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ABSTRACT

This Waste Placement Plan for the Idaho National Engineering and Environmental Laboratory Comprehensive Environmental Response, Compensation, and Liability Act Disposal Facility (ICDF) provides an overview for waste placement procedures and operational requirements associated with the facility.

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CONTENTS

ABSTRACT 3

ACRONYMS 7

1. INTRODUCTION 9

1.1 Facility Description 9

2. WASTE MATERIAL DESCRIPTIONS 9

2.1 General 9

2.2 Landfill Waste Form 9

2.3 Restricted Waste Materials 10

2.4 Evaporation Pond Waste Delivery Requirements 10

3. WASTE PLACEMENT PROCEDURES 10

3.1 General 10

3.1.1 Protection of Facilities 10
3.1.2 Quality Assurance 11
3.1.3 As-Placed Map 11
3.1.4 Facility Access 12
3.1.5 Haul Roads 12

3.2 Filling Sequence 13

3.2.1 Filling Sequence Overview 13
3.2.2 Initial Fill Sequence 15
3.2.3 Subsequent Layers 15
3.2.4 Future Development of Cell 2 15
3.2.5 Settlement 17

3.3 Filling Operations 17

3.3.1 General 17
3.3.2 Personal Protective Equipment 18
3.3.3 Soil 18
3.3.4 Containers 19
3.3.5 Building Demolition Material 21
3.3.6 Asbestos-Containing Material 24
3.3.7 Soft Debris 24
3.3.8 Other Debris-Like Material 25
3.3.9 Compaction 26

4. REFERENCES 27

Appendix A—Geotextile Specifications 29

FIGURES

1. Cell 1 filling sequence plan 12

2. Cell filling haul path and dumping detail 14

3. Cell filling cross section 16

4. Long containers configuration 20

5. Short containers configuration 20

6. Concrete beams configuration 22

7. Concrete monoliths configuration 22

8. Large concrete rubble configuration 23

9. Small concrete rubble configuration 24

10. Large debris-like item placed in landfill depression 26

11. Large debris-like item placed on landfill base for forming and grouting 26

TABLES

1. Suggested waste compaction requirements 26

ACRONYMS

ACM	asbestos-containing material
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DOE-ID	Department of Energy Idaho Operations Office (now NE-ID)
EDF	Engineering Design File
ICDF	INEEL CERCLA Disposal Facility
IDAPA	Idaho Administrative Procedures Act
INEEL	Idaho National Engineering and Environmental Laboratory
SSSTF	Staging, Storage, Sizing, and Treatment Facility
WAC	Waste Acceptance Criteria
WPP	Waste Placement Plan

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ICDF Waste Placement Plan

1. INTRODUCTION

The objective of this Waste Placement Plan (WPP) is to provide direction for placing waste into the Idaho National Engineering and Environmental Laboratory (INEEL) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Disposal Facility (ICDF) landfill and evaporation pond. The WPP describes the general features of the ICDF landfill and evaporation pond, the waste material descriptions, and waste placement procedures.

1.1 Facility Description

The first phase of the ICDF Complex operation consists of waste disposal in Cell 1 of the landfill and operation of both the east and west evaporation ponds. The ICDF Complex will operate 12 months per year; however, the ICDF landfill will operate approximately seven months per year, with a winter shutdown period. Waste will not be temporarily stored in the ICDF landfill during winter shutdown periods.

2. WASTE MATERIAL DESCRIPTIONS

2.1 General

The ICDF Complex is designed to provide for the disposal of CERCLA remediation waste that is generated at the INEEL. Most of the waste will be contaminated soil, but debris and CERCLA investigation-derived waste will also be included in the waste inventory. The ICDF Complex will accept only low-level, mixed low-level, hazardous, and limited quantities of Toxic Substances Control Act waste for disposal.

The *ICDF Complex Waste Acceptance Criteria* (DOE-ID 2003a) provides the proposed operations and restrictions for waste entering the ICDF Complex. Both the ICDF *Waste Acceptance Criteria for ICDF Landfill* (DOE-ID 2004a) and the *Waste Acceptance Criteria for ICDF Evaporation Pond* (DOE-ID 2004b) further describe physical, chemical, and radiological properties, and quantities of wastes. In addition, the *ICDF Complex Operations and Maintenance Plan* (DOE-ID 2003b) provides requirements and restrictions regarding waste placement within the ICDF complex.

2.2 Landfill Waste Form

The majority of waste to be placed in the ICDF landfill is soil and soil-like material. Additional waste materials that are shown to meet the ICDF Waste Acceptance Criteria (WAC) include building debris, concrete (monoliths and rubble), and containerized material (boxes and drums). Building demolition debris will include beams (steel and concrete), concrete rubble, pipe, etc. Sizes evaluated for beams were 1.5 ft wide × 1.5 ft deep × 20 ft long, and for concrete rubble were approximately 12 in. in diameter (EDF-ER-267). Other debris could be crushed during placement operations in the landfill by multiple passes of operations equipment. Concrete monoliths are assumed to be 8 × 10 × 3 ft with an estimated weight of 18 tons. There is a potential for overpacked drums to be placed in the landfill. If these overpacked drums are identified for disposal at the ICDF, specific placement methods, such as grouting the void space in the overpack or crushing the overpack during placement, will be implemented to conform with WAC requirements. It is anticipated that the majority of waste will be delivered as bulk

shipments. Other debris-like material, such as breached tanks, may be disposed of in the landfill subject to WAC requirements.

The containerized waste to be placed in the ICDF landfill typically will be placed in wooden or steel boxes and drums. Example size and estimated weight of the boxes and the size of the drums are as follows:

- 4 × 4 × 8 ft steel or wood box: estimated weight is 8 tons
- 4 × 4 × 4 ft steel or wood box: estimated weight is 4 tons
- 4 × 4 × 6 ft steel box: estimated weight is 6 tons
- 2 × 4 × 8 ft steel or wood box: estimated weight is 4 tons
- 35-gal drums
- 55-gal drums.

Other sizes may be placed in the landfill with the approval of the disposal subcontractor.

2.3 Restricted Waste Materials

Materials prohibited from the ICDF Complex disposal are described in the ICDF Landfill WAC (DOE-ID 2004a) and the ICDF Evaporation Pond WAC (DOE-ID 2004b).

2.4 Evaporation Pond Waste Delivery Requirements

Evaporation pond waste requirements are described in the ICDF Evaporation Pond WAC (DOE-ID 2004b). Waste designated for the ICDF evaporation pond will be in liquid form. The ICDF Complex leachate will be pumped to the ICDF evaporation pond from the leachate collection or leak detection sumps. Treatment effluent or decontamination water from the Staging, Storing, Sizing, and Treatment Facility (SSSTF) also will be pumped to the evaporation pond. The delivery procedures for disposing of liquid waste into the evaporation pond, other than ICDF Complex leachate or SSSTF effluent, are described fully in the Operations and Maintenance Plan (DOE-ID 2003b). In general, monitoring well purge and development water will be delivered in containers and pumped to the pond through the truck unloading station.

3. WASTE PLACEMENT PROCEDURES

3.1 General

This section of the WPP describes the general procedures for placement of waste material in Cell 1 and Cell 2 of the ICDF landfill. Placement procedures for specific waste material are described below.

3.1.1 Protection of Facilities

Waste material placement activities shall be conducted in a manner that protects and maintains the integrity of the liner system, leachate collection system, final cover system, and all ICDF landfill ancillary facilities and equipment. Slope stability assessments (EDF-ER-268) were performed to aid in the design

of the liner system for the ICDF landfill and evaporation pond. The proposed side slope design was evaluated under a range of loading conditions and determined to satisfy the minimum requirements for stability. In addition, anchorage of the high-density polyethylene geomembrane, as demonstrated in the H-200 series design drawings, was determined to meet the minimum requirements for stability (EDF-ER-268). Evaluations performed in the following Engineering Design Files (EDFs) aided in the development of waste placement activities: EDF-ER-268, "Slope Stability Assessments"; EDF-ER-267, "Landfill Compaction/Subsidence Study"; and EDF-ER-277, "Waste-Soil Design Ratio Calculations." The recommendations and conclusions made in these evaluations are incorporated throughout this WPP and are designed to further provide for a stable waste mass that forms the foundation for the final cover. Waste material placement activities shall not commence in Cell 2 until the liner system has been completed in accordance with the regulatory requirements and cell construction has been completed and operations are allowed to proceed.

