H-AREA TANK FARM

TYPE II WASTE TANK INPUTS

HTF-IP-03

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1.0 HTF TYPE II WASTE TANK CONCEPTUAL MODEL

Waste tank design data is necessary to perform groundwater modeling supporting the Savannah River Site (SRS) H-Area Tank Farm (HTF) Performance Assessment (PA). The purpose of this input package is to compile relevant background information regarding the actual waste tank design and present the conceptual design of the waste tank for transport modeling. Modeling parameters outside of the tank boundary will not be provided in this package.

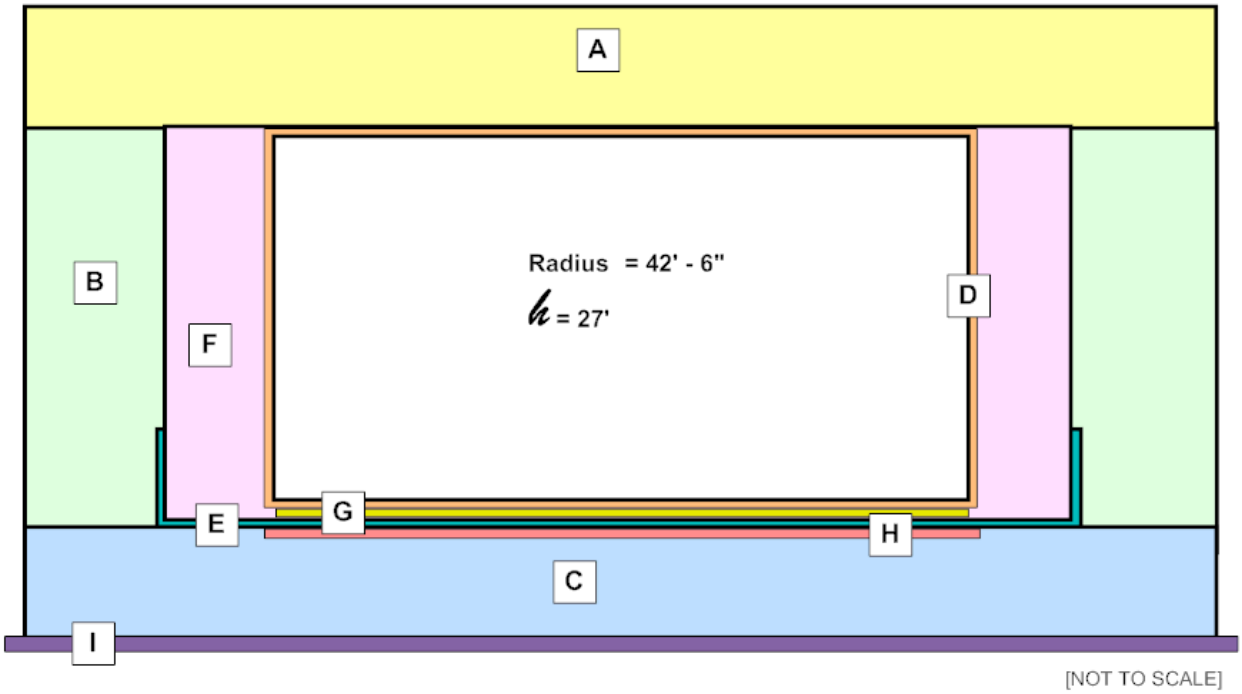
The conceptual design is a physical simplification of the actual waste tank design, which is required for analytical modeling. Certain waste tank features and design elements have been omitted in the conceptual model. A number of general modeling decision guidelines were followed for the initial design:

- The intent of the conceptual model is to capture waste tank dimensions and relative material differences for each discrete tank segment.
- Each discrete tank segment/area is represented as homogeneous, ignoring interior elements (e.g., rebar, cooling coils) and/or penetrations through the area (e.g., tank risers, transfer lines).
- Minimum segment thicknesses are used where an area had variable thickness (e.g., tank walls, tank tops).
- Grouting of tank void areas (e.g., tank primary, tank annulus, cooling coils) is assumed to have occurred as planned.

