

FLUOR

**Combined Technical Specifications
For
Soil and Disposal Facility Project
Area 3B/4B/5 Remediation**

**Excavation for Remediation
Technical Specifications
Document 20300-TS-0001
Revision E**

**Area 4B Dewatering
Technical Specifications
Document 20810-TS-0001
Revision A**

September 2002

**U.S. DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

Fluor Fernald
P.O. Box 538704
Cincinnati, OH 45253-8704

000001

710A

4517

5-203.50

FLUOR

**Technical Specifications
For
Soil and Disposal Facility Project
Excavation For Remediation**

**Document 20300-TS-0001
Revision E**

September 2002

PREPARED BY: _____

CHECKED BY: _____

APPROVED BY: _____

**U.S. DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

Fluor Fernald
P.O. Box 538704
Cincinnati, OH 45253-8704

U.S. DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Excavation For Remediation Technical Specifications

Technical specifications contained in this document detail requirements for soil excavation projects performed under the Soils and Disposal Facility Project. Technical specifications referenced, but not contained herein, are provided in On-Site Disposal Facility (OSDF) technical specification packages. The Legend and General Notes drawing within each excavation design package identify the applicable OSDF technical specification package document.

TABLE OF CONTENTS

SECTION	TITLE	REV.	DATE
02150	Traffic Control	E	9/27/02
02205	Impacted Material Excavation	E	9/27/02
02206	Earthwork for Remediation	E	9/27/02
02207	Area Isolation Trenching	E	9/27/02
02275	Surface Water Management and Erosion Control for Remediation	E	9/27/02

REFERENCED OSDF SPECIFICATIONS

02100	Surveying	1	03/13/02
02200	Earthwork	1	03/13/02
02215	Trenching and Backfilling	1	03/13/02
02230	Road Construction	1	03/13/02
02270	Surface Water Management and Erosion Control	1	03/13/02
02930	Vegetation	1	03/13/02

000003

SPECIFICATION REVISION RECORD

Spec. No./Rev.	Description	Approval	Date
02150, Rev.A	Issue for 30% design review	DRR	5/23/02
02150, Rev B	Issue for 90% A2PII design review	DRR	6/24/02
02150, Rev C	Issue for 90% SWL/FTF design review	DRR	7/16/02
02150, Rev D	Re-issue for 90% SWL/FTF and 90% 3B/4B/5 design reviews	DRR	8/13/02
02150, Rev E	Issue for 100% 3B/4B/5 design review	DRR	9/27/02
02205, Rev.A	Issue for 30% design review	DRR	5/23/02
02205, Rev B	Issue for 90% A2PII design review	DRR	6/24/02
02205, Rev C	Issue for 90% SWL/FTF design review	DRR	7/16/02
02205, Rev D	Re-issue for 90% SWL/FTF and 90% 3B/4B/5 design reviews	DRR	8/13/02
02205, Rev E	Issue for 100% 3B/4B/5 design review	DRR	9/27/02
02206, Rev.A	Issue for 30% design review	DRR	5/23/02
02206, Rev B	Issue for 90% A2PII design review	DRR	6/24/02
02206, Rev C	Issue for 90% SWL/FTF design review	DRR	7/16/02
02206, Rev D	Re-issue for 90% SWL/FTF and 90% 3B/4B/5 design reviews	DRR	8/13/02
02206, Rev E	Issue for 100% 3B/4B/5 design review	DRR	9/27/02
02207, Rev.A	Issue for 30% design review	DRR	5/23/02
02207, Rev B	Issue for 90% A2PII design review	DRR	6/24/02
02207, Rev C	Issue for 90% SWL/FTF design review	DRR	7/16/02
02207, Rev D	Re-issue for 90% SWL/FTF and 90% 3B/4B/5 design reviews	DRR	8/13/02
02207, Rev E	Issue for 100% 3B/4B/5 design review	DRR	9/27/02
02210	Deleted in favor of project-specific ACM work plans	DRR	8/13/02
02275, Rev.A	Issue for 30% design review	DRR	5/23/02
02275, Rev B	Issue for 90% A2PII design review	DRR	6/24/02
02275, Rev C	Issue for 90% SWL/FTF design review	DRR	7/16/02
02275, Rev D	Re-issue for 90% SWL/FTF and 90% 3B/4B/5 design reviews	DRR	8/13/02
02275, Rev E	Issue for 100% 3B/4B/5 design review	DRR	9/27/02

000004

SECTION 02150
TRAFFIC CONTROL

PART 1 GENERAL

1.1 SCOPE

- A. This Section includes the traffic control requirements for the excavation areas, Special Materials Transfer Area (SMTA), Stockpile 7 (SP-7) and movement between the following: On-Site Disposal Facility (OSDF), OSDF Material Transfer Areas (OMTA), Bulk Material Transfer Area (BMTA), OSDF borrow area, and designated project operational limits. (Requirements for traffic control within the OSDF and OSDF borrow area are contained in the IMPP and the OSDF Borrow Area Management and Restoration Work Plan.)

1.2 RELATED SECTIONS AND DOCUMENTS

- A. Section 02200 - Earthwork
- B. Section 02205 - Impacted Material Excavation.
- C. Section 02206 - Earthwork for Remediation.

1.3 REFERENCES

- A. Manual of Uniform Traffic Control Devices (MUTCD) for Streets and Highways, current edition.
- B. State of Ohio, Department of Transportation (ODOT): Construction and Material Specifications, current edition.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide materials for traffic control, including stop and yield signs conforming to MUTCD and ODOT specifications.
- B. Provide fencing as specified in Section 02200.

PART 3 EXECUTION

3.1 TRAFFIC CONTROL

- A. Supply, install, and maintain traffic control devices.
- B. Maintain speed limit of construction vehicles and equipment per postings and specific requirements stated in the Construction Traveler Package.

- C. Ensure that haul equipment or other equipment traveling between certified and non-certified areas, remains on roads constructed of certified material. Perform wheel-wash activities and decontamination as necessary. The Construction Manager will arrange for radiological monitoring in accordance with Section 02205.
- D. Provide entry points to the excavation area free of interference from non-project operations. Ensure that traffic entering haul roads yields to traffic already on the road.
- E. Ensure that traffic routes are acceptable for use (stable) daily and after an event (rain) that may have altered the condition of the route.
- F. Routes that cause equipment and/or vehicles to operate on inclines shall be evaluated and operational limits stated.

3.2 IMPACTED MATERIAL HAUL ROAD

- A. Control the Impacted Material Haul Road (IMHR) as a contamination area during excavation and hauling of above-WAC materials. The Construction Manager must approve IMHR crossings from controlled areas.
- B. The Construction Manager may post or reclassify road crossing intersections with the IMHR during periods of inactivity.

3.3 UTILITY CROSSINGS

- A. Protect energized or active utility lines outside of existing paved areas that intersect proposed traffic routes. Use a 1 inch thick steel plate or an equivalent alternative. Provide length and width of steel plates as required to protect the existing utilities.

3.4 EQUIPMENT PARKING

- A. OSDF Contractor Administration Area
 - 1. Provide non-contaminated equipment parking areas within the OSDF Contractor Administration Area.
 - 2. Restrict personal vehicles from the equipment parking areas.
 - 3. Provide personnel parking at the OSDF Contractor Administration Area.
- B. Contaminated Equipment Parking Area
 - 1. Locate the contaminated equipment parking area as close as possible to the Radiological Control Point Facility.
 - 2. Maintain contaminated equipment parking areas free of mud, debris and standing water.
 - 3. Park contaminated equipment utilized in the SP-7 area, or above-WAC areas at the boundary of the area, in accordance with Section 02205, until decontaminated and released from the area.

- C. Parking areas shall be constructed to insure that personnel accessing and servicing the vehicles shall have stable footing. The use of rip rap and other like materials is not acceptable.

END OF SECTION

SECTION 02205
IMPACTED MATERIAL EXCAVATION

45 17

7102

PART 1 GENERAL

1.1 SCOPE

- A. This Section includes the requirements for excavating, size-reducing, segregating, stockpiling, loading, hauling, and unloading impacted material. Activities include, but are not limited to, the following:
1. Excavation of impacted materials to the design grade.
 2. Segregation of impacted materials for disposition or reuse.
 3. Size reduction of remaining structures, utilities, and miscellaneous debris.
 4. Loading, hauling and unloading of impacted materials to appropriate disposition.
 5. Development and maintenance of project stockpiles.
 6. Support of site monitoring and sampling activities.
 7. Performance of area management activities.
 8. Supplemental excavation beyond the design grade.
 9. Excavation of utilities below the design grade.

1.2 RELATED SECTIONS AND DOCUMENTS

- A. Section 02100 – Surveying.
- B. Section 02150 – Traffic Control.
- C. Section 02200 – Earthwork.
- D. Section 02206 – Earthwork for Remediation.
- E. Section 02210 – Asbestos Containing Material (ACM).
- F. Section 02230 – Road Construction.
- G. Section 02275 – Surface Water Management and Erosion Control for Remediation.
- H. Section 02930 – Vegetation.
- I. Impacted Materials Placement Plan (IMPP), On Site Disposal Facility (OSDF), 20100-PL-007, current revision.

1.3 REFERENCES

- A. Title 29, Code of Federal Regulations (CFR): 29 CFR 1926 Subpart P – Excavation, current edition.

- 5.1 (B) Waste Acceptance Criteria (WAC) Attainment Plan for On Site Disposal Facility (OSDF),
20100-PL-0014, current revision.

1.4 DEFINITIONS

45 17

- A. Active Stockpile: A stockpile specifically designed to operate for longer than 45 calendar days. This includes interim stockpiles that are older than 45 days and existing stockpiles shown on the Construction Drawings.
- B. Debris: Impacted material that is generated during the excavation and removal of building structures, utilities, miscellaneous man-made materials, and natural materials. These materials include floor slabs; foundation walls; foundations; piers; footings; hydraulic ram casings; structural steel, re-bar and miscellaneous metal; electrical duct-bank, manholes, electrical wiring, and power poles; remaining equipment and miscellaneous mechanical items; chain link and other fencing; agricultural drain tiles; and rock, asphaltic pavement, and other aggregate materials not defined as Special Materials.
- C. Design Grade: Grade created by excavation of impacted material to the lines and grades shown on Construction Drawings.
- D. Final Remediation Levels (FRLs): The permissible concentration of contaminants that may remain in site soil and sediment following completion of remedial actions.
- E. Hazardous Waste Management Unit (HWMU): Area shown on the Drawings that has contained hazardous or mixed waste.
- F. Impacted Material: Soil with contamination levels above the established FRLs or man-made materials. Impacted materials associated with soil excavation projects are presented in Table 02205-1.
- G. Interim Stockpile: An impacted material project stockpile that is intended to be dispositioned in less than 45 calendar days.
- H. Process Piping: Piping that is more likely to contain contaminated residue based on process knowledge of previous excavation activities (i.e. sanitary, effluent, or sump liquor lines).
- I. Real-time Monitoring: Consists of several alternative methods of utilizing in-situ gamma spectroscopy, to analyze contaminant levels on the excavation surface.
- J. Special Materials: Impacted material requiring special handling as specified in this Section and presented in Table 02205-1.
- K. Supplemental Excavation: Removal of impacted material encountered beyond design grade.
- L. Underground Storage Tank (UST): Tank that was used to contain an accumulation of a regulated substance, of which the volume was 10 percent or more beneath the ground surface.

- M. WAC: Waste acceptance criteria (WAC) for disposition of material at the OSDF as defined by the WAC Attainment Plan. This WAC includes radiological/chemical criteria for soil, physical criteria for debris, and criteria for ancillary remediation waste (i.e., analytical sample returns, PPE).

1.5 SUBMITTALS

- A. Maintain a daily record of underground utilities that have been excavated from below the design grade, in the form of a redline drawing mark-up, for review by the Project Engineer every 30 days following the start of excavation beyond the design grade.
- B. Submit calculations certified by a registered Professional Engineer ensuring slope stability when using equipment having a gross weight greater than the specified Caterpillar CAT 350L within the excavation area, as necessary.

1.6 VERIFICATION OF THE EXISTING CONDITIONS

- A. Verify existing conditions as specified in Section 02100.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide 20-mil sheets of Herculite or equal for use in buffer areas.
- B. Provide 3/8-inch yellow nylon rope fence. Posts shall be in accordance with Section 02200.

2.2 EQUIPMENT

- A. Furnish and maintain equipment to perform required operations in accordance with this Section.
- B. Equipment used to haul impacted material over the existing paved IMHR, shall be equal to or less than the gross vehicle weight and axle loading for a Caterpillar CAT D300E haul truck (gross vehicle weight of 120,000 pounds and maximum axle width of 9-feet 10-inches). Pavement width of the existing two-way IMHR is 24-feet. Select equipment and equipment width to ensure safe operation on this road.
- C. Equipment used within the excavation area shall be equal or less than the gross weight for a Caterpillar CAT 350L track hoe (112,500 pounds). Heavier equipment may be approved for use in this area pending submittal and approval of calculations certified by a registered Professional Engineer, that ensure slope stability.
- D. Equipment used to excavate, load, haul, and unload impacted materials shall have enclosed cabs. Enclosed cab is defined as an equipment cab isolated from outside environment (intact windows, doors, panels and floors surrounding driver with windows and doors shut) which provides a barrier from intrusion of outside airborne particles. Heating, ventilating, or air conditioning units associated with the equipment cab must not provide a direct path

for outside air to enter (air conditioner on air recirculate mode) unless the air is first passed through a high efficiency particulate air filter pulled directly from outside the cab.

- E. Furnish placards, placard carriers and 3-inch nominal diameter mounted sealable polyvinyl-chloride (PVC) tubes to serve as manifest carriers on haul trucks. Install at locations as directed by the Construction Manager.
- F. Assign equipment used to haul material to the OSDF with unique alpha-numeric identifiers. This identifier shall be placed on both sides of the truck cab and shall be visible from 20 feet.
- G. Equip trucks used for hauling impacted material with automatic load cover tops or employ Best Available Technology (BAT) methods to ensure that no airborne materials are emitted from the haul truck bed or load, whether empty or full.
- H. Provide water tank trucks, water wagons, hydroseeders, portable tanks, pressure distributors, piping, sprinklers or other equipment designed to apply water and/or dust suppressant and crusting agent uniformly and in controlled quantities to variable surface widths to provide fugitive dust control.
- I. Provide pressure wash or comparable equipment necessary to clean visible process residue and soil from piping and debris for placement in the OSDF.
- J. Provide portable wash equipment to wash vehicle tires and vehicle exteriors as necessary.
- K. Equipment used for size reducing concrete and asphalt materials for use as temporary aggregate surfaces.

PART 3 EXECUTION

3.1 GENERAL EXCAVATION

- A. Prior to performing excavation activities, satisfy the following requirements:
 - 1. Complete preliminary survey and layout work in accordance with Section 02100.
 - 2. Establish dust control methods in accordance with site procedures.
 - 3. Install and manage surface water management and erosion and sediment control measures in accordance with Section 02275.
 - 4. Install, modify, and manage construction safety and radiological-control fence and signage. Install posts at spacing recommended by the manufacturer's installation procedures and as required to prevent sagging. Posts with less than 4 feet remaining above the ground after installation shall have safety caps installed.
 - 5. Obtain survey and red line markup of area isolation trench, where applicable, to verify completeness.
- B. Perform excavation activities in compliance with 29 CFR Part 1926.650 through 1926.652.
- C. Unless otherwise noted on the Construction Drawings, the following slope stability requirements shall apply during excavation activities:

1. Excavation slopes with depths less than 20-feet shall be performed in accordance with applicable Occupational Safety and Health Administration (OSHA) guidelines.
 2. Sloped excavations greater than 20 feet in depth shall be designed by a Registered Professional Engineer (RPE) with registration in the state of Ohio.
 3. Temporary excavation slopes with depths less than 20-feet shall be no steeper than 1.5H:1V with a maximum height of 13 feet between 15 foot benches.
 4. Design slopes and slopes created by supplemental excavation shall be no steeper than 2H:1V with a maximum height of 13 feet between 15 foot benches.
- D. Install and manage traffic control devices in accordance with Section 02150.
- E. Blasting, including use of explosives or explosive devices, is not permitted.
- F. As necessary, establish and manage Special Materials Transfer Area(s) (SMTA) as follows:
1. Establish the SMTA on an existing building slab, paved parking area, or new aggregate surface adjacent to the project boundary, accessible from inside and outside the excavation area.
 2. Construct ingress/egress to the SMTA, including access roads, ramps, and drainage improvements as required.
 3. Install new aggregate surface SMTA in accordance with the Construction Drawings and Section 02230, and provide positive drainage.
 4. The SMTA shall not be used as a laydown area.
 5. The SMTA shall be controlled as a radiological buffer area in accordance with this Section.
- G. Establish controls for removal of ACM in accordance with approved Construction Traveler Package.
- H. Excavate surface material within the limits of excavation to a minimum depth of 2 feet, unless otherwise noted on the Construction Drawings.
- I. Excavate fractured materials concurrent with the adjacent above-WAC or below-WAC material, minimizing generation of above-WAC material. Fracturing of at-grade concrete slabs may continue concurrently with above-WAC and/or RCRA hazardous soil removal, but concrete outside of above-WAC and RCRA hazardous areas shall not be removed until above-WAC and RCRA hazardous soil removal has been completed, unless otherwise approved by the Construction Manager.
- J. Excavate and load material in such a manner that enables visual observation of excavation and loading operations as required to accurately manifest material for disposition.
- K. Excavations shall generally proceed in an up-gradient to down-gradient pattern to the lines and grades shown on the Construction Drawings.
- L. Keep excavation equipment in contaminated areas to prevent recontamination of areas excavated to final grade. Excavate an area by methods that prevent drainage of surface water into the area.

- M. Unless otherwise noted on the Construction Drawings or directed by the Construction Manager, excavate material from known above-WAC and RCRA hazardous areas in accordance with this Section, prior to excavating below-WAC material.
- N. Survey and stake excavation areas as shown on the Construction Drawings, in accordance with Section 02100. Perform intermediate and final surveys as specified in Section 02100 for measurement and to confirm attainment of the design grade.
- O. Remove material adjacent to structures that extend above the excavation surface, as well as the structures themselves, in a safe manner to ensure that an unstable condition is not created.
- P. Prior to excavating previously trenched and backfilled isolation trenches, physical sampling is required in locations where sanitary and process lines were cut during trenching. Allow 10 working days for physical sampling and analysis.
- Q. Design contours and grades shown on the Construction Drawings represent the minimum limits of excavation required to capture contamination and foundations, while maintaining safe slope requirements. Minimal changes may be submitted to incorporate breaks in contours, ponding of water, equipment accessibility, etc. These changes shall not exceed 10% of the total designed excavation quantity.
- R. In the event a historic, prehistoric, or archeological site, feature, or object is discovered, stop excavation in the area and immediately notify the Construction Manager.
- S. Continuously observe excavations for Special Materials or change in materials. In the event a Special Material or change in materials is encountered, stop excavation in the area and immediately notify the Construction Manager. Dispose of Special Materials in accordance with Table 02205-1.
- T. In the event solvent saturated soils are encountered, stop excavation in the area and immediately notify the Construction Manager. Excavate, load, and haul the material as directed by the Construction Manager.
- U. Prevent damage to adjacent structures, materials, and equipment, including utilities that are to remain, or those installed for performance of this work. Repair damage that occurs due to execution of this scope.

3.2 EXCAVATIONS APPROACHING THE GMA

- A. Stop excavation activities in the immediate area and immediately notify the Construction Manager if sands and gravel are encountered, even if the design grade has not been reached.
- B. Use caution when excavations encroach on the 5-foot protective cover over the unsaturated sands and gravel of the GMA. Approximate GMA elevations are shown on the Construction Drawings.
- C. Prior to initiating work activities which will encroach on the 5-foot protective cover but not

extend within 2-feet of the GMA, proceed as follows:

1. Excavate to achieve design grades shown on the Construction Drawings or to remove Above-FRL material.
 2. Allow 24 hours for coordination of the following: examination of the excavation bottom to determine if GMA sediments are present, real-time monitoring and/or physical sampling of the area to be backfilled, and identification of necessary pumping requirements for ponded water.
 3. Immediately following monitoring and sampling, initiate backfilling to protect the GMA in accordance with Section 02206.
- D. Prior to initiating work activities which will encroach within 2 feet of or breach the GMA, obtain approval and direction from the Construction Manager. Proceed as follows:
1. Excavate to achieve design grades shown on the Construction Drawings or to remove Above-FRL material.
 2. Allow for real-time monitoring and physical sampling in the area prior to backfilling.
 3. Immediately following monitoring and sampling collection, initiate backfilling to protect the GMA in accordance with Section 02206.

3.3 BUFFER AREA MANAGEMENT

- O. Establish excavation boundary and buffer area controls for above-WAC, RCRA hazardous areas, USTs, and HWMUs as follows:
1. Establish excavation area boundaries at surveyed and staked locations, in accordance with this Section.
 2. Install T-posts and rope fence at the excavation boundary.
 3. Establish the buffer area adjacent to the excavation area to serve as a controlled loading area between the excavation area and the surrounding radiological controlled area.
 4. Grade the buffer area to drain into the excavation.
 5. Install T-posts and rope fence around the buffer area.
 6. Cover the buffer area with a 20-mil sheet of Herculite, or equivalent.
 7. Collect water encountered during excavation and pump it as specified in Section 02275 and the construction drawings.
 8. Keep the buffer area clean and free of dirt and mud.
 9. Remove spillage before releasing haul equipment from the buffer area.
- P. Dedicate and restrict equipment required to excavate, load, haul and place above-WAC, RCRA hazardous and HWMU material to that specific use until decontamination rinsing has been completed and approved by the Construction Manager. Upon approval by the Construction Manager that no visible material is present on exterior equipment surfaces, or in haul truck beds, equipment may be used elsewhere.
- Q. In above-WAC, RCRA hazardous and HWMU excavations, load haul equipment by reaching over the excavation area boundary and dumping directly into haul equipment located in the buffer area. Load haul equipment in a manner that prevents spillage and

accumulation of material on the wheels and exterior of the haul equipment. Remove visible material that accumulates on the truck exterior. Multiple loading areas may be established within the buffer area.

- R. Wash haul equipment within the buffer area as necessary (using low volume, high-pressure washer or approved equivalent) to remove above-WAC, RCRA hazardous or HWMU material from the exterior of equipment.

3.4 ABOVE-WAC EXCAVATIONS

- A. Establish excavation boundary and buffer area controls in accordance with this Section.
- B. Remove debris (concrete, asphalt, and miscellaneous structures) from above-WAC areas and pressure wash the debris to remove soil/residue. The Construction Manager will visually monitor washing operations to ensure that debris is free of soil/residue and approved for loading and hauling to the OSDF.
- C. Debris from above-WAC areas not approved for disposal at the OSDF shall be dispositioned at SP-7 in accordance with this Section.
- D. Excavate above-WAC soil/gravel in 3+/-1 foot lifts to the design grade, as shown on the Construction Drawings. Load and haul above-WAC soil/gravel to SP-7 in accordance with this Section.
- E. The Construction Manager will arrange for real-time monitoring on excavated side slopes after each lift is removed and on the excavation floor upon achieving the above-WAC contamination limits shown on the Construction Drawings. In above-WAC areas contaminated with Tc-99, as shown on the Construction Drawings, the Construction Manager will arrange for physical sampling at the design depth. Allow 10 working days for sampling and analysis. Do not proceed with further excavation in this area until directed by the Construction Manager.
- F. If initial depth of above-WAC material is below the existing surface, excavate below-WAC material in 2+/-1 foot lifts until above-WAC material has been reached, then proceed in 3+/-1 foot lifts.
- G. Pending results of monitoring or analysis, perform supplemental above-WAC excavation beyond design limits shown on the Construction Drawings or in areas not shown on the Construction Drawings, as directed by the Construction Manager.

3.5 RCRA HAZARDOUS EXCAVATIONS

Excavate RCRA Hazardous areas to the limits shown on the Drawings as follows:

- A. Establish excavation boundary and buffer area controls in accordance with this Section.
- B. Remove debris (concrete, asphalt, and miscellaneous structures) from RCRA hazardous areas and pressure wash the debris to remove any soil/residue. The Construction Manager will visually monitor washing operations to ensure that debris is free of all soil/residue and

approved for loading and hauling to the OSDF. The Construction Manager may require additional washing as necessary to satisfy visual inspection.

- C. Debris from RCRA hazardous areas not approved for disposal at the OSDF shall be staged at an appropriate area for treatment by others, as directed by the Construction Manager.
- D. Excavate RCRA hazardous soil/gravel in 3+/-1 foot lifts to the limits shown on the Drawing. Load and haul material to an appropriate area for treatment by others, as directed by the Construction Manager. Do not proceed with further excavation in this area until directed by the Construction Manager.
- E. The Construction Manager will perform physical sampling upon confirmation that all RCRA hazardous material has been excavated. Allow 10 working days for sampling and analysis.
- F. Perform additional RCRA hazardous excavations, as directed by the Construction Manager, if analysis identifies additional RCRA hazardous material beyond the limits shown on the Drawings.

3.6 HWMU EXCAVATIONS

Excavate material from the HWMU to the limits shown on the Drawings as follows:

- A. Establish excavation boundary and buffer area controls in accordance with this Section.
- B. Remove debris (concrete, asphalt, and miscellaneous structures) from the HWMU and haul to the OSDF as a discrete waste stream. If the HWMU is considered an above-WAC area, load and haul the debris to SP-7, or containerize it as directed by the Construction Manager.
- C. Excavate HWMU soil/gravel in 3+/-1 foot lifts to the HWMU design grade, as shown on the Construction Drawings. Load and haul HWMU soil/gravel to the OSDF as a discrete waste stream. If the HWMU is considered an above-WAC area, containerize soil/gravel as directed by the Construction Manager.
- D. The Construction Manager will arrange for physical sampling on excavated side slopes after each lift is removed and on the excavation floor upon achieving the HWMU design grade shown on Construction Drawings. Allow 10 working days for sampling and analysis required for closure of the HWMU. Do not proceed with further excavation in the area until directed by the Construction Manager.
- E. Pending analysis of sample results, perform supplemental HWMU excavation beyond the design grade shown on Construction Drawings as directed by the Construction Manager.
- F. Upon confirmation from the Construction Manager that the HWMU excavation is complete, remove HWMU boundary fence, load and haul buffer area Herculite as HWMU debris.

3.7 UST EXCAVATIONS

Excavate USTs and areas that previously contained USTs shown on the Construction Drawings, as well as USTs discovered during excavation, as follows:

- A. Excavate to expose the top of the tank (UST) to allow the Construction Manager to assess the tank's condition.
- B. The Construction Manager and Industrial Hygiene will inspect the tank for the presence of liquid or non-soil residue.
- C. If the tank contains liquid or non-soil residue, as determined by the Construction Manager, proceed as follows:
 - 1. Pump remaining tank contents into drums provided by the Construction Manager.
 - 2. Move filled drums from the excavation area to the SMTA.
 - 3. Drums will be removed from the SMTA by others for appropriate disposition.
- D. Upon confirmation from the Construction Manager that the tank is empty, excavate the tank. Ensure that water does not accumulate in the tank from the surrounding excavation.
- E. During excavation, stage the tank, soil excavated from around the UST, and soil excavated from areas that previously contained USTs separate from other excavated materials.
- F. Upon confirmation from the Construction Manager that the tank is free of visible process residue, size-reduce the tank to meet physical WAC and dispose of it in the OSDF as a discrete waste stream.
- G. If the tank cannot be cleaned of visible process residue, size-reduce the tank for disposition in accordance with this Section.
- H. Over-excavate soil surrounding UST excavations and from areas that previously contained USTs to remove visible stains. Transport this soil as directed by the Construction Manager.

3.8 BELOW-WAC EXCAVATIONS

Excavate below-WAC material to the limits shown on the Construction Drawings as follows:

- A. Remove slabs, concrete pads, asphalt, gravel, base and sub-base to sub-grade soil within below-WAC areas. Load and haul this material to the OMTA-Bulk Debris or OSDF. The Construction Manager will arrange for real-time monitoring prior to subsequent excavation in the below-WAC area.
- B. Excavate below-WAC areas to the design grade shown on Construction Drawings. Load and haul this material to the OSDF in accordance with this Section.
- C. In below-WAC excavations driven by contamination rather than removal of underground structures, as shown on Construction Drawings, excavate in 3+/-1 foot lifts to the design grade shown on Construction Drawings. The Construction Manager will arrange for real-time monitoring upon removal of each lift. Do not proceed with further excavation in these areas until directed by the Construction Manager.

- D. Over-excavate a minimum of 6 inches in areas where impacted material was stockpiled or pushed for load-out during excavation to allow for visual inspection and disposition of debris that may have been tracked into the soil.
- E. Coordinate real-time monitoring as necessary to minimize delays.
- F. Upon reaching the design grade, notify the Construction Manager for real-time monitoring.