During operations, certain materials will be strictly prohibited from disposal in the ICDF. Those prohibitions are described in the WAC for the ICDF landfill (DOE-ID 2004a) and for the ICDF evaporation pond (DOE-ID 2004b).

Dust control will be necessary during loading, transportation, placement, and compaction. This will be accomplished by using dust suppression techniques (e.g. water truck[s] and/or soil fixatives). Fixatives used for dust control shall be reviewed prior to application for potential effects on landfill leachate and landfill surface runoff. Over-application of water resulting in free liquids will not be allowed because of waste minimization controls. If required and specified, fixatives may be used to mitigate dust. To prevent wind dispersion and dust generation from contaminated materials, during winter season shutdown periods and for use as daily/interim covers, fixatives will be applied over contaminated material. Dust control will be in accordance with Idaho Administrative Procedures Act (IDAPA) 58.01.01.008 (as promulgated October 1, 1999) and all applicable INEEL standards. For worker protection, air will be monitored for radiological and hazardous constituents.

Work will be restricted or suspended if unacceptable amounts of dust are being generated as determined by the field team leader, health and safety officer, and/or radiological control technician. Dust may be the result of dry soil (which may require wetting down) or wind. All excavating, loading, hauling, and dumping operations will be suspended when wind speeds are determined to be excessive as described in the *Health and Safety Plan for INEEL CERCLA Disposal Facility Operations*, (INEEL 2003). Work areas that have the potential for generating dust will require dust suppression techniques and monitoring.

3.1.2 Quality Assurance

Quality assurance requirements are defined in Plan (PLN) -873, "Quality Program Plan for the INEEL CERCLA Disposal Facility Complex."

3.1.3 As-Placed Map

The coordinate system and the methods for dividing the landfill into a 50 × 50-ft grid spacing for each 5-ft elevation for the as-placed map is documented in EDF-ER-322, "Waste Placement Mapping Plan." As the day-to-day operations occur in the ICDF landfill, the height of the waste will be monitored for each waste placement area. When the waste for a specific operation reaches the required height for mapping, at 5 ft 0 in. elevation intervals, it will be mapped in accordance with the ICDF procedures.

3.1.4 Facility Access

Access to the ICDF landfill Cell 1 disposal area will initially be from the south. Waste may initially be placed in the northwest corner of Cell 1 and progress southward along the western embankment (see Figure 1). The waste will form a foundation to support the construction of a haul road and dump peninsula. The clean haul road surface may be extended when the waste fill has been brought up to the height of 10 ft, the height of an operational lift.

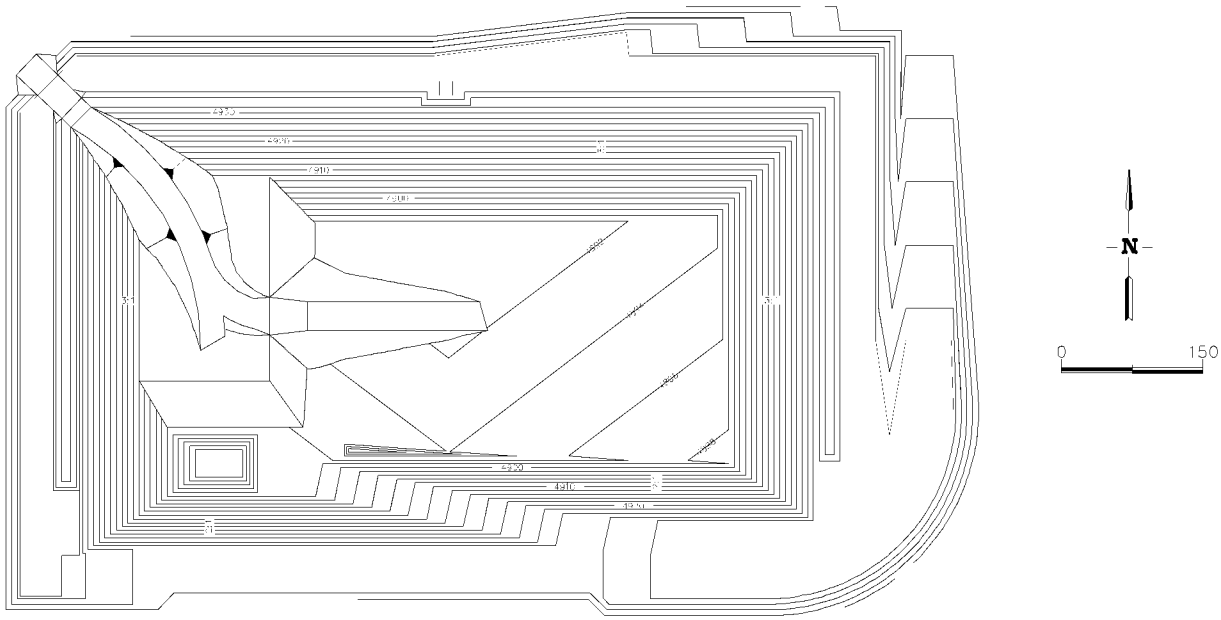

Figure 1. Cell 1 filling sequence plan.

Once the haul road has been constructed, the northwest corner may be developed in a series of 10-ft-thick operational lifts to reach the top of the Cell 1 side slope. After the waste fill reaches this point, access to the filling areas may move to the crest of the berm. A new operations vehicle access road, which will be surfaced with gravel, will be constructed to provide access to Cell 1 and the dump peninsula via the crest of the berm at the northwest corner. As the operations layers become built up over time, fill placement may be occurring on several layers of waste, and haul roads will be constructed to allow access to the various layers of fill construction as required. The clean south access road will be maintained to provide an alternate access route into the fill area and landfill floor until construction begins on Cell 2.

3.1.5 Haul Roads

Haul roads will be constructed within the ICDF landfill Cell 1 and Cell 2 to provide a clean haul surface to the active disposal area(s). Haul roads will be approximately 18 in. thick and consist of compacted granular fill (native alluvium) from the permanent stockpile south of the ICDF. The haul roads will be graded and maintained during filling operations. The haul roads will be a minimum of 30 ft wide to allow two-way traffic with adequate turning radii at all curves. Haul roads will have a maximum slope of 10%. Haul roads will be routinely monitored for contamination and be maintained as clean areas.

Haul roads will be developed with a dump peninsula to allow for dumping contaminated waste from the haul road, which is a clean surface (see Figure 2). The haul roads and dump peninsulas will be developed and extended as fill is placed and compacted. The peninsula dump face will be sloped to minimize falling hazards and eliminate the need for fall protection measures.

Day-to-day landfill operations will determine the routing and management of haul roads, possibly including one-way usage of haul roads to accommodate a specific haul or specialized equipment. Traffic control signage will be posted as required.

3.2 Filling Sequence

3.2.1 Filling Sequence Overview

The filling sequence will begin with the initial operational lift. Operational lifts are 10 ft thick and consist of ICDF landfill waste soil and debris. The filling sequence will be built up in three operational lifts to reach the crest of the excavation.

The initial 10-ft-thick lift will consist of two types of waste fill. Select waste fill will be placed for the first 5 ft of the operations lift. Select waste fill consists of waste soil that contains no large metal, concrete, or other debris material that may damage the liner system. The subsequent 5 ft will consist of general waste, which may include debris.

The next two 10-ft-thick operational lifts will consist of general waste, which may include debris. Debris will not be allowed within 50 ft of the edges (side slopes) of the landfill or within 5 ft of the final cover.

Each of the 10-ft-thick operational lifts consists of individual 12-in. compacted layers. The compacted layer thickness may vary with the type of material placed in the cell. Each individual, compacted 12-in. layer is placed, graded, and compacted until reaching the 10-ft-thick operational lift requirement. A 2-ft-thick clean soil fill operational cover will be placed over the final operational lift to provide clean access to the working face and a final interim clean cover. The landfill has been designed for the current estimated volume of waste (510,000 yd^3). During the lifespan of the landfill, the total volume of waste and the waste streams will become further understood and defined. When the volume of waste entering the landfill is at this more definitive stage, the final volumes, final contouring, and final elevations will be evaluated. It may be necessary for future plans to allow for the volume of waste to dictate the final contouring and final elevation for waste placement.

The conceptual fill sequences are presented below. Actual fill sequences may vary based on volume and type of incoming fill. After a minimum 100-ft-wide operational lift of waste has been placed next to the 3:1 side slopes of the landfill, placement of subsequent operational lifts of waste can begin. The minimum 100-ft width of the operational lift is designed to protect against shear failure in the liner system and provide buttressing for side slope stability. In addition, the selective placement of materials is designed to further ensure maintenance of liner integrity.

