

Engineering Design File

Project No. 23350

ICDF Waste Placement Plan

**Idaho
Cleanup
Project**

CH2M ♦ WG Idaho, LLC is the Idaho Cleanup Project contractor for the U.S. Department of Energy

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ABSTRACT

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

CONTENTS

ACRONYMS.....	6
1. INTRODUCTION.....	7
1.1 Facility Description.....	7
2. WASTE MATERIAL DESCRIPTIONS.....	7
2.1 General.....	7
2.2 Landfill Waste Form.....	7
2.3 Restricted Waste Materials.....	8
2.4 Evaporation Pond Waste Delivery Requirements.....	8
3. WASTE PLACEMENT PROCEDURES.....	9
3.1 General.....	9
3.1.1 Protection of Facilities.....	9
3.1.2 Quality Assurance.....	9
3.1.3 As-Placed Waste Location.....	10
3.1.4 Facility Access.....	10
3.1.5 Haul Roads.....	11
3.2 Filling Sequence.....	11
3.2.1 Filling Sequence Overview.....	11
3.2.2 Initial Fill Sequence.....	13
3.2.3 Subsequent Lifts.....	14
3.2.4 Settlement.....	14
3.3 Filling Operations.....	14
3.3.1 General.....	14
3.3.2 Personal Protective Equipment.....	16
3.3.3 Soil.....	16
3.3.4 Containers.....	17
3.3.5 Building Demolition Material.....	19
3.3.6 Asbestos-Containing Material.....	21
3.3.7 Soft Debris.....	22
3.3.8 Other Debris-Like Material.....	22
3.3.9 Debris Trenches.....	23
3.3.10 Compaction.....	23
4. REFERENCES.....	24
Appendix A—Geotextile Specifications.....	26

FIGURES

1.	Cell 1 filling sequence plan (example).....	10
2.	Cell filling haul path and dumping detail (example).....	12
3.	Cell filling cross section (example).....	15
4.	Concrete beams configuration.....	19
5.	Concrete monoliths configuration.....	20
6.	Large concrete rubble configuration.....	21
7.	Large debris-like item placed in landfill depression.....	23
8.	Large debris-like item placed on landfill base for forming and grouting.....	23

TABLES

1.	Cargo container acceptable placement.....	18
2.	Suggested waste compaction requirements.....	24

ACRONYMS

ACM	asbestos-containing material
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE-ID	U.S. Department of Energy Idaho Operations Office
EDF	Engineering Design File
GCL	geosynthetic clay liner
ICDF	Idaho CERCLA Disposal Facility
IDAPA	Idaho Administrative Procedures Act
INEEL	Idaho National Engineering and Environmental Laboratory
IWTS	Integrated Waste Tracking System
SSSTF	Staging, Storage, Sizing, and Treatment Facility
WAC	Waste Acceptance Criteria
WPP	Waste Placement Plan

ICDF Waste Placement Plan

1. INTRODUCTION

The objective of this Waste Placement Plan (WPP) is to provide direction for placing waste into the Idaho 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 ICDF Complex operation consists of waste disposal (soil and debris) in the landfill and operation of both the east and west evaporation ponds. The ICDF landfill was designed as a two-cell facility with a common wall that separated the two cells during construction. Cell 1 was completed and disposal operations began in 2003. Cell 2 was completed in late 2005 and disposal operations began in 2006. With the completion of Cell 2, the landfill is one cell comprising the areas formerly referred to as Cell 1 and Cell 2. Earlier revisions of this EDF were prepared when the Cell 1/Cell 2 distinction was appropriate. Since that is no longer the case, all references to Cell 1 and Cell 2 have been removed from this revision.

The ICDF Complex operates 12 months per year. The ICDF landfill normally disposes of soils approximately 7 months per year, with a winter shutdown period. Debris may be disposed of throughout the year. Waste will not be temporarily staged in the ICDF landfill during winter shutdown periods. However, waste may be permanently placed in the ICDF landfill during the winter shutdown period providing the location is documented. Soils placed in the winter shall either be containerized or placed in specific designated locations and spread in approximately 1-ft lifts for compaction when the landfill thaws in the spring.

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 Idaho National Laboratory Site. Most of the waste will be contaminated soil, but significant amounts of debris and CERCLA investigation-derived waste are 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 (TSCA) waste for disposal.

The *ICDF Complex Waste Acceptance Criteria* (WAC) (DOE-ID 2013a) provides the criteria for waste entering the ICDF. In addition, the *ICDF Complex Operations and Maintenance Plan* (DOE-ID 2013b) 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 WAC, such as building debris, concrete (monoliths and rubble), and containerized material (in boxes, drums, cargo containers, and similar containers), may also be disposed of in the landfill. Building demolition debris will include beams (steel and concrete), concrete

rubble, pipe, ductwork, and other equipment. 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. Other debris could be crushed during placement operations in the landfill by multiple passes of operations equipment. 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 to 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 meeting WAC requirements.

Example sizes and estimated weights of containerized waste and other debris type of material that were evaluated are as follows:

- Two stacked 4- × 4- × 8-ft steel boxes (voids filled with grout): estimated weight is 44 tons
- One cargo container 8- × 8- × 20-ft steel (voids filled with grout): estimated weight is 217 tons
- Debris trench 12 × 50 × 10 ft with 1.5:1 slope (voids filled with grout): estimated weight is 2,268 tons
- One tank-like debris 12 × 55 ft (voids filled with grout): estimated filled weight is 713 tons.

The aforementioned debris is not all inclusive; however, these waste footprints with the associated estimated weights are bounding. If other debris materials are above these bearing pressures, an additional evaluation will be performed using the methodology describe in EDF-ER-281 to ensure that the liner system will not be damaged.

Other sizes may be placed in the landfill with the approval of the ICDF Complex facility manager.