The HTF Type II tank dimensions detailed in Figure 1.0-1 will be used in the HTF PA modeling as a simplification of the actual physical infrastructure of a Type II tank. Specific areas where these modeling decisions will be implemented for the Type II tanks are highlighted below:

- The tank basemat segment is based on the basemat thickness and disregards other material layers below the tank (i.e., concrete working slab, grout layer, and waterproofing layer).
- The primary and secondary liner assumed thicknesses are based on minimum thicknesses only.
- The tank wall and tank liner penetrations (i.e., transfer lines) are not modeled discretely.
- The tank primary liner is assumed to be filled with grout and is treated as a discrete area.
- The tank support column and cooling coils are not modeled discretely, and are included in the tank primary. The tank annulus is assumed to be filled with grout and is treated as a discrete area.
- The tank roof penetrations (i.e., risers) are not modeled discretely.
- Concrete rebar in the tank top, tank walls, and tank basemat is not modeled discretely, such that concrete is considered a homogenous material.
- The soil hydration system was not modeled discretely.

Figure 1.0-1: Typical Type II Waste Tank Modeling Dimensions



LABEL	THICKNESS	MATERIAL
A Concrete Roof	45"	Concrete
B Concrete Wall	33"	Concrete
C Concrete Basemat	42"	Concrete
D Primary Liner	0.5"	Carbon Steel
E Secondary Liner	5' high and 0.5" thick	Carbon Steel
F Grouted Annulus	30.625"	Tank Fill Grout
G Primary Liner Sand Bed	1"	Sand
H Secondary Liner Sand Bed	1"	Sand
I Concrete Working Slab	6"	Concrete