To prevent equipment and personnel from exposure or contact with contaminated materials, separation techniques (e.g. operational cover, fixative, platforms, or plastic) may be utilized on an as-needed basis. The operational cover would consist of alluvium soil stockpiled as it becomes available from the excavation of the ICDF landfill.

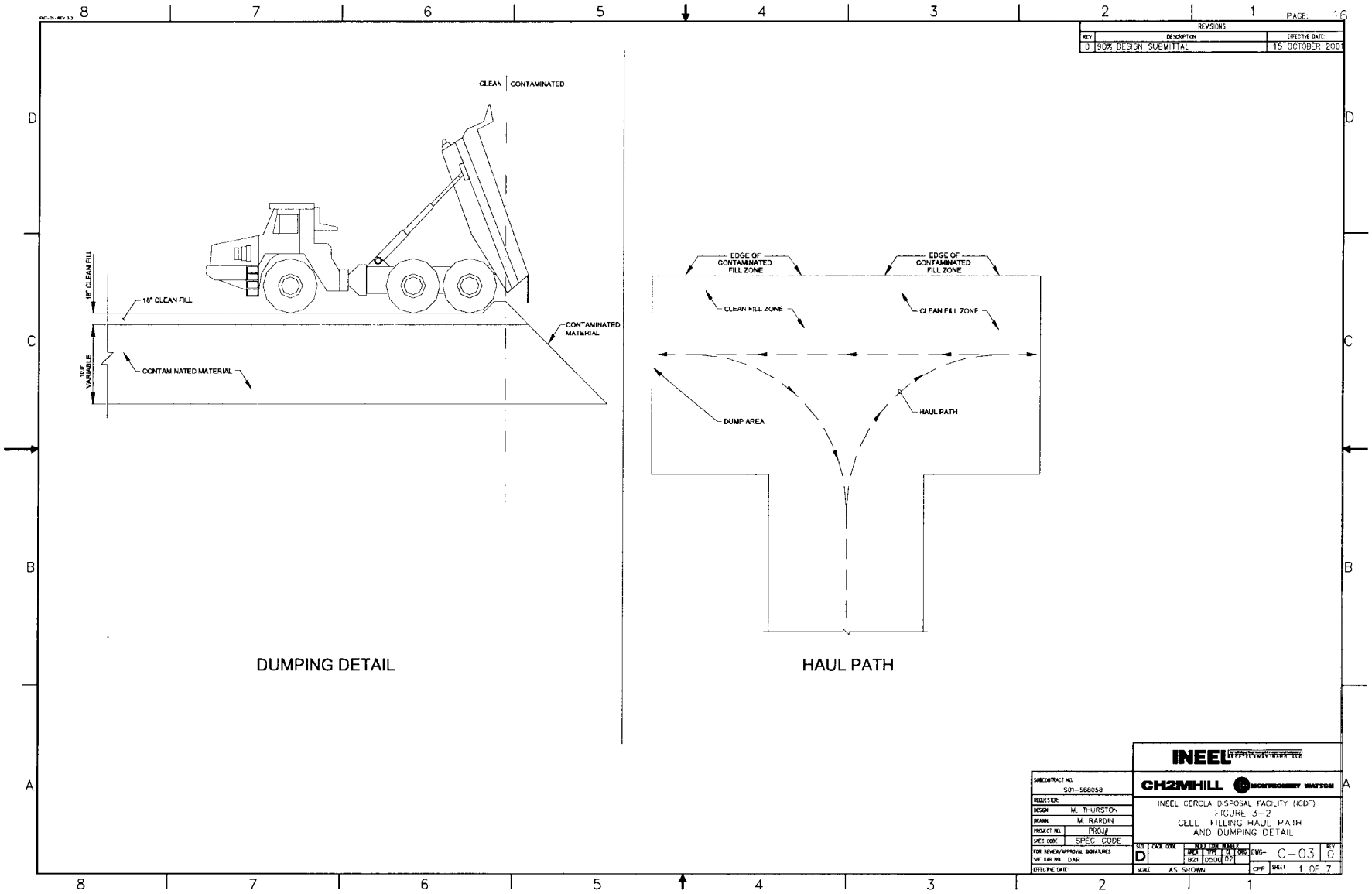

Figure 2. Cell filling haul path and dumping detail.

3.2.2 Initial Fill Sequence

The initial filling sequence for Cell 1 will start at the northwest corner. Initially, a dumping peninsula configuration will be developed that will allow for trucks to turn around and dump waste (see Figure 2). Waste will be built up to support the expansion of the haul road and the development of the initial 100-ft-wide buttress. The dumping peninsula and the haul road will be built up of 12-in. layers that are compacted and brought to the 10-ft operational lift thickness. The initial fill sequence will then proceed to the northwest and southwest corners.

The initial fill sequence will begin by placement of a geotextile over the operations layer (shown as Operations Layer 1 on the construction drawings and was placed as part of the landfill construction) prior to waste placement. The geotextile will consist of nonwoven, needle-punched polypropylene material that meets the specifications set forth in Appendix A. The initial placement of waste will consist of two types of waste fill: select soil waste in the first 5 ft of the operational layer; and general waste fill in the second 5 ft of the initial operational layer. The select soil waste (i.e., contains no large metal, concrete, containers, demolition debris, or other material that may damage the liner system) shall be placed in 12-in. layers and compacted. After the select soil waste fill is placed and compacted, an additional 5-ft-thick layer of general waste fill will be placed in 12-in. layers and compacted to reach the desired 10-ft-thick operational lift.

The geotextile will inhibit silty soil particles from migrating to the leachate collection system. The most granular select soil available will be utilized for the select soil waste zone in accordance with EDF-ER-280, "Landfill Leachate Collection System Design Analysis."

3.2.3 Subsequent Layers

Subsequent layers of waste fill can be placed on top of the compacted initial operational lift after a minimum 100-ft-wide buttress has been developed. The northwest corner will be the first area of Cell 1 to develop the 100-ft-wide buttressing and may have additional lifts placed while the initial filling sequence will continue toward the south and east.

As operational lifts increase in elevation, the final lift will be constructed to an elevation not to exceed approximately 4,927 ft (2 ft lower than the exterior berm edge) such that runoff water within the active waste placement area will be collected in the landfill and removed by the leachate collection system.

Each individual layer of waste material should be spread in an approximate thickness of 12 in. (or as required). Each loose layer shall be compacted and tracked before additional layers are placed on top. All material placed within the 5-ft mapping layer must comply with the requirements of the initial 10-ft-thick grid layer. Actual fill sequence may vary based on volume and type of incoming fill. As operations proceed, multiple haul roads and dumping peninsulas will be developed to support the multiple work faces of the operational lifts. Figure 3 shows a cross section of the filling sequence.

3.2.4 Future Development of Cell 2

Before Cell 1 is filled, a revision to this WPP that incorporates the access roads, haul roads, filling sequence, and operations of Cell 2 may be necessary. Cell 2 filling can commence when all Cell 2 construction and construction quality assurance activities are complete and approval to operate has been granted. The sump in the southwest corner of Cell 1 is to contain the surface water runoff from the unlined portion of Cell 1. This sump will be removed as a part of the tie-in to Cell 2. The water that is