3.9 UTILITY REMOVAL BELOW THE DESIGN GRADE

- A. Excavate known utilities as indicated on the Construction Drawings. Prior to removal, cap, drain, purge and/or plug utility lines to be excavated to prevent release of material into surrounding soil. If fluids or hold-up material is encountered in utility lines, stop work and notify the Construction Manager. Plug sanitary and process lines when liquid flow is detected. Material released from sanitary or process lines will be excavated and dispositioned as directed by the Construction Manager.
- B. If unidentified utilities or underground structures are encountered, notify the Construction Manager, and proceed in accordance with the approved Penetration Permit.
- C. Process piping that is deformed, closed or otherwise hinders visual inspection shall be managed as above-WAC debris based on it's area of origin.
- D. If a utility is suspected of containing ACM, notify the Construction Manager and Industrial Hygiene and manage in accordance with Section 02210.
- E. Excavate, size-reduce, and handle piping and debris in such a manner to minimize the generation of above-WAC debris or friable asbestos.
- F. Prior to excavating utilities below the design grade, satisfy the following conditions:
 - 1. Complete the intermediate survey, as specified in Section 02100.
 - 2. Obtain Construction Manager approval that real-time monitoring of the design grade is complete.
- G. Excavate and remove utilities in accordance with this Section and details shown on Construction Drawings.
- H. Backfill utilities located below the design grade in accordance with the details shown on Construction Drawings and Section 02206.
- I. If visual monitoring identifies Special Materials during excavation of utilities below the design grade, perform supplemental excavation in accordance with this Section.
- J. Excavate miscellaneous debris encountered below the design grade and disposition in accordance with this Section.
- K. Maintain a daily record of underground utilities excavated from below the design grade.

3.10 MATERIAL SEGREGATION

- A. During excavation, segregate materials by the impacted material categories as defined in the IMPP. Maximize the volume of Category 1 material.
- B. Segregate below-WAC material to support construction of the four zones of each OSDF cell (protective layer, select impacted material layer, impacted material layer, and contouring layer).
- C. Segregate existing surface aggregate material and size-reduced concrete and asphalt materials for use as temporary aggregate material.

3.11 SIZE REDUCTION

- A. Size-reduce remaining structures (i.e., building foundations, slabs, sumps, hydraulic ram casings) located above the design grade to meet OSDF physical WAC.
- B. Size-reduce concrete and asphalt structures (i.e., building slabs, concrete/asphalt pads, roads, parking areas) to maximize the generation of material for temporary aggregate surfaces.
- C. Size-reduce piping and debris to meet OSDF physical WAC in accordance with the IMPP, or size requirements for SP-7 in accordance with this Section.
- D. Size-reduce metal materials (i.e., structural steel, piping, equipment, re-bar, miscellaneous metal) in accordance with the IMPP. Load metal components in bulk and haul to the OSDF or OMTA.
- E. Size-reduction shall be by mechanical means, not by flame or torch cutting.

3.12 GENERAL LOADING AND HAULING

- A. Use paved haul roads designated on the Construction Drawings for hauling. Upon entering the paved haul roads with haul equipment, do not exit except to the excavation area, SP-7, OMTA Bulk Debris Area, and/or the OSDF, without approval by the Construction Manager.
- B. Maintain equipment within the excavation area during periods of non-work (evenings, weekends, and holidays) unless equipment decontamination has been completed. Complete decontamination activities and request a radiological survey of the equipment prior to moving equipment out of radiological contamination areas.
- C. When hauling materials to the SMTA, enter the SMTA from the excavation area only.
- D. Load haul equipment in a fashion to minimize load shifting and to prevent spillage during transit.
- E. Extend automatic covers on suitably equipped haul equipment, whether full or empty, during equipment movement.
- F. Keep equipment cab closed and stay within the equipment cab when inside posted

contamination area without appropriate PPE except in emergency situations.

- G. Provide material tracking information in accordance with the Material Tracking Plan shown on Construction Drawings.
- H. Prior to loading and hauling, material designated for the OSDF shall be void of free liquid.
- I. Prohibit tracked equipment from hauling, operating, or tracking over the Impacted Material Haul Road (IMHR) or other paved roadways, unless otherwise approved by the Construction Manager.

3.13 GENERAL DISPOSAL

- A. Dispose of impacted material in accordance with this Section. Table 02205-1 provides guidance for the disposition of materials that may be encountered which will be disposed at the 3 destinations identified in this Section. Notify the Construction Manager in the event that materials are discovered that do not appear to be represented in Table 02205-1.
- B. Pending coordination between the projects, material designated for SP-7 disposition may be hauled directly to WPRAP. Material hauled directly to WPRAP must comply with SP-7 disposition requirements presented in this Section.
- C. OSDF disposition requires the following:
 - 1. Compliance with requirements stated in the WAC Attainment Plan and the IMPP.
 - 2. Piping and debris shall be cleaned of process-related residue in accordance with this Section. Notify the Construction Manager of residue that is not readily removed and manage the debris as directed.
 - 3. Compliance with criteria identified in Table 02205-1 for management of Special Materials for disposition at the OSDF.
 - 4. ACM shall be removed, packaged, loaded and hauled in accordance with Section 02210.
- D. SP-7 disposition requires the following:
 - 1. Soil, piping and debris exceeds the requirements for OSDF disposition as outlined in Table 02205-1.
 - 2. Piping and debris shall be less than 10 inches in at least one dimension, and no longer than 6 feet in any dimension.
- E. SMTA disposition requires the following:
 - 1. Soil, piping and debris exceeds the requirements for OSDF and SP-7 disposition as outlined in Table 02205-1.
 - 2. Materials shall be containerized as directed by the Construction Manager.
 - 3. Loaded containers shall be placed in the SMTA in a manner that protects the containers from damage. Do not stack containers.

3.14 STOCKPILING

- A. Install construction safety fence around active stockpiles in accordance with Section 02200.
- B. Install appropriate signage around the boundary of active stockpiles as directed by the Construction Manager.
- C. Install erosion control measures around active stockpile in accordance with Section 02275.
- D. Maintain fencing, signage, and erosion control measures for the duration of the active stockpile's existence.
- E. Repair damage to active stockpile support structures (i.e., silt fence, perimeter fence) inflicted during performance of this project to their original condition within 24 hours of damage discovery.
- F. Apply crusting agent as specified in Section 02930 within 7 calendar days upon completion of the active soil stockpile or if the active soil stockpile is to be inactive for more than 45 calendar days.
- G. Compact/seal the surface of the stockpile in use at the close of each work-day to prevent fugitive dust and erosion.
- H. Construct stockpiles with maximum slopes of 3H:1V and a maximum height-to-base ratio 0.2.
- I. Locate interim stockpiles within the limit of excavation upon approval from the Construction Manager. Remove interim stockpiles within 45 calendar days.
- J. Establish a separate stockpile for solvent saturated soils, as encountered. Manage the stockpile material to avoid cross-contamination with adjacent soil, and to control surface water and dust.
- K. Stockpile excavated surface aggregate materials and size-reduced concrete and asphalt as necessary for use as temporary aggregate material.
- L. Stockpiles shall not be located within 30 feet of an excavation top-of-slope.
- M. In addition to general stockpiling requirements, the following requirements shall apply to the management of above-WAC stockpiles:
 - 1. Use dedicated equipment for the preparation and management of the stockpiles.
 - 2. Maintain ingress/egress to the stockpiles, including access roads, ramps, and drainage features.
 - 3. Maintain unloading areas that prevent haul equipment tires from coming in contact with stockpiles material.
 - 4. Locate the stockpiles as directed by the Construction Manager.
 - 5. Decontaminate tools and equipment used to place and manage material withing these stockpiles prior to requesting release. Following decontamination, the

Construction Manager will arrange for a radiological survey to release tools and equipment.

- N. Cover or lock down soil or debris containing non-friable ACM at the end of the day in accordance with Section 02210.

3.15 MONITORING AND SAMPLING

- A. The Construction Manager will arrange for real-time monitoring of below-WAC areas following removal of surface aggregate, concrete and asphalt slabs, pads, roads and parking areas, and between each lift in contaminated areas until the design grade has been achieved, including the design grade.
- B. The Construction Manager will arrange for real-time monitoring after each excavation lift for above-WAC materials.
- C. The Construction Manager will arrange for radiological monitoring before equipment is released from a buffer area. Working in rain and/or wet weather increases scanning time.
- D. The Construction Manager will perform visual monitoring during excavation for Special Materials that are not permitted in the OSDF or that will require additional processing to meet WAC. If Special Materials are found, real-time monitoring may be performed to verify removal and determine appropriate disposition of the material.
- E. The Construction Manager will visually monitor piping and debris to ensure no visible process residue remains, in order to be placed in the OSDF.
- F. The Construction Manager will arrange for real-time monitoring to verify that the excavation area has met the requirements for precertification.
- G. When real-time monitoring or sampling is required, excavate in an alternate location within the excavation area while awaiting the results. Excavate alternate locations a minimum of 50 feet from the area being monitored. Allow up to 2 working days for monitoring after area is ready for monitoring. Extend duration for monitoring at least 1 working day for each day precipitation occurs.
- H. The Construction Manager and regulatory agencies may collect samples from the excavation, haul equipment and the OSDF at any time during the project.
- I. The Construction Manager will monitor water collected in suspect VOC areas for the presence of volatile organic compounds (VOCs). If VOCs are detected, the water will be sampled and analyzed to determine disposition.
- J. The Construction Manager will arrange for magnetometer surveys to verify removal of ferrous debris from areas where former underground utilities and structures were excavated.

3.16 PRECERTIFICATION AND SUPPLEMENTAL EXCAVATION

- A. The Construction Manager will arrange for real-time monitoring to pre-certify an area as having attained FRL requirements.

- B. Perform supplemental excavations beyond the design grade if either of the following conditions exist:
 - 1. Real-time monitoring and/or physical sampling identifies material beyond the design grade that does not meet FRL requirements.
 - 2. Utilities or other impacted materials identified beyond the design grade.
- C. Install rope fencing and appropriate signage around the pre-certified area perimeter after precertification has been achieved.

3.17 AREA MANAGEMENT

- A. Maintain construction safety fence, radiological-control fence, and stockpile fence as specified in this Section, Section 02200, and as shown on the Construction Drawings.
- B. Management of excavation water shall be as specified in Section 02275.
- C. Perform stabilization of the excavated areas using crusting agent and temporary seeding in accordance with Sections 02275 and 02930.
- D. Notify the Construction Manager prior to removing sediment and debris from ditches, drains and erosion control devices. The Construction Manager will arrange for sampling and analysis of sediment for WAC compliance. Remove and de-water sediment in accordance with the following:
 - 1. Notify the Construction Manager two (2) days prior to removing sediment from ditches, drains and erosion and sediment control devices to arrange for sampling and analysis of the sediment for disposition.
 - 2. Remove accumulated sediment from ditches, drains and erosion and sediment control devices as directed by the Construction Manager. In no case shall sediment reduce the available depth of the associated feature to less than two-thirds the depth shown on Construction Drawings.
 - 3. De-water sediment removed from above-WAC or RCRA hazardous areas within the associated above-WAC or RCRA hazardous area.
 - 4. De-water sediment removed from ditches, drains and erosion and sediment control devices adjacent to and up-gradient of the associated feature as necessary to allow water to drain immediately back into the feature.
 - 5. Disposition de-watered sediment to the OSDF unless otherwise directed by the Construction Manager.
 - 6. Place sediments accumulated in above-WAC stockpile surface water control devices in the associated stockpile.
- E. Implement seasonal closure methods at the end of each construction season and maintain seasonal closure through winter shutdown. Seasonal shutdown requirements include, but are not limited to:
 - 1. Maintain surface water management and erosion and sediment controls.
 - 2. Maintain dust control, as required.

3. Perform equipment decontamination, as required.
4. Remove water from excavation during seasonal closure, when water depth exceeds 1-foot. Pump water out of the excavations in a manner that maintains the integrity of the 2H:1V side slopes, (i.e., no rapid draw down) and prevents an overflow condition. The pumping priority for open excavations is as follows:
 - a. Open excavation areas containing impacted material that are located up-gradient of remediated areas,
 - b. Completed excavations, and
 - c. Other uncompleted excavations.
5. Remove sediment and debris from sediment control basins and ditches in accordance with this Section.
6. Seed/stabilize stockpiles.

END OF SECTION

Table 02205-1

The table should be interpreted to read that material in column 1 may be dispositioned at the appropriate destination in columns 2-4 if the corresponding criteria are met.

MATERIAL	DESTINATION*		
	OSDF	SP7 ⁽¹⁾	SMTA ⁽³⁾
Soil from general/UST excavation	• Meets WAC	• Above-WAC	• Not applicable
Soil from RCRA hazardous excavation	• Prohibited	• Prohibited	• Containerize
Soil from HWMU excavation	• Meets WAC	• From an Above-WAC area	• RCRA Hazardous
Soil requiring treatment	• Prohibited pending treatment and direction by the Construction Manager	• Prohibited pending treatment and direction by the Construction Manager	• Fails treatment
Debris from general/UST excavation	• Meets WAC	• Above-WAC • Visible residue cannot be removed	• Not applicable
Debris from above-WAC excavation	• Meets WAC and free of visible soil/residue	• Visible soil/residue cannot be removed	• Not applicable
Debris from RCRA hazardous excavation	• Meets WAC and free of visible soil/residue	• Above-WAC and free of visible soil/residue	• Visible soil/residue cannot be removed
Debris from HWMU excavation	• Meets WAC	• Above-WAC and free of visible soil/residue	• Above-WAC and visible soil/residue cannot be removed
Asbestos ⁽³⁾	• Meets WAC and passes visual inspection by CM	• Above-WAC and non-friable • Visible soil/residue cannot be removed and non-friable	• Friable and fails visual inspection by CM
Non-pressurized Containers ⁽³⁾	• Meets WAC, free of visible soil/residue, and contains no free liquid, product, etc	• Above-WAC and contains no free liquid, product, etc. • Visible soil/residue cannot be removed and contains no free liquid, product, etc. • Has been crushed	• Contains free liquid, residue, etc • Has been crushed
Piping/Pumps ⁽³⁾	• Meets WAC, free of visible soil/residue, and contains no free liquid	• Interior not visible and contains no free liquid • Visible soil/residue cannot be removed and contains no free liquid	• Above-WAC/HWMU and visible soil/residue cannot be removed • Above-WAC/RCRA and visible soil/residue cannot be removed
Transformers/Electrical Equipment ⁽³⁾	• Meets WAC and free of visible soil/residue	• Visible soil/residue cannot be removed and drained of all fluid	• Contains fluid • Above-WAC/HWMU and visible soil/residue cannot be removed • Above-WAC/RCRA and visible soil/residue cannot be removed
Brick including Acid Brick ⁽³⁾	• No acid brick	• Acid brick	• Not applicable
Lead Acid Batteries ⁽³⁾	• Prohibited	• Prohibited	• Containerize
Medical Infectious Waste ⁽³⁾			
Non-soil Residue ⁽³⁾			
Pressurized Containers ⁽³⁾			
Tires ⁽³⁾			
Uranium Metal ⁽³⁾			
Sealed radiological calibration sources			

(1) Must meet SP7 size requirements per this Section (2) SMTA materials must be containerized. (3) Special Material per this Section.

* These are final destinations beyond which the project bears no responsibility for material movement. The OMTA area staging areas prior to OSDF disposition.

000025

4517

SECTION 02206
EARTHWORK FOR REMEDIATION

-- 4517

PART 1 GENERAL

1.1 SCOPE

- A. This Section includes requirements for earthwork associated with remediation of the former production area to include, but is not limited to:
1. Excavation of fill material.
 2. Excavation and placement of materials for ditches and berms.
 3. Placement of fill material in trenches excavated for utility removal in areas below design grade.
 4. Placement of plug material over the unsaturated sands and gravels of the Great Miami Aquifer (GMA).
 5. Interim grading for drainage and road preparation.
 6. Final grading.

1.2 RELATED SECTIONS AND DOCUMENTS

- A. Section 02100 – Surveying.
- B. Section 02150 – Traffic Control.
- C. Section 02205 – Impacted Material Excavation.
- D. Section 02230 – Road Construction.
- E. Section 02275 – Surface Water Management and Erosion Control for Remediation.
- F. Section 02930 – Vegetation.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
1. ASTM C150 Specification for Portland Cement, current edition.
 2. ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft), current edition.
 3. ASTM D2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock, current edition.
 4. ASTM D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), current edition.

- | | | |
|----|------------|---|
| 5. | ASTM D2922 | Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth). |
| 6. | ASTM D3017 | Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth). |
| 7. | ASTM D4643 | Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Method. |

1.4 DEFINITIONS

- A. Fill Material: Non-impacted soil obtained from within the excavation area, below the design grades, following pre-certification, or from a designated borrow area.
- B. Design Grade: Grade created by excavation of impacted material to the lines and grades shown on Construction Drawings.
- C. GMA Plug: Non-impacted gray clay material from the certified Borrow Area used to maintain a minimum protective cover thickness over, and seal breaches into, the GMA unsaturated sands and gravels.
- D. Clay Plug: Same material as specified for GMA Plug used to create a protective cover thickness over pilings to be cut off and left in place as shown on the Construction Drawings.

1.5 SUBMITTALS

- A. Submit for approval, name, address, and qualifications of an independent soil testing laboratory and resume(s) of field technician(s).
- B. Within seven (7) calendar days of obtaining samples and performing field tests, provide copies of lab and field tests performed by the soil testing laboratory and Contractor performing field tests. Soil test results shall include Standard Proctor moisture density tests, sieve analysis, density tests, and Proctor curves for each type of material to be used prior to its use. Field test results shall include a map depicting locations and depth/lift.
- C. Submit specification sheet and MSDS for sodium bentonite grout.
- D. Submit specification sheet and MSDS for Portland cement.
- E. Submit as-built survey to verify completion of design excavation in accordance with Section 02100, Surveying.
- F. Documentation of nuclear density gauge calibration in accordance with manufacturer's requirements.

1.6 EXISTING CONDITIONS

- A. Verify existing conditions as specified in Section 02100.

PART 2A PRODUCTS

45 17

2.1 MATERIALS

- A. Fill material shall be free of debris, foreign objects, large rock fragments (maximum dimension of 6 inches), organic, and other deleterious materials.
- B. GMA plug material shall be fill material conforming to CL classification according to United Soil Classification System in accordance with ASTM D2487.
- C. Use the designated certified borrow area as the source for GMA plug material.
- D. Material used to backfill utility trenches located below the design grade and areas where grout plugs are installed into air-gapped storm sewers shall be surrounding soils following pre-certification.
- E. Use below-FRL material from the excavation area, following pre-certification, as a source of fill material for supplemental excavations.
- F. Portland cement per ASTM C150, normal – Type 1.
- G. Sodium bentonite grout.
- H. Safety signs around ponds shall be exterior quality signs with minimum 4 inch high letter and shall state, "Life jackets required when working within 5 feet of edge of ponds, use of buddy system required". Hand written signs are unacceptable.

2.2 EQUIPMENT

- A. Furnish and maintain equipment to perform required operations in conformance with the requirements of these specifications.
- B. Furnish equipment to perform required operations in conformance with this Section. Equipment that results in waste or damage of material, inaccurate work, or is otherwise objectionable shall be promptly replaced.
- C. Equipment used to haul non-impacted material over the existing paved Impacted Material Haul Road (IMHR), shall be equal to or less than the gross weight and axle loading for a Caterpillar CAT D300E haul truck (gross vehicle weight of 120,000 pounds and maximum axle width of 9-feet 10-inches). Pavement width of the existing two-way IMHR is 24-feet. Select equipment and equipment width to ensure safe operation on this road.
- D. Equipment used within the excavation area shall be in accordance with Section 02205.
- E. Furnish compaction equipment, as needed.

PART 3 EXECUTION

4517

3.1 GENERAL

- A. Perform intermediate surveys in accordance with Section 02100, to confirm attainment of design grade prior to initiating earthwork activities below the design grade.
- B. Stop excavation activities and immediately notify the Construction Manager upon discovery of unexpected cultural resources suspected to be historic, prehistoric, or archeological site, feature or object.
- C. Excavate soil below the design grade with equipment free of visible above-FRL soil.
- D. Use material from the immediate excavation area or a designated borrow area to meet fill material requirements for trenches and supplemental excavations.
- E. Perform construction activities such that surface water runoff from non-certified construction areas does not flow into pre-certified areas, in accordance with Section 02275.
- F. Maintain slope stability outside of utility trenches created by excavating utilities below the design grade, in accordance with Section 02205.
- G. After certification, perform final grading in accordance with this Section.

3.2 BACKFILL

- A. Obtain fill material from areas approved by the Construction Manager. In high-leachability areas shown on the Construction Drawings, obtain fill material from precertified or certified areas meeting the 20 mg/kg total Uranium FRL.
- B. Maintain a minimum 5-foot protective cover over the unsaturated sands and gravel of the GMA in accordance with the following. GMA elevations are shown on the Construction Drawings.
 - 1. Following excavation activities that encroach on the 5-foot protective cover but do not extend within 2-feet of the GMA, install GMA plug as follows:
 - a. Immediately following monitoring and sampling activities specified in Section 02205, survey the excavation and initiate filling.
 - b. Backfill using GMA plug material meeting the requirements of this Section. Complete backfilling within 5 days following sampling.
 - c. Backfill GMA plug material in 8-inch +/- 1-inch loose lifts until protective cover is returned to a minimum thickness of 5-feet.
 - d. Compact fill material in each 8-inch loose lift to at least 95% Standard Proctor dry density (ASTM D698) within 0 to +3% of optimum moisture content.

- 7100
2. Following excavation activities that encroach within 2 feet of or breach the GMA, install GMA plug as follows:
 - a. Immediately following monitoring and sampling activities specified in Section 02205, survey the excavation and initiate backfilling.
 - b. Backfill using GMA Plug material meeting the requirements of this Section.
 - c. If precipitation is likely within the next 24 hours, immediately place a minimum fresh compacted thickness of 2 feet. Otherwise, place the 2 feet of compacted cover within 24 hours of excavating to within 2 feet or breaching the GMA.
 - d. Place the first lift of GMA plug material in an approximate 18-inch loose lift. Compact the first lift using 4 passes of compaction equipment approved by the Construction Manager.
 - e. Backfill the remaining lifts in 8-inch +/- 1-inch loose lifts until the protective cover is returned to a minimum of 5 feet. Compact GMA plug material in each 8-inch loose lift to at least 95% Standard Proctor dry density (ASTM D698) within 0 to +3% of optimum moisture content. These lifts must be continuous over the entire breached area.

D. Install clay plug in locations shown on the Construction Drawings in accordance with the following:

1. Backfill using clay plug material meeting the requirements of this Section.
2. Place clay plug material in 8-inch +/- 1-inch loose lifts as necessary to achieve a total compacted thickness of 2-feet.
3. Compact each lift with four (4) passes of compaction equipment approved by the Construction Manager.
4. If clay plug is placed over an open pile, seal void spaces within the pile with sodium bentonite grout and cap the top 2 feet of the pile with Type 1 Portland cement ASTM C150 prior to placing the clay plug. Sodium bentonite grout shall be mixed at a water ratio of 2.1 pounds of sodium bentonite per gallon of water, and have a minimum density of 9.4 lbs./gallon. Grout viscosity shall be field checked periodically to assure proper viscosity of 70 +/- 6 seconds using the Marsh funnel viscometer. Tremie the grout into the open pile to eliminate void space.

E. Excavate, remove utilities, and backfill trenches below the design grade in accordance with the following:

1. Remove utilities located below the design grade in accordance with Section 02205 and details presented on Construction Drawings.
2. Remove water collected in trenches to sump areas and pump it to the appropriate sediment control basin as specified in Section 02275.
3. Backfill utility trenches located below design grade in accordance with the Construction Drawings.

3.3 FIELD QUALITY CONTROL

- A. In-place density testing will be performed in accordance with ASTM D2922. Nuclear density gauge (ASTM D2922) will be calibrated in accordance with the manufacturer's requirements. Documentation of this calibration will be provided to the Construction Manager. Register nuclear or radiological sources brought on site.
- B. Perform in-place moisture tests in accordance with ASTM D3017, or ASTM D4643 as applicable.
- C. Determine moisture-density curves in accordance with ASTM D698 (Standard Proctor). Test results must be reviewed and approved by the Construction Manager.
- D. If in-place density and/or moisture tests indicate that work does not meet specified requirements, remove work and replace or re-compact to specified requirements.
- E. Perform soil classification in accordance with ASTM D2487.
- F. Frequency of Tests: Frequency of in-place density and moisture testing shall be whichever of the following requires the greatest number of test:
 - 1. Once each day when compacting GMA plug material.
 - 2. Once each compacted lift of GMA plug material.
 - 3. Once every 3,000 sq. ft. of compacted GMA plug material.
- G. Notify the Construction Manager of activities requiring testing/inspection a minimum of 24 hours prior to the start of such activities.

3.4 EARTHEN BERMS

- A. Install earthen berms at locations shown on the Construction Drawings using soils from surrounding area following pre-certification by Fluor Fernald.
- B. Place material in 8-inch loose lifts.
- C. Compact each lift of berm with 4 passes of compaction equipment approved by the Construction Manager.

3.5 INTERIM GRADING

- A. When the design grade has been achieved, perform interim grading as follows:
 - 1. Correct washouts or other similar irregularities to maintain the design grade slopes of 2H:1V or less.
 - 2. Grade to maintain smooth continuous slopes.
 - 3. Finish ditches so they drain readily.
 - 4. Perform temporary seeding in accordance with Section 02930.
 - 5. Repair damage within 3 working days.

3.6 FINAL GRADING

- A. Obtain verification that the area to be graded has been certified.
- B. Provide, maintain and operate temporary drains, ditches, pumps, drainage lines or other equipment to intercept, divert, or remove water from excavations.
- C. Provide and maintain stormwater management measures that assure isolation of stormwater between certified and non-certified areas.
- D. Regrade within the certified area by cutting back the 2H:1V grades to achieve grades no steeper than 5H:1V. As the 5H:1V excavation proceeds, the cut material shall be placed in the bottom of existing excavations and graded level.
- E. Final grading shall be achieved with minimum 5 foot radii at contour direction changes, and smooth transitions between grade breaks and depressions.
- F. Perform permanent seeding in accordance with Section 02930.
- G. Stabilize 2H:1V slopes along excavation boundary with erosion control blankets in accordance with Section 02275.

3.7 SURFACE WATER MANAGEMENT

- A. Manage surface water in accordance with Section 02275.
- B. Perform excavation in a manner that promotes positive drainage.
- C. Install earthen berms as shown on Construction Drawings. Apply temporary seed and fertilizer on earthen berms in accordance with Section 02930.

3.8 SEASONAL SHUTDOWN

- A. Perform seasonal shutdown activities in accordance with Section 02205.

END OF SECTION

5100

45 17

SECTION 02207
AREA ISOLATION TRENCHING

PART 1 GENERAL

1.1 SCOPE

- A. This Section includes the requirements for trenching and backfilling an isolation trench around the project excavation limits, as shown on the Construction Drawings.

1.2 RELATED SECTIONS AND DOCUMENTS

- A. Section 02205 – Impacted Material Excavation.
- B. Section 02275 –Surface Water Management and Erosion Control for Remediation.

1.3 REFERENCES

- A. Title 29, Code of Federal Regulations (CFR): 29 CFR 1926 Subpart P – Excavation, current edition.
- B. RM-0021, “Safety Performance Requirements Manual”.
- C. RM-0047, “Fugitive Dust Control Requirements”.
- D. SPR 3-5, “Barricades”.

1.4 DEFINITIONS

- A. Special Materials: Impacted material requiring special handling as specified in Section 02205 and presented in Table 02205-1.
- B. Trencher: Specific equipment used in trenching around the area excavation limits.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Provide rope fence consisting of 3/8-inch yellow nylon rope as shown on the Construction Drawings.
- B. Provide T-posts in accordance with Section 02200.
- C. Provide construction area signage in accordance with SPR 3-5.

- D. Provide crusting agent as specified in Section 02275.