2.3 Restricted Waste Materials

Materials prohibited from the ICDF Complex disposal are described in the ICDF WAC.

2.4 Evaporation Pond Waste Delivery Requirements

Evaporation pond waste requirements are described in the ICDF WAC. 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 Decontamination/Treatment Facility (CPP-1688) 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 Decontamination/Treatment Facility effluent, are described fully in the *ICDF Complex Operations and Maintenance Plan* (DOE-ID 2013b). 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 the ICDF landfill. Placement procedures for specific waste material are described below.

3.1.1 Protection of Facilities

Waste 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 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-266, "Subsurface Consolidation 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.

During operations, certain materials will be strictly prohibited from disposal in the ICDF. Those prohibitions are described in the ICDF WAC.

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) 58.01.01.650 (as promulgated October 1, 1999) and all applicable Idaho Cleanup Project 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 landfill supervisor, 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 Idaho CERCLA Disposal Facility Operations* (ICP 2012). 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 companywide Manual 13.

3.1.3 As-Placed Waste Location

The coordinate system and the methods for dividing the landfill into a 50- × 50-ft grid spacing for each 5-ft elevation is documented in EDF-ER-322, “Waste Placement Mapping Plan.” As waste is placed, the locations will be documented and the locations will be maintained in the Integrated Waste Tracking System (IWTS).

3.1.4 Facility Access

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

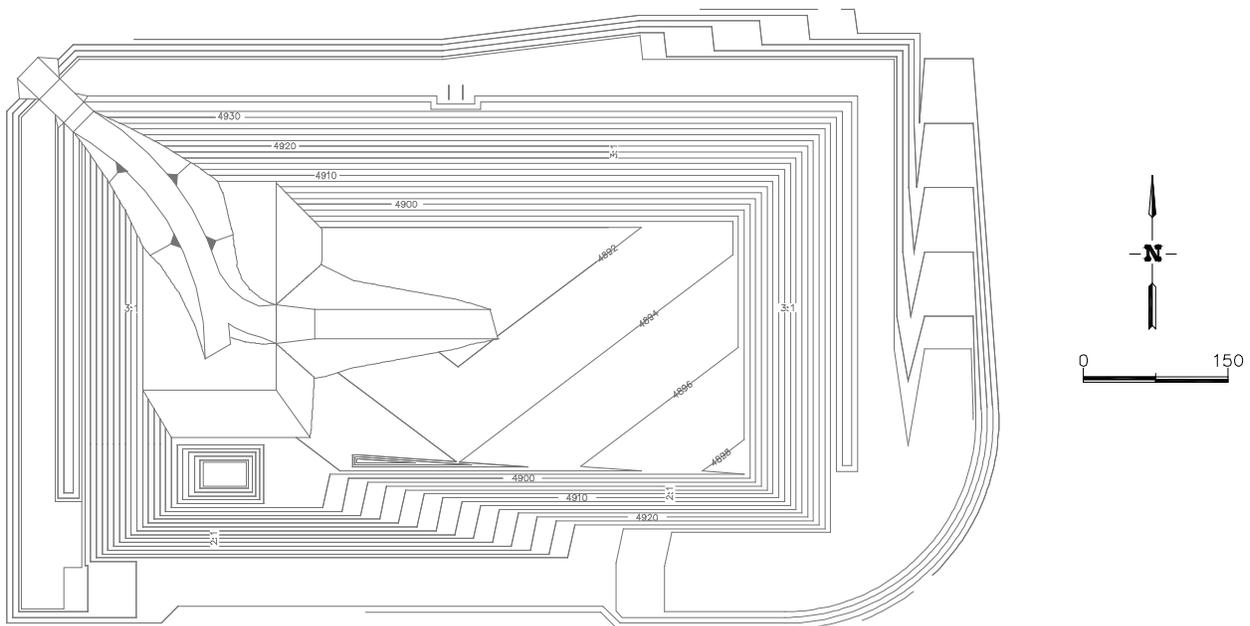


Figure 1. Cell 1 filling sequence plan (example).

Once the haul road was constructed, the northwest corner was developed in a series of 10-ft-thick operational lifts to reach the top of the side slope. After the waste fill reached this point, access to the filling areas moved to the crest of the berm. A new operations vehicle access road, which is surfaced with gravel, was constructed to provide access to the landfill and the dump peninsula via the crest of the berm at the northwest corner. As the waste lifts have become built up over time, fill placement occurs on several lifts of waste, and haul roads are constructed to allow access to the various lifts of fill construction as required. More than one waste placement area may be active at any given time. For example, two soil placement areas (dumpfaces) and a debris placement area may be active to accommodate remediation requirements.

3.1.5 Haul Roads

Haul roads will be constructed within the ICDF landfill 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. Haul roads will be graded, routinely monitored for contamination, and maintained during filling operations.

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. (Note that the lifts, except for the 10-ft buttress lift adjacent to the sideslopes, are artificial designations used to facilitate waste location tracking, not defined waste placement requirements. That is, at any one time the waste may be placed at several different elevations based on waste type and landfill configuration rather than the entire landfill being filled at one elevation before proceeding to the next.) Before placing soil on the operations layer, a geotextile meeting the specifications in Appendix A will be placed over the operations layer.

The filling sequence will be built up in four operational lifts to reach an elevation of 4,927 ft. One additional lift, which will be approximately $400 \times 400 \times 10$ ft, will be placed above the 4,927-ft elevation to bring the estimated volume of waste material in the landfill to 510,000 yd³. Each 10-ft lift is subdivided into two sublfts, designated as A and B. Therefore, the first lift is comprised of lifts 1A and 1B, the second is lifts 2A and 2B, etc. This allows the waste to be located vertically within 5 ft. As noted, different portions of the landfill will be at different levels based on waste receipt/placement requirements.

