40-8724

# B. KOH & ASSOCIATES, INC.

Environmental Restoration Radioactive Waste Management

Principal Office 9199 Reisterstown Road, Suite 111-C Owings Mills, Maryland 21117-4520 Telephone: (410) 356-6612 FAX: (410) 356-4213 New York Office 11 West Main Street Springville, New York 14141-1012 Telephone: (716) 592-3431 FAX: (716) 592-3439

May 11, 1998

Mr. Jerry Parker, R.S., E.I.T. Ohio Environmental Protection Agency Northeast District Office 2110 East Aurora Road Twinsburg, Ohio 44087

Subject: Chemetron Corporation Bert Avenue Remediation Project - Closure Plan Revisions to Specification Sections 02200, 13000, 13500 and Construction Quality Assurance Project Plan

Dear Mr. Parker:

Enclosed for your information are revised Specification Sections 02200, 13000, 13500 and Construction Quality Assurance Project Plan (QAPP) of the Chemetron Corporation, Bert Avenue Remediation Project Closure Plan. These revisions incorporate changes based on the results of the clay test pad construction and additional slope stability analysis. In addition, these revisions incorporate previous changes described Engineering Field Changes ENG-10 and ENG-11.

Specifically, the technical specifications and QAPP have been revised to: 1) ensure that the material specifications, construction methods, and quality control procedures are consistent with requirements determined by the clay test pad construction and the additional slope stability evaluation that was performed, 2) clarify the intent of the contract document with regards to the placement of fill and geosynthetic clay liner and 3) clarify the intent of the contract document with regards to the with regards to the QA/QC document.

9805190276 980511 PDR ADOCK 04008724 PDR

DA98-057:CHE Chemetron

NMSS/UDP

400014

Mr. Jerry Parker

If you have any questions, please give me a call at (716) 592-3431.

Very truly yours,

& adam near

Theodore G. Adams Technical Manager

- cc: B. Koh, w/o enclosure
  - H. Davidson, w/o enclosure

P. Smith, w/o enclosure

L. Chintella, w/o enclosure

T. Johnson, with enclosure

J. Romano, w/o enclosure

S. Kilper, w/o enclosure

D. Raffel, w/o enclosure

DA98-057:CHE Chemetron

## FIELD CHANGE REQUEST FORM

Field Change No: ENG-FC-12		Page_1 of _44	
Project: <u>Chemet</u>	ron Corporation	Bert Avenue Site Remediation	
Type of Change:	Major	🖾 Minor	
Applicable Document: Assurance Project Plan	Specification Section	ns 02200, 13000, 13500, and Co	nstruction Quality
Description: <u>To inco</u> additional slope stabilit	rporate changes based y analysis. These revis	on the results of the clay test participations also incorporate changes des	d construction and cribed in ENG -FC

11 and ENG FC-10.

Reason for Change: <u>To revise material specifications, construction methods and quality control</u> procedures to be consistent with requirements determined by the clay test pad construction and additional slope stability analysis that was performed. To clarify the intent of the contract documents with regards to the placement of fill and geosynthetic clay liner. To clarify the intent of the contract the contract documents with regards to OA/OC organization.

Impact on Present and Completed Work: None

Requested by: Dames & Moore

Safety Evaluation: This change has no impact on project safety.

Approvals:

Project Site Supervisor or Designee

Project Radiation Safety Officer or Designee

10

Project Manager or Designee

Owner's Engineer or Designee

## TECHNICAL SPECIFICATIONS DIVISION 2 - SITE WORK

## SECTION 02200 - EARTHWORK

## PART 1 GENERAL

### 1.01 Work Included

A) The work covered in this section includes excavation, temporary staging, fill placement, and grading as shown on the Drawings and in the other sections of this specifications.

## PART 2 MATERIALS

## 2.01 Definitions

A) Subgrade Material

Subgrade material shall be soil resulting from on-site excavation needed to meet the design grade as shown on the drawings or soil from a borrow source approved by the Construction Manager. Imported fill shall consist of fine sand or silt with some clay and be free of roots, vegetation, or other deleterious materials.

B) Granular Drainage Material

Granular drainage material shall be used in constructing the following layers of the cell as shown on the Drawings:

1) Ground Water Conveyance Layer

Granular drainage material used for the ground water conveyance shall consist of either sand, gravel, crushed stone, or a combination of these materials from a borrow source approved by the Construction Manager, and have a minimum permeability of  $1 \times 10^{-2}$  cm/sec.

2) Temporary Stormwater Collection System Layer

Granular drainage material used for the temporary stormwater collection system layer under the waste shall consist of sand with a minimum permeability of 1 x  $10^{-3}$  cm/sec.

3) Granular Drainage Layer of the Cover System

Granular drainage material used for infiltration control in the cover system shall consist of sand with a minimum permeability of  $1 \times 10^{-3}$  cm/sec.

C) Compacted Clay Material

Compacted clay material shall be used in constructing the following layers of the cell as shown on the Drawings:

1) Compacted Clay Layer Under the Waste

Compacted clay material placed in the layer under the waste and on top of the ground water conveyance layer shall be from a borrow source as approved by the Construction Manager. It shall conform to the following material specifications:

- a) with 100 percent of the particles having a maximum dimension not greater than two inches;
- b) with not more than 10 percent of the particles, by weight, having a dimension greater than 0.75 inches;
- c) with not less than 50 percent of the particles, by weight, passing through the 200-mesh sieve;
- d) with not less than 25 percent of the particles, by weight, having a maximum dimension not greater than 0.002 millimeters; and
- e) shall be modeled by the construction of a test pad(s) as specified in the Test Fill Plan attached to these specifications to demonstrate that the permeability of the placed material is  $1 \times 10^{-7}$  cm/sec or less.