2.2 EQUIPMENT

- A. Furnish and maintain trencher equipment, manufactured by Vermeer or an approved equivalent, to perform trenching in accordance with this Section. The trencher must meet the following requirements:
1. Trencher must be capable of cutting to a minimum depth of 12 feet, with a tolerance of 0 to 6 inches.
 2. Trencher must be capable of cutting a trench no greater than 30 inches wide.
 3. Trencher must be capable of maintaining a trench centerline lateral tolerance of +/- 1 foot over the entire trench depth.
 4. Trencher digging mechanism must be capable of being removed for turnover to Fluor Fernald at the completion of the project.
- B. Furnish and maintain equipment to perform trench backfilling in accordance with this Section.
- C. Equipment used within the trenching exclusion zone shall have enclosed cabs. Enclosed cab is defined as an equipment cab isolated from the outside environment (intact windows, doors, panels and floors surrounding driver with windows and doors shut) which provides a barrier from intrusion of outside airborne particles. Heating, ventilating, or air conditioning units associated with the equipment cab must not provide a direct path for outside air to enter (air conditioner on air recirculate mode) unless the air is first passed through a high efficiency particulate air filter pulled directly from outside the cab.
- D. Furnish and maintain equipment to perform compaction in accordance with this Section.
- E. Provide water tank trucks, water wagons, hydroseeders, portable tanks, pressure distributors, piping, sprinklers or other equipment designed to apply water and/or dust suppressant and crusting agent uniformly and in controlled quantities to variable surface widths to provide fugitive dust control.
- F. Furnish and maintain portable wash equipment to wash vehicle tires and vehicle exteriors as necessary.
- G. Equipment used within the excavation area shall meet weight requirements in accordance with Section 02205, to ensure slope stability.

PART 3 EXECUTION

3.1 GENERAL

SOIL EXCAVATION SPEC REV E

Section 02207: Area Isolation Trenching

- A. Survey and layout the isolation trench centerline as shown on Construction Drawings. Remove or relocate surface obstructions that may impede trencher operations prior to trenching, as approved by the Construction Manager.
- B. Prior to trenching activities, install and manage rope fence and appropriate signage to establish safe distances around the trench and excavations during equipment operation and while the trench remains open.
- C. Install radiological-control signs as required.
- D. Install and maintain surface water management and erosion and sediment control measures in accordance with Section 02275.
- E. Trench and backfill in accordance with the Construction Drawings and this Section.
- F. Blasting, including use of explosives or explosive devices, is not permitted.
- G. Maintain equipment in a safe condition within the trenching/excavation area during periods of non-work (evening, weekends, and holidays).
- H. Prohibit tracked equipment from hauling, operating, or tracking over or on the Impacted Material Haul Road (IMHR) or other paved roadways unless otherwise approved by the Construction Manager.
- I. In the event a historic, prehistoric, or archeological site, feature, or object is discovered, stop work immediately in the area and immediately notify the Construction Manager.
- J. Excavation performed in support of trenching activities shall be in accordance with Section 02205.
- K. Material removed from the utility isolation trench shall be backfilled daily to avoid stockpile requirements.

3.2 TRENCHING

- A. Trench at locations, as shown on the Construction Drawings, using approved trencher equipment. Trenches shall be cut to a minimum depth of 12 feet, with a tolerance of 0 to 6 inches. Trench centerline shall have a lateral tolerance of +/- 1-foot. Deviation beyond the +/- 1-foot lateral tolerance requires prior review and approval by the Construction Manager, Project Engineer, and Utility Engineer to evaluate potential impacts to surrounding structures and utilities.
- B. Trench in such a manner that enables the Construction Manager to visually observe trenching activities.

SOIL EXCAVATION SPEC REV E

Section 02207: Area Isolation Trenching

- C. In areas inaccessible to the trencher, excavate around utilities and structures as directed by the Construction Manager, to verify no active utilities are present. Air gap active utilities found in areas inaccessible to the trencher using methods and equipment as approved by the Construction Manager, in accordance with the Construction Drawings. Dispose of pipe sections removed during air-gapping in accordance with Section 02205.
- D. Stop trenching and immediately notify the Construction Manager if unidentified utilities are encountered.
- E. Continuously observe trenching for the presence of Special Materials or change in materials. Stop trenching in the area and immediately notify the Construction Manager if Special Materials are encountered. Dispose of Special Materials in accordance with Section 02205.
- F. Stop trenching operations and notify the Construction Manager if fluid is detected flowing into the trench from a utility line cut during the trenching operations. The Construction Manager will note the location of the leakage for future remediation of the trenching corridor by others.
- G. Perform trenching activities in such a manner as to minimize water accumulation in the trench.
- H. Backfill trenches and excavations daily unless otherwise approved by the Construction Manager. Trenches or excavations remaining open after working hours shall be barricaded in accordance with requirements stated in the approved Construction Traveler(s).
- I. Verify and record "as-built" trench locations and depths every 50 feet, and at intersections, along the trench centerline.

3.3 BACKFILL

- A. Backfill trenches and excavations using material removed during trenching and excavation activities. The final 24 inches of backfill placed shall be free of debris, foreign objects, large rock fragments (maximum dimension of 6 inches), organic matter, and other deleterious materials so as to obtain adequate compaction. Spread these materials within the adjacent excavation area.
- B. Backfill trenches to within 24 inches of grade. Backfill and compact the remaining 24 inches in 8-inch lifts compacted by four passes of compaction equipment suitable for use in the trench.
- C. Use remaining material removed during trenching to construct a diversion berm along the trench centerline as shown on the Construction Drawings. Construct diversion berm in 8-inch lifts compacted by four passes of equipment approved by the Construction Manager. Obtain supplemental material to construct the diversion berm as necessary from the

SOIL EXCAVATION SPEC REV E

Section 02207: Area Isolation Trenching

surrounding areas as directed by the Construction Manager. Spread excess material in place.

- D. After completion of backfilling and diversion berm construction activities, install and modify rope fence to locations as shown on the Construction Drawings unless otherwise directed by the Construction Manager.
- E. Upon completion of trenching, backfilling and diversion berm construction, stabilize the disturbed area using crusting agent in accordance with Section 02275.

END OF SECTION

SECTION 02275
SURFACE WATER MANAGEMENT AND EROSION CONTROL FOR REMEDIATION

PART 1 GENERAL

1.1 SCOPE

A. This Section includes, but is not limited to, the following:

1. Installation of erosion and sediment control measures.
2. Maintenance of existing and new erosion and sediment control measures installed under this activity, including removal of temporary erosion control facilities.
3. Management of excavation water in excavation areas, including pumping water to the appropriate sediment basin during general excavation and management of volatile organic compound (VOC)-contaminated water.
4. Modification of existing storm sewer system.
5. Installation and maintenance of runoff controls along the perimeter of the project boundary.
6. Protection of the unsaturated sands and gravels of the Great Miami Aquifer (GMA) from runoff within the excavation areas, including installation and maintenance of runoff controls.
7. Management of area for precertification.
8. Stabilization of disturbed excavation areas or stockpiles.
9. Inspection requirements.

1.2 RELATED SECTIONS AND DOCUMENTS

- A. Section 02100 – Surveying.
- B. Section 02205 – Impacted Material Excavation.
- C. Section 02206 – Earthwork for Remediation.
- D. Section 02270 – Surface Water Management and Erosion Control
- E. Section 02930 – Vegetation.

1.3 REFERENCES

- A. State of Ohio, Department of Natural Resources (ODNR), Rainwater and Land Development, Ohio's Standard for Stormwater Management Land Development and Urban Stream Protection, current edition.
- B. State of Ohio, Department of Transportation (ODOT), Construction and Material Specifications, current edition.
- C. Surface Water Management Plan (SWMP) for the applicable soil excavation project.

1.4 DEFINITIONS

- A. Excavation Water: The combination of surface water and perched water that collects in the excavation.

1.5 SUBMITTALS

- A. For each product proposed for use, submit the following:
 1. Manufacturer's product data and recommended methods of installation and maintenance.
 2. Certification from manufacturer that the product meets the material requirements of this Section, including test results.
 3. Material Safety Data Sheet (MSDS), if applicable.
- B. Records of inspection of erosion and sediment control measures as specified herein shall be submitted monthly upon completion of the inspection report.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Furnish silt fence in accordance with ODNR, composed of, at a minimum, strong rot-proof polymeric fibers formed into a woven fabric having fabric and fence post properties as shown on the Construction Drawings.
- B. Furnish woven yarn blanket-like erosion mat that will resist degradation for a minimum 6-month period after installation, having a permissible velocity of 7 feet per second, with the following material properties:
 1. Yarn content: 100 percent jute or coconut fiber.
 2. Weight: minimum 11.5 ounces per square yard.
 3. Open Area: maximum 65 percent.
 4. Mesh Opening: minimum 0.5 inches.
- C. Furnish metal staples specifically made to anchor erosion control blankets. Anchors will be 11 gauge wire formed into a staple shape with minimum dimensions of 6 inches by 1 inch by 6 inches.
- D. Furnish dust suppression/crusting agent in accordance with Section 02930.
- E. Furnish backfill in accordance Section 02206.

2.2 EQUIPMENT

- A. Furnish portable tank (minimum 3,000 gal.), as needed to hold water contaminated with volatile organic compounds (VOCs).

- B. Furnish pumps, filters, hoses and other appurtences required to execute work specified in this Section.

- 45 17

PART 3

EXECUTION

3.1 GENERAL

- A. Construct and maintain erosion and sediment control measures as specified in this Section and shown on Construction Drawings. Maintain existing erosion and sediment control facilities and measures in accordance with this Section.
- B. Minimize runoff into disturbed excavation areas by grading the surrounding area away from the disturbed area and/or by constructing temporary diversions as shown on Construction Drawings.
- C. As the excavation progresses, excavate sumps at resulting low points used for water collection of excavation water. Do not penetrate to within 5 feet of the GMA with sump excavations.
- D. Dewater excavations in accordance with the Construction Drawings. Excavation water collected within active excavations and below design grade utility removal shall be pumped to the appropriate sediment control basin as shown on Construction Drawings. Collected water shall be pumped down to a depth of less than one foot remaining in the bottom of the excavation within 3 days of the last rainfall.
- E. The Construction Manager will arrange for sampling and analysis of excavation water present in suspect VOC areas prior to a discharge event. Following sampling and analysis, pump collected VOC-contaminated water to the appropriate treatment and/or disposition.
- F. Plug storm sewers at the excavation boundary prior to removal of storm sewer piping located within the excavation area. Plug storm sewer system in such a manner to minimize water collected in abandoned portions of the system.
- G. Remove erosion and sediment control measures after the disturbed excavation areas are stabilized as specified in Section 02930.

3.2 SILT FENCES

- A. Install silt fence at locations down-gradient of areas to be disturbed until drainage and erosion control structures have been established as shown on the Construction Drawings. Remove and dispose accumulated sediment as specified in Section 02205.
- B. Install breaks and overlaps in silt fence as necessary to allow equipment access to construction areas.

3.3 EROSION CONTROL BLANKETS

- A. Install and maintain erosion control blankets in accordance with manufacturer's recommendations. Install additional staples as necessary to maintain erosion control blankets taut to the ground surface.

45 17

3.4 SEDIMENT BASINS AND DITCHES

- A. Remove accumulated sediment and debris from sediment basins and ditches. In no case shall sediment build up to a depth greater than 10 inches in the sediment basin or to a depth greater than one-half the constructed depth of the ditch.
- B. Dispose of sediment and debris as specified in Section 02205.

3.5 GMA PROTECTION

- A. When possible, limit excavations within 5 feet of the GMA to periods of dry weather.
- B. Slope bench terrace directly above the GMA toward the excavated slope as shown on the Construction Drawings. Grade the bench terrace to a sump for pumping to prevent runoff into the GMA.
- C. Size and locate pumps for sumps along benches above the GMA such that no water within the excavation area shall overflow into the GMA from a 10-yr, 24-hr or lesser storm event. Proposed pump locations and sizes are found in the project-specific surface water management plans (SWMPs). Sump bottoms shall not extend to within 5 feet of the GMA.
- D. For excavations extending to within 5-feet of the GMA elevation shown on the Construction Drawings, maintain less than one foot of standing water in the excavations by pumping excavation water to a sediment basin or an adjacent excavation, as necessary.
- E. Backfill over the GMA in accordance with Section 02206.
- F. In areas where 2 feet of compacted cover has been recently restored following excavation which has extended to within 2 feet of or breached the GMA, pump ponded water from the affected excavation as soon as practical (but within 24 hours or by the direction of the Construction Manager) following a precipitation event.

3.6 PRECERTIFICATION

- A. Pipes that daylight at the excavation face shall be plugged at the excavation face prior to precertification in accordance with Section 02205 and the Construction Drawings.
- B. Install run-on controls along perimeter of precertification boundary, as shown on the Construction Drawings, to prevent surface water from non-certified areas from flowing into precertified areas.
- C. During precertification, direct drainage from precertified areas to the sediment basin. Routing of surface water pump lines must be approved by the Construction Manager.

- D. Maintain surface water management within the area to be precertified in accordance with this Section until precertification is complete.

3.7 INSPECTION

45 17

- A. Inspect erosion and sediment control measures in accordance with Section 02270.
- B. File records of inspections in accordance with Section 02270. In addition, the records of inspection shall include destination of pumping ponded water, estimated quantity of ponded water and corrective action measures, as required. The records of inspection shall indicate if areas are not in compliance or contain a certification that control measures are effective and in compliance with this Section and Section 02270.

END OF SECTION

FLUOR

**Technical Specifications
For
Soil and Disposal Facility Project**

Area 4B Dewatering

**Document 20810-TS-0001
Revision A**

September 2002

PREPARED BY: _____

CHECKED BY: _____

APPROVED BY: _____

**U.S. DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT**

Fluor Fernald
P.O. Box 538704
Cincinnati, OH 45253-8704

000043

U.S. DEPARTMENT OF ENERGY

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Area 4B Dewatering Technical Specifications

Technical specifications contained in this document detail requirements for Area 4B dewatering performed under the Soils and Disposal Facility Project. Technical specifications referenced, but not contained herein, are provided in On-Site Disposal Facility (OSDF) technical specification packages.

TABLE OF CONTENTS

SECTION	TITLE	REV.	DATE
02668	Transfer Lines	A	9/25/02
15060	Pipe, Fittings, Valves, and Accessories	A	9/25/02
15160	Lift Station Pumps	A	9/25/02
16050	Basic Electrical Materials and Methods	A	9/25/02
16170	Grounding and Bonding	A	9/25/02
16370	Overhead Power Distribution	A	9/25/02
16462	Dry Type Transformer/Panel Boards	A	9/25/02

SPECIFICATION REVISION RECORD

Spec. No./Rev.	Description	Approval	Date
02668, Rev.A	Issue for 100% 3B/4B/5 design review	CRN	9/25/02
15060, Rev.A	Issue for 100% 3B/4B/5 design review	CRN	9/25/02
15160, Rev.A	Issue for 100% 3B/4B/5 design review	CRN	9/25/02
16050, Rev.A	Issue for 100% 3B/4B/5 design review	CRN	9/25/02
16170, Rev.A	Issue for 100% 3B/4B/5 design review	CRN	9/25/02
16370, Rev.A	Issue for 100% 3B/4B/5 design review	CRN	9/25/02
16462, Rev.A	Issue for 100% 3B/4B/5 design review	CRN	9/25/02

000044

**SECTION 02668
TRANSFER LINES****PART 1 GENERAL****1.1 SCOPE**

This Section includes, but is not limited to:

- A. High-density polyethylene pipe and fittings for transfer lines.
- B. Tie-in to existing storm sewer system.

1.2 RELATED SECTIONS AND PLANS

- A. Section 02200 - Earthwork.
- B. Section 02215 - Trenching and Backfilling
- C. Section 15060 - Pipe, Fittings, Valves and Accessories.

1.3 REFERENCES

- A. American Society for Nondestructive Testing (ASNT):
 - 1. ASNT-SNT-TC-1A-96 Personnel Qualifications and Certification Recommended Practice, December 1992 Edition.

000045

7103

- 45 17

SOIL EXCAVATION SPEC REV A
Section 02668: Transfer Lines

- B. American Society for Testing and Materials (ASTM) Standards:
 - 1. ASTM D1248-84 (1989)e1 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
 - 2. ASTM D2657-90 Standard Practice for Heat Joining Polyolefin Pipe and Fittings.
 - 3. ASTM D3350-96 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - 4. ASTM F714-97 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

- C. American Water Works Association (AWWA):
 - AWWA C207-94 Steel Pipe Flanges for Waterworks Service.

1.5 SUBMITTALS

- A. Product Data: Provide data on all pipe materials, pipe fittings, accessories, manholes, manhole lids, lift station and the methods and equipment for HDPE fusion welding.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements of this Section.
- C. Submit documentation of training and certification of personnel qualified to perform butt-fusion welding of HDPE pipe and fittings.
- D. Pressure test and examination reports, within 7 calendar days after completion of test or examination.
- E. Nondestructive testing personnel qualifications shall be in accordance with ASNT SNT-TC-1A.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Pipes shall be new material that has not been previously used.
- B. Pipe bedding material shall be in accordance with the Construction Drawings.
- C. Transfer Line and Fittings:
1. Transfer pipe and fittings shall be Iron Pipe Size (IPS), high-density polyethylene (HDPE) PE 3408 pipe, Type III, Class C, Category 5, Grade P34, in accordance with ASTM D1248, with cell classification 345434C in accordance with ASTM D3350, Minimum Pressure Class 150. All piping and fittings shall be of the same material and shall have a Dimension Ratio (DR) as indicated on the Construction Drawings (ASTM F714). Pipe and fittings shall be from the same manufacturer. The manufacturer's name and DR shall be marked on the side of the pipe. Transfer line and fittings shall be of the size indicated on the Construction Drawings.
 2. Mechanical Joints:
 - a. Mechanical joints shall be made using HDPE flange adapters. Provide nipple-end for butt fusion to transfer pipe. Flat-face suitable for use under pressure with flange sealing gasket.
 - b. Metal back-up rings shall be Class D, slip-on type, in accordance with AWWA C207. Back-up rings shall be supplied by the manufacturer or supplier of HDPE pipe.
 - c. Bolts used with back-up rings on mechanical joints shall be semifinished hex head, Type Grade B8, UNC threads.
 - d. Nuts shall be semi-finished regular hex head, Grade 8F, UNC threads.
- D. Marking Tape: Plastic marking tape, color green with metallic strip for locating pipe. Install over all buried pipelines.
- E. Piping and appurtenances shall be as indicated on the Construction Drawings.

PART 3 EXECUTION**3.1 EXAMINATION**

Verify existing conditions, tie-in connection, line size, line type, location, and inverts in area of work. Any discrepancies shall be brought to Construction Manager's attention in a written statement immediately upon discovery.

3.2 PREPARATION

Remove scale and dirt on inside and outside of new pipe and fittings and existing pipe at joints, prior to assembly.

3.3 ERECTION/INSTALLATION/APPLICATION

- A. Install pipe from HDPE to carbon steel transition at the valve boxes and in the transfer line, as indicated on the Construction Drawings.
- B. Sections of pipe with cuts, gouges or scratches on the outside diameter (OD) surface that exceed 10 percent of the wall thickness of the pipe shall be removed completely and rejoin ends of the pipe. The inside diameter (ID) surface shall be free of cuts, gouges and/or scratches.
- C. Join HDPE piping and fittings by butt weld fusion method, in accordance with manufacturer's recommendations and ASTM D2657. Extrusion welding shall only be used where butt-fusion welding cannot be performed and as approved by the Construction Manager. Hot gas welding shall not be used.
- D. Route pipe as shown on Construction Drawings. The minimum bending radius shall be as specified by the pipe manufacturer.
- E. Install transfer line extensions above ground as indicated on the Construction Drawings.

SOIL EXCAVATION SPEC REV A
Section 02668: Transfer Lines

- F. Locate below ground installations as indicated on Construction Drawings.
Trenching and backfilling shall be in accordance with Section 02215.

- G. Testing of HDPE shall be as specified in Section 15060.

END OF SECTION

7/02

4517

SOIL EXCAVATION SPEC REV A
Section 15060: Pipe, Fittings, Valves, and Accessories

**ATTACHMENT A
PIPING MATERIAL DATA SHEETS**

(For HDPE Materials, See Section 02668)

000050

5193

4517

SOIL EXCAVATION SPEC REV A
Section 15060: Pipe, Fittings, Valves, and Accessories

PIPING MATERIAL DATA SHEET				MAT'L CODE (SPEC)	A
				PAGE	1 OF 2
RATING: CLASS 150		CORROSION ALLOWANCE: 0.125"			
FACING: RF		PRESSURE LIMIT: PER ASME/ANSI B16.5			
MATERIAL: CARBON STEEL		TEMPERATURE LIMIT: -20°F TO 750°F			
CODE NUMBER	ENCODER	SIZE FROM TO	DESCRIPTION	NOTES	REV
			<u>PIPE</u>		
		1/2" - 2"	SEAMLESS CARBON STEEL, ASTM A53 GRADE B, EXTRA STRONG, PLAIN ENDS		
		2-1/2" - LARGER	SEAMLESS CARBON STEEL, ASTM A53 GRADE B, STANDARD WEIGHT, BEVELED ENDS		
			<u>FLANGES</u>		
		1/2" - 2"	CLASS 150, CARBON STEEL, RF, ASTM A105, SOCKETWELD (XS BORE)		
		2-1/2" - LARGER	CLASS 150, CARBON STEEL, RFSF, ASTM A105, WELD NECK (STANDARD WEIGHT BORE)		
		1/2" - LARGER	CLASS 150, BLIND, CARBON STEEL, ASTM A105, RFSF		
			<u>FITTINGS</u>		
		1/2" - 2"	CLASS 3000, CARBON STEEL, ASTM A105, SOCKETWELD		
		1/2" - 2"	CLASS 3000, THREADED CARBON STEEL, ASTM A105; THREDOLET CAP	1, 4 1	
			PLUG, ROUNDHEAD PLUG, HEX HEAD	1 4	
		2-1/2" - LARGER	SEAMLESS CARBON STEEL, BUTT WELD ENDS, ASTM A234 GRADE WPB, STANDARD WEIGHT		
			<u>SWAGES</u>		
		1/2" - 8"	SCHEDULE 80 CARBON STEEL, ASTM A234, GRADE WPB, PREPARE ENDS AS REQUIRED (BEVELED, PLAIN OR THREADED)	2	
			<u>GASKETS</u>		
		1/2" - LARGER	TEFLON, 1/8 INCH THICK		
			<u>BOLTING</u>		
			STUD BOLTS WITH 2 HEAVY HEX NUTS, ASTM A193 GRADE B7/ASTM A194 GRADE 2H		

--	--	--	--

PIPING MATERIAL DATA SHEET	<table border="1"> <tr> <td>MAT'L CODE (SPEC)</td> <td style="text-align: center;">A</td> </tr> <tr> <td>PAGE</td> <td style="text-align: center;">2 OF 2</td> </tr> </table>	MAT'L CODE (SPEC)	A	PAGE	2 OF 2
MAT'L CODE (SPEC)	A				
PAGE	2 OF 2				

RATING: CLASS 150
FACING: RF
MATERIAL: CARBON STEEL

CORROSION ALLOWANCE: 0.125"
PRESSURE LIMIT: PER ASME/ANSI B16.5
TEMPERATURE LIMIT: -20°F TO 750°F

CODE NUMBER	ENCODER	SIZE FROM TO	DESCRIPTION	NOTES	REV
			<u>GATE VALVES</u>		
		1/2" - 2"	CLASS 800, CARBON STEEL, ASTM A105, SOCKETWELD ENDS, OS&Y, BOLTED BONNET, SOLID WEDGE, 12% CR TRIM.	5	
		2-1/2"- LARGER	CLASS 150, CAST STEEL, ASTM A216, GRADE WCB, RF FLANGE, 11-13 CR TRIM, OS&Y.	5	
			<u>BALL VALVES</u>		
		1/2" - 2"	1500 PSI WOG, CARBON STEEL, ASTM A216 GRADE WCB, THREE PIECE, SOCKETWELD, CHROMIUM PLATED BALL, TFE SEATS, LEVER OPERATOR, APOLLO 83-600 SERIES OR EQUAL	5	
		2-1/2" - 4"	CLASS 150, CARBON STEEL, ASTM A216, GRADE WCB, RFSF FLANGE, CHROME PLATED BALL, TFE SEATS, WRENCH OPERATOR, APOLLO 88-200 SERIES OR EQUAL.	5	
		6" - LARGER	CLASS 150, CARBON STEEL, ASTM A216, GRADE WCB, RFSF FLANGE, CHROME PLATED BALL, TFE SEATS, GEAR OPERATOR, APOLLO 88-200 SERIES OR EQUAL.	5	
			<u>CHECK VALVES</u>		
		2-1/2" - LARGER	CLASS 150, CAST STEEL, ASTM A216, GRADE WCB, RF, FLANGE, CHROME TRIM, BOLTED COVER, SWING TYPE, LUNKENHEIMER FIG. 1572 OR EQUAL	3	
			<u>PIPE NIPPLES</u>		
			CARBON STEEL, ASTM A53, GRADE B		
		1/2" - 2"	SCH 160, TBE, SMLS 3" LONG		
		1/2" - 2"	SCH 160, TBE, SMLS 6" LONG		
		1/2" - 2"	SCH 160, POE-TOE, SMLS 3" LONG		
		1/2" - 2"	SCH 160, POE-TOE, SMLS 6" LONG		
			<u>NOTES</u>		
			1. USE FOR UNVALVED VENTS AND DRAINS.		
			2. USE SWAGES WHERE SMALL END IS 2" AND SMALLER. USE WELD REDUCER WHERE SMALL END IS 2-1/2" AND LARGER.		
			3. INSTALL IN HORIZONTAL POSITION OR WITH FLOW UP.		
			4. USE FOR PROCESS DRAINS.		
			5. EQUIP VALVE WITH LOCKING DEVICE WITH NOT LESS THAN 3/8" DIAMETER HOLE FOR LOCK.		

000053

SECTION 15060
PIPE, FITTINGS, VALVES, AND ACCESSORIES

PART 1 GENERAL

1.1 SCOPE

This Section includes, but is not limited to:

- A. Metal Pipe for Transfer Lines and Lift Stations.
- B. Fabricated piping assemblies.
- C. Fittings.
- D. Valves.
- E. Specialty items.

1.2 RELATED SECTIONS AND PLANS

- A. Section 02215 – Trenching and Backfilling.
- B. Section 02668 - Transfer Lines.

1.3 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 - 1. ASME A13.1-81 Scheme for the Identification of Piping Systems (R1993).

SOIL EXCAVATION SPEC REV A
Section 15060: Pipe, Fittings, Valves, and Accessories

2. ASME B16.5-88 Pipe Flanges and Flanged
1992 Addenda Fittings.
 3. ASME B31.3-96 Process Piping.
- B. American Society for Nondestructive Testing (ASNT):
1. ASNT-SNT-TC-1A-92 Personnel Qualifications and Certification
Recommended Practice, December 1992
Edition.
- C. American Society for Testing and Materials (ASTM):
1. ASTM-A53-96 Standard Specification for
Pipe, Steel, Black and Hot-Dipped, Zinc-
Coated, Welded and Seamless.
 2. ASTM-A105/
A105M-96 Standard Specification for
Carbon Steel Forgings for Piping
Applications.
 3. ASTM A193/
A193M-Rev. A-96 Standard Specification for
Alloy-Steel and Stainless Steel Bolting
Materials for High-Temperature Service.
 4. ASTM-A194/
A194M-96 Standard Specification for
Carbon and Alloy Steel Nuts for Bolts for
High-Pressure and High-Temperature
Service.
 5. ASTM-A216/
A216M-93 Standard Specification for
Steel Castings, Carbon, Suitable for Fusion
Welding, for High Temperature Service.
 6. ASTM-A234/
A234M Rev. A-96 Standard Specification for
Piping Fittings of Wrought Carbon Steel and
Alloy Steel for Moderate and Elevated
Temperatures.
- D. American Water Works Association (AWWA)
1. AWWA C207-94 Steel Pipe Flanges for Waterworks Service.

SOIL EXCAVATION SPEC REV A
Section 15060: Pipe, Fittings, Valves, and Accessories

- E. American Welding Society (AWS):
1. AWS A5.1-91 Carbon Steel Electrodes for Shielded Metal Arc Welding.

1.4 SUBMITTALS

- A. Submit product data for pipe, fittings, valves, and accessories.
- B. Submit shop drawings for shop-fabricated piping assemblies, including spool piece drawings.
- C. Submit installation, maintenance, and operation instruction manuals for valves and accessories.
- D. Submit certificates of conformance that material and equipment meet specification requirements.
- E. Submit test procedures for required pressure and flow testing. Test procedures shall include criteria for acceptable performance.
- F. Submit procedures for repair or replacement of piping failing tests and/or examination.
- G. Submit pressure and flow test and examination reports.
- H. Submit welder and examiner qualifications, procedure qualification records, and welding procedure specifications.

1.5 QUALITY ASSURANCE

- A. Except where more stringent requirements are specified or indicated, the work specified herein shall conform to ASME B31.3.
- B. Welding Procedures and Qualifications

SOIL EXCAVATION SPEC REV A
Section 15060: Pipe, Fittings, Valves, and Accessories

1. Fabrication, assembly, and erection shall be in accordance with ASME B31.3.
2. Welder qualifications shall be made available to, and approved by, the Construction Manager.
3. Nondestructive testing personnel qualifications shall be in accordance with ASNT SNT-TC-1A.