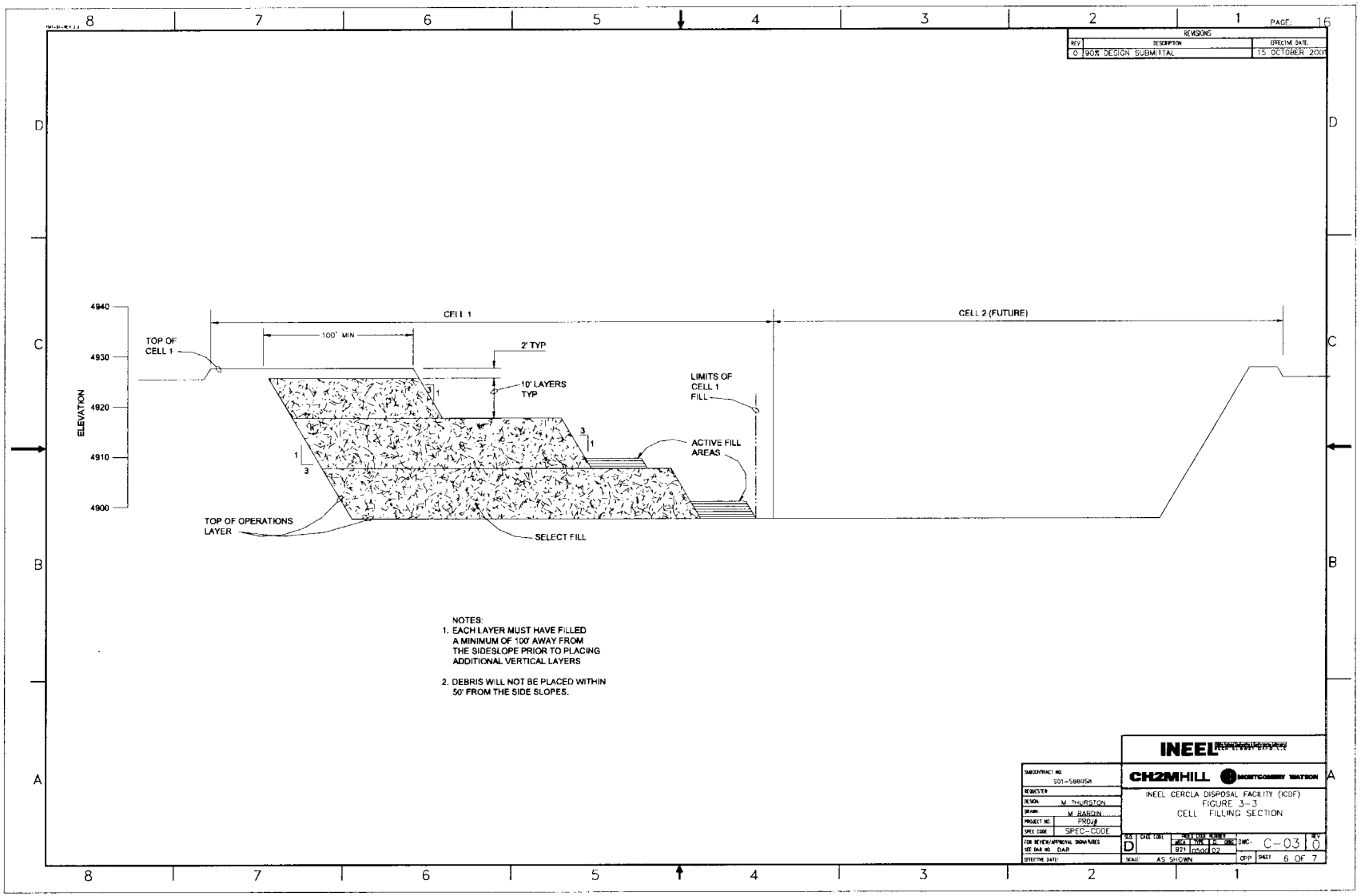

Figure 3. Cell filling cross section.

collected in the drainage sump is expected to drain through soil percolation and evaporation. The initial filling sequence into Cell 2 will follow a filling sequence similar to that used in Cell 1 (e.g., a 5-ft-thick select fill on operations layer, a completed 10-ft-thick lift with general fill, and the minimum 100-ft-wide buttress layer maintained adjacent to side slopes).

In addition, Cell 1 operations need to be considered for the dovetailed sequence of work leading to the development of Cell 2. The maximum extent of waste placed in Cell 1 will be controlled by several factors: the maximum height of waste allowed, the waste placement boundaries established by the placement of the Cell 1 liner (15 ft away from the edge of the liner), and Cell 1 storm water control and management. The ICDF Complex detailed operations schedule developed for Cell 2 construction should consider the generation of Cell 1 storm water runoff.

After construction of Cell 2 is complete, the entire interior of the ICDF landfill will be lined. However, until Cell 2 construction is complete, Cell 1 waste placement management must take into consideration the generation of the contaminated storm water runoff of Cell 1 waste and the capacity of the south storm water berm.

As Cell 1 waste fill placement develops, careful operations will be required to prevent runoff from the waste fill onto the south, unlined portions of the landfill. As waste placement of Cell 1 builds up at the 15-ft waste placement boundary on the liner, storm water runoff will be an issue based on the height and location of the waste. While enough storm water space is available for water that percolates through the waste layers into the leachate collection system, careful attention will be required such that the generation of storm water will not exceed the capacity of the south berm provided for storm water retainage. An option may be the placement of a clean liner cover to go over the exterior slope of waste that has been placed on or near the south waste placement boundary.

3.2.5 Settlement

Settlement of the waste materials is expected to occur, primarily due to consolidation of the waste soil and some degradation. The EDF-ER-267, "Landfill Compaction/Subsidence Study," presents a detailed evaluation of settlement.

Based on the results of the compaction/subsidence study, the design cover slope can accommodate placement of waste materials including bulk waste soils, building demolition material, and other waste containers throughout the facility's waste depth profile without adverse impact to long-term cover performance. However, the projected design inventory described in EDF-ER-264, "INEEL CERCLA Disposal Facility Design Inventory," identifies the majority of waste to be bulk soils. Nonbulk soil material will be placed as described in Section 3.3.

3.3 Filling Operations

3.3.1 General

The materials planned for disposal in the ICDF landfill have unique characteristics for unloading, placement, and compaction. The following sections describe those operational issues for waste placement. In addition, recommended placement configuration of containers and building demolition material is provided. Determination of placement configuration was made from the waste-soil evaluations performed in EDF-ER-277, "Waste-Soil Design Ratio Calculations." Waste-to-soil ratio determinations are affected by several factors, including haul road management, interim cover requirements, severe weather operations, and waste material characterization. Filling operations described in this WPP shall be

coordinated with all detailed ICDF landfill operating procedures (e.g., waste segregation, transportation plans, recordkeeping, and severe weather operation).

Other debris-like material may be disposed of in the landfill subject to meeting the landfill WAC and the requirements in 3.3.8 below. Examples of other debris-like material include tanks or large odd-size demolition material. When other debris-like material is proposed for disposal, the generator, in consultation with ICDF operations, shall prepare a placement plan that addresses the methods for compliance with placement and compaction criteria.

Special care will be required for equipment operation on the side slopes. Only a low ground pressure bulldozer, in accordance with the technical specifications, should be used for construction and maintenance directly on the side slopes until the initial fill layer is placed over the operations layer. Bulldozers or other equipment should not be operated on the slope during or soon after periods of heavy rainfall until the initial fill layer is placed over the operations layer. In addition, placement of debris will not be allowed within 50 ft of the side slopes. Proper disposal of debris requires spreading debris to allow complete soil coverage that will allow proper compaction of soil for support and not on the strength of debris.

Routine operations allow staging waste in an interim area in the landfill until conditions allow for correct compaction around the waste. However, waste may not be staged in the landfill longer than seven calendar days. Placement of debris that is greater than 1 ft in height may require many months to compact soil around the entire container or bulk debris item (e.g., tanks, boxes, drums). Once the debris waste is placed in its final resting place in the landfill, it is not considered staged even though compaction of soil waste around the debris waste has not been completed. In addition, waste to be grouted in place may be collected in a final placement location for a period of time greater than 7 days until it is cost-effective and space-management-effective to grout the debris waste.

3.3.2 Personal Protective Equipment

Contaminated personal protective equipment (e.g., gloves, Tyvek suits) generated by operations personnel is not considered to be debris and should be treated as bulk soil. These items will be distributed throughout the bulk soil in the landfill and covered.

3.3.3 Soil

The majority of the material sent for disposal in the ICDF landfill will be bulk waste soils. These waste soils will be transported to the site in self-dumping vehicles. The placement of this material should be accomplished by standard construction methods for unloading, spreading, grading, and compacting soils.

- **Unloading:** Trucks shall dump the waste soil at the direction of the field coordinator with Radiological Control and industrial hygiene and safety concurrence. The waste tracking form will specify the ICDF Complex unit location (e.g. landfill, evaporation ponds) where the waste should be placed. If deviations are required, they will be documented.

- **Placement Procedures:** The waste soil shall be spread by the ICDF landfill equipment in 12-in. loose lifts and then compacted as described below. Moisture conditioning should be used with the use of appropriate equipment to ensure adequate compaction. Before additional lifts of soil are placed, the previous lift shall be track-walked with a bulldozer and moisture-conditioned. The purpose of this preparation is to promote adhesion of the previous lifts with the new lifts and to mitigate preferential pathways forming between adjacent lifts.