Material with less than 25 percent of the particles, by weight, having a maximum dimension not greater than 0.002 millimeters may be used provided that it can be demonstrated by construction of a test pad in accordance with OAC 3745-27-

08(C)(1)(m) that the permeability of the placed material is  $1 \times 10^{-7}$  cm/sec or less and provided that this alteration is approved by the Ohio Environmental Protection Agency and the Engineer.

2) Compacted Clay Barrier Layer of the Cover System

Compacted clay material used for the barrier layer of the cover system over the waste and fill shall be from a borrow source as approved by the Construction Manager. It shall conform to the following material specifications:

- a) with 100 percent of the particles having a maximum dimension not greater than two inches;
- b) with not more than 10 percent of the particles, by weight, having a dimension greater than 0.75 inches;
- c) with not less than 50 percent of the particles, by weight, passing through the 200-mesh sieve;
- d) with not less than 25 percent of the particles, by weight, having a maximum dimension not greater than 0.002 millimeters; and
- e) shall be modeled by the construction of a test pad(s) as specified in the Test Fill Plan attached to these specifications to demonstrate that the permeability of the placed material is  $1 \times 10^{-6}$  cm/sec or less.

Material with less than 25 percent of the particles, by weight, having a maximum dimension not greater than 0.002 millimeters may be used provided that it can be

demonstrated by construction of a test pad in accordance with OAC 3745-27-08(C)(1)(m) that the permeability of the placed material is  $1 \times 10^{-7}$  cm/sec or less and provided that this alteration is approved by the Ohio Environmental Protection Agency and the Engineer.

3) Compact Clay (Soil) Under Lower Retention Area

Clean compacted clay (soil) excavated from the site in preparation for the subgrade shall be used under the lower retention area as shown on the Project Drawings.

- D) Select Fill Material
  - 1) Compacted Select Fill On Top of Waste

Select fill used to obtain the required elevations and grade for the placement of the cover system as shown on the Drawings shall consist of sand with some silt and/or clay and be free of deleterious materials, and from a borrow source approved by the Construction Manager.

2) Select Backfill of the Cover System

Select backfill material placed on top of the geotextile and granular drainage layer of the cover system shall be soil from a borrow source approved by the Construction Manager. It shall consist of fine sand or silt with some clay and be free of roots, vegetation, or other deleterious materials.

E) Topsoil Material of the Cover System

Topsoil material placed on top of the select backfill material shall consist of fertile, friable, loamy surface soil from a borrow source approved by the Construction Manager. It shall have a pH range of 5.0 to 7.5, and not contain less than 3 percent nor more than 20 percent organic matter.

F) Pipe Bedding Material

Pipe bedding materials shall be as specified on the Project Drawings.

### 2.02 Temporary Staging

A) Liners For Temporary Staging Pads

The liner used in construction of the waste staging pads shall be a minimum of 40-mil High Density Polyethylene (HDPE). The dimensions of the liner panels shall be based upon the Contractor's sizing and layout of the staging pads, allowing for coverage over the containment berm and anchoring as shown on the Drawings.

B) Bedding Materials For Temporary Staging Pads

Materials used for bedding under the staging pad liners shall be rounded sand from a borrow source as approved by the Construction Contractor.

#### C) Covers

Cover material for stockpiled waste and waste staging pads shall be reinforced polyethylene sheeting with a minimum thickness of 10-mil. The cover must be of sufficient size to extend over the entire waste pile with at least 3 feet of excess material on all sides for anchoring. Field seeming of cover material, if necessary, shall be neat and watertight and in accordance with manufacturer's recommendations.

#### 2.03 Materials

- A) All soil materials shall be essentially homogenous, and free from lenses, pockets, streaks or layers of material differing substantially in texture, gradation, or color from the surrounding material. Contractor shall field-mix material to conform to this specification, if necessary.
- B) The Contractor shall secure sources for imported backfill material meeting the requirements of this Section and the CQAPP, and arrange for material delivery to the Site. The sources of imported fill shall be subject to approval by the Construction Manager based upon certifications and testing data submitted by the Contractor in accordance with Section 01300 documenting that the sources and materials are in compliance with the specifications. The Contractor shall bear all costs of importing backfill material.
- C) The Construction Manager may determine that subgrade materials present on or beneath the site may be suitable for use as construction material in engineered fills or other improvements. Such materials which are excavated and stockpiled in accordance with Sections 02210 and 02220 shall be used by the Contractor for construction as directed by the Construction Manager.
- D) The Contractor may offer substitutions for materials required by this Section. The Contractor shall provide information showing that the substitution meets the technical requirements of the applicable specification. No substitution may be used by the Contractor unless specifically approved by the Construction Manager and the Engineer.
- E) All fill material shall be obtained from sources as approved by the Construction Manager. The Contractor shall submit a list of proposed sources, representative samples of the various fill materials defined in this section, estimated quantities available along with the test results at the frequency and required be the CQAPP.
- F) The Contractor shall submit information for approval of imported fill material sources at least two (2) weeks in advance of scheduled deliveries and use. The Contractor's submittal shall be made in accordance with Section 01300.
- G) Initial source certification and testing as well as quality control testing required by this Section shall be carried out by an approved independent testing agency, at the expense of the Contractor. Test results shall reference the material source, material type and applicable Section of the specification. Test reports shall be submitted to the Construction Manager.
- H) The Contractor shall schedule delivery of imported fill material to the site based upon his schedule of construction. Imported fill may be stockpiled at approved locations of the site. Stockpiles areas shall be kept neat and orderly, and materials shall be segregated in separate stockpiles by type.

