during day if seaming conditions have been altered.

a. Use 10 foot long test weld from each welding machine, and mark with date, ambient temperature, and machine number.

b. Take 4 lineal feet of welded samples by 1'-6" wide from installed welded sheeting at rate of 1 sample for each seaming crew for each day.

c. Cut samples in 2 parts, keep 1/2 for testing and deliver remaining half to KEH.

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3.3.2.2 Have equipment to perform bonded seam strength and peel adhesion in field.

3.3.2.3 Field tests: Test samples for bonded seam strength and peel adhesion strength and document results to KEH.

a. Perform bonded seam tests for shear strength using one inch nominal width specimens. Grip separation shall be approximately 2 inches plus width of seams with seam centered between grips. Minimum elongation at break shall be 30 percent. Tear resistance at break shall be minimum 90 percent of tensile strength at yield as specified in subparagraph 2.1.1.2.

b. Perform peel adhesion strength tests using specimens one inch nominal width specimen (grip positioned approximately 1/2 inch on either side of start of seam). Peel strength shall be minimum 60 percent of tensile strength at yield as specified in subparagraph 2.1.1.2.

c. Test minimum of 5 specimens for each sample. For both tests cross head speed shall be 2 inches per minute. Note specimen failures other than film tear bond.

3.3.2.4 KEH will collect minimum 2 samples of liner material from different rolls, full roll width and at least 2 feet long, from each lot.

3.3.3 Documentation

3.3.3.1 Document field seam test results by marking installation drawings with location of sample identification number and label sample with location, date, time, crew identity, and machine number.

3.3.3.2 Certify test results.

3.3.3.3 Deliver completed daily documentation to KEH within 7 working days after each days seaming.

3.3.4 Final Examination and Acceptance

3.3.4.1 Measure overlap of seams and verify no damage has occurred to liner.

3.3.4.2 Prepare record drawings showing field changes.

3.3.4.3 Deliver record drawings to KEH within 10 working days after completion of liner installation.

END OF SECTION

SECTION 02756

LEACHATE COLLECTION SYSTEM

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American National Standards Institute (ANSI)

ANSI B16.11-1980 American National Standard
Forged Steel Fittings, Socket-
Welding and Threaded

1.1.1.2 American Society for Testing and Materials (ASTM)

A 53-87b Standard Specification for
Pipe, Steel, Black and Hot-
Dipped, Zinc-Coated Welded and
Seamless

A 105-87a Standard Specification for
Forgings, Carbon Steel, for
Piping Components

A 194-87 Standard Specification for
Carbon and Alloy Steel Nuts for
Bolts for High-Pressure and
High-Temperature Service

D 422-63 Standard Method of Particle-
Size Analysis of Soils

D 1682-64 (1975) Standard Test Methods for
Breaking Load and Elongation of
Textile Fabrics

D 1777-64 (1975) Standard Method for Measuring
Thickness for Textile Materials

D 3776-85 Standard Test Methods for Mass
Per Unit Area (Weight) of Woven
Fabric

D 3787-80a Standard Test Method for
Bursting Strength of Knitted
Goods--Constant-Rate-of-
Traverse (CRT) Ball Burst Test

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D 4533-85 Standard Test Method for Trapezoid Tearing Strength of Geotextiles

D 4632-86 Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method)

D 4751-87 Standard Test Method for Determining Apparent Opening Size of a Geotextile

1.1.1.3 American Water Works Association (AWWA)

C203-86 AWWA Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines--Enamel and Tape--Hot-Applied

1.1.1.4 Deleted

1.1.1.5 National Sanitation Foundation (NSF)

NSF Standard 54-85 Flexible Membrane Liners

1.1.1.6 Washington State Department of Transportation (WSDOT)

M41-10-88 Standard Specification for Road, Bridge, and Municipal Construction

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Fabricator Drawings: Submit drawings and procedures showing layout and details of factory and field joints, and pipe penetrations.

1.2.2 Installation Plan: Submit plans and procedures for installation and testing of geotextile and carbon steel pipe. Include list of equipment and amount of utilities required, proposed method of installing materials and components, joining pipe, and following.

1.2.2.1 Method for holding materials in place during installation.

1.2.2.2 Method for examining materials, and for testing joints, seams, welds, and trench insertions.

1.2.3 Manufacturer's Data: Provide data defining physical properties of geotextile filtration and reinforcing fabrics to be supplied. As minimum, properties shall meet requirements of specified ASTM standards. Provide 20 square feet of geotextiles from same batch of material used in actual construction. These will be archived for future reference.

1.2.4 Care and Repair Instructions: Submit information concerning recommended care, maintenance, and repair procedures for geotextiles.

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Include recommended shoe types for construction personnel, tools for cleaning and removing wind-blown sand and debris, and minimum and maximum temperatures at which cleaning, inspecting, and repair operations may be performed.

1.2.5 Material Properties: Submit material properties of geotextile. Submittal may be in form of manufacturers material data sheets or certificate of conformance signed by authorized agent of geotextile manufacturer stating that materials supplied meet the requirements of this Section.

1.2.6 Certificate of Conformance: Submit legible certificate from supplier stating that drainage gravel furnished meets the requirements of Paragraph 2.1.3.

1.2.7 Deleted.

1.2.8 Deleted.

1.2.9 Placement of Drainage Gravel: Submit procedure for placing drainage gravel in accordance with Paragraph 3.2.5. Include precautions taken to prevent damage to liner.

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Installer: Licensed or approved by manufacturer of geotextiles. Provide evidence of successfully installing at least 10 projects, and at least 1,000,000 square feet of geotextiles. Projects shall also include Resource Conservation and Recovery Act (RCRA) Landfills and Surface Impoundments.

1.3.2 Upon completion of work, and as condition of acceptance, deliver to KEH 2 copies of certificate signed by authorized agent of manufacturer of geotextiles, and co-signed by installer, stating materials and methods used meet specified requirements.

1.3.3 Deleted.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 During shipment and storage, wrap geotextiles in heavy-duty protective covering to prevent damage.

1.4.1.2 Examine geotextile delivered to site for damage. If damaged, set aside and do not use. Identification labels will be removed only by KEH.

1.4.2 Storage

1.4.2.1 Unload and store with minimum of handling.

1.4.2.2 Do not store materials on ground.

1.4.2.3 Storage area shall protect geotextile from mud, soil, dust, debris, ultraviolet light, heavy winds, temperature extremes, and precipitation.

1.4.2.4 Store geotextile materials indoors in original unopened packaging.

1.4.2.5 If temporarily outdoors, place on pallet and protect from direct rays of sun under light colored heat-reflective opaque cover in manner to provide free air flowing space between materials and cover.

1.4.2.6 Cover gravel to protect from blowing sand and debris.

1.4.3 Handling: Handle materials to ensure sound, undamaged condition.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Nonwoven Geotextile: Long-chain synthetic polymer composed of polypropylene and contain stabilizers and inhibitors added to base plastic to make filaments resistant to deterioration due to ultraviolet and heat exposure. Geotextile shall be composed of continuous geotextiles held together through needle-punching. Edges of fabric shall be sealed or otherwise finished to prevent outer material from pulling away from fabric, or ravelling. Geotextile shall meet following requirements.

<u>Property</u>	<u>Test Method</u>	<u>Values</u>
Fabric Weight (oz/sq yd, min)	ASTM D 3776	10
Thickness (mil, min)	ASTM D 1777	70
Grab Tensile Strength (lbs/min)	ASTM D 1682 or ASTM D 4632	200
Grab Elongation (% , min)	ASTM D 1682 or ASTM D 4632	30 in any principal direction
Tear Strength (lbs, min trapezoidal)	ASTM D 4533	100 in any principal direction
Apparent Opening Size (AOS), US Sieve	ASTM D 4751	70-140
Minimum Width (ft)	----	12

2.1.2 Carbon Steel Drainage System

2.1.2.1 Pipe: Meet the requirements of ASTM A 53, Type S. Perforate by drilling four 1/4 inch holes for each foot of length.

2.1.2.2 Threaded fittings, including flanges: Meet the requirements of ASTM A 105 and ANSI B16.11.

2.1.2.3 Hex nuts: Meet the requirements of ASTM A 194, Grade 2.

2.1.2.4 ~~Gasket mating flange to liner: Full face teflon.~~

2.1.3 Drainage Gravel

2.1.3.1 Thoroughly washed and screened naturally occurring gravel, having following size distribution when tested in accordance with ASTM D 422.

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch	100
3/4 inch	85-95
3/8 inch	45-55
#4	20-25
#8	0-2

2.1.3.2 Crushed or partially crushed gravel will not be acceptable.

2.1.4 Vent Gravel: Coarse gravel aggregate, washed and graded, meeting the requirements of WSDOT M41-10, 9-03.1(3)C, Grade 5.

2.1.5 Hydrogen Gas Vent: See Section 15493.

2.1.6 Wire Mesh: 20 x 20 Type 316 stainless steel wire cloth.

2.1.7 Clamps: Series 300 stainless steel hose clamp.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Before work is started examine sheet rolls for damage from transit and storage. If damaged set aside and do not use.

3.1.2 During unrolling of material, visually examine surfaces. Do not use material showing defects, ribs, holes, flaws, deterioration, or other damage.

3.1.3 Before covering gas vent tube with end tube, examine for kinks, indentations, and obstructions. Flush line for 3 minutes with compressed air, 50 psi maximum, to clean and verify continuous air flow.

3.2 INSTALLATION

3.2.1 Climatic Conditions

3.2.1.1 Within limits given in NSF Standard 54, Appendix C while handling geotextile material.

3.2.1.2 Temperature: 40 to 104 F.

3.2.1.3 Winds: 15 mph, maximum.

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3.2.2 Geotextiles

3.2.2.1 Place at locations shown on approved installation drawings.

3.2.2.2 Lay smooth and free of tension, stress, folds, wrinkles, or creases, and to provide minimum 12 inch overlap for each joint.

3.2.2.3 Measure overlap joints and seams as single layer of cloth.

3.2.2.4 Use bags of clean, washed gravel to secure material during installation. Do not use securing pins.

3.2.2.5 Protect geotextile and gravel during construction from contamination.

3.2.2.6 Remove contaminated geotextile and gravel and replace with new.

3.2.3 Install leachate collection pipe as shown on the Drawings.

3.2.3.1 Coat threads of pipe and fittings with coal tar enamel meeting the requirements of AWWA C203.

3.2.3.2 Backfill with material specified in Paragraph 2.1.3 up to elevation shown on the Drawings. Compact each lift as specified in Paragraph 3.2.5. No other compaction equipment shall be used unless approved by KEH. Protect gravel from contamination during construction.

3.2.4 Repairs: Make repairs to geotextile in accordance with manufacturer's recommended procedures.

3.2.5 Drainage Gravel

3.2.5.1 Before placement of drainage gravel, clean liner of soil, rocks, or other debris. Liner shall fit contour of basin in accordance with the Drawings.

3.2.5.2 Place drainage gravel specified in Paragraph 2.1.3 in accordance with approved procedure before anchoring basin liner to walls.

3.2.5.3 Place gravel beginning at center of basin and working towards edges with one of the following methods.

a. 6 inch maximum lifts with 2 passes of a vibratory plate compactor, per lift.

b. 24 inch maximum lifts with compaction achieved by water flooding and gravel vibration. Vibration shall be in maximum 2 foot square grids with minimum 2/3 lift depth penetrations. Vibrators shall have 3 inch minimum head diameter and minimum frequency of 6000 impulses per minute when submerged.

3.2.5.4 Hand place first lift around sump and leachate collection pipe.

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3.2.5.5 Workers inside basin shall wear soft soled shoes. Do not drag sharp equipment, machinery or tools inside basin.

3.2.6 Vent Gravel: Place and compact in accordance with subparagraph 3.2.5.3.

3.3 FIELD QUALITY CONTROL

3.3.1 Final Examination and Acceptance: Measure proper overlap of seams and verify no damage has occurred to geotextile. Prepare record drawings showing where field changes have been incorporated. Deliver test documentation and record drawings to KEH.

3.3.2 Samples: KEH will collect minimum 2 geotextile samples from different rolls, full roll width at least 5 feet long, from each lot.

3.3.3 Tests: Acceptance sampling and testing of drainage gravel will be performed by KEH. Gradation acceptance will be based on average of 3 samples.

END OF SECTION

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American Concrete Institute (ACI)

ACI 301-84 (Revised 1987) Specifications for Structural Concrete for Buildings

ACI 306.1-87 Standard Specification for Cold Weather Concreting

1.1.1.2 American Society for Testing and Materials (ASTM)

A 185-85 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

A 615-87 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

C 33-86 Standard Specification for Concrete Aggregates

C 94-86b Standard Specification for Ready-Mixed Concrete

C 150-86 Standard Specification for Portland Cement

C 260-86 Standard Specification for Air-Entraining Admixtures for Concrete

1.1.1.3 National Ready Mixed Concrete Association (NRMCA)

January 1, 1976 Certification of Ready Mixed
(Third Revision) Concrete Production Facilities

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Form Coating Materials: Submit proposed form coating materials in accordance with ACI 301, Section 4.4.

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1.2.2 Certification of Ready Mixed Concrete Production Facilities: Submit current legible copy of "Certificate of Conformance for Concrete Production Facilities" issued by and bearing the seal of the National Ready Mixed Concrete Association. Certificate shall contain signature and seal of registered Civil Engineer.

1.2.3 Certified Test Reports for Reinforcing Steel: Submit manufacturer's certified test reports showing chemical analysis and physical tests made on particular heat or heats of steel from which reinforcement was manufactured. Furnish separate certificates for each group of items furnished by each supplier.

1.2.4 Reinforcing Steel Fabricator Drawings: Submit complete reinforcing fabrication and placing drawings based on block diagram in accordance with ACI 301, Section 5.1, including splices not shown on the Drawings.

1.2.5 Block Diagram: Submit block diagram of scheduled concrete pours. Identify pours.

1.2.6 Concrete Materials, Mix Design and Mix Proportions: Submit concrete materials, mix design and mix proportions in accordance with ACI 301, Sections 3.8 and 16.7.3. Define each material to be used in concrete and state amount, by weight, to be utilized per cubic yard of plastic mix.

1.2.7 Cold Weather Concreting: Submit detailed procedure in accordance with ACI 306.1, Section 1.5.1.

1.2.8 Curing Procedure: Submit description of materials and methods of curing in accordance with ACI 301, Section 12.2.

1.2.9 Certificate of Conformance: Submit legible certificate, certified by manufacturer, that lifting inserts and plates meet the requirements of the Drawings. Include load capacity and factor of safety.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Concrete

2.1.1.1 Cement: ASTM C 150, Type II (Low Alkali)

2.1.1.2 Aggregates: ASTM C 33, maximum size as follows.

a. 3/4 inch for duct banks.

b. 1-1/2 inch for all other.

2.1.1.3 Air-entraining admixture: Meeting the requirements of ASTM C 260; Sika Chemical Company "SIKA AER"; Chem-Masters Corp "Adz-Air"; or Protex Industries "Protex".

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2.1.1.4 Properties

a. Minimum allowable compressive strength at 28 days.

1) 3000 psi for duct banks.

2) 4000 psi for all other.

b. Slump: 4 inch maximum in accordance with ACI 301, Section 3.5.

c. Air content: In accordance with ACI 301, Table 3.4.1.

d. Proportions: In accordance with ACI 301, Sections 3.8 and 3.9.

2.1.1.5 Mixing: In accordance with ASTM C 94.

2.1.1.6 Delivery: In accordance with ASTM C 94.

2.1.2 Reinforcing Steel

2.1.2.1 Steel bars: ASTM A 615, deformed, Grade 60.

2.1.2.2 Welded wire fabric: ASTM A 185.

2.1.2.3 Tie wire: Black annealed steel, 16 gage minimum.

2.1.3 Nonshrink Grout

2.1.3.1 Nonmetallic type: "Five Star Grout" by US Grout Corp; "Por-Rok" Anchoring Cement by Hallemite; or "Masterflow 713" by Master Builders.

2.1.4 Forms: Wood, steel, plywood, or Masonite Corporation "Concrete Form Presdwood", as required for various specified finishes.

2.1.5 Lifting Inserts and Plates: Specified on the Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Form Construction

3.1.1.1 Install formwork in accordance with ACI 301, Section 4.2. Interior shape and rigidity shall be such that finished concrete will meet the requirements of the Drawings within tolerances specified in ACI 301, Table 4.3.1.

3.1.1.2 Prepare form surfaces in accordance with ACI 301, Section 4.4.

3.1.1.3 Forms for surfaces which will be permanently concealed from view may be saturated with water before placing concrete instead of other

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treatment, except in freezing weather forms shall be treated with oil or stearate.

3.1.1.4 Clean forms of foreign material before placing concrete.

3.2 INSTALLATION

3.2.1 Reinforcing Steel

3.2.1.1 Fabricate bars accurately to dimensions shown on Drawings, within tolerances shown in ACI 301, Section 5.4.

3.2.1.2 Tag in accordance with bar list.

3.2.1.3 Place as shown on approved submittals within tolerances specified in ACI 301, Sections 5.4 and 5.5.

3.2.1.4 Tie to prevent displacement during placement of concrete.

3.2.1.5 Do not force into concrete after initial set has started.

3.2.1.6 Place with dimension of concrete protection equal to minimum given in ACI 301, Section 5.5, except where shown otherwise on the Drawings.

3.2.1.7 Place welded wire fabric on chairs and lap two mesh at splices. Tie splices with wire.

3.2.2 Concrete

3.2.2.1 Before ordering, obtain approval of required submittals.

3.2.2.2 Before batching, obtain approval of formwork and reinforcement by KEH.

3.2.2.3 Before placing:

a. Obtain approval of "Pour Slip" by KEH. "Pour Slip" shall include appropriate reference to specific portion of structure to be placed, maximum size of coarse aggregate, design strength, admixture, and slump. "Pour Slip" forms can be obtained from KEH.

b. For each truck load, deliver "Trip Ticket" to KEH. "Trip Ticket" shall contain information listed in ASTM C 94, subparagraphs 16.1.1 through 16.1.10, and include water/cement ratio.

3.2.2.4 Place in accordance with ACI 301, Sections 8.1, 8.2, and 8.3. Do not drop (free fall) more than 5 feet. Insert vibrator, vertically if possible, into concrete and reach small distance into concrete in next lower layer. Do not insert vibrators into lower courses that have reached initial set. Take care to avoid allowing head of vibrator to come in contact with forms or embedded items.

3.2.2.5 Temper only as permitted in ACI 301, Section 7.5.

3.2.2.6 Place nonshrink grout where shown on the Drawings and in accordance with manufacturer's recommendations.

3.2.2.7 Weather conditions: Protect concrete during placement in accordance with ACI 301, Section 8.4. Cold weather concreting shall be in accordance with approved procedure.

3.2.2.8 Construction joints: Make in accordance with ACI 301, Section 6.1, and as detailed on the Drawings.

3.2.2.9 Embedded items: Install in accordance with ACI 301, Sections 6.4 and 6.5.

3.2.2.10 Placing concrete against earth: Place on or against firm, damp surfaces free of frost, ice and free water. Do not place until required com-paction has been obtained. Dampen earth surfaces to receive fresh concrete.

3.2.2.11 Consolidation: Consolidate concrete slabs in accordance with ACI 301, Section 11.6.

3.2.3 Concrete Repair and Form Removal

3.2.3.1 Form removal: Remove in accordance with ACI 301, Section 4.5.

3.2.3.2 Cut back form ties and examine concrete surfaces for defects. Repair only after permission for patching is given by KEH.

3.2.3.3 Place concrete repair mortar within 1 hour after mixing. Do not retemper mortar.

3.2.3.4 Surface defect repair: Repair in accordance with ACI 301, Sections 9.1, 9.2 and 9.3. Cure concrete repairs same as new concrete.

3.2.4 Concrete Finishes and Tolerances

3.2.4.1 Formed surfaces: Start finishing following concrete repair and complete within 96 hours after forms have been removed. Finish in accordance with sections of ACI 301 noted below.

- | | |
|---|----------------|
| a. Surfaces exposed to earth backfill | Section 10.2.1 |
| b. Interior surfaces | Section 10.2.2 |
| c. Exterior surfaces exposed to weather | Section 10.2.2 |
| d. Related unformed surfaces | Section 10.5 |
| e. Surfaces to receive special protective coating | Section 10.3.2 |

3.2.4.2 Unformed surfaces: Finish in accordance with sections of ACI 301 noted below:

- a. Interior floors Section 11.7.3
- b. Exterior equipment slabs Section 11.7.3

3.3 FIELD QUALITY CONTROL

3.3.1 Concrete Testing: Sampling and testing of concrete will be the responsibility of KEH. Concrete will be tested to ACI 301, Sections 16.3.4, 16.3.5, 16.3.6 and 16.3.8.

3.4 CURING AND PROTECTION

3.4.1 Curing

3.4.1.1 Cure concrete in accordance with ACI 301, Section 12.2. Clear curing compounds shall be tinted or applied surfaces marked to delineate extent of spraying.

3.4.1.2 Do not use curing compound on concrete surfaces to receive flooring or special protective coating.

3.4.2 Protection

3.4.2.1 Protect concrete during extreme weather conditions in accordance with ACI 301, Section 12.3.

3.4.2.2 Protect concrete from mechanical injury in accordance with ACI 301, Section 12.4.

END OF SECTION

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SECTION 03301

VAULT AND BASIN CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American Concrete Institute (ACI)

ACI 117-90	Standard Specification for Concrete Construction and Materials
ACI 301-84 (Revised 1987)	Specifications for Structural Concrete for Buildings
ACI 306.1-87	Standard Specification for Cold Weather Concreting
ACI 315-80	Details and Detailing of Concrete Reinforcement
ACI 347-78 (Reapproved 1984)	Recommended Practice for Concrete Formwork
ACI 349-85	Code Requirements for Nuclear Safety Related Concrete Structures

1.1.1.2 American Society for Testing and Materials (ASTM)

A 108-81	Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
A 307-86a	Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
A 615-87	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C 31-88	Standard Practice for Making and Curing Concrete Test Specimens in the Field
C 33-86	Standard Specification for Concrete Aggregates

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C 39-86	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C 87-83	Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
C 94-86b	Standard Specification for Ready-Mixed Concrete
C 125-88	Standard Terminology Relating to Concrete and Concrete Aggregates
C 138-81	Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C 143-78	Standard Test Method for Slump of Portland Cement Concrete
C 150-86	Standard Specification for Portland Cement
C 171-69 (1986)	Standard Specification for Sheet Materials for Curing Concrete
C 227-87	Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
C 233-87a	Standard Test Method for Air- Entraining Admixtures for Concrete
C 260-86	Standard Specification for Air- Entraining Admixtures for Concrete
C 289-87	Standard Test Method for Potential Reactivity of Aggregates (Chemical Method)
C 309-81	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

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- C 311-87 Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
- C 494-86 Standard Specification for Chemical Admixtures for Concrete
- C 618-87 Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete
- C 920-86 Standard Specification for Elastomeric Joint Sealants
- C 932-80 (1985) Standard Specification for Surface Applied Bonding Agents for Exterior Plastering
- D 75-87 Standard Practice for Sampling Aggregates
- D 512-81 (1985) Standard Test Methods for Chloride Ion in Water
- D 516-82 Standard Test Methods for Test for Sulfate Ion in Water
- D 2000-86 Standard Classification System for Rubber Products in Automotive Applications
- D 3370-82 Standard Practices for Sampling Water
- E 779-87 Standard Test Method for Determining Air Leakage Rate by Pressurization
- 1.1.1.3 American Welding Society (AWS)
 - AWS D1.1-88 Structural Welding Code - Steel
 - AWS D1.4-79 Structural Welding Code - Reinforcing Steel
 - AWS QC1-86 Standard for Qualification and Certification of Welding Inspectors

1.1.1.4 Federal Specifications (FS)

TT-S-00230C,
Including AMD 2

Sealing Compound: Elastomeric
Type, Single Component (For
Calking, Sealing, And Glazing
In Buildings And Other
Structures)

1.1.1.5 National Ready Mixed Concrete Association (NRMCA)

January 1, 1976
(Third Revision)

Certification of Ready Mixed
Concrete Production Facilities

1.1.1.6 Washington State Department of Transportation (WSDOT)

M41-10-88

Standard Specifications for
Road, Bridge, and Municipal
Construction

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Formwork: Submit fabrication drawings showing general arrangement of forms, sizes and grades of lumber, panels and related components. Include placement rate of fresh concrete in walls based on ACI 347, Chapter 2. Show control joints and method of forming, locations of inserts, tees, sleeves, and other related items.

1.2.2 Form Coating Materials: Submit proposed form coating materials in accordance with Paragraph 3.1.2 and ACI 301, Section 4.4.

1.2.3 Certification of Ready Mixed Concrete Production Facilities: Submit current legible copy of "Certificate of Conformance for Concrete Production Facilities" issued by and bearing the seal of the National Ready Mixed Concrete Association. Certificate shall be dated within past 12 months of first concrete delivery.

1.2.4 Laboratory Test Reports: Submit certified copies of test reports showing following materials meet specified requirements.

1.2.4.1 Cement

1.2.4.2 Aggregates

1.2.4.3 Admixtures

a. Air-entraining: Tested in accordance with ASTM C 233.

b. Water reducing: Tested by combining with cement and aggregates to be used to produce specified concrete having desired properties with respect to time of set, water-reduction, slump, strength, shrinkage, and pumpability.

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c. Set retarding: Tested by combining with cement and aggregates to be used to produce specified concrete having desired properties with respect to retardation, water content, slump and strength.

d. Pozzolan: Tested in accordance with ASTM C 311.

1.2.4.4 Reinforcement

1.2.4.5 Concrete curing material

1.2.4.6 Water

1.2.5 Reinforcing Steel Fabricator Drawings: Submit complete and checked reinforcing steel fabrication and installation drawings, based on schedule for concrete placement and showing bending diagrams, assembly diagrams, splicing and laps of rods, and shapes, dimensions and details of bar reinforcing and accessories. Prepare drawings in accordance with ACI 315, Chapter 2.

1.2.6 Manufacturer's Data: Submit manufacturer's catalog cuts of reinforcing steel mechanical couplers along with data on material and installation procedures. Include type and series identification of sleeve splice for size of bars to be supplied.

1.2.7 Certified Test Reports: Submit manufacturer's certified test reports showing chemical analysis and physical tests made on particular heat or heats of steel from which reinforcing steel mechanical couplers were manufactured. Submit separate certificates for each group of like items furnished by each supplier.

1.2.8 Schedule for Concrete Placement: Submit schedule delineating location, sequence of pouring and time lapse between supporting and supported elements. Provide block diagrams and pouring sequence for slabs and walls.

1.2.9 Mix Design: Submit mix design, in accordance with ACI 349, Paragraphs 4.2 and 4.3 based on aggregate data, gradation and specific gravity determined by laboratory within past 6 months, and specified requirements.

1.2.10 Mix Certification: Submit certification of concrete mix design, by approved independent engineering testing laboratory. Certification shall include but not be limited to following.

1.2.10.1 Confirmation of aggregate test data based on available test results determined within past 6 months and date tests were made.

1.2.10.2 Evaluation of mix design: Check calculations and report cement factor, concrete plant standard deviation used in design of mix, maximum water (gallons per sack of cement), percentage of fine aggregate to total aggregate by weight, weight in pounds of saturated surface-dry aggregates per sack of cement, percentage of admixtures and yield for 1 cubic yard of concrete.

1.2.11 Control Procedures for Batching: Submit detailed procedures for controlling following activities.

1.2.11.1 Handling and storage of cement, fly ash, aggregate, and admixtures.

1.2.11.2 Limiting moisture content of fine aggregate to 5 percent.

1.2.11.3 Batching operation to include sequencing of material.

1.2.11.4 Addition of chilled water or ice.

1.2.11.5 Prohibition of added water except to adjust slump at point of placement. Additional water may be added if slump of concrete is less than specified.

1.2.11.6 Regulation of mixing drum revolutions.

1.2.12 Certificate of Conformance: Submit legible certificate stating that concrete delivery equipment meets the requirements of subparagraphs 2.2.6.2a and 2.2.6.2b.

1.2.13 Construction Joints: Submit drawings showing location and treatment of construction joints in accordance with ACI 301, Section 6.1.

1.2.14 Weather Protection During Placement: Submit protection procedures meeting the requirements of subparagraph 3.2.9.5 and ACI 301, Section 8.4.

1.2.15 Curing and Protection: Submit description of materials and methods of curing in accordance with Article 3.4 and ACI 301, Section 12.2.

1.2.16 Pump Concrete: Submit description of concrete pump and form capacity in accordance with subparagraph 3.2.9.6.

1.2.17 Methods for Controlling Heat of Hydration and Thermal Gradients: Submit control procedures meeting the requirements of subparagraph 3.2.9.7.

1.2.18 Air Leakage Test: Submit description of major components to be used in testing as defined in ASTM E 779, Paragraph 6.2 and proposed method.

1.2.19 Manufacturer's Data: Provide basic data defining material type, grade, and hardness for neoprene sheeting meeting the requirements of Paragraph 2.1.9.

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Welding Personnel and Procedures

1.3.1.1 Personnel and procedures for welding shall have been qualified in accordance with AWS D1.1 and AWS D1.4 before welding.