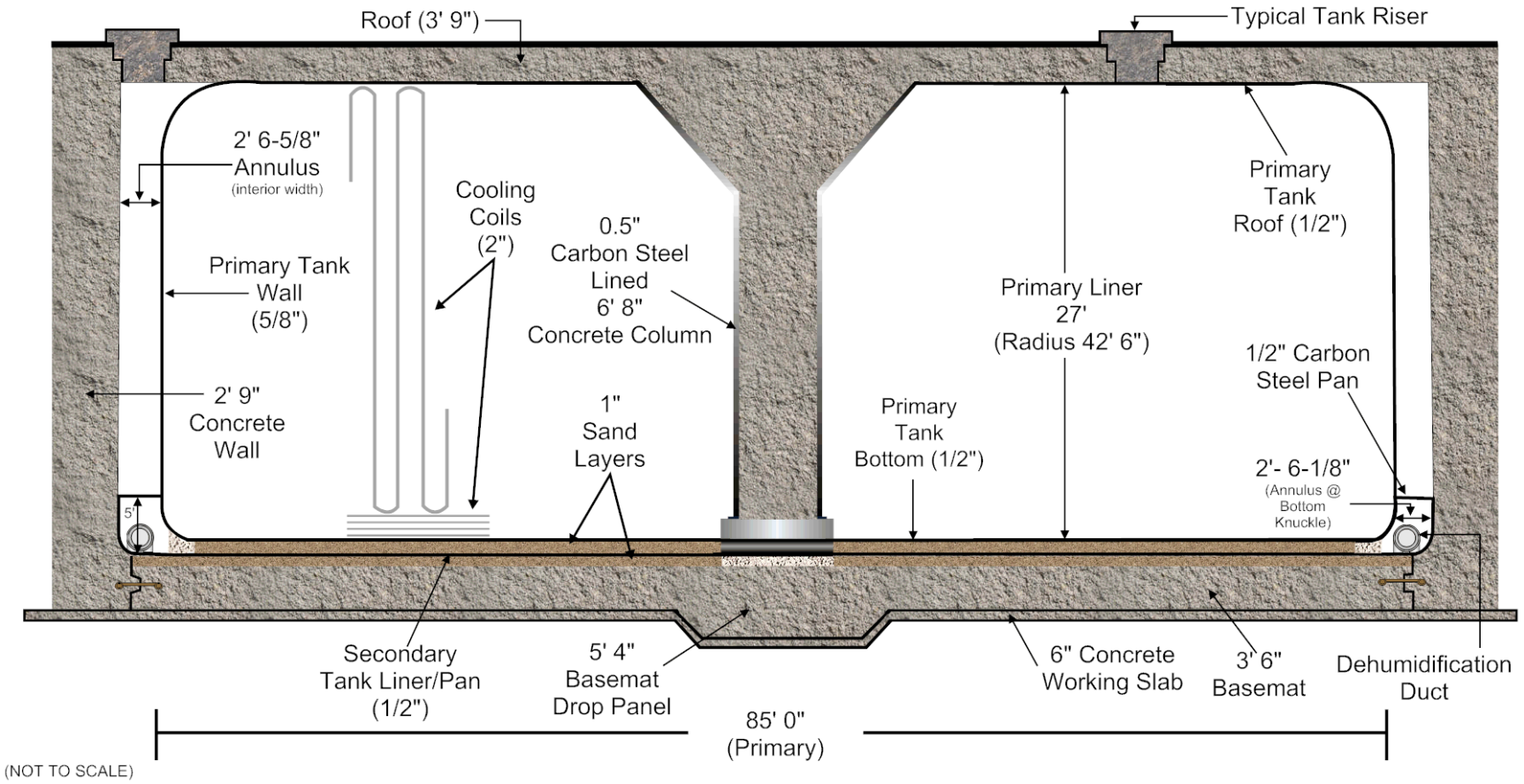
2.0 HTF TYPE II TANK DIMENSIONS

There are only four Type II tanks at SRS. They are located in HTF and are Tanks 13 through 16. The HTF Type II tanks were constructed between 1955 and 1956. A typical Type II waste tank is presented in Figure 2.1-1.

The HTF Type II tank dimensions are as follows:

- Type II primary liner inner radius is 42 feet - 6 inches (excluding 0.625 inch liner width). [W162672]
- Type II secondary liner inner radius is 45 feet - 1.5 inches (excluding 0.5 inch liner width). [W162688]
- Type II primary tank inner liner height is 27 feet. [W162672]
- Type II tanks have a nominal operating capacity of 1,030,000 gallons.

Figure 2.1-1: Typical Type II Waste Tank (Cross-sectional View)



3.0 HTF TYPE II TANK LOCATIONS

The HTF Type II tank locations (longitude and latitude) and elevations are summarized in Table 3.1-1. [W163048, W163018]

Table 3.1-1: HTF Type II Waste Tank Locations and Elevations

Tank	North Location	East Location	Reference	Top Elevation of Tank (MSL)	Bottom Elevation of Working Slab (MSL)	Reference
13	71318	62043	W163048	304.87	269.83	W163018
14	71318	62160	W163048	304.87	269.83	W163018
15	71200	62043	W163048	304.87	269.83	W163018
16	71200	62160	W163048	304.87	269.83	W163018

(Mean Sea Level = MSL)