## PART 3 EXECUTION

- 3.01 Test Fill Construction and Testing
  - A) Test fill construction and testing shall be in accordance with Test Fill Plan attached to these specifications.
- 3.02 Excavation
  - A) Areas to be excavated are generally as shown on the Drawings. The Contractor shall lay out the work and excavate material to depths and grades as specified or as directed by the Construction Manager. Material excavated by the Contractor shall be relocated to temporary staging pads or fill areas under construction as shown on the Drawings, or as directed by the Construction Manager.
  - B) The Contractor shall segregate excavated material on the basis of initial classification as shown on the Drawings or as otherwise directed by the Construction Manager. Classifications are as follows:
    - 1) solid waste.
    - 2) radiologically contaminated waste.
    - 3) site fill.
  - C) Solid waste and radiologically contaminated waste shall be removed to designated fill or waste staging areas as they are excavated. Site fill material shall be stockpiled in designated material staging areas or in close proximity to its area of intended use, as directed by the Construction Manager.
  - D) The Contractor shall determine the methods and procedures to be used for excavation work given the extent of the required excavation and the hazards associated with materials that must be handled.
  - E) The Contractor must provide for adequate decontamination of personnel and equipment in exclusion zones where radiologically contaminated waste is located or encountered to assure that contamination is not spread beyond the limits of the controlled area. All work must be carried out in accordance with the Contractor's Health and Safety.
  - F) Excavation methods and procedure shall be clearly identified in the Contractor's submittals in accordance with Section 01300.
  - G) The Owner shall conduct testing of radiologically contaminated waste and areas to evaluate contamination levels in relation to clearance standards as the work progresses. The sampling and testing performed will be in accordance with the Construction Sampling and Analysis Plan. The bottom of an excavation will be sampled after the excavation has been completed to its specified depth and grade as specified in the Construction Sampling and Analysis Plan. Samples will be tested for radiological activity and results will be used to control additional excavation if so required to meet clearance standards. The Contractor shall protect the excavation while sampling and testing is in progress.

H) When the excavation has been completed to its scheduled limit and depth and test results indicate that emedial objectives have been achieved, the Construction Manager will scheduled a clearance inspection by the NRC. The Contractor shall protect the excavation until the area has been cleared by the NRC or additional excavation has been ordered.

I) Progression of Work

The Owner's plan for sequencing excavation work is shown by the Drawings and in Section 01140. The plan allows for concurrent construction of fill areas to minimize material stockpiling needs and shorten the overall time period required for construction. The Contractor's schedule and sequence of excavation work shall be consistent with the Owner's plan without significant deviation unless otherwise approved by the Construction Manager.

J) Layout and Control

The Contractor shall stake out or delineate areas to be excavated as indicated on the Drawings. The limits of the excavations shall be located by measuring off control points placed by survey in accordance with Section 01040. The Contractor shall notify the Construction Manager when layout is complete and available for inspection prior to start of excavation work. Grade stakes shall be used to control excavation depth as the work progresses.

- K) Excavation
  - Excavation of waste and fill shall proceed in an orderly and efficient manner. Depth of excavation shall be controlled by measured reference to ground surface elevation prior to start of excavation and by grade stakes. The Contractor shall note any changes in fill characteristics as the work progresses and call such changes to the immediate attention of the Construction Manager.
  - 2) The Contractor, with approval of the Construction Manager or in accordance with the Contractor's Health and Safety Plan, may wet waste material with a fine spray of clean water as it is excavated to reduce dust. Wetting shall be carefully controlled to assure that no runoff or standing water conditions are created.
  - 3) The Contractor shall stop work and notify the Construction Manager immediately when ground water seepage is observed in any excavation.
  - 4) The Contractor shall assure that all excavations are in compliance with applicable code. Unless otherwise directed by the Construction Manager, over-excavation to comply with shoring or cutback requirements shall be at the Contractor's expense. Any excess spoil resulting from such over-excavation shall be stockpiled separately and used for backfill by the Contractor, also at his expense. Fill shall be placed in accordance with 3.04 of this Section.
- L) Protection of the Excavation
  - The Contractor shall assume full responsibility for maintaining the stability of all open excavations until final acceptance of the work. Design of shoring, bracing or other methods to prevent caving or sliding of excavation side wall material shall be done by a professional engineer registered to proctice in the State of Ohio. The slope of embankments and various methods of choring, bracing and underpinning

shall be as selected by the Contractor unless otherwise specifically detailed on the Drawings. The Contractor is required to comply with all federal, state and local laws which apply to excavation operations including the Occupational Safety and Health Act, Construction Safety Act, and rules, regulations and standards of the Secretary of Labor.

