

Energy Fuels Resources Piñon Ridge Mill Montrose County, Colorado	HDPE INSPECTION AND REPAIR PROCEDURE	Number: MP-030 Page: 1 of 6 Revision: 0 Date: 10/12/10
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1.0 PURPOSE

The purpose of this procedure is to inspect and repair high-density polyethylene (HDPE) geomembrane-lined facilities (e.g. tailings cells, stormwater ponds, evaporation ponds, and lined channels) in order to maintain plant operations.

2.0 APPLICABILITY

This procedure applies to the Tailings Cells, East Stormwater Pond, West Stormwater Pond, Evaporation Ponds, geomembrane-lined conveyance channels and spillways, and other facilities lined with HDPE geomembrane. The work to be performed may also be subject to the Radiation Work Permits Procedure RH-060 (see Section 7.1.2 below).

3.0 EQUIPMENT

3.1 EQUIPMENT

- 3.1.1 Portable generator or permanent power supply.
- 3.1.2 Equipment for repair of geomembrane liner using fusion or extrusion methods suitable for the conditions of service.
- 3.1.3 Equipment for testing of repaired geomembrane liner using nondestructive (e.g., vacuum testing) or destructive (e.g., pressure testing) procedures, suitable for the conditions.
- 3.1.4 Personal Protective Equipment (PPE)
 - 3.1.4.1 Standard site PPE includes identity and safety badges, hardhat, safety glasses, and steel-toe boots.
 - 3.1.4.2 The inspection crew members may require steel-toe water proof boots, rain suits (consisting of bibs and jacket), rubber gloves, goggles, or face shield.
- 3.1.5 Grease pencils for marking visual damage to geomembrane liners.
- 3.1.6 Hand-held micrometer for measurement of liner thickness during repair.
- 3.1.7 Hand-held temperature gauge to measure outdoor temperature during HDPE repair.
- 3.1.8 Hand-held radios.

APPROVALS	<i>Signature</i>	<i>Date</i>
GF		
Plant Manager		

Energy Fuels Resources Piñon Ridge Mill Montrose County, Colorado	HDPE INSPECTION AND REPAIR PROCEDURE	Number: MP-030 Page: 2 of 6 Revision: 0 Date: 10/12/10
----------------------------------------------------------------------------------	-------------------------------------------------	---------------------------------------------------------------------------

3.1.9 Temporary lighting (if working at night, though not recommended).

3.2 MATERIALS

3.2.1 Rolls or pieces of HDPE liner, as appropriate, for patching and repair to damaged HDPE liner.

3.2.2 Fuel supply for the portable generator.

3.2.3 Fresh water to facilitate vacuum testing of repaired geomembrane.

3.2.4 Soap to be added to water to facilitate vacuum testing of repaired geomembrane.

4.0 OTHER DOCUMENTS

4.1 REFERENCES

4.1.1 Sedimentation Trap, Stormwater and Evaporation Ponds Cleanout Procedure MP-040.

4.1.2 Radiation Work Permits Procedure RH-060.

4.1.3 Technical Specifications - Geomembrane Section (Golder, Section 02776.0)

5.0 RESPONSIBILITY

5.1 The Radiation Safety Officer (RSO) is responsible for:

5.1.1 Reviewing the solution and sediment chemical analysis results in the inspection areas and determining the need for a Radiation Work Permit.

5.1.2 Inspecting the leak collection and recovery system (LCRS) records and repair records on a quarterly basis to verify that potential HDPE leaks are being identified and repaired.

5.2 The General Mill Foreman is responsible for:

5.2.1 Ensuring that the Mill Foreman is proceeding according to proper procedures.

5.2.2 Ensuring that routine daily inspections of all exposed HDPE geomembrane lined areas occurs, and that damaged liner is repaired expeditiously, depending on the location of damage.

5.2.3 Ensuring that the Mill Foremen reviews the flow rates to the LCRS within the tailings cells, evaporation ponds and stormwater ponds on a daily basis

Energy Fuels Resources Piñon Ridge Mill Montrose County, Colorado	HDPE INSPECTION AND REPAIR PROCEDURE	Number: MP-030 Page: 3 of 6 Revision: 0 Date: 10/12/10
----------------------------------------------------------------------------------	-------------------------------------------------	---------------------------------------------------------------------------

to allow detection of leakage through the primary liner that may have resulted from damage to covered/unexposed geomembrane liner.