Except as noted in Section 3.2.2, 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 material larger than 36 in. in any direction that may damage the liner system. The subsequent 5 ft will consist of general waste, which may include debris.

The next three 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 3 ft of the final cover (the final cover starts with the compacted clay layer).

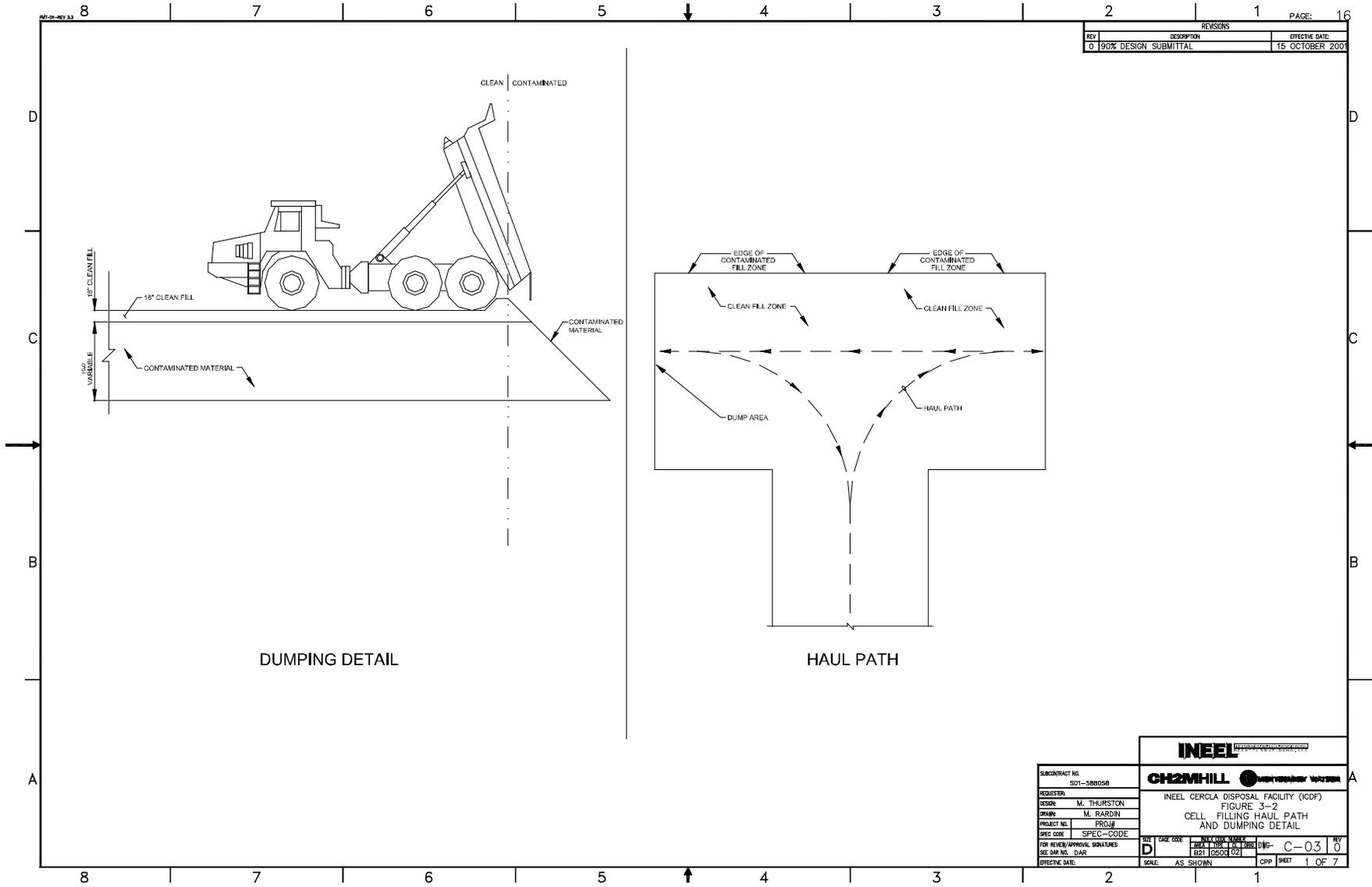


Figure 2. Cell filling haul path and dumping detail (example).

Each 10-ft-thick operational lift 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 yd³). 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 150-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 150-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 will consist of alluvium soil stockpiled as it becomes available from the excavation of the ICDF landfill or other suitable source.

3.2.2 Initial Fill Sequence

The initial filling sequence for the landfill started at the northwest corner. Initially, a dumping peninsula configuration was developed that allowed for trucks to turn around and dump waste (see Figure 2). Waste was built up to support the expansion of the haul road and the development of the initial 150-ft-wide buttress. The dumping peninsula and the haul road were built up of approximately 12-in. layers that were compacted and brought to the 10-ft operational lift thickness. The initial fill sequence then proceeded to the southwest and then northeast.