- 2) The Owner has developed Slope Stability Evaluation Reports that are included as part of the contract documents. These documents present minimum standards which have been determined by the Owner for excavation of side slope areas. The Contractor shall be responsible for verifying the information contained in these documents and shall assume all responsibility for maintaining the stability of open excavations.
- The Contractor shall protect all unattended excavations by installation of temporary fencing which complies with Section 02830.
- M) Removal of Excavated Material
  - The Contractor shall provide the necessary labor, materials and equipment to transfer excavated material to a fill area under construction or an approved staging area. The methods and procedures used for material handling shall be as determined by the Contractor, subject to the approval of the Construction Manager.
  - 2) Material shall be removed as it is excavated. Intermediate waste stockpiles, if required by the Contractor's operation, shall be placed on a suitable liner to protect the subgrade from contamination. Stockpiles shall be covered with suitable cover material as provided in these Specifications. All excavated material shall be transferred to a fill construction area or staging area prior to the end of the Contractor's work shift. Waste shall be kept covered while being moved from the point of excavation to the fill or staging area.
  - 3) Excavated materials shall be kept segregated from imported fill staged on-site.
- N) Bottom of Excavation

Soft, unstable, or otherwise unsuitable material encountered at the bottom shall be removed by the Contractor and replaced with suitable backfill, subject to authorization and approval by the Construction Manager.

- O) Control of Water
  - The Contractor shall take all necessary measures to prevent surface water drainage from entering and accumulating in excavations. The Contractor shall also install controls as necessary to prevent the transport of sediment erode from excavations to adjacent areas.
  - 2) No excavation shall be permitted if standing water is present in the excavation. Standing water shall be allowed to infiltrate within the limits of the excavation before proceeding with the work.

#### 3.03 Temporary Staging

.\*

- A) Excavated materials which can not be immediately placed or used in a fill area which is under construction must be transferred to an approved stockpile or staging area for temporary storage. Materials must be segregated based on designated classification.
  - Site fill material which is not classified as a solid waste may be stockpiled in designated material storage areas or in close proximity to its intended point of use provided that such stockpiles do not impede construction activities.
  - 2) Solid waste may be stockpiled at approved locations in the work area which are not designated as exclusion zones because of radiologically contamination. Solid waste stockpiles must be covered as described in 2.02 of this Section and protected from surface water drainage.
  - Radiologically contaminated solid waste staged outside of designated exclusion zones must be placed on temporary staging pads and covered as described in this Section.
  - Radiologically contaminated solid waste staged in exclusion zones must comply with 2) above.
- B) Waste Staging Areas Required
  - The Contractor shall construct and operate staging areas to be used for temporary storage of radiologically contaminated waste pending placement of the waste in constructed fill areas, as required.
  - 2) Areas for stockpiling of site fill material and solid waste shall be as needed by the Contractor to support his planned work methods and schedules.
- C) Waste staging areas shall be located in close proximity to haul roads taking planned fill construction work into consideration. The proposed locations of individual waste staging pads shall be shown on the Contractor's detailed plans for layout of the Site. The physical dimensions of the staging pads shall be based upon the Contractor's intended methods and procedures for material handling and upon the Contractor's layout of the Site.
- D) Shop Drawings and product data for the waste staging areas shall be submitted by the Contractor for approval in accordance with Section 01300.
- E) Installation
  - The subgrade and berms for waste staging pads shall be compacted and graded. Areas of the subgrade which are soft and deemed not suitable by the Construction Manager shall be stabilized by approved methods or replaced with approved fill. Grading shall establish a corner low point which will collect any free liquids which drain from stockpiled wastes.
  - 2) Following approval by the Construction Manager, sand bedding shall be placed in a single 8-inch layer. The geomembrane shall then be installed using methods and equipment that will not result in damage to the material.

#### F) Material Handling

- Excavated wastes shall be transported to, placed on, and removed from staging pads and areas using the Contractor's approved methods and procedures. The bottom 1 foot of material placed on liners shall be free of debris or other sharp objects which could cause damage to the liner. Only rubber-tired equipment shall be used on liners for load in, piling, and load out operations.
- 2) A waste staging pad holding radiologically contaminated material shall constitute an exclusion zone subject to provisions of the Contractor's Health and Safety Plan. The Contractor shall employ acceptable methods for control of fugitive dust during material handling operations at waste staging pads.
- Any free water that drains from stockpiled wastes shall be removed by the Contractor as soon as possible and managed in accordance with Section 01670.
- G) Protection of Staged Material
  - All staged waste material shall be covered when not in active use and during periods of adverse weather. Covers shall be anchored by sand bags or other methods approved by the Construction Manager.
  - 2) The Contractor shall take all measures necessary to ensure that water from precipitation and surface runoff is not allowed to enter or accumulate on the waste storage pad in contact with contaminated materials.
- H) Waste staging pads shall be removed with the stockpiled waste when no longer required by the Contractor for his operations. All materials of construction including cover, liner and bedding material berms and at least 6 inches of subgrade shall be removed with the waste and placed in a constructed fill area.
- 3.04 Fill Placement
  - A) Approved imported and site fill materials shall be used by the Contractor where shown on the Drawings. The Construction Manager will inspect areas scheduled for fill placement prior to start of filling and compaction. The subgrade shall be cleared of all water, ice, snow, trash and debris. Neither the fill material nor the subgrade shall be frozen at the time of fill placement. The Contractor shall be responsible for the integrity of subgrade materials. Where soft, unstable, or otherwise unacceptable conditions are encountered, the Contractor shall remove or stabilize subgrade material using methods and procedures approved by the Construction Manager. Silt or clay material used as subgrade shall be compacted in accordance with section 3.04(D) of this section.
  - B) Placement of fill material shall progress in cells, layers and lifts as shown on the Drawings. Fill placed over waste material shall be worked uniformly across the waste such that equipment and personnel do not come in direct contact with the waste.
  - C) Granular Drainage Material

Granular drainage material placed as part of the groundwater conveyance layer, the temporary stormwater collection layer, for pipe and structure bedding and the cover drainage layer shall be placed and compacted in horizontal lifts not to exceed eight (8) inches in loose thickness.