- 5.2.4 Assembling and staging all necessary equipment and materials required to repair damaged HDPE geomembrane within the tailings cells, evaporation ponds, stormwater ponds, lined channels, and other facilities.
- 5.2.5 Obtaining progress reports from the Maintenance Foreman regarding repairs and determining if additional equipment, materials, supplies or personnel are required to maintain satisfactory progress.

5.3 The Mill Foremen are responsible for:

- 5.3.1 Assigning the routine daily visual inspections of all exposed HDPE geomembrane lined areas.
- 5.3.2 Reviewing the flow rates to the LCRS within the tailings cells, evaporation ponds and stormwater ponds on a daily basis to allow detection of leakage through the primary liner that may have resulted from damage to covered/unexposed geomembrane liner.

5.4 The Maintenance Foreman is responsible for:

- 5.4.1 Having all necessary personnel, materials, and supplies in place before proceeding with the geomembrane repair operations.
- 5.4.2 Ensuring that the geomembrane liner installation personnel are properly trained and aware of the project specifications for HDPE geomembrane liner installation and testing.
- 5.4.3 Periodically checking on the repair operations and verifying that the repair procedure is being followed by the geomembrane liner installation crew.
- 5.4.4 Verifying that all testing has been completed and equipment and materials removed from the HDPE lined facility before placing the repaired structure back into service and returning the process plant to normal operating conditions.
- 5.4.5 Documenting the locations, sizes, and types of repairs made in an HDPE repair book or binder. Each repair location will be identified on a drawing in sufficient detail to allow future relocation of the repair. Repair documentation is to be made available for inspection by the RSO and the Colorado Department of Public Health and Environment (CDPHE).

6.0 PREREQUISITE INFORMATION AND CONDITIONS

6.1 SAFETY

Energy Fuels Resources Piñon Ridge Mill Montrose County, Colorado	HDPE INSPECTION AND REPAIR PROCEDURE	Number: MP-030 Page: 4 of 6 Revision: 0 Date: 10/12/10
----------------------------------------------------------------------------------	-------------------------------------------------	---------------------------------------------------------------------------

6.1.1 See Piñon Ridge Mill Health and Safety Plan.

6.2 INSPECTION FREQUENCY

6.2.1 Visually inspect HDPE lined facilities on a daily basis and during routine cleanouts from high to low points to visually observe defects or damage and mark the observed defects for repair.

6.3 FREQUENCY OF REPAIR

6.3.1 As necessary in order to maintain function and appropriate protection measures.

6.4 SURFACE PREPARATION

6.4.1 Where HDPE geomembrane requiring repair is beneath solutions or sediments, the surface shall first be cleaned prior to repair in accordance with Sedimentation Trap, Stormwater and Evaporation Ponds Cleanout Procedure MP-040.

6.4.2 Prior to repair of damaged HDPE geomembrane, the guidelines outlined in Section 7.1, Surface Preparation Procedure Guidelines, below shall be followed.

7.0 PROCEDURE

7.1 SURFACE PREPARATION PROCEDURE GUIDELINES

7.1.1 The General Mill Foreman will plan and schedule the cleanout of the HDPE lined facilities in accordance with Sedimentation Trap, Stormwater and Evaporation Ponds Cleanout Procedure MP-040, if required, and follow this procedure prior to commencing surface preparation of the HDPE liner for repair. Project-specific procedures are to be developed should tailings sands need to be removed to facilitate repairs.

7.1.2 The RSO will determine the applicability of the Radiation Work Permits Procedure RH-060 based on the chemical make-up of solutions and sediments and will follow the procedure where applicable.

7.1.3 Procure the equipment and required materials to prepare the HDPE liner surface for repair.

7.1.4 Wash large areas of HDPE liner requiring repair with wash water through hand-held hoses. Smaller areas (i.e. areas with localized geomembrane damage) may be spot cleaned. In addition, the HDPE surface may be brushed or blown to facilitate mud and dust removal.