3.3.4 Containers

Containers will include wooden boxes, steel boxes, and drums. The wooden and steel boxes may contain soil, stabilized soil material, scrap metal, and building debris. The wooden boxes are assumed to be compressible and able to collapse. Steel boxes and drums must meet the void compaction requirements of the WAC. All container and debris material placement will be according to EDF-ER-277, "Waste Soil Design Ratio Calculations." Containers may be handled by specialized equipment. Specialized equipment consists of, but is not limited to, loaders, excavators, and cranes. Soil will be placed around containers and hand compacted with conventional or hand compactors to achieve specified compaction.

3.3.4.1 Wooden Containers

- **Unloading:** Wooden containers will be unloaded with specialized equipment, as necessary.

- **Placement Procedures:** The wooden containers will be placed so that the equipment used to spread the material can crush the containers. Containers may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil.

  Wooden containers shall be crushed and their contents (soil, plastic liner, and wooden container) will be evenly spread to allow thorough compaction of the material. This material will be mixed with bulk soil waste to minimize void spaces within the lift. Based on radiological constituents, the waste may need to be covered with clean material prior to compaction.

- **Placement Configuration:** Recommended placement of containers, including long and short boxes is shown in Figures 4 and 5. Figure 4 identifies placement of long boxes (4 × 4 × 8 ft or 2 × 4 × 8 ft), and Figure 5 shows placement of short boxes (4 × 4 × 4 ft). As the boxes are crushed, their contents will be blended with bulk soil based on Radiological Control and industrial hygiene and safety evaluations. Soil will be brought in 12-in. lifts and compacted using conventional compaction equipment.

3.3.4.2 Steel Containers

- **Unloading:** The steel containers will be unloaded with specialized equipment, as necessary.

- **Placement Procedures:** The steel containers will be placed so that the soil between the containers can be adequately compacted by conventional compaction equipment. Containers may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil.

- **Placement Configuration:** Recommended placement of containers, including long and short boxes is shown in Figures 4 and 5 and according to EDF-ER-268, "Waste Soil Design Ratio Calculations." Figure 4 identifies placement of long boxes (4 × 4 × 8 ft) and Figure 5 shows placement of short boxes (4 × 4 × 4 ft). Soil will be brought in 12-in. lifts and compacted around the boxes using conventional compaction equipment.

3.3.4.3 Drums

- **Unloading:** Drums will be unloaded with specialized equipment, as necessary.

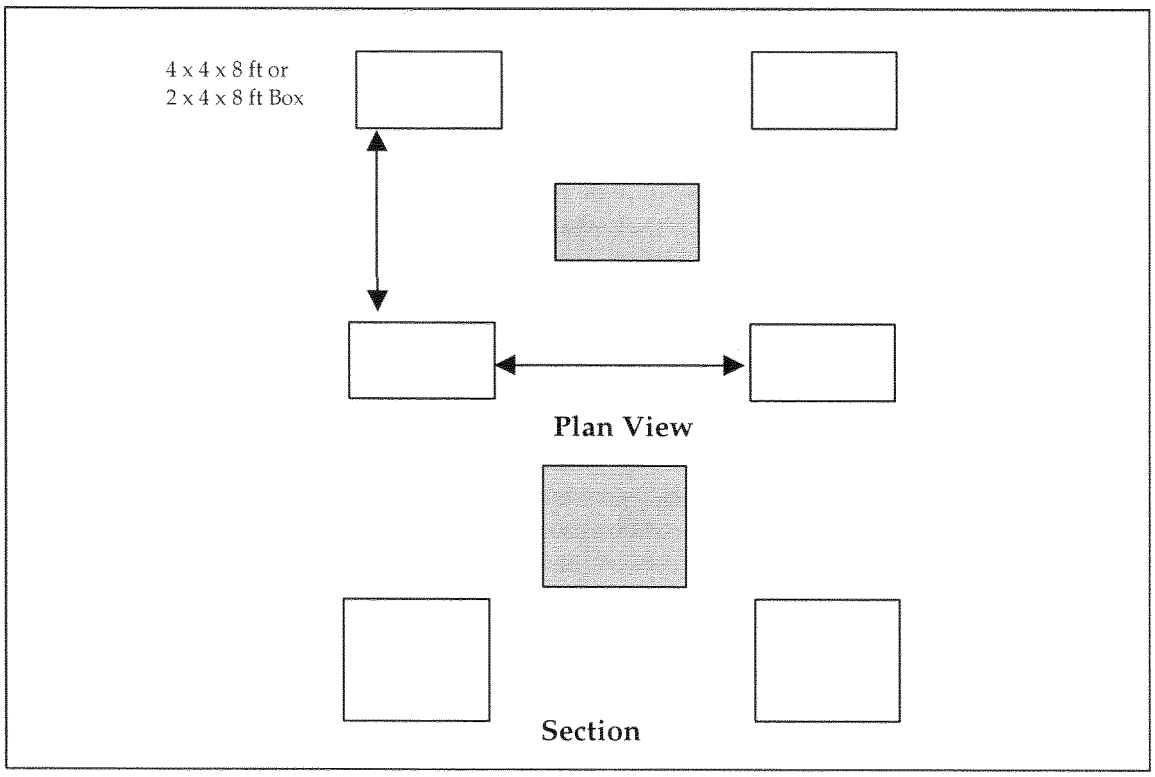

Figure 4. Long containers configuration.

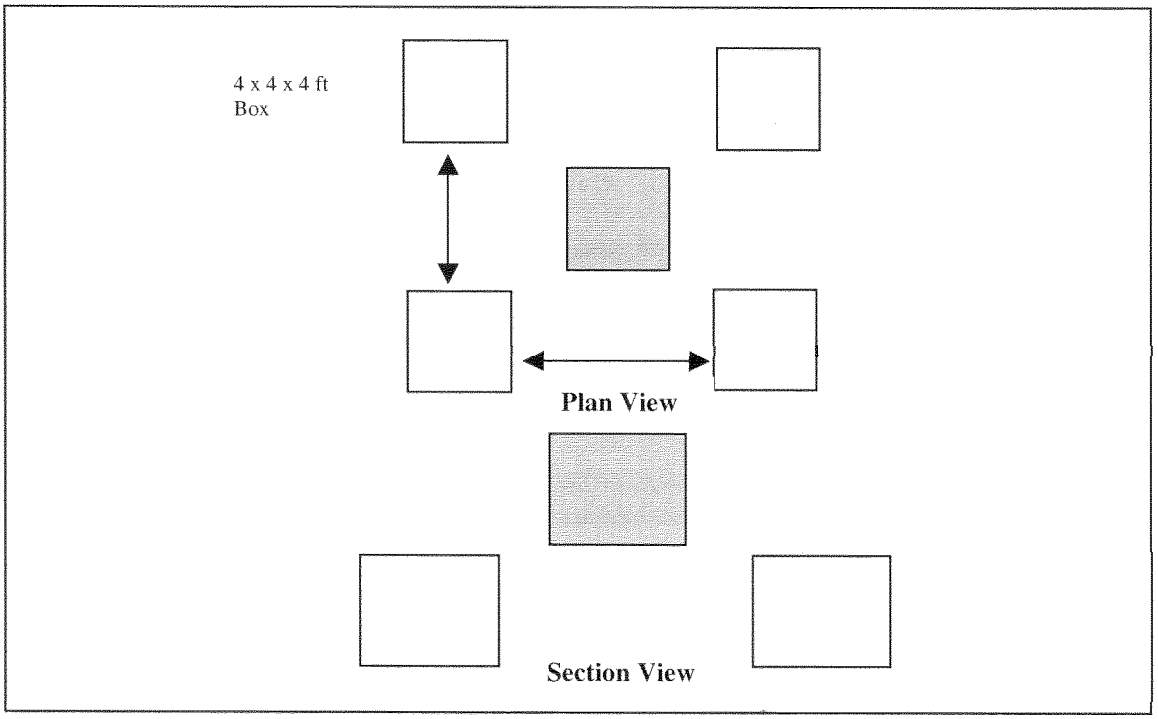

Figure 5. Short containers configuration.

- **Placement Procedures:** Drums may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil.

  Placement of drums will be dependent on the quantity of drums being placed in the landfill at a given time. Drums will be placed so that soil between the drums can be adequately compacted.