1.3.1.2 Deliver 2 copies of welding procedure specifications, procedure qualification records, and welder performance qualification test results to KEH 5 days before welding. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

1.3.2 ~~Qualification of Nondestructive Examination (NDE) Personnel~~

1.3.2.1 Visual weld examinations and appropriate documentation shall be performed by Certified Welding Inspectors (CWI) who have received certification in accordance with AWS QC1. Welding related examination documentation shall be signed, or stamped, by individual performing examination.

1.3.2.2 Deliver 2 copies of NDE personnel qualifications to KEH 5 days before examining. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

1.3.3 Qualification of Splicers: Personnel splicing reinforcing bars by welding or mechanical splice shall be qualified before splicing in accordance with following requirements.

1.3.3.1 Prepare 2 qualification splices on largest bar size for each splice position using reinforcing bar identical to 1 used in structure.

1.3.3.2 Tensile test splices with results equal to 125 percent of specified yield strength.

1.3.3.3 Deliver 2 copies of splicer performance qualification test results to KEH 5 days before splicing. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

1.3.3.4 Requalification of personnel required if:

- a. Specific splice position has not been used for period of 3 months or more.
- b. Completed splices fail to pass visual examination or tensile tests.
- c. Consistent visual rejects occur.
- d. Requalification not required if based on single visual reject.
- e. Requalification procedures shall be identical to original qualification procedure.

1.3.4 Test Records: Institute and maintain for examination by KEH complete legible records of tests performed pursuant to design of concrete mixtures. Keep records in chronological order of initial and subsequent mixture designs, and correspondence related to design and testing, along with results of tests.

1.3.5 Quarry Aggregate Testing: Determine sieve analysis of separate sizes of coarse and fine aggregates sampled at quarry source and results combined in accordance with proportions of mix design. Keep records of tests. Combined aggregates proportioned at concrete plant using separate sizes of aggregates shall meet specified gradation. Gradation of separate individual sizes of coarse and fine aggregates shall meet specified requirements. In following table, letter "X" is gradation Contractor proposes to furnish for specific sieve sizes. In addition to grading, distribution of aggregates shall be as follows.

1.3.5.1 Fine aggregate

a. Difference between total percentage passing No. 16 sieve and total percentage passing No. 30 sieve: Between 10 and 35.

b. Difference between percent passing No. 30 and No. 50 sieves: Between 10 and 30.

1.3.5.2 Make additional sieve analysis and other aggregate tests in accordance with applicable ASTM C 33 or approved alternate WSDOT specified in subparagraph 2.1.2.2.a.1) whenever sieve analysis fails to meet requirements, there is change of aggregate source, or consecutive concrete strength results fail to meet specified strengths.

FINE AGGREGATE GRADING

Sieve Size	PERCENT PASSING	
	Individual Test Result	Moving Average of Five
3/8 in.	100	100
No. 4	95-100	96-100
No. 8	80-100	81-99
No. 16	X ± 10	X ± 8
No. 30	X ± 9	X ± 7
No. 50	X ± 6	X ± 4
No. 100	2 - 10	3 - 9
No. 200	0 - 5	0 - 4

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Packing and Shipping to Site

1.4.1.1 Identification: Each bundle of reinforcing bars shall display permanently marked tag identifying manufacturer and heat numbers from which product was made along with ASTM specification number and type to which product complies, unless permanently marked on each bar.

1.4.2 Acceptance at Site: Reinforcement will be receipt examined by KEH for compliance with material identification tag.

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1.4.3 Storage and Protection at Plant

1.4.3.1 Cement: Store immediately upon receipt.

a. Bags

1) Store in suitable weatherproof structure, as air-tight as practicable, with floors elevated above ground sufficiently to prevent absorption of moisture.

2) Stack close together to reduce circulation of air, but not against outside walls, in manner to permit easy access for examination and identification of shipments.

b. Bulk cement: Transfer to elevated airtight and weatherproof bins.

c. At time of use cement shall be free-flowing, and free of lumps. Cement stored longer than 6 months shall be tested by standard mortar tests or other tests deemed necessary by KEH to determine suitability of use, and not used without approval of KEH.

d. Cement containers shall show production date of cement.

1.4.3.2 Aggregates

a. Store on areas covered with tightly laid wood planks, sheet metal, or other hard and clean surface, and in manner to preclude inclusion of foreign material.

b. Store aggregates of different sizes in separate piles.

c. Build stock piles of coarse aggregate in horizontal layers not exceeding 4 feet in depth to minimize segregation.

d. Should coarse aggregate become segregated, remix to meet grading requirements.

e. Do not store fine aggregate from different sources of supply in same stockpile.

1.4.3.3 Admixtures

a. Store in manner to prevent damage to containers.

b. Air-entraining admixtures stored longer than 6 months, or subjected to freezing shall not be used until retest proves satisfactory.

c. Production dates of admixtures shall be shown on containers.

1.4.4 Storage and Protection at Site: Store and protect reinforcement to avoid excessive rusting or coating with grease, oil, dirt, and other objectionable materials.

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PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Reinforcing Steel

2.1.1.1 Steel bars: ASTM A 615, deformed, Grade 60.

2.1.1.2 Tie wire: Black annealed steel, 16 gage minimum.

2.1.1.3 Provide stirrups, hanger bars, wire ties, chairs, spacers, supports, and other devices shown on the Drawings or required in this Section.

2.1.1.4 Reinforcing steel mechanical couplers: Sleeves with ferrous filler material, or other types of couplers which can be used with specified reinforcing steel bars, and capable of 125 percent of yield strength of reinforcing steel.

2.1.2 Concrete: Meet construction requirements of ACI 349 and ACI 301. If conflicts between ACI 349 and ACI 301 occur, ACI 349 shall govern.

2.1.2.1 Cement: ASTM C 150, Type II. Cement content minimum required to attain specified properties.

2.1.2.2 Aggregates: ASTM C 33, maximum size 3/4 inch, free of chlorides, sulfates, and substances which may be deleteriously reactive with alkalis in cement in amount sufficient to cause excessive expansion of concrete.

a. Fine aggregates: Grade in accordance with ASTM C 33. Aggregates from different sources of supply shall not be used alternately in same structure.

1) Aggregate meeting grading requirements of WSDOT, Section 9-03.1(2)B, Class 1 may be used instead of ASTM C 33.

b. Coarse aggregate: Grade in accordance with ASTM C 33, Size Number 67.

2.1.2.3 Water: Water for mixing and curing, including free moisture and water in aggregates, shall be fresh, clean and potable. Turbidity of water shall not exceed 2,000 turbidity units expressed as JTU (Jackson Turbidity Units) or FTU (Formeson Turbidity Units).

2.1.2.4 Admixtures: Do not use admixtures containing chloride ions.

a. Air-entraining admixtures: Meeting the requirements of ASTM C 260.

b. Water-reducing admixture: Pozzolan meeting the requirements of ASTM C 618, Class N or F.

c. Set-retarding admixture: Meeting the requirements of ASTM C 494.

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2.1.2.5 Properties

28 days.

- a. Minimum allowable compressive strength: 4500 psi at
- b. Slump: 3-5 inches, determined in accordance with
ASTM C 143.
- c. Air-entrained: 4.5 percent plus 1.0 or minus 1.5 percent.
- d. Water/cement ratio: 0.41 maximum.

2.1.2.6 Chloride contamination: Level of soluble chloride in fresh concrete mix from all sources shall not exceed 1000 ppm (0.1 percent) by weight of cement.

2.1.3 Waterstops: See Section 05500.

2.1.4 Concrete Curing Material

2.1.4.1 Waterproof paper: Regular, meeting the requirements of ASTM C 171.

2.1.4.2 Polyethylene film: Clear, meeting the requirements of ASTM C 171.

2.1.4.3 White-burlap-polyethylene sheet: Meeting the requirements of ASTM C 171.

2.1.4.4 Liquid membrane-forming compound: Meeting the requirements of ASTM C 309, Type 1, Class B.

2.1.5 Bonding Agent

2.1.5.1 Concrete: Meeting the requirements of ASTM C 932.

2.1.5.2 Neoprene: Urethane meeting FS TT-S-00230, Type II, Class A, or ASTM C 920, Type S, Grade NS, Class 25.

2.1.6 Anchor Bolts: ASTM A 307.

2.1.7 Weld Anchors and Shear Connectors: ASTM A 108.

2.1.8 Formwork: Materials meeting the requirements of ACI 347, Chapter 4.

2.1.9 Neoprene Bearing Pad: Solid neoprene sheeting meeting the requirements of ASTM D 2000, Durometer Hardness 50, Type BC.

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2.2 BATCHING AND MIXING

2.2.1 Equipment for weighing and measuring materials shall meet local and state requirements, and visually exhibit latest seals.

2.2.2 Batch concrete in plant approved by NRMCA and the Operating Contractor.

2.2.3 Aggregates

2.2.3.1 Fine aggregates: Do not mix fine aggregates from different sources of supply.

2.2.3.2 Coarse aggregates: Combine separate sizes of coarse aggregates with other sizes in proportions by weight to produce aggregate meeting grading specified.

2.2.4 Admixtures: When more than 1 admixture is use in mix, furnish satisfactory evidence that admixtures to be used are compatible in combination with cement and aggregates, and suitable at job temperatures.

2.2.4.1 Air-entraining admixtures: Add in solution in portion of mixing water by mechanical batcher ensuring uniform distribution of agent throughout batch.

2.2.4.2 Water-reducing admixture: Replace 20 percent of cement in concrete mix with Pozzolan. Accurate batching is required.

2.2.4.3 Set-retarding admixture: Use as necessary to meet specified water/cement ratio and delay set 2 to 3 hours.

2.2.5 Proportioning Concrete Materials: In accordance with ASTM C 94.

2.2.6 Ready-Mixed Concrete: Equipment for ready-mixed concrete shall meet the requirements of ASTM C 94 as modified herein. Ready-mixed concrete may be used provided plant has sufficient capacity and transportation equipment to deliver concrete at rate desired, and meets the requirements specified for equipment, measurement of materials, and mixing, except as modified herein. Cement, aggregates, water and admixtures shall meet applicable requirements of this Section. Mix and deliver ready-mixed concrete by 1 of following methods.

2.2.6.1 Central-plant mixing: Utilize central-plant mixing specified in ASTM C 94, Paragraph 11.3. Mix concrete in stationary mixer at plant and transport to site in truck agitator or truck mixer operating at agitating speed. Begin mixing within 30 minutes after cement has been added to aggregates. When authorized in writing by KEH, approved nonagitation equipment

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may be used for transporting concrete. Time lapse between introduction of mixing water to cement and aggregates and placing of concrete in final position in forms, shall not exceed the following.

a. For agitating equipment: 90 minutes when air temperature is less than 85 F, and 60 minutes when air temperature is equal to or greater than 85 F.

2.2.6.2 Truck-mixed concrete: Ready-mixed concrete may be batched from manually-operated batch plant and mixed and delivered in truck-mounted mixer units provided following additional requirements are adhered to.

a. Truck mixer units used meet the requirements of ASTM C 94. Demonstrate compliance by performing tests in accordance with ASTM C 94, Annex A1.

b. Establish maintenance inspection program to ensure mixer units are maintained in condition to perform in accordance with ASTM C 94. Maintenance inspection program shall address following as minimum.

- 1) Frequency of inspection.
- 2) Inspection criteria including requirements for water measuring devices, counters, fin heights, and cleanliness.
- 3) Name of individual performing inspection.
- 4) Results of inspection.
- 5) Statement that units are satisfactory for use. Include equipment numbers.

c. To preclude weighing inaccuracies in batch constituents bring dial indicator on weigh scales to essentially motionless condition at each desired intermediate batch weight before addition of remainder of material or discharge of weigh hopper.

2.3 SOURCE QUALITY CONTROL

2.3.1 Sampling: Before delivery of concrete to site, sample fine and coarse aggregates in accordance with ASTM D 75. Each sample shall be in clean container, securely fastened to prevent loss of material, and tagged for identification with following information.

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Contract No. _____

Sample No. _____ Quantity _____

Date of Sample _____

Sampler's Signature _____

Source _____

Intended Use _____

For Testing _____

2.3.1.1 Fine aggregates: Take two 50 pound samples for each 200 tons for sieve analysis of fine aggregate sand and specific gravity tests. Sampling may be reduced to 1 when test results show fine aggregates consistently meet specified requirements. Additional samples shall be taken when analyses show deficiencies, unacceptable variances, or deviations. Take samples of sand when sand is moist.

2.3.1.2 Coarse aggregate: Take 50 pound or larger sample for each 400 tons, from conveyor belt. Bring plant up to full operation before taking samples. Take samples so uniform cross section, accurately representing materials on belt or in bins, is obtained. Additional sampling shall be made when analyses show deficiencies or unacceptable variances or deviations from specified requirements.

2.3.1.3 Obtain water samples in accordance with ASTM D 3370, Practice A.

2.3.2 Testing: Test and record results at least 10 days before using materials.

2.3.2.1 Aggregates: Make gradation tests on each sample taken at batch plant. Make other required aggregate tests on samples, and repeat whenever there is a change of source. Tests shall include analysis of each grade of material and analysis of combined material representing aggregate part of mix. Combined aggregates proportioned at plant using separate sizes of aggregates shall meet specified gradation.

2.3.2.2 Test for potential reactivity of aggregates in accordance with ASTM C 289. Test aggregates from newly-developed quarries in accordance with ASTM C 227.

a. Fineness modulus of fine aggregate, defined in ASTM C 125, shall be at least 2.3 but not more than 3.1. Aggregate showing variation in fineness modulus more than plus or minus 0.2 of representative sample submitted will be rejected.

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2.3.2.3 Water: Test at start of work, and change of source.

a. Determine extent of chloride and sulfate contamination of water in accordance with ASTM D 512 and ASTM D 516. Water shall contain no more than 250 ppm of chlorides as CL nor more than 250 ppm of sulfates as SO_4 .

b. Mortar specimens made in accordance with ASTM C 87, when compared with similar mortar specimens made with water of known satisfactory quality and using same sand and cement, shall show no unsoundness or marked change in setting, and compressive strength of mortar specimens at 28 days shall be at least 95 percent of compressive strength of specimens made with water of known satisfactory quality.

2.3.2.4 Test cement in accordance with ASTM C 150.

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Form Construction: Construct and install forms in accordance with approved submittals, set true to line and grade, and maintained to ensure completed work within specified tolerances and mortar-tight.

3.1.1.1 Arrange bolts and rods used for internal ties so when forms are removed, metal shall be at least 2 inches from surfaces.

a. Do not use bolts or rods that must be removed when forms are removed.

3.1.1.2 Provide forms with temporary and adequate clean-out openings at base of wall forms to permit examination and easy cleaning after reinforcement has been placed.

3.1.1.3 Where forms for continuous surfaces are placed in successive units, fit over completed surface to obtain accurate alignment and prevent leakage of mortar.

3.1.1.4 Construct panel forms to provide tight joints between panels. Form repair requires KEH approval before use.

3.1.1.5 Construct forms to be removed without damaging concrete.

3.1.2 Form Coating

3.1.2.1 Coat contact surfaces of forms with nonstaining mineral oil or form coating compound, or 2 coats of nitrocellulose lacquer.

3.1.2.2 When temperature is above 40 F, sheathing may be thoroughly wetted with clean water.

3.1.2.3 Remove excess coating by wiping with cloths.

3.1.2.4 Thoroughly clean contact surfaces of reused forms.

3.1.2.5 Apply additional coating to previously coated forms.

3.1.3 Form Insulation: See subparagraph 3.2.9.7.

3.1.4 Tolerances: In accordance with ACI 347, Paragraph 3.3.5.

3.2 INSTALLATION

3.2.1 Reinforcing Steel, General: Wash reinforcement that has been in contact with the ground with water before placing to remove potential chloride contamination.

3.2.1.1 Reinforcing shall be free of rust, scale, oil, grease, clay, coatings, or foreign substances that will reduce or destroy bond between steel and concrete.

3.2.1.2 Rusting will not be basis for rejection, provided it has not reduced effective cross sectional area of reinforcement to extent that strength is reduced beyond specified values.

3.2.1.3 Remove heavy, thick rust or loose, flaky rust by rubbing with burlap or other approved method, before placing.

3.2.2 Placing

3.2.2.1 Accurately and securely place reinforcing in accordance with approved submittals.

3.2.2.2 On ground, and where otherwise subject to corrosion, use concrete or other suitable noncorrodible material for supporting reinforcing.

3.2.2.3 Support and wire reinforcing together to prevent displacement by construction loads or placing of concrete.

3.2.2.4 Unless directed otherwise by KEH do not bend reinforcing after partial embedment in hardened concrete.

3.2.3 Splicing, General

3.2.3.1 Examine bar ends and splice sleeves before assembly for cleanliness and proper end preparation. Bars shall meet sleeve manufacturer's recommendations.

3.2.3.2 Preparation and testing of sister joints: Make sister joints, removable test splices, in place, adjacent to production joints and by same welder or splicer making production joint. Perform tests as follows.

a. For each bar direction taken separately (horizontal, vertical, or diagonal), provide sister joints in following number.

1) 1 for first 10 production splices of each type in each direction.

2) 1 for next 25 production splices of each type in each direction.

3) From then on, 1 for every 33 production splices of each type in each direction.

b. Test sister joints in tension to destruction.

1) Acceptable tensile strength of each sample: 125 percent of specified yield strength.

2) If tensile strength of test splice does not equal or exceed acceptable tensile strength, test 1 production splice on each side of failed test splice, if either production splice fails, remove splices made by welder or splicer making production splice. Additional tensile tests may be made on production splices to demonstrate acceptability of splices.

3.2.3.3 Splice reinforcement in accordance with ACI 349 and approved submittals, except as modified by this Section and the Drawings. Do not splice at points of maximum stress. Butt splicing may be used instead of lap splicing provided splice material, equal or greater in cross-section to spliced steel, has minimum 125 percent of yield strength. Lap splices shall be Class C unless otherwise noted or dimensioned on the Drawings.

3.2.3.4 Welded

a. Weld reinforcing bar splices with full penetration butt welds, unless shown otherwise, in accordance with AWS D1.4.

b. Do not weld until welding documents have been approved.

c. KEH may examine welding processes.

d. Weld identification: Prepare and maintain map of welded splices. Deliver to KEH at completion of work.

1) Assign weld number, prefixed by letter 'W', to each weld as made. Show numbers on splice map.

2) Place identification symbol of welder making weld and weld number adjacent to each weld. Use marking crayon or paint.

3) Do not reuse weld numbers. If weld is completely replaced, assign new number.

3.2.3.5 Mechanical

a. Where bar cutting is required, cut by sawing, shearing, or flame cutting. If bars are sheared, straighten ends after shearing. If bars are flame cut, remove slag by chipping and wire brushing before splicing.

b. Splice bars in accordance with manufacturer's approved instructions. Make connections with manufacturer's standard hardware and equipment.

c. Splice identification: Prepare and maintain map of mechanical splices. Deliver to KEH at completion of work.

1) Assign splice number, prefixed by letter "C", to each splice as made. Show splice numbers on splice map.

2) Place identification symbol of splicer making splice and splice number adjacent to each splice. Use marking crayon or paint.

3) Do not reuse splice numbers. If splice is completely replaced, assign new number.

3.2.4 Nondestructive Examination

3.2.4.1 Welds: Perform 100 percent visual examination of welds in accordance with AWS D1.4. Document examination of cover pass on splice map.

3.2.4.2 Splice sleeves with filler metal

a. Examine connections visually after cooling for longitudinal centering of sleeve on spliced ends, allowable voids in filler metal, extent of leaking of filler metal, gas blowout, amount of packing, and slag at tap hole.

b. Bar end location markers and filler metal shall be visible at each bar end and at filler hole.

c. Subject each end to maximum allowable void criteria recommended by manufacturer.

d. Splices that fail to pass visual examination shall be discarded and replaced, and not used as tensile strength samples.

3.2.4.3 Splice sleeves without filler metal

a. Mark bars with suitable marker to show depth of insertion into splice. After completion, use mark to check actual depth of insertion for compliance with manufacturer's recommendations. Insertion depth shall not vary from manufacturer's recommendations by more than 1/4 bar diameter.

b. Check assembly and swaging pressure for compliance with installation procedure described in manufacturer's instructions. Certification of calibration of gages used for registering press pressures is required.

c. Check length of each coupler after swaging for compliance with manufacturer's minimum final length requirements.

d. Replace coupler splices, rejected for not meeting visual quality acceptance standards, with new splices using new couplers.

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3.2.5 Moving Reinforcing

3.2.5.1 Placing, or moving reinforcing after placement, to positions other than shown or specified, requires approval of KEH.

3.2.5.2 Bars may be moved to avoid interference with other reinforcing steel, conduits, or embedded items, but shall not impair design strength of members.

3.2.6 Protect reinforcing with concrete as shown, and in accordance with ACI 117 and ACI 349, Paragraph 7.7.

3.2.7 Tolerances: In accordance with ACI 117 and ACI 349, Paragraph 7.5.

3.2.8 Embedded Items: Accurately position and support waterstops and embedded items against displacement. Temporarily fill voids in sleeves, inserts, and anchor slots with readily removable material to prevent entry of concrete.

3.2.8.1 Waterstops: Locate waterstops in construction joints as shown on the Drawings. Make joints at intersections and ends of pieces with complete penetration butt splice welds. Bending plates at corners is allowable, except minimum inside radius shall be 1 inch.

3.2.8.2 Other embedded items: Place sleeves, inserts, anchors, and embedded items required for adjoining work or its support before placing concrete.

3.2.8.3 Waterstops and other embedded items shall be free of mud, oil, or other material to facilitate bonding to concrete.

3.2.9 Conveying and Placing Concrete

3.2.9.1 Before placing, obtain following.

- a. Approval of required submittals.
- b. Approval of formwork and reinforcement by KEH.

c. Obtain approval of "Pour Slip" by KEH. "Pour Slip" shall include project name, location of pour, concrete strength, slump, places for signoff by contractors having embedded items, estimated and actual cubic yards of concrete, date and time of placing concrete, pour slip number and signoff by Contractor with date. Contractor's signature shall indicate embedments are in place and concrete may be placed. Deliver completed pour slips to KEH upon completion of pour.

d. For each truck load, deliver "Trip Ticket" to KEH. "Trip Ticket" shall contain information listed in ASTM C 94, subparagraph 16.1.1 through 16.1.10, and include water/cement ratio, water temperature at plant, mixer discharge time, and Contractor's signature.

3.2.9.2 Conveying

a. Convey concrete from mixer to forms as rapidly as practicable by methods which will not cause segregation or loss of ingredients or interruption of continuous pour.

b. Clean conveying equipment before each run.

c. Remove and dispose of concrete which has segregated in conveying as directed by KEH.

3.2.9.3 Placing

a. Place no concrete after initial set, or when weather conditions prevent proper placement and consolidation. Placement in uncovered areas during precipitation or in water will not be permitted.

b. Deposit as nearly as practicable in final position in forms.

c. Deposit concrete as soon as practicable after forms and reinforcement have been examined and approved.

d. Forms shall be clean of dirt, construction debris, water, snow, and ice.

e. Maximum free vertical drop of concrete shall not exceed 4-1/2 feet. Chuting will be permitted only where concrete is deposited into hopper before placing in forms.

f. Deposit concrete in horizontal layers 12 to 20 inches deep in manner to preclude formation of cold joints between successive layers. Deposit by method to avoid displacing reinforcement and segregating aggregate.

g. Use telescoping drop chute to place concrete in walls and when vertical lift of forms exceeds 4 feet.

h. Work concrete about reinforcement and embedded fixtures and into corners and angles of forms. Avoid overworking which may result in segregation.

i. Remove water accumulation on surface of concrete during placing by absorption with porous materials that prevent removal of cement.

j. Pumping concrete through aluminum pipe will not be permitted.

k. Concrete that has partially hardened before placing or been contaminated or remixed after initial set shall not be used.

3.2.9.4 Vibration

a. Compact with high frequency, internal mechanical vibrating equipment supplemented by hand spading and tamping. Vibrators shall be designed to operate with vibratory element submerged in concrete, and have minimum frequency of 6,000 impulses per minute when submerged.

- KEH.
- b. Avoid vibrating forms and reinforcement unless authorized by KEH.
 - c. Do not transport concrete in forms with vibrators.
 - d. Discontinue vibrating when concrete has been compacted and ceases to decrease in volume.
 - e. When concrete is placed in layers, vibrator shall penetrate previously placed layer, to prevent formation of cold joints.

3.2.9.5 Weather conditions

a. Placing concrete in cold weather: Place in accordance with ACI 306.1 except as modified herein. Concrete shall not be placed when atmospheric temperature is less than 40 F except when authorized by KEH. When freezing temperatures are likely to occur within 24 hours heat concrete materials so minimum temperature of concrete when deposited will be 40 F. Do not heat mixing water above 140 F. Remove lumps of frozen material and ice from aggregates before placing in mixer. Do not use calcium chloride in concrete as accelerator. Remove concrete damaged by freezing and replace with new concrete.

b. Placing concrete in hot weather: Reduce temperature of concrete being placed to prevent rapid drying. Temperature of concrete placed shall not exceed 70 F. Shade fresh concrete as soon as possible after placing. Start curing as soon as surface of fresh concrete is sufficiently hard to prevent damage.

c. Control concrete placement temperatures by 1 or combination of the following.

- 1) Shade aggregates from sun and keep stockpiles moist by sprinkling with water to keep temperature of aggregate at or below 60 F.
- 2) Avoiding use of hot cement.
- 3) Add sufficient crushed ice, made from water meeting the requirements of subparagraph 2.1.2.3 to concrete mix, replacing equivalent amount of mix water to maintain required water/cement ratio, to reduce temperature of concrete mix at time of mixing.
- 4) Insulating water supply lines and tanks.
- 5) Insulating mixer drums, or cooling them with sprays or wet burlap coverings.
- 6) Working only at night.
- 7) Adding retarder or water reducing retarder in mix, if approved by KEH.

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3.2.9.6 Pump concrete

a. If pumping of concrete from mixer to forms is used, deliver following certification, information and data at least 10 days before placement of concrete.

- 1) Name, type and capacity of proposed pump.
- 2) Statement from manufacturer that pump will pump specified class of concrete without changes to approved mix proportions and slump.
- 3) Certified statement that concrete forms to receive pumped concrete have been designed to withstand concrete pressure in its plastic condition as result of proposed vertical placement rate and expected ambient temperatures during pumping.

b. Pumping concrete from mixer to forms may be permitted only if approved standby method of concrete placement, such as standby pump, is available at Site.

3.2.9.7 Control of heat of hydration and thermal gradients

a. Insulate grout vault and concrete basin forms, except construction joints, with at least 1 inch of polyurethane foam, or cover pit or provide equivalent means of reducing thermal gradients. Leave insulated forms in place for at least 14 days after completion of pour. Instead of polyurethane foam insulation remaining in place for 14 days, curing blankets with R value of at least 6 may be used to cover exterior of wall forms before concrete placement completion. Wall form removal and curing compound application may be done the fifth day after pour. Reinstall curing blankets as soon as possible, but no later than 4 hours after form removal. Curing blankets may be removed for short periods of time not exceeding 4 hours as construction practices necessitate. Curing blankets may be removed 14 days after pour.

b. Cover unformed portions of slab receiving troweled finish with insulating blankets or equivalent, having R value of 5.8 or greater, morning after finishing. Insulation shall remain for curing period specified in Paragraph 3.4.4 except for short periods not exceeding 4 hours as construction practices necessitate.

3.2.10 Construction Joints: Make and locate joints shown on the Drawings in accordance with approved submittal.

3.2.10.1 Reinforcement: Continue reinforcing steel across joints. Provide keys as shown. Provide longitudinal keys at least 1-1/2 inches deep in joints in walls.

3.2.10.2 Surface preparation: Clean surface of concrete at joints and remove laitance.

3.2.10.3 Bonding: Bond construction joints and joints between new and existing concrete by 1 of following methods.

- a. Use specified bonding agent.
- b. Roughen surface of concrete to expose aggregate uniformly and not leave laitance, loosened particles of aggregate, or damaged concrete at surface.
- c. Concrete retardant to delay concrete curing on joint surfaces may be used with approval by KEH.

3.2.11 Form Removal

3.2.11.1 Remove forms in manner to prevent damage to concrete. Remove forms after minimum periods following placement of concrete specified below, with approval of KEH.

a. Insulated forms: 14 days.

b. Uninsulated forms with curing blankets: 5 days. Forms at perimeter of foundation slabs and slab construction joints may be removed after 60 hours.

3.2.11.2 If average ambient temperatures during curing are below 50 F, minimum time for removal of forms and shores shall be 50 percent greater than specified.

3.2.11.3 Protect concrete work from damage during construction.

3.2.11.4 Place no concrete for subsequent wall lifts until supporting members have reached at least 70 percent of design strength.

3.2.12 Concrete Repair: Repair surface defects including tie holes, minor honeycombing and otherwise defective concrete with cement mortar of same composition used in concrete. Patch as soon as forms are removed.

3.2.12.1 Thoroughly clean and cut out areas to be patched to solid concrete to depth of at least 1 inch. Edges of cut shall be perpendicular to surface of concrete.

3.2.12.2 Saturate area to be patched and at least 6 inches adjacent thereto with water before placing mortar. Mix mortar 1 hour before placing and remix occasionally during period with trowel and without addition of water. Brush grout of cement and water mixed to consistency of paint onto surfaces to which mortar is to be bonded. Compact mortar into place and screed slightly higher than surrounding surface.