The initial fill sequence began by placement of a geotextile over the operations layer (shown as Operations Layer 1 on the construction drawings that was placed as part of the landfill construction) prior to waste placement. The geotextile consists of nonwoven, needle-punched polypropylene material that meets the specifications set forth in Appendix A. Except as noted for the boxes below, the initial 10-ft-thick lift consists of two types of waste fill. Select waste fill will be placed for the first 5 ft of the lift. Waste including debris may be placed in the second 5 ft of the lift. Select waste fill consists of waste soil that contains no material larger than 36 in. in any direction that may damage the liner system. One layer of 4- × 4- × 6-ft metal boxes filled primarily with soil may be placed directly on the operations layer. At least 1 ft of select waste will be placed over the operations layer prior to placing soil-filled wood boxes. Only one layer of 4- × 4- × 6-ft boxes (or two layers of 2- × 4- × 6-ft boxes) may be placed without additional soil being placed over the boxes. The required amount of interstitial soil between layers of boxes will be determined and Agency concurrence will be obtained before placing a second layer of boxes. Debris that will not damage the liner system, such as flat plates, may be placed in the first 5 ft provided the bearing pressure is within allowable limits and the waste does not contain protrusions that might damage the liner. At least 5 ft of select waste is required prior to placement of other types of debris. Other debris types will be placed as described in Section 3.3 below. 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 Lifts

Subsequent lifts of waste fill can be placed on top of the compacted initial operational lift after a minimum 150-ft-wide buttress has been developed. The northwest corner will be the first area to develop the 150-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 4,927 ft at the edge of the landfill next to the berm (5 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 documented before additional layers are placed on top. Compaction is achieved as noted in Section 3.3.10, Table 2. Confirmatory compaction tests, using a nuclear density gauge, are taken for each 2,500 yd³ of placed soil. 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 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."

Other debris-like material may be disposed of in the landfill subject to meeting the ICDF WAC and the requirements in Section 3.3.8. Examples of other debris-like material include tanks or large odd-size demolition material or equipment. When other debris-like material is proposed for disposal, the generator shall provide information to ICDF regarding size, weight, and shipping configuration. ICDF shall ensure that the item(s) can be off-loaded and placed in the landfill in compliance with placement and compaction criteria.

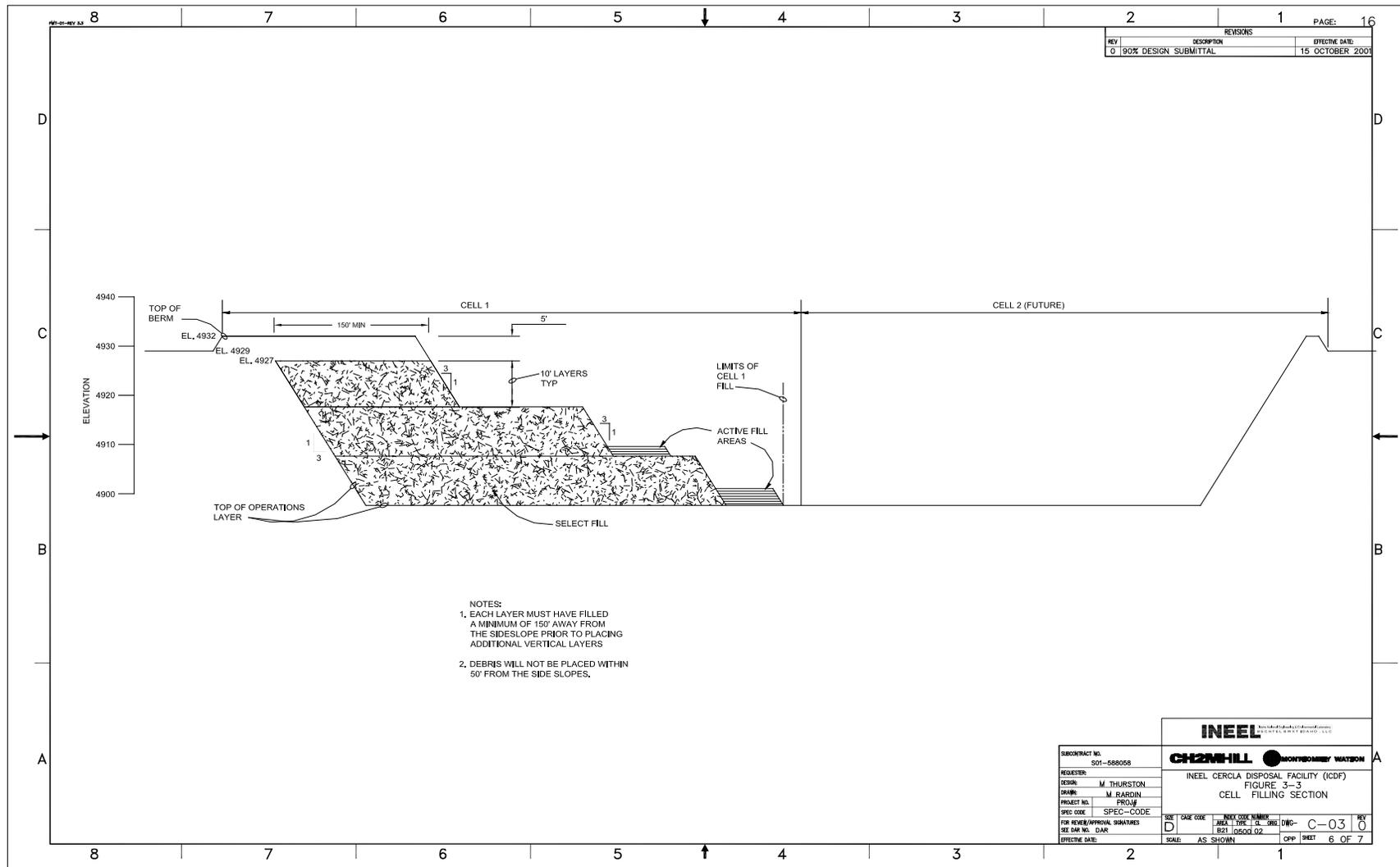


Figure 3. Cell filling cross section (example).

Compaction will normally be achieved by the D-9 dozer making the required number of passes over the soil. In circumstances when this method is not practical, other compaction equipment, such as a mechanical compactor on the end of a backhoe or excavator arm, may be used. Because of as-low-as-reasonably-achievable requirements, personnel safety, and productivity considerations, hand compaction will only be used when other methods are not feasible. Compaction for alternative methods will be verified by testing until the specific application, i.e., number of passes or amount of compaction, can be proven. At that time, compaction testing will revert to the required one test for each 2,500 yd³ of placed soil. Debris that contains voids or that cannot be integrated into the compacted soil matrix will be grouted to meet compaction requirements.