- **Placement Configuration:** If there is a minimum of drums (less than 25 drums), drum placement will be similar to small container placement. Drums may be placed a minimum of 36 in. edge-to-edge with soil placed around the drums and hand compacted. Conversely, at the discretion of the facility manager, drums may be placed far enough apart that the D-9 dozer can compact between the drums, with hand compaction required only immediately adjacent to the drums. Soil will be placed around the drums in 12-in. layers and compacted as noted above.

3.3.5 Building Demolition Material

3.3.5.1 Steel and Concrete Beams

- **Unloading:** Steel and concrete beams shall be unloaded using specialized equipment, as necessary.

- **Placement Procedures:** Beams may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil.

  Steel and concrete beams will be placed with a minimum of 1-ft horizontal and vertical spacing between the beams. This is to allow a proper compacted soil envelope around the beams. Concrete and steel beams will be in pieces that could be placed as flat as possible in the landfill, rather than a tangled mass that would be compressible as additional fill is placed. Moisture will be placed as needed to control dust and to achieve compaction requirements.

- **Placement Configuration:** The recommended placement of steel and concrete beams is identified in Figure 6. In general, the beams will be placed with soil compacted around them in 12-in. lifts.

3.3.5.2 Concrete Monoliths

- **Unloading:** Concrete monoliths are assumed to be 8 × 10 × 3 ft. Monoliths of other sizes may be placed based on approved methods to ensure adequate compaction. Concrete monoliths will be unloaded using specialized equipment, as necessary.

- **Placement Procedures:** Concrete monoliths will be placed so that the soil between the monoliths can be adequately compacted. Moisture will be placed as needed to control dust and to achieve compaction requirements. Monoliths may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil.

- **Placement Configuration:** The recommended placement of large concrete and building debris, including concrete beams, concrete rubble, and concrete monoliths is shown in Figure 7. Concrete monoliths may be placed a minimum of 36 in. edge-to-edge with soil placed around the monoliths and hand compacted. Conversely, at the discretion of the facility manager, they may be placed far enough apart that the D-9 dozer can compact between the monoliths, with hand compaction required only immediately adjacent to the monoliths. Soil will be brought up around the monoliths in 12-in.-thick lifts and compacted as noted above.

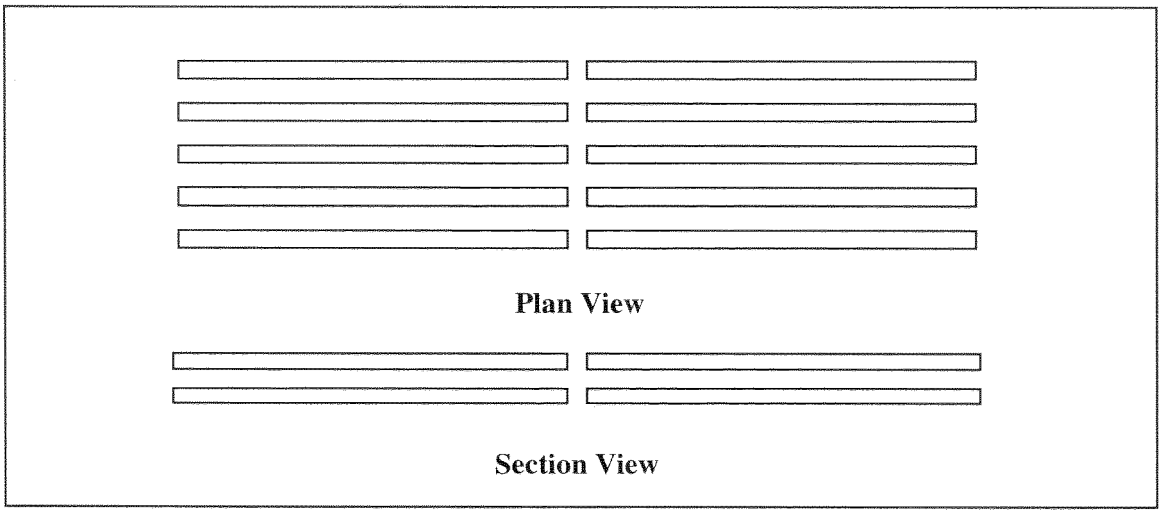

Figure 6. Concrete beams configuration.

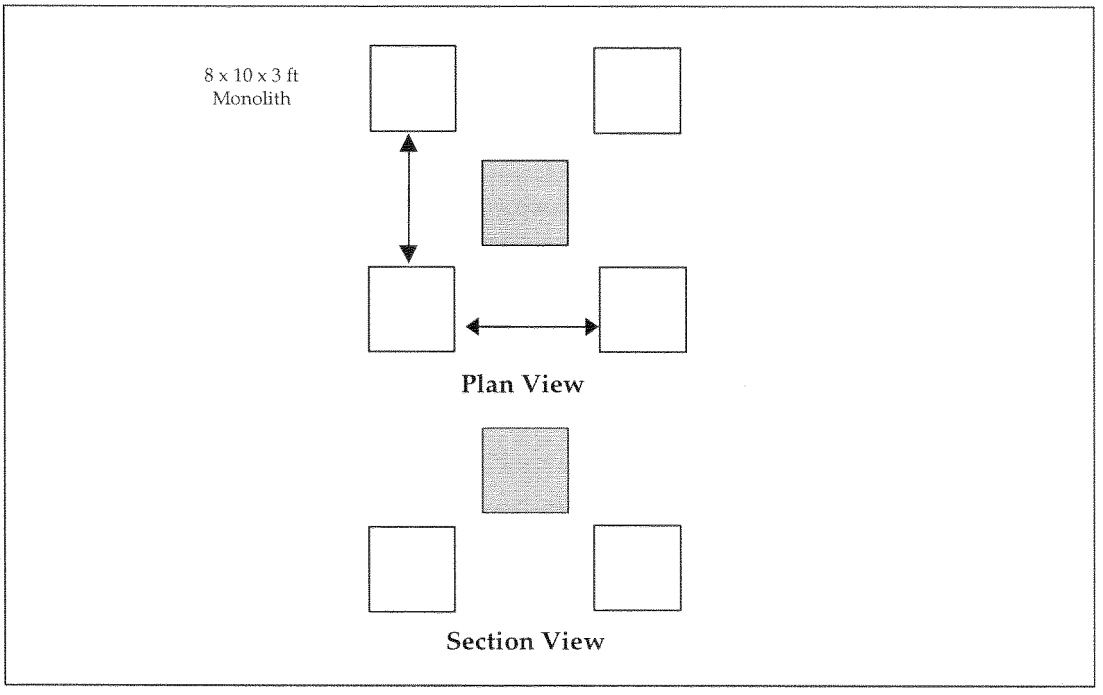

Figure 7. Concrete monoliths configuration.

3.3.5.3 Large Concrete and Building Rubble

- **Unloading:** Large concrete and building rubble is assumed to be approximately 4 × 4 × 1 ft. Pieces may be flattened prior to arrival onsite. Concrete and building rubble of other sizes may be placed based on approval of methods to ensure adequate compaction. Large concrete and building rubble will be unloaded using specialized equipment as necessary.

- **Placement Procedures:** The rubble material will be placed so that the soil between the material can be adequately compacted. Moisture will be placed as needed to control dust and to achieve

compaction requirements. Large building demolition objects may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil.

Building debris will be broken down into pieces prior to placement into the ICDF. These broken-down pieces will be placed as flat as possible in the landfill, rather than in a tangled mass or pile that would be compressible as additional fill is placed.

- **Placement Configuration:** The recommended placement of large concrete and building debris building demolition material is shown in Figure 8. Soil will be brought up around the rubble in 12-in.-thick lifts and compacted using conventional compaction equipment. There will be a minimum 1-ft-thick soil envelope around the large concrete and building debris in order to avoid localized voids.

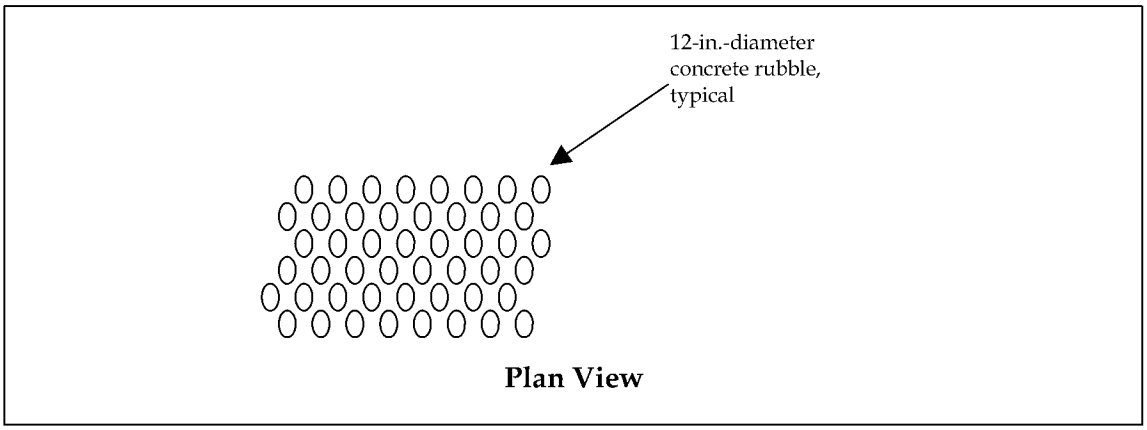

Figure 8. Large concrete rubble configuration.