3.2.12.3 Finish patches on exposed surfaces to match adjoining surfaces, after they have set for an hour or more. Cure patches as specified for concrete.

3.2.12.4 Fill holes extending through concrete by plunger type gun or other suitable device from exterior face. Wipe excess mortar off exposed face with cloth.

3.2.12.5 Protect finished surfaces from stains and abrasions.

3.2.12.6 Concrete with excessive honeycombing which exposes reinforcing steel or other defects which affect structural strength of member, will be rejected or defects corrected as directed by KEH.

3.2.13 Concrete Finishing: Finish formed surfaces as soon as practicable after form removal and repair of surface defects. Chamfer exposed joints, edges, and corners 3/4 inch minimum, unless specified otherwise.

3.2.13.1 Rough form finish, exterior walls of concrete basin and grout vault: No selected form facing materials are required for rough form finish surfaces. Patch tie holes and defects. Chip or rub off fins exceeding 1/8 inch in height. Otherwise, leave surfaces with texture imparted by forms.

3.2.13.2 Grout cleaned finishes, interior walls of concrete basin: Remove forms in accordance with Paragraph 3.2.11 and complete patching as soon after form removal as possible without jeopardizing structure. Prepare surface with light sand blast or low pressure water blast to remove laitence and expose air holes. Mix one part portland cement and 1-1/2 parts fine sand with sufficient water to produce grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout and apply grout uniformly with brushes or spray gun. Immediately after applying grout, scrub surface vigorously with cork float or stone to coat surface and fill air bubbles and holes. While grout is still plastic, remove excess grout by working surface with rubber float, burlap, or other means. After surface whitens from drying, and 30 minutes at normal temperatures, rub vigorously with clean burlap. Keep finish damp for at least 36 hours after final rubbing.

3.2.13.3 Related unformed surfaces: Tops of walls or buttresses and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and be floated to texture reasonably consistent with formed surfaces. Final treatment on formed surfaces shall continue uniformly across unformed surfaces.

3.2.14 Placing and Screeding Concrete Slabs: Place, consolidate, and strike-off concrete of slump within specified limits to bring top surface of slab to proper contour, grade and elevation. Operation may be followed by darbying or full floating of surface with wooden, aluminum or magnesium tools to correct unevenness. Complete striking-off and darbying before bleed water appears on surface of freshly-placed concrete. Perform no further work until concrete has attained set sufficient for floating and to support weight of finisher and equipment. If bleed water has not disappeared by time floating is to start, drag excess water off surface with rubber hose. Do not use dry cement to absorb bleed water.

3.2.14.1 Provide floated finish for grout vault slabs. Perform floating by hand with wood or magnesium float, or with power-driven float of suitable type. During floating, check surface with 10 foot straight edge applied at 2 different angles minimum. Cut down high spots and fill low spots to produce surface true to plane within 1/2 inch in 10 feet. Refloat slab to uniform sandy texture.

3.2.14.2 Provide troweled finish for concrete basin slabs. First give slabs floated finish as specified. Upon attaining proper set, power trowel or hand steel trowel surfaces. First troweling after floating shall produce smooth surface relatively free of defects but may still show some trowel marks. Do additional trowelings with raised edge by hand after surface has hardened sufficiently to provide consolidated surface. Finished surface shall be free of troweled marks, uniform in texture and be true to plane 1/4 inch in 10 feet when checked with 10 foot straight edge placed anywhere on slab in any direction.

3.3 FIELD QUALITY CONTROL

3.3.1 Concrete Testing: Sampling and testing of concrete will be the responsibility of KEH. Concrete will be tested to ACI 301, Sections 16.3.4, 16.3.5, 16.3.6, and 16.3.8.

3.3.1.1 Strength tests: Specified strengths and design mix will be verified by testing standard cylinders of samples taken at Site. 6 test specimens for laboratory curing and 3 for field curing for each 150 cubic yards of concrete, minimum 1 set each day, will be made in accordance with ASTM C 31.

a. Tests: Specimens will be tested for compressive strength in accordance with ASTM C 39 at 7, 28, and 90 days from time of molding on laboratory cured cylinders. Strength test results will be average strengths of 3 test specimens at 28 days, except if 1 specimen in set of 3 shows evidence, other than low strength, of improper sampling, molding, handling, or curing, remaining 2 specimens will be considered strength test result.

b. Test results: Evaluation of 28 day test results will be made in accordance with ACI 349, Paragraph 4.7.2.3.

3.3.1.2 Tests for consistency: Slump will be measured in accordance with ASTM C 143. Samples will be taken for slump determination from concrete during placing in forms. Tests will be made as follows.

a. At beginning of concrete placement operation and at subsequent intervals to ensure specified requirements are met.

b. Whenever test cylinders are made.

3.3.1.3 Yield tests will be made in accordance with ASTM C 138 as follows.

a. Whenever yield of concrete mix is challenged by KEH.

b. Twice a day on concrete.

c. Whenever materials or mix proportions are changed.

3.3.1.4 Temperature tests will be made as follows.

a. In hot or cold weather conditions at frequent intervals until satisfactory control is established.

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b. Whenever test cylinders are made.

3.3.1.5 Contractor-furnished mix design: If evaluation of 28 day test results show concrete strength is below specified limits and does not meet other requirements make necessary adjustments, as directed by KEH.

3.3.2 At completion of concrete work, plant's coefficient of variation and standard deviation results for each class of concrete placed will be determined by KEH.

3.3.3 Waterstop Field Joint: Perform 100 percent visual examination of fit-up, root, and cover passes of steel waterstop welds. Acceptance criteria for welds shall be in accordance with AWS D1.1, paragraph 8.15.1. Document examination of fitup and cover pass on NDE/Weld Record Form KEH-433, sample appended, furnished by KEH.

3.3.3.1 Complete and document required NDE/Weld examination, and deliver to KEH before concrete placement.

3.3.4 Vault Testing

3.3.4.1 Hydrostatic

a. Fill vault with 33 feet of water, after application of interior protective coating specified in Section 09885, and before installation of exterior drainage path specified in Section 02753. Protect interior coating with splash pad during filling operation.

b. Test for 48 hours after water reaches specified depth.

c. Monitor vault wall exterior and leachate collection sump liner for leakage throughout test. Mark visible leaks and damp spots on exterior wall for reference.

d. Water drops forming on exterior vault walls or visible leakage is unacceptable and vault shall be repaired.

e. Maximum leakage rate collected in leachate collection sump liner: 0.10 gallons per day.

f. If precipitation occurs during test period, restart test after exterior walls have dried and rainwater collected in concrete basin and leachate collection sump has been removed.

1) Contractor may provide method to prevent precipitation from entering concrete basin and wetting exterior walls.

g. Vault repair

1) Repair concrete as specified in Paragraph 3.2.12.

2) Repair interior protective coating in accordance with Section 09885.

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3) Repeat vault hydrostatic testing.

h. Remove water from vault immediately after hydrostatic testing and dispose of in accordance with Section 01500.

3.3.4.2 Air Leakage

a. Perform test in accordance with ASTM E 779 after installation of precast roof specific in Section 03419, concrete topping shown on the Drawings, and sealing vault penetrations.

b. Air in leakage rate: Determined at test pressure differences between 0.05 and 0.5 inch water gage vacuum.

c. Maximum air leakage rate: 3000 cfm at 0.5 inch water gage vacuum.

d. Vault and roof repair

1) Repair concrete and concrete roof topping as specified in Paragraph 3.2.12.

2) Repeat air leakage test.

e. Document test results in accordance with Paragraph 3.3.5 with following minimum information.

1) Vault number.

2) Items required in ASTM E 779, Paragraphs 10.1.2, 10.1.3, and 10.1.4.

3.3.5 Documentation

3.3.5.1 Document test results and examinations required in this Section.

3.3.5.2 Documentation shall be kept current and is subject to review by KEH. Prepare and certify records as work progresses.

3.3.5.3 Deliver documentation to KEH within 7 working days after completion of tests.

3.4 CURING AND PROTECTION

3.4.1 General

3.4.1.1 Protect concrete from injurious action by sun, rain, flowing water, frost, and mechanical injury. Do not allow to dry out from time placed until expiration of minimum curing periods specified.

3.4.1.2 Cure by moist curing, or application of liquid chemical or liquid membrane-forming compound. Continue curing following removal of forms.

3.4.1.3 Maintain temperature of air next to concrete at 40 F minimum for full curing periods. When concrete is authorized for placement in temperatures below 40 F, maintain air in contact with concrete at temperature of at least 50 F for 7 days after placing, or at 70 F minimum for 3 days after placing, and at 40 F minimum for remainder of specified curing periods.

3.4.1.4 Heating concrete in place shall be by vented heaters, steam coils under canvas covers, or other suitable means. Temperature within enclosures shall not exceed 100 F, and adequate moisture shall be applied to concrete surface during heating period to prevent it from drying out.

3.4.1.5 Rate of cooling after protection period shall be approximately 1 F per hour for first 24 hours and 2 F per hour thereafter.

3.4.1.6 Protect concrete against freezing for full curing period specified.

3.4.2 Moist Curing: Moist or wet curing with water or by complete coverage with waterproof membrane sheets shall be continuous for 7 days at 60 F and above, and for longer periods at lower temperatures.

3.4.2.1 Mats: Cover entire surface of concrete slabs with 2 thicknesses of wet burlap weighing at least 7 ounces per square yard dry weight, cotton mats, or other suitable material having high absorptive quality. Thoroughly wet material when applied and keep continuously wet during time remaining on slab. Make mats of clean material free of substances which will have deleterious effects on concrete, and at least as long as width of concrete under construction. During application, do not drag mats over finished concrete slabs or mats already placed, and place to provide complete coverage of surface with slight overlap over adjacent mats. Leave mats in place during curing period.

3.4.2.2 Impervious sheeting curing

a. Thoroughly wet entire exposed surface with fine water spray and cover with 1 of the following.

- 1) Waterproofed paper.
- 2) Polyethylene-bonded waterproof paper sheeting.
- 3) Polyethylene-coated burlap sheeting.
- 4) Polyethylene sheeting.

b. Lay sheets directly on concrete surface and overlap 12 inches when continuous sheet is not used. Curing medium shall be at least 18 inches wider than concrete surface to be cured, and be weighted down by placing bank of moist earth on edges just outside forms and over transverse laps to form closed joints. Repair or replace sheets if torn or otherwise damaged during curing. Curing medium shall remain on concrete surface for at least 7 days.

3.4.3 Liquid Membrane-Forming Compound Curing: Apply clear liquid compound, free of paraffin or petroleum, over concrete surface to restrict evaporation of mixing water. Cure for 7 days following placing of liquid membrane-forming compound.

3.4.3.1 Application of curing compound: Apply after surface loses water sheen and has dull appearance. Agitate curing compound by mechanical means during use and apply uniformly in 2 coat continuous operation by suitable power spraying equipment. Total coverage for 2 coats shall be between 150 and 200 square feet per gallon of undiluted compound. Compound shall form uniform, continuous, coherent film that will not check, crack, or peel and be free of pinholes or other imperfections. Apply additional coat of compound to areas where film is defective. Keep suitable covering, other than liquid curing compound, readily available for use to protect freshly placed concrete in event conditions occur which prevent correct application of compound at proper time. Respray concrete surfaces that are subject to heavy rainfall within 3 hours after curing compound has been applied as specified.

3.4.3.2 Protection of treated surfaces: Keep treated surfaces free from foot and vehicular traffic and other sources of abrasion for at least 72 hours. Maintain continuity of coating for entire curing period and repair damage.

3.4.3.3 Liquid chemical compound curing may be provided instead of liquid membrane-forming compound curing. Apply as specified for liquid membrane-forming compound curing except coverage and number of applications shall be in accordance with manufacturer's recommendations.

3.4.4 Thermal Curing Periods: When 7 day compression test cylinders, representative of parts of structure already placed, indicate that 28 day strengths may be less than 90 percent of design strengths, give those parts of structure additional curing, as directed by KEH. Curing shall be as follows.

<u>Time (Min.)</u>	<u>Concrete Element</u>
14 days	Concrete basin slabs and walls.
14 days	Grout vault slabs and walls.
* 14 days	Construction joints (* or until adjacent concrete is placed).

3.5 CLEANING

3.5.1 Clean basin slabs with ordinary brooms or other suitable method. Keep clean and free of debris and dirt until concrete basin liner is in place.

3.5.2 Clean grout vault floor by sweeping with ordinary brooms or other suitable method.

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NDE / WELD RECORD		1. Project/W.O. No.	2. Weld Identification Dwgs.		3. Contractor	
4. WELD INFORMATION	5. VISUAL EXAMINATION			6. LIQUID PEN. / MAG. PART.	7. RADIO. / LEAK TEST	9. Other:
	Fit-up	Root Pass	Cover Pass			
Weld No.				Root Pass	Radiographic	
Welder Identification						
Welding Procedure Specification				Cover Pass	Leak Test	
Weld Filler Mat'l.						
Weld No.				Root Pass	Radiographic	
Welder Identification						
Welding Procedure Specification				Cover Pass	Leak Test	
Weld Filler Mat'l.						
Weld No.				Root Pass	Radiographic	
Welder Identification						
Welding Procedure Specification				Cover Pass	Leak Test	
Weld Filler Mat'l.						
Weld No.				Root Pass	Radiographic	
Welder Identification						
Welding Procedure Specification				Cover Pass	Leak Test	
Weld Filler Mat'l.						
Weld No.				Root Pass	Radiographic	
Welder Identification						
Welding Procedure Specification				Cover Pass	Leak Test	
Weld Filler Mat'l.						

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END OF SECTION

SECTION 03419

PRECAST PRESTRESSED CONCRETE SECTIONS

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American Association of State Highway and Transportation Officials (AASHTO)

1983 Standard Specification for Highway Bridges, 13th Edition

1.1.1.2 American Concrete Institute (ACI)

ACI 301-84 (Revised 1987) Specification for Structural Concrete for Buildings

ACI 318-83 (Revised 1986) Building Code Requirements for Reinforced Concrete

1.1.1.3 American Society for Testing and Materials (ASTM)

A 36-87 Standard Specification for Structural Steel

A 53-87b Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A 185-85 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

A 370-89 Standard Test Methods and Definitions for Mechanical Testing of Steel Products

A 416-87a Standard Specification for Uncoated Seven-Wire Stress-Relieved Strand for Prestressed Concrete

A 615-87 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

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- C 33-86 Standard Specification for Concrete Aggregates
- C 150-86 Standard Specification for Portland Cement
- C 260-86 Standard Specification for Air-Entraining Admixtures for Concrete
- C 494-86 Standard Specification for Chemical Admixtures for Concrete

1.1.1.4 American Welding Society (AWS)

- AWS D1.1-88 Structural Welding Code-Steel
- AWS D1.4-79 Structural Welding Code-Reinforcing Steel

1.1.1.5 Federal Specifications (FS)

- WW-U-531F Unions, Pipe, Steel Or Malleable Iron; Threaded Connection, 150 Lb And 250 Lb

1.1.1.6 Prestressed Concrete Institute (PCI)

- MNL-116-85 Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products

1.1.1.7 Washington Industrial Safety and Health Act (WISHA)

Washington Administrative Code (WAC)

Title 296, Labor and Industries
Chapter 296-155 WAC, Safety Standards for Construction Work

Use, Part F Material Handling, Storage, and Disposal

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Fabricator Drawings: Prepare and submit complete drawings and design calculations for prestressing and erection methods, materials and equipment. Drawings shall show plan, elevations and sections of units, and methods and sequence of stressing, including specifications and details of prestressing steel and anchoring devices, anchoring stresses, type of enclosure, arrangement of prestressing steel, erection procedures, location of lifting points for handling, method of transportation, details of lifting

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devices, details of penetrations and embedments, and method of sealing/joining adjacent cover panels.

1.2.2 Records of Tests: Maintain and submit records of tests performed to determine properties of materials used in concrete.

1.2.3 Concrete Materials and Mix Design: Submit concrete materials and mix design established in accordance with ACI 318, Chapter 4. Define each material used in concrete and state amount, by weight, utilized per cubic yard of plastic mix.

1.2.4 Certification: Submit certification of proof-testing lifting devices in accordance with WISHA.

1.2.5 Certification of Prestressed Concrete Production Facilities: Submit current legible copy of certification by Prestressed Concrete Institute.

1.2.6 Manufacturer's Quality Assurance Plan: Submit quality assurance plan for Project that addresses requirements of Section 01400, Article 1.3.

1.2.7 Calculations: Submit design calculations per the requirements of Section 1.3.

1.2.8 Verification: Submit certification and documentation for vault roof panels per the requirements of Section 1.3.

1.2.9 Certified Test Reports: Submit for Dowel Bar Splicer System CGI Testing.

1.3 DESIGN REQUIREMENTS

1.3.1 Design sections in accordance with ACI 318.

1.3.2 Design Calculations: Prepared by registered engineer experienced in precast, prestressed concrete design. Calculations shall include estimated camber and expected deflections for each sequence of applied loading.

1.3.3 Loadings for Design.

1.3.3.1 Soil/overburden: 600 psf.

1.3.3.2 Surcharge: 300 psf.

1.3.3.3 Dead loads including member weight and concrete topping varying in thickness from 2 inches at plank ends to 8 inches at center of span.

1.3.3.4 Thermal loading: Temperature gradients will exist between top and bottom of members as follows.

a. Construction: 60 F; 120 F at top to 60 F at bottom.

b. Operations: 98 F; 60 F at top to 158 F at bottom.

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1.3.3.5 Other loads specified on the Drawings.

1.3.4 Sections shall be able to withstand torsional, impact and point loads generated by handling from place of casting to and including installation.

1.3.5 Design and fabricate lifting devices meeting the requirements of WISHA, of malleable steel formed so considerable deformation, easily discernable to eye, is required before failure.

1.3.6 Design Verification: Independent verification of computer programs utilized and design calculations provided for vault cover panels, are required and shall be performed by registered engineer from the State of Washington. Documented design reviews, alternate calculations, or qualification tests may be performed to provide verification. Documentation of design verification shall consist of a certification statement describing the method of verification and addressing the adequacy of design inputs/outputs, assumptions and methods, and signed by the engineer performing said verification.

1.3.7 Bearing Surfaces: Cover panel surfaces bearing on vault walls shall have smooth finish to provide full (uniform) contact with bearing pads.

1.4 QUALITY ASSURANCE

1.4.1 Testing

1.4.1.1 Fabrication of precast prestressed concrete sections shall include testing in accordance with PCI MNL-116, Section 6.1.

1.4.1.2 Inspection and test records shall be in accordance with PCI MNL-116, Section 1.2, 6.1, and 6.2. Deliver to KEH upon request.

1.4.2 Personnel and procedures for welding shall have been qualified in accordance with AWS D1.1 and D1.4 before welding.

1.4.3 Deliver 2 copies of welding procedure specifications, procedure qualification records, and welder information qualification test results to KEH 5 days before welding. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Deliver, store and handle members in accordance with PCI MNL-116, Sections 5.1.7 and 5.1.8.

1.5.2 Lift members only at lifting points shown on fabricator drawings, using approved lifting devices. Lifting devices shall have minimum safety factor of 5.

1.5.3 Support members during manufacture, stockpiling, transporting and installing only at support points shown on fabricator drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Each aggregate, cement, water and admixture shall be capable of producing consistent quality within quantity of materials required for project. Aggregates, cement and admixtures shall have been produced by same manufacturer and, when quantity required is less than one batch or mix, be from same batch or mix.

2.1.2 Aggregates: Meet the requirements of ASTM C 33.

2.1.3 Portland Cement: ASTM C 150, type or modified type compatible with aggregates, water and admixtures.

2.1.4 Water: Potable and free of foreign materials in amounts harmful to concrete and embedded steel.

2.1.5 Admixtures

2.1.5.1 Air-entraining agents: Meeting the requirements of ASTM C 260.

2.1.5.2 Water reducing agents: Meeting the requirements of ASTM C 494, Type "A."

2.1.6 Stressing Steel: 7 wire stress-relieved steel strand units meeting the requirements of ASTM A 416, Grade 250 or 270.

2.1.7 Reinforcing Steel

2.1.7.1 Steel bars: ASTM A 615, deformed, Grade 60..

2.1.7.2 Welded wire fabric: ASTM A 185.

2.1.7.3 Tie wire: Black annealed steel, 16 gage minimum.

2.1.8 Anchors and Inserts

2.1.8.1 Anchors and inserts: Structural steel, ASTM A 36 with manufacturer's standard shop prime finish.

2.1.8.2 Pipe inserts: Carbon steel meeting the requirements of ASTM A 53. Malleable iron pipe caps, threaded, in accordance with FS WW-U-531.

2.1.8.3 Reinforcing splice inserts: DB-SAE Dowel Bar Splicer System manufactured by Richmond Screw Anchor Company.

2.1.9 Grout

2.1.9.1 Cement grout: Portland cement, sand and water sufficient for placement and hydration. Minimum strength, 3000 psi at 28 days.

2.1.9.2 Nonshrink grout: See Section 03300.

2.1.10 Elastomeric Bearing Pads: Meeting the requirements of AASHTO "Standard Specification for Highway Bridges," Division 1, Section 25.

2.2 MIXES

2.2.1 Design each concrete mixture using data obtained from tests in Article 1.4.

2.2.1.1 Minimum allowable compressive strength: 6000 psi at 28 days.

2.2.1.2 Minimum release strength: 4500 psi.

2.2.2 Concrete may contain air-entraining agent.

2.2.3 Use of calcium chloride, chloride ions, or other salts will not be permitted.

PART 3 - EXECUTION

3.1 FABRICATION

3.1.1 Fabrication of sections shall be by PCI certified fabricator.

3.1.2 Fabrication Procedures: In accordance with PCI MNL-116.

3.1.3 Fabrication Tolerances: Meet the requirements of PCI MNL-116.

3.1.4 Finishes

3.1.4.1 Finishes for completed units shall be in accordance with PCI MNL-116, Section 3.5.

3.1.4.2 Finishing of formed surfaces shall be from casting against approved, properly cleaned forms using industry practice in placing and curing.

3.1.4.3 Strands on end surfaces shall be recessed and ends of members shall receive sack finish.

3.1.4.4 Finish cover panel bearing surfaces in accordance with ACI 301, paragraph 10.2.2 or 11.7.2 with finish tolerance per paragraph 11.9.2 in direction of bearing surface.

3.2 INSTALLATION

3.2.1 Install members by competent erector. Lift members in accordance with Paragraph 1.5.2.

3.2.2 Align and level members as shown on approved fabricator drawings.

3.2.3 Variation between adjacent members shall be reasonably leveled out by jacking or other feasible method acceptable to KEH.

3.3 FIELD QUALITY CONTROL

3.3.1 Sampling and testing will be the responsibility of precast fabricator.

END OF SECTION

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SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American Society of Mechanical Engineers (ASME)

1986 Edition, w/Addenda
through Dec 1988

Section IX

ASME Boiler and Pressure Vessel
Code

Qualification Standard for
Welding and Brazing Procedures,
Welders, Brazers, and Welding
and Brazing Operators

1.1.1.2 American Society for Testing and Materials (ASTM)

A 36-87

Standard Specification for
Structural Steel

A 53-89a

Standard Specification for
Pipe, Steel, Black and Hot-
Dipped, Zinc-Coated Welded and
Seamless

A 105-87a

Standard Specification for
Forgings, Carbon Steel, for
Piping Components

A 106-87a

Standard Specification for
Seamless Carbon Steel Pipe for
High-Temperature Service

A 108-81

Standard Specification for
Steel Bars, Carbon, Cold
finished, Standard Quality

A 234-87

Standard Specification for
Piping Fittings of Wrought
Carbon Steel and Alloy Steel
for Moderate and Elevated
Temperatures

A 307-88a

Standard Specification for
Carbon Steel Bolts and Studs,
60 000 PSI Tensile Strength

A 500-84	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A 563-88a	Standard Specification for Carbon and Alloy Steel Nuts
A 569-85	Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
F 436-86	Standard Specification for Hardened Steel Washers

1.1.1.3 American Welding Society (AWS)

AWS D1.1-88	Structural Welding Code - Steel
AWS D1.3-81	Structural Welding Code - Sheet Steel

1.1.1.4 Steel Structures Painting Council (SSPC)

SSPC-SP 3-82	No. 3 Power Tool Cleaning
--------------	---------------------------

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Fabricator Drawings: Submit drawings and bill of materials for waterstops. Include plans, elevations, details, sections and connections. Show thickness, type, grade, class of metal, and accessory items where applicable.

1.2.2 Certified Material Test Reports (CMTR): Submit legible reports, certified by responsible manufacturer, showing chemical analysis and physical properties of material used for waterstops. Submit separate reports for each lot of steel furnished by each supplier.

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Welding Personnel and Procedures

1.3.1.1 Personnel and procedures for welding structural steel shall have been qualified in accordance with AWS D1.1 before welding. Qualification in accordance with ASME Section IX may be substituted for this requirement.

1.3.1.2 Deliver 2 copies of welding procedure specifications, procedure qualification records, and welder performance qualification test results to KEH 5 days before welding. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

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1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Deliver metal fabrications to project at time convenient for installation. If exposed to inclement weather, protect fabrications with paper, plastic or other weatherproof covering and store off ground.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Waterstop: 6 inch wide by 1/4 thick continuous steel plate; ASTM A 36.

2.1.2 Rolled Steel Shapes and Plates: ASTM A 36.

2.1.3 Sheet Steel: ASTM A 569.

2.1.4 Steel Pipe: ASTM A 106, Grade B, or ASTM A 53.

2.1.5 Steel Tubing: ASTM A 500, Grade B.

2.1.6 Weld Studs: Nelson Stud Welding Company Type H4L.

2.1.7 Steel Bars and Rods: ASTM A 108 or ASTM A 36, minimum yield 36,000 psi.

2.1.8 Bolts: ASTM A 307, Grade A or B, except requirement for bolt head marking is waived.

2.1.9 Nuts: ASTM A 563, Grade A, heavy hex.

2.1.10 Washers: ASTM F 436, circular washers.

2.1.11 Flanges: ASTM A 105.

2.1.12 Fittings: ASTM A 234, Grade WPB, wrought carbon steel, schedule to match pipe.

2.1.13 Gaskets: Use full face gasket with flat face flanges.

2.1.13.1 Compressed synthetic fiber, minimum 1/16" thick. Anchor style #443.

2.1.13.2 Neoprene, minimum 1/8" thick. Garlock #8312.

2.2 FABRICATION

2.2.1 General

2.2.1.1 Verify measurements and take field measurements necessary before fabrication. Provide miscellaneous supports and braces necessary for completion of metal fabrications.

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2.2.1.2 Workmanship: Form metal fabrications to shape and size, with sharp lines, angles, and true curves.

2.2.1.3 Perform welding in accordance with AWS D1.1, Section 8, using E70XX electrodes and complete penetration welds.

2.2.1.4 Weld and examine sheet steel in accordance with AWS D1.3

2.2.2 Waterstop: Steel free of mud, oil, or other material to facilitate bonding to concrete.

2.2.2.1 Make splices by buttwelding ends of plates together.

2.2.2.2 Bending of plates at corners is allowable, except minimum inside radius shall be 1 inch.

2.2.3 Finishes

2.2.3.1 Do not coat members to be embedded in concrete, or surfaces and edges to be field welded.

2.2.3.2 Remove weld spatter, flux, slag, and other deleterious matter in accordance with SSPC-SP 3.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Install metal fabrications plumb, level or as shown on the Drawings.

3.1.2 Make field connections as neatly as possible with joints flush and smooth.

END OF SECTION

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SECTION 09805

SPECIAL PROTECTIVE COATING

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 Steel Structures Painting Council (SSPC)

SSPC-SP 6-85

No. 5 White Metal Blast

Cleaning

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 List of Materials: Submit complete list of materials, colors and location to be used, to substantiate compliance with the Drawings and this Section. List shall enumerate percentage of volatile and nonvolatile materials and percentage of component parts of each type of material.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Deliver materials to site in manufacturer's unopened containers with labels intact. Do not open containers or remove labels until after inspection and acceptance by KEH.

1.3.2 Store materials in accordance with manufacturer's recommendations and in well ventilated area not exposed to excessive heat, sparks, flame or direct rays of sun.

1.4 PROJECT CONDITIONS

1.4.1 Environment for Coating: Coat exterior surfaces only when ambient and surface temperatures are between 35 F and 120 F, and temperature is 5 F above dewpoint.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Filler: Nu-Klad 114 produced by Protective Coatings Division of Ameron, Brea, CA.

2.1.2 Coating materials are products of Carboline, St. Louis, MO unless otherwise specified.

2.1.3 Primers

2.1.3.1 Carbo Zinc II.

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- 2.1.3.2 Carboline 193 LF.
- 2.1.3.3 Rustbond 6c.
- 2.1.4 Finish Coatings
- 2.1.4.1 Polyclad 933-1.
- 2.1.4.2 Carbomastic 18.
- 2.1.4.3 Carboline 1294.
- 2.1.5 Colors
- 2.1.5.1 Finish coat
- a. Carbomastic 18: Black.
 - b. All others: White.
- 2.1.5.2 Symbols and flow diagram: Black letters on yellow background, except as shown on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into acceptable condition through preparatory work included in Article 3.2.