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. Debris may be grouted in lieu of enclosing it in compacted soil.

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, cargo containers). When 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 until it is cost-effective and space-management-effective to grout the debris waste. Waste shall not be staged in the landfill for more than 7 days.

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 will 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, industrial hygiene, and safety concurrence. The waste tracking form will specify where the waste is to be placed. If deviations are required, they will be documented.
- **Placement Procedures:** The waste soil shall be spread by the ICDF landfill equipment in approximately 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, cargo containers, soft-sided bags, and drums that may contain soil, stabilized soil material, scrap metal, and building debris. Wooden boxes are assumed to be compressible and able to collapse. Steel boxes and drums must meet the void space reduction requirements of the WAC or have the remaining void space filled with grout. As noted in the WAC, Sections 4.4.1 and 4.4.2, soft-sided bags are approved containers for bulk soil and meet placement criteria without further compaction. Containers may be handled by specialized equipment consisting of, but not limited to, loaders, excavators, and cranes. Soil will be placed around containers and compacted with conventional or hand compactors to achieve specified compaction. Alternatively, the void space between containers may be grouted to meet compaction requirements.

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.

Wooden containers shall be crushed and their contents (soil, plastic liner, and wooden container) 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. Soil will be placed in approximately 12-in. lifts and compacted using conventional compaction equipment. Based on radiological constituents, the waste may be covered with clean material prior to compaction.

3.3.4.2 *Steel Box Containers*

- **Unloading:** The steel containers will be unloaded with specialized equipment, as necessary.
- **Placement Procedures:** Box containers may be stacked two high and may be placed adjacent to one another in an arranged pattern with grout placed in the voids under and around if the void space exceeds 5% of the entire volume. Alternatively, at the discretion of the facility manager, containers may be placed far enough apart that the D-9 dozer can compact between the containers, with hand or other compaction measures required only immediately adjacent to the containers. Soil will be placed around the containers in approximately 12-in. lifts and compacted using conventional compaction equipment. Containers may be positioned above previously placed containers or debris as long as there is no tipping hazard.

3.3.4.3 *Steel Cargo Containers*

- **Unloading:** Steel cargo containers will be unloaded with specialized equipment, as necessary.
- **Placement Procedures:** Cargo containers may be placed adjacent to one another in an arranged pattern with grout placed in the voids if the void space exceeds 5% of the entire volume. Alternatively, at the discretion of the operations manager, containers may be placed far enough apart that the D-9 dozer can compact between the containers, with hand compaction required only immediately adjacent to the containers. Soil will be placed around the containers in approximately 12-in. lifts and compacted using conventional compaction equipment. Containers may be

positioned above previously placed containers or debris but are not allowed to be stacked. A minimum of 2 ft of soil cover needs to be over an existing container or debris prior to placing another container over it.

The geosynthetic clay liner (GCL) bearing analysis provided in EDF-ER-281 shows that 10 ft of soil cover is required to protect the GCL from pressures exerted by steel cargo containers. Since the operations layer, including drain gravel, is 4 ft thick and placement of select waste is required for the first 5 ft above the operations layer, then 1 additional foot of soil is required before placement of a cargo container on the bottom of the landfill. For placement of cargo containers along the landfill side slopes, cargo containers with an overall density less than 104 lb/ft³ may be placed to within 6 ft measured in any direction to the liner, cargo containers with an overall density of less than 135 lb/ft³ may then be placed to within 10 ft measured in any direction to the liner, and cargo container equal to or exceeding 135 lb/ft³ are not to be placed within the 50 ft horizontal setback of the landfill slope (Schaeffer and Reimbold 2014) (see Table 1). Cargo containers loaded at the ICDF will be loaded as evenly as practicable. Any cargo with an unevenly distributed load will be placed, whenever possible, such that the heavy end will be toward the center of the landfill. Any cargo in excess of 100 tons will require a bearing evaluation for protectiveness of the GCL liner.

Table 1. Cargo container acceptable placement.

Container/Placement Characteristic		8- × 8- × 20-ft Cargo Container Gross Weight as Received (container tare plus waste weight)		
		≤7.4 Tons	<27.5 Tons	≥27.5 Tons
Density (lb/ft ³)		<104	<135	≥135
Bearing pressure (psi)		<5.8	<7.5	≥7.5
Acceptable placement	Horizontal distance to side slope (ft)	≥10	≥25	≥50
	Any direction to the liner system (ft)	≥6	≥10	≥10

3.3.4.4 Drums

- **Unloading:** Drums will be unloaded with specialized equipment, as necessary.
- **Placement Procedures:** Drums may be placed in a honeycomb pattern with grout placed in the voids if the void space exceeds 5% of the entire volume. Alternatively, 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 approximately 12-in. layers and compacted using conventional compaction equipment. Drums may be positioned above previously placed containers or debris.

3.3.5 Building Demolition Material

NOTE: *When building debris includes embedded rebar, the rebar will be cut as close as possible to the surface of the concrete. The length of remaining rebar will not exceed 2 ft.*

3.3.5.1 Steel and Concrete Beams

- **Unloading:** Steel and concrete beams shall be unloaded using specialized equipment, as necessary.
- **Placement Procedures:** Steel and concrete beams will be placed with a minimum of 1-ft horizontal and vertical spacing between the beams (see Figure 4). This is to allow a proper compacted soil envelope around the beams. Alternatively, at the discretion of the facility manager, beams may be placed far enough apart that the D-9 dozer can compact between the beams, with hand compaction required only immediately adjacent to the beams. Concrete and steel beams will be in pieces that can be placed as flat as possible in the landfill, rather than a tangled mass that will compress as additional fill is placed. Beams may be positioned above previously placed containers or debris but are not allowed to be stacked. A minimum of 2 ft of soil cover needs to be placed over existing containers or debris prior to placing a beam over it.