- D) Compacted Clay Material
  - Compacted clay material shall be placed in loose lifts not to exceed eight (8) inches in loose thickness. Each lift shall be compacted by suitable methods and equipment to at least 95 percent of the maximum Standard Proctor Density using ASTM D-698, or at least 90 percent of the maximum Modified Proctor Density using ASTM D-1557 unless otherwise noted on the Drawings or directed by the Construction Manager. Each lift shall achieve the required density before proceeding with the next lift. If the material fails to meet the required density, the material shall be reworked, replaced, or construction methods altered as necessary to obtain the required density.
  - The moisture content of the soil shall be -0 to +4 percent of optimum as tested per ASTM D-2216 or ASTM D-3017.
  - 3) In-place density and moisture testing shall be performed at a frequency of not less than five (5) tests per acre per lift. The tests shall be performed at locations as directed by the Construction Manager.
  - 4) Maximum dry density and optimum moisture content testing shall be performed on proposed fill material prior to the start of backfill operations for each 1,500 cubic yards of material placed, and when a source has changed or there is an apparent change in material characteristics.
  - 5) Compacted Clay Used For the Cover Barrier Layer and Clay Liner of the cell shall be placed using the same size and type of equipment, as well as the same procedures used to construct the test fill pad.
- E) Select Backfill
  - 1) Select backfill used as part of the site cover system shall be placed in loose lifts not to exceed Eight (8) inches in loose thickness. Each lift shall be compacted by suitable methods and equipment to at least 95 percent of the maximum Standard Proctor Density using ASTM D-698, or at least 90 percent of the maximum Modified Proctor Density using ASTM D-1557 unless otherwise noted on the Drawings or directed by the Construction Manager. Each lift shall achieve the required density before proceeding with the next lift. If the material fails to meet the required density, the material shall be reworked, replaced, or construction methods altered as necessary to obtain the required density.
  - The moisture content of the soil shall be -1 to +3 percent of optimum as tested per ASTM D-2216 or ASTM D-3017.
  - 3) In-place density and moisture testing shall be performed at a frequency of not less than five (5) tests per acre per lift. The tests shall be performed at locations as directed by the Construction Manager.
  - 4) Maximum dry density and optimum moisture content testing shall be performed on proposed fill material prior to the start of backfill operations for each 1,500 cubic yards of material placed, and when a source has changed or there is an apparent change in material characteristics.

5) Select backfill used to obtain grade in areas outside of the limits of the cell shall be placed in loose lifts not to exceed twelve (12) inches in loose thickness. Each lift shall be compacted by suitable methods and equipment to at least 92 percent of the maximum Standard Proctor Density using ASTM D-698 unless otherwise noted on the Drawings or directed by the Construction Manager. Each lift shall achieve the required density before proceeding with the next lift. If the material fails to meet the required density, the material shall be reworked, replaced, or construction methods altered as necessary to obtain the required density.

#### F) Select Fill

- 1) Select backfill used to obtain grade over the waste shall be placed in loose lifts not to exceed Twelve (12) inches in loose thickness. Each lift shall be compacted by suitable methods and equipment to at least 95 percent of the maximum Standard Proctor Density using ASTM D-698, or at least 90 percent of the maximum Modified Proctor Density using ASTM D-1557 unless otherwise noted on the Drawings or directed by the Construction Manager. Each lift shall achieve the required density before proceeding with the next lift. If the material fails to meet the required density, the material shall be reworked, replaced, or construction methods altered as necessary to obtain the required density.
- The moisture content of the soil shall be -1 to +3 percent of optimum as tested per ASTM D-2216 or ASTM D-3017.
- 3) In-piace density and moisture testing shall be performed at a frequency of not less than five (5) tests per acre per lift. The tests shall be performed at locations as directed by the Construction Manager.
- 4) Maximum dry density and optimum moisture content testing shall be performed on proposed fill material prior to the start of backfill operations for each 1,500 cubic yards of material placed, and when a source has changed or there is an apparent change in material characteristics.
- G) Topsoil
  - 1) Topsoil shall be placed and spread in areas and to minimum depths as shown on the Drawings.
  - 2) Topsoil shall not be compacted.
- H) Waste
  - Placement of radioactively contaminated solid waste shall be in accordance with the project Health and Safety Plan(s).
  - 2) Each lift of the radioactively contaminated solid wastes placed into the cell shall be sampled in accordance with the project Sampling and Analyses Plan.

WASTE COMPACTION SPECIFICATIONS TO BE PROVIDED

- 3.05 Grading
  - A) The Contractor shall spread grade lifts of waste material and fill in horizontal layers during placement unless otherwise shown on the Drawings. Edges of lifts shall be

continued to intercept existing contour or graded over to the fill limit as shown on the Drawings. Graded surfaces shall be uniform and free of mounds, depressions or similar irregularities which are not part of the design..