3.1.2 Report in writing to KEH conditions that may potentially affect proper application of finish. Do not commence surface preparation or coating application until defects have been corrected and conditions are made suitable.

3.2 PREPARATION

3.2.1 General: Before application, sweep and dust space or area to receive coating.

3.2.2 Pre-Priming

3.2.2.1 Prepare ferrous metals in accordance with SSPC-SP 5, remove abrasive residue and dust, and prime within 4 hours after preparation.

3.2.2.2 Clean concrete surfaces of laitance, oil, stains, dust and other foreign material.

a. Where laitance has not been removed, treat concrete with uniform application of 1 of following solutions.

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- 1) 1 part 10 percent solution muriatic acid and 3 parts water.
- 2) 5 percent solution of trisodium phosphate.

b. When solution ceases to foam, rinse thoroughly with clean water and scrub with stiff bristle brush. Allow treated area to thoroughly dry. Scratches, cracks, holes and abrasions shall be cut back to proper key and filled with Nu-Klad 114.

c. Allow concrete to cure 30 days before coating is applied, except coating may be applied after concrete has cured 21 days if moisture content of concrete is less than 12 percent.

3.2.3 Post Priming

3.2.3.1 Feather abrasions, chips, skips and holidays occurring in prime coat by sanding and recoat with material and color to minimum dry film thickness specified.

3.2.3.2 Previously coated surfaces shall be recoated only after existing film is completely dry.

3.2.3.3 Protect coating from rain until dry to touch.

3.2.4 Protection

3.2.4.1 Provide and install drop cloths, shields and other protective devices required to protect surfaces adjacent to areas being coated. Keep spatter, smears, droppings and over-run of coating materials to minimum and remove as coating work progresses.

3.2.4.2 Remove and store electrical fixtures, outlets and switch plates, mechanical diffusers, escutcheons, surface hardware, fittings and fastenings before starting work. Clean and reinstall upon completion of work in each area. Use no solvent or abrasives to clean hardware that will remove lacquer finish normally used on some items.

3.3 APPLICATION

3.3.1 Apply coating materials in accordance with manufacturer's recommendations.

3.3.2 Apply with equipment recommended by manufacturer.

3.3.3 Identify each coat of opaque material by its relation to color of finish coat. Prime coat shall be darkest tint of specified color with each succeeding coat lighter, up to finish coat, which shall be color, tint and sheen specified. Tints of identical coats of identical color and material shall not vary.

3.4 FIELD QUALITY CONTROL

3.4.1 Inspection: KEH will perform tests to ascertain that coating materials have been applied in accordance with this Section.

3.5 CLEANING

3.5.1 Furnish and maintain at site, closed metal containers for disposal of waste materials. Place materials spotted or soaked with paint, oil or solvents in containers.

3.5.2 Brushes, rollers, spatulas and spray equipment shall be thoroughly cleaned after each use and shall contain no oils, thinners or other residue after such cleaning.

3.5.3 Remove empty cans from site at end of each shift.

3.5.4 At completion of coating work, remove materials, containers, rags, cloths, brushes, and other equipment from site. Clean up spills.

3.6 COATING SCHEDULE

		Minimum Wet Film Thickness and Percent- age of Film Forming <u>Solids per Volume</u>	Minimum Dry Film <u>Thickness</u>
3.6.1	Concrete and Masonry		
	Prime: Rustbond 6c	9 mils & 24 ± 2	2 mils
	Second: Polyclad 933-1	8 mils & 27 ± 2	2 mils
	Finish: Polyclad 933-1	8 mils & 27 ± 2	2 mils
3.6.2	Ferrous Metals		
	Prime: Carbo Zinc II	4 mils & 79 ± 2	3 mils
	Second: Rustbond 6c	9 mils & 24 ± 2	2 mils
	Third: Polyclad 933-1	8 mils & 27 ± 2	2 mils
	Fourth: Polyclad 933-1	8 mils & 27 ± 2	2 mils
	OR		
	Third: Carboline 1294	6 mils & 34 ± 2	2 mils
	Fourth: Carboline 1294	6 mils & 34 ± 2	2 mils
3.6.3	Carbon Steel		
	Prime: Carboline 193 LF	6 mils & 50 ± 2	3 mils
	Second: Carbomastic 18	20 mils & 80 ± 2	16 mils

END OF SECTION

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SECTION 09885

PROTECTIVE COATING FOR
CONCRETE VAULT INTERIOR

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 National Association of Corrosion Engineers (NACE)

NACE Standard RP-02-74

Recommended Practice - High Voltage Electrical Inspection of Pipeline Coatings Prior to Installation

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 List of Materials: Submit complete list of materials. List shall enumerate percentage of volatile and nonvolatile materials and percentage of component parts of each type of material.

1.2.2 Certified Material Test Reports (CMTR): Submit materials test reports, certified by manufacturer of protective coating, which identify components and show chemical analysis and physical properties for each lot number used.

1.2.3 Samples: Submit 1 gallon sample of coating material to be used on Project, for independent testing and comparison with CMTRs.

1.2.4 Certificates of Experience: Submit "Certificate of Experience" from substrate preparer and applicator in accordance with Paragraphs 1.3.1 and 1.3.2. Include list showing names, addresses and telephone numbers for complete projects.

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Substrate Preparer: Provide evidence of previous successful concrete substrate preparation for coating applications.

1.3.2 Qualification of Applicator: Provide evidence of previous successful sprayed-on asphalt coating applications. Provide qualifications of key personnel including superintendent and foreman.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Deliver materials to site in manufacturer's unopened containers with labels intact. Do not open containers or remove labels until after inspection and acceptance by KEH.

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1.4.2 Store materials in accordance with manufacturer's recommendations and in well ventilated area not exposed to excessive heat, sparks, flame or direct rays of sun.

1.5 PROJECT CONDITIONS

1.5.1 Environment for Coating

1.5.1.1 Preferred ambient and surface temperatures: 60 F or above and rising.

1.5.1.2 Minimum ambient and surface temperatures: 40 F and rising.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Coating materials are products of Protective Coatings Department of Lion Oil Company, El Dorado, Arkansas. No substitutes allowed.

2.1.1.1 Primer: Nokorode 705M thinned at ratio of 1 to 1 with naptha or mineral spirits.

2.1.1.2 Finish Coating: Nokorode 705M.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Examine surfaces scheduled to receive coating for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into acceptable condition through preparatory work included in Article 3.2.

3.1.2 Report in writing to KEH conditions that may potentially affect proper application of finish. Do not commence surface preparation or coating application until defects have been corrected and conditions are made suitable.

3.2 PREPARATION

3.2.1 General

3.2.1.1 Allow concrete to cure 21 days minimum before preparing surface.

3.2.1.2 Before application, sweep and dust space or area to receive coating.

3.2.2 Pre-Priming

3.2.2.1 Clean concrete surfaces of laitance, oil, stains, dust and other foreign material.

3.2.2.2 Prepare concrete by removing surface until dry, clean, contaminant-free, sound, open pore, exposed-aggregate concrete is obtained by using 1 of the following methods. Remove spalled concrete.

- a. Scabbling machine: Hammer type.
- b. Steel shot, for horizontal surfaces only: Wheelabrator-Frye Blastrac type. Ensure no shot remains.
- c. Sandblasting.
- d. Very high pressure water/sandblasting: Use clean, fresh water and dry blasting silica, maximum particle passing 16 mesh screen, at pressure sufficient to achieve specified surface.
- e. Ultra high pressure waterblasting: Use clean fresh water at highest pressure necessary to achieve specified surface.

3.2.2.3 Remove dust and debris from concrete pores with clean, dry, oil-free compressed air or adequately powered, heavy duty industrial vacuum.

3.2.2.4 Thoroughly dry surface before applying primer.

3.2.3 Post Priming

3.2.3.1 Feather abrasions, chips, skips and holidays occurring in prime coat by sanding and recoat.

3.2.3.2 Protect coating from rain until dry to touch.

3.2.4 Protection: Provide and install drop cloths, shields and other protective devices required to protect surfaces adjacent to areas being coated. Keep spatter, smears, droppings and over-run of coating materials to minimum and remove as coating work progresses.

3.3 APPLICATION

3.3.1 Do not apply materials when excessive wind, blowing dust, or rain is imminent.

3.3.2 Minimum Temperature of Coating Material: 70 F.

3.3.3 Spray apply coating materials in accordance with Article 3.6 and manufacturer's recommendations.

3.3.3.1 Apply second coat 5 to 60 minutes after primer.

3.3.3.2 Do not allow second coat to cure beyond elastomeric set before applying finish coat. Apply an additional coating on the upper 4 feet of vertical surfaces. Do not allow the finish coat to cure beyond elastomeric set before applying additional coat.

3.3.3.3 On vertical surfaces, apply finish coat perpendicular to second coat.

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- 3.3.3.4 Allow finish coat to cure dry to touch before repairing.
- 3.3.3.5 Protect coated surfaces from dust and other foreign materials while curing.
- 3.3.3.6 Protect coating from sunlight until roof is installed.
- 3.3.4 Apply with equipment recommended by manufacturer.
- 3.3.5 Repair: Scratch area with wire brush before application of additional coats.

3.4 FIELD QUALITY CONTROL

3.4.1 Testing

- 3.4.1.1 Test for wet film thickness where directed by KEH.
- 3.4.1.2 Test entire surface for pinholes using an electrical holiday detector. Perform test in accordance with NACE Standard RP-02-74.
- 3.4.2 Inspection: KEH will witness tests to ascertain that coating materials have been applied in accordance with this Section.

3.5 CLEANING

- 3.5.1 Furnish and maintain at site, closed metal containers for disposal of waste materials. Place materials spotted or soaked with paint, oil or solvents in containers.
- 3.5.2 Spray equipment shall be thoroughly cleaned after each use and shall contain no oils, thinners or other residue after such cleaning.
- 3.5.3 Remove empty cans from site at end of each shift.
- 3.5.4 At completion of coating work, remove materials, containers, rags, cloths, brushes, and other equipment from site. Clean up spills.

3.6 COATING SCHEDULE

<u>Thickness</u>		<u>Approximate Rate</u>	<u>Min Wet Film Thickness</u>	<u>Min Dry Film</u>
3.6.1	Concrete			
	a. Vertical surfaces			
	Prime: Nipkorode 705M, thinned	0.5-0.75 gal/ 100 ft ²	Uniform Cover	

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Second: Nokorode 705M	2.0 gal/ 100 ft ²	30 mils	26 mils
Finish: Nokorode 705M	2.0 gal/ 100 ft ²	30 mils	26 mils
Additional: Nokorode 705M	2.0 gal/ 100 ft ²	30 mils	26 mils

b. Horizontal surfaces

Prime: Nokorode 705M, thinned	0.5-0.75 gal/ 100 ft ²	Uniform Cover	
Finish: Nokorode 705M	4.0 gal/ 100 ft ²	60 mils	52 mils

END OF SECTION

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SECTION 13440

INSTRUMENTATION

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American National Standards Institute (ANSI)

ANSI MC96.1-1982	American National Standards for Temperature Measurement Thermocouples
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1.1.1.2 National Electrical Manufacturers Association (NEMA)

Standards Publication/ No. ICS 6-1983 w/Rev through Nov 1986	Enclosures for Industrial Controls and Systems
--	---

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Approval Data: Submit information listed in Column 5 of Vendor Data List in this Section.

1.2.2 Certified Vendor Information (CVI): Submit information listed in Column 6 of Vendor Data List in this Section.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery field mounted equipment assemblies completely assembled, except as noted.

1.3.1.1 Thermocouple assemblies: Package with padding material and place inside pipe with cap on end. Junction box shall have door secured and be well padded, then wrapped with packaging tape. Assemblies shall then be secured to shipping pallets.

1.3.1.2 Deleted

1.3.1.3 Deleted

1.4 FURNISHED EQUIPMENT

1.4.1 Following items are furnished for Contractor installation. Upon request, one copy of approved vendor submittal data will be furnished. Delivery equipment delivery requirements 10 days before need.

1.4.1.1 Sheathed, Type K thermocouples for installation in conduit in walls, floor slab, and precast roof planks of vaults.

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PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Other materials required to complete instrumentation installation are specified in Section 15493, Section 16400 and on the Drawings.

2.2 EQUIPMENT

2.2.1 Instruments: In accordance with data sheets in this Section.

2.2.1.1 Identification: Attach nameplates, in readily visible locations, with manufacturer's name, model number, name of item, and serial number.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Install instruments, materials, and equipment in accordance with the Drawings, manufacturers' instructions, and Section 16400.

3.2 FIELD QUALITY CONTROL

3.2.1 Test thermocouple assemblies prior to shipment.

3.2.1.1 Test thermocouple within each assembly by testing each thermocouple against the room ambient temperature. Heat each thermocouple and verify a temperature rise. Deliver test results to KEH upon completion of tests.

3.2.2 Test and record loop resistance of vault mounted wall, slab, and precast roof plank thermocouple element, transition joint and leadwire before associated concrete lift or pour that will encase thermocouple element within wall, slab or roof. Record loop resistance of like leadwire length and like ambient temperature groups and calculate average resistance of each group. Each thermocouple resistance shall be within plus or minus 5 percent of average resistance calculated. Replace defective or damaged thermocouples with spare and test until unit passes. Place new heat shrinkable tubular plastic cable marker, imprinted with thermocouple tag number and length, on end of spare thermocouple extension leadwire cable.

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THERMOCOUPLE ASSEMBLIES

VAULT LOCATED

- | | |
|----------------------------|--|
| 1. Tag Numbers | (See Note 1) |
| 2. Type | Type K, 16 point |
| 3. Protection Tube | 1 inch Schedule 40S 304
stainless steel pipe |
| 4. Length | (See Note 2) |
| 5. Thermocouple Spacing | (See Note 2) |
| 6. Service | Grouted radioactive waste
(pH 12+) |
| 7. Temperature | 35 to 250 F |
| 8. Wire Size | Manufacturer's standard |
| 9. Junction | Ungrounded |
| 10. Insulation Material | Mineral Oxide |
| 11. Test Resistance | 100 Mohm minimum, TC to sheath
and TC to TC |
| 12. Accuracy | ANSI MC96.1 |
| 13. Lead Termination | Terminal strips in NEMA 4
junction box suitable for
direct burial (See Note 2) |
| 14. Conduit Connection | 1-1/2 inches, bottom of
junction box |
| 15. Lag Extension | (See Note 2) |
| 16. Special Feature | Protection tube to be factory
sealed to junction box (See
Note 2) |
| 17. Suggested Manufacturer | Thermo-Couple Products Co, Inc,
Sales Aid No. 126 |

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THERMOCOUPLE ASSEMBLIES (cont)

VAULT LOCATED

NOTES: 1. Tag Numbers:

TE-102-1	TE-103-1
TE-102-2	TE-103-2
TE-102-3	TE-103-3
TE-102-4	TE-103-4
TE-104-1	TE-105-1
TE-104-2	TE-105-2
TE-104-3	TE-105-3
TE-104-4	TE-105-4

2. See Drawings.

3. Instrumentation system shall have minimum service life of 30 years under normal use and maintenance.

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Project No. B-714, 13440

**KAISER ENGINEERS
HANFORD**

Title Vault Concrete Basin, Shell, and Leachate Sump for Grouted Waste

VENDOR DATA LIST

Disposal Facilities Grouted Vault Pair (218-E-16-102 and 103)

("X" Indicates Required Data)

1 EPN Identification	2 Description	3 Reference Drawing	4 Specification Paragraph	5 Approval/Data									6 Certified Vendor Information (CVI)							7 Remarks				
				Dimensional Drawings	Equipment Weights	Specifications	Material Description	Performance Data	Circuit or Control Diagrams	Data Sheets	Illustrative Cuts	Installation Instructions	Dimensional Drawings	Equipment Weights	Specifications	Certified Test Data	Circuit or Control Diagram	Instructions			Spare Parts List			
Y-102	Thermocouple Assembly			X	X	X	X	X	X	X	X	X	X	X										

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END OF SECTION

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Rev 1

SECTION 15493

CHEMICAL PROCESS PIPING SYSTEMS

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Referenced Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American National Standards Institute (ANSI)

ANSI B16.9-1986 American National Standard
Factory-Made Wrought Steel
Buttwelding Fittings

ANSI B31.3 - 1987 Edition,
w/Addenda ANSI B31.3a and
B31.3b American National Standard Code
for Pressure Piping--Chemical
Plant and Petroleum Refinery
Piping

1.1.1.2 American Society of Mechanical Engineers (ASME)

1986 Edition, w/Addenda
through Dec 1988 ASME Boiler and Pressure Vessel
Code

Section II Material Specifications

Section IX Qualification Standard for
Welding and Brazing Procedures,
Welders, Brazers, and Welding
and Brazing Operators

1.1.1.3 American Society for Nondestructive Testing (ASNT)

Recommended Practice
No. SNT-TC-1A
(1984 Edition) Personnel Qualification
and Certification in
Nondestructive Testing

1.1.1.4 American Society for Testing and Materials (ASTM)

A 106-87a Standard Specification for
Seamless Carbon Steel Pipe for
High-Temperature Service

A 234-87 Standard Specification for
Piping Fittings of Wrought
Carbon Steel and Alloy Steel
for Moderate and Elevated
Temperatures

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A 269-88a	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A 307-86a	Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
A 563-84	Standard Specification for Carbon and Alloy Steel Nuts
C 518-85	Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
D 1621-73 (1979)	Standard Test Method for Compressive Properties of Rigid Cellular Plastics
D 1622-83	Standard Test Method for Apparent Density of Rigid Cellular Plastics
D 1623-78	Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
D 2842-69 (1975)	Standard Test Method for Water Absorption of Rigid Cellular Plastics
D 2856-87	Standard Test Method for Open Cell Content of Rigid Cellular Plastics by the Air Pycnometer
1.1.1.5	American Welding Society (AWS)
AWS QC1-86	Standard for Qualification and Certification of Welding Inspectors
1.1.1.6	American Water Works Association (AWWA)
C203-86	AWWA Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines--Enamel and Tape--Hot-Applied

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- 1.1.1.7 Pipe Fabrication Institute (PFI)
 ES-24 (April 1985) Pipe Bending
 Tolerances--Minimum Bending
 Radii--Minimum Tangents
- 1.1.1.8 Steel Structures Painting Council (SSPC)
 SSPC-SP 3-82 No. 3 Power Tool Cleaning
 SSPC-SP 6-85 No. 6 Commercial Blast Cleaning
- 1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.
- 1.2.1 Certified Material Test Reports (CMTR): Submit legible reports, certified by responsible manufacturer of materials used in fabrication of pipe, fittings and flanges for pipe code and services noted below. Reports shall present results of chemical analysis and physical tests specified in ASTM Standards of production lots and heats of materials. Submit separate reports for following.
- 1.2.1.1 Pipe Code M-25: Service; Grout, and Excess Water.
- 1.2.1.2 Pipe Code M-26a: Service; Grout Encasement, Excess Water Encasement, and Encasement Drains.
- 1.2.1.3 Pipe Code M-31: Service, Hydrogen Gas.
- 1.2.2 Certificate of Conformance: Submit legible certificate stating that polyurethane insulation materials furnished meet requirements of Drawings and this Section. Include date of manufacture, shelf life of material, physical properties, and material safety data sheets.
- 1.2.3 Weld Identification Drawings: Submit isometric and spool drawings which show relative location of each weldment in piping systems.
- 1.2.4 Filler Material Control Procedure: Submit procedure for control of filler material. Specify methods of control, by heat or lot number, from receipt of material to consumption during fabrication, and control and disposal of contaminated and partially used material.
- 1.2.5 Welding Filler Metal: Submit certified material test reports giving results of tests in applicable material specifications in ASME Section II, Part C. If testing is not required by material specification, submit Certificate of Conformance to applicable material specification.
- 1.2.6 Welding Procedures and Personnel: Submit welding procedure specifications, procedure qualification records, and welder performance qualification test results meeting the requirements of Paragraph 1.3.1.
- 1.2.7 Nondestructive Examination (NDE) Personnel and Procedures: Submit personnel certifications and written NDE performance procedures meeting the requirements of Paragraph 1.3.2.

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1.3 QUALITY ASSURANCE

1.3.1 Qualification of Welding Personnel and Procedures

1.3.1.1 Personnel and procedures for welding pressure retaining components along with attachments thereto shall have been qualified in accordance with ANSI B31.3 before welding.

1.3.1.2 Personnel and procedures for welding structural steel, nonpressure components, shall have been qualified in accordance with ASME Section IX before welding.

1.3.1.3 Deliver 2 copies of welding procedure specifications, procedure qualification records and welder performance qualification test results to KEH 5 days before welding. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

1.3.2 Qualification of Nondestructive Examination (NDE) Personnel

1.3.2.1 Visual weld examinations and appropriate documentation shall be performed by Certified Welding Inspectors (CWI) who have received certification in accordance with AWS QC1. Certified Associate Welding Inspectors (CAWI), certified in accordance with above standard, may perform examinations when under immediate direction of CWI. Welding related examination documentation shall be signed, or stamped by individual performing examination. Where CAWIs are used for examinations, documentation shall be signed, or bear CAWI's stamp in addition to CWIs under whom examinations were performed.

1.3.2.2 Personnel performing other NDE shall have been certified in accordance with Contractor's written practice, which shall meet the requirements of ASNT No. SNT-TC-1A, before performing NDE. Use Level II or III personnel to interpret test results.

1.3.2.3 Deliver 2 copies of personnel certifications, Contractor's written practice, and written NDE performance procedures to KEH 5 days before examining. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Pipe

1.4.1.1 Preserve identity of pipe and tube from time of receipt on site until installation is complete. Store pipe of different material specification and grade separately.

1.4.1.2 When pipe is removed from bundle and cut, return remaining piece to bundle or clearly and permanently mark. Do not remove manufacturer's identifying tags from bundles.

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1.4.1.3 When material identifying mark is cut from length of pipe re-mark remaining section clearly and permanently. Use either original marking or field code identification symbol.

1.4.1.4 KEH may inspect materials for compliance with above storage and control procedures.

1.4.2 Welding Materials

1.4.2.1 Store separately, welding materials of different material specifications.

1.4.2.2 Store and control filler material in accordance with approved procedure.

1.4.2.3 Preserve identity from time of receipt on site until use in facility construction.

1.4.2.4 KEH may inspect materials for compliance with procedure specifications.

1.5 FURNISHED EQUIPMENT

1.5.1 Following items are furnished for Contractor installation. Upon request, KEH will furnish 1 copy of approved vendor submittal data. Submit equipment delivery requirements to KEH 10 days before need.

1.5.1.1 2 inch nozzles (PN 2).

1.5.1.2 2 inch kickplates (PN 4).

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Piping

2.1.1.1 Piping materials shall meet the requirements of attached pipe codes, and details on the Drawings.

2.1.1.2 Valves shall be as specified in pipe codes unless shown otherwise on the Drawings. Brand names and catalog numbers are shown only to illustrate type and class of valve required. Unless otherwise specified, valve packing shall be manufacturer's standard for intended service.

2.1.1.3 Integrally reinforced branch connections may be used on 2 inch and larger welded main lines instead of butt welding tees noted in pipe codes. Material and weight shall correspond to pipe code for particular piping system.

2.1.1.4 Close or butt nipples are not permitted.

2.1.1.5 Attachments welded to pressure containment boundaries may be noncertified material, provided material bears type identifying mark, is suitable for welding, and compatible with material to which attached.

2.1.2 Pipe Joint Sealant for Threaded Joints: Chesterton "Goldend" No. 7298; Federal Process Company "JC-30"; Lake Chemical Co "Slic-tite" with teflon.

2.1.3 Protective Coating For Earth Backfill

2.1.3.1 Carbon steel piping: Factory applied exterior protective coating consisting of coal tar enamel, felt wrap and cover wrap of kraft paper in accordance with AWWA C203.

2.1.3.2 Carbon steel field joints, fittings, and short lengths of pipe: Tapecoat Company "Tapecoat 20" and primer meeting the requirements of AWWA C203.

2.1.4 Nonshrink Grout: See Section 03300.

2.1.5 Polyurethane Foam for Below Grade Piping: 2 component sprayed foam-in-place rigid product, similar to PSI-S200-25 system by Polythene Systems Inc, with the following physical properties.

2.1.5.1 Apparent overall density: 2.2 to 2.8 lb/cu ft when tested in accordance with ASTM D 1622.

2.1.5.2 Minimum compressive strength: 45 psi parallel to rise and 27 psi perpendicular to rise when tested in accordance with ASTM D 1621.

2.1.5.3 Minimum tensile strength: 60 psi when tested in accordance with ASTM D 1623.

2.1.5.4 Closed cells: 90 to 95 percent when tested in accordance with ASTM D 2856.

2.1.5.5 Maximum water absorption: 0.06 lb/cu ft of surface area in accordance with ASTM D 2842.

2.1.5.6 K factor: Approximately 0.15 Btu in./hr ft² at 75 F after aging 10 days at 140 F when tested in accordance with ASTM C 518.

2.1.6 Flexible Duct Liner: Similar to CA Schroeder Inc, Casco-Flex air duct CF-25.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Piping, General

3.1.1.1 Fabricate and install in accordance with ANSI B31.3, the Drawings, and this Section.

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3.1.1.2 Cut pipe with cutters designed specifically for task.

3.1.1.3 Ream pipe to nominal inside diameter after cutting. Remove burrs from threads before assembly.

3.1.1.4 Bend pipe using methods and equipment which produce bends free of wrinkles, bulges, or kinks. When wall thickness, diameter, and bend radius indicate possibility of wall collapse during bending, fill pipe with clean silica sand or fusible material such as Cerro-bend, manufactured by Cerro Corp. Bend pipe in accordance with ANSI B31.3, and meet tolerances given in ANSI B31.3 and PFI ES-24.

a. Measure and document wall thickness at equally spaced 2 inch increments radially around each bend on M-25 grout feed line pipe at locations shown on the Drawings. Take 4 measurements 90 degrees apart at each increment. Documentation shall be traceable to bend location. Deliver documentation to KEH.

3.1.1.5 Clean interior of M-26a pipe and exterior of M-25 pipe to remove dirt and oily residue, before fabrication, using steam/TURCO "PLAUDIT" mixture, 1 part Plaudit to each 40 parts water in concentrate tank. Flush with filtered water and dry with clean oil-free air or nitrogen. Check for grease removal by passing swab over cleaned surface. Repeat if grease or oil is detected. After cleaning wrap exterior surface with plastic wrap and cap pipe ends.

3.1.1.6 Keep piping systems clean. Once fabrication has started plug or cap ends of piping when installation is not in progress to prevent entry of dirt and other foreign material. Cap ends if work is not to be performed on pipe or spool within 4 hours, or, if due to environmental conditions, debris or water can enter pipe. Leave ends of spare lines capped or blind flanged when installation has been completed.

3.1.2 Underground Piping

3.1.2.1 Place piping supports on undisturbed soil, or backfill placed and compacted in accordance with Section 02200, Paragraph 3.1.1.2.

3.1.2.2 Application of heat to pipe for purposes of heat bending to meet Drawing installation tolerances will not be permitted.

3.1.2.3 Cold springing of pipe will not be permitted.

3.1.2.4 Protect outdoor welding operation from rain and wind by using barriers to protect welder and weld joint. KEH will determine if environmental conditions are such that barriers are required.

3.1.2.5 Complete piping welds before tie-in welds to valve pits, risers, or fixed items and install leak detection pull wire in accordance with Section 16400, Paragraph 3.2.8.

3.1.2.6 Survey piping systems for elevation and location before final tie-in welds to valve pits, risers, or fixed items. Placement of supports shall be complete and meet Specification and Drawing requirements before

survey. Elevation and location shall be in accordance with the Drawings. After final tie-ins, survey piping system again for final acceptance.

3.1.3 Welding

3.1.3.1 Weld piping and attachments to pressure retaining components in accordance with ANSI B31.3.

3.1.3.2 See Section 05500 for carbon steel fabrications.

3.1.3.3 Use gas tungsten arc welding (GTAW) process for first 2 passes on pressure retaining components. Use either GTAW or shielded metal arc welding (SMAW) process for remaining passes. Welding process for nonpressure components is optional.

3.1.3.4 When welding pipe in contact with earth, ground welding machine to same pipe being welded in close proximity to weld being made, less than 100 feet.

a. Welding machine attachments to pipe system shall be secured to bare metal with pipe clamps that apply firm pressure. Clamps shall have current carrying capacity equal to or greater than output of welding machine. Clamps shall be installed so they cannot be accidentally dislodged.

3.1.3.5 Backing strips are not permitted.

3.1.4 Weld Identification

3.1.4.1 Prepare weld identification drawings, isometric and spool, which show relative position of each pressure containing weld and each attachment weld to pressure retaining components.

3.1.4.2 Assign weld number to each pressure containing weld and each attachment weld to pressure retaining components as it is made. Record weld number on weld identification drawings as weld is made.

3.1.4.3 Place identification symbol of welder and weld number adjacent to each weld upon completion. Place identification symbol approximately every 3 feet on long weld seams or large weldments. Use crayon or paint. Vibratory etching equipment may be used with approval of KEH.

3.1.4.4 Do not reuse weld numbers. If weld is completely replaced, assign new number.

3.1.4.5 Show on weld identification drawings location and extent of pressure boundary materials and materials attached to pressure boundary requiring CMTRs. Reference each item to its specific report.