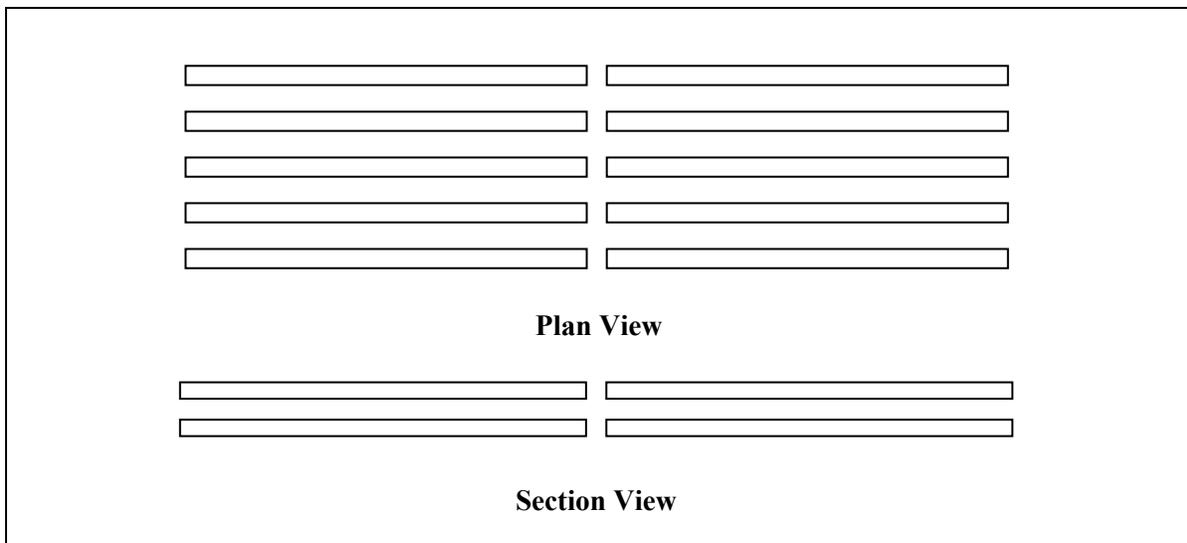


Figure 4. Concrete beams configuration.

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 can be placed adjacent to one another such that soil between them can be adequately placed and compacted to ensure that the void space between the monoliths is less than 5% of the total volume (see Figure 5). Soil will be placed around the monoliths in approximately 12-in. lifts and compacted using conventional compaction equipment. If the void space is greater than 5%, then grout will be placed between the monoliths. Alternatively,

at the discretion of the facility manager, monoliths 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. Monoliths may be positioned above previously placed containers or debris but are not allowed to be stacked. A minimum of 2 ft of soil cover needs to be over existing containers or debris prior to placing a monolith over it.

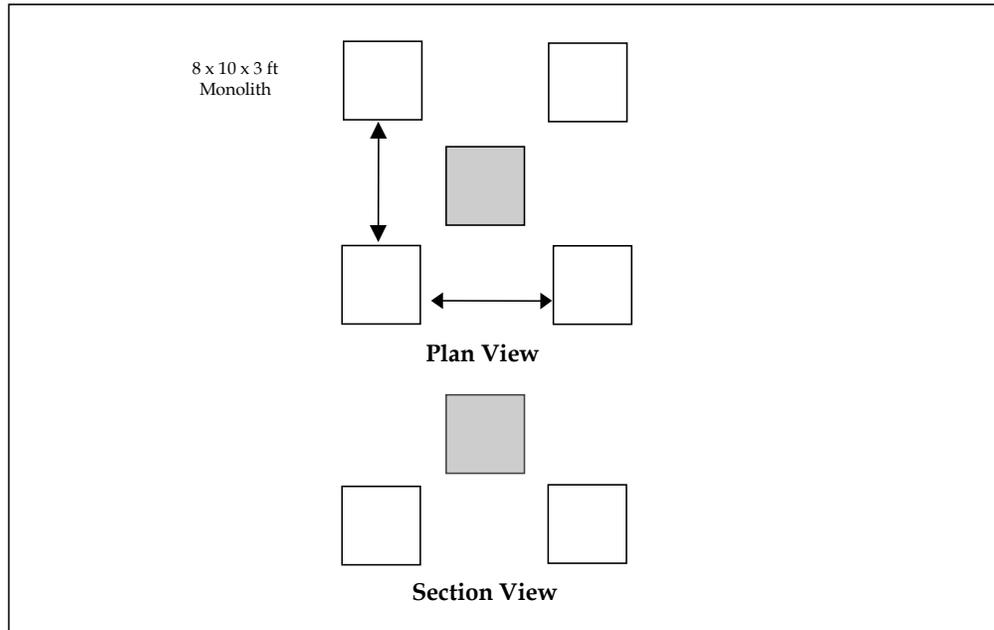


Figure 5. Concrete monoliths configuration.

3.3.5.3 Large Concrete and Building Rubble

- **Unloading:** Large concrete and building rubble is assumed to be approximately $4 \times 4 \times 1$ 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:** 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 compress as additional fill is placed. The rubble material will be placed so that the soil between the rubble can be adequately compacted (see Figure 6). Soil will be placed around the rubble in approximately 12-in.-thick lifts and compacted using conventional compaction equipment. Rubble may be positioned above previously placed containers or debris.