3.3.5.4 Small Concrete and Building Rubble

- **Unloading:** Small concrete and building rubble will be unloaded using specialized equipment as necessary.

- **Placement Procedures:** Small concrete and building rubble will be placed with a minimum of 1-ft horizontal and vertical spacing between rubble loads. Individual rubble loads will be spread out as necessary to ensure proper filling of voids with soil. Small rubble may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil. The material will be placed so that the soil between the material can be adequately compacted. Moisture will be placed as needed to control dust and to achieve compaction requirements.

- **Placement Configuration:** The recommended placement of small concrete and building rubble is shown in Figure 9. In general, small building rubble will be placed in the landfill with soil placed around the debris. Soil will be brought up around the rubble in 12-in.-thick lifts and compacted using conventional compaction equipment. There will be a minimum 1-ft-thick soil envelope around the large concrete and building debris in order to avoid localized voids.

  Alternate placement configuration can include grouting the rubble in place in the landfill to accomplish the requisite compaction requirements.

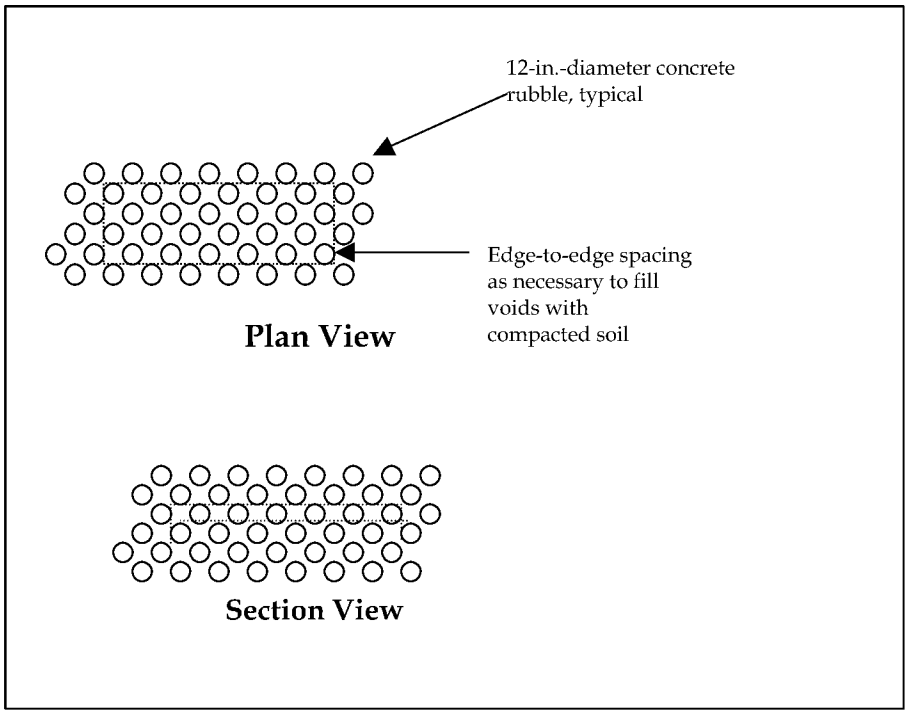

Figure 9. Small concrete rubble configuration.

3.3.6 Asbestos-Containing Material

- **Unloading:** Approved asbestos-containing material (ACM) meeting the WAC may cause fiber release problems if not handled properly. All ACM will be wrapped according to the ICDF Complex requirements. Appropriately wrapped ACM will be brought to the ICDF landfill in haul trucks and unloaded. Specialized equipment will be utilized as required.

- **Placement Procedures:** ACM will be placed in the designated ACM location for each operational layer of waste placement. The ACM may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil. The area designated for ACM will have applicable signage and barricade as required. Moisture will be placed as needed to control dust and to achieve compaction requirements.

- **Placement Configuration:** The asbestos waste will be placed in preconstructed trenches with a minimum depth of 2 ft. Previously placed waste will not be disturbed. The trenches will be created long enough to accommodate a single layer of the packaged asbestos waste material (i.e., large quantities of ACM will not be stacked on top of a previous layer of ACM). Bulk soil waste of at least 0.5 ft in thickness will be placed over the asbestos waste prior to compaction. This will be completed at the end of the operating day, or within a 24-hour period while the site is in continuous operation. This will minimize the potential for asbestos fiber releases. The soil will then be compacted using conventional compaction equipment.

3.3.7 Soft Debris

- **Unloading:** Soft debris consists of bulk wood, paper, cardboard, and other biodegradable materials that may cause subsidence problems in the landfill. Soft debris will be brought to the ICDF landfill in haul trucks and unloaded.

- **Placement Procedures:** Soft debris will be placed in a designated soft debris location for each operational layer of waste placement. The soft debris may be positioned above previously placed containers or debris as long as the two areas are separated by a minimum of 5 vertical ft of compacted waste soil. Moisture will be placed as needed to control dust and to achieve compaction requirements.

- **Placement Configuration:** Soft debris material will be uniformly distributed throughout the landfill. Soft debris material will not be stacked immediately on top of a previous layer of soft debris. Bulk soil will be placed in 12-in. lifts above the soft debris and compacted, minimizing potential voids and possible subsistence. Soft debris may be staged in the bottom of the disposal cell in boxes for a period of no longer than 7 calendar days before incorporation into the working face.

3.3.8 Other Debris-Like Material

The most common "other debris-like material" will be tanks. Tanks disposed in the landfill must be:

- Open

- Filled with solid debris and grout or grout-like material (e.g., waste-crete that equals or exceeds the bearing capacity of the compacted soil

- Enclosed in compacted soil meeting the compaction recommendations of Section 3.3.9 or formed and encased in concrete/grout that equals or exceeds the bearing capacity of the compacted soil.

Examples of placement options are shown in Figures 10 and 11 below. Other alternatives may be proposed and will be evaluated by ICDF operations on a case-by-case basis. Whatever plan is developed must meet all placement criteria including:

- Placed waste cannot be recontoured to accept the debris-like item. Any contouring, as shown in Figure 10, must be done at the time of soil waste placement.

- The item must ultimately be encased in grout, concrete, or compacted soil that meets the landfill compaction requirements.

- The item internals must be filled with solid debris, grout, concrete, or waste-crete that meets landfill compaction requirements.

- The item, including contents, must meet all other landfill WAC requirements, including land disposal restrictions as applicable.

Another alternative for placing debris is to construct a concrete-bearing pad into the landfill and place, pile, or stack debris upon this pad until it accumulates to a point that the pad can no longer contain the debris. The pad will then be formed and concrete grout pumped into the piled debris matrix to satisfy compaction and subsidence prevention requirements. All waste placed onto such a pad must satisfy all the WAC requirements for waste constituents and land disposal restrictions prior to being placed on the pad for eventual internment.

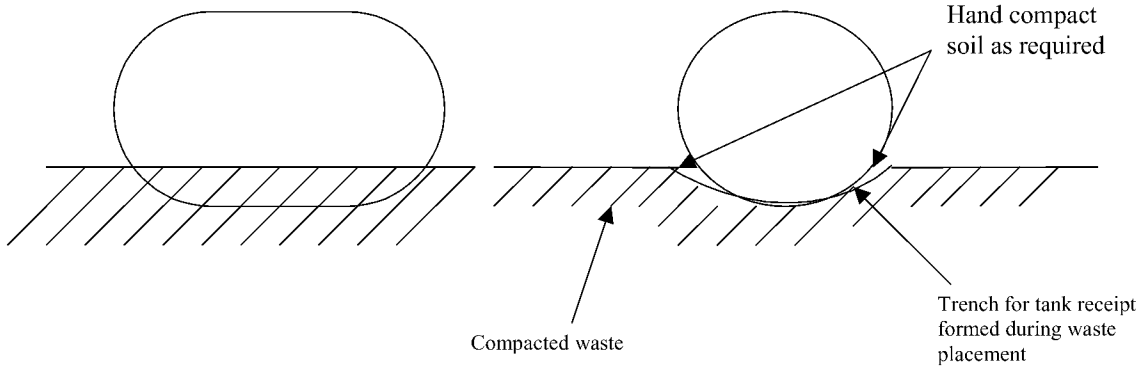

Figure 10. Large debris-like item placed in landfill depression.