3.1.4.6 Perform nondestructive weld examination in accordance with Paragraph 3.2.2.

3.1.5 Flushing: Flush piping noted below after installation.

3.1.5.1 Piping and services are as follows.

<u>Service</u>	<u>:</u>	<u>Pipe Code</u>	<u>:</u>	<u>Flushing Method</u>
Grout	:	M-25	:	Water
Excess Water	:	M-25	:	Water

3.1.5.2 Water flushing

a. Prepare written procedure for disposal of flushing water. Deliver to KEH for approval 10 days before flushing. Disposal of water near ground supported pipe supports will not be permitted.

b. After fabrication and NDE is completed and before leak testing completed system, or before connecting completed system into existing system, flush piping with water until effluent is clean and contains no visible particulate matter. Duration of flush shall be at least 1 minute. Use flushing pressure, not to exceed maximum operating pressure specified on pipe codes, sufficient to produce velocity of at least 5 feet per second in largest pipe section with pipe full. Water velocity shall be verified by suitable instrument at inlet of flushing water to determine velocity at largest pipe section. If leak testing is not performed within 4 hour period, or, if due to environmental conditions, debris may enter, seal flushed lines until leak testing is performed.

3.1.6 Exterior Protective Coating

3.1.6.1 Complete NDE and leak testing before application of exterior protective coating.

3.1.6.2 Coat grout encasement and excess water encasement pipes, including sections to be covered with polyurethane foam, with specified coating.

3.1.6.3 Protect short lengths of carbon steel pipe and fittings exposed to earth backfill with specified coating.

a. Clean carbon steel surfaces to white metal by sandblasting in accordance with SSPC-SP 6. Where blasting is impracticable, as determined by KEH, clean by power wire brushing in accordance with SSPC-SP 3.

b. Heat and apply specified tape in accordance with AWWA C203, Section 3, and manufacturer's instructions.

3.1.6.4 After installation, examine carbon steel pipe having factory applied exterior protective coating, and joints, fittings, and short lengths of pipe having field applied exterior protective coating materials.

a. Use electrical holiday detector in accordance with AWWA C203, Section 2.14.12.

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b. Repair damage to coating in accordance with AWWA C203, Section 2.14.12.

3.1.7 Polyurethane Foam

3.1.7.1 Install in accordance with manufacturer's recommended procedure.

3.1.7.2 Side-wall retainer may be used to assure uniform width and height of sprayed foam. Obtain approval of retainer wall installation and materials from KEH.

3.1.7.3 Secure flexible duct to pipe in position shown on the Drawings.

3.1.7.4 Verify compressive strength of foam in accordance with Paragraph 3.2.4.

3.2 FIELD QUALITY CONTROL

3.2.1 Notify KEH before performing following.

3.2.1.1 Flushing piping systems.

3.2.1.2 Testing piping exterior protective coatings.

3.2.1.3 Hydrostatic testing.

3.2.1.4 Final weld connections into valve pits, risers, tanks, and other fixed items.

3.2.1.5 Backfilling, or covering with concrete, pipe connections.

3.2.2 Nondestructive Weld Examination (NDE)

3.2.2.1 Equipment and materials used for NDE shall be available for review and approval by KEH before performing work.

3.2.2.2 KEH may witness NDE of welds. When KEH disagrees with performance of NDE or with Contractor's acceptance of examination results, decision of KEH will be final.

3.2.2.3 Perform NDE for pressure containing welds and attachment welds to pressure retaining components specified for each pipe code listed on back of attached NDE/Weld Record Form KEH-433.

3.2.2.4 Visual examination: Perform in accordance with ANSI B31.3 paragraph 344.2.

a. Verify following and consider as part of fit-up examination. Document on NDE/Weld Record under fit-up.

1) Longitudinal alignment of pipes being joined: Within 2 degrees measured from outside diameter of pipe.

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- 2) No cold springing.
- 3) Pipe symmetrically located within encasement.

3.2.2.5 Liquid penetrant (dye penetrant) examination (PT): Perform in accordance with ANSI B31.3 paragraph 344.4.

3.2.2.6 Radiographic examination: Perform in accordance with ANSI B31.3 paragraph 344.5.

a. If Iridium 192 source is used, deliver verified radiographic examination procedures to KEH before use for production radiographs. Procedures shall be verified by demonstration that required radiographic sensitivity has been obtained for material to be radiographed. Procedure shall be proven satisfactory by actual demonstration of penetrometer resolution on minimum thickness of material to be radiographed. Use of Cobalt 60 will not be permitted.

b. Identify radiographic film with project or work order number assigned to work covered by this Section.

c. Prepare radiographic examination reports as follows: List each radiographic exposure location (0-1, 1-2, ...) individually on radiographic examination report. Indicate location acceptability or rejectability and note discontinuities whether rejectable or not. When report includes radiographs of welds which have been repaired, indicate which welds are repair welds and how many times each weld has been repaired.

d. If additional welding is performed on weld area which has already been examined radiographically, this area is repair area. Identify subsequent radiographs by "R-1, R-2", etc.

e. Deliver radiographs along with original of reports to KEH within 24 hours after radiographs are taken.

3.2.2.7 Tie-in weld examination: Where leak testing of tie-in weld cannot be performed due to physical impossibility, or impracticality of pressure test application requires concurrence of KEH, perform additional NDE as follows.

Service	:	Pipe Code	:	Additional NDE
Grout (GR)	:	M-25	:	Liquid Penetrant
Excess Water (EW)	:	M-25	:	Liquid Penetrant

3.2.2.8 NDE documentation

a. Document examination of pressure welds and welds to pressure retaining components for piping systems on NDE/Weld Record Form KEH-433 furnished by KEH (sample appended).

1) See Form KEH-433 for instructions for recording weld identification drawings, weld numbers, welder identification, welding

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procedure specification numbers, visual examinations, nondestructive examinations, and for noting satisfactory completion of leak testing.

b. Documentation shall be kept current and is subject to review by KEH. Prepare and certify records as work progresses.

c. Required NDE/Weld examinations shall be completed and documented before start of leak testing.

d. NDE/Weld Record information and weld identification drawings defined in Paragraph 3.1.4 may be incorporated on single format or traveler for specific work package.

e. Deliver completed NDE/Weld Record and record weld identification drawings to KEH within 7 working days after completion of system leak testing.

3.2.3 Leak/Pressure Testing

3.2.3.1 General

a. Perform leak/pressure testing of pipe in accordance with ANSI B31.3 and this Section.

b. Document testing of each piping system on "Leak/Pressure Test Certification" Form KEH-1757 (sample appended). Forms will be furnished by KEH. Use 1 or more forms to describe and record each piping system. Under "Description" describe piping system in enough detail to be correlated to weld identification drawings, shop fabrication drawings, and Contract Drawings as applicable. For systems tested segmentally, indicate continuity in "Description" to ensure entire system has been tested.

c. Pipe joints, fittings and other potential leak sources to be tested shall be visible and accessible during tests.

d. Complete testing of piping before field application of foam or protective coating.

e. Install necessary restraining devices, before applying test pressure, to prevent distortion or displacement of piping.

f. Install 1 temporary relief valve during testing. Relief valve shall have discharge capacity of at least 125 percent of capacity of pressurizing device and be set to operate at not more than 110 percent of test pressure. Tag each relief valve used to show serial number, calibration date, and pressure setting.

g. Isolate instruments and other items which could be damaged by test pressures.

h. Visually examine piping and tubing joints, fittings, and other potential leak sources, includes welds which attach wear plates, anchors, etc to piping systems, during testing. Repair leaks and reexamine.

i. Duration of tests shall be at least 10 minutes with no visible leaks or drop in test pressure, and for such additional time as may be necessary to conduct examination for leakage.

j. Test gages shall have been calibrated within 2 weeks before start of test. Use gages with dial-type face and range between 1.5 and 4 times test pressure.

3.2.3.2 Hydrostatic testing

a. Prepare written procedure for disposal of water used for testing. Deliver to KEH for approval 10 days before testing.

b. Perform tests on systems listed below.

<u>Service</u>	:	<u>Pipe Code</u>	:	<u>Test Pressure</u>
(psig)				
Grout	:	M-25	:	1,200
	:		:	
Excess Water	:	M-25	:	1,200
	:		:	
Excess Water	:	M-26a	:	90
Encasement and	:		:	
Encasement Drain	:		:	

c. Piping systems with removable jumper assemblies shall be tested without jumper in place. Jumpers will be tested by others.

d. Verify that air has been expelled from piping before applying hydrostatic pressure.

e. Coat piping joints, fittings and other potential leak sources, includes welds attaching wear plates, anchors, etc, to piping systems, with mixture of powdered blue chalk and either water or isopropyl alcohol, and allow to dry before filling piping with water and inspecting for leaks.

f. Remove water from lines immediately after hydrostatic testing is completed.

3.2.3.3 Pneumatic testing

a. Perform testing with oil-free air or nitrogen on piping systems listed below.

<u>Service</u>	:	<u>Piping Code</u>	:	<u>Test Pressure (psig)</u>
Grout Encasement	:	M-26a	:	90
and Encasement	:		:	
Drain	:		:	

b. Coat joints and other potential leak sources with bubble forming solution approved by KEH. Soaps and detergents designed specially

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for cleaning shall not be used. Apply internal gas pressure before solution contacts external surface. Remove solution at completion of testing.

3.2.4 Testing Polyurethane Foam

3.2.4.1 Perform compressive properties test in accordance with ASTM D 1621 and this Section.

3.2.4.2 Take separate test samples from production batch for each day and from each batch of foam sprayed. Take samples at time work is being performed.

3.2.4.3 Test 5 specimens, minimum, from test sample. Specimens shall be 2.7 inch diameter cylinders, 2 inches long, cored and cut with saw having at least 11 teeth per inch. Dimensional tolerance shall be plus or minus 1/16 inch.

3.2.4.4 Minimum compressive load of field test specimen for Tests No. 1 and 2 shall be:

<u>TEST</u>	<u>HOURS AFTER DEPOSITION OF INSULATION</u>	<u>FORCE (Pounds)*</u>
No. 1	Within 2-4 hours for ambient temperature above 50 F	115
	or Within 4-8 hours for ambient temperature equal to or less than 50 F	115
No. 2	Within 20-28 hours	150

*Minimum force required to reach 10 percent deformation. (0.2 inch for 2 inch high specimen when tested with Link PB3-250 Compression Tester. Tester ram diameter: 2.625 inch).

3.2.4.5 Document force and deformation results of each test specimen on Form KEH-377.00, sample appended.

3.2.4.6 Complete compressive testing of specimens before backfilling.

3.2.4.7 Remove insulation which fails tests. Replace damaged parting agent and apply new insulation, then retest.

3.2.4.8 Deliver report of results to KEH upon completion of tests.

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PIPE CODE M-25

Service:	Max Operating Pressure:	Max Operating Temp:
Grout (GR)	800 psig	200 F
Excess Water (EW)	800 psig	200 F

Size : 4" and smaller

Pipe : Carbon steel, ASTM A 106, Grade B.

Wall :
Thickness : Schedule 40, and 80*

Fittings : Wrought carbon steel, butt welding, in accordance with ANSI B16.9,
: ASTM A 234, Grade WPB. Schedule to match pipe.

Valves : Shown on Drawings.

*2" excess water piping on top of vault: Schedule 40.

2" grout distribution, and excess water return pipes: Schedule 80.

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PIPE CODE M-26a

Service: Max Operating Pressure: Max Operating Temp:

Grout Encasement	60 psig	200 F
Excess Water Encasement	60 psig	200 F
Encasement Drains	60 psig	200 F

Size : All

Pipe Grade: Carbon Steel, ASTM A 106, Grade B.

Wall :
Thickness : Schedule 40

Fittings : Wrought carbon steel, ASTM A 234, Grade WPB, buttwelding in
: accordance with ANSI B16.9. Schedule to match pipe.

Bolting : Carbon steel, heavy hex head series bolts, ASTM A 307,
: Grade B and heavy hex nuts, ASTM A 563, Grade A.

Gaskets : Compressed synthetic fiber 1/16". Anchor Style #443. Use full
: face gasket with flat face flanges.

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PIPE CODE M-31

Service:	Max Operating Pressure:	Max Operating Temp:
Vent	Atmospheric	100 F

Size : 3/4" OD and smaller

Tube : Stainless steel, ASTM A 269, Grade TP304, annealed and pickled

Wall :
Thickness : 0.035"

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NDE / WELD RECORD		1. Project/W.O. No.		2. Weld Identification Dwgs.		3. Contractor	
4. WELD INFORMATION	5. VISUAL EXAMINATION			6. LIQUID PEN. / MAG. PART.	7. RADIO. LEAK TEST	9. Other:	
	Fit-up	Root Pass	Cover Pass				
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							
Weld No.				Root Pass	Radiographic		
Welder Identification							
Welding Procedure Specification				Cover Pass	Leak Test		
Weld Filler Mat'l.							

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INSTRUCTIONS FOR USE

The NDE/WELD RECORD form shall be used to document the nondestructive examination/testing of the piping systems listed below. Entries shall be made as work progresses, and records are subject to review by the Government's Representative at any time.

Complete the NDE/WELD RECORD as follows (number in parenthesis corresponds to block number).

- (1) Enter Project Number.
- (2) Enter Weld Identification Drawing Numbers.
- (3) Enter name of Contractor.
- (4) Enter Weld Information:
 - Weld Number
 - Welder Identification
- (5) through (9) Enter date of examination/testing in upper half of block; initial or stamp lower half of block as each weld is examined and accepted in compliance with contract requirements.
 - Welding Procedure Specification
 - Weld Filler Material (Type)

NONDESTRUCTIVE EXAMINATION/TESTING REQUIREMENTS FOR PIPING SYSTEMS

NDE/NDT METHOD	PIPE CODES								COMMENTS	
	M-25	M-26a								
VISUAL										
Fitup	C	C, D								
Root Pass	C	C, D								
Cover Pass	C, E, G	C, D, E, G								
LIQUID PENETRANT										
Root Pass										
Cover Pass	A, F	A, C, F								
MAGNETIC PARTICLE										
Root Pass										
Cover Pass										
RADIOGRAPHIC										
Completed Weld	B, C									
LEAK/PRESSURE										
Completed Weld	A, C, E	A, C, D, E								
OTHER										

- Legend**
- A. Requires witnessing concurrently by the Government Representative and acceptance prior to recording.
 - B. Requires acceptance of radiographs and documentation by the Government Representative prior to recording.
 - C. Circumferential and longitudinal butt welds.
 - D. Full penetration welds on branch connections.
 - E. Attachment welds to pipe.
 - F. Tie-in circumferential and longitudinal butt welds that cannot be examined by leak/pressure test.
 - G. Other: KEH will inspect 10 percent of welds, minimum.

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Project or W.O. No.	Title	Dwg. Reference	Test Procedure/Rev.
Construction Spec./Rev.	Code or Standard	Year	Addenda _____ Class _____ Stamp Required <input type="checkbox"/> Yes <input type="checkbox"/> No

Description of System or Component(s) Test Boundaries

TEST PREPARATION

Notification Requirements <input type="checkbox"/> Quality Control <input type="checkbox"/> Acceptance Inspection <input type="checkbox"/> Safety Engineer <input type="checkbox"/> Client _____ <input type="checkbox"/> Authorized Inspector <input type="checkbox"/> _____	Valve Line-up Requirements (for permanent valves installed) <table style="width:100%;"> <tr> <td>Valve I.D. _____</td> <td><input type="checkbox"/> Open</td> <td><input type="checkbox"/> Close</td> </tr> <tr> <td>Valve I.D. _____</td> <td><input type="checkbox"/> Open</td> <td><input type="checkbox"/> Close</td> </tr> <tr> <td>Valve I.D. _____</td> <td><input type="checkbox"/> Open</td> <td><input type="checkbox"/> Close</td> </tr> <tr> <td>Valve I.D. _____</td> <td><input type="checkbox"/> Open</td> <td><input type="checkbox"/> Close</td> </tr> <tr> <td>Valve I.D. _____</td> <td><input type="checkbox"/> Open</td> <td><input type="checkbox"/> Close</td> </tr> <tr> <td>Valve I.D. _____</td> <td><input type="checkbox"/> Open</td> <td><input type="checkbox"/> Close</td> </tr> </table>	Valve I.D. _____	<input type="checkbox"/> Open	<input type="checkbox"/> Close	Valve I.D. _____	<input type="checkbox"/> Open	<input type="checkbox"/> Close	Valve I.D. _____	<input type="checkbox"/> Open	<input type="checkbox"/> Close	Valve I.D. _____	<input type="checkbox"/> Open	<input type="checkbox"/> Close	Valve I.D. _____	<input type="checkbox"/> Open	<input type="checkbox"/> Close	Valve I.D. _____	<input type="checkbox"/> Open	<input type="checkbox"/> Close
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Valve I.D. _____	<input type="checkbox"/> Open	<input type="checkbox"/> Close																	
Valve I.D. _____	<input type="checkbox"/> Open	<input type="checkbox"/> Close																	

Required Test Medium _____	Required Test Medium Temp. _____	Flushing Requirements _____	<input type="checkbox"/> Blue Chalking Required
Medium _____	Temp. _____	Flushing _____	<input type="checkbox"/> Soap Solution Required
Design System _____	Design Test _____	Specified _____	Prepared By _____
Pressure _____	Pressure _____	Hold Time _____	Date _____

PRETEST CHECKLIST

Item or Requirement	Craft Supervision	Quality Control	
		Accept	Date
Valve line-up per design requirements (see above line up).			
Flushing of system and/or component completed per design requirements.			
All lines or components not to be tested are properly isolated or disconnected.			
Vents and openings checked; proper Pressure Relief Valve installed and discharge checked.			
Test medium per design requirements; temperature equalized. Medium _____ Medium Temp. _____ (ASME only)			
Test gauge(s) correct range and currently calibrated. SN _____ Range _____ Cal. Due Date _____ SN _____ Range _____ Cal. Due Date _____ SN _____ Range _____ Cal. Due Date _____			
Pressure Relief Valve properly set and currently calibrated. SN _____ PSI Set _____ Checked Date _____ SN _____ PSI Set _____ Checked Date _____ SN _____ PSI Set _____ Checked Date _____			

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TEST PERFORMANCE

Item or Requirement	Quality Control	
	Accept	Date
RDT/NE and other if specified:		
50% Tp obtained and examination conducted = Tp _____		
Pressure increments at 0.10 Tp:		
= Tp _____		
0.5 Static testing - areas to be inspected chalked prior to application of pressure.		
0.2 Static testing - examination conducted while system/component pressurized.		
Specified Tp _____ PSI obtained at _____ a.m. p.m.		
0.1 Automatic Testing - soap solution applied to areas to be tested and system/components examined while pressurized.		
Specified Tp _____ PSI obtained at _____ a.m. p.m.		
0.0 Pressure Test	Quality Control Signature	Stamp or PR No.
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected		Date

INSPECTION VERIFICATION

0.2 Documentation properly prepared.	<input type="checkbox"/> Yes <input type="checkbox"/> No	Actual Tp during final inspection _____ PSI
0.1 Joints and welded attachments to pressure retaining ponents chalked/soaped as applicable.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
0.3 Joints and welded attachments to pressure retaining ponents visually inspected for leakage.	<input type="checkbox"/> Yes <input type="checkbox"/> No	Specified hold time verified at _____ a.m. p.m.
0.0 Pressure Test	Acceptance Inspection Signature	Stamp or PR No.
<input type="checkbox"/> Accepted <input type="checkbox"/> Rejected		Date

OTHER

Comments

NCR No. (if applicable)	Client Representative	Date
	Witness - ASME Authorized Inspector	Date
<input type="checkbox"/> Document Reviewed <input type="checkbox"/> Drawings Highlighted	Construction Engineering	PR No.
		Date

ACCEPTANCE INSPECTION REPORT

Project No.

Inspection Plan No.

Items Inspected

Acc.

Rej.

Other Documentation

93127501330

Other Activities/General Comments

Date this Report

Reviewed by

Inspector's Signature

Employee No.
KEH-

SECTION 16300

HIGH VOLTAGE DISTRIBUTION
(Above 600-Volt)

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

- 1.1.1.1 American Association of State Highway and Transportation Officials (AASHTO)
- 1983 Standard Specifications for Highway Bridges, 13th Edition
- 1.1.1.2 American National Standards Institute (ANSI)
- ANSI C2-1987 American National Standard National Electrical Safety Code, 1987 Edition
- ANSI C57.12.00-1980 American National Standard General Requirements for Liquid- Immersed Distribution, Power and Regulating Transformers
- ANSI C57.12.70-1978 American National Standard Terminal Markings and Connections for Distribution and Power Transformers
- ANSI C80.1-1983 American National Standard for Rigid Steel Conduit--Zinc Coated
- ANSI 05.1-1979 American National Standard Specifications and Dimensions for Wood Poles
- 1.1.1.3 American Wood Preservers Association (AWPA)
- C7-73 Western Red Cedar, Northern White Cedar and Alaska Yellow Cedar Poles - Preservative Treatment of Incised Pole Butts by the Thermal Process
- P1-78 (Revised) Standard for Coal Tar Creosote for Land and Fresh Water Use

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P8-87

Standard for Oil-Borne
Preservatives

P9-87

Standard for Solvents and
Formulations for Organic
Preservative Systems

1.1.1.4 Federal Specifications (FS)

W-C-1094A

Conduit and Conduit Fittings
Plastic, Rigid

1.1.1.5 Institute of Electrical and Electronics Engineers (IEEE)

IEEE C62.1-1984

IEEE Standard for Surge
Arresters for AC Power Circuits

1.1.1.6 National Electrical Manufacturers Association (NEMA)

Standards Publication/
No. FB 1-1983 w/Rev through
Sep 1984

Fittings and Supports for
Conduit and Cable Assemblies

Standards Publication/
No. ICS 6-1983 w/Rev
through Nov 1986

Enclosures for Industrial
Controls and Systems

Standards Publication/
No. WC 8-1976 (R 1982)
w/Rev through Jan 1983

Ethylene-Propylene-Rubber-
Insulated Wire and Cable for
the Transmission and
Distribution of Electrical
Energy

1.1.1.7 National Fire Protection Association (NFPA)

NFPA 70

National Electrical Code,
1987 Edition

1.1.1.8 Underwriters Laboratories, Inc (UL)

May 1988

Electrical Appliance and
Utilization Equipment Directory

May 1988

Electrical Construction
Materials Directory

UL 1242-1985

Standard for Intermediate Metal
Conduit

1.1.1.9 Washington State Department of Transportation (WSDOT)

M41-10-88

Standard Specification for
Road, Bridge, and Munciple
Construction

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Approval Data: Submit information listed in Column 5 of Vendor Data List in this Section.

1.2.2 Certified Vendor Information (CVI): Submit information listed in Column 6 of Vendor Data List in this Section.

1.3 QUALITY ASSURANCE

1.3.1 Standards: Products shall be identified for intended purpose by Underwriters Laboratories, Inc (UL) in the Electrical Appliance and Utilization Equipment Directory or Electrical Construction Materials Directory, and bear listing mark of laboratory. In absence of mark, submit documentation of applicable listing. Listing and marking by UL is not required for products specified to meet the requirements of a national standard, or designated by manufacturer's part number on the Drawings or in this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 Cable: Upon delivery to site inspect cable and reels for shipping damage such as:

- a. Marks caused by improper lifting equipment or techniques.
- b. Breaks or cuts in outer covering.
- c. Damaged jacket or insulation.
- d. Reel damage from mishandling.

1.4.1.2 Test: Operating Contractor will perform dc overpotential test on new cable upon delivery to site. Acceptance criteria is given in subparagraph 3.3.2.1.

1.4.2 Storage

1.4.2.1 Cable

a. Store reels with flanges resting on hard surface or pallet to prevent sinking into ground.

b. Reel flanges shall not touch cable on other reels.

c. Do not store reels on side. Store with reel axis horizontal.

d. Cap or tape cable ends to prevent entrance of moisture.

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1.4.2.2 Pole line materials

a. Poles stored longer than 2 weeks shall be stacked on supports at least 1 foot above ground. Strength and spacing of supports, and manner of stacking shall produce no noticeable distortion in poles.

b. Locate material stored at site to prevent damage from weather and adjacent construction operations.

1.4.3 Handling

1.4.3.1 Cable

a. Do not drop reels.

b. Slings and forklifts shall not contact cable or protective covering.

c. Use spreader bar when lifting reel with bar and sling.

1.4.3.2 Pole line material

a. Handle poles, fittings, insulators, and miscellaneous hardware with care to prevent damage. Unload carefully from truck and do not drop. Do not drag poles.

b. Do not use construction hooks, tongs, or other sharp tools on treated portion of poles.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Deleted.

2.1.2 Raceways and Fittings

2.1.2.1 Conduit shall meet the requirements of appropriate standard as follows.

- | | |
|-----------------------|----------------------|
| a. Rigid steel | ANSI C80.1 |
| b. Intermediate metal | UL 1242 |
| c. PVC (Schedule 40) | FS W-C-1094, Type II |

2.1.2.2 Deleted.

2.1.2.3 Fittings for rigid steel conduit shall meet the requirements of NEMA FB 1.

2.1.2.4 Deleted.

2.1.3 Cable: 15 kV single conductor meeting the requirements of NEMA WC 8 for both wet and dry conditions at normal operating temperature of 90 C max.

2.1.3.1 Conductor: Copper, annealed, Class B concentric stranding.

2.1.3.2 Conductor shield: Extruded semi-conducting thermosetting compound, 15 mils thick, minimum.

2.1.3.3 Insulation: Ethylene-propylene-rubber, 220 mils thick, minimum.

2.1.3.4 Insulation shield: Minimum 30 mil extruded nonmetallic covering over insulation with minimum 5 mil nonmagnetic metal component directly over or embedded in covering.

2.1.3.5 Jacket: Black polyethylene, 80 mils average minimum thickness.

2.1.3.6 Cable shall have continuous permanent printing on jacket showing manufacturer's name, trade name, type, size, rated voltage and footage markings. Cable reels shall be marked to show above information and length of each cable. Ends of cable shall have weatherproof seals and both ends exposed on reel, accessible for testing.

2.1.4 Deleted.

2.1.5 Nameplates: Made from 1/16 inch laminated plastic stock with white surface and black core. Edges smooth, without burrs, and beveled 45 degrees. Letters sharp and clear.

2.1.6 Wire Pulling Compound: "Y-er Eas" manufactured by Electro Compound Co, or Polywater manufactured by American Polywater Corp.

2.1.7 Tape

2.1.7.1 Plastic insulating tape: Scotch No. 33+ manufactured by 3M Company.

2.1.7.2 Conduit protection tape: Scotchrap No. 50 manufactured by 3M Company.

2.1.7.3 Silicon rubber termination tape: Scotch No. 70 manufactured by 3M Company.

2.1.8 Deleted.

2.1.9 Deleted.

2.1.10 Deleted.

2.1.11 Wood Poles: Meeting the requirements of ANSI 05.1 and be western red cedar cut from live timber. Poles shall be butt-treated by manufacturer in accordance with AWPAC7, using preservative meeting the requirements of AWPAC8 and P9, or P1. Each pole shall be given single top cut at 30 degree angle with normal to axis of pole and at right angles to sweep. Gains shall

be cut so roof will be at right angles to line and sweep of pole will be in line. Roofs and gains shall be brush-treated by manufacturer with specified preservative. Each gain shall fit crossarm tightly. Bolt holes shall not be more than 1/16 inch oversize.

2.2 EQUIPMENT

2.2.1 Deleted.

2.2.2 Outdoor Distribution Transformer: Meeting the requirements of ANSI C57.12.00 with kVA and voltage ratings shown on the Drawings. Transformer shall be oil filled, 55c rise, deadfront loop feed, self-cooled 3 phase with 2 primary bushing wells for each phase, each with bushing insert for use with 200A, 15 kV class load break elbows, as shown on the Drawings and have two 2-1/2 percent above and below normal high-voltage taps. Identify high and low voltage bushings in accordance with ANSI C57.12.70. Transformer oil to be certified PCB free.

2.2.2.1 Transformer shall be self-protecting with metal oxide varistor elbows, deadfront arrester, 15 kV class arrester elbow, gapless, solid-state with metal oxide varistor permanently sealed into elbow shank. Primary fuses Bay-o-net fused with Kerney DEWL Cat. No. 124080-8, Kerney Back-up CLF Cat. No. 150615-50.

2.2.2.2 Transformer shall be designed for pad mounting and include following.

a. Three 200 to 5A current transformers: General Electric Type JAB-0 Cat. No. 750X36G202 with socket type kilowatt hour demand meter for 277/480V ac, wye, 3 phase, 4 wire, 200A system, Westinghouse Type D4S-8M Class 10, 240V.

b. KVA rating shown on the Drawings.

c. Transformer secondary distribution panelboard rated 480/277 VAC, 225 amp, with (1) 225AF, 150AT, 3P molded case circuit breaker, (3) 100AF, 60AT, 3P molded case circuit breakers, and space for (2) 100AF, 3P molded case circuit breakers. Circuit breaker IC rating shall be for 22,000 amp symmetrical.

d. One heavy duty circuit breaking receptacle, rated 200 ampere, 600 VAC, 3-wire, 4-pole, Crouse Hinds, catalog number AR20422 with angle adaptor, catalog number AJA1.

e. Three heavy duty circuit breaking receptacles, rated 60 ampere, 600 VAC, 3-wire, 4-pole, Crouse Hinds, catalog number AR648 with angle adaptor, catalog number AJA6.

f. Pulse generator

1) KWH/pulse: 0.25.