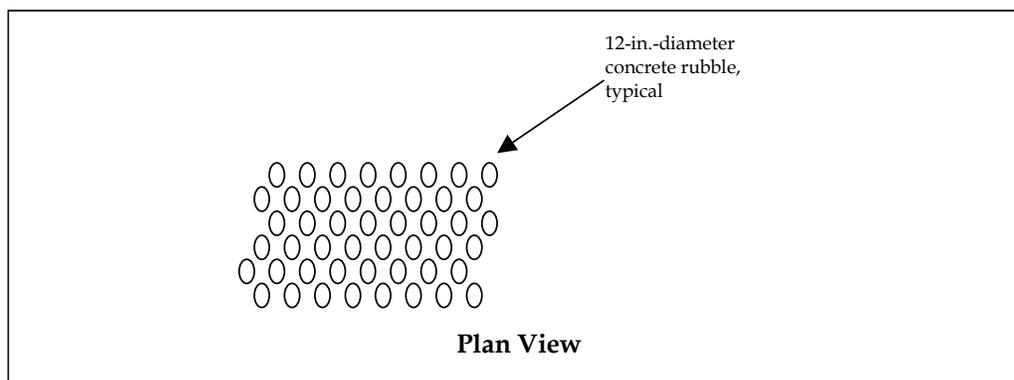


Figure 6. Large concrete rubble configuration.

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. Soil will be placed around the rubble in approximately 12-in.-thick lifts and compacted using conventional compaction equipment. Small rubble may be positioned above previously placed containers or debris.

An alternate placement configuration consists of grouting the rubble in place in the landfill to accomplish the requisite compaction requirements.

3.3.6 Asbestos-Containing Material

- **Unloading:** Approved asbestos-containing material (ACM) meeting the ICDF WAC may cause fiber release problems if not handled properly. All ACM will be wrapped or containerized according to ICDF WAC 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 a designated ACM location for each operational lift of waste placement. The ACM may be positioned above previously placed containers or debris. The area designated for ACM will have applicable signage and barricade as required, or the containers will be appropriately labeled and/or be locked. Moisture will be placed as needed to control dust and to achieve compaction requirements.

The ACM may 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. Alternatively, ACM may be containerized and the containers

placed and grouted to fill void space and prevent spread of the asbestos. The location of ACM containers will be specifically documented in the waste placement map.

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 material will be uniformly distributed throughout the landfill but not within 50 ft of the side slopes. The soft debris may be positioned above previously placed containers or debris. Bulk soil will be placed in approximately 12-in. lifts above the soft debris and compacted, minimizing potential voids and possible subsidence.

3.3.8 Other Debris-Like Material

The most common “other debris-like material” will be items formerly used as tanks as well as miscellaneous building debris such as cranes, ductwork, and equipment. To be disposed of in the landfill, these items must be:

- Open, i.e., breached or sized in a manner that renders them nonfunctional as tanks.
Note: Filling the item with grout is sufficient to render it non-tank-like.
- Filled with solid debris and grout or grout-like material that equals or exceeds the bearing capacity of the compacted soil to meet the <5% void space requirement. Solid debris may include rock, rubble, concrete, pipe, or other solid, noncompressible material.
- Enclosed in compacted soil meeting the compaction recommendations of Section 3.3.10 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 7 and 8. 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 7, 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 ICDF WAC requirements, including land disposal restrictions as applicable.
- The GCL bearing analysis provided in EDF-ER-281 shows that 12 ft of soil cover is required to protect the GCL from pressures exerted by a 12- × 55-ft tank. Since the operations layer, including drain gravel, is 4 ft thick and placement of select waste is required for the first 5 ft above the operations layer, then an additional 3 ft of soil would be required before placement of such a tank.

3.3.9 Debris Trenches

Another alternative for placing debris in the landfill is to construct a trench or bathtub out of waste soil and/or wood/steel forms and place the debris into it. Once the trench/bathtub is full of debris, it will be grouted to satisfy compaction and subsidence-prevention requirements. All waste placed in this manner must satisfy all the WAC requirements for waste constituents and land disposal restrictions prior to being placed.

3.3.10 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 2 provides a summary of the recommended compaction methods and equipment for different waste streams.

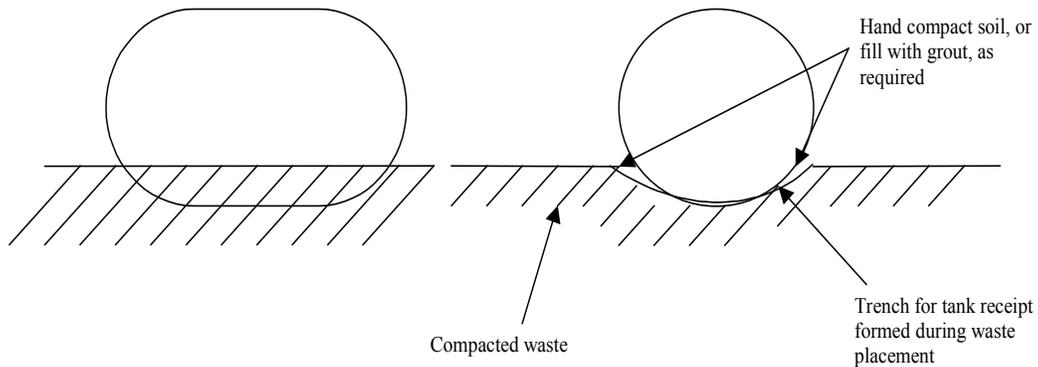


Figure 7. Large debris-like item placed in landfill depression.