C. Inspection, Examination, and Testing

1. Inspection, examination, and testing shall be in accordance with ASME B31.3.
2. The Construction Manager shall be given advance written notification prior to any testing.
3. A written report of the examination and testing shall be submitted to the Construction Manager following the successful completion of examination and testing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging

1. Materials shall be cleaned to remove chips, slag, weld spatter, oil, grease, debris, and other foreign material prior to packaging for shipment. Openings shall be covered, capped, or plugged to prevent damage and the ingress of foreign materials during shipment and storage. Tape alone shall not be used for sealing openings.

B. Storage and Handling

1. Piping materials and prefabricated assemblies shall be stored off the ground and handled with care so that physical damage, contamination, or abrasion of the piping materials does not occur. End seals of pipe, flange covers, valve covers, and similar protection shall not be removed until necessary for cleaning, fabrication, inspection, and erection.
2. Welding rods and electrodes shall be stored, handled, and identified to ensure the use of the proper welding rod. Electrode ovens for the storage of low-hydrogen welding rods shall be used.

PART 2 PRODUCTS**2.1 PRODUCTS/EQUIPMENT**

- A. Piping and Valve Specification
1. Piping materials and valves shall meet the requirements indicated on the piping material data sheets in Attachment A.
 2. For HDPE underground piping, see Section 02668.
 3. Provide one spare valve for each size and type installed.
 4. Schedule 40, Carbon Steel, 24-inch diameter, .200-slotted screen pipe for Lift Stations.
- B. Steel flanges shall conform to AWWA C207.

2.2 LABELING

- A. Valve Identification
1. Each valve shall be identified with the unique valve number and description, as shown on the P&IDs.
 2. The tag shall not be attached to any part of the valve which may interfere with valve operation.
 3. Label size shall be based on using 1/2-inch letters.
 4. Labels shall be constructed of nonreflective corrosion-resistant materials, with good contrast and legibility.
- B. Pipe Identification
1. Identify the flow medium and the flow direction for piping systems by labeling adjacent to each valve, adjacent to abrupt pipe directional change, and at intervals of 50 feet along exposed pipe. Pipes shall be labeled as indicated on the P&IDs and in accordance with ASME A13.1.
- C. Product Marking
1. Piping materials shall be marked in accordance with the applicable ASTM

specification.

2. Welding rod and electrode packages shall be marked in accordance with AWS A5.1.
3. Welding rods and electrodes shall be identified in accordance with AWS A5.1. In addition, welding rods 1/8-inch diameter and over shall be marked or stamped with positive identification marks at intervals of not more than 18 inches. Such marks shall include the classification number of the welding rod and the trade designation of the manufacturer.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

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

3.2 PREPARATION

- A. Primer Application
 1. Carbon steel piping, with the exception of 24-inch diameter piping for Lift Stations, shall be prime coated per AWWA C203.
- B. Trenching and pipe bedding shall be in accordance with Section 02215 and as shown on the Construction Drawings.

3.3 ERECTION/INSTALLATION

- A. Layout, Cutting, and Fitting Up
 1. Piping shall be Category D fluid service under ASME B31.3.
 2. Assembled piping shall be installed without springing, forcing, or cold bending. Cutting or otherwise weakening structural members to facilitate piping installation shall not be permitted.
 3. Install valves with stems upright or horizontal, not inverted.
 4. Slope field-routed piping and tubing, and arrange to drain at all low points.

SOIL EXCAVATION SPEC REV A
Section 15060: Pipe, Fittings, Valves, and Accessories

B. Welding

1. Welding electrodes shall be in accordance with AWS A5.1.
2. Socketwelds shall be made by shielded metal arc or gas tungsten arc welding process.
3. Socketweld joints shall be assembled so that the space between the end of the pipe and the bottom of the socket is no less than 1/16 inch or no more than 1/8 inch.
4. Field welding shall be minimized through maximum use of shop-fabricated piping assemblies.
5. Arc strikes and weld starts shall not be made on the base metal outside the weld groove nor inside an area which will be encompassed by a fillet or socket weld. Inadvertent arc strikes outside a weld zone shall be removed by grinding or filing, and the arc strike area shall be visually examined under 5X magnification.

C. Flanged Joints

1. The mating surfaces of the flanges shall be in a plane that is perpendicular to the axis of the pipe. Flanges shall be rotated so that the bolt holes straddle the vertical flange centerline. Gaskets shall be evenly centered between the flange faces with ring-type gaskets engaging fully upon raised-face flanges. Flanges shall mate flush and the bolts shall be tightened uniformly to draw the flanges evenly and firmly upon the gasket. Bolts shall be torqued within the flange manufacturer's recommended range and tightening sequence.
2. Full-faced flanges and full-face gaskets shall be used.
3. Flanged joints shall be made with new gasket and bolting materials. Bolts and nuts damaged during installation shall be replaced.

- D. Install temporary Lift Stations and ultimately convert to permanent Lift Stations in accordance with sequence on Construction Drawings.

3.4 QUALITY CONTROL

A. Hydrostatic Testing

SOIL EXCAVATION SPEC REV A
Section 15060: Pipe, Fittings, Valves, and Accessories

1. Piping systems shall be hydrostatically leak tested in accordance with ASME B31.3, Chapter VI.
2. Pressure vessels, equipment, and instruments shall not be included in these tests if they will be damaged by the test pressure.
3. Equipment which is not to be subjected to the pressure test shall be disconnected from the piping and a pipe spool inserted in its place, or the equipment may be isolated by way of a single-line blind. Valves may be used provided that the valve is suitable for the proposed test procedure.
4. Hydrostatic test pressures shall be 1.5 times the design pressure, as directed by the Construction Manager.
5. The piping system shall be examined prior to leak testing to ensure that connections are tight.
6. Test pressure gauges shall be calibrated no more than 90 days prior to the hydrostatic leak test. Gauges shall be selected so that the test pressures are at the mid-range of the gauge. Documentation shall be maintained and made available showing reliability of calibrated equipment.
7. Every precaution shall be taken during testing to ensure personnel safety.
8. Pressure gauges shall not be subjected to pressure in excess of their scale range.
9. Control valves (unless being tested) shall be set and maintained in the full OPEN position.
10. Lines containing check valves shall have the pressure applied upstream of the check valve so that pressure is applied under the seat.
11. Joints found to be defective shall be repaired and retested. Retest pressures shall be the same as those originally specified for the test.
12. Hydrostatic test pressures shall not be applied until the piping system and the testing medium have reached thermal equilibrium.
13. High-point vents and low-point drains shall be provided for hydrostatic tests.

END OF SECTION

— 45 17

**SECTION 15160
LIFT STATION PUMPS**

PART 1 GENERAL

1.1 SCOPE

This Section includes, but is not limited to:

- A. Electric driven submersible pumps with float control.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI HI11.6 Standard for Submersible Pumps.

1.4 SUBMITTALS

- A. Submit certified pump curves showing performance characteristics with pump and system operating point plotted, including minimum and maximum flow.
- B. Submit completed pump data sheets.
- C. Submit certificates of conformance to specification requirements and certificates guaranteeing performance at design point.
- D. Submit an Installation, Operation, and Maintenance Manual:
 - 1. The pump manufacturer shall supply a complete set of comprehensive

written instructions to enable an operator to properly operate and maintain the equipment supplied. Content of the instructions shall assume the operator is familiar with pumps, motors, piping, and valves, but that the operator has not previously operated nor maintained the exact equipment supplied.

- 2. The instructions shall be prepared as a system manual applicable solely to the pump equipment and related devices supplied by the manufacturer, as specified herein.
- 3. The instructions shall include, but not be limited to, the following:
 - a. Descriptions of, and operating instructions for, each major component of the complete pump package as supplied.
 - b. Instructions on operation of the pump and pump controls in intended modes of operation.
 - c. Instruction for adjustments which must be performed at initial start-up of pump equipment, adjustments required after the replacement of liquid level control system components, and adjustments as required in the course of preventative maintenance as specified by the manufacturer.
 - d. Service instructions for major components not manufactured by the pump package manufacturer, but supplied by the manufacturer in accordance with the specifications. In such case, the literature supplied by the actual manufacturer shall be incorporated as appendices.
 - e. Electrical schematic diagram of the pump and control package.
 - f. Layout drawings of the pump package as supplied showing the location of submersible pumps, baseplates, and guide assemblies. Drawings shall provide necessary information to ensure proper installation and alignment of the guides and baseplate to the pump.

E. Submit test procedures and test results.

1.5 QUALITY ASSURANCE

A. Tests will be witnessed by the Construction Manager. Provide testing procedures fifteen (15) days prior to the test.

7104
1.6

45 17

DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry place and protect from weather prior to shipment. Provide protection from weather and from damage during transit.
- B. Loose items shall be tagged and delivered in standard commercial package(s). The package(s) shall be protected from the weather, from climate conditions including temperature and humidity variations, and from dirt, dust, and other contaminants that could adversely affect assembly and operation.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Gorman-Rupp Company.

2.2 PUMPS

- A. See Attachment A - Pump Data Sheets. Written exception shall be taken to any requirements proposed pump-motor combination does not meet.
- B. Motors shall meet applicable NEMA Standards, including NEMA MG 1-93.

2.3 LABELING

- A. Equipment identification: Pumps shall be provided with a permanently attached stainless steel nameplate indicating equipment name, number, model number, and rated capacity. Lettering shall be manufacturer's standard size and shall be stamped.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

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

3.2 ERECTION/INSTALLATION/APPLICATION

- A. The installation of the equipment shall be in accordance with the manufacturer's installation manual.
- B. A copy of the manufacturer's installation and service manual for each piece of the equipment shall be available at the site.

3.3 QUALITY CONTROL

- A. Tests: Acceptance operating tests shall be performed after installation. If the results are unsatisfactory, adjust or replace the equipment to meet the specification requirements and retest the equipment.
- B. Inspection: Notify the Construction Manager of testing and inspection activities at least 24 hours prior to the start of all tests and/or inspections.
- C. Testing shall not start until the testing procedure has been approved by the Construction Manager.
- D. Demonstrate the ability to meet operating point as shown on the pump curve. Vibration shall be within the manufacturer's acceptable range.

3.4 MANUFACTURER ASSISTANCE

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

END OF SECTION

45 17

**ATTACHMENT A
PUMP DATA SHEETS**

000066

PUMP DATA SHEET										
PROJECT TITLE: Soil Remediation Area 4B							TASK ORDER:			
PUMP NAME: Basin 4B1 Pump							QUANTITY: 1 + spare			
TYPE PUMP: Submersible centrifugal							DRAWING NUMBER 99X-5500-G-00683			
TYPE DRIVER: Submersible electric motor		SUPPLY W/PUMP		X YES		NO				
MANUFACTURER AND MODEL NO.: Gorman-Rupp Model S4F-E20					EQUIP NO.: PMP-1 & include name for spare					
OPERATING CONDITIONS										
FLUID PUMPED: STORMWATER				AT A PUMPING TEMPERATURE OF:				60		°F
SPECIFIC GRAVITY: 1.0		AT 60°F		AT P.T.		VISCOSITY: 1.1		AT P.T.		
SOLIDS IN FLUID: 1-5		WT%		DENSITY: NA		SIZE: ≤1/2" dia.		ABRASIVE: NO		
NATURE OF SOLIDS: NA						FLUID VAPOR PRESSURE:		FT. of FLUID @ P.T.		
DESIGN CAPACITY: 570		GPM AT 72		FT. TH at P.T.		DESIRED RANGE: 500 GPM TO 650 GPM				
SUCTION PRESS: NA		FT.		PSIG		DISCHARGE PRESS: FT.		PSIG		NPSH AVAIL: NA
PUMP SPECIFICATIONS										
TYPE PUMP: Centrifugal, direct-connected						NO. STAGES: 1		RPM: 3450		
TYPE IMPELLER: Open						SIZE: IN.		MAX SIZE: IN.		
EFFICIENCY AT DESIGN CAPACITY: (min)%				BHP @ DESIGN CAPACITY:		MAXIMUM BHP: 20				
TYPE BEARINGS: Oil-lubricated, anti-friction										
TYPE COUPLING:						LUBRICATION:				
TYPE OF SEAL: Double Mechanical										
CONNECTIONS - SIZE & RATING										
SUCTION: IN.			LB.			Flange			DISCHARGE: 4 IN. Class 125 Flange	
VENT: IN.			LB.			DRAIN: IN.				
CONSTRUCTION MATERIALS										
RESTRICTIONS:										
CASING: Aluminum Alloy					IMPELLER: Ductile Iron					
SHAFT: Stainless steel					SHAFT SLEEVE: Stainless steel					
CASE RING:					IMP. RING:					
DISCHARGE ELBOW: Aluminum Alloy					RELIEF VALVE:					
ELECTRIC MOTOR										
VOLTS	PHASE	HERTZ	H.P.	NON-OVERLOAD	CLASS	GROUP	RPM	TYPE		
460	3	60		YES						
REMARKS: 1) Vendor shall complete data sheet as required. 2) Provide one set of recommended pump spare parts. 3) Provide float type level switches										

000067

45 17

PUMP DATA SHEET

PROJECT TITLE: Soil Remediation Area 4B						TASK ORDER			
PUMP NAME: Basin 4B2 Pump						QUANTITY: 1 + 1 spare			
TYPE PUMP: Submersible centrifugal						DRAWING NUMBER 99X-5500-G-000683			
TYPE DRIVER: Submersible electric motor		SUPPLY W/PUMP		X YES		NO			
MANUFACTURER AND MODEL NO.: Gorman-Rupp Model S3A						EQUIP NO.: PMP-2 & include name for spare			
OPERATING CONDITIONS									
FLUID PUMPED: STORMWATER						AT A PUMPING TEMPERATURE OF:		60 °F	
SPECIFIC GRAVITY: 1.0 AT 60°F		AT P.T.		VISCOSITY: 1.1		AT P.T.			
SOLIDS IN FLUID: 1-5 WT%		DENSITY: NA		SIZE: ≤1/2" dia.		ABRASIVE: NO			
NATURE OF SOLIDS: NA				FLUID VAPOR PRESSURE:		FT. of FLUID @ P.T.			
DESIGN CAPACITY: 233 GPM AT 36 FT. TH at P.T.		DESIRED RANGE: 230 GPM TO 260 GPM							
SUCTION PRESS: NA FT. PSIG		DISCHARGE PRESS: FT. PSIG		NPSH AVAIL: NA					
PUMP SPECIFICATIONS									
TYPE PUMP: Centrifugal, direct-connected						NO. STAGES: 1		RPM: 3450	
TYPE IMPELLER: Open						SIZE: IN.		MAX SIZE: IN.	
EFFICIENCY AT DESIGN CAPACITY: (min)%				BHP @ DESIGN CAPACITY:		MAXIMUM BHP: 5			
TYPE BEARINGS: Oil-lubricated, anti-friction									
TYPE COUPLING:						LUBRICATION:			
TYPE OF SEAL: Double Mechanical									
CONNECTIONS - SIZE & RATING									
SUCTION: IN. LB.		Flange		DISCHARGE: 3 IN. Class 125 NPT					
VENT: IN. LB.				DRAIN: IN.					
CONSTRUCTION MATERIAL									
RESTRICTIONS:									
CASING: Aluminum Alloy				IMPELLER: Ductile Iron					
SHAFT: Stainless steel				SHAFT SLEEVE: Stainless steel					
CASE RING:				IMP. RING:					
DISCHARGE ELBOW: Aluminum Alloy				RELIEF VALVE:					
ELECTRIC MOTOR									
VOLTS	PHASE	HERTZ	H.P.	NON-OVERLOAD	CLASS	GROUP	RPM	TYPE	
230	1	60		YES					
REMARKS: 1) Vendor shall complete data sheet as required. 2) Provide one set of recommended pump spare parts. 3) Provide float type level switches									

000068

15160

09/27/02

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Combination magnetic motor starters.
- B. Selector switches.
- C. Receptacles.
- D. Conduit.
- E. Wire and cable.
- F. Instrument cable.
- G. Nameplates.
- H. Wire markers and cable tags.
- I. Wireway and auxiliary gutters.
- J. Splicing and termination components.
- K. Boxes.
- L. Cabinets.
- M. Supporting Devices.

- N. Underground Warning Tape.
- O. Electrical Testing, General.

1.2 RELATED SECTIONS

- A. Section 02200 - Earthwork.
- B. Section 15160 - Lift Station Pumps.
- C. Section 16170 - Grounding and Bonding.
- D. Section 16370 - Overhead Power Distribution.
- E. Section 16462 - Dry Type Transformers/Panelboards.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI C80.1-90 Rigid Steel Conduit-Zinc Coated.
- B. InterNational Electrical Testing Association (NETA):
 - 1. NETA ATS-95 Acceptance Testing Specification for Electrical Power Distribution Equipment.
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code, 1999 Edition.
- D. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA AB 1-93 Molded Case Circuit Breakers and Molded Case Switches.
 - 2. NEMA ICS 1-93 Industrial Control and Systems General Requirements.
 - 3. NEMA ICS 2-93 Industrial Control and System Controllers,

SOIL EXCAVATION SPEC REV A
Section 16050: Basic Electrical Materials and Methods

Contractors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC.

- 4. NEMA ICS 4-93 Industrial Control and Systems Terminal Blocks.
- 5. NEMA ICS 6-93 Industrial Control and Systems Enclosures.
- 6. NEMA OS 1-89 Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- 7. NEMA WD 1-83 General Requirements for Wiring Devices.
- 8. NEMA WD 6-88 Wiring Devices - Dimensional Requirements.
- 9. NEMA 250-91 Enclosures for Electrical Equipment (1,000 Volts Maximum).

E. Underwriters Laboratories Inc. (UL):

- 1. UL 360-96 UL Standard for Safety Liquid-Tight Flexible Steel Conduit.
- 2. UL 486A-91 UL Standard for Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- 3. UL 510-94 UL Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
- 4. UL 854-96 Service-Entrance Cables.
- 5. UL 870-95 UL Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings.
- 6. Electrical Construction Materials Directory - 98.

1.5 SUBMITTALS

A. Provide submittals for equipment, hardware, materials, conduit and wire. Unless specified otherwise, submittals shall be made to the Construction Manager for review and approval.

1.6 QUALITY ASSURANCE PROGRAM

- A. Work shall comply with NFPA 70. Use of conduit for equipment ground is prohibited.
- B. Products shall be listed in the UL Electrical Construction Materials Directory, for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 EQUIPMENT

- A. Combination Magnetic Motor Starters
 - 1. Combination Magnetic Motor Starters: NEMA ICS 1, NEMA ICS 2, AC general purpose Class A magnetic starter for induction motors for the rated horsepower combined with a magnetic circuit breaker, NEMA AB 1, with instantaneous magnetic trip in each pole. Starter, circuit breaker, and control power transformer shall be in a common enclosure. Terminals, minimum 75 degrees C rated.
 - 2. Provide externally operable handle interlocked to prevent opening of cover with circuit breaker in the ON position. Allow handle to be lockable in the OFF position.
 - 3. Contactor Coil Operating Voltage: 120 V, 60 Hz.
 - 4. Overload Relay: NEMA ICS 2, bimetal.
 - 5. Control Power Transformer: 120 V secondary, 50 VA minimum. Provide fused primary and secondary of transformer, and ground unfused leg of secondary to enclosure.
 - 6. Enclosure: NEMA ICS 6, Type 4X, outdoor.
 - 7. Heater elements shall be included, as required, for the described service conditions.
 - 8. Two auxiliary contacts (electrically dry), one each, normally closed and normally open, in addition to the hold-in contact, shall be provided.
- B. Selector Switches
 - 1. Enclosure, NEMA ICS 6, Type 4.

SOIL EXCAVATION SPEC REV A
Section 16050: Basic Electrical Materials and Methods

2. Two-position, maintained contact (start/stop), as indicated.
3. Three-position, maintained contact (hand/off/auto or local/off/remote), as indicated.

C. Receptacles

1. Convenience Receptacle: 125 V, 15/20 A, NEMA WD 1, heavy-duty, general use with metal cover plate; conforming to NEMA WD 6, Configuration 5-20. 125 V, 30 A, NEMA WD 1, heavy-duty, general use with metal cover plate; conforming to NEMA WD 6, Configuration 5-30. Furnish with weatherproof "while in use" covers for outdoors, wet or industrial locations.
2. Convenience receptacles in potentially wet environments, in addition to those required by NFPA 70, shall be GFCI type for personnel protection with covers to protect the receptacle from water during usage.

D. Cabinets

1. Boxes: Galvanized steel with removable endwalls.
2. Box Size: As indicated on construction drawings.
3. Fronts: Steel, surface type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
4. Knockouts: Provide as required for conduits indicated plus 25 percent spare.
5. Provide metal barriers to form separate compartments wiring of different systems and voltages.
6. Provide accessory feet for free-standing equipment.
7. Terminal Blocks: NEMA ICS 4.
 - a. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
 - b. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
8. Provide ground bus and ground terminal block, each connector bonded to enclosure.
9. Provide plastic channel with hinged or snap-on covers for internal wiring raceway.

2.2 MATERIALS

A. Conduit

1. Rigid steel, heavy wall, galvanized conduit conforming to ANSI C80.1. Rigid steel intermediate metal conduit (IMC) shall be acceptable for interior spaces. Conduit shall be 1/2 inch diameter minimum.
2. Liquid-tight flexible metal conduit conforming to UL 360. Conduit shall be 1/2 inch diameter minimum, 5 feet in length (maximum) unless indicated on construction drawings.
3. Conduit connections shall be threaded.

B. Wire and Cable

1. Single conductor, 600 volt insulated copper conductor, unless indicated otherwise. Conductors for power and lighting branch circuits shall not be smaller than No. 12 AWG. Conductors No. 12 AWG and larger shall be stranded. Conductors for control shall not be smaller than No. 14 AWG stranded. Conductors for Class 1 remote-control and signal circuits shall be enclosed in cable and shall comply with NFPA 70. Power and lighting conductor insulation shall be Type THW, XHHW, or THWN. Conductors required to be rated 90 degrees C in accordance with NFPA 70 shall be insulation Type XHHW-2 or THW-2. Direct burial cable shall be type USE, conforming to UL 854.

C. Instrument Cable

1. Instrumentation cable shall be No. 16 AWG stranded tinned copper conductors. Conductors shall be polyethylene insulated and rated 600 volts, 60 degrees C. Conductors shall be twisted with aluminum-polymer shield; No. 18 AWG stranded, tinned copper drain wire. Cable shall have overall-chrome gray FR-PVC jacket.

D. Nameplates

1. Nameplates shall be engraved, three-layer laminated plastic, 5/16-inch bold style, black letters on white background.

E. Wire Markers and Cable Tags

SOIL EXCAVATION SPEC REV A
Section 16050: Basic Electrical Materials and Methods

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

F. Wireway and Auxiliary Gutters

- 1. Wireway and Auxiliary Gutters: General purpose, NEMA ICS 6, Type 3R enclosure with knockouts on bottom.
- 2. Size: As required.
- 3. Cover: Screw cover with full gasketing.
- 4. Fittings: UL 870, lay-in type with removable top, bottom, and side; captive screws.
- 5. Material: Carbon steel.
- 6. Finish: Rust-inhibiting primer coating with gray enamel finish.

G. Splicing and Termination Components

- 1. Wire connectors, UL 486A, as applicable.
- 2. Insulation tape, UL 510.
- 3. Provide solderless terminal lugs, rated 75 degrees C minimum, on stranded conductors.

H. Boxes and Cover Plates

- 1. Junction and Pull Boxes
 - a. Junction and pull boxes shall be sized as indicated in accordance with NFPA 70, Article 370.
 - b. Junction and pull boxes located indoors shall be code-gauge, galvanized sheet steel and shall be of welded construction with conduit knockouts or raceway openings and hinged or screwed covers as indicated. Type 3R, according to NEMA 250.
 - c. Junction and pull boxes located outdoors shall have screwed, gasketed covers, and watertight hubs. Type 3R, according to NEMA 250.

2. Device and Outlet Boxes
 - a. Device and outlet boxes shall be pressed steel, zinc, or cadmium coated in accordance with NEMA OS 1 unless otherwise indicated.
 - b. Outlet boxes shall not be smaller than 4 inches octagonal by 1-1/2 inches deep and shall be provided with the proper size knockouts for the conduits intended. Unused knockouts shall remain closed or shall be sealed with knockout closures.
 - c. Device or outlet boxes shall be of unit construction of a size required for the number of switches or outlets called for on the construction drawings. No sectional device boxes shall be permitted.
 - d. Surface-mounted outlet boxes for receptacles, switches, or similar devices shall be cast type.

I. Supporting Devices

1. Support Channel shall be galvanized or painted steel.
2. Support hardware and accessories shall be corrosion resistant.
3. Supports shall be of all-welded construction.

J. Underground Warning Tape

1. 4-inch-wide plastic tape, colored yellow with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 SITE CONDITIONS

- A. Ensure site is ready to receive work before start of construction.

3.2 ERECTION/INSTALLATION/APPLICATION

A. Conduit

1. Route conduit parallel or at right angles to building lines. Provide conduit supports at approximately 8-foot intervals. Route conduit so as not to create a hazard for tripping or to compromise head clearance. Minimum height above floor shall be 7 feet, 6 inches.

SOIL EXCAVATION SPEC REV A
Section 16050: Basic Electrical Materials and Methods

2. Cut conduit square using saw or pipecutter. Cut ends of conduit shall be reamed smooth.
3. Install no more than the equivalent of three 90 degree bends between junction boxes. Use hydraulic one-shot conduit bender or factory elbows for conduit diameter larger than 1-1/2 inch.
4. Use Form 8 conduit bodies to make sharp changes in direction. Avoid moisture traps, provide junction box with weep hole.
5. Provide cast metal boxes such as FS or FD in damp or wet locations.
6. Provide 1/8-inch nylon pull cord in empty conduits. Cap empty conduits to prevent entry of moisture and foreign objects.
7. Final conduit connections to motors or other vibrating equipment shall be made with approximately 3-foot liquid-tight flexible metal conduit.
8. Conduit and supports are to be field routed. They are not indicated explicitly on construction drawings.

B. Wire and Cable

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

480Y/277V	Phase A	Yellow
	Phase B	Orange
	Phase C	Brown
	Neutral (grounded)	Gray

SOIL EXCAVATION SPEC REV A
Section 16050: Basic Electrical Materials and Methods

	Ground	Green
208Y/120V	Phase A	Black
	Phase B	Red
	Phase C	Blue
	Neutral (grounded)	White
	Ground	Green
	Plant Fire	Red and Yellow
	Alarm System	Brown and Yellow

C. Nameplates

1. Clean surfaces prior to installing nameplates.
2. Install nameplates parallel to equipment lines. Secure nameplates to equipment fronts using self-tapping screws.

D. Wire and Cable Markers

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

E. Disconnect Switches

1. Mounting supports shall not be fastened to or penetrate wall panels.

F. Receptacles

1. Install convenience receptacles as indicated on construction drawings.
2. Label receptacles with panelboard and circuit number from which they are served.

G. Combination Magnetic Motor Starters

1. Install motor controllers where indicated on construction drawings.
2. Install motor controller with center line of disconnect operator 54 inches above grade.
3. Install overload heater element in motor controller to match motor characteristics.
4. Provide engraved nameplate identifying motor served.

SOIL EXCAVATION SPEC REV A
Section 16050: Basic Electrical Materials and Methods

H. Selector Switches

1. Mount selector switches at a mounting height of 54 inches above grade adjacent to the equipment controlled.

I. Clearances

1. Clearances from points of access to electrical equipment and other devices shall conform to the requirements of NFPA 70.
2. Equipment control devices and other electrical equipment requiring operation or maintenance shall have a minimum working clearance of 3 feet from the surface of operation or access, unless greater clearance is required by NFPA 70.

J. Boxes

1. Coordination of Box Locations

- a. Provide electrical boxes as indicated and as required for splices, taps, wire pulling, and equipment connections.
- b. Electrical box locations indicated are approximate unless dimensioned.
- c. Locate and install boxes to allow access.
- d. Do not install boxes back to back in walls. Provide 6-inches (minimum) separation in non-acoustic rated walls and 24 inches (minimum) separation in acoustic rated walls.
- e. Coordinate mounting heights of boxes and locations of outlets mounted above counters, benches, and backsplashes to ensure locations are useful.
- f. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

2. Outlet Box Installation

- a. Firmly secure in place outlet or utility boxes concealed in the construction. Set outlet or utility boxes true, square, and flush with the finish surfaces for the application of the appropriate cover plate.
- b. Provide knockout closures for unused knockout openings.
- c. Support boxes independently of conduit except for cast boxes

SOIL EXCAVATION SPEC REV A
Section 16050: Basic Electrical Materials and Methods

when connected to two rigid metal conduits, both supported within 12 inches of the box to be supported.