2) Pulse ratio: 125/72.

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g. Sweepand type demand register with 30 minute demand interval.

h. Combination meter socket and test switch: Superior Cat. No. W11511-MM.

2.2.3 Load break center module and load break elbows shown on the Drawings.

2.2.4 Overhead Lightning Arresters: Distribution valve type rated 15 kV, 95 BIL, for use on 13.8 kV high impedance ground system, and meeting the requirements of IEEE C62.1. Porcelain bodies shall be wet porcelain with uniform color glaze. Galvanized cap and base hardware shall have bolted clamps for both line and ground connections. Mounting bolts shall be galvanized.

2.2.5 Manholes: Reinforced precast concrete utility vault with top, configuration shown on the Drawings, and meeting AASHTO, Section 1.2.5 (E), H-20 load criteria; Arco Concrete, Inc Cat. No. 6060-7 complete with manhole ring and cover meeting the requirements of WSDOT M41-10, Section 9-05.15(1). Manhole cover shall be embossed with words "HIGH VOLTAGE ELECTRIC".

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Field Measurements: Scale dimensions on the Drawings show desired and approximate location of equipment, actual locations, distances, and levels shall be governed by field conditions.

3.2 INSTALLATION

3.2.1 General

3.2.1.1 Perform work in accordance with NFPA 70 (NEC) and ANSI C2.

3.2.1.2 Install products as shown on the Drawings and specified.

a. Identify electrical equipment with nameplates engraved with designation and function shown on the Drawings.

b. Attach nameplates on or near equipment with clear RTV silicone sealant.

3.2.1.3 Use appropriate special calibrated tools when installing devices for which special installation tools are recommended by manufacturer.

3.2.2 Grounding Systems: Use galvanized, stranded steel conductors for ground conductors installed in earth or concrete. Make joints connecting copper and galvanized steel conductors above grade and in dry location.

3.2.3 Conduits

3.2.3.1 Use rigid steel or intermediate metal conduit.

3.2.3.2 Deleted.

3.2.3.3 Install #14 gage galvanized steel pull wire or 1/8 inch polyethylene rope in conduit installed and left empty for future use.

3.2.3.4 Use black paint and stencil to identify each conduit in each manhole. Place number, shown on Wire Run List, approximately 1/2 inch above point of entry into manhole.

3.2.3.5 Make elbows, offsets and bends uniform and symmetrical. Bend conduit with approved bending devices.

3.2.3.6 Cut square, ream and remove burrs. Conduit shall be clean, dry, and free of debris. Immediately after installation, plug or cap exposed ends with standard accessories until wires are installed.

3.2.3.7 Deleted.

3.2.3.8 Use pipe straps, 1 hole clamps equipped with clampbacks or Unistrut with clamps to secure conduits.

3.2.3.9 Set up joints in conduit installed in concrete, underground, or exposed to weather, with high temperature, antiseize, conductive thread lubricant and sealant.

3.2.3.10 Install exposed conduit stubbing up through concrete slabs straight and plumb, lined up, and uniformly spaced. Install at sufficient depth below slab to eliminate part of bend above top of slab. Couple conduit flush with surface of slab. Verify stub-up locations with final equipment arrangements.

3.2.3.11 Wrap conduit, passing from concrete to air or to direct burial, with conduit protection tape 3 inches in concrete to at least 12 inches in earth or 3 inches in air, unless conduit is PVC or PVC coated.

3.2.4 Underground Duct Banks

3.2.4.1 Use PVC conduit in concrete encased duct banks.

3.2.4.2 Install underground ducts as shown on the Drawings.

3.2.4.3 Deleted.

3.2.4.4 Form concrete encasements unless written waiver is obtained from KEH.

3.2.4.5 Demand meter, socket, test switch, and current transformers will be installed by others.

3.2.5 ~~Nonaerial Type Conductors~~

3.2.5.1 Use paint or pressure-sensitive colored tape to identify conductors. Maintain phase color coding as follows.

- a. "A" Phase - Red.
- b. "B" Phase - Yellow.
- c. "C" Phase - Blue.

3.2.5.2 Use lubricant recommended by cable manufacturer, or wire pulling compound specified, to decrease friction when pulling wire and cable through conduit.

3.2.5.3 Do not install or handle wires with thermoplastic insulation or jacket when ambient temperature is 15 F or below.

3.2.5.4 Maximum pulling tension on conductors as recommended by the conductor manufacturer.

3.2.6 Splices and Cable Terminations

3.2.6.1 Deleted.

3.2.6.2 Deleted.

3.2.6.3 Deleted.

3.2.6.4 Follow manufacturer's instructions and directions for splices, stress cones and cable terminations.

3.2.6.5 Wrap terminations for stranded insulated conductors on aerial equipment with 2 half-lapped layers of plastic insulating tape from 2 inches back on cable insulation to cover barrel of terminal. Taping shall effect moisture barrier so moisture cannot penetrate between conductor and insulation or interstices of stranded conductor. Overlay 1 half-lapped layer of silicon rubber termination tape over plastic insulating taping.

3.2.7 Setting Poles

3.2.7.1 Excavate holes large enough to admit tamping bar around pole at butt. Do not use explosives to excavate holes.

3.2.7.2 Use backfill materials which can be solidly compacted by hand tamping in 6 inch lifts. Compact surplus earth around pole in cone 1 foot high above grade. Add additional backfill where backfill has settled, and tamp before completion of work.

3.2.7.3 Set 30 foot poles 6 feet in earth and 50 foot poles 7 feet in earth. Measure depth from lowest side, on moderately sloping ground and from point 2'-6" from center of pole toward low side on steep slopes, cuts, embankments, or where soil is likely to be washed away from pole.

3.2.7.4 Set poles plumb and in line, except that corners and other strain points which are guyed shall have butts displaced to keep tops in line where feasible. At such locations, rake against strain shall be approximately 3 inches for each 10 feet of height.

3.3 FIELD QUALITY CONTROL

3.3.1 Testing, General

3.3.1.1 Test equipment and wiring for continuity and unintentional grounds, and verify proper phase sequence and voltage at equipment served before attempt is made to operate equipment. Notify KEH before start of tests. Correct items found, during testing or examination by KEH, to be at variance with the Drawings and this Section.

3.3.1.2 Furnish instruments, labor and equipment required to conduct the testing.

3.3.1.3 Use test instruments which bear valid calibration stamp showing date of calibration and expiration date of stamp. Calibration and accuracy of test instruments shall be certified by independent testing laboratory having standards traceable to the National Bureau of Standards.

3.3.1.4 In addition to testing specified to be performed by Contractor, installation will be subject to examination by KEH for conformance with design and applicable codes. Assist KEH as requested.

3.3.2 Acceptance Testing

3.3.2.1 Upon receipt of new cable, Operating Contractor will perform following tests.

	<u>Test</u>	<u>Acceptance Criteria</u>
a.	dc Test Overpotential (Hi-Pot) 15 kV dc shielded cable tested at 55 kV dc for 15 minutes.	Leakage current not to exceed 5 micro- amps.

3.3.2.2 After installation Operating Contractor will perform following tests to verify acceptability of cable installation.

	<u>Test</u>	<u>Acceptance Criteria</u>
a.	Transformer	
	. Routine	ANSI C57.12.00
	. Resistance Measurement	Not applicable, for base data
	. Combustible Gas	Less than 0.5 percent
	. Oil Neutralization Number	Less than 0.1 mg KOH/gram
	. Oil Dielectric	18 kV or greater
	. Oil Interfacial Tension	18 dynes/Cm or greater
	. Askarel Content	1 PPM
	. Oil Power Factor	1 percent
	. Oil PCB Content	Less than 1 PPM

b. Cable

- . ac Power Factor (not to exceed rated voltage of cable). Power factor not to exceed 2 percent.
- . dc Overpotential (Hi Pot) 15 kV shielded cable tested at 55 kV dc for 15 minutes. Leakage current not to exceed 5 micro-amps.
- . Shield resistance test for shield-to-termination continuity between phases and between each phase and ground. Observe uniformity between resistance readings. Resistance readings greater than 5 ohms are generally indication of discontinuity (or open circuit) and are not acceptable.

9 3 1 2 7 6 0 1 3 4 1

SECTION 16400

SERVICE AND DISTRIBUTION
(600-Volt and Below)

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American National Standards Institute (ANSI)

ANSI C80.1-1983 American National Standard for Rigid Steel Conduit--Zinc Coated

1.1.1.2 American Society for Testing and Materials (ASTM)

D 3222-81 Standard Specification for Unmodified Poly (Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials

1.1.1.3 Federal Specifications (FS)

W-C-1094A Conduit And Conduit Fittings Plastic, Rigid

W-F-406D Fittings For Cable, Power, Electrical And Conduit, Metal, Flexible

TT-S-00230C,
Including AMD 2 Sealing Compound: Elastomeric Type, Single Component (For Calking, Sealing, And Glazing In Buildings And Other Structures)

WW-C-566C Conduit, Metal, Flexible

1.1.1.4 National Electrical Manufacturers Association (NEMA)

Standards Publication/
No. FB 1-1983 w/Rev through
Sep 1984 Fittings and Supports for Conduit and Cable Assemblies

Standards Publication/
No. ICS 6-1983 w/Rev through
Nov 1986 Enclosures for Industrial Controls and Systems

Standards Publication/
No. RN 1-1980

Polyvinyl-Chloride Externally
Coated Galvanized Rigid Steel
Conduit and Electrical Metallic
Tubing

1.1.1.5 National Fire Protection Association (NFPA)

NFPA 70

National Electrical Code,
1987 Edition

1.1.1.6 Underwriters Laboratories, Inc (UL)

May 1988

Electrical Appliance and
Utilization Equipment Directory

May 1988

Electrical Construction
Materials
Directory

UL 1242-1985

Standard for Intermediate Metal
Conduit

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Approval Data: Submit information listed in Column 5 of Approval
Data List in this Section.

1.2.2 Vendor Information: Submit information listed in Column 5 of
Vendor Information list in this Section.

1.3 QUALITY ASSURANCE

1.3.1 Standards: Products shall be identified for intended purpose by
Underwriters Laboratories, Inc (UL) in the Electrical Appliance and
Utilization Equipment Directory or Electrical Construction Materials
Directory, and bear listing mark of laboratory. In absence of mark, submit
documentation of applicable listing. Listing and marking by UL is not
required for products specified to meet the requirements of a national
standard, or designated by manufacturer's part number on the Drawings or in
this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Solderless Connectors and Terminal Lugs: Pressure type, rated
for use with copper or aluminum conductors with insulating caps or covers
rated for system utilization voltage. Connectors shall be types specified
below.

2.1.1.1 For conductors #8 AWG and smaller.

a. Ideal Industries, Inc "Wire-Nuts."

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b. Thomas and Betts Company "Sta-Kon."

c. 3M Company "Scotchlok."

2.1.1.2 For conductors #6 AWG and larger.

a. Burndy Engineering Company "Screw Pressure Connectors" or "Hydent."

b. Thomas and Betts Company "Lock-tite."

2.1.2 Raceways, Fittings and Boxes

2.1.2.1 Conduit shall meet the requirements of appropriate standard as follows.

a. Rigid steel ANSI C80.1

b. Intermediate metal UL 1242

c. PVC (Schedule 40) FS W-C-1094, Type II

d. Flexible metal FS WW-C-566

e. PVDF (Schedule 80 KYNAR) ASTM D 3222, Type II

2.1.2.2 PVC coating on rigid steel conduit: Factory applied, and meeting the requirements of NEMA RN 1, Type A-40.

2.1.2.3 Conduit fittings for rigid steel and electrical metallic tubing shall meet the requirements of NEMA FB 1. Only compression type threadless fittings shall be used with EMT.

2.1.2.4 Fittings used with flexible metal conduit shall meet the requirements of FS W-F-406 and be squeeze type only. Flexible metal conduit shall have integral ground conductor.

2.1.2.5 Use "Myers" type watertight fittings or sealing locknuts manufactured by Midwest Electric Manufacturing Corp, for conduit entries into sides or tops of NEMA Type 3, 3R, or NEMA Type 4X enclosures.

2.1.3 Conductors: #10 and 12 AWG conductors for power branch circuits shall be solid copper. #8 AWG conductors and larger shall be stranded copper. Type and AWG size as specified on the drawings.

2.1.3.1 Conductor insulation: As specified on the drawings.

2.1.4 Leak Sensing and Locating Cable: Raychem TraceTek Catalog No. TT3000-MC.

2.1.4.1 Modular jumper cable: With male connector on 1 end and female connector on other end; Raychem TraceTek Catalog No. TT-MJC-MC.

2.1.4.2 Modular end termination: Raychem TraceTek Catalog No. TT-MET-MC.

2.1.4.3 Deleted

a. Deleted

2.1.5 Wiremarkers: Imprinted tubular plastic.

2.1.6 Nameplates: Made from 1/16 inch laminated plastic stock with white surface and black core. Edges smooth, without burrs, and beveled 45 degrees. Letters sharp and clear.

2.1.7 Concrete and Masonry Anchors: Kwik-Bolt manufactured by Hilti Fastening Systems or Red Head Wedge Anchor manufactured by Phillips Drill Company.

2.1.8 Wire Pulling Compound: "Y-er Eas" manufactured by Electro Compound Company or Polywater manufactured by American Polywater Corp.

2.1.9 Tape

2.1.9.1 Plastic insulating tape: Scotch No. 33+ manufactured by 3M Company.

2.1.9.2 Conduit protection tape: Scotchrap No. 50 manufactured by 3M Company.

2.1.10 Deleted.

2.1.11 Duct Sealing Compound: "Sealex" manufactured by Porcelain Products Co or "Kerite" manufactured by Kerite Co.

2.1.12 Nonshrink Grout: See Section 03300.

2.1.13 Deleted.

2.1.14 Sealant: Polysulfide meeting the requirements of FS TT-S-00230, Type II, Class B.

2.2 EQUIPMENT

2.2.1 Equipment enclosures shall meet the requirements of NEMA ICS 6-110 and be type shown on the Drawings.

2.2.2 Terminal Blocks

2.2.2.1 For #10 AWG conductors and smaller: Either 1-piece or factory assembled sectional double terminal, barrier type, with binder screw terminals. Terminal ampacities shall be equal to or greater than conductor ampacities; Marathon or Buchanan.

2.2.2.2 For #8 AWG conductors and larger: Either 1-piece or factory assembled sectional barrier type with box lug terminals having pressure plate between screw and conductor. Size terminals to accommodate conductors to be connected.

2.2.2.3 Furnish covers to cover live parts of terminations for circuits of more than 150 volts to ground. Provide with means for ready inspection and full width marking areas.

2.2.3 Annunciator: Similar to X12 Series manufactured by Ronan.

2.2.3.1 Weatherproof, in NEMA 4 enclosure, with 7 row high by 8 column wide plug-in light boxes. Input power 120V ac, 60 Hz.

2.2.3.2 Display shall have white translucent nameplates 3 inches by 2-3/4 inches nominal. Lamp boxes shall have 1 alarm point each with minimum 2 lamps for each alarm.

2.2.3.3 Solid state electronics with internal 24V dc power supply. Field contacts field selectable, NO or NC, for 24V dc.

2.2.3.4 Features

- a. Lock-in of momentary alarms.
- b. Auxiliary contacts.
- c. Ring-back circuit by alarm audible signal.
- d. Signal own failure.
- e. Lamp test.
- f. Flasher, common "acknowledge" pushbutton, and common "test" pushbutton located in cabinet.
- g. Common alarm relay with 2 SPDT contacts, 24 V dc, energized in normal operation.

2.2.3.5 Sequence of operation

<u>STAGE</u>	<u>VISUAL SIGNAL</u>	<u>AUDIBLE SIGNAL</u>
Normal	Off	Off
Alert, initial	Flashing	On
Acknowledge, initial	On steady	Off
Return to normal	Off	Off
Reset	Auto	Auto

2.2.3.6 Accessories: Horn, 120V ac, NEMA 4 rating, 24V dc power supply located in cabinet.

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Field Measurements: Scale dimensions on Drawings show desired and approximate location of equipment, actual locations, distances, and levels shall be governed by field conditions.

3.2 INSTALLATION

3.2.1 General

3.2.1.1 Perform work in accordance with NFPA 70 (NEC).

3.2.1.2 Fasten equipment to structural members or metal supports attached to structure.

a. Use clamping devices for attaching to structural steel, or, when clamping is impracticable, obtain written authority from KEH to weld to, drill or cut structural members to provide attachment.

b. Fasten equipment to concrete with expansion anchors.

c. Deleted.

d. Locate equipment, boxes and conduit approximately where shown in relation to equipment served.

e. Do not install conduit raceways and boxes in positions that interfere with work of other trades.

f. Identify components by nameplate engraved with designation and function shown on the Drawings.

g. Attach nameplates on or near equipment with clear RTV silicone sealant.

3.2.1.3 Use appropriate special calibrated tools when installing devices for which special installation tools are recommended by manufacturer.

3.2.2 Grounding Systems

3.2.2.1 Underground conductors, electrodes, and connections: Install in accordance with the Drawings. Make joints connecting copper and galvanized steel conductors above grade and in dry location.

3.2.2.2 System and equipment grounding: Solidly ground neutral conductor of 3-wire, single phase and 4-wire, 3 phase, wye-connected distribution systems. Ground equipment in accordance with the Drawings and the NEC.

3.2.3 Conduit

3.2.3.1 Use rigid steel or intermediate metal where subject to mechanical damage, installed in concrete, or installed exposed to weather.

3.2.3.2 Install #14 gage galvanized steel pull wire or 1/8 inch polyethylene rope in spare conduits.

3.2.3.3 Install concealed conduits as directly as possible and with bend radii as long as possible. Install exposed conduit parallel with or at right angles to structure lines.

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3.2.3.4 Permanently label each conduit, using black paint and stencil, at both ends, with number shown on the Drawings. In manholes place number approximately 1/2 inch above point of entry into manhole.

3.2.3.5 Make elbows, offsets and bends uniform and symmetrical. Bend conduit with approved bending devices.

3.2.3.6 Cut square, ream and remove burrs. Conduit shall be clean, dry, and free of debris. Immediately after installation, plug or cap exposed ends with standard accessories until wires are installed.

3.2.3.7 Use galvanized steel locknuts and insulated bushings for attachment to enclosures except threaded hubs or sealing type locknuts shall be used outdoors or where moisture is present. Threadless fittings will not be permitted for rigid conduit. Use Erickson type couplings where required. Do not use running threads.

3.2.3.8 Use 1 hole clamps equipped with clampbacks or Unistrut with clamps to secure conduits.

3.2.3.9 Install without moisture traps wherever possible. Where practicable, provide drain holes in pullboxes or fittings at low points in raceway systems and remove burrs from drilled holes.

3.2.3.10 Flexible conduit

a. Use to make connections to equipment that will be raised upon closure of vault, and to motors and other equipment subject to vibration. Use liquidtight flexible metal conduit where conduit and fittings are installed outdoors or exposed to moisture.

b. Deleted.

c. Deleted.

3.2.3.11 Set up joints in conduit installed in concrete, underground, or exposed to weather, with high temperature, antiseize, conductive thread lubricant and sealant.

3.2.3.12 Install exposed conduit stubbing up through concrete slab straight and plumb, lined up, and uniformly spaced. Install at sufficient depth below slab to eliminate part of bend above top of slab. Cap or plug stub-up before placing concrete. Verify stub-up locations with final equipment arrangements.

3.2.3.13 Wrap conduit passing from concrete to air or to direct earth burial with conduit protection tape from 3 inches in concrete to at least 12 inches in earth, or 3 inches in air, unless conduit is PVC coated.

3.2.3.14 Deleted.

3.2.3.15 Deleted.

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3.2.3.16 Install PVC coated conduit in accordance with manufacturer's recommendations. Repair coating, damaged during handling or installation using PVC paint recommended by conduit manufacturer.

3.2.3.17 Seal opening around conduit penetrating manhole walls with nonshrink grout.

3.2.4 Underground Duct Banks

3.2.4.1 Use either rigid steel or PVC conduit in concrete encased duct banks.

3.2.4.2 For single conduit runs, PVC coated rigid steel conduit may be used instead of concrete encased duct bank. Conduit installed in diffusion material shall be rigid steel not PVC coated.

3.2.4.3 Install underground ducts in accordance with the Drawings and slope down to manholes where practicable to eliminate drains.

3.2.4.4 Where drains or risers are required, install in accordance with the Drawings. Seal conduit at both ends with duct sealing compound.

3.2.4.5 Form concrete encasements unless written waiver is obtained from KEH.

3.2.5 Boxes, Enclosures and Wiring Devices

3.2.5.1 Install boxes firmly in position and plumb.

3.2.5.2 Deleted.

3.2.5.3 Deleted.

3.2.5.4 Deleted.

3.2.6 Conductors

3.2.6.1 Do not bend cables installed in wireways to less than manufacturer's recommended minimum bending radius. Bind power and control circuits separately with nylon cable ties, at 18 inch intervals. Lay cables in wireways in straight parallel lines, and avoid crossing.

3.2.6.2 Maximum pulling tension on conductors: Recommended by manufacturer.

3.2.6.3 Identify each conductor with wiremarker labeled with wire number shown on the Drawings. Attach wiremarker at each termination point within 2 inches of wire termination. Wiremarker nomenclature shall be visible without moving wire or wiremarker.

3.2.6.4 Paint or pressure-sensitive colored tape may be used for coding conductors instead of colored insulation on #8 AWG and larger wire only. Maintain phase color coding, in accordance with the following, for branch and feeder circuits up to and including equipment connections.

a. For three phase circuits:

Phase A	Red or marked red
Phase B	Yellow or orange or marked yellow
Phase C	Blue or black
Neutral	White or grey only, for #6 and smaller or marked white larger than #6
Equipment Ground	Green or bare copper wire for #1 to #4/0

b. For single phase circuits:

Number 1, Hot	Black only
Number 2, Hot	Red or marked red
Neutral	White or grey only, #6 and smaller or marked white larger than #6
Equipment Ground	Green or bare copper wire for #1 to #4/0

3.2.6.5 Use lubricant recommended by cable manufacturer, or wire pulling compound specified, to decrease friction when pulling wire and cable through conduit.

3.2.6.6 Do not install or handle wires with thermoplastic insulation or jacket when ambient temperature is 15 F or below.

3.2.6.7 Deleted.

3.2.7 Splices, Taps and Conductor Terminations

3.2.7.1 Make splices and taps in building wire with solderless connectors described in Paragraph 2.1.1. Use connectors in accordance with manufacturer's instructions.

3.2.7.2 Use plastic insulating tape for uninsulated splices and taps. Apply tape to thickness at least equal to conductor insulation.

3.2.7.3 Use crimp-on type ring or spade lugs with turned up legs for wire terminations of stranded conductors to binder screw or stud type terminals. Lugs shall have insulated sleeves.

3.2.8 Sensing Cable: Install in bottom of annulus between 2 inch inside and 4 inch outside pipes of grout transfer line as follows.

3.2.8.1 Install #14 gage galvanized steel pull wire from 1 termination access port to next at time of pipe fabrication and installation. Take care to ensure pull wire is installed in bottom segment of annulus and not burned-off or welded to pipe.

3.2.8.2 Pull in cable after completion of pipe installation.

3.2.8.3 Connect cables at each termination access port using connectors supplied as part of modular sensing cable.

3.2.8.4 Install specified modular end termination on end of cable at vault pit, and lay cable back in annulus.

3.2.8.5 Contact representative of TraceTek before installation of first sensing cable, and as needed for installation of remaining cables.

3.3 FIELD QUALITY CONTROL

3.3.1 Testing, General

3.3.1.1 Test equipment and wiring for continuity and unintentional grounds, and verify proper phase sequence and voltage at equipment served before attempt is made to operate equipment. Notify KEH before start of tests. Correct items found, during testing or examination by KEH, to be at variance with the Drawings and this Section.

3.3.1.2 Furnish instruments, labor and equipment required to conduct testing.

3.3.1.3 Use test instruments which bear valid calibration stamp showing date of calibration and expiration date of stamp. Calibration and accuracy of test instruments shall be certified by independent testing laboratory having standards traceable to the National Bureau of Standards.

3.3.1.4 In addition to testing specified to be performed by Contractor, installation will be subject to examination by KEH for conformance with design and applicable codes. Assist KEH as requested.

3.3.2 Wiring Systems

3.3.2.1 Megger conductors rated 600 volts and used for services, feeders or branch circuits over 150 volts to ground, phase-to-phase, and phase-to-ground. Minimum acceptable value of insulation resistance is 200 megohms. Megger manufacturer's instruction pamphlet, furnished with megger, shall provide instructions for conducting tests. Disconnect devices not capable of withstanding voltage or current of megger test, such as

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indicating instruments, relays and lamps, before test is made. Voltage output of megger shall be 1000V dc, nominal.

3.3.2.2 Test wiring operating less than 150 volts to ground for continuity and unintentional grounds. Resistance, except thermocouple leads, shall not exceed 1 ohm on continuity checks.

3.3.2.3 Thermocouple tests: Test and record loop resistance of all thermocouples at terminals in temperature element terminal boxes. Install tubular plastic wiremarker with imprinted words "FAULTY THERMOCOUPLE" on thermocouples that are shorted or open circuited.

3.3.2.4 Contractor may elect to group and connect together conductors within raceway while performing megger test. Record readings which indicate less than minimum acceptable value. Repeat megger test after replacement of defective wiring.

3.3.2.5 Reconnect devices disconnected during testing.

3.3.3 Sensing Cable

3.3.3.1 Before installation: Connect portable test box to 1 end and modular end termination to other end of each sensing cable and verify there is no current leakage caused by dirt, grease, or moisture. If current leakage is detected, clean or replace cable.

3.3.3.2 During installation: Connect portable test box to 1 end and modular end termination to other end of sensing cable. Monitor cable for current leakage caused by dirt, grease, or moisture during pull. If current leakage is detected, pull cable out, clean pipe annulus, and clean or replace cable. Hand pull cable with 50 pounds maximum pull tension.

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SECTION 16640

CATHODIC PROTECTION

PART 1 - GENERAL

1.1 REFERENCES

1.1.1 Reference Standards and Specifications: The following standards and specifications, including documents referenced therein, form part of this Section to extent designated herein.

1.1.1.1 American National Standards Institute (ANSI)

ANSI C39.1-1981 American National Standard
Requirements for Electrical
Analog Indicating Instruments

ANSI C80.1-1983 American National Standard
for Rigid Steel Conduit--Zinc
Coated

1.1.1.2 American Society for Testing and Materials (ASTM)

B 8-86 Standard Specification for
Concentric-Lay-Stranded Copper
Conductors, Hard, Medium-Hard,
or Soft

D 3487-82a Standard Specification for
Mineral Insulating Oil Used in
Electrical Apparatus

1.1.1.3 American Wood-Preservers Association (AWPA)

C1-87 All Timber Products--
Preservative Treatment by
Pressure Processes

C2-87 Lumber, Timbers, Bridge Ties
and Mine Ties--Preservative
Treatment by Pressure Processes

P8-87 Standards for Oil-Borne
Preservatives

1.1.1.4 National Association of Corrosion Engineers (NACE)

RP-01-69 Recommended Practice - Control
(Rev 1983) of External Corrosion on
Underground or Submerged
Metallic Piping Systems

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- 1.1.1.5 National Electrical Manufacturers Association (NEMA)
- | | |
|--|---|
| Standards Publication/
No. 250-1985 | Enclosures for Electrical
Equipment (1000 Volts Maximum) |
| Standards Publication/
No. RN 1-1980 | Polyvinyl-Chloride Externally
Coated Galvanized Rigid Steel
Conduit and Electrical Metallic
Tubing |
| Standards Publication/
No. WC 5-1973 (R 1979) w/Rev
through Mar 1985 | Thermoplastic-Insulated Wire
and Cable for the Transmission
and Distribution of Electrical
Energy |

- 1.1.1.6 National Fire Protection Association (NFPA)
- | | |
|---------|---|
| NFPA 70 | National Electrical Code,
1987 Edition |
|---------|---|

- 1.1.1.7 Underwriters Laboratories, Inc (UL)
- | | |
|----------|---|
| May 1988 | Electrical Appliance and Utili-
zation Equipment Directory |
| May 1988 | Electrical Construction
Materials Directory |

1.2 SUBMITTALS: Refer to Section 01300 for submittal procedures.

1.2.1 Approval Data: Submit information listed in Column 5 of Vendor Data List in this Section.

1.2.2 Certified Vendor Information (CVI): Submit information listed in Column 6 of Vendor Data List in this Section.

1.2.3 Visual Examination Procedure: Submit examination procedure for attaching cables, wires, or leads to pipe wall by exothermic weld process.

1.2.4 Manufacturer's Instructions: Submit manufacturer's instructions for exothermic welding of conductors to horizontal and vertical pipe.

1.3 QUALITY ASSURANCE

1.3.1 Qualification and Demonstration of Exothermic Weld Process: Personnel shall be qualified in accordance with following requirements.