- B) Final grading of the uppermost backfill and topsoil layers shall be in accordance with the Drawings unless otherwise directed by the Construction Manager.
- C) Grading will be controlled by survey in accordance with Section 02100. Grade stakes shall be used to control fill depth and elevation.
- D) Water may be used by the Contractor during grading of fill material to maintain optimum moisture content and to control fugitive dust.

-- End of Section 02200 --

## TECHNICAL SPECIFICATIONS DIVISION 13 - SPECIAL CONSTRUCTION SECTION 13000 -- HDPE COVER

## PART 1 GENERAL

#### 1.01 Work Included

Furnishing and installing 60-mil high density polyethylene (HDPE) cover as shown on the Drawings. Constructing and backfilling the cover system anchor trench.

- 1.02 Related Work
  - A) Section 13225 Geofabric
- 1.03 Cover Installation Meetings

Parties involved with the installation shall attend a meeting prior to installation of any HDPE cover (cover). The purpose of this meeting is to define the responsibilities of each party and establish lines of authority and lines of communication. The intent of the meeting also covers establishing site-specific quality control, monitoring procedures, and defining the method of acceptance of the completed cover. The meeting shall be documented and minutes transmitted to all parties.

1.04 Experience and Qualifications Necessary for Cover Installation

The cover manufacturer, fabricator, and installer shall provide experience qualifications to the Construction Manager with at least three projects totaling a minimum of 2 million square feet for which they supplied high density polyethylene (HDPE). The following information shall be provided for each project: name and purpose of project, location, date, name of the Construction Manager, designer, fabricator and installer, thickness, surface area, and available written information on the performance of the project.

- 1.05 Documentation for Cover Installation
  - A) The quality control certificates pertaining to raw materials, nanufactured cover rolls, and compliance to applicable ASTM requirements shall be provided by the cover manufacturer to the Construction Manager prior to installation. The Construction Manager shall review the test results for completeness and for compliance with the required minimum properties for both the raw materials and manufactured cover rolls. Materials and rolls which are in noncompliance with the minimum required properties shall be rejected.
  - B) The cover installer shall provide the certification of acceptance of surface preparation to the Construction Manager prior to any cover installation. Thereafter, the installer shall provide the Construction Manager written acceptance daily for the surface to be covered by cover in that day's operation.
  - C) The cover fabricator shall provide the Construction Manager with daily reports addressing (as necessary): (1) the total amount of cover seamed; (2) identifiers of rolls and fabricated blankets; (3) quality control tests of materials used during the day; (4) seaming equipment and products used; (5) names of seamers; and (6) seam testing performed.

D) The cover installer shall provide the Construction Manager with daily reports of: (1) the total amount and location of cover placed; (2) total amount and location of seams completed and seamer and units used; (3) changes in layout Drawings; (4) results of test seams; (5) location and results of non-destructive testing; (6) location and results of repairs and; (7) location of destructive test samples.

#### 1.06 Record Drawings for Cover Installation

The installer shall have one complete set of contract Drawings designated just for as-built Drawings. The cover installer shall ensure that as soon as a change or addition is made in construction, it is noted on the as-built Drawings. All changes shall be approved by the Construction Manager

#### 1.07 Cover Acceptance

The cover shall be accepted by the Construction Manager when (1) the installation is completed; (2) copies of all documentation of installation have been submitted to the Construction Manager; and (3) verification of the adequacy of all field seams and repairs, and associated testing is complete.

### 1.08 References

- A) ASTM D-638 Standard Test Method for Tensile Properties of Plastics
- B) ASTM D-746 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
- C) ASTM D-792 Standard Test Methods for Specific Gravity and Density of Plastics by Displacement
- D) ASTM D-1203 Standard Test Methods for Voiatile Loss from Plastics Using Activated Carbon Methods
- E) ASTM D-1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
- F) ASTM D-1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique
- G) ASTM D-1603 Standard Test Method for Carbon Black in Olefin Plastics
- H) ASTM D-2103 Standard Specification for Polyethylene Film and Sheeting

## PART 2 MATERIALS

- 2.01 Definitions
  - A) Field Seam Seam welded during cover instaliation. All field seams shall be welded.
  - B) Factory Seam Seam made during factory fabrication of the sheeting. Factory seams shall have tensile strength properties equal to or greater than the parent material. Bidders shall submit a sample of a factory seam, if applicable, with their bid.
  - C) Panel a single factory fabricated section of the cover membrane.

D) Geofabric - Non-woven polyester geotextile.

## 2.02 Delivery and Protection

- A) Cover rolls shall be packaged and labeled prior to shipment to the site. The label shall indicate the cover manufacturer, cover fabricator, type of cover, thickness, and roll number. During transportation the rolls shall be handled so that no damage is caused. Wooden cases or other cover containers shall be strong enough to withstand impact and rough handling without injury. The cover manufacturer shall be responsible for the cover transportation if fabrication is not required. If fabrication is required, then the responsibility falls upon the cover fabricator.
- B) The storage of the cover is the responsibility of the installer. The cover shall be protected from direct sunlight and heat to prevent degradation of the cover material and adhesion of individual sheets of the roll. Adequate measures shall be taken to keep the cover away from deteriorating sources such as theft and vandalism. On-site handling of the cover is the responsibility of the cover installer. Appropriate equipment shall be used in moving the rolls and instructions for moving the rolls shall be reviewed with the workers and approved by the Construction Manager.
- C) Care shall be taken to keep the geofabric clean and free from debris prior to installation. If the geofabric is not free of soil and debris before installation, it shall be cleaned by the Contractor just prior to installation to the satisfaction of the Construction Manager.
- 2.03 Materials of the HDPE Cover
  - A) The HDPE cover shall meet or exceed the following physical properties:

#### **RECOMMENDED TEST**

Property	Method	Membrane Value
Density	ASTM D-792 or ASTM D-1505	0.94 grams/cc
Tensile properties	ASTM D-638 - Type IV dumbbell at 2 ipm	
Tensile strength at break	Same as above	228 lb/in.
Elongation at break	Same as above	>560 percent
Tensile strength at yield	Same as above	126 lb/in.
Elongation at yield	Same as above	>12 percent
Low temperature	ASTM D-746	-60∞F
Tear resistance	ASTM D-1004 die C	39 lbs
Carbon black content	ASTM D-1603	2 to 3 percent

Thickness

## ASTM D-2103

Average required thickness is 60-mil.

Minimum acceptable thickness is 90% of thickness specified on the Drawing.

h

B) Testing Frequency

Density	1 per resin batch number	
Tensile properties	1 per 40,000 sq ft of manufactured sheet	
Carbon black	1 per resin batch number	
Thickness	1 test (15 measurements per roll)	
Low temperature	Certification by resin supplier with each resin bate	

- C) Test results shall be submitted to the Construction Manager for approval prior to delivery of the HDPE cover to the job site. Alternate testing methods may be used with prior approval by the Construction Manager.
- D) Prior to installation, a peel strength value and the test procedure used to determine the peel strength for both smooth and texturized membrane shall be submitted to the Construction Manager for approval. These values will be used to evaluate field seam quality.

#### 2.04 Cover Quality

- A) The cover shall be manufactured of first quality, newly produced raw materials. The use of reclaimed polymers and similar materials shall not be permitted. Recycling of materials containing reinforcing scrim shall not be permitted. Recycling scrap that does not contain scrim may be permitted.
- B) The cover material shall be so produced as to be free of holes, blisters, undispersed raw materials, or any size. of contamination by foreign matter.
- 2.05 Cover Texture
  - A) The portion of the cover over the east slope shall have a textured surface. The cover over other portions of the site may be smooth or textured.

#### 2.06 Acceptable Manufacturers

- A) Gundle Lining Systems, Inc., 1340 East Richey Road, Houston, Texas, 77073.
- B) National Seal Company, 600 North 1st Bank Drive, Palatine, Illinois, 60067.
- C) Poly-America, Inc., 2000 West Marshall Drive, Grand Prairie, Texas 75051.
- D) Similar products may be substituted subject to approval by the Construction Manager.

## PART 3 EXECUTION

3.01 Foundation Preparation for the Cover

The compacted clay of the cover barrier layer shall serve as the HDPE cover base. The cover installer shall certify in writing daily that the base material on which the HDPE cover is to be installed is acceptable. No installation of the cover shall commence until this certification is furnished to and accepted by the Construction Manager. No cover shall be placed in an area which has become softened by precipitation.

3.02 Cover System Anchor Trench

The construction Contractor shall be responsible for excavating the anchor trench and backfilling the trench after the cover system is installed.

- An approximate 2-foot deep anchor trench (with 1:1 side slopes) shall be constructed around the perimeter of the surface impoundment and former waste pile area as shown on the Drawings.
- The HDPE cover will extend beyond the limits of final cover as depicted on the Drawings.
- 3) The trench shall be backfilled with the compacted soil material.
- 3.03 Installation of HDPE Cover
  - A) The field-erection Drawings showing cover panel layout shall be submitted by the cover installation Contractor and approved by the Construction Manager prior to cover installation.
  - B) Individual panels of cover material shall be laid out and overlapped by a minimum of 3 inches (or as required by the material manufacturer) prior to welding. Care shall be taken by the installer in the preparation of the areas to be welded. The area to be welded shall be cleaned and prepared according to installation procedures provided by the material manufacturer and be subject to approval by the Construction Manager.
  - C) All welding material shall be of a type recommended and supplied by the manufacturer and shall be delivered in the original sealed containers - each with an indelible label bearing the brand name, manufacturer's mark number, and complete directions as to proper storage.
  - D) The welding equipment used shall be capable of continuously monitoring and controlling the temperature of the zone of contact where the machine is actually fusing the lining material so as to ensure that changes in environmental conditions will not affect the integrity of the weld.
  - E) All welds on completion of the work shall be tightly bonded. Any membrane area showing injury due to excessive scuffing, puncture, or distress from any cause shall be replaced or repaired with an additional piece of HDPE membrane.
  - F) No "fish mouths" shall be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped and an overlapping extrusion weld shall be applied.

G) Cover placement shall stop at an ambient temperature below 41°F or above 95°F. Unless otherwise specified weather conditions required for seaming are as follows: (1) no weld shall be done below 34°F; (2) between 34°F and 50°F, seaming is possible if the cover is pre-heated by either sun or hot air device, and if there is not excessive cooling resulting from wind as determined by the Construction Manager; and (3) above 50°F, no preheating is required. In all cases, the cover shall be dry.