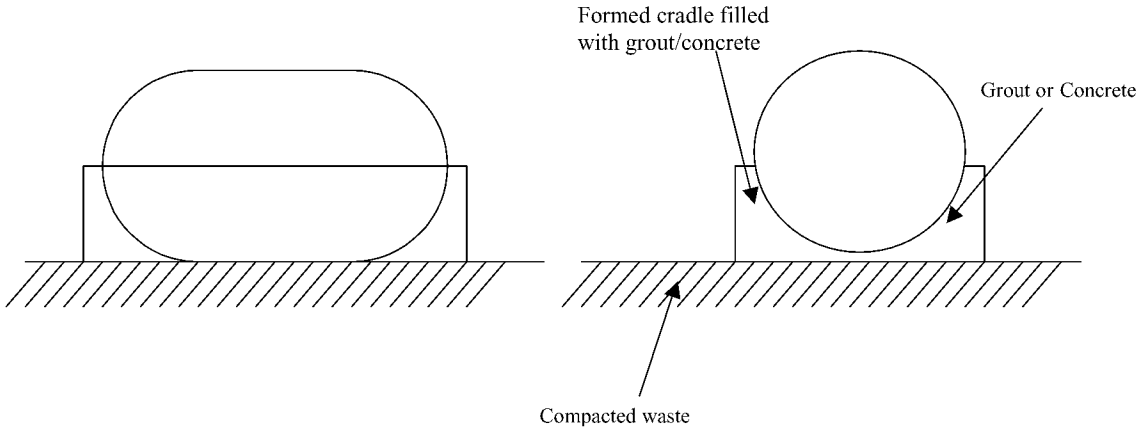

Figure 11. Large debris-like item placed on landfill base for forming and grouting.

3.3.9 Compaction

The EDF-ER-267, "Landfill Compaction/Subsidence Study," performed subsidence calculations and developed a summary of suggested compaction methods, equipment, and testing methods to ensure uniform compaction of the waste. Table 1 provides a summary of the recommended compaction methods and equipment for different waste streams.

Table 1. Suggested waste compaction requirements.

Waste	Requirement
Fine-grained soils or coarse-grained soils with fines	Minimum three passes with compaction equipment, or number of passes necessary to achieve ≥90 relative compaction (ASTM-D698).
Coarse-grained soils (free draining) < 5% fines	Minimum three passes with compaction equipment, or number of passes necessary to achieve ≥90 relative compaction (ASTM-D698).
Rock and debris	Mixed with soils during placement. Three passes with a compactor.

The information in Table 1 may be modified based on in-place waste compaction and density measurements that meet compaction requirements.

In the case that a waste item poses difficulty for compaction, creates excessive void space, or poses a danger to compaction equipment or personnel, in-cell grouting may be performed.

4. REFERENCES

DOE-ID, 2003a, *ICDF Complex Waste Acceptance Criteria*, DOE/ID-10881, Rev. 1, July 2003.

DOE-ID, 2003b, *ICDF Complex Operations and Maintenance Plan*, DOE/ID-11000, Rev. 1, October 2003.

DOE-ID, 2004a, *Waste Acceptance Criteria for ICDF Landfill*, DOE/ID-10865, Rev. 4, January 2004.

DOE-ID, 2004b, *Waste Acceptance Criteria for ICDF Evaporation Pond*, DOE/ID-10866, Rev. 5, January 2004.

DOE M 435.1-1, 2001, *Radioactive Waste Management Manual*, Chg. 1, June 2001.

EDF-ER-264, 2002, "INEEL CERCLA Disposal Facility Design Inventory," Rev. 1, Environmental Restoration, December 2002.

EDF-ER-267, 2002, "Landfill Compaction Subsidence Study," Rev. 1, Environmental Restoration, May 2002.

EDF-ER-268, 2002, "Slope Stability Assessments," Rev. 1, Environmental Restoration, May 2002.

EDF-ER 277, 2002, "Waste-Soil Design Ratio Calculations," Rev. 1, Environmental Restoration, May 2002.

EDF-ER-280, 2002, "Landfill Leachate Collection System Design Analysis," Rev. 1, Environmental Restoration, May 2002.

EDF-ER-322, 2001, "Waste Placement Mapping Plan (60% Design Component)," Rev. 0, Environmental Restoration, November 2001.

IDAPA 58.01.01, 1994, "Rules for the Control of Air Pollution in Idaho," Idaho Administrative Procedures Act, Idaho Department of Environmental Quality, (as promulgated October 1, 1999).

INEEL, 2003, *Health and Safety Plan for INEEL CERCLA Disposal Facility Operations*, INEEL/EXT-01-01318, Rev. 1, July 2003.

PLN-873, 2002, "Quality Program Plan for the INEEL CERCLA Disposal Facility Complex," Rev. 0, March 2002.

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Appendix A

Geotextile Specifications

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GEOTEXTILE SPECIFICATIONS

PART 1 - GENERAL:

Geotextile:

Separation geotextile shall be 6 oz/yd^2 nominal weight and shall be used for separation of soil layers between the operations layer and the waste and will consist of commercial grade material.

Geotextile, shall be nonwoven, needle-punched polypropylene.

Manufacturer: The geotextile manufacturer shall be a commercial entity normally engaged in manufacture of geotextiles for landfill applications.

REQUIRED PROPERTIES:

Property Values:

Geotextile properties shall meet or exceed the values specified in Table A-1.

The manufacturer shall certify that the materials supplied meet the requirements of this Part.

Integrity:

Geotextile shall retain their structure during handling, placement, and long-term service.

TRANSPORTATION, HANDLING, AND STORAGE:

Geotextiles shall be supplied in rolls wrapped in covers. Transportation of the geotextiles to the site and all handling onsite shall be the responsibility of the subcontractor. During shipment and storage, the geotextile shall be protected from mud, dirt, UV exposure, dust, puncture, cutting, or other damaging or deleterious conditions. The subcontractor shall be responsible for the storage of the geotextiles on site.

PART 2 - EXECUTION

GENERAL:

HANDLING AND PLACEMENT:

The subcontractor shall handle all geotextiles in such a manner as to ensure that they are not damaged.

Place geotextiles in a manner that prevents folds and wrinkles. Folds or wrinkles shall be pulled smooth prior to seaming. Geotextiles shall be cut using an approved geotextile cutter only.

If light-colored geotextile is used, precautions shall be taken against “snowblindness” of personnel.

JOINTS:

Edge of roll seams are not required to be sewn and shall be overlapped a minimum of 6 in. End of roll seams are not required to be sewn and shall be overlapped a minimum of 12 in.

Areas to be seamed shall be clean and free of foreign material.

REPAIR:

Any holes or tears in the geotextile shall be repaired as follows:

Remove any soil or other material that may have penetrated the torn geotextile. Replace torn areas and holes by placing a geotextile patch having dimensions of at least 12 in. greater than the tear or hole.

MATERIALS IN CONTACT WITH GEOTEXTILE:

The construction subcontractor shall place all soil materials located on top of a geotextile in such a manner as to ensure that the following conditions are satisfied:

No damage to the geotextile

Minimal slippage of the geotextile on underlying layers

No excess tensile stresses in the geotextile.

1 Table A-1. Required geotextile properties.

Property	Unit	Separation[a]	Test Method
Mass/unit area	oz/yd^2	6.0[b]	ASTM D5261 or D3776
Apparent opening	Size[b]	U.S. Sieve 70 maximum opening 100 minimum opening	ASTM D4751
Grab strength	lb	140	ASTM D4632
Trapezoidal tear strength	lb	70	ASTM D4533
Puncture strength	lb	70	ASTM D4833
Flow rate	gpm/ft^2	100	ASTM D4491
UV resistance (500 hours)	% strength retained	70	ASTM D4355

a. All values are minimum average values, except as noted.
b. Nominal values.

2