Energy Fuels Resources Piñon Ridge Mill Montrose County, Colorado	HDPE INSPECTION AND REPAIR PROCEDURE	Number: MP-030 Page: 5 of 6 Revision: 0 Date: 10/12/10
----------------------------------------------------------------------------------	-------------------------------------------------	---------------------------------------------------------------------------

- 7.1.5 For HDPE liners covered with solids, wash the solids from the high point to the low point of the facility until the HDPE liner is exposed.
- 7.1.6 Decant all remaining water, remove the cleanout equipment, and allow the HDPE liner to dry prior to making repairs.

7.2 HDPE GEOMEMBRANE INSPECTION AND REPAIR PROCEDURE

- 7.2.1 Check that there are no ambient conditions which could affect the quality of installations, i.e., no high winds, precipitation, or standing water. Also, check that the ambient temperatures are between 35°F and 100°F to facilitate welding, as per the project specifications.
- 7.2.2 Repair HDPE defects localized to smaller areas (i.e. defects that do not require HDPE geomembrane replacement of more than 1,000 square feet) per Section 02776.0 of the project specifications.
 - 7.2.2.1 Small holes shall be repaired by abrading the sheet surface and welding an extrusion bead. If the hole is larger than one-quarter (1/4) inch in diameter, it shall be patched.
 - 7.2.2.2 Tears shall be repaired by patching. Where the tear is on a slope or an area of stress and has a sharp end, it must be rounded prior to patching.
 - 7.2.2.3 Blisters, large holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches.
 - 7.2.2.4 Surfaces of geomembrane that are to be patched shall be abraded and cleaned no more than fifteen (15) minutes prior to the repair. No more than ten (10) percent of the thickness shall be removed.
- 7.2.3 Patches shall be round or oval in shape, and extend a minimum of six (6) inches beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. All patches shall have their top edge beveled to an approximate 45-degree angle with an angle grinder prior to placement of the patch. Patches shall be applied using approved methods only.
- 7.2.4 The extrusion welding process shall restart by grinding the existing seam and re-welding a new seam. Welding shall commence where the grinding started and must overlap the previous seam by at least two (2) inches. Re-seaming over an existing seam without regrinding shall not be permitted.
- 7.2.5 Each repair shall be vacuum tested per Section 02776.0 Subsection 3.08 B. of the project specifications.
 - 7.2.5.1 Excess sheet overlap shall be trimmed away.

Energy Fuels Resources Piñon Ridge Mill Montrose County, Colorado	HDPE INSPECTION AND REPAIR PROCEDURE	Number: MP-030 Page: 6 of 6 Revision: 0 Date: 10/12/10
----------------------------------------------------------------------------------	-------------------------------------------------	---------------------------------------------------------------------------

- 7.2.5.2 Clean the vacuum box window, gasket surfaces and check for leaks.
- 7.2.5.3 Energize the vacuum pump and reduce the tank pressure to approximately five (5) psi.
- 7.2.5.4 Wet a strip of geomembrane having the approximate dimensions of the vacuum box with soapy solution.
- 7.2.5.5 Place the box over the wetted area and compress.
- 7.2.5.6 Close the bleed valve and open the vacuum valve.
- 7.2.5.7 Ensure that a leak-tight seal is created.
- 7.2.5.8 For a period of not less than ten (10) seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
- 7.2.5.9 If no bubbles appear after ten (10) seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum three (3) inches overlap and repeat the process.
- 7.2.5.10 All areas where soap bubbles appear shall be marked and repaired again following the above procedure.
- 7.2.6 Defects to larger areas requiring HDPE geomembrane replacement may be repaired using a combination of fusion and extrusion welding per Section 02776 of the project specifications.
- 7.2.7 Each HDPE repair and replaced HDPE geomembrane shall be tested for leaks per Section 02776, Subsection 3.08 of the project specifications.
- 7.2.8 Following repair, remove the equipment and place the HDPE lined facility back into service.
- 7.2.9 Document the location, size, and type of each repair (see Section 5.4.5 above).