#### 3.05 Field Seam Testing/Quality Control of Cover

- A) The installer shall be responsible for all labor, equipment, and supplies necessary to perform all field and laboratory inspection, sampling, and testing of the cover and seams. All personnel shall be fully qualified and all equipment and procedures shall meet applicable standards.
- B) The installer shall employ on-site physical non-destructive continuous testing on all welds to ensure watertight homogeneous seams. Acceptable methods are:
  - 1) Acoustic Method ultrasonic pulse echo
  - 2) Acoustic Method continuous wave resonant frequency
  - 3) Vacuum Chamber
  - 4) Double Seam Pressurization
- C) A quality-control technician shall inspect each seam. Any area showing a defect shall be marked and repaired in accordance with Construction Manager-approved procedures. The locations and types of defect shall be indicated on the field erection Drawings.
- D) A test weld 3-feet long from each welding machine shall be run each day prior to cover welding and under the same conditions as exist for the cover welding. The test weld shall be marked with date, ambient temperature, and welding machine number. Samples of weld 1 inch wide shall be cut from the test weld and pulled in shear and peel. The tensile yield strength of the seam should be a minimum of 90 percent of the tensile yield strength of the parent material. The peel adhesion strength of the seam should be greater than the strength of the cover which can be observed if the seam experiences Film Tear Bond (FTB). Test procedures and performance shall be as recommended in the NSF Standards for Flexible Membrane Covers. Random weld samples will be removed from the installed welded sheeting at an average frequency of 1 per 500 feet of weld at locations designated by the Construction Manager. A rinimum of one sample per day or two samples per 8 hours of welding shall be tested to determine seam tensile properties and peel strength.
- E) Destructive testing on weld samples shall be performed by a qualified, independent geosynthetics laboratory acceptable to the Owner. Results from laboratory testing shall be reported before 5:00 PM EDT the day following sample collection, unless otherwise approved by the Owner's Representative.

#### 3.06 Warranty and Guarantee

The manufacturer/installer shall provide a written 20-year pro-rata warranty during which the cover and geofabric materials and workmanship specifically provided or performed under this project shall be free from any significant defects that will affect their performance. Such written guarantee shall provide for the total and complete repair or replacement of the defect or defective area of lining and geofabric upon written notification and demonstration by the Construction Manager of the specific non-conformance of the materials or installation with the project Specifications. Such defects or non-conformance shall be repaired or replaced in a timely fashion on a pro-rata basis at the then current price in such a manner as to charge the Owner only for that portion of the warranted 20-year life which has elapsed since the purchase of the material.

## PART 4 ATTACHMENTS

Figure 1 - Bert Avenue Site Showing Area of Textured Flexible HDPE Membrane Liner

-- end of Section 13000 --



#### TECHNICAL SPECIFICATIONS DIVISION 13 - SPECIAL CONSTRUCTION .... SECTION 13500 -- GEOSYNTHETIC CLAY LINER

## PART 1 GENERAL

#### 1.01 Work Included

Furrishing and placing geosynthetic clay liner materials as shown on the drawings.

## 1.02 Related Work

A) Section 02220 - Earthwork

## PART 2 MATERIALS

## 2.01 Definitions

- A) The geosynthetic clay liner shall be a composite needle-punched containment liner with geotextile outer layers and an inner layer of low-permeability sodium bentonite. The liner shall be constructed in a manner to support its own weight and maintain its integrity when placed on a 5-foot high, 5 percent slope, even when hydrated.
- B) The hydraulic conductivity of the geosynthetic clay liner shall be less than 5 x 10<sup>-9</sup> cm/sec
- C) The geosynthetic clay liner shall have a minimum sodium bentonite content of 1.0 lb/sf at 12 percent moisture content.
- 2.02 Acceptable Products

Manufactured bentonite liner similar or equal to Claymax<sup>™</sup>, Bentomat<sup>™</sup> or Bentofix<sup>™</sup> which has been proven in the field and has been EPA accepted.

## PART 3 EXECUTION

- 3.01 Storage and Handling
  - A) Geosynthetic clay liner torn or otherwise damaged during handling shall not be used.
  - B) Geosynthetic clay liner in storage shall be covered and protected from sunlight.
  - C) Stored geosynthetic clay liner shall be raised off the floor and protected from accumulated moisture.

#### 3.02 Placement

- A) The underlying material shall be capable of supporting equipment used to place the liner and other overlying materials without pumping or rutting. The geosynthetic clay liner shall not be placed un if the underlying material has been approved by the Engineer.
- B) The geosynthetic clay liner shall be unrolled across the Engineer approved surface and loosely laid in such a manner that it will conform to irregularities of the surface. Geosynthetic clay liner panels shall not be seamed across slopes. All slope seams shall be located perpendicular to the top of slope.
- C) Geosynthetic clay liner panels shall be installed with a minimum overlap of 6-inches and for end of panel seams a minimum overlap of 12-inches. Overlap shall be increased in accordance with the manufacturer's specifications. Unless otherwise recommended by the manufacturer, dry bentonite powder shall be applied in a 2-inch wide continuous strip at a rate of 1/4 pound per foot between the overlapped panels in order to seal the seam.
- D) Geosynthetic clay liner shall not be left exposed to the environment since it will swell on contact with water. The geosynthetic clay liner shall be covered upon installation as shown on the construction drawings. Geosynthetic panels that hydrate appreciably during construction shall be replaced at no additional cost to the Owner.

-- end of Section 13500 --