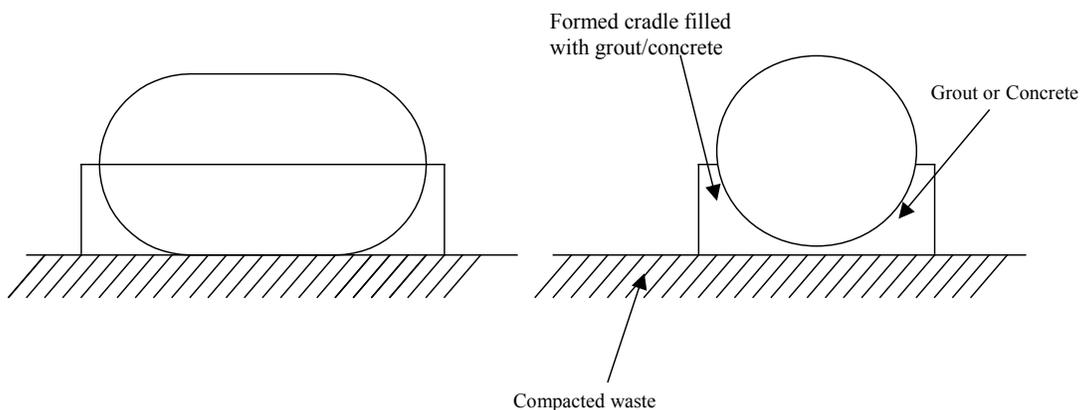


Figure 8. Large debris-like item placed on landfill base for forming and grouting.

Table 2. Suggested waste compaction requirements.

Waste	Requirement
Fine-grained soils or coarse-grained soils with fines	Minimum three passes with compaction equipment (D9 dozer) or number of passes necessary to achieve $\geq 90\%$ relative compaction (ASTM-D698).
Coarse-grained soils (free-draining) <5% fines	Minimum three passes with compaction equipment (D9 dozer) or number of passes necessary to achieve $\geq 90\%$ relative compaction (ASTM-D698).
Rock and debris	Mixed with soils during placement. Three passes with a compactor (D9 dozer).

The information in Table 2 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

- ASTM-D698, 2012, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)), American Standard for Testing and Materials, May 1, 2012.
- DOE-ID, 2013a, *ICDF Complex Waste Acceptance Criteria*, DOE/ID-10881, Rev. 12, U.S. Department of Energy Idaho Operations Office, December 2013.
- DOE-ID, 2013b, *ICDF Complex Operations and Maintenance Plan*, DOE/ID-11000, Rev. 9, U.S. Department of Energy Idaho Operations Office, December 2013.
- EDF-ER-264, 2005, "INEEL CERCLA Disposal Facility Design Inventory," Rev. 3, Idaho National Engineering and Environmental Laboratory, January 2005.
- EDF-ER-266, 2006, "Subsurface Consolidation Calculations," Rev. 2, Idaho Cleanup Project, August 2006.
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- EDF-ER-280, 2006, "Landfill Leachate Collection System Design Analysis," Rev. 2, Idaho Cleanup Project, August 2006.

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Manual 13, 2014, *Quality Assurance Program*, Rev. 102, Idaho Cleanup Project, January 2014.

Schaeffer, Jen and Mike Reibold, 2014, "Idaho CERCLA Disposal Facility (ICDF): Review of Waste Placement Operations within the 50-ft Setback," Document ID 4648882, Technical Memorandum, CH2M-WG Idaho, LLC, July 2014.

Appendix A

Geotextile Specifications

1 GEOTEXTILE SPECIFICATIONS

2
3
4 PART 1 - GENERAL:

5
6 Geotextile:

7
8 Separation geotextile shall be 6 oz/yd² nominal weight and shall be used for separation of soil layers between the
9 operations layer and the waste and will consist of commercial grade material.

10
11 Geotextile, shall be nonwoven, needle-punched polypropylene.

12
13 Manufacturer: The geotextile manufacturer shall be a commercial entity normally engaged in manufacture of
14 geotextiles for landfill applications.

15
16 REQUIRED PROPERTIES:

17
18 Property Values:

19
20 Geotextile properties shall meet or exceed the values specified in Table A-1.

21
22 The manufacturer shall certify that the materials supplied meet the requirements of this Part.

23
24 Integrity:

25
26 Geotextile shall retain their structure during handling, placement, and long-term service.

27
28 TRANSPORTATION, HANDLING, AND STORAGE:

29
30 Geotextiles shall be supplied in rolls wrapped in covers. Transportation of the geotextiles to the site and all handling
31 onsite shall be the responsibility of the subcontractor. During shipment and storage, the geotextile shall be protected
32 from mud, dirt, UV exposure, dust, puncture, cutting, or other damaging or deleterious conditions. The subcontractor
33 shall be responsible for the storage of the geotextiles on site.

34
35 PART 2 - EXECUTION

36
37 GENERAL:

38
39
40 HANDLING AND PLACEMENT:

41
42 The subcontractor shall handle all geotextiles in such a manner as to ensure that they are not damaged.

43
44 Place geotextiles in a manner that prevents folds and wrinkles. Folds or wrinkles shall be pulled smooth prior to
45 seaming. Geotextiles shall be cut using an approved geotextile cutter only.

46
47 If light-colored geotextile is used, precautions shall be taken against "snowblindness" of personnel.
48

1 JOINTS:

2
3 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
4 required to be sewn and shall be overlapped a minimum of 12 in.

5
6 Areas to be seamed shall be clean and free of foreign material.

7
8 REPAIR:

9
10 Any holes or tears in the geotextile shall be repaired as follows:

11
12 Remove any soil or other material that may have penetrated the torn geotextile. Replace torn areas and holes by
13 placing a geotextile patch having dimensions of at least 12 in. greater than the tear or hole.

14
15 MATERIALS IN CONTACT WITH GEOTEXTILE:

16
17 The construction subcontractor shall place all soil materials located on top of a geotextile in such a manner as to
18 ensure that the following conditions are satisfied:

19
20 No damage to the geotextile

21
22 Minimal slippage of the geotextile on underlying layers

23
24 No excess tensile stresses in the geotextile.

25
26 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.