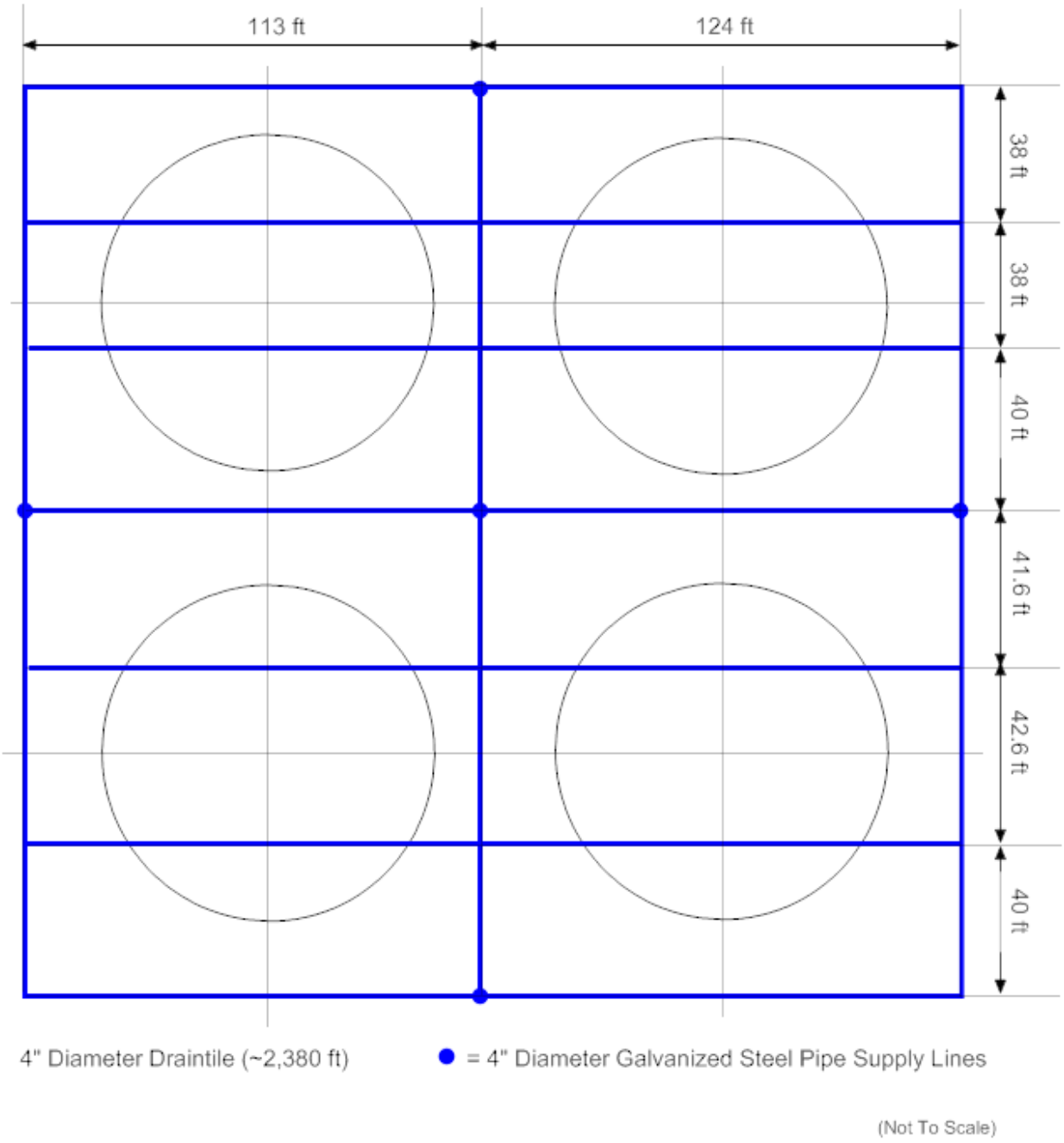
4.0 HTF TYPE II WASTE TANKS BASEMAT AND WORKING SLAB

The working slab for the Type II tanks is 6 inches thick, with the four tanks placed within a 255 foot x 274 foot rectangle. [W163048] Figure 4.1-1 presents the working slab for the four tanks. The concrete for the working slab was installed per the requirements of Spec-3537, with 3,000 psi strength at a 28 day cure time. [W162675] A 3 foot - 6 inch thick reinforced concrete basemat is located on top of the working slab. The basemat was also installed per the requirements of Spec-3537, with 3,000 psi strength at a 28 day cure time. There is a 1 inch layer of sand between the top of the basemat and the secondary liner (0.5 inch thick pan). There is also a 1 inch layer of sand between the secondary liner and primary liner. [W163018] The basemat has reinforcing bars placed throughout the basemat. The depth, length, and type of rebar vary depending upon the location within the basemat. [W162675]

Figure 4.1-1: Type II Tank Working Slab and Basemats

A soil hydration system and five feed wells were installed beneath the Type II tanks to address potential issues with soil shrinkage and settlement. The hydration system consisted of an interconnecting grid comprised of 4 inch diameter drain tile (perforated piping) located 18 inches below the working slab (Figure 4.1-2). Five supply lines (feed wells) made of 4 inch galvanized steel piping were connected to the grid to allow water to be injected below the working slab. The drain tile was installed inside a 24 inch deep by 18 inch wide trench filled with sand and aggregate. The bottom 6 inches of the trench was comprised of sand that half buried the drain tile while the remaining 18 inches of the trench was filled with aggregate. [W163048, W163278] The soil hydration system was never used, since the water table under the Type II tanks was higher than anticipated and soil dehydration was not a problem.