1.3.1.1 Prepare 2 exothermic weld connections, #4 or #6 AWG cable to pipe, for each weld position to be used.

1.3.1.2 Qualification tests shall meet the requirements of subparagraphs 3.3.8.3a and 3.3.8.3b.

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1.3.1.3 Examine connection in accordance with manufacturer's recommended method.

1.3.1.4 KEH will witness performance qualification tests.

1.3.1.5 Deliver 2 copies of connection performance qualification test results to KEH 5 days before making exothermic weld connections. Maintain additional copies as specified in Section 01400, Paragraph 1.6.2.

1.3.2 Standards: Products shall be identified for intended purpose by Underwriters Laboratories, Inc (UL) in the Electrical Appliance and Utilization Equipment Directory or Electrical Construction Materials Directory, and bear listing mark of laboratory. In absence of mark, submit documentation of applicable listing. Listing and marking by UL is not required for products specified to meet the requirements of a national standard, or designated by manufacturer's part number on the Drawings or in this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Solderless Terminal Lugs: Pressure type, rated for use with copper conductors with insulating caps rated for system utilization voltage. Lugs shall be types specified below.

2.1.1.1 For conductors #8 AWG and smaller: Thomas and Betts Company "Sta-Kon."

2.1.1.2 For conductors #6 AWG and larger.

a. Burndy Engineering Company "Hydent."

b. Thomas and Betts Company "Lock-tite."

2.1.2 Compression Splice Connectors: Burndy Co "Crimpfit," size shown on the Drawings.

2.1.3 Exothermic Fusion Weld Mold for Connection of Pipe Test Conductors, Jumpers, and Negative Return Cables to Steel or Cast Iron Pipe: Erico Products "Cadweld" size and part number shown on the Drawings.

2.1.3.1 Exothermic weld metal: Erico Products "Cadweld" shown on the Drawings.

2.1.4 Ground Clamp Connector: Bronze, Teledyne Penn-Union, Catalog No. GPL, size as required.

2.1.5 Conduit: Meet the requirements of ANSI C80.1 and be PVC coated in accordance with NEMA RN 1, Type A-40.

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2.1.6 Conductors

2.1.6.1 Direct current (DC): ~~High molecular weight low density polyethylene~~, Type "CP", meeting the requirements of ASTM B 8 and NEMA WC 5. Size specified on the Drawings.

2.1.6.2 Alternating current (AC): Stranded copper with 600 volt Type THHN/THWN insulation. Size specified on the Drawings.

2.1.7 Conductor Splice Kit: Scotchcast Brand, Catalog No. 82-B1 and 90-B1.

2.1.8 Tape

2.1.8.1 Plastic insulating: 3/4 inch wide, Scotch No. 88 manufactured by 3M Company.

2.1.8.2 Electrical splice insulating: Self-vulcanizing rubber, 3/4 inch wide.

2.1.8.3 Electrical color coding: 3/4 inch wide, Scotch No. 35 manufactured by 3M Company.

2.1.9 Plastic Sheet Marker: See Section 02200, yellow warning tape.

2.1.10 Wiremarkers: Imprinted tubular plastic.

2.1.11 Equipment Nameplates: Laminated plastic, 1/16 inch thick with white surface and black core. Edges beveled and smooth. Engraved nomenclature shall be sharp and clear.

2.1.12 Cable Marker: Field fabricate and paint as shown on the Drawings.

2.2 EQUIPMENT

2.2.1 Anodes: Durichlor 51, Type D, size 2 inch by 60 inch with 20 foot lead wire of #8 AWG stranded copper with high molecular weight, low density polyethylene (HMW PE) insulation, prepackaged in 8 inch by 96 inch steel canister with coke breeze backfill.

2.2.1.1 Cable to anode connection: Covered with epoxy cap, in accordance with manufacturer's standards.

2.2.1.2 Canister: 30 gage galvanized stove pipe.

2.2.1.3 Coke breeze: Compacted to total weight of approximately 200 pounds per canister.

2.2.1.4 Electrical resistivity of coke breeze shall not exceed 50 ohm/cm³.

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2.2.2 Anode Junction Box, and Test Station Enclosures: Quazite Corporation, Style "PG" service box, Model No. PG1324BA18 with locking steel cover, Part No. PG1324SA00 with logo engraved: "CATHODIC PROTECTION".

2.2.3 Anode Junction Box: Single hub, double box, slip fit for 3 inch rigid conduit, 8 standard terminals, each terminal 3/8 inch silicon bronze studs with nuts and washers; Gerome, Catalog No. 2007.

2.2.4 Test Station: Single hub, double box, slip fit for 3 inch rigid conduit, 8 standard terminals and 6 extra terminals, each terminal 3/8 inch silicon bronze with nuts and washers; Gerome, Catalog No. 2007.

2.2.5 Reference Electrode: Permanent horizontal copper-copper sulfate type, Harco Corp, Part No. IHRP-802, Matcor Part No. PRC-CU4, or Farwest Corrosion, Part No. FWCC-SP-150. Provide with 50 feet of #8 AWG HMW/PE insulated wire.

2.2.6 Rectifier

2.2.6.1 General requirements: Rectifier and associated equipment shall operate and deliver rated capacity, without exceeding temperature limitations specified, when operating in following environment.

a. Operating Environment

- 1) Location: Outdoors in direct sunlight.
- 2) Ambient temperature: Minimum minus 13 F, Maximum 131 F.
- 3) Relative humidity: Maximum 100 percent.
- 4) Dust: Exposure to dust particulate (sandstorm).
- 5) Precipitation: Driving rainstorm.
- 6) Snow: Accumulation of sleet or snow.

b. Design life: Minimum 20 years.

2.2.6.2 Design Requirements

a. Rating

- 1) ac line input voltage: 480V ac, minus 5 percent to plus 10 percent.
- 2) ac line frequency: 60 Hertz.
- 3) Number of phases: 3.
- 4) dc output voltage: 120 volts.
- 5) DC output current: 12 amps.

- b. Oil-immersed type.
- c. ~~Suitable for mounting on concrete slab.~~

d. Transformer: Separate primary and secondary windings fully rated for maximum capacity. Electrostatic shield placed between primary and secondary windings and fully insulated from both windings. Arrange shield not to form complete closed loop and equip with lead wire connected to negative terminal.

e. Silicon stacks: Connected in full wave bridge circuit configuration, and coated with corrosion-resistant finish equivalent to NEMA Grade C.

f. Silicon diodes: Rated to provide margin for over-voltage surges and over-current surges, and protected by selenium surge-plates against over-voltage surges and by current-limiting devices against over-current surges. Heat sinks sized to keep diode junction and case temperatures below temperatures that could cause failure.

g. Efficiency filter: Incorporate in rectifier to increase efficiency of unit.

h. Enclosure: Meet the requirements of NEMA 250.

i. Current carrying pressure connections, such as terminal studs and current shunt connections, shall have thin layer of conductive grease applied to contact surfaces to prevent oxidation.

2.2.6.3 Construction requirements

a. Construct to permit transformer, stacks and other internal components to be immersed in oil. Inside of enclosure shall be accessible through cover mounted on top. Attach cover to cabinet by hinges and provide with quick-release clamps and padlock clasp or other means of locking cabinet. Provide stop to limit swing of lid when opened. Provide positive, oil-resistant, compressible sealing lid gasket. Cork and sponge materials are not acceptable. Gasket joints shall not have gaps.

b. Provide panel for mounting terminals, circuit breakers, shunts, etc. Board inside panel shall be micarta or similar insulating material, supported on 4 edges.

c. Enclosure and appurtenances: Approved for use in specified environmental conditions. Materials and methods used in construction and fabrication of rectifier shall be in accordance with NEMA requirements for specified service. Internal components and connections of rectifier shall be immersed under 3 inches of oil, minimum.

d. Enclosure shall be minimum 0.1196 inch steel provided with oil drain plug. Oil level shall be clearly marked.

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e. Construct and protect enclosure so environmental conditions specified in subparagraph 2.2.6.1a will not affect rectifier rated performance.

f. Finish enclosure inside and outside with 1 coat of epoxy red oxide primer and 2 coats of gray baked enamel.

g. Provide engraved, manufacturer's standard nameplates on rectifier. Nameplate information shall include rating data specified in subparagraph 2.2.6.2a.

2.2.6.4 Instrumentation

a. Indicating instruments: Meet the requirements of ANSI C39.1.

b. Continuous reading, 3-1/2 inch flush mounted dc voltmeter, for measuring voltage output. Scale shall be linear and range from 0 to 125 percent of rated output voltage.

c. 3-1/2 inch flush mounted dc ammeter, connected across external shunt for reading total dc current output of rectifier. Meter circuit shall have disconnect switch which may be closed by operator when readings are being taken. Ammeter scale shall be linear and range from 0 to 125 percent of rated current output in amperes.

d. Shunt: 50 millivolt, 12 amp mounted on front of instrument panelboard.

2.2.6.5 Voltage and current control: Output voltage manually controlled. Transformer taps shall have tap-changing devices for manual operation to permit at least 18 equal steps of adjustment.

2.2.6.6 Protection: Furnish with following protective devices and equipment.

a. AC thermal magnetic circuit breakers: Mounted within panel and provide short-circuit protection for rectifier.

b. DC fuse: Rated at 15 amps, 125 volts, and installed in positive phase leg. Fuse shall be accessible from front of panel.

c. DC valve-type arrester: For 150 volt maximum line-to-ground fault voltage.

d. AC input surge (lightning) arresters.

e. Ground lug: Installed on cabinet so cabinet may be connected to grounding system. Size ground lug for #4 AWG copper ground cable.

2.2.6.7 Output terminals

a. 2 negative and 4 positive terminals mounted on front of panel and appropriately marked.

b. External shunts on output (positive and negative) circuits indicated above. Output shunts of same rating as ammeter external shunt.

2.2.6.8 Shop tests: Factory test and inspect to establish that design and construction are in accordance with this Section and applicable standards, and to determine that equipment is free from electrical and mechanical defects.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Where existing pipes are exposed during excavation, and usage not known and cannot be verified, do not exothermically weld test conductors to pipe unless written permission is granted by KEH. Make connections using bronze ground clamp connector. Coat connection using same materials and installation methods as for exothermic weld.

3.2 PREPARATION

3.2.1 Field Measurements: Scale dimensions on the Drawings show desired and approximate location of equipment, actual locations, distances, and levels shall be governed by field conditions.

3.3 INSTALLATION

3.3.1 General

3.3.1.1 Perform work in accordance with NFPA 70 (NEC).

3.3.1.2 Cathodic protection systems: Meet the requirements of NACE RP-01-69.

3.3.1.3 Use appropriate special calibrated tools when installing devices for which special installation tools are recommended by manufacturer.

3.3.2 Anodes: Install vertically to depth shown on the Drawings.

3.3.2.1 Drill or auger hole to enable anode to be lowered into hole. Where casing is used to maintain open hole, remove after anode has been placed in hole.

3.3.2.2 Lower anode to bottom of hole by rope and center within hole. Do not use lead wire to lower anode into hole.

3.3.2.3 Backfill and compact in accordance with Section 02200.

3.3.2.4 If temporary casing was used, lower anode into position and slowly withdraw casing while backfilling.

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3.3.2.5 Repair damaged anode lead wire insulation by encapsulation with epoxy resin using conductor splice kit.

3.3.2.6 Splice anode lead conductor to anode header cable as shown on the Drawings.

3.3.2.7 Insulate splice as shown on Drawings. Provide 18 inch slack cable on anode lead at splice location.

3.3.3 Anode Junction Box Enclosure: Install 2 inches above grade at location shown on the Drawings. Install nameplate on top of enclosure. Engrave nameplate, using 3/16 inch letters, ANODE JUNCTION BOX AJB (number shown on the Drawings). Fasten nameplate to enclosure by machine screws or rivets. Install steel cover on enclosure and lock.

3.3.4 Anode Junction Box: Install inside anode junction box enclosure and terminate anode header and loop cables on terminals as shown on the Drawings. Install equipment nameplate on cover of each junction box. Engrave nameplate, using 3/16 inch letters, ANODE JUNCTION BOX AJB (number shown on the Drawings). Fasten nameplate to box by machine screws or rivets. Form slack loop in anode header and loop cables, length shown on the Drawings, and place in bottom of enclosure.

3.3.4.1 Use 1/8 inch thick bus bar of bus grade copper, cut and drilled to fit, to connect terminal studs shown on the Drawings.

3.3.5 Test Station Enclosure: Install 2 inches above grade at location shown on the Drawings. Install nameplate, on top of enclosure. Engrave nameplate, using 3/16 inch letters, TEST STATION T (numbers shown on the Drawings). Fasten nameplate to enclosure by machine screws or rivets. Install steel cover on enclosure and lock.

3.3.6 Test Station: Install inside test station enclosure and terminate pipe and reference electrode test conductors on terminals shown on the Drawings. Install nameplate on cover of test station. Engrave nameplate, using 3/16 inch letters, TEST STATION T (number shown on the Drawings). Fasten nameplate to box by machine screws or rivets. Form slack loop in pipe test conductors, length shown on the Drawings, and place in bottom of enclosure.

3.3.7 Reference Electrode

3.3.7.1 Install at each test station enclosure location as shown on the Drawings.

3.3.7.2 Soak in water for minimum 3 hours, then lower into hole with ropes. Do not use lead to lower into hole.

3.3.7.3 Install package between 6 and 18 inches below outer surface of pipe. 1 electrode is required for 2 pipes or less. For configuration of 2 parallel pipes, install electrode in center of configuration, and not adjacent to or touching foreign pipelines. KEH will assist in positioning reference electrodes.

3.3.7.4 Bring lead wire to top of hole for termination in test station.

3.3.7.5 Repair damaged lead wire insulation using conductor splice kit.

3.3.7.6 Backfill trench in accordance with Section 02200.

3.3.8 Rectifier: Attach to concrete pad with anchor bolts as shown on the Drawings.

3.3.8.1 Terminate ac wiring on input circuit breaker in rectifier.

3.3.8.2 Fill rectifier to level shown on rectifier case, with transformer oil meeting the requirements of ASTM D 3487.

3.3.8.3 Pipe test conductors

a. Verify usage of each pipe to which pipe test conductors are to be connected. If pipes are coated, cut window in coating large enough to accommodate exothermic weld mold. Wire brush each pipe and file to bright metal surface, free of oil and dirt. Make exothermic weld of test conductor to pipe in accordance with approved manufacturer's instructions, size shown on the Drawings. Install weld mold as shown on the Drawings.

b. After weld is made, test integrity of connection by tapping side of weld material with hammer. If weld fails, make another weld at least 3 inches from previous attempt.

c. Coat exothermic weld as shown on the Drawings. If pipe is coated, overlap coating 2 inches beyond cut edge of coating around exothermic weld.

d. Conductor size and color code marking specified on the Drawings.

e. Repair damaged conductor insulation using conductor splice kit.

f. Make repairs of foam insulation on pipe with sprayed polyurethane, specified in Section 15493, applied in accordance with manufacturer's instructions.

g. Identify each conductor using specified wiremarker with typewritten pipe number to which conductor is connected. Label pipe test conductors connected to unidentifiable pipes with pipe size followed by words "UNKNOWN".

h. Use solderless terminal lugs for conductor terminations in test station.

i. Where required, place plastic sheet marker 1 foot below grade and over pipe test conductors in accordance with Section 02200.

j. Backfill in accordance with Section 02200.

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3.3.8.4 Reference electrode conductor

- a. Wrap lead wire in test station with green electrical color coding tape.
- b. Identify conductor using specified wiremarker with typewritten reference electrode number shown on the Drawings.
- c. Use solderless terminal lug for conductor termination in test station.
- d. Terminate lead wire in test station as shown on the Drawings. After termination, place test station in flush-mounted enclosure. Form slack loop in lead wire, length shown on the Drawings, and place at bottom of enclosure.
- e. Repair damaged conductor insulation using conductor splice kit.

3.3.8.5 Backfill in accordance with Section 02200.

3.3.9 Conductors

3.3.9.1 Anode header, anode loop, and negative return cables

- a. Place on bedding in trenches prepared in accordance with the Drawings.
- b. Where only 1 cable is being installed, center in trench. Where more than 1 cable is installed, minimum spacing between cables shall be 1 inch. Do not transpose cables in trench.
- c. Loosely bundle anode header and loop cables together with electrical tape and center in trench. Provide 12 inch slack loop in header cable at anode lead splice locations. Provide 18 inch slack loop in anode lead cable at tap splice location.
- d. Maintain identity of each cable. Where 2 or more cables are in same trench, maintain relative positions of cables, as shown on the Drawings, throughout entire run. Identify cables, using specified wiremarkers, at terminations and where in-line splice is necessary, before leaving unattended.
- e. Terminate anode header and loop cables at rectifier positive output terminals and anode junction box. Terminate negative return cable at rectifier negative output terminal. Use solderless terminal lugs for conductor terminations. Identify cables using specified wiremarkers, typewritten.
- f. Repair damaged cable insulation by using "Scotchcast" 90-B1 splice kits for #2 and #2/0 AWG cables and "Scotchcast" 82-B1 splice kits for #8 AWG anode lead cables.

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g. Place minimum 3 inches of bedding material, as shown on the Drawings, over cables and compact in accordance with Section 02200.

h. Place 2 inch by 12 inch wood planks, treated in accordance with AWWA C1, C2, and P8, continuous over bedding for entire length of trench. Do not place planks over individual anode leads.

i. Place plastic sheet marker 1 foot below grade directly above wood planks in accordance with Section 02200. Do not place over anode leads.

j. Identify each cable end, with nomenclature as shown on the drawings, typewritten on specified wiremarker.

k. Cover cable ends with plastic electrical tape until ready to be terminated at rectifier, or anode junction box.

l. Cable marker

1) Install directly over cables at locations shown on the Drawings.

2) Install 5 feet from end of cable run and on turns of cable runs. Arrow on marker shall be parallel to cable.

3) Do not place marker in traffic ways. Where cathodic protection cables cross roadways, crossing shall be as shown on Drawings.

3.3.9.2 Connection of negative return and jumper cables to pipe.

a. Connections shall not be made to pipe until pipe has been identified by KEH.

b. Prepare cable and make connections to pipe as shown on the Drawings.

c. If pipes are coated or covered by foam insulation, cut windows large enough to accommodate exothermic weld mold.

d. Connect each conductor section to pipe by exothermic weld process.

e. Insulate weld as shown on the Drawings. Insulate welds on coated pipe in same manner as bare pipe welds. Weld coating material shall overlap existing pipe coating 2 inches, minimum.

f. Make repairs of foam insulation with sprayed polyurethane insulation foam specified in Section 15493.

3.3.10 Conduit: Install PVC coated conduits in accordance with manufacturer's installation instructions and as shown on the Drawings. Cut conduit square, ream and deburr. Damage to PVC coated conduits shall be touched up with "Plastic-Bond" touch-up compound.

3.4 FIELD QUALITY CONTROL

3.4.1 Testing, General

3.4.1.1 Test conductors for continuity where practicable. Resistance values shall be less than 1 ohm. Notify KEH before start of tests. Correct items found during testing or examination to be at variance with the Drawings or Specifications.

3.4.1.2 Furnish instruments, labor and equipment required to conduct testing.

3.4.1.3 Use test instruments which bear valid calibration stamp showing date of calibration and expiration date of stamp. Calibration and accuracy of test instruments shall be certified by independent testing laboratory having standards traceable to the National Bureau of Standards.

3.4.1.4 In addition to testing specified to be performed by Contractor, installation will be subject to examination by KEH for conformance with design and applicable codes.

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9 3 1 2 7 5 0 1 3 6 9

Project No. 16640
 Distributed Waste Disposal Facilities
 Grout Vault Pair (218-E-16-102 and 103)

**KAISER ENGINEERS
 HANFORD**

VENDOR DATA LIST

("X" Indicates Required Data)

1 EPN Identification	2 Description	3 Reference Drawing	4 Specification Paragraph	5 Approval/Data									6 Certified Vendor Information (CVI)							7 Remarks
				Dimensional Drawings	Equipment Weights	Specifications	Material Description	Performance Data	Circuit or Control Diagrams	Data Sheets	Illustrative Cuts	Installation Instructions	Dimensional Drawings	Equipment Weights	Specifications	Certified Test Data	Circuit or Control Diagram	Instructions		
															Installation	Operation	Maintenance			
	Anodes		2.2.1	X	X	X					X		X							
	Anode Junction Box, and Test Station Enclosures		2.2.2		X					X										
	Anode Junction Box Test Station		2.2.3		X					X										
	Reference Electrode		2.2.4		X					X			X							
	Rectifier		2.2.5	X	X	X			X	X		X	X	X	X	X	X	X	X	

B714C2.SP1.1000

END OF SECTION
16640 - 14

B-714-C2
Rev 1

DISTRIBUTION SHEET

To <i>Distribution</i>	From <i>J. R. Briggs</i>	Page <u>1</u> of <u>1</u>
Project Title/Work Order		Date <u>2/6/91</u>
		EDT No.
		ECN No. <u>B714-75</u>

	Name	MSIN	With Attach.	EDT/ECN & Comment	EDT/ECN Only
	<i>J R Briggs</i>	<i>2 R3-27</i>	<i>X</i>		
	<i>RL Trokin</i>	<i>1 S4-43</i>	<i>X</i>		
	<i>K Johnson</i>	<i>1 R4-01</i>	<i>X</i>		
	<i>DL Law</i>	<i>1 R4-01</i>	<i>X</i>		
	<i>DB Powell</i>	<i>2 R4-03</i>	<i>X</i>		
<i>0</i>	<i>AR Jeskechi</i>	<i>1 R4-02</i>	<i>X</i>		
<i>7</i>	<i>K Cordroy</i>	<i>1 S1-54</i>	<i>X</i>		
<i>3</i>	<i>R Chapman</i>	<i>25 E2-70</i>	<i>X</i>		
<i>1</i>	<i>6 Koci</i>	<i>4 E6-31</i>	<i>X</i>		
<i>0</i>	<i>L Gaddis</i>	<i>1 E2-70</i>	<i>X</i>		
<i>6</i>	<i>J Gutierrez</i>	<i>1 R3-27</i>	<i>X</i>		
<i>7</i>	<i>S Hill</i>	<i>1 R4-57</i>	<i>X</i>		
<i>2</i>	<i>D Helverson</i>	<i>1 R3-09</i>	<i>X</i>		
<i>1</i>					
<i>3</i>					
<i>9</i>	<i>L Garza</i>	<i>8 A3-80</i>	<i>X</i>		

ENGINEERING CHANGE NOTICE

Page 1 of 8

1. ECN ~~XXXXXX~~

Proj. ECN B-714-124

2. ECN Category (mark one)		Supplemental <input checked="" type="checkbox"/>	Change ECN <input type="checkbox"/>	Supersedure <input type="checkbox"/>
Cancel/Void <input type="checkbox"/>	Direct Revision <input type="checkbox"/>	Temporary <input type="checkbox"/>	Discovery <input type="checkbox"/>	
3. Originator's Name, Organization, MSIN, and Telephone No. A. R. Snowwhite, KEH, E6-42, 6-0324			4. Date 04-28-92	
5. Project Title/No./Work Order No. B-714, Grouted Waste Disposal Facilities/ER8007		6. Bldg./Sys./Fac. No. 218-E-16		7. Impact Level 3Q /SC-2
8. Document Number Affected (include rev. and sheet no.) See Block 12		9. Related ECN No(s). B-714-098		10. Related PO No. N/A
11a. Modification Work Unknown <input type="checkbox"/> Yes (fill out Blk. 11b) <input type="checkbox"/> No (NA Blks. 11b, 11c, 11d)	11b. Work Package Doc. No. Unknown	11c. Complete Installation Work Cog. Engineer Signature & Date	11d. Complete Restoration (Temp. ECN only) Cog. Engineer Signature & Date	
12. Description of Change Block 8: Drawings H-2-77638 Sh 1, Rev 1 H-2-78504 Sh 1, Rev 1 H-2-77641 Sh 1, Rev 2 H-2-78507 Sh 1, Rev 2 H-2-77642 Sh 1, Rev 2 H-2-78508 Sh 1, Rev 2 H-2-77642 Sh 2, Rev 2 H-2-78508 Sh 2, Rev 2 H-2-77646 Sh 1, Rev 1 H-2-78509 Sh 1, Rev 1 H-2-78510 Sh 1, Rev 1 Specification B-714-C2, Rev 1 (V-B714C2-003)			SC-2: Items as noted on page 3, 4 & 5 SC-3: All other items	
***** DESCRIPTION OF CHANGES ON SUCCEEDING PAGES *****				
13a. Justification (mark one)	Criteria Change <input type="checkbox"/>	Environmental <input type="checkbox"/>	Facilitate Const. <input checked="" type="checkbox"/>	
Design Error/Omission <input checked="" type="checkbox"/>	Design Improvement <input type="checkbox"/>	As-Found <input checked="" type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>	
13b. Justification Details (FC): Manholes selected by contractor are 2 feet larger in length & one-half the price of originally specified manholes (Item 1, 6, & 12B). A TKE 5-5-92 (AF): Erroneous information found on prior project drawings which impacted drawings on this project (Item 5B, 7A, 7B, 10, & 11). Arco Company was purchased by Carder Concrete Products Company (Item 12A). *** JUSTIFICATION DETAILS CONTINUED ON PAGE 3 *** B TKE 5-5-92				
14. Distribution (include name, MSIN, and no. of copies)			RELEASE STAMP	
KEH DISTRIBUTION			OFFICIAL RELEASE BY WHC 13 DATE MAY 08 1992 STA 4	
Const Doc Cntl E2-50				
WHC DISTRIBUTION				
Project Files R1-28				
J. K. Epperley R1-29				
T. K. Cordray S1-54				
S.T.A. 10 A3-87				
S.T.A. 12 72-83				
L. GARZA 16-76				
O. A. Halvorson R3-10				
J. S. Hill [2] H4-57				
K. S. McCullough N1-83				
D. B. Powell [4] R4-03				
T. W. Staehr (PE) R3-27				
J. E. Vanbeek R3-27				
DOE				
A. G. Lassila A5-10				

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ENGINEERING CHANGE NOTICE

15. Design Verification Required <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	16. Cost Impact <table style="width: 100%;"> <tr> <th style="text-align: center;">ENGINEERING</th> <th style="text-align: center;">CONSTRUCTION</th> </tr> <tr> <td>Additional Savings <input checked="" type="checkbox"/> \$ 1917</td> <td>Additional Savings <input checked="" type="checkbox"/> \$ 500</td> </tr> <tr> <td><input type="checkbox"/> \$</td> <td><input type="checkbox"/> \$</td> </tr> </table>	ENGINEERING	CONSTRUCTION	Additional Savings <input checked="" type="checkbox"/> \$ 1917	Additional Savings <input checked="" type="checkbox"/> \$ 500	<input type="checkbox"/> \$	<input type="checkbox"/> \$	17. Schedule Impact (days) Improvement <input type="checkbox"/> Delay <input type="checkbox"/> N/A
ENGINEERING	CONSTRUCTION							
Additional Savings <input checked="" type="checkbox"/> \$ 1917	Additional Savings <input checked="" type="checkbox"/> \$ 500							
<input type="checkbox"/> \$	<input type="checkbox"/> \$							

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	<input type="checkbox"/>	Seismic/Stress Analysis	<input type="checkbox"/>	Tank Calibration Manual	<input type="checkbox"/>
Functional Design Criteria	<input type="checkbox"/>	Stress/Design Report	<input type="checkbox"/>	Health Physics Procedure	<input type="checkbox"/>
Operating Specification	<input type="checkbox"/>	Interface Control Drawing	<input type="checkbox"/>	Spares Multiple Unit Listing	<input type="checkbox"/>
Criticality Specification	<input type="checkbox"/>	Calibration Procedure	<input type="checkbox"/>	Test Procedures/Specification	<input type="checkbox"/>
Conceptual Design Report	<input type="checkbox"/>	Installation Procedure	<input type="checkbox"/>	Component Index	<input type="checkbox"/>
Equipment Spec.	<input type="checkbox"/>	Maintenance Procedure	<input type="checkbox"/>	ASME Coded Item	<input type="checkbox"/>
Const. Spec.	<input type="checkbox"/>	Engineering Procedure	<input type="checkbox"/>	Human Factor Consideration	<input type="checkbox"/>
Procurement Spec.	<input type="checkbox"/>	Operating Instruction	<input type="checkbox"/>	Computer Software	<input type="checkbox"/>
Vendor Information	<input type="checkbox"/>	Operating Procedure	<input type="checkbox"/>	Electric Circuit Schedule	<input type="checkbox"/>
OM Manual	<input type="checkbox"/>	Operational Safety Requirement	<input type="checkbox"/>	ICRS Procedure	<input type="checkbox"/>
FSAR/SAR	<input type="checkbox"/>	IEFD Drawing	<input type="checkbox"/>	Process Control Manual/Plan	<input type="checkbox"/>
Safety Equipment List	<input type="checkbox"/>	Cell Arrangement Drawing	<input type="checkbox"/>	Process Flow Chart	<input type="checkbox"/>
Radiation Work Permit	<input type="checkbox"/>	Essential Material Specification	<input type="checkbox"/>	Purchase Requisition	<input type="checkbox"/>
Environmental Impact Statement	<input type="checkbox"/>	Fac. Proc. Samp. Schedule	<input type="checkbox"/>		<input type="checkbox"/>
Environmental Report	<input type="checkbox"/>	Inspection Plan	<input type="checkbox"/>		<input type="checkbox"/>
Environmental Permit	<input type="checkbox"/>	Inventory Adjustment Request	<input type="checkbox"/>		<input type="checkbox"/>

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
--------------------------	--------------------------	--------------------------

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog./Project Engineer <i>M. Stahl</i>	5-7-92	PE <i>C. B. K. H.</i>	5/7/92
Cog./Project Engr. Mgr. <i>R. Van Beek</i>	5/7/92	QA <i>B. L. Gillon</i>	5/7/92
QA <i>D. K. Barclay</i>	5-7-92	Safety <i>J. Lundgren</i>	5-6-92
Safety		Design ELEC: <i>G. R. Snowhite</i>	5-1-92
Security		Other ENVIR: <i>P. H. H. H.</i>	5-5-92
Proj. Prog./Dept. Mgr.		PLE: <i>A. R. Koci</i>	5-5-92
Def. React. Div.		CQA: <i>J. A. Adels</i>	5-7-92
Chem. Proc. Div.			-
Def. Wst. Mgmt. Div.		DEPARTMENT OF ENERGY	
Adv. React. Dev. Div.			
Proj. Dept.		ADDITIONAL	
Environ. Div.			
IRM Dept.			
Facility Rep. (Ops.)			
Other			

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Block 13b (Justification Details) continued:

(DE): Information inadvertently deleted from drawings when revised (Item 2, 3, 4A, 4C, 8, 9A, & 9C). (DE): Item 4B, 5A, 7C, & 9B.