- d. Use multiple gang boxes where more than one device is mounted together. Do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

3. Pull and Junction Box Installation

- a. Support pull and junction boxes independently of conduit.

K. Cabinets

- 1. Install cabinet fronts plumb.

L. Supporting Devices

- 1. Installation of structural steel framing, concrete pads, etc., shall be complete before installing supporting devices.
- 2. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structures in accordance with manufacturer's recommendations as indicated.
- 3. Use expansion anchors for support on concrete surfaces.
- 4. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- 5. Do not drill structural steel members for installing support devices.
- 6. Fabricate supports from structural steel or steel channel. Rigidly bolt to structural steel to present a neat appearance. Use hexagon head bolts with spring lock washers under nuts.
- 7. Install freestanding electrical equipment on concrete pads.
- 8. Install surface mounted cabinets and enclosures with four anchors (minimum). Provide steel channel supports to stand cabinets and enclosures 1 inch from the wall.

3.3 QUALITY CONTROL

A. Electrical Inspection and Testing - General

- 1. Electrical inspection and testing for work in this section and in other electrical sections shall conform to the following requirements and to NETA ATS. Tests required by NETA ATS for electrical work on this

SOIL EXCAVATION SPEC REV A
Section 16050: Basic Electrical Materials and Methods

project shall be performed unless specific instruction is provided otherwise. Any additional requirements or exceptions shall be as noted in the other electrical sections for the specific electrical work of that section only.

2. Testing shall be witnessed by Fluor Fernald, CQC Consultant-Quality Control personnel (who must approve results) and manufacturer's service representative(s), if required. Notice of testing must be furnished 7 days in advance.
3. Submit test results and calibration data on approved forms.
4. Perform operational tests to demonstrate control and interlocking wiring.
5. Visual inspections shall be performed for phasing and connections. Phasing shall be A, B, C clockwise at all three phase disconnects.
6. Repair or replacement of components where test results are unacceptable, including those damaged during testing process, is required.

B. Electrical Inspection and Testing - This Section

1. Perform continuity and operation tests on power and control circuits. Low voltage thermographic survey of cable connections required by NETA ATS are not required. Wire insulation for conductors No. 6 AWG and larger shall be megger tested between each conductor and ground. A 1000-volt megger shall be used for insulation rated 600 volts. Minimum resistance shall be 100 megohms.
2. Insulation resistance tests shall not be performed on solid state equipment unless authorized by its manufacturer and in strict accordance with the manufacturer's recommendations. Solid state equipment includes static ground fault devices, such as ground fault circuit interrupters.
3. Confirm that electrical connections to utilization equipment have been made in accordance with manufacturer's instructions.
4. Perform motor tests according to NETA ATS.
5. Motor windings shall be checked for continuity.
6. Motor windings rated 460 volts nominal shall be megger tested with a 1,000-volt megger prior to connection of power leads. Minimum acceptable resistance shall be 100 megohms. Motor and phase rotation shall be checked with a phase rotation tester manufactured by G. Biddle Company (Catalog No. 56060) or equal on equipment which could be damaged by reverse rotation.

SOIL EXCAVATION SPEC REV A

Section 16050: Basic Electrical Materials and Methods

- a. Motor and phase rotation shall be verified before energizing motors.
- b. Motors shall be "bumped" to check for proper direction of rotation prior to performing operational tests on the equipment in the presence of Construction Manager.

END OF SECTION

**SECTION 16170
GROUNDING AND BONDING****PART 1 GENERAL****1.1 SCOPE**

This Section includes but is not limited to:

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

1.2 RELATED SECTIONS

- A. Section 02100 - Surveying.
- B. Section 16050 - Basic Electrical Materials and Methods.
- C. Section 16370 - Overhead Power Distribution.

1.3 REFERENCES

- A. InterNational Electrical Testing Association (NETA):
 - 1. NETA ATS-95 Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association (NFPA):

1. NFPA 70 National Electrical Code, 1999 Edition.
- C. Underwriters Laboratories, Inc. (UL):
 1. UL 467-93 UL Standard for Safety Grounding and Bonding Equipment.
 2. Electrical Construction Materials Directory-98.

1.4 SYSTEM DESCRIPTION

- A. Rod electrode and grounding connections.
- B. Grounding System Resistance: 5 ohms maximum.

1.5 SUBMITTALS

- A. Provide submittals for hardware, ground rods and ground wire. Unless specified otherwise, submittals shall be made to the Construction manager for review and approval.
- B. Provide certification of ground testing instrumentation.
- C. Provide record of as-built locations, as specified in Section 02100, of grounding electrodes, if grounding electrodes are required.

1.6 QUALITY ASSURANCE PROGRAM

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed in the UL Electrical Construction Materials Directory as suitable for the purpose specified and indicated.
- C. Provide certification of ground testing instrumentation according to NETA ATS.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Acceptable Manufacturers
 - 1. Mechanical Connectors
 - a. Burndy.
 - b. Ideal.
 - c. IlSCO.
 - 2. Exothermic Connections
 - a. Cadweld.
 - b. Thermoweld.

2.2 MATERIALS

- A. Rod Electrode
 - 1. Copper-clad steel, 3/4-inch diameter, 10-foot length.
- B. Mechanical Connectors
 - 1. Bronze.
- C. Wire
 - 1. Stranded copper.
 - a. Grounding Conductor: Size to meet NFPA 70 requirements.
- D. Grounding and bonding materials shall conform to UL 467.

PART 3 EXECUTION**3.1 SITE CONDITIONS**

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

- B. Verify that underground utilities will not interfere with the proposed rod locations prior to driving rod electrodes.

3.2 ERECTION/INSTALLATION/APPLICATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install additional rod electrodes as required to achieve specified resistance to ground.
- C. Equipment Grounding Conductor: Provide separate, insulated conductor with each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- D. Connect ground conductors to reinforcing bars in foundation before pouring concrete. Tie to structural steel members when they are installed, by exothermic connection.
- E. Ground metal equipment enclosures by attachment to ground rod system, the building steel, or existing periphery grounding system.
- F. Ground pole-mounted equipment and static line conductors as indicated on the construction drawings.
- G. Drive ground rods until the top is 12 inches below grade.

3.3 QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation as defined by contract documents and manufacturer's instructions. Accurately record as-built locations of grounding electrodes if required, and submit to Construction Manager. Test instrumentation shall conform to NETA ATS. Provide certification for instrumentation.

- B. Measure the system's resistance to the ground; perform testing in accordance with instrument manufacturer's recommendations using the fall-of-potential method. Measure resistance at each pole and at each 480 V service as a minimum. Provide written test reports indicating overall resistance to ground and resistance of each electrode to ground.

END OF SECTION

**SECTION 16370
OVERHEAD POWER DISTRIBUTION****PART 1 GENERAL****1.1 SCOPE**

This Section includes but is not limited to:

- A. Poles.
- B. Pole hardware.
- C. Line conductors.
- D. Anchors.

1.2 RELATED SECTIONS

- A. Section 16050 - Basic Electrical Materials and Methods.
- B. Section 16170 - Grounding and Bonding.

1.3 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code, 1999 Edition.
- B. American National Standards Institute (ANSI):
 - 1. ANSI C2-97 National Electrical Safety Code.
 - 2. ANSI C135.1-79 Galvanized Steel Bolts and Nuts for Overhead Line Construction.

SOIL EXCAVATION SPEC REV A
Section 16370: Overhead Power Distribution

3. ANSI O5.1-92 Wood Poles Specifications and Dimensions.
- C. American Society for Testing and Materials (ASTM):
1. ASTM A36/A36M-96 Standard Specification for Carbon Structural Steel.
 2. ASTM A475-95 Standard Specification for Zinc-Coated Steel Wire Strand.
 3. ASTM D698-91 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- D. American Wood-Preservers Association (AWPA):
1. AWPA C4-89 Poles - Pressure Process.
 2. AWPA C25-89 Standard for the Preservative Treatment of Crossarms by the Pressure Process.
- E. National Electrical Manufacturers Association (NEMA):
1. NEMA WC 7-88 Cross-Linked Thermosetting Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- F. Underwriters Laboratories, Inc. (UL):
1. UL 96-94 UL Standard for Safety Lightning Protection Components.
 2. Electrical Construction Materials Directory-98.

1.4 QUALITY ASSURANCE PROGRAM

- A. Conform to requirements of NFPA 70 and ANSI C2.
- B. Furnish products, where available, listed in the UL Electrical Construction Materials Directory, as suitable for the purpose specified and indicated.
- C. Installation shall comply with ANSI C2, Heavy Loading District, Grade B Construction.

SOIL EXCAVATION SPEC REV A
Section 16370: Overhead Power Distribution

- D. Provide submittals for poles, pole hardware, line conductors and anchors. Unless specified otherwise, submittals shall be made to the Construction Manager for review and approval.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect poles from damage and decay by stacking to provide free circulation of air. Maintain 1 foot minimum spacing between bottom pole and ground or ground vegetation. Do not store poles above decayed or decaying wood.
- B. Stack poles stored for more than 2 weeks on decay-resistant skids arranged to support poles without noticeable pole distortion.
- C. Handle treated poles with tools which will not produce an indentation greater than 1 inch deep. Do not drag treated poles along ground. Do not apply tools to that section of treated poles between 1 foot above and 2 feet below ground line.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Poles
1. Wood Poles: ANSI O5.1; treated southern pine poles of length and class indicated.
 2. Select poles for straightness, minimum sweeps, and short crooks.
 3. Preservative: ANSI O5.1 and AWP A C4, Pentachlorophenol.
 4. Apply preservative to poles as required by AWP A C4 with minimum net retention of 12 lbs/ft³ (285 kg/m³). Obtain complete sapwood penetration.
- B. Pole Hardware
1. Miscellaneous Pole Hardware: Hot-dipped galvanized after fabrication.
 2. Eye Bolts and Nuts: ANSI C135.1.
 3. Ground Rods: Copperweld 3/4 inch O.D. by 10 foot -0 inches long.
 4. Guy Strand: High strength, seven-strand steel cable galvanized to ASTM A475, Class A or B.

5. Guy Termination: Preformed wire type.
 6. Guy Guards: 8-foot (2 m) long plastic, colored yellow.
 7. Ground Wire: Soft drawn solid copper conductors, 4 AWG minimum size.
 8. Air Terminal: UL 96; 18-inch copper air terminal.
 9. Guy Adapter: Tripleye.
- C. Line Conductors
1. Secondary Conductors: aluminum, three insulated conductors and messenger/ground wire with 600 volt cross-linked polyethylene insulation for phase conductors conforming to NEMA WC 7.
- D. Anchors
1. Helical Screw Anchors: Galvanized steel, ASTM A36/36M.

PART 3 EXECUTION

3.1 SITE CONDITIONS

- A. Verify that field measurements are as shown on drawings.
- B. Verify that there are no underground utilities located below the poles prior to installation.

3.2 ERECTION/INSTALLATION/APPLICATION

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

SOIL EXCAVATION SPEC REV A
Section 16370: Overhead Power Distribution

- E. Dig setting holes large enough to permit use of power tampers to full depth. Place earth in maximum 6-inch layers and power tamp each layer until hole is restored to grade.
- F. Rake poles located at corners, angles, and dead ends so that poles are vertical after line installation.
- G. Do not install poles along the edge of cuts and embankments or where soil may be washed out.
- H. Identify each pole using aluminum marker stamped with characters 2-1/2 inches high, minimum. Locate to provide maximum visibility from roadway and fasten with aluminum nails. Obtain identifying numbers from Construction Manager.
- I. Minimum depths in normal firm ground, measured from lower side of pole:

OVERALL LENGTH	DEPTH FOR STRAIGHT LINES	DEPTH AT CURVES, CORNERS, AND POINTS OF EXTRA STRAIN
30'	5'-6"	5'-6"
35'	6'-0"	6'-0"
40'	6'-6"	6'-6"
45'	7'-0"	7'-6"
50'	7'-6"	8'-0"
55'	7'-6"	8'-0"

- J. Set crossarms at right angles to line for straight runs; and to bisect the angle of turns in line direction.
- K. Provide two braces for each crossarm.
- L. Install conductors to ANSI C2. Maintain clearances required by ANSI C2, except as follows: phase to phase - 20 inches, phase to ground - 16 inches, above roads,

480 V conductors - 23 feet, over buildings, all conductors, 8 feet. Conductor arrangement shall be phase A, B, C from north to south and from east to west for horizontal construction.

- M. Conductor taps shall be made with bail clamps and hot line connectors using compression connectors. Taps shall not be made directly on line conductors. Make aluminum connections to copper or other material using only splices, connectors, lugs, or fittings designed for that specific purpose.
- N. Install guys and anchors according to ANSI C2 requirements.
- O. Use small diameter steel probe to verify area is free of underground obstructions prior to installation of anchors.
- P. Bond metal enclosures on poles to pole ground wire in accordance with NFPA 70, ANSI C2 and manufacturer's instructions.
- Q. After initial energizing of transformers, measure the secondary voltage and adjust to nominal voltage by changing taps.

END OF SECTION

5104

- 45 17

SECTION 16462
DRY TYPE TRANSFORMER/PANELBOARDS

PART 1 GENERAL

1.1 SCOPE

Section includes, but is not limited to:

- A. Dry type, two-winding transformers integrated with primary and secondary main breakers and feeder breakers.

1.2 RELATED SECTIONS

- A. Section 16050 - Basic Electrical Materials and Methods.
- B. Section 16170 - Grounding and Bonding.

1.3 REFERENCES

- A. InterNational Electrical Testing Association (NETA):
 - 1. NETA ATS-95 Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA AB 1-93 Molded Case Circuit Breakers and Molded Case Switches.
 - 2. NEMA PB 1-90 Panelboards.
 - 3. NEMA PB 1.1-91 General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
 - 4. NEMA ST 20-92 Dry Type Transformers for General Applications.
 - 5. NEMA 250-91 Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code, 1999 Edition.

- D. Underwriters Laboratories, Inc. (UL):
1. Electrical Construction Materials Directory-98.

1.4 SUBMITTALS

- A. Provide submittals for transformers and panel boards. Unless specified otherwise, submittals shall be made to the Construction Manager for review and approval.
- B. Product Data: Include outline and support point dimensions of enclosures and accessories; unit weight; voltage; kVA, number of phases, impedance ratings, and characteristics; X/R ratio; tap configurations; insulation system type; rated temperature rise; and main bus ampacity, integrated short circuit ampere rating, circuit breaker, arrangement, and sizes.
- C. Transformer Test Reports:
1. Factory Test: NEMA ST 20. Indicate loss data; efficiency at 25, 50, 75, and 100 percent rated loads; and sound level.
2. Field Test: Indicate primary and secondary voltages as measured.

1.5 QUALITY ASSURANCE PROGRAM

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed in the UL Electrical Construction Materials Directory for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver transformers/panelboards individually wrapped for protection and mounted on shipping skids.
- B. Accept transformers/panelboards on site. Inspect for damage.
- C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer/panelboards' internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Siemens.
- B. Westinghouse.
- C. Square D.

2.2 EQUIPMENT

- A. Two-winding transformers
 1. Description: NEMA ST 20, factory-assembled, air-cooled, dry type transformers; ratings as indicated on construction drawings.
 2. Insulation system and average winding temperature rise for rated kVA as follows:
 - a. 1-30 kVA: Class 185 with 115 degrees C rise.
 - b. 16-500 kVA: Class 220 with 115 degrees C rise.
 3. Case Temperature: Do not exceed 40 degrees C rise above ambient at warmest point.
 4. Winding Taps:
 - a. Transformers: NEMA ST 20. Transformers shall have four full current taps, two at 2-1/2 percent each above and two at 2-1/2 percent each below normal voltage.
 5. Sound Levels: NEMA ST 20, not to exceed 85 dBA at 3 feet.
 6. Basic Impulse Level: 10 kV.
 7. Ground core and coil assembly to enclosure by means of a visible, flexible copper grounding strap.
 8. Mounting: Suitable for wall or floor mounting.
 9. Coil Conductors: Continuous windings with terminations brazed or welded.
 10. Enclosure: NEMA ST 20. Provide lifting eyes or brackets.
 11. Isolate core and coil from enclosure, using vibration-absorbing mounts.
 12. Nameplate: Include connection data and overload capacity based on rated allowable temperature rise.
- B. Branch Circuit Panelboards
 1. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.
 2. Enclosure: NEMA PB 1; Type 3R conforming to NEMA 250.
 3. Cabinet Size: As shown on manufacturer's drawings.
 4. Cabinet Front: Hinged cover with paddle lock hinge.
 5. Provide an integrated unit with transformer. Finish in manufacturer's standard gray enamel.
 6. Provide panelboards with copper bus, ratings as scheduled on construction drawings. Provide copper ground bus in each panelboard.

0000

7. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical.
8. Molded Case Circuit Breakers: NEMA AB 1; plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, rated for 75 degrees C copper conductors. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where required. Provide 20 percent spare breakers installed in the panelboard.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

- A. Install transformer/panelboards in accordance with NEMA PB 1.1.
- B. Install plumb, and in accordance with manufacturer's instructions, and as indicated on construction drawings.
- C. Height: 6 feet, 6 inches to top of transformer section.
- D. Provide grounding connections in accordance with Section 16170.
- E. Provide filler plates for unused spaces in panelboards.
- F. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- G. Provide engraved plastic nameplates identifying transformer/panelboard equipment number.
- H. After initial energizing of transformers, measure the secondary voltage and adjust to nominal voltage by changing taps.

3.2 QUALITY CONTROL

- A. Test according to general requirements of Section 16050 and to the relevant requirements of NETA ATS.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, grounding, and conformance of installation to contract documents and manufacturer's instructions. Check tightness of wiring and mounting connections for circuit breakers and transformer prior to energizing.
- C. Record primary and secondary voltages; submit to Construction Manager.

- D. Measure steady state load currents at each panelboard feeder. Rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

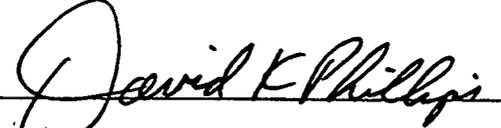
000098

SPECIFICATION COVER SHEET

SPECIFICATION SECTION: 02100 TITLE: SURVEYING

Specifications By: Signature  17 Aug 01
(Cognizant Engineer) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Scope and Format
Checked By: Signature  17 Aug 01
(Checker) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Detailed Requirements
Checked by: Signature  17 Aug 01
(Checker) Date
Printed Name David K. Phillips
and Title Senior Project Engineer

Overall Review By: Signature  20 Aug 2001
(PDP) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Approved by: Signature  21 Aug 2001
(DTL) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	Certified for Construction	20 August 01	WJM	DKP	JFB
1	Revisions from Phase III DCNs	13 March 02	DKP	DKP	JFB

000099

SECTION 02100**SURVEYING****PART 1 GENERAL****1.01 SCOPE**

- A. This Section includes the requirements for surveying. Requirements include, but shall not be limited to:
1. establishing permanent and temporary survey benchmarks and control points;
 2. establishing a horizontal and vertical project control system based on existing benchmarks;
 3. setting limits and boundaries of construction activities;
 4. performing support surveys and surveys for conformance checks, "red-line" drawings, and sketches, and to determine measurement of quantities for periodic progress payments and final payment;
 5. preparing and furnishing "red-line" drawings and sketches; and
 6. surveys for Excavation Project.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02110 - Clearing, Grubbing, and Stripping
- B. Section 02200 - Earthwork
- C. Section 02205 - Impacted Material Excavation
- D. Section 02206 - Earthwork for Remediation
- E. Section 02207 - Area Isolation Trenching
- F. Section 02215 - Trenching and Backfilling
- G. Section 02225 - Compacted Clay Liner and Cap
- H. Section 02230 - Road Construction
- I. Section 02240 - Non-Impacted Protective and Contouring Layers
- J. Section 02250 - Vegetative Soil Layer
- K. Section 02270 - Surface-Water Management and Erosion Control

- L. Section 02271 - Riprap
- M. Section 02275 - Surface Water Management and Erosion Control for Remediation
- N. Section 02280 - Biointrusion Barrier
- O. Section 02605 - High-Density Polyethylene (HDPE) Pipes and Fittings
- P. Section 02710 - Granular Drainage Material
- Q. Section 02712 - Granular Filter Material
- R. Section 02721 - Culverts
- S. Section 02770 - Geomembrane Liner and Cap
- T. Section 02831 - Chain-Link Fences and Gates
- U. Section 02920 - Topsoil
- V. Section 13000 - Borrow Area Management
- W. Section 13005 - Liner Penetration Boxes
- X. Section 13010 - Impacted Materials Placement
- Y. Impacted Materials Placement (IMP) Plan
- Z. Part 6 - Statement of Work
- AA. Part 8 - Environmental Health & Safety/Training Requirements
- BB. Part 9 - Quality Assurance Requirements

1.03 REFERENCES

- A. National Geodetic Survey (NGS) Standards.

1.04 QUALIFICATIONS

- A. Oversight for the survey work shall be provided and certified by a Land Surveyor licensed in the State of Ohio.
- B. Surveying work shall be performed under the direct supervision of a person who has at least 5 years of experience in construction surveying.

- C. Work performed in referencing or re-establishment of land or United States survey monuments shall be signed and sealed by a Land Surveyor licensed in the State of Ohio.

1.05 SUBMITTALS

- A. Submit a copy of Land Surveyor's license and a résumé of the person supervising the surveys to the Construction Manager within 10 calendar days from Notice to Proceed.
- B. For each liner and cap submit two copies of proposed control points on a minimum 50-foot grid for verification of the following surfaces at least 3 days prior to commencement of work:
1. subgrade for roads, clay liner, and for other locations shown on the construction drawings;
 2. top of compacted clay liner;
 3. top of leak detection system (LDS);
 4. top of leachate collection system (LCS);
 5. top of impacted protective layer and non-impacted protective layer within impacted runoff catchment area and intercell berm;
 6. top of protective clay layer in Area 1;
 7. top of impacted select layers;
 8. top of impacted material placement;
 9. top of select impacted material placement;
 10. top of contouring layer;
 11. top of compacted clay cap;
 12. top of protective clay layer in Area 4;
 13. top of cover drainage layer;
 14. top of biointrusion barrier with choking layer;
 15. top of granular filter;
 16. top of vegetative soil layer; and
 17. top of topsoil layer.
- C. Submit electronic files and two hard copies of the survey notes, sketches, and drawings for the following surveys to the Construction Manager within one week of performance:
1. preliminary surveys;
 2. intermediate surveys;
 3. written statement and surveys for conformance checks and "red-line" drawings;
 4. surveys prior to end of construction season and/or winter shutdown;
 5. survey at completion of impacted material excavation specified in Section 02205 of the following:
 - a. above Waste Acceptance Criteria (WAC) material;

- b. above Final Remedial Level (FRL) material;
 - c. Resource Conservation and Recovery Act (RCRA) hazardous waste;
 - d. underground storage tanks and/or associated soil; and
 - e. Hazardous Waste Management Units (HWMUs);
6. survey at completion of the Contract;
 7. measurement and payment surveys; and
 8. final surveys.
- D. On request by the Construction Manager, submit documentation verifying accuracy of survey work.
- E. Upon completion of the survey work, provide the Construction Manager the original field notes, layout, computations, signed and sealed sketches and drawings in Microstation 95 ".dgn" format or electronic files in other format approved by the Construction Manager.
- F. One complete set of final "red-line" drawings, sketches, and survey notes signed and sealed by a Land Surveyor licensed in the State of Ohio shall be submitted to the Construction Manager within 15 days of completion of the Contract. Drawing and sketch format shall be Microstation 95 ".dgn" or electronic files in other format approved by the Construction Manager. Survey notes shall include a point listing with coordinates, elevation, and description.

1.06 PROJECT RECORD DOCUMENTS

- A. Maintain on site, a complete, accurate log documenting survey work as it progresses.
- B. Maintain on-site, a plan showing survey control points, and benchmarks with coordinates and elevations.
- C. Maintain on-site, an accurate and current set of marked-up "red-line" drawings showing "as-built" conditions. "As-built" conditions shall be marked-up on "red-line" drawings within one week of completion of the respective construction activity.

1.07 HEALTH AND SAFETY REQUIREMENTS

- A. Environmental health & safety/training requirements shall be in accordance with Part 8 of the Contract Documents.

1.08 CONTRACTOR'S QUALITY ASSURANCE

- A. Contractor's quality assurance requirements shall be in accordance with Part 9 of the Contract Documents.

PART 2 PRODUCTS**2.01 MATERIALS AND SURVEY INSTRUMENTS**

- A. Provide materials as required to properly perform the surveys, including, but not limited to, personal protective equipment, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else as required.
- B. The survey instruments used for this work shall be precise and accurate to meet the needs of the project. Survey instruments should be capable of reading to a precision of 0.001 feet and with a setting accuracy of ± 8 seconds.

PART 3 EXECUTION**3.01 GENERAL**

- A. Maintain accurate and complete notes of surveys:
 - 1. Handwritten survey field notes and information shall be documented. A copy of the numbered, dated, and signed documentation shall be given to the Construction Manager weekly or upon request by the Construction Manager. Survey notes shall be legibly recorded. Notation shall be consistently applied to survey work. The stake marking format and the document notations shall be compatible. Identify survey benchmarks on the field notes, sketches, and drawings.
 - 2. Electronically collected field survey information shall be stored, for retrieval and submittal if requested by the Construction Manager, during the period of performance of the Contract.
 - a. Electronic format for printed output of data collector field survey notes shall be compatible with the approved field notation format.
 - b. Electronic format for printed output of data collector survey work shall be compatible with the Contractor's computer equipment and software specified in this Section for verifying and checking the work. A copy of the data disk shall be submitted to the Construction Manager monthly.
 - 3. Submit electronic file and two hard copies of above information when requested by the Construction Manager
- B. During construction, survey notes shall be retained by the Contractor and Land Surveyor.

- C. Perform surveys for conformance checks specified in this Section. Contractor shall submit a written statement with conformance surveys certifying compliance of the preceding layer thickness, limits, and grades to the Construction Manager.
- D. The precision of horizontal and vertical controls shall meet or exceed Third-Order Class I and Third-Order accuracies, respectively, as defined by NGS Standards.
- E. Conformance check surveys for elevation and for horizontal coordinates shall be recorded to the nearest 0.01 feet and for angles shall be to the nearest 20 seconds.
- F. Measurement and payment surveys for elevation and for horizontal distances shall be recorded to the nearest 0.1 feet and 0.05 feet, respectively.
- G. Final "red-line" drawings and sketches shall be signed and sealed for method and accuracy of work and sealed by the Land Surveyor.
- H. Perform construction layout surveys in advance of scheduled construction activities. At completion of a survey, provide a copy of the field notes, drawings, or sketches to the Construction Manager for review. The Contractor shall allow the CQC Consultant and/or Construction Manager three working days for review of conformance surveys. The Contractor shall be responsible for rework and/or construction delays caused by survey or staking errors.
- I. Set grade and slope stakes required for construction activities as the work progresses. Staking shall be in accordance with accepted surveying practices, provisions herein, and subject to Construction Manager review. Set fine grade stakes on all surfaces for which the plans show a definite grade line. Grade stakes shall not be permitted on soil layers overlying any geosynthetic material within 12 inches of the geosynthetic material or on the contouring layer and first lift of compacted clay cap.
- J. Verify pipe alignment and elevation. The Contractor shall:
1. check layout and elevation of pipe embedment fill prior to pipe placement;
 2. check pipe alignment during placement and backfill; and
 3. verify alignment and elevation at top of pipe after pipe has been backfilled to top of pipe at a maximum interval of 25 feet.
- K. Upon completion of the work, the Contractor shall provide the Construction Manager with original survey field notes, layouts, computations, and electronic files, binders containing electronic file information and one copy each of electronic files specified in this Section.
- L. Protect benchmarks and survey control points. Replace disturbed survey control points and benchmarks at no additional cost.

- M. Establish temporary survey control points to support construction work activities.
- N. Survey control points, accuracy, and documentation:
1. Record the following information in survey notebooks for each control point established:
 - a. designation of control point;
 - b. coordinates based on State Planar North American Datum (NAD) 1983 Ohio South;
 - c. elevations based on National Geodetic Vertical Datum (NGVD);
 - d. date of establishment;
 - e. description and sketch of the control point location; and
 - f. control points referenced to a minimum of three features that can be seen from the control point.
 2. Document survey work in the fieldbooks using the format and procedures described below:
 - a. title and consecutive fieldbook number on the front cover;
 - b. consecutively numbered pages;
 - c. table of contents, indicated by survey task, on the first numbered page;
 - d. legend indicating symbols used in survey notes;
 - e. names of survey team for each task;
 - f. notes on weather, equipment, etc.;
 - g. date and time on each page to indicate when work was recorded;
 - h. notes in a uniform character such that they can be interpreted and used by anyone with survey knowledge; and
 - i. description and/or sketches of the existing survey control used.
- O. Provide hardware and software to download data to Fluor Fernald computers as approved by Engineering Manager.