Figure 4.1-2: Soil Hydration System Below Type II Tanks

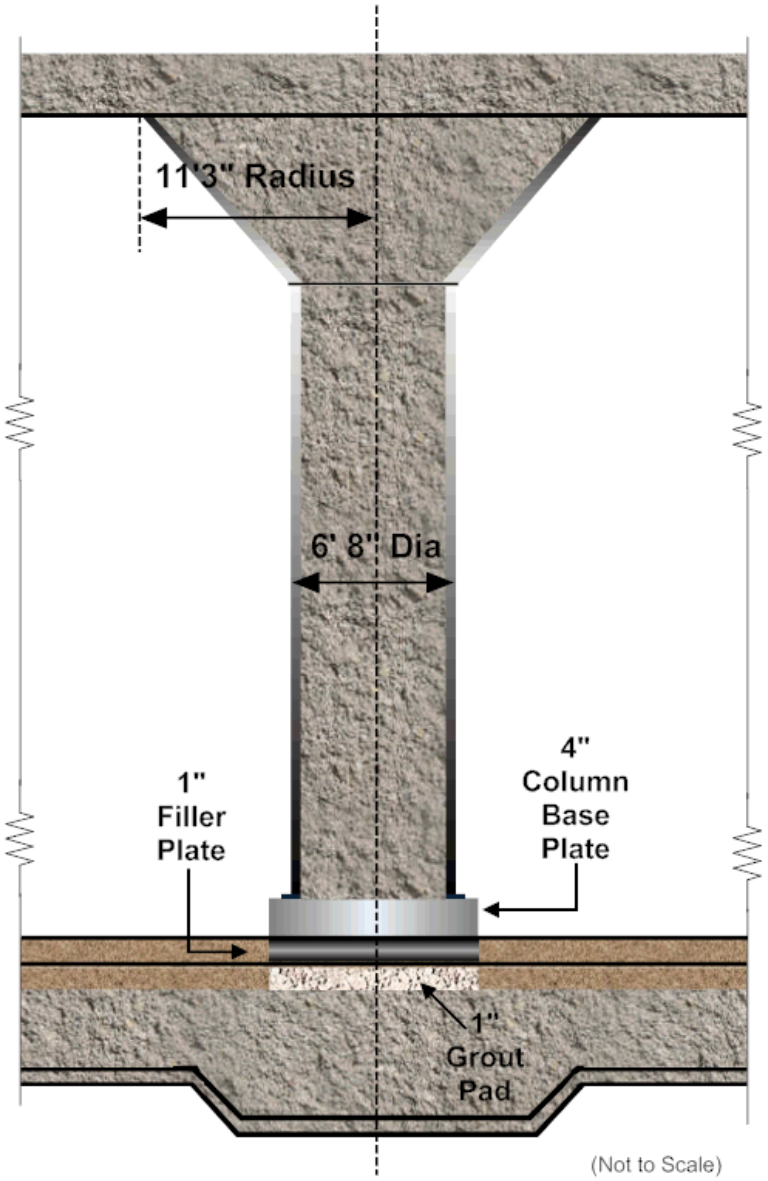


[W163278]

5.0 HTF Type II Waste Tanks Roof Support Columns

One central reinforced concrete and steel column supports the roof of a Type II tank (Figure 5.1-1). The steel column was welded to a steel bottom plate. The 0.5 inch thick carbon steel column was filled with concrete and has an inside diameter of 6 feet - 8 inches. The column has a flared capital at the top filled with reinforced concrete. The steel specifications, including material and welding information, are provided in Spec-3537. [W162672] The concrete for the steel column was installed per the requirements of Spec-3537, with 3,000 psi minimum compressive strength at a 28 day cure time. [W163018] The center support column contains varying length and types of reinforcing rebar. [W162676]

Figure 5.1-1: Type II Tank Column Dimension Details



6.0 HTF TYPE II TANKS PRIMARY AND SECONDARY LINER DESCRIPTION

The primary liner for Type II tanks is a cylinder made of carbon steel per the requirements of Spec-3537. The walls of the primary liner are welded to the side and bottom of the waste tank by a curved knuckle plate. The steel specifications, including material and welding information are provided in Spec-3537. [W162672] The liner plate locations and thickness are identified in Table 6.1-1.