CHANGES MADE TO SAFETY CLASS 2 ITEMS DO NOT IMPACT THE INTEGRITY OF THE ORIGINAL FACILITY DESIGN.

Beginning of Block 12 (Description of Changes):

1) H-2-77638, SH 1, REV 1

(sc-2) A) (Z D7): Add below words "TYPICAL MANHOLE EXTERIOR WALL" the words:
(DIMENSIONS ARE MINIMUM REQUIRED)

(sc-2) B) (Z E3-4): Add below words "TYPICAL MANHOLE COVER PLAN" the words:
(DIMENSIONS ARE MINIMUM REQUIRED)

(sc-2) C) Manhole Table (Z B5-6): Delete " 6' x 6' x 7' " from title AND delete
" 46"OD x " from Item 3.

(sc-2) D) (Z E6, F7 & E7): Near the 6'-0" dimension -
DELETE the 7'-0" manhole width dimension AND
CHANGE the 6" (TYP) wall thickness dimension to 5" (TYP)
ALSO, DELETE 12" DIA from the manhole sump callout.

2) H-2-77641, SH 1, REV 2

GWD 80:

- Change NUMBER OF WIRES from "3/C" to "4/C"
- Add "GND" to WIRE NUMBERS

3) H-2-77642, SH 1, REV 2

A) ADD Leachate Sump Temperature to Connector Schedule as shown on page 6 of this ECN.

B) ADD Leachate Sump Temperature to Connector Termination Chart as shown on page 7 of this ECN.

4) H-2-77642, SH 2, REV 2

A) ADD Leachate Sump Temperature to Connector Schedule as shown on page 6 of this ECN.

(sc-2) B) Change EQUIPMENT CONN TYPE in Connector Schedule for Leachate Pit Leak from
"CA-3101E-..." to "CA-3102E-..."

C) ADD Leachate Sump Temperature to Connector Termination Chart as shown on page 7 of this ECN.

93127601373

5) H-2-77646, SH 1, REV 1

- A) Detail 4 (Z C8): Change " 2 #12,... " to " 3 #12,... "
- B) Note 3: Change first sentence to read " ... CIRCUIT SPACE 9." to " ...CIRCUIT SPACES 7, 9 & 11. "

6) H-2-78504, SH 1, REV 1

- (sc-2) A) (Z D7): Add below the word (TYPICAL) the words:
(DIMENSIONS ARE MINIMUM REQUIRED)
- (sc-2) B) (Z E3): Add below the word (TYPICAL) the words:
(DIMENSIONS ARE MINIMUM REQUIRED)
- (sc-2) C) Manhole Table (Z B6): Delete " 46"OD x " from Item 3.
- (sc-2) D) (Z E6, F7 & E7): Near the 6'-0" dimension -
DELETE the 7'-0" manhole width dimension AND
CHANGE the 6" (TYP) wall thickness dimension to 5" (TYP)
ALSO, DELETE 12" DIA from the manhole sump callout.

7) H-2-78507, SH 1, REV 2

- A) GWD 126:
· FROM column: Change "(CIRCUIT 9)" to "(CIRCUIT 7)"
· WIRE NUMBERS: Change "...-9A,-9B,-9C..." to "...-7A,-7B,-7C..."
- B) GWD 148: Change WIRE NUMBERS "...-9A,-9B,-9C..." to "...-7A,-7B,-7C..."
- C) CONDUIT SCHEDULE:
· Delete "GWD 137," from C95
· Delete "GWD 147," from C96

8) H-2-78508, SH 1, REV 2

- A) ADD Leachate Sump Temperature to Connector Schedule as shown on page 6 of this ECN.
- B) ADD Leachate Sump Temperature to Connector Termination Chart as shown on page 7 of this ECN.

9) H-2-78508, SH 2, REV 2

- A) ADD Leachate Sump Temperature to Connector Schedule as shown on page 6 of this ECN.
- (sc-2) B) Change EQUIPMENT CONN TYPE in Connector Schedule for Leachate Pit Leak from "CA-3101E-..." to "CA-3102E-..."
- C) ADD Leachate Sump Temperature to Connector Termination Chart as shown on page 7 of this ECN.

10) H-2-78509, SH 1, REV 1

MANHOLE 103A, POWER TERMINAL BOX (Z D4): On TB2, change wire number suffixes from "9A", "9B", "9C" to "7A", "7B", "7C" respectively.

11) H-2-78510, SH 1, REV 1

ONE LINE DIAGRAM (Z C1-F3): Replace with new one line diagram as shown on page 8 of this ECN.

12) SPECIFICATION B-714-C2

(sc-2) A) SECTION 01400, APPENDIX A (Affects ECN B-714-098, page 3):
Change the columns for Manholes as follows:

Item Description: Delete "ARCO #6060-7"

Acceptance Value: Delete "Catalog No."

Method of Verification: Delete ALL the words after "Test:" and add "Verify dimensions agree with those shown on Typical Manhole Exterior Wall Elevation as shown on the drawings."

(sc-2) B) SECTION 16300, PARAGRAPH 2.2.5: Change "Arco Concrete, Inc Cat. No. 6060-7" to "Carder Concrete Products, Cat. No. 6060-7 or approved substitute"

REGISTERED ENGINEER REVIEW - ELEC ONLY (All Items)



EXPIRES 5/31/94

93127601375

Ref. Dwg. H-2-77642	Sh. 1	Rev. 2	Prepared By TE COYNE	Checked By L. D. JOHNSON	ECN No. B-714-124	Page 5/8
H-2-77642	2	2				
H-2-78508	1	2				
H-2-78508	2	2				

CONNECTOR SCHEDULE

EQUIPMENT				CONNECTING CABLE			MENT
DEVICE	NAME	CONN NO	CONN TYPE	CABLE NO	CONN NO		CONN TYPE
LEACHATE SUMP TEMPERATURE	TE-LS-1A/2A TE-LS-102-1B/2B	J-I-TE-LS-102-1A/2A-1	PV-72L18-32SL W/ CAP & CHAIN SEE NOTE 3	I-Y-TE-LS-1A/2A		← BY OTHERS →	

H-2-77642, SH 1

CONNECTOR SCHEDULE

EQUIPMENT				CONNECTING CABLE			MENT
DEVICE	NAME	CONN NO	CONN TYPE	CABLE NO	CONN NO		CONN TYPE
LEACHATE SUMP TEMPERATURE	TE-LS-1A/2A TE-LS-103-1B/2B	J-I-TE-LS-103-1A/2A-1	PV-72L18-32SL W/ CAP & CHAIN SEE NOTE 3	I-Y-TE-LS-1A/2A		← BY OTHERS →	

H-2-77642, SH 2

CONNECTOR SCHEDULE

EQUIPMENT				CONNECTING CABLE			MENT
DEVICE	NAME	CONN NO	CONN TYPE	CABLE NO	CONN NO		CONN TYPE
LEACHATE SUMP TEMPERATURE	TE-LS-1A/2A TE-LS-104-1B/2B	J-I-TE-LS-104-1A/2A-1	PV-72L18-32SL W/ CAP & CHAIN SEE NOTE 3	I-Y-TE-LS-1A/2A		← BY OTHERS →	

H-2-78508, SH 1

CONNECTOR SCHEDULE

EQUIPMENT				CONNECTING CABLE			MENT
DEVICE	NAME	CONN NO	CONN TYPE	CABLE NO	CONN NO		CONN TYPE
LEACHATE SUMP TEMPERATURE	TE-LS-1A/2A TE-LS-105-1B/2B	J-I-TE-LS-105-1A/2A-1	PV-72L18-32SL W/ CAP & CHAIN SEE NOTE 3	I-Y-TE-LS-1A/2A		← BY OTHERS →	

H-2-78508, SH 2

93127601376

Ref. Dwg. H-2-77642	Sh. 1	Rev. 2	Prepared By TE COYNE	Checked By L. D. JOHNSON	ECN No. B-714-124	Page 7/5
H-2-77642	2	2				
H-2-78508	1	2				
H-2-78508	2	2				

			CONNECTOR TERMINATION CHART									
DEVICE	CONNECTOR NO	WIRE PREFIX NO	A	B	C	D	E	F	G	H	J	K
LEACHATE SUMP TEMPERATURE	J-I-TE-LS-102-1A/2A-1	TE-LS	1(+)	1(-)	2(+)	2(-)	SP-3(+)	SP-3(-)	SP-4(+)	SP-4(-)		

H-2-77642, SH 1

			CONNECTOR TERMINATION CHART									
DEVICE	CONNECTOR NO	WIRE PREFIX NO	A	B	C	D	E	F	G	H	J	K
LEACHATE SUMP TEMPERATURE	J-I-TE-LS-103-1A/2A-1	TE-LS	1(+)	1(-)	2(+)	2(-)	SP-3(+)	SP-3(-)	SP-4(+)	SP-4(-)		

H-2-77642, SH 2

			CONNECTOR TERMINATION CHART									
DEVICE	CONNECTOR NO	WIRE PREFIX NO	A	B	C	D	E	F	G	H	J	K
LEACHATE SUMP TEMPERATURE	J-I-TE-LS-104-1A/2A-1	TE-LS	1(+)	1(-)	2(+)	2(-)	SP-3(+)	SP-3(-)	SP-4(+)	SP-4(-)		

H-2-78508, SH 1

			CONNECTOR TERMINATION CHART									
DEVICE	CONNECTOR NO	WIRE PREFIX NO	A	B	C	D	E	F	G	H	J	K
LEACHATE SUMP TEMPERATURE	J-I-TE-LS-105-1A/2A-1	TE-LS	1(+)	1(-)	2(+)	2(-)	SP-3(+)	SP-3(-)	SP-4(+)	SP-4(-)		

H-2-78508, SH 2

93127601377

Ref. Dwg.
H-2-78510

Sh.
1

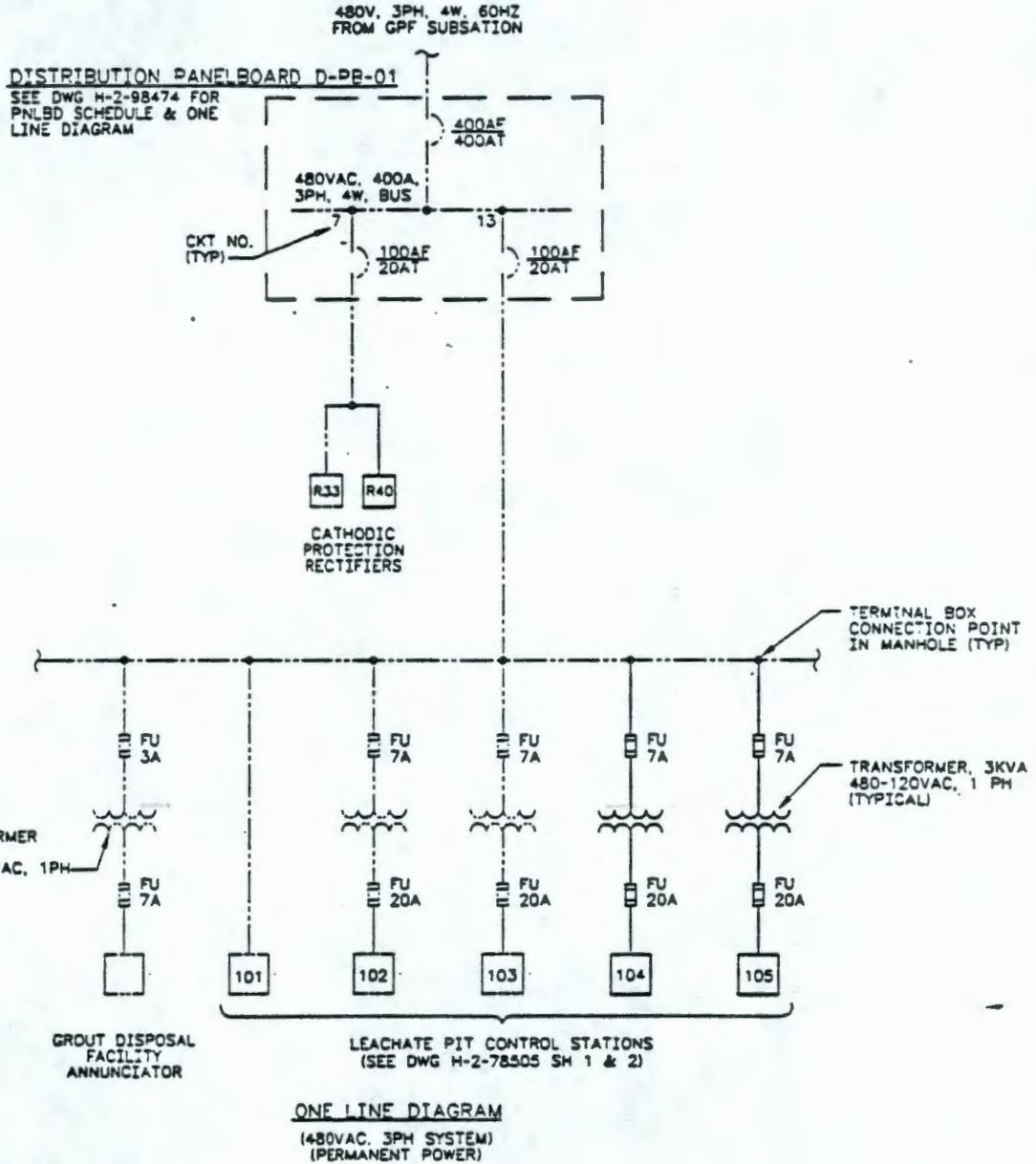
Rev.
1

Prepared By
TE COYNE

Checked By
L.D. JOHNSON

ECN No.
B-714-124

Page
8/8



93127601378

ENGINEERING CHANGE NOTICE

15. Design Verification Required <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	16. Cost Impact				17. Schedule Impact (days) Improvement <input type="checkbox"/> Delay <input type="checkbox"/> N/A
	ENGINEERING	CONSTRUCTION			
	Additional Savings	<input checked="" type="checkbox"/> \$ 1917 <input type="checkbox"/> \$	Additional Savings	<input checked="" type="checkbox"/> \$ 500 <input type="checkbox"/> \$	

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog./Project Engineer <i>M. Stahl</i>	5-7-92	PE <i>C. B. Hill</i>	5/7/92
Cog./Project Engr. Mgr. <i>B. Van Beek</i>	5/7/92	QA <i>B. R. Sullivan</i>	5/7/92
QA <i>D. K. Cerdony</i>	5-7-92	Safety <i>D. Lundgren</i>	5-6-92
Safety	_____	Design ELEC: <i>G. R. ...</i>	5-1-92
Security	_____	Other ENVIR: <i>B. ...</i>	5-5-92
Proj. Prog./Dept. Mgr.	_____	PLE: <i>A. ...</i>	5-5-92
Def. React. Div.	_____	CQA: <i>L. ...</i>	5-7-92
Chem. Proc. Div.	_____		
Def. Wst. Mgmt. Div.	_____	DEPARTMENT OF ENERGY	
Adv. React. Dev. Div.	_____		
Proj. Dept.	_____	ADDITIONAL	
Environ. Div.	_____		
IRM Dept.	_____		
Facility Rep. (Ops.)	_____		
Other	_____		

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Block 13b (Justification Details) continued:

(DE): Information inadvertently deleted from drawings when revised (Item 2, 3, 4A, 4C, 8, 9A, & 9C). (DE): Item 4B, 5A, 7C, & 9B.

CHANGES MADE TO SAFETY CLASS 2 ITEMS DO NOT IMPACT THE INTEGRITY OF THE ORIGINAL FACILITY DESIGN.

Beginning of Block 12 (Description of Changes):1) H-2-77638, SH 1, REV 1

(sc-2) A) (Z D7): Add below words "TYPICAL MANHOLE EXTERIOR WALL" the words:
(DIMENSIONS ARE MINIMUM REQUIRED)

(sc-2) B) (Z E3-4): Add below words "TYPICAL MANHOLE COVER PLAN" the words:
(DIMENSIONS ARE MINIMUM REQUIRED)

(sc-2) C) Manhole Table (Z B5-6): Delete " 6' x 6' x 7' " from title AND delete
" 46"OD x " from Item 3.

(sc-2) D) (Z E6, F7 & E7): Near the 6'-0" dimension -
DELETE the 7'-0" manhole width dimension AND
CHANGE the 6" (TYP) wall thickness dimension to 5" (TYP)
ALSO, DELETE 12" DIA from the manhole sump callout.

2) H-2-77641, SH 1, REV 2

GWD 80:

- Change NUMBER OF WIRES from "3/C" to "4/C"
- Add "GND" to WIRE NUMBERS

3) H-2-77642, SH 1, REV 2

A) ADD Leachate Sump Temperature to Connector Schedule as shown on page 6 of this ECN.

B) ADD Leachate Sump Temperature to Connector Termination Chart as shown on page 7 of this ECN.

4) H-2-77642, SH 2, REV 2

A) ADD Leachate Sump Temperature to Connector Schedule as shown on page 6 of this ECN.

(sc-2) B) Change EQUIPMENT CONN TYPE in Connector Schedule for Leachate Pit Leak from
"CA-3101E-..." to "CA-3102E-..."

C) ADD Leachate Sump Temperature to Connector Termination Chart as shown on page 7 of this ECN.

5) H-2-77646, SH 1, REV 1

- A) Detail 4 (Z C8): Change " 2 #12,... " to " 3 #12,... "
- B) Note 3: Change first sentence to read " ... CIRCUIT SPACE 9." to " ...CIRCUIT SPACES 7, 9 & 11. "

6) H-2-78504, SH 1, REV 1

- (sc-2) A) (Z D7): Add below the word (TYPICAL) the words:
(DIMENSIONS ARE MINIMUM REQUIRED)
- (sc-2) B) (Z E3): Add below the word (TYPICAL) the words:
(DIMENSIONS ARE MINIMUM REQUIRED)
- (sc-2) C) Manhole Table (Z B6): Delete " 46"OD x " from Item 3.
- (sc-2) D) (Z E6, F7 & E7): Near the 6'-0" dimension -
DELETE the 7'-0" manhole width dimension AND
CHANGE the 6" (TYP) wall thickness dimension to 5" (TYP)
ALSO, DELETE 12" DIA from the manhole sump callout.

7) H-2-78507, SH 1, REV 2

- A) GWD 126:
· FROM column: Change "(CIRCUIT 9)" to "(CIRCUIT 7)"
· WIRE NUMBERS: Change "...-9A,-9B,-9C..." to "...-7A,-7B,-7C..."
- B) GWD 148: Change WIRE NUMBERS "...-9A,-9B,-9C..." to "...-7A,-7B,-7C..."
- C) CONDUIT SCHEDULE:
· Delete "GWD 137," from C95
· Delete "GWD 147," from C96

8) H-2-78508, SH 1, REV 2

- A) ADD Leachate Sump Temperature to Connector Schedule as shown on page 6 of this ECN.
- B) ADD Leachate Sump Temperature to Connector Termination Chart as shown on page 7 of this ECN.

9) H-2-78508, SH 2, REV 2

- A) ADD Leachate Sump Temperature to Connector Schedule as shown on page 6 of this ECN.
- (sc-2) B) Change EQUIPMENT CONN TYPE in Connector Schedule for Leachate Pit Leak from "CA-3101E-..." to "CA-3102E-..."
- C) ADD Leachate Sump Temperature to Connector Termination Chart as shown on page 7 of this ECN.

10) H-2-78509, SH 1, REV 1

MANHOLE 103A, POWER TERMINAL BOX (Z D4): On TB2, change wire number suffixes from "9A", "9B", "9C" to "7A", "7B", "7C" respectively.

11) H-2-78510, SH 1, REV 1

ONE LINE DIAGRAM (Z C1-F3): Replace with new one line diagram as shown on page 8 of this ECN.

12) SPECIFICATION B-714-C2

(sc-2) A) SECTION 01400, APPENDIX A (Affects ECN B-714-098, page 3):
Change the columns for Manholes as follows:

Item Description: Delete "ARCO #6060-7"

Acceptance Value: Delete "Catalog No."

Method of Verification: Delete ALL the words after "Test:" and add "Verify dimensions agree with those shown on Typical Manhole Exterior Wall Elevation as shown on the drawings."

(sc-2) B) SECTION 16300, PARAGRAPH 2.2.5: Change "Arco Concrete, Inc Cat. No. 6060-7" to "Carder Concrete Products, Cat. No. 6060-7 or approved substitute"

REGISTERED ENGINEER REVIEW - ELEC ONLY (All Items)

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EXPIRES 5/31/94

Ref. Dwg. H-2-77642	Sh. 1	Rev. 2	Prepared By TE COYNE	Checked By L. D. JOHNSON	ECN No. B-714-124	Page 6/8
H-2-77642	2	2				
H-2-78508	1	2				
H-2-78508	2	2				

CONNECTOR SCHEDULE

EQUIPMENT				CONNECTING CABLE			MENT
DEVICE	NAME	CONN NO	CONN TYPE	CABLE NO	CONN NO		CONN TYPE
LEACHATE SUMP TEMPERATURE	TE-LS-1A/2A TE-LS-102-1B/2B	J-I-TE-LS-102-1A/2A-1	PV-72L18-32SL W/ CAP & CHAIN SEE NOTE 3	I-Y-TE-LS-1A/2A		← BY OTHERS →	

H-2-77642, SH 1

CONNECTOR SCHEDULE

EQUIPMENT				CONNECTING CABLE			MENT
DEVICE	NAME	CONN NO	CONN TYPE	CABLE NO	CONN NO		CONN TYPE
LEACHATE SUMP TEMPERATURE	TE-LS-1A/2A TE-LS-103-1B/2B	J-I-TE-LS-103-1A/2A-1	PV-72L18-32SL W/ CAP & CHAIN SEE NOTE 3	I-Y-TE-LS-1A/2A		← BY OTHERS →	

H-2-77642, SH 2

CONNECTOR SCHEDULE

EQUIPMENT				CONNECTING CABLE			MENT
DEVICE	NAME	CONN NO	CONN TYPE	CABLE NO	CONN NO		CONN TYPE
LEACHATE SUMP TEMPERATURE	TE-LS-1A/2A TE-LS-104-1B/2B	J-I-TE-LS-104-1A/2A-1	PV-72L18-32SL W/ CAP & CHAIN SEE NOTE 3	I-Y-TE-LS-1A/2A		← BY OTHERS →	

H-2-78508, SH 1

CONNECTOR SCHEDULE

EQUIPMENT				CONNECTING CABLE			MENT
DEVICE	NAME	CONN NO	CONN TYPE	CABLE NO	CONN NO		CONN TYPE
LEACHATE SUMP TEMPERATURE	TE-LS-1A/2A TE-LS-105-1B/2B	J-I-TE-LS-105-1A/2A-1	PV-72L18-32SL W/ CAP & CHAIN SEE NOTE 3	I-Y-TE-LS-1A/2A		← BY OTHERS →	

H-2-78508, SH 2

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Ref. Dwg. H-2-77642	Sh. 1	Rev. 2	Prepared By TE COYNE	Checked By L. D. JOHNSON	ECN No. B-714-124	Page 7/5
H-2-77642	2	2				
H-2-78508	1	2				
H-2-78508	2	2				

			CONNECTOR TERMINATION CHART									
DEVICE	CONNECTOR NO	WIRE PREFIX NO	A	B	C	D	E	F	G	H	J	K
LEACHATE SUMP TEMPERATURE	J-I-TE-LS-102-1A/2A-1	TE-LS	1(+)	1(-)	2(+)	2(-)	SP-3(+)	SP-3(-)	SP-4(+)	SP-4(-)		

H-2-77642, SH 1

			CONNECTOR TERMINATION CHART									
DEVICE	CONNECTOR NO	WIRE PREFIX NO	A	B	C	D	E	F	G	H	J	K
LEACHATE SUMP TEMPERATURE	J-I-TE-LS-103-1A/2A-1	TE-LS	1(+)	1(-)	2(+)	2(-)	SP-3(+)	SP-3(-)	SP-4(+)	SP-4(-)		

H-2-77642, SH 2

			CONNECTOR TERMINATION CHART									
DEVICE	CONNECTOR NO	WIRE PREFIX NO	A	B	C	D	E	F	G	H	J	K
LEACHATE SUMP TEMPERATURE	J-I-TE-LS-104-1A/2A-1	TE-LS	1(+)	1(-)	2(+)	2(-)	SP-3(+)	SP-3(-)	SP-4(+)	SP-4(-)		

H-2-78508, SH 1

			CONNECTOR TERMINATION CHART									
DEVICE	CONNECTOR NO	WIRE PREFIX NO	A	B	C	D	E	F	G	H	J	K
LEACHATE SUMP TEMPERATURE	J-I-TE-LS-105-1A/2A-1	TE-LS	1(+)	1(-)	2(+)	2(-)	SP-3(+)	SP-3(-)	SP-4(+)	SP-4(-)		

H-2-78508, SH 2

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Ref. Dwg.
H-2-78510

Sh.
1

Rev.
1

Prepared By
TE COYNE

Checked By
L.D. JOHNSON

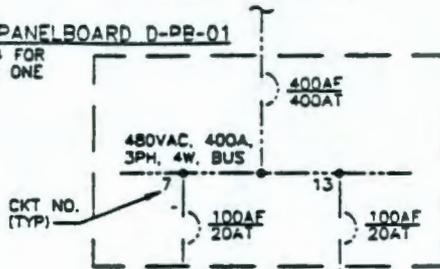
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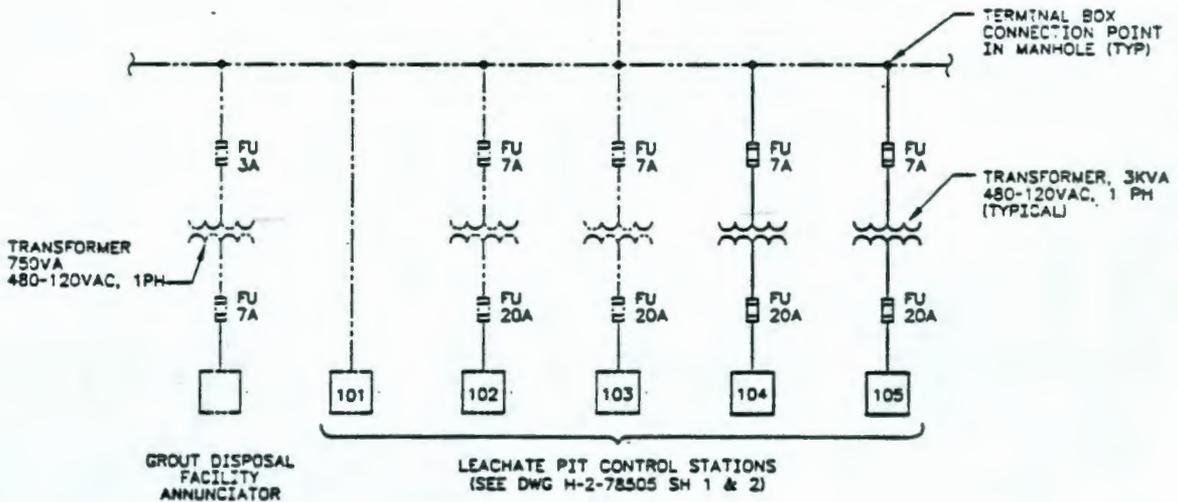
DISTRIBUTION PANELBOARD D-PB-01

SEE DWG H-2-98474 FOR
PNLBD SCHEDULE & ONE
LINE DIAGRAM

480V, 3PH, 4W, 60HZ
FROM GPF SUBSTATION



CATHODIC
PROTECTION
RECTIFIERS



ONE LINE DIAGRAM

(480VAC, 3PH SYSTEM)
(PERMANENT POWER)

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