3.02 SUPPORT SURVEYS

- A. Preliminary Surveys:
1. Verification of the Existing Conditions:
 - a. Prior to the start of clearing and earthwork activities, verify the accuracy of the existing conditions shown on the Construction Drawings and Reference Drawings. Immediately notify the Construction Manager in writing of deviations from the existing conditions indicated on the Construction Drawings and Reference Drawings that affect construction cost and/or schedule.
 2. Verify the existing benchmarks, structures, utilities, wells, topography, surface-water management and erosion control measures, construction safety and radiological-control fences, sedimentation basins and appurtenances, drainage

features, and existing stockpiles of materials and quantities shown on the Construction Drawings, Reference Drawings, or specified in the Contract. Notify the Construction Manager of any differences or conflicts with work included in this Contract.

3. Verify Mid-Valley Pipeline Easement as shown on the Construction Drawings adjacent to battery limits. Stake western limits of easement at 50-foot intervals.
4. Establish construction limits required for installation of the construction safety fence and radiological-control fence specified in Section 02200.
5. Establish location for the installation of the surface-water management and erosion control measures specified in Sections 02270, 02271, and 02275.
6. Clearing Limit Staking: Stake clearing limits specified in Section 02110.
7. Alignment and Existing Ground Staking: Following clearing operations and before stripping operations begin, preliminary locations of alignments and/or baseline of project features shall be established. Perform topographic surveys to describe original ground features before stripping or excavation begins. The distance between grid points shall not exceed 50 feet, and all breaks shall be noted.
8. Earthwork Staking: Staking for excavation and fill limits shall establish the exterior limits of excavations and fills. The maximum staking interval shall be 50 feet. Stakes shall be prominently noted with description of point, vertical distance to design elevation, and offset distance as applicable.
9. Perform additional surveys required for the layout of other construction activities.
10. Prior to construction activities in remedial excavation areas specified in Sections 02205 and 02207, perform topographic surveys of above-WAC and impacted runoff catchment area (IRCA) stockpiles, staging areas, excavation areas, and concrete crushing support areas at minimum 50-foot intervals with additional points as follows:
 - a. grade breaks;
 - b. points of horizontal curvature and tangency;
 - c. edge and corners of concrete or asphalt pads, slabs, catch basins, and manholes;
 - d. above-grade obstructions (e.g., fire hydrants, utility poles, handrails, etc.); and
 - e. ditches, channels, and depressions.

In addition, spot check slab elevations as indicated on applicable building foundation reference drawings. This includes basement, pit, sump, and other below-grade slab elevations.

11. Prior to area isolation trench excavation specified in Section 02207, survey the trench location and stake the centerline of the trenches.
12. Initial limits of excavation specified in Section 02207 shall be surveyed and staked after the completion of excavation of area isolation trenches.

13. The centerline of the completed area isolation trench specified in Section 02207 shall be surveyed with reference to the permanent trench monuments and staked after the completion of trenching. Provide redline mark-ups showing where the trench deviates from the design location by more than the maximum lateral tolerance specified in Section 02207. The Contractor will identify the area isolation trench using a rope boundary. The rope will be a color other than orange, yellow, or magenta.

B. Intermediate Surveys:

1. Perform surveys during progress of the construction activities to verify the accuracy of work and as directed by the Construction Manager. These surveys include, but are not limited to, surveys of the subgrade excavation; compacted clay liner and cap; LDS, LCS, and cover drainage layers; protective layer; contouring layer; biointrusion barrier layer; granular filter; vegetative soil layer; topsoil; LDS and LCS piping; horizontal monitoring wells; select impacted material layer; impacted material layer; and other surveys directed by the Construction Manager.
2. Perform surveys for the impacted material placement and stockpiles as follows:
 - a. Survey the locations and surface of impacted material placement when the category of impacted material changes in any given grid. Survey the locations and surface of the previous layers prior to changing impacted material category within the grid.
 - b. Survey the locations and surface of completed impacted material lifts in any grid where placement occurs at or near the end of the workday.
 - c. Survey the impacted material placed in the OSDF every week and within one working day of the last day of the month. This survey shall include locations, elevations, category of impacted materials, and pertinent information in ASCII format necessary to develop a 3-D topographic computer generated surface.
 - d. Perform interim surveys of impacted material stockpiles or other areas designated by the Construction Manager. This survey shall include volume (CY) remaining in the stockpiles or in designated areas.
 - e. Survey the impacted material surface in the OSDF, including the cell access ramps, at the completion of the construction season activities.
3. Perform surveys for measurement and periodic progress payment as specified in this Section.
4. Perform surveys during progress of impacted material excavations specified in Section 02205 to confirm limits of the excavation.
5. Perform survey if either the unsaturated sands and gravel of the Great Miami Aquifer (GMA) are encountered or excavation has reached the GMA elevation as indicated on the Construction Drawings.

6. Perform surveys after the installation of the first 2 feet of GMA plug placement to confirm 2 feet thickness.
7. Perform surveys upon restoration of the minimum 5-foot protective cover over the unsaturated sands and gravel of the GMA.
8. Perform surveys when establishing new Special Material Transfer Areas.
9. Prior to obtaining GMA plug material as specified in Section 02206, perform topographic survey and establish work limits of designated borrow areas.
10. Perform survey at the completion of each supplemental excavation.

C. Final Surveys:

1. Final topography shall be surveyed at nominal 50-foot intervals. Additionally, the following points shall be surveyed as applicable:
 - a. grade breaks;
 - b. points of horizontal curvature and tangency; and
 - c. points of stationing equation.
2. Structures: Survey structure centerlines or building lines so that the orientation, position, limits, and foundation elevation(s) are positively identified.
3. Ditches and Channels: Survey ditches, channels, and culverts as specified in Sections 02270, 02275, and 02721.
4. Limits of Final Excavations: Survey limits of final impacted material excavations.
5. Pipes: Utility pipes shall be surveyed at nominal 25-foot intervals at the top of pipe. Surface-water management pipes shall be surveyed at inlet and outlet inverts and along perimeter of riprap protection.

3.03 SURVEYS FOR MEASUREMENT AND PAYMENT

- A. Perform surveys for periodic progress payments and final payment to determine quantities of work and percent of completed work. Quantities to be measured and measurements for quantities shall be as specified in Part 6 of the Contract Documents.
- B. Calculate and certify quantities of work and submit survey notes and calculations to the Construction Manager for review, evaluation, and payment.

3.04 SURVEYS FOR CONFORMANCE CHECKS AND "RED-LINE" DOCUMENTS

- A. Survey the following to verify the locations, lines, and grades achieved during construction for conformance checks and "red-line" documents:
 1. for berms, roads, ditches, and other earthwork specified in Sections 02200, 02206, 02230, and 02270:
 - a. original grade surface;
 - b. compacted surface of cut slopes; and
 - c. finished grade surface;

2. for culverts and other surface-water management and erosion control structures specified in Sections 02270 and 02721:
 - a. original grade surface;
 - b. pipe inverts; and
 - c. finished grade surface including riprap protection at inverts;
3. for the subgrade specified in Section 02200:
 - a. prepared subgrade surface;
4. for the trenching and backfilling specified in Section 02215;
 - a. bottom of the liner system anchor trench and pipe trench and top of finished compacted backfill; and
 - b. pipes and culverts;
5. for the compacted clay liner specified in Section 02225:
 - a. finished compacted clay liner surface;
6. for the liner penetration boxes specified in Section 13005 and shown on the Construction Drawings:
 - a. original grade surface; and
 - b. top of liner penetration boxes;
7. for the LDS, LCS, and cover drainage layers, and piping specified in Sections 02605 and 02710:
 - a. finished grade surface;
 - b. horizontal monitoring wells; and
 - c. piping system, including location of each joint;
8. for the granular filter specified in Section 02712:
 - a. finished granular filter surface;
9. for the compacted clay cap specified in Section 02225:
 - a. prepared top of non-impacted contouring layer surface; and
 - b. finished compacted clay cap surface;
10. for the geomembrane liner specified in Section 02770:
 - a. anchor trench;
 - b. top and bottom of side slopes;
 - c. seam intersections;
 - d. repairs; and
 - e. location of destructive testing;
11. for the non-impacted protective layer specified in Section 02240:
 - a. finished protective layer surface;
12. for impacted material placement surface specified in Section 13010:
 - a. top of protective layer surface;
 - b. top of select impacted material layers (liner and final cover system) surfaces;
 - c. top of final impacted material surface (prior to placement of select impacted material layer in final cover system); and

- d. Category 5 material placement per specialized placement plans as specified in the IMP Plan.
 13. for biointrusion barrier specified in Section 02280:
 - a. finished biointrusion barrier surface;
 14. for vegetative soil layer specified in Section 02250:
 - a. finished vegetative soil layer surface;
 15. for topsoil specified in Section 02920:
 - a. top of topsoil surface;
 16. for chain-link fences and gates specified in Section 02831:
 - a. location and alignment;
 17. for the borrow area specified in Section 13000:
 - a. test pits used for pre-conformance testing; and
 - b. finished grades of interim restoration of borrow subareas;
 18. centerlines at nominal 50-foot intervals and at points of intersection of area isolation trenches specified in Section 02207.
- B. Drawings and sketches for the items described in this Section shall include the following:
1. North arrow, graphical scale, title block, and legend;
 2. Northing and Easting grid lines;
 3. spot grade location and elevation on plan including list of coordinates with point number, northing, easting, and elevation in table format;
 4. 1-foot contour lines;
 5. location of structures;
 6. labeled components;
 7. for geomembrane liner and cap plans:
 - a. all seams;
 - b. panel identification numbers;
 - c. location of top of slope, toe of slope, anchor trench, and limits of geomembrane;
 - d. repair location and identifying number; and
 - e. destructive testing location and identifying number; and
 8. for pipe profiles:
 - a. original grades with stationing;
 - b. final grades with stationing; and
 - c. pipe with inverts, slopes, pipe material, pipe size, and length of pipe.
- C. Perform conformance checks and "red-line" surveying immediately upon completion of a given installation or excavation activity to facilitate progress and avoid delaying commencement of the next installation. Provide the following minimum spacings and locations for survey points (additional survey points may be required if field conditions warrant):

1. surfaces with gradients less than 10 percent, survey on a square grid spaced not wider than 50 feet;
2. on slopes greater than 10 percent, a square grid spaced not wider than 50 feet shall be used, but in any case, a line at the crest and toe of the slope shall be taken; if the slope distance is greater than 50 feet, a midpoint slope survey point is required;
3. a line of survey points spaced not more than 50 feet apart shall be taken along any slope break (this will include the inside edge and outside edge of any bench on a slope);
4. a line of survey points spaced not more than 25 feet apart shall be taken at the top of any pipes or other appurtenances; and
5. at the corners and midpoints of the top and bottom of slope breaks for liner penetration areas in cells.

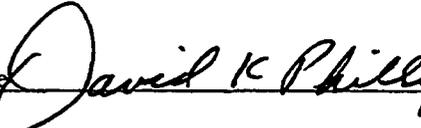
[END OF SECTION]

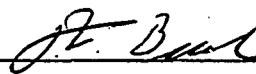
SPECIFICATION COVER SHEET

SPECIFICATION SECTION: 02200 TITLE: Earthwork

Specifications By: Signature  17 Aug 01
(Cognizant Engineer) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Scope and Format
Checked By: Signature  17 Aug 01
(Checker) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Detailed Requirements
Checked by: Signature  17 Aug 01
(Checker) Date
Printed Name David K. Phillips
and Title Senior Project Engineer

Overall Review By: Signature  20 Aug 2001
(PDP) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Approved by: Signature  20 Aug 2001
(DTL) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	Certified for Construction	20 August 01	mon	DKP	JFB
1	Revisions from Phase III DCNs	13 March 02	DKP	DKP	JFB

000113

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes site preparation including construction safety fence and radiological-control fence, surface-water management and erosion control, excavation, dewatering, stockpiling, subgrade and top of contouring layer preparation, compacted fill, and clayey rockfill.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 - Surveying
- B. Section 02110 - Clearing, Grubbing, and Stripping
- C. Section 02150 - Traffic Control
- D. Section 02205 - Impacted Material Excavation
- E. Section 02206 - Earthwork for Remediation
- F. Section 02215 - Trenching and Backfilling
- G. Section 02225 - Compacted Clay Liner and Cap
- H. Section 02230 - Road Construction
- I. Section 02240 - Non-Impacted Protective and Contouring Layers
- J. Section 02250 - Vegetative Soil Layer
- K. Section 02270 - Surface-Water Management and Erosion Control
- L. Section 02271 - Riprap
- M. Section 02280 - Biointrusion Barrier
- N. Section 02605 - High-Density Polyethylene (HDPE) Pipes and Fittings
- O. Section 02710 - Granular Drainage Material

- P. Section 02712 - Granular Filter Material
- Q. Section 02714 - Geotextiles
- R. Section 02721 - Culverts
- S. Section 02831 - Chain-Link Fences and Gates
- T. Section 02920 - Topsoil
- U. Section 02930 - Vegetation
- V. Section 13000 - Borrow Area Management
- W. Section 13005 - Liner Penetration Boxes
- X. Section 13010 - Impacted Materials Placement
- Y. Construction Quality Assurance (CQA) Plan
- Z. Part 6 - Statement of Work
- AA. Part 8 - Environmental Health & Safety/Training Requirements
- BB. Part 9 - Quality Assurance Requirements

1.03 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) Standards:
 1. ASTM D 698. Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 2. ASTM D 2487. Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- B. Reference Reports addressing On-Site Disposal Facility (OSDF) and borrow area site subsurface conditions:
 1. "Geotechnical Investigation Report, On-Site Disposal Facility" [Parsons, 1995]. This report contains geotechnical data for the subsurface soils in the OSDF area.
 2. "Disposal Facility Pre-Design Geotechnical Investigation, Soil Investigation Data Report, CERCLA-RCRA Unit 2" [Science Applications International Corporation, 1995]. This report presents geotechnical data for the subsurface soils in the OSDF area.

3. "Geotechnical Data and Evaluation Report for East and South Field Borrow Areas" [Parsons, 1996]. This report contains geotechnical data for the subsurface soils in the borrow area.

1.04 SUBMITTALS

- A. Submit to the Construction Manager for review a Contractor's Earthwork Work Plan within 30 calendar days from Notice to Proceed. The Contractor's Earthwork Work Plan shall include, at a minimum:
 1. list of equipment and description of construction methods proposed for the scope specified in this Section and in Sections 02110, 02206, 02215, 02225, 02230, 02240, 02250, 02271, 02280, 02605, 02710, 02712, 02714, 02721, 02831, 02920, 02930, 02940, and 13005;
 2. location of equipment service area and fueling station;
 3. excavation and trenching dewatering methods and techniques;
 4. methods for removal of visible rock particles larger than specified from the material for compacted fill and clayey rockfill specified in this Section and compacted clay liner and cap specified in Section 02225;
 5. coordination of survey requirements for the site work;
 6. verification of the existing conditions and material stockpiles;
 7. stockpile management plan including surface-water management and erosion control, stockpiling by type of material, stockpile maintenance, stockpile removal and relocation, and site grading and stabilization;
 8. coordination of earthwork activities with Contractor's Surface-Water Management and Erosion Control Work Plan specified in Section 02270;
 9. schedule for site work activities;
 10. water supply system including location, type, and size of water tank, water distribution system and equipment for dust control, construction and wheel wash system;
 11. plan and measures for cold weather at temperatures below 32 degrees Fahrenheit site work activities;
 12. installation and maintenance of construction safety fence and radiological-control fence;
 13. coordination with Traffic Control Plan specified in Section 02150;
 14. location of construction laydown area(s);
 15. locations of stockpiles for material generated from clearing, grubbing, and stripping operations;
 16. layout and typical cross sections of roads within the Contractor's work area;
 17. construction site access and haul road layout;
 18. construction utilities layout including construction power and water;
 19. description of methods for installation and removal of trench supports; and

20. coordination with the Contractor's Quality Assurance Work Plan in accordance with Part 9 of the Contract Documents.

1.05 HEALTH AND SAFETY REQUIREMENTS

- A. Environmental health & safety/training requirements shall be in accordance with Part 8 of the Contract Documents.

1.06 CONTRACTOR'S QUALITY ASSURANCE

- A. Contractor's quality assurance requirements shall be in accordance with Part 9 of the Contract Documents.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Obtain fill material for compacted fill from OSDF cell excavation, trenching, and stockpiles approved by the Construction Manager. Obtain additional fill material for compacted fill, if required, from the on-site borrow area indicated on the Construction Drawings. Borrow area management shall be in accordance with Section 13000.
- B. Fill material for compacted fill and trench backfill shall be free of debris, foreign objects, large rock fragments, organics, and other deleterious materials. Visible rock particles shall be maximum dimension of 5 inches for 8-inch \pm 1-inch thick loose lifts and 2 inches for 4-inch \pm 1-inch thick loose lifts. Material for compacted fill shall conform to GC, SC, SM, ML, CL, or CH according to the Unified Soil Classification System (per ASTM D 2487).
- C. Clayey rockfill: The reject material from clay screening operations may be substituted for material for compacted fill below base aggregate elevations in the impacted material haul roads, cell access ramps, access corridor located outside the perimeter berm baseline, and borrow area haul road; for interim restoration in borrow area; and other fill areas outside the OSDF perimeter berm baseline. Use of clayey rockfill as specified in this Section shall be approved by the Construction Manager.
- D. Construction water for moisture conditioning compacted fill shall be obtained from the on-site water source shown on the Construction Drawings.
- E. Construction safety fence and radiological-control fence for activities with duration less than 30 calendar days shall be orange, high-density polyethylene, 4 feet in height, opening size approximately 4 inches by 1 inch, minimum tensile strength of 2000

- pounds per foot of width. Where used to delineate radiologically controlled areas (RCAs), no fencing is required. Contractor shall install posts and Fluor Fernald will provide and install yellow/magenta rope. Posts shall be T-shaped (T-post), 1-1/2 inch by 1-1/2 inch, 3/16 inch thick by 6 feet long, and made of steel or as approved by the Construction Manager.
- F. Furnish construction safety fence and radiological-control fence for activities with a duration greater than 30 calendar days made of galvanized steel welded wire fabric, 2 inch by 4 inch mesh, 4 feet in height, 12-1/2 gauge, or equivalent approved by the Construction Manager. Posts for the fence material shall be 6 feet long and made of steel. Install posts at spacing recommended by the Manufacturer's installation procedures and as required to prevent sagging.
 - G. Contractor shall furnish and install signs for construction safety fence in accordance with Part 8 of the Contract Documents.
 - H. Signs for radiological-control fence shall be furnished and installed by Fluor Fernald, Inc.

2.02 EQUIPMENT

- A. Furnish equipment to perform work specified in this Section.
- B. Furnish equipment to achieve required compaction specified in this Section.
- C. Furnish hand compaction equipment, such as walk-behind padfoot compactors, hand tampers, or vibratory plate compactors, for compaction in areas inaccessible to large compaction equipment.
- D. Furnish water tank trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities at variable surface widths to provide the required in-place moisture content and to prevent drying of soil surfaces.
- E. Furnish equipment such as scarifiers, disks, spring tooth or spike tooth harrows, earth hauling equipment, and other equipment as required for earthwork construction.

PART 3 EXECUTION

3.01 GENERAL

- A. Verify existing conditions in accordance with Section 02100.

- B. Perform construction activities in such a manner that equipment operating in the RCAs do not operate in non-RCAs. Equipment operating in RCAs shall be washed by the Contractor; and radiologically surveyed and released by Fluor Fernald, Inc. prior to exiting for use in non-RCAs.
- C. Install surface-water management and erosion controls in accordance with Section 02270.
- D. Dust control shall be in accordance with Part 6 of the Contract Documents.

3.02 SITE PREPARATION

- A. Install construction safety fence and radiological-control fence at construction limits and limits of the RCAs in accordance with the Contractor's Earthwork Work Plan and Part 8 of the Contract Documents. Relocate construction safety fence and radiological-control fence as shown on the Construction Drawings or as approved by the Construction Manager. Provide construction safety fence as shown on Construction Drawings. Signs and barricades around trenches, stockpiles, and excavated areas shall be in accordance with Part 8 of the Contract Documents.
- B. Maintain and repair construction safety fence and radiological-control fence for the duration of the Contract. Fencing shall be maintained so as to minimize vertical sagging.
- C. Install, maintain, and inspect surface-water management and erosion controls in accordance with Section 02270.
- D. Prior to earthwork activities, perform clearing, grubbing, and stripping in accordance with Section 02110.
- E. Construct impacted material haul roads, cell access ramps, and access corridors in accordance with the Construction Drawings and Section 02230.
- F. Locate existing manholes, drop inlet structures, monitoring wells, piezometers, lysimeters, utilities, and other subsurface structures in the work area. Protect structures and utilities during earthwork activities as indicated on the Construction Drawings and approved by the Construction Manager.

3.03 SURFACE-WATER MANAGEMENT AND EROSION CONTROL

- A. Install surface-water management and erosion controls in and around work areas in accordance with Section 02270.

3.04 EXCAVATION

- A. Excavate designated areas to the subgrade elevations or excavation limits shown on the Construction Drawings. Stockpile excavated material in the designated stockpile area shown on the Construction Drawings or at locations approved by the Construction Manager.
- B. Excavate material within the excavation limits, including rock encountered, regardless of type, character, composition, and condition. Remove clay pipe tile subdrain system when encountered in accordance with Section 02205. Place clay pipe subdrain section in the OSDF constructed cells in accordance with Section 13010.
- C. Blasting, including use of explosives or explosive devices, shall not be permitted.
- D. Remove and relocate impacted material encountered during excavation in accordance with Section 02205. Impacted material meeting OSDF Waste Acceptance Criteria (WAC) shall be placed in accordance with Section 13010. Impacted materials exceeding OSDF WAC shall be disposed of in accordance with Section 02205.
- E. Minimize sloughing and caving of excavations. Over-excavate and fill areas of excavations that cave or slough with compacted fill in accordance with this Section.
- F. Over-excavate abandoned monitoring wells, borings, utilities, and lysimeters within the OSDF perimeter baseline shown on the Reference Drawings to a depth of 3 feet below subgrade elevation. Well casings, concrete, and grout shall be excavated in accordance with Section 02205 and placed in the OSDF constructed cells in accordance with Section 13010. Before removal of the existing well casings, Construction Managers will verify closure of the existing wells. Fill to subgrade elevation with compacted fill in accordance with this Section.
- G. Do not remove soil from the site or dispose of soil included in this Contract except as approved in writing by the Construction Manager.
- H. Perform activities in such a manner that hauling equipment transporting non-impacted materials do not operate on roads used to haul impacted material. Equipment driven on roads used to haul impacted material or in an impacted area shall be washed by Contractor, and radiologically surveyed and released by Fluor Fernald, Inc. prior to being used for earthwork activities in non-impacted areas.
- I. Perform activities in such a manner that earthwork and hauling equipment working in contamination areas do not cross into certified areas.

- J. Remove the existing Rerouted North Entrance and North Entrance Road pavement within the limits shown on the Construction Drawings and haul and place in OSDF constructed cells in accordance with Section 13010. Existing North Entrance Road pavement section consists of 6 inches of asphaltic concrete over 6 inches of crushed rock. Existing rerouted North Entrance Road pavement section consists of 12 inches of asphalt concrete over 8 inches of crushed rock. Existing rerouted North Entrance Road pavement section consists of 12 inches of asphaltic concrete over 8 inches of crushed rock. Excavate 2 feet below bottom of pavement elevation and road shoulder in accordance with Section 02205 and place in accordance with Section 13010, unless otherwise directed by the Construction Manager.
- K. Stabilize disturbed areas in accordance with Section 02930.

3.05 EXCAVATION DEWATERING

- A. Anticipate seepage of groundwater into and accumulation of surface-water runoff in excavations. Manage groundwater and surface-water runoff in excavations in accordance with this Section and Section 02270.
- B. Collect water that accumulates in the excavation in a toe drain, or other suitable sump, and pump to the former production area stormwater drain control system, the leachate transmission system, or other locations as directed by the Construction Manager.
- C. Prevent surface-water runoff from adjacent areas from entering the excavation in accordance with Section 02270.

3.06 STOCKPILING

- A. Stockpile excavated soils in the stockpile areas shown on the Construction Drawings or as directed by the Construction Manager.
- B. Construct stockpiles no steeper than 3H:1V (horizontal:vertical), grade to drain, seal by tracking perpendicular to the slope contours with a dozer, and dress daily during periods when material is taken from or added to the stockpile.
- C. Install surface-water management and erosion control measures at the stockpile areas in accordance with Section 02270. Stabilize stockpiles in accordance with Section 02930.

3.07 SUBGRADE AND TOP OF CONTOURING LAYER PREPARATION

- A. Subgrade and top of contouring layer material shall be free of debris, foreign objects, organics, and other deleterious materials.

- B. In the event saturated subgrade is encountered, localized sumps shall be constructed to facilitate removal of water. Manage removed water in accordance with this Section.
- C. Perform subgrade and top of contouring layer proofrolling by driving a loaded dump truck with minimum loaded weight of 20 tons and minimum weight of 10 tons per axle or other pneumatic-tired vehicle back and forth across the area to be prepared to confirm the firmness of subgrade and top of contouring layer surface. Overlap the passes such that one set of tires on each pass runs between the two sets of tire tracks from the previous pass. Soils shall not exhibit pumping or develop ruts more than 2 inches in depth. Rutting, larger than 2 inches, shall be scarified in accordance with this Section and regraded with compacted fill material or non-impacted contouring layer material to meet the proposed subgrade or top of contouring layer elevations.
- D. Subgrade for the compacted clay liner and top of contouring layer shall be scarified in accordance with Section 02225. At other locations where compacted fill is to be placed, prepare the subgrade by scarifying to a depth of 2 inches using the equipment identified in this Section.
- E. In areas where unsuitable soils are encountered, remove and replace the soil to a minimum depth of 1 foot below the proposed subgrade elevation. Remove unsuitable subgrade to an additional depth if necessary to obtain a suitable soil surface for subsequent fill placement. Removal of unsuitable soils to additional depth shall be as approved by the Construction Manager. Suitable soil surface exhibiting pumping or developing ruts more than 2 inches in depth shall be removed to a minimum depth of 1 foot or dried in place by a method approved by the Construction Manager. Fill areas from which subgrade has been removed with compacted fill in accordance with this Section. Compact the fill material to at least 95 percent standard Proctor maximum dry unit weight as determined by ASTM D 698. Compact the uppermost lift of compacted fill beneath road and access corridor alignments to a minimum 98 percent of the standard Proctor maximum dry unit weight as determined by ASTM D 698.
- F. In excavations or other areas where water accumulates, implement measures to remove the water in accordance with this Section. Maintain the subgrade surface free of standing water and in a firm condition to meet the proofrolling requirements of this Section. Maintain dewatered areas in this condition until overlying construction is complete.
- G. Manage surface-water runoff or runoff in accordance with Section 02270.

3.08 COMPACTED FILL

- A. Use fill material that meets the material requirements of this Section. Place the fill material to the limits and grades shown on the Construction Drawings.

- B. Place fill material on surfaces which are free of debris, branches, vegetation, mud, ice, or other deleterious materials.
- C. Place fill material in loose lifts with a thickness of 8 inches \pm 1 inch. In areas where compaction is to be performed using hand-operated equipment, place the fill material in loose lifts with a thickness of 4 inches \pm 1 inch.
- D. Remove visible rock particles with a maximum dimension larger than 5 inches for 8-inch \pm 1-inch thick loose lifts. For 4-inch \pm 1-inch thick loose lifts, the maximum rock particle size shall be 2 inches.
- E. Prior to placing a succeeding lift of fill material over a previously compacted lift, thoroughly scarify the previous lift to a depth of 2 inches by discing, raking, or tracking with a dozer. Moisture condition the preceding lift in accordance with this Section if the moisture content of the surface of the preceding lift is not within the range of acceptable moisture contents specified in this Section.
- F. The trafficking of scarified surfaces by trucks or other equipment, except compaction equipment, is not permitted.
- G. The maximum acceptable soil clod size after processing is 3 inches. Reduce clod size by discing, raking, tracking with a dozer, using a soil stabilizer, or other means approved by the Construction Manager. Soil clumps, consisting of an agglomeration of 3-inch clods, or smaller, will not be considered a clod for purposes of this Section.
- H. Compact fill material in each lift to at least 95 percent of its standard Proctor maximum dry unit weight as determined by ASTM D 698. Compact fill at a moisture content within \pm 3 percentage points of the standard Proctor optimum moisture content as determined by ASTM D 698.
- I. Moisture condition the fill material to achieve the compaction requirements of this Section. Use a water spraying system for wetting. During wetting or drying, regularly disc, rake, or otherwise mix the material to thoroughly blend the moisture throughout the lift. Use discing, raking, or other appropriate methods to dry the material as required.
- J. Do not place frozen fill nor place fill material on frozen subgrade or previously placed compacted fill.
- K. Do not compact fill material at temperatures below 32 degrees Fahrenheit, unless authorized in writing by the Construction Manager.

