WISCONSIN CONSTRUCTION SPECIFICATION

300. CLAY LINER

1. SCOPE

The work shall consist of the construction of the clay liner as shown on the construction plans.

2. MATERIALS

Soils used in clay liner construction shall have a minimum plasticity index of 12 as tested by Atterberg Limit tests (ASTM D4318), a minimum percentage passing the number 200 sieve as specified on the construction plans, and a recompacted in-place permeability of 1×10^{-7} centimeters per second or less.

Clay materials shall contain no sod, brush, roots, frozen soil, or other perishable materials. Rock particles larger than 3 inches shall be removed prior to compaction of the clay.

3. FOUNDATION PREPARATION

Foundation surfaces shall be graded to remove surface irregularities and shall be scarified or otherwise acceptably scored or loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the clay liner, and the surface materials of the foundation shall be compacted and bonded with the first layer of the clay liner as specified for subsequent layers of clay liner.

4. PLACEMENT

The clay liner shall not be placed until the required foundation preparation has been completed and the foundation has been inspected and approved by the Technician or Engineer. The clay liner shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the clay liner.

The clay liner shall be placed in lifts. The thickness of each lift before compaction shall not exceed the smaller of 6 inches or the length of the teeth of the footed compactor used.

The distribution of materials throughout the clay liner shall be essentially uniform, and the clay liner shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material.

If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified to a depth of not less than 2 inches before the next layer is placed.

5. CONTROL OF MOISTURE CONTENT

During placement and compaction of the clay liner, the moisture content of the clay being placed shall be maintained above optimum moisture as determined by the Standard Proctor Test (ASTM D698) or Modified Proctor Test (ASTM D1557).

The application of water to the clay shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the clay after placement and before compaction of the liner, if necessary. Uniform moisture distribution shall be obtained by disking.

6. COMPACTION

The clay liner shall be compacted to a minimum of 95% of standard proctor dry density (ASTM D698) or to a minimum of 90% of modified proctor dry density (ASTM D1557), at a moisture content above optimum moisture.

The clay liner shall be compacted with a footed compactor weighing at least 25,000 pounds, operated continuously, in uncompacted lift thicknesses not to exceed the smaller of 6 inches or the length of the teeth on the footed compactor used.

7. REWORKING OR REMOVAL AND REPLACEMENT OF DEFECTIVE LINER

Clay placed at densities lower than the specified minimum density or at moisture contents lower than optimum moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the specifications or removed and replaced. The replacement clay and the foundation and fill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction.

8. TESTING AND DOCUMENTATION REQUIREMENTS

Liner construction shall be tested and documented as specified below. Copies of the documentation report, including test locations and test results, shall be provided to the owner.

Field and laboratory soil tests shall be completed on the clay liner, by a third party engineering or testing firm retained by the contractor, to document compliance with this specification. Testing shall be completed as the liner is being placed. The following tests shall be completed at the specified frequency.

Standard proctor test (ASTM D698) or	1 per 5,000 cubic yards of clay liner
Modified Proctor Test (ASTM D1557)	1 per 5,000 cubic yards of clay liner
Field density tests ASTM D2922, or D2937, or D2167, or D1556)	1 test per 100-foot grid per 1 foot thickness of clay liner
Atterberg Limit tests (ASTM D4318)	1 per 1,500 cubic yards of clay liner
Grain size distribution (ASTM D422)	1 per 1,500 cubic yards of clay liner
Permeability (ASTM D5084)	1 per 5,000 cubic yards of clay liner (2 minimum per facility)

Atterberg limits, grain size distribution, and permeability tests shall be completed on undisturbed samples obtained from the constructed clay liner. A minimum of one of each of the laboratory tests specified above shall be completed per clay liner.

All test holes shall be backfilled using powdered bentonite mixed with clay soil used in liner construction and compacted by hand tamping. The clay shall be broken down into clods less than ½ inch in diameter. A minimum of 25% of the backfilled test hole volume shall be occupied by powdered bentonite after backfilling.