- L. Do not place fill during periods of precipitation. Placement may occur during periods of misting or drizzle, but only if authorized by the Construction Manager.
- M. Rework compacted fill that does not meet the required compaction.

3.09 CLAYEY ROCKFILL

- A. Visible rock particles with maximum dimension greater than 12 inches shall be removed from the clayey rockfill and stockpiled for future use in areas designated by the Construction Manager. Clayey rockfill shall be placed in maximum 12-inch thick loose lifts and compacted with a minimum of four passes of a Caterpillar 815 compactor or approved equal. Final lift surface of compacted clayey rockfill material shall be proofrolled as specified in this Section. Any compacted clayey rockfill material exhibiting excessive pumping or rutting (ruts greater than 2 inches in depth) due to wet material or insufficient compaction shall be dried and recompactd or removed from the fill. Clayey rockfill shall be used only as specified in this Section unless otherwise approved by the Construction Manager.

3.10 PERFORATIONS

- A. Perforations in the compacted fill, subgrade, and top of contouring layer resulting from survey stakes or other activities shall be backfilled with soil or bentonite mix specified in Section 02225. Perforations resulting from nuclear density tests and sand-cone or drive cylinder density tests will be filled by the CQC Consultant in accordance with Section 02225.

3.11 CONSTRUCTION QUALITY REQUIREMENTS

- A. CQC Consultant will perform soil conformance testing on compacted fill materials to confirm compliance with this Section. Conformance testing to be performed and minimum testing frequencies shall be in accordance with the Construction Quality Assurance (CQA) Plan. Provide equipment and labor to assist the CQC Consultant in obtaining conformance samples from excavations, stockpiles, and borrow areas. Identify source(s) and quantity of fill material required from each source for Construction Manager's approval at least 15 calendar days prior to use.
- B. CQC Consultant will monitor earthwork activities in accordance with this Section and the CQA Plan. CQC Consultant will provide documentation to the Construction Manager for the proofrolling of subgrade, top of contouring layer, and compacted clayey rockfill final lift surface.

- C. CQC Consultant will perform performance testing on compacted fill lifts to confirm compliance with this Section. The performance testing to be performed and minimum testing frequencies shall be in accordance with the CQA Plan.
- D. If CQC Consultant's tests indicate that any portion of the compacted fill does not meet the requirements of this Section, CQC Consultant will delineate the extent of the nonconforming area. Rework the nonconforming area until it meets the requirements of this Section.

3.12 SURVEY CONTROL

- A. Survey the locations, limits and grades of excavations, stockpiles, prepared subgrade, compacted fill, and compacted clayey rockfill in accordance with Section 02100.

3.13 TOLERANCES

- A. Perform the earthwork construction to within ± 0.3 feet of the grades indicated on the Construction Drawings except for subgrade for the compacted clay liner, top of contouring layer, access corridor, and roads for which earthwork construction shall be within -0.3 to $+0.1$ feet of the grades indicated.

[END OF SECTION]

SPECIFICATION COVER SHEET

SPECIFICATION SECTION: 02215 TITLE: Trenching and Backfilling

Specifications By: Signature *[Signature]* 17 Aug 01
(Cognizant Engineer) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Scope and Format
Checked By: Signature *[Signature]* 17 Aug 01
(Checker) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Detailed Requirements
Checked by: Signature *[Signature]* 17 Aug 01
(Checker) Date
Printed Name David K. Phillips
and Title Senior Project Engineer

Overall Review By: Signature *[Signature]* 20 Aug 2001
(PDP) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Approved by: Signature *[Signature]* 20 Aug 2001
(DTL) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	Certified for Construction	20 August 01	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
1	Revisions from Phase III DCN.	13 March 02	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

SECTION 02215

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes trenching and backfilling, including pipe embedment fill materials and placement.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 - Surveying
- B. Section 02110 - Clearing, Grubbing, and Stripping
- C. Section 02200 - Earthwork
- D. Section 02225 - Compacted Clay Liner and Cap
- E. Section 02605 - High-Density Polyethylene (HDPE) Pipes and Fittings
- F. Section 02721 - Culverts
- G. Section 13000 - Borrow Area Management
- H. Construction Quality Assurance (CQA) Plan
- I. Part 6 - Statement of Work
- J. Part 8 - Environmental Health & Safety/Training Requirements
- K. Part 9 - Quality Assurance Requirements

1.03 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) Standards:
 - 1. ASTM C 136. Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ASTM D 698. Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

- B. Latest version of Ohio Department of Transportation Construction and Material Specifications (Ohio DOT Specifications).
- C. Latest version of Occupational Safety and Health Administration (OSHA) Construction Standards.
- D. Reference Reports addressing On-Site Disposal Facility (OSDF) and borrow area site subsurface conditions and off-site borrow sources:
 - 1. "Geotechnical Investigation Report, On-Site Disposal Facility" [Parsons, 1995]. This report contains geotechnical data for the subsurface soils in the OSDF area.
 - 2. "Disposal Facility Pre-Design Geotechnical Investigation, Soil Investigation Data Report, CERCLA-RCRA Unit 2" [Science Applications International Corporation, 1995]. This report presents geotechnical data for the subsurface soils in the OSDF area.
 - 3. "Geotechnical Data and Evaluation Report for East and South Field Borrow Areas" [Parsons, 1996]. This report contains geotechnical data for the subsurface soils in the borrow area.
 - 4. "Off-Site Borrow Materials Geotechnical Evaluation Report" [Parsons, 1996]. This report presents geotechnical data for potential off-site borrow sources for OSDF construction materials, including fine concrete aggregates (sand), coarse concrete aggregates (gravel), pea gravel, and riprap.

1.04 SUBMITTALS

- A. For each source of pipe embedment fill material, submit the following to the Construction Manager for review within 30 calendar days from Notice to Proceed:
 - 1. the source of the pipe embedment fill material;
 - 2. written certification and test results conducted in accordance with ASTM C 136; and
 - 3. a 50-pound representative sample of the pipe embedment fill for visual examination, and testing, if necessary.
- B. Provide a list of equipment, description of construction methods for trenching and backfilling, and other required information for trenching and backfilling in the Contractor's Earthwork Work Plan specified in Section 02200.

1.05 HEALTH AND SAFETY REQUIREMENTS

- A. Environmental health and safety/training requirements shall be in accordance with Part 8 of the Contract Documents.

1.06 CONTRACTOR'S QUALITY ASSURANCE

- A. Contractor's quality assurance requirements shall be in accordance with Part 9 of the Contract Documents.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Furnish natural sand pipe embedment fill material for reinforced concrete pipe (RCP), corrugated metal pipe (CMP), and high-density polyethylene (HDPE) pipe meeting the gradation requirements of Section 703.06 of the Ohio DOT Specifications unless otherwise indicated on the Construction Drawings or specified in this Section. Gradation testing shall be in accordance with ASTM C 136.
- B. Furnish trench backfill material for RCP, CMP, HDPE pipe, and electrical conduit that meet the fill material requirements for compacted fill specified in Section 02200. Obtain trench backfill material from OSDF cell excavation, trenching, and stockpiles shown on the Construction Drawings. Obtain additional material for trench backfill, if required, from on-site borrow areas indicated on the Construction Drawings. Borrow area management shall be in accordance with Section 13000.
- C. Trench backfill material for liner system anchor trenches shall meet the material requirements for compacted clay liner and cap specified in Section 02225.
- D. Construction water for moisture conditioning trench backfill shall be obtained from on-site water source shown on the Construction Drawings.
- E. Furnish a minimum 4-inch wide plastic underground marker tape with suitable warning legend to mark HDPE pipes and electrical conduits.
- F. Furnish 14-gauge insulated stranded copper wire as shown on the Construction Drawings.
- G. Bentonite for soil-bentonite plugs shall be in accordance with Section 02225.

2.02 EQUIPMENT

- A. Furnish equipment to perform the work specified in this Section.
- B. Furnish hand compaction equipment such as walk-behind pad-foot compactor, hand tamper, or vibratory plate compactors for compaction in areas inaccessible to large compaction equipment.

PART 3 EXECUTION**3.01 GENERAL**

- A. Verify existing conditions in accordance with Section 02100.
- B. Review existing site utility drawings, and identify and stake existing above and below ground utilities in vicinity of trenching. Staking shall be as approved by the Construction Manager.
- C. In areas of trenching and backfilling, maintain and protect existing above and below ground utilities.
- D. Do not damage or disturb survey benchmarks, finished construction, and existing utilities and structures.
- E. Perform clearing, grubbing, and stripping in accordance with Section 02110.
- F. Dust control for trenching and backfilling shall be in accordance with Part 6 of the Contract Documents.

3.02 TRENCHING

- A. Trench for placement of pipes and for liner system anchor trenches shall be to the depths and dimensions shown on the Construction Drawings. Stockpile excess excavated material from trenching in the stockpile areas shown on the Construction Drawings or as approved by Construction Manager in accordance with Section 02200.
- B. Use trench support methods approved by the Construction Manager. Trench support shall satisfy applicable local, state, and federal requirements, including requirements of the OSHA Construction Standards. Provide trench support materials on site prior to the start of trenching. Maintain the safety and stability of slopes and trenches and protect adjacent utilities and structures.
- C. Protect and maintain the trench bottom. Remove rock fragments or raveled materials that collect on the trench bottom. Backfill any overexcavation with compacted fill in accordance with Section 02200. Excavate any soft subgrade encountered at the trench bottom and backfill to trench bottom elevation with compacted fill in accordance with Section 02200.
- D. Where trenches will be excavated in compacted fill areas, perform trenching only after compacted fill has reached at least 12 inches above proposed elevation of top of the pipe.

- E. For pipe installation limit the maximum length of open trench to 200 feet in advance and 200 feet behind pipe unless otherwise approved by the Construction Manager. For anchor trench limit, open trenches to length of proposed daily geosynthetics installation unless otherwise approved by the Construction Manager. Contractor shall provide appropriate non-skid surface walkways, such as wooden boards, for access across open trenches.
- F. Continuously dewater trenches. Perform dewatering in accordance with Section 02200.
- G. The inside edge of liner system anchor trenches where geosynthetics will be placed shall be cut with a trenching machine to minimize soil raveling and shall be rounded to a minimum 6-inch radius.

3.03 BACKFILLING

- A. General:
 - 1. Do not backfill with frozen or saturated material.
 - 2. Do not backfill over frozen, wet, or soft trench bottom or side slopes. Remove materials that are frozen, wet, or soft as specified in this Section.
 - 3. Do not disturb or damage piping or geosynthetics in trench during backfilling.
 - 4. Do not use compaction equipment which exerts greater than 10 pounds per square inch ground pressure over piping that is covered by less than 12 inches of backfill material.
- B. Placement of pipe embedment fill for pipes and culverts:
 - 1. Place pipe embedment fill in 7-inch \pm 1-inch thick loose lifts to the elevation of the bottom of the pipe or culvert.
 - 2. Compact pipe embedment fill with a minimum of 4 passes of a vibratory plate compactor prior to placing pipe.
 - 3. Place pipe or culvert on top of the compacted pipe embedment fill.
 - 4. Install 14-gauge insulated stranded copper wire to top of HDPE pipes as shown on the Construction Drawings. Use cable tie-wraps at 5-foot intervals to tie copper wire to pipe prior to backfilling.
 - 5. For pipes 12 inches in diameter or less, place additional pipe embedment fill on the sides and gently hand tamp the fill around the sides as needed, such that intimate contact between the pipe and the pipe embedment fill is maintained below the spring line of the pipe. Continue placing pipe embedment fill until it is even with the top of the pipe. Compact the pipe embedment fill with a minimum of 4 passes of a walk-behind pad-foot compactor, hand tamper, or vibratory plate compactor, as appropriate. Place pipe embedment fill above the top of pipe to a minimum depth of 12 inches in two 7-inch \pm 1-inch thick loose lifts. Compact each lift of pipe

embedment fill with a minimum of 4 passes of a walk-behind pad-foot compactor, hand tamper, or vibratory plate compactor, as appropriate.

- 6. For pipes or culverts greater than 12 inches in diameter, place pipe embedment fill in 7-inch ±1-inch thick loose lifts to the limits shown on the Construction Drawings. Compact each lift with a minimum of 4 passes of a vibratory plate compactor.
- 7. For horizontal monitoring well pipe trenches and HDPE pipe trenches between each valve house tie-in and the cell outlet, construct a soil-bentonite plug every 50-feet along the length of the trench. Prepare soil-bentonite mixture consisting of embedment fill at its natural moisture content mixed with minimum 10 percent (by dry weight basis) bentonite granules. Thoroughly mix with a portable cement mixer or other suitable method. Place and compact the soil-bentonite mixture in the same manner as specified in this Section for the embedment fill.

C. Placement of trench backfill material for pipes and culverts:

- 1. After placement and compaction of pipe embedment fill to the limits shown on the Construction Drawings, place the first lift of trench backfill material in a 12-inch thick loose lift. Place subsequent lifts of trench backfill material in 8-inch ±1-inch thick loose lifts.
- 2. Compact trench backfill material in each lift to at least 95 percent of its standard Proctor maximum dry unit weight and at a moisture content within ±3 percent of the optimum moisture content as determined by ASTM D 698.

D. Placement of trench backfill material for liner system anchor trench:

- 1. Place the anchor trench backfill material in 8-inch ±1-inch thick loose lifts if compaction equipment operating weight is greater than 2000 pounds, and in 4-inch ±1-inch thick loose lifts if compaction equipment operating weight is less than 2000 pounds.
- 2. Compact the anchor trench backfill material to the minimum dry unit weight and range of moisture contents required for compacted clay liner and cap material specified in Section 02225.

E. Place underground marker tape in trench backfill 12 inches below finished grade above all HDPE pipes and electrical conduits.

3.04 PERFORATIONS

A. Perforations in the trench backfill resulting from survey stakes or other activities shall be backfilled with trench backfill material. Perforations resulting from nuclear density

tests and sand-cone or drive cylinder density tests will be filled with trench backfill material by the CQC Consultant.

3.05 CONSTRUCTION QUALITY REQUIREMENTS

- A. CQC Consultant will perform conformance testing on pipe embedment fill and trench backfill materials to establish compliance with this Section, and Sections 02200 and 02225, as applicable. The conformance testing to be performed and the minimum testing frequencies shall be in accordance with the Construction Quality Assurance (CQA) Plan.
- B. CQC Consultant will monitor trenching and backfilling as specified in this Section and the CQA Plan.
- C. CQC Consultant will perform performance testing on the backfill materials to establish compliance with this Section. The performance testing to be performed and minimum testing frequencies shall be in accordance with the CQA Plan.
- D. CQC Consultant shall review and approve pipe installation as-built elevations prior to backfilling.

3.06 SURVEY CONTROL

- A. Survey the locations, limits, and grades of the bottom of the liner system anchor trench and compacted trench backfill in accordance with Section 02100.
- B. Survey the locations, limits, and grades of pipes and culverts, including invert elevations, in accordance with Section 02100.

3.07 TOLERANCES

- A. Trench bottom shall be within 0.0 to +0.2 feet of the depth indicated on the Construction Drawings.
- B. Embedment fill for pipes and culverts shall be placed within 0.0 to +0.2 feet of the depth indicated on the Construction Drawings.

[END OF SECTION]

45 17

SPECIFICATION COVER SHEET

SPECIFICATION SECTION: 02230 TITLE: Road Construction

Specifications By: Signature *[Signature]* 17 Aug 01
(Cognizant Engineer) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Scope and Format
Checked By: Signature *[Signature]* 17 Aug 01
(Checker) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Detailed Requirements
Checked by: Signature *[Signature]* 17 Aug 01
(Checker) Date
Printed Name David K. Phillips
and Title Senior Project Engineer

Overall Review By: Signature *[Signature]* 20 Aug 2001
(PDP) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Approved by: Signature *[Signature]* 20 Aug 2001
(DTL) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	Certified for Construction	20 August 01	<i>[Signature]</i>	DICP	JFB
1	Revisions from Phase III DCNs	13 Aug 02	DICP	DICP	JFB

000134

SECTION 02230**ROAD CONSTRUCTION****PART 1 GENERAL****1.01 SCOPE**

- A. This Section includes impacted material haul roads, cell access ramps, access corridor, the Emergency Access Road, the Special Materials Transfer Area (SMTA), and other roads and areas as shown on the Construction Drawings to be surfaced with base aggregate.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 - Surveying
- B. Section 02110 - Clearing, Grubbing, and Stripping
- C. Section 02150 - Traffic Control
- D. Section 02200 - Earthwork
- E. Section 02270 - Surface-Water Management and Erosion Control
- F. Section 02714 - Geotextiles
- G. Construction Quality Assurance (CQA) Plan
- H. Part 6 - Statement of Work
- I. Part 8 - Environmental Health & Safety/Training Requirements
- J. Part 9 - Quality Assurance Requirements

1.03 REFERENCE

- A. Latest version of Ohio Department of Transportation Construction and Material Specifications (Ohio DOT Specifications).

1.04 SUBMITTALS

- A. For each source of base aggregate material, submit the following to the Construction Manager for review within 30 calendar days from Notice to Proceed:
1. the source of the materials along with written certification from the supplier that the material meets the material requirements of this Section; and
 2. certification shall include test results as required by Ohio DOT Specifications for base aggregate materials demonstrating that it meets the requirements of items from the Ohio DOT Specifications specified in this Section.
- B. Provide a list of equipment, description of construction methods, and other required information to perform the construction activities described in this Section with the Contractor's Earthwork Work Plan specified in Section 02200.

1.05 HEALTH AND SAFETY REQUIREMENTS

- A. Environmental health & safety/training requirements shall be in accordance with Part 8 of the Contract Documents.

1.06 CONTRACTOR'S QUALITY ASSURANCE

- A. Contractor's quality assurance requirements shall be in accordance with Part 9 of the Contract Documents.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Furnish base aggregate material consisting of crushed carbonate stone or crushed gravel, free of organic matter and other deleterious materials, which meets the requirements of Items 304.02 and 703.04 (2) of the Ohio DOT Specifications for aggregate base.
- B. Furnish a geotextile separator meeting the requirements of Section 02714.
- C. Furnish materials for compacted fill or clayey rockfill meeting the requirements of Section 02200.
- D. Furnish road signs and other traffic controls in accordance with Section 02150.

2.02 EQUIPMENT

- A. Furnish equipment for construction of impacted material haul roads, cell access ramps, access corridors, the Emergency Access Road, the SMTA, and other roads shown on the Construction Drawings in accordance with the requirements of this Section.

PART 3 EXECUTION

3.01 GENERAL

- A. Dust control during the performance of road construction activities described in this Section shall be in accordance with Part 6 of the Contract Documents.
- B. Install surface-water management and erosion controls in accordance with Section 02270.
- C. Perform clearing, grubbing, and stripping to the limits indicated on the Construction Drawings or identified by the Construction Manager, and in accordance with Section 02110 prior to any earthwork activity.

3.02 SUBGRADE PREPARATION

- A. Prepare subgrade for the road construction described in this Section in accordance with Section 02200.

3.03 GEOTEXTILE PLACEMENT

- A. Install the geotextile separator over the prepared subgrade in accordance with Section 02714.

3.04 BASE AGGREGATE

- A. Construct the base aggregate layer to the thickness, grades, and limits indicated on the Construction Drawings.
- B. Place the base aggregate material on top of the geotextile separator by end dumping and carefully spread using a track bulldozer. Do not operate equipment directly on the geotextile.
- C. Place the base aggregate in accordance with the requirements of Item 304.04 of the Ohio DOT Specifications.

- D. Compact the base aggregate in accordance with the requirements of Item 304.05 of the Ohio DOT Specifications.

3.05 CONSTRUCTION QUALITY REQUIREMENTS

- A. CQC Consultant will perform conformance testing on materials for compacted fill used for the construction described in this Section to establish compliance with this Section and Section 02200 as applicable. Conformance testing to be performed and minimum testing frequencies shall be in accordance with the Construction Quality Assurance (CQA) Plan.
- B. CQC Consultant will monitor road construction in accordance with this Section and the CQA Plan.
- C. CQC Consultant will perform performance testing on compacted fill and/or compacted clayey rockfill used for the construction described in this Section to establish compliance with this Section and Section 02200. Performance test requirements and minimum testing frequencies shall be in accordance with the CQA Plan.

3.06 SURVEY CONTROL

- A. Survey alignment and grades for roads, ramps, the SMTA, and corridor in accordance with Section 02100.

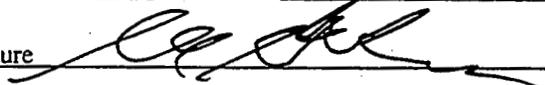
TOLERANCES

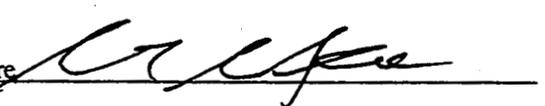
- A. Construct the base aggregate to within 0.0 to +0.1 feet of the thickness indicated on the Construction Drawings.
- B. Construct the impacted material haul roads, cell access ramps, access corridor, the Emergency Access Road, the SMTA, and other roads shown on the Construction Drawings to within ± 0.2 feet of the grades indicated on the Construction Drawings.

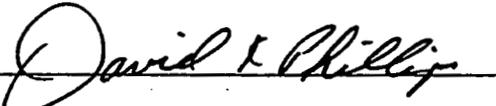
[END OF SECTION]

SPECIFICATION COVER SHEET

SPECIFICATION SECTION: 02270 TITLE: Surface-Water Management and Erosion Control

Specifications By: Signature  17 Aug 01
(Cognizant Engineer) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Scope and Format
Checked By: Signature  17 Aug 01
(Checker) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Detailed Requirements
Checked by: Signature  17 Aug 01
(Checker) Date
Printed Name David K. Phillips
and Title Senior Project Engineer

Overall Review By: Signature  20 Aug 2001
(PDP) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Approved by: Signature  20 Aug 2001
(DTL) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	Certified for Construction	20 August 01	MSM	DKF	JFB
1	Revisions from Phase III DCNs	13 March 02	DKF	DKF	JFB

000139

SECTION 02270**SURFACE-WATER MANAGEMENT AND EROSION CONTROL****PART 1 GENERAL****1.01 SCOPE**

- A. This Section includes materials and placement of silt fence, erosion mat, check dams, construction entrances, diversions, ditches, channels, berms, and stabilization; and maintenance of sedimentation basins and surface-water management and erosion control measures.
- B. Surface-water management and erosion control for the impacted material placement shall be in accordance with Section 13010.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 - Surveying
- B. Section 02200 - Earthwork
- C. Section 02240 - Non-Impacted Protective and Contouring Layers
- D. Section 02271 - Riprap
- E. Section 02275 – Surface Water Management and Erosion Control For Remediation
- F. Section 02721 - Culverts
- G. Section 02930 - Vegetation
- H. Section 13010 - Impacted Materials Placement
- I. Surface-Water Management and Erosion Control (SWMEC) Plan
- J. Construction Quality Assurance (CQA) Plan
- K. Part 6 - Statement of Work
- L. Part 8 - Environmental Health & Safety/Training Requirements
- M. Part 9 - Quality Assurance Requirements

000140

1.03 REFERENCES

- A. Latest version of Ohio Department of Natural Resources (ODNR) Rainwater and Land Development Standards (ODNR Rainwater and Land Development Standards).

1.04 SUBMITTALS

- A. Submit to the Construction Manager for review within 15 calendar days from Notice to Proceed, Contractor's Surface-Water Management and Erosion Control Work Plan that shall be prepared in accordance with this Section, Section 02240, Section 02275, Section 13010, ODNR Rainwater and Land Development Standards, and the Surface-Water Management and Erosion Control (SWMEC) Plan, and shall include but not be limited to the following:
1. descriptions of the surface-water management and erosion control measures to be implemented throughout the duration of the Contract;
 2. a list of equipment, description of methods, and other required information for installing and maintaining surface-water management and erosion control measures specified in this Section;
 3. drawings showing, in plan view, the location and sequencing of the surface-water management and erosion control measures and other required information for installation of surface-water management and erosion control measures;
 4. drawings showing details of the surface-water management and erosion control measures; and
 5. calculations supporting the selection and use of surface-water management and erosion control measures.
- B. Submit the following to the Construction Manager for review within 15 calendar days from Notice to Proceed:
1. manufacturer's product data and recommended methods of installation for products used for surface-water management and erosion control measures; and
 2. certification from the supplier or Manufacturer that products meet the requirements of this Section.

1.05 HEALTH AND SAFETY REQUIREMENTS

- A. Environmental health & safety/training requirements shall be in accordance with Part 8 of the Contract Documents.

1.06 CONTRACTOR'S QUALITY ASSURANCE

- A. Contractor's quality assurance requirements shall be in accordance with Part 9 of the Contract Documents.

000141

PART 2 PRODUCTS**2.01 SILT FENCE**

- A. Furnish silt fence with either woven or nonwoven geotextile conforming to ODNR Rainwater and Land Development standards. Silt fence shall:
1. be woven geotextile consisting of slit films of polypropylene treated with ultraviolet light stabilizers, or nonwoven geotextile consisting of long chain polymeric filaments or polyester yarns;
 2. be inert to chemicals commonly found in soils and to hydrocarbons;
 3. be resistant to mildew, rot, insects, and rodent attack; and
 4. have geotextile and fence post properties and minimum dimensions in accordance with this Section and ODNR Rainwater and Land Development Standards.

2.02 EROSION MAT

- A. Furnish erosion mat which shall be a woven blanket-like fabric made of biodegradable yarn with the following material properties:
1. Yarn Content: 100 percent jute except as indicated on Construction Drawings;
 2. Weight: Minimum 11.5 ounces per square yard;
 3. Open Area: 55 ± 10 percent; and
 4. Minimum Mesh Opening: 0.5 inches.
- B. Furnish erosion mat that will resist degradation for a minimum 6-month period after installation.
- C. Furnish erosion mat having a permissible velocity of 7 feet per second (fps).

2.03 STABILIZATION

- A. Materials for stabilization, including vegetation and crusting agent, shall be in accordance with Section 02930.

2.04 OTHER MATERIALS

- A. Riprap shall be in accordance with Section 02271.
- B. Culverts shall be in accordance with Section 02721.
- C. Materials for berms shall be as specified for compacted fill in Section 02200.
- D. Construction entrances shall be in accordance with ODNR Rainwater and Land Development Standards.

000142

- E. Diversions and channels shall be in accordance with ODNR Rainwater and Land Development Standards.
- F. Materials for other surface-water management and erosion controls, including storm drain inlet protection, shall be in accordance with ODNR Rainwater and Land Development Standards.

2.05 EQUIPMENT

- A. Furnish equipment to perform work specified in this Section.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Silt Fence
 - 1. Install silt fence in accordance with ODNR Rainwater and Land Development, and at the locations required by the Contractor's Surface-Water Management and Erosion Control Work Plan.
- B. Erosion Mat
 - 1. Provide erosion mat at the locations indicated on the Construction Drawings and the locations indicated on the Contractor's Surface-Water Management and Erosion Control Work Plan, and those locations resulting from Section 02930 permanent slope stabilization requirements. Begin installation of erosion mat in a specific area within 48 hours after seeding has been completed in that area. Seeding shall be as specified in Section 02930. If seeding coverage in an area is lost due to inclement weather prior to installation of the erosion mat, Contractor shall reseed the previously seeded area.
 - 2. Place erosion mat on a prepared surface that is free of deleterious vegetation, trash, ruts, and rocks.
 - 3. Overlap adjacent erosion mats in accordance with the Manufacturer's recommendations.
 - 4. Install and staple erosion mat in accordance with Manufacturer's recommendations, except staples shall be a minimum 6-inches in length.
- C. Install check dams in ditches and channels in accordance with ODNR Rainwater and Land Development Standards.
- D. Apply crusting agents in accordance with Section 02930. Areas of crusting agent application shall be approved in advance by the Construction Manager.
- E. Stabilize and vegetate disturbed areas in accordance with Section 02930.

000143

- F. Install riprap in accordance with Section 02271 and as shown on the Construction Drawings.
- G. Construct channels, ditches, and berms as shown on the Construction Drawings and in accordance with the Contractor's Surface-Water Management and Erosion Control Work Plan. Earthwork for channels, ditches, and berms shall be in accordance with Section 02200.
- H. Install construction entrances in accordance with the Contractor's Surface-Water Management and Erosion Control Work Plan.
- I. Install additional surface-water management and erosion controls in accordance with the Contractor's Surface-Water Management and Erosion Control Work Plan.
- J. Install storm drain inlet protection in accordance with ODNR Rainwater and Land Development Standards.

3.02 ADDITIONAL REQUIREMENTS

- A. Prevent the runoff of polluting substances such as silt, clay, fuels, oils, and contaminated soils into water supplies and surface waters in accordance with the Contractor's Surface-Water Management and Erosion Control Work Plan.
- B. Remove accumulated silt and debris from behind the face of the silt fence when the silt deposits reach approximately one half the height of the fence. Replace silt fence geotextile damaged during maintenance operations. Removed silt and debris shall be placed in the OSDF constructed cells in accordance with Section 13010 or stockpiled in locations approved by the Construction Manager.

3.03 SURVEY CONTROL

- A. Survey permanent locations of surface-water management and erosion control measures in accordance with Section 02100.

3.04 MAINTENANCE

- A. Clean, maintain, repair, and replace surface-water management and erosion controls for the duration of the Contract in accordance with the Contractor's Surface-Water Management and Erosion Control Work Plan.
- B. Maintain erosion control measures and existing sedimentation basins in accordance with Part 6 of the Contract Documents.
- C. Sedimentation basins shall be cleaned of silt once per construction season.

000144

3.05 INSPECTIONS

- A. Inspect surface-water management and erosion control measures and sedimentation basins to evaluate their effectiveness and need for maintenance. Any required repairs to the surface-water management and erosion control measures and sedimentation basins shall be initiated upon discovery, but no later than 24 hours after discovery. Inspections shall occur, at a minimum, at the following frequencies:
1. weekly;
 2. daily after each rain event exceeding 0.5 inches; and
 3. at least daily during prolonged rainfall events.
- B. Records of inspections shall be kept on file on-site by Contractor and shall be submitted monthly to the Construction Manager. The records of inspection shall include the following:
1. summary of the scope of the inspection;
 2. name of inspector;
 3. inspection date;
 4. inspection location;
 5. purpose of the inspection (i.e., regular weekly, following a storm, etc.);
 6. observations relative to performance of the surface-water management and erosion control measures;
 7. any necessary corrective actions; and
 8. corrective actions completed and their performance since the previous inspection.

3.06 CONSTRUCTION QUALITY REQUIREMENTS

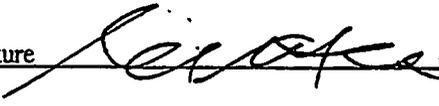
- A. CQC Consultant will monitor the installation and maintenance of surface-water management and erosion control measures in accordance with this Section and the Construction Quality Assurance (CQA) Plan.

[END OF SECTION]

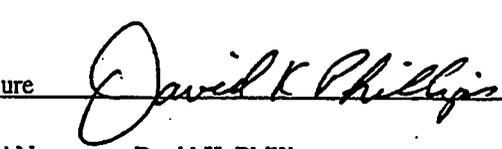
000145

SPECIFICATION COVER SHEET

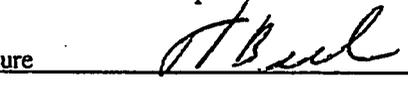
SPECIFICATION SECTION: 02930 TITLE: Vegetation

Specifications By: Signature  17 Aug 01
(Cognizant Engineer) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Scope and Format
Checked By: Signature  17 Aug 01
(Checker) Date
Printed Name Michael J. Monteleone, P.E.
and Title Associate

Detailed Requirements
Checked by: Signature  17 Aug 01
(Checker) Date
Printed Name David K. Phillips
and Title Senior Project Engineer

Overall Review By: Signature  20 Aug 2001
(PDP) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Approved by: Signature  20 Aug 2001
(DTL) Date
Printed Name J.F. Beech, Ph.D., P.E.
and Title Principal

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	Certified for Construction	20 August 01	MSW	DKB	JFB
1	Revisions from Phase III DENs	13 March 02	DKB	DKB	JFB

SECTION 02930**VEGETATION****PART 1 GENERAL****1.01 SCOPE**

- A. This Section includes soil stabilization, which includes application of crusting agent and establishing vegetation by seeding. The work in this Section includes, but is not limited to; soil preparation, interim vegetation, permanent vegetation, application of fertilizer, application of mulches, and application of crusting agent.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02200 - Earthwork
- B. Section 02270 - Surface-Water Management and Erosion Control
- C. Part 6 - Statement of Work
- D. Part 8 - Environmental Health & Safety/Training Requirements
- E. Part 9 - Quality Assurance Requirements

1.03 REFERENCES

- A. Latest version of Ohio Department of Natural Resources (ODNR) Rainwater and Land Development Standards (ODNR Rainwater and Land Development Standards).
- B. "*Identification and Listing of Hazardous Waste*", Title 40, Code of Federal Regulations (CFR), Part 261, Subpart E.C.
- C. "*Federal Hazardous Material Transportation Law*", U.S. Department of Transportation [U.S. DOT, 1994].

1.04 SUBMITTALS

- A. Submit the following to the Construction Manager for review within 15 calendar days from Notice to Proceed:
 - 1. proposed mixes and application rates for seed, mulch, fertilizers, and crusting agents;

- 2. Manufacturer's product data and recommended methods of application for seed, mulches, fertilizer, and crusting agents;
 - 3. product data for fertilizer shall also include chemical analysis including uranium analysis to assure there is no resultant or derived uranium from fertilizer use, unless waived by Construction Manager;
 - 4. material safety data sheet (MSDS) for fertilizer, mulch binder and crusting agent; and
 - 5. inoculant information for the permanent seed mixes.
- B. Submit the following to the Construction Manager for review within 30 calendar days before seeding:
- 1. certificate stating seed mixture, guaranteed percentages of purity, weed content, germination of seed, name of seller, test date for the seed, and the net weight and date of shipment;
 - 2. Manufacturer's certificate stating the available nutrients contained in the proposed fertilizer;
 - 3. Manufacturer's certificate stating that the fiber matrix (wood fibers) meets the requirements of this Section;
 - 4. Manufacturer's certificate stating the mulch binder meets the requirements of this Section;
 - 5. Manufacturer's certificate stating the crusting agent meets the requirements of this Section; and
 - 6. documentation of the straw to be used for mulch; this documentation shall verify that the straw is weed free in accordance with the requirements of this Section.
- C. Submit to the Construction Manager for review within 10 calendar days before seeding a plan showing seeding area and a written statement of application rate of seed mix and/or associated materials (i.e., fertilizer, mulch, and mulch binder). Choice of seeding type shall follow the site seeding requirements and as approved by the Construction Manager.
- D. Provide a list of equipment, description of construction methods, and other required information for vegetation and application of crusting agent in the Contractor's Earthwork Work Plan specified in Section 02200.

1.05 HEALTH AND SAFETY REQUIREMENTS

- A. Environmental health & safety/training requirements shall be in accordance with Part 8 of the Contract Documents.

1.06 CONTRACTOR'S QUALITY ASSURANCE

- A. Contractor's quality assurance requirements shall be in accordance with Part 9 of the Contract Documents.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Furnish seed labeled in accordance with U.S. Department of Agriculture (USDA) Rules and Regulations under the Federal Seed Act and applicable State seed laws. Furnish seed in sealed bags or containers bearing the date of expiration. Do not use seed after its date of expiration. Each variety of seed shall have a purity of not less than 90 percent by weight, a percentage of germination not less than 80 percent by weight, and a weed to seed content of not more than 0.75 percent by weight and contain no noxious weeds. Furnish seed mixtures having seed proportioned by weight in accordance with Tables 02930-1A, 02930-1B, 02930-1C and 02930-2. Areas requiring permanent seeding during the summer months (June 15 – September 20), excluding the OSDF Cell Final Cover, shall be seeded with 30 lbs/acre of ReGreen as specified in this Section. An alternative to ReGreen, and the only acceptable alternative for summer seeding of the OSDF Cell Final Cover, is stabilizing with a crusting agent as specified in this Section. Stabilization performed during the summer shall be followed by fall application of the appropriate permanent seed mix.
- B. Permanent seed mixes shall be treated with fungal (Mycorrhizae) inoculant and bacterial (Rhyzobium) inoculants. The specified legumes must be inoculated with the appropriate Rhizobial strains.
- C. Furnish mulch meeting the following requirements:
1. Mulch shall be straw or wood cellulose fiber, free of clay, stone, foreign substances, and free of weeds.
 2. Straw should not contain sticks larger than ¼-inch diameter or other materials that may prevent matting down during application. Use straw that is free from mold and other objectionable material for placing with mulch blower equipment or other equipment as approved by the Construction Manager. Straw shall be generally 6 inches or more in length.
 3. Straw shall be:
 - a. weed free straw from the Minnesota Crop Improvement Association certified weed free straw vendors;
 - b. straw that has been inspected and determined to be weed free by Central Ohio Seed Testing;

- c. native prairie grass mulch; or
 - d. equivalent substitute as approved by the Construction Manager.
4. Mulch applied by hydrospraying shall be a bonded fiber matrix containing wood fibers held together with a hydrocolloid-based binder, which upon drying becomes insoluble and non-dispersible. Mulch shall be comprised of 39 parts wood fiber to one part binder by weight. The fibers shall be composed of 100 percent wood or wood by-products and shall be 100 percent biodegradable. Use a bonded fiber matrix containing a green dye that will provide for easy visual inspection for uniformity of slurry spread. The bonded fiber matrix, including dye, shall contain no growth or germination inhibiting properties. The wood cellulose fiber shall be manufactured in such a manner that, after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a homogeneous material. When sprayed on the ground, the material shall allow absorption and percolation of moisture. The wood cellulose fiber shall meet the following requirements:

<u>Item</u>	<u>Specification Limit</u>
Particle Length	0.8 inch (maximum)
Particle Thickness	0.047 inch (maximum)
Ph	4.0 to 8.5
Ash Content	1.6% (maximum)
Water Holding Capacity (based on fiber dry weight)	500% (minimum)
Moisture Content	12% ± 4% (by weight)

- D. Mulch binder agent shall be as approved by the Construction Manager and shall meet the following requirements:
1. The mulch binder shall be hydrocolloid base (guar gum) and shall not dissolve or disperse upon rewetting.
 2. The mulch binder shall not have hazardous characteristics of ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR Part 261, Subpart C, for a hazardous waste in either its pre-applied or cured states.
 3. The mulch binder shall have a flash point greater than 200°F. The mulch binder shall be neither a flammable nor combustible liquid per United States (US) Department of Transportation definition [U. S. DOT, 1994]. The mulch binder must not be susceptible to significant deterioration from exposure to the elements, including sunlight.
 4. The mulch binder shall be provided in concentrated solution and prepared so that it will not change in transportation or storage.

- E. The crusting agent shall be as approved by the Construction Manager and shall meet the following criteria:
1. pine sap emulsion comprised of a 100 percent organic emulsion produced from naturally occurring resins (pine sap); or an approved equal;
 2. not comprised of chloride, lignosulfonate, petroleum, or asphaltic-type emulsions;
 3. provide dust suppression and surface stability for exposed soils, both disturbed and undisturbed soils, and exposed coal fired ash (fly ash);
 4. compatible with application via a hydro seeder, and must not require intense cleaning of equipment after application;
 5. non-tracking (i.e., will not stick to boots or tires) once cured;
 6. not have hazardous characteristics of ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR Part 261, Subpart C, for a hazardous waste in either its pre-applied or cured states;
 7. have a flash point greater than 200 °F;
 8. be neither a flammable nor combustible liquid per DOT definition; and
 9. not be susceptible to significant deterioration from exposure to the elements, including sunlight.
- F. Erosion mat shall be in accordance with Section 02270.
- G. Fertilizer:
1. Furnish commercial grade fertilizer, uniform in composition that meets the requirements of all State and Federal regulations and standards of the Association of Agricultural Chemists.
 2. Fertilizer shall be slow release complete fertilizer.
 3. Two types of fertilizer mixes shall be used. Fertilizer for application within the former production area shall be 34-0-10; other fertilizers may be approved by the Construction Manager for the former production area, but they must not contain phosphorous. Fertilizer for other areas shall be 22-5-10. Other fertilizers may be approved by the Construction Manager for areas outside the former production area provided the fertilizer mix does not contain more than 6% phosphorous. Fertilizers shall contain not less than 1 percent added sulfur and not more than 8 percent added iron, or an approved equal.
 4. Fertilizer must have MSDS submitted in accordance with this Section.
 5. Fertilizer shall be used for interim seeding only.
- H. Construction water shall be obtained from the on-site water source shown on the Construction Drawings.

2.02 EQUIPMENT

- A. Provide equipment of size and type to perform work specified in this Section.

PART 3 EXECUTION**3.01 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver containerized materials in uniform packages bearing the name of the manufacturer, the net weight and a statement of content. Deliver containerized materials to the site in original, properly labeled, unopened, clean containers each showing the manufacturer's guaranteed analysis conforming to applicable regulations and standards.
- B. Store materials in a dry area in a manner to prevent physical damage.

3.02 GENERAL

- A. Stabilization of disturbed areas by vegetation or by use of a crusting agent shall be performed at completion of excavation and stockpiles or within 7 calendar days of knowing a disturbed area will be idle for more than 45 calendar days, whichever is sooner.
- B. Crusting agents may be used as temporary measures prior to placement of interim vegetation after approval for the area by the Construction Manager.
- C. Interim vegetation, as specified in this Section, is required for all areas except OSDF final cover system and soil stockpiles, which are scheduled to be disturbed in future. Fertilizer shall be used for interim vegetation as specified in this Section.
- D. Permanent vegetation, as specified in this Section, is required for OSDF final cover system. No fertilizer shall be used with permanent vegetation as specified in this Section.
- E. Disturbed areas which are scheduled to be significantly disturbed after initial stabilization and/or need effective erosion control immediately, are to be stabilized with the interim seed mix rate specified in this Section. Disturbed areas which are not scheduled to be significantly disturbed again are to be stabilized with the permanent seed mix rate specified in this Section. Soil piles, which require effective erosion control immediately, are to be stabilized with the interim seed mix rate or a crusting agent as specified in this Section.
- F. Use an erosion mat as specified in Section 02270 at locations shown on the Construction Drawings after application of seed mixture.
- G. Area(s) to be seeded shall be generally free of debris, rock, root material, and other objects that may impede soil preparation and seeding activities. Perform soil

preparation by tilling/cultivating, to a depth of approximately 2 inches, to eliminate uneven areas and low spots. Maintain lines, levels and contours.

- H. Repeat cultivation in areas where equipment used for hauling and spreading has compacted the area(s) to be seeded.

3.03 APPLICATION

- A. The seeding season, for interim vegetation specified in this Section, is year round. However, if seeding is contemplated during the winter months of December through March, then field conditions should be assessed for ability to provide soil to seed contact. If field conditions do not support the ability to provide soil to seed contact then the area shall be stabilized with a crusting agent followed by seeding during conditions conducive to adequate soil to seed contact.
- B. The permanent seeding in wet and dry areas and the cell final cover shall be performed in the Spring Season between April 1 and June 15 and/or the Fall Season between September 20 and November 30, unless otherwise approved by the Construction Manager.
- C. Apply fertilizer, seed, and mulch to disturbed areas and areas excavated and graded under this Contract requiring seeding unless otherwise directed by the Construction Manager. Apply mulch within 24 hours of seeding; do not seed areas in excess of that which can be mulched within 24 hours. Winter application of seed and related materials are subject to adjustment as directed by the Construction Manager.
- D. Apply seed using either the drilling, broadcasting, or hydroseeding method, as described below:
1. Seed drilling method:
 - a. This method shall be used for applying the permanent seed mix in accessible areas unless otherwise approved by the Construction Manager. The method may also be used for interim vegetation.
 - b. Prepare area to be seeded by loosening the soil to a minimum depth of 3 inches.
 - c. Apply commercial grade, slow release complete fertilizer, for interim vegetation only, at a rate of 150 lbs/acre at the time of preparing the seedbed for seeding.
 - d. Install seed with a seed drill to obtain a final planting depth of $\frac{1}{4}$ to $\frac{1}{2}$ inch using the seed rates indicated in Tables 02930-1A, 02930-1B, 02930-1C and 02930-2. All seed drilling should be done perpendicular to the direction of surface-water flow.

2. Broadcast Seeding Method:

- a. This method may be used for interim vegetation, and can be performed with the use of mechanical "cyclone" seeders, by hand seeding or by any other method which scatters seed over the soil surface.
- b. This method may also be used for permanent seeding in areas that are not accessible by the seed drill method or areas where seed drilling cannot be performed perpendicular to the direction of the surface-water flow.
- c. If Broadcast Method is used to apply permanent seed mix in sloped areas (3H:1V slope or steeper), seeding application rates in Tables 02930-1A and 02930-1B should be doubled.
- d. Prepare the area to be seeded by loosening the soil to a minimum depth of 3 inches. This is critical to allow seeds to filter into the soil to avoid washout from runoff.
- e. Apply commercial grade, slow release complete fertilizer, for interim vegetation only, at a rate of 150 lbs/acre at the time of preparing the seedbed for seeding.
- f. Install seed by broadcasting evenly over the entire site using the seed rates indicated in this Section.
- g. After application of seed, perform the following prior to placement of erosion mat.
 - i. For areas receiving seed mix for cell final cover permanent vegetation (Table 02930-1C), roll seeded area with a 200 to 600 pound drum roller after seeding. If surface is not accessible for the drum roller after seeding, apply sprayed mulch at 1500 pounds per acre minimum and 100 percent continuous coverage. Mix the mulch with water at a ratio of 50 pounds of mulch per 100 gallons of water.
 - ii. For areas receiving other seed mixes (Tables 02930-1A, 02930-1B or 02930-2), rake seeded area after seeding
- h. Mulch and disc-anchor using weed free mulch at a rate of 2.0 tons per acre. Spread straw mulch, either by hand or by blowing method, at the rate of 2 air-dried tons per acre. During June through September, increase straw mulch application rate to 3 air-dried tons per acre. Application of straw mulch by the blowing method is exempt from the dust control requirements specified in Part 6 of the Contract Documents.3.

Hydroseeding Method:

- a. This method may be used for interim vegetation only. Hydroseeding shall be a two-step process. The seed shall be applied first, followed by a separate application of the mulch. This is to ensure soil to seed contact.
- b. The mixture tank shall be cleaned prior to use to ensure remnant seed is not introduced to the proposed seed mixture.

- c. Prepare area to be seeded by loosening the soil to a minimum depth of 3 inches. This is critical to allow seeds to filter into the soil to avoid washout from runoff.
- d. Apply commercial grade, slow release complete fertilizer, for interim vegetation only, at a rate of 150 lbs/acre. The fertilizer is to be mixed and applied with the mulch.
- e. Install seed by hydroseeding evenly over the entire area using the seed rates indicated in Table 02930-2. Use a fan-type nozzle with approximately 500 gallons of water per acre to ensure even distribution.
- f. Rake the area where accessible following seeding.
- g. Apply sprayed mulch at a net dry weight of 2,000 pounds per acre minimum and 100 percent continuous coverage. Mix the mulch with water at a ratio of 50 pounds of mulch per 100 gallons of water.

E. Application of Crusting Agent:

- 1. Apply crusting agent in accordance with manufacturer's directions.
- 2. Unless otherwise specified by the manufacturer, dilute concentrated pine sap emulsion to ratio of 4 parts water to 1 part concentrate. Apply diluted pine sap emulsion at a rate of 2,500 gallons per acre.

3.04 MAINTENANCE

- A. Maintain the vegetated areas in satisfactory condition until acceptance of the vegetation by the Construction Manager. Maintenance of the vegetated areas includes repairing eroded areas, revegetating when necessary, watering, and mowing (if applicable). A satisfactory condition of vegetated area is defined as follows:
 - 1. an area shall have a predominant stand of the seeded vegetation;
 - 2. within 3 weeks, germination must occur over 90 percent of the area with no single bare area greater than 3 square feet; and
 - 3. within 3 months, 90 percent of the area must be covered with mature vegetation.
- B. The above timeframes for germination and coverage requirements are to be delayed during the dormant season between November 1 and March 15 application of the seed. The performance criteria shall be measured at the beginning of the growing season (April 1) for seed applied during the previous dormant season.
- C. Areas that fail to meet these requirements shall be repaired or reseeded as necessary to produce an acceptable stand of vegetation, as specified in this Section.
- D. The acceptance inspection will be performed by the Construction Manager who will determine whether repair of vegetated areas or revegetation is required.

- E. Maintain areas with a crusting agent to ensure proper erosion control. The crusting agent shall be reapplied to eroded and bare areas as necessary.

3.05 WARRANTY

- A. Vegetated areas shall be subject to a warranty period of not less than 12 months from initial establishment of vegetation over 100 percent of the areas seeded.
- B. At the end of the warranty period, the Construction Manager will perform an inspection of the area. Seeded areas not demonstrating satisfactory condition of vegetation as specified in this Section, shall be repaired, reseeded, and maintained to meet requirements as specified in this Section at the Contractor's expense.
- C. Areas that fail to meet these requirements shall be repaired or reseeded as necessary to produce an acceptable stand of vegetation, as specified in this Section. For the OSDF Cell Final Cover vegetation only, areas that fail to meet these requirements shall be repaired as necessary and reseeded to produce an acceptable stand of vegetation by using an alternate seed mix such as hydroseeding tall fescue as determined to be appropriate by the Construction Manager.

3.06 ACCEPTANCE

- A. The vegetated areas shall be accepted at the end of the warranty period if a satisfactory condition exists as defined in this Section.
- B. After disturbed areas are stabilized and all necessary corrective work has been completed, the Construction Manager will certify in writing the final acceptance of the vegetated areas.

3.07 CONSTRUCTION QUALITY REQUIREMENTS

- A. CQC Consultant will monitor vegetation and crusting agent application in accordance with this Section and Construction Quality Assurance (CQA) Plan.

TABLE 02930-1A

SEED MIX IN DRY AREAS FOR PERMANENT VEGETATION

SPECIES	POUNDS PER ACRE
	(lb/ac)
Big Bluestem (<i>Andropogon gerardi</i>)	3
Little Bluestem (<i>Andropogon scoparius</i>)	2
Side-Oats Grama (<i>Bouteloua curtipendula</i>)	0.5
Indian Grass (<i>Sorghastrum nutans</i>)	2
Canada Wild-Rye (<i>Elymus canadensis</i>)	25
Switch grass (<i>Panicum virgatum</i>)	0.5
ReGreen	5
Wildflowers ⁽¹⁾ :	1.5
Butterflyweed (<i>Asclepias tuberosa</i>)	
New England Aster (<i>Aster novae-angliae</i>)	
Smooth Aster (<i>Aster laevis</i>)	
Canada Milkvetch (<i>Astragalus Canadensis</i>)	
Purple Prairie Clover (<i>Petalostemum purpureum</i>)	
Ox-eye Sunflower (<i>Heliopsis helianthoides</i>)	
Bergamot (<i>Monarda fistulosa</i>)	
Purple Coneflower (<i>Echinacea purpurea</i>)	
Pale Purple Coneflower (<i>Echinacea pallida</i>)	
Yellow Coneflower (<i>Ratibida pinnata</i>)	
Black-Eyed Susan (<i>Rudbeckia hirta</i>)	
Spiderwort (<i>Tradescantia ohioensis</i>)	
Blue Vervain (<i>Verbena hastata</i>)	
Hoary Vervain (<i>Verbena stricta</i>)	
Beardtongue (<i>Penstemon grandiflorus</i>)	
Cupplant (<i>Silphium perfoliatum</i>)	
Sweet Joe Pye-Weed (<i>Eupatorium purpureum</i>)	
White False Indigo (<i>Baptisia leucantha</i>)	
Blue False Indigo (<i>Baptisia australis</i>)	
Partridge Pea (<i>Cassia fasciculata</i>)	
Rattlesnake Master (<i>Eryngium yuccifolium</i>)	
Round-headed Bush Clover (<i>Lespedeza Capitata</i>)	
Stiff Goldenrod (<i>Solidago risida</i>)	

Note: (1) Wildflower mix to be apportioned according to species aggressiveness and seed counts as approved by the Construction Manager. If certain species are not available, appropriate substitutions will be approved by the Construction Manager.

000157

TABLE 02930-1B

SEED MIX IN WET AREAS⁽¹⁾ FOR PERMANENT VEGETATION

Species	POUNDS PER ACRE (lb/ac)
Big Bluestem (<i>Andropogon gerardi</i>)	3
Canada Wild-Rye (<i>Elymus canadensis</i>)	25
S Grass (<i>Panicum virgatum</i>)	0.5
Blue Joint Grass (<i>Calamagrostis canadensis</i>)	0.5
Porcupine Sedge (<i>Carex hystericina</i>)	1 ounce per acre (oz/ac)
Fox Sedge (<i>Carex stipata</i>)	1 ounce per acre (oz/ac)
Dark Green Bulrush (<i>Scirpus atrovirens</i>)	1 ounce per acre (oz/ac)
ReGreen	5
Prairie Cordgrass (<i>Spartina pectinata</i>)	1
Wildflowers ⁽²⁾ :	1.5
Red Milkweed (<i>Asclepias incarnata</i>)	
New England Aster (<i>Aster novae-angliae</i>)	
Wild Senna (<i>Cassia hebecarpa</i>)	
Canada Tick Trefoil (<i>Desmodium canadense</i>)	
Prairie Blazingstar (<i>Liatris pycnostachya</i>)	
Great Blue Lobelia (<i>Lobelia siphilitica</i>)	
Bergamot (<i>Monarda fistulosa</i>)	
Yellow Coneflower (<i>Ratibida pinnata</i>)	
Branched Coneflower (<i>Rudbeckia hirta</i>)	
Blue Vervain (<i>Verbena hastata</i>)	
Angelica (<i>Angelica atropurpurea</i>)	
Sweet Joe-Rye Weed (<i>Eupatorium purpureum</i>)	

Notes: (1) Seeding in drainage ditches or swales shall contain erosion mats as specified in Section 02270 after application of seed mixture. Erosion mat shall cover a minimum width of 12 feet.

(2) Wildflower mix to be apportioned according to species aggressiveness and seed counts as approved by the Construction Manager. If certain species are not available, appropriate substitutions will be approved by the Construction Manager.

TABLE 02930-1C

SEED MIX FOR CELL FINAL COVER PERMANENT VEGETATION

Grass	Species	POUNDS PER ACRE (lb/ac)
	Big Bluestem (<i>Andropogon gerardi</i>)	0.5
	Little Bluestem (<i>Andropogon scoparius</i>)	3
	Side-Oats Grama (<i>Bouteloua curtipendula</i>)	5
	Buffalo Grass (<i>Buchloe dactyloides</i>)	1
	Indian Grass (<i>Sorghastrum nutans</i>)	0.5
	Canada Wild-Rye (<i>Elymus Canadensis</i>)	25
	Annual Rye (<i>Lolium multiflorum</i>)	10
	Prarie Dropseed (<i>Sporobulus heterolepis</i>)	1.5
Wildflower	Species	Ounces Per Acre (oz/ac)
	Butterflyweed (<i>Asclepias tuberosa</i>)	3.125
	Smooth Aster (<i>Aster laevis</i>)	0.25
	Ox-eye Sunflower (<i>Heliopsis helianthoides</i>)	1.75
	Bergamot (<i>Monardara fistulosa</i>)	0.25
	Purple Coneflower (<i>Echinacea purpurea</i>)	2.0
	Pale Purple Coneflower (<i>Enhinacea pallida</i>)	2.0
	Yellow Coneflower (<i>Ratibida pinnata</i>)	0.375
	Black-Eyed Susan (<i>Rudbeckia hirta</i>)	1.0
	Spiderwort (<i>Tradescantia ohioensis</i>)	1.25
	Hoary Vervain (<i>Verbena stricta</i>)	0.50
	Beardtongue (<i>Penstemon grandiflorus</i>)	1.0
	Sweet Joe Pye-Weed (<i>Eupatorium perpureum</i>)	0.25
	White False Indigo (<i>Baptisia leucantha</i>)	4.25
	Blue False Indigo (<i>Baptisia australis</i>)	4.25
	Partridge Pea (<i>Cassia fasciculate</i>)	32
	Round-headed Bush Clover (<i>Lespedea Capitata</i>)	1.0
	Stiff Goldenrod (<i>Solidago risida</i>)	0.75

000159

4517

TABLE 02930-2

SEED MIX FOR INTERIM VEGETATION

Species	Pounds Per Acre (lb/ac)
ReGreen	50
Partidge Pea (<i>Cassia fasciculata</i>)	10
Canada Wild Rye (<i>Elymus Canadensis</i>)	40

[END OF SECTION]