Table 6.1-1: HTF Type II Waste Tank Primary Liner Plate Locations and Thickness

Location	Thickness
Top and bottom	0.5 inch
Upper knuckle	0.562 inch
Wall	0.625 inch
Lower knuckle	0.875 inch

Type II tanks were constructed above a 1 inch sand layer contained within a circular pan. An additional 1 inch sand layer is located under the secondary liner (Figure 6.1-1). [W163018] In accordance with the requirements of Spec-3537, the consistency of sand in both of the 1 inch layers consists of clean; hard; durable; siliceous particles free from foreign material (i.e., procured and washed sand free of silt or clay), and uniformly graded from standard sieves #16 and #100. The size of the sand grain ranges from 0.15 mm (#100 sieve) to 1 mm (#16 sieve), and is classified as fine to medium sand per the Unified Soil Classification System (USCS), and fine to coarse per the United States Department of Agriculture (USDA) classification.

Figure 6.1-1: Installing Lower Sand Layer over Basemat

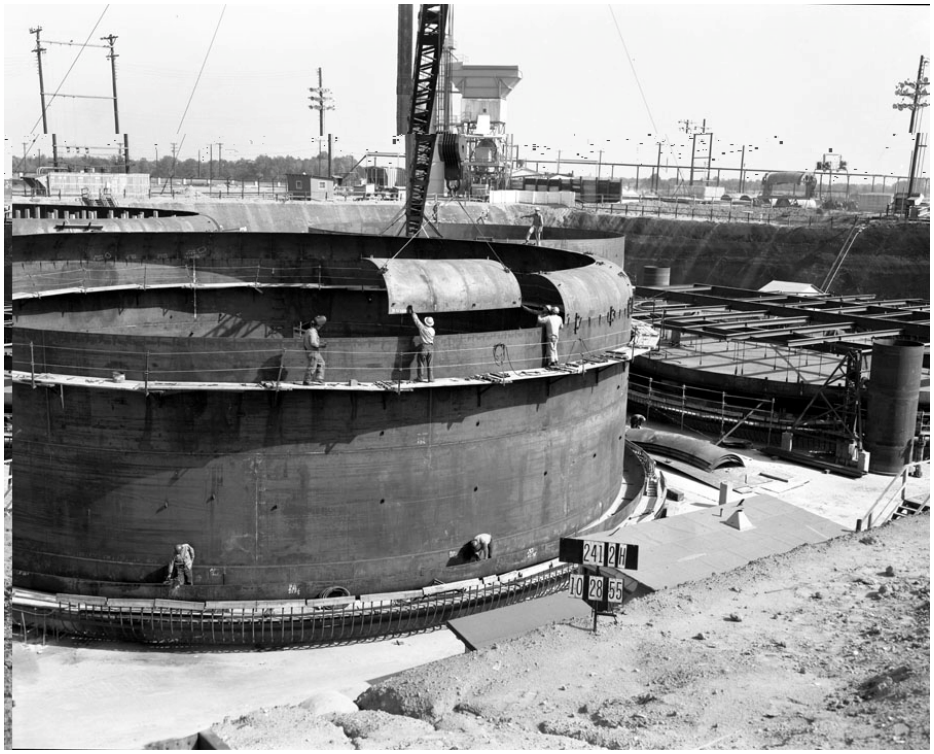
The secondary liner for the Type II tank forms an annulus space 30.625 inches wide between the primary liner and concrete wall. The upper portion is formed by the concrete wall while the bottom is formed by the 5 foot high carbon steel annulus pan. Type II tank primary and secondary liners are shown in Figure 6.1-2.

Figure 6.1-2: Type II Tank Primary and Secondary Liner Construction

The secondary liner material is 0.5 inch, carbon steel. [W162688, Spec-3537] The carbon steel stiffener angle located at the top of the annulus pan measure 6 inches x 4 inches x 0.375 inches. All the seams in the bottom plates of the annulus pan are full penetration butt welded using a backup strip on the underside. The steel specifications, including material and welding information are provided in Spec-3537. [W163018, W162672]

Type II tank tops are equipped with risers which provide access into the tank and annulus interiors. A 3 inch stainless steel waste transfer line penetrates the tank through the upper knuckle by way of a 4 inch schedule 40 pipe that is welded to the waste tank liner. The annular space between the 3 inch pipe and the 4 inch pipe is packed with asbestos wicking. [W162672]

Figure 6.1-3: Type II Tank Placement of Upper Knuckle



7.0 HTF TYPE II TANK VAULT DESCRIPTION

The Type II tanks are completely enclosed in a concrete vault. A 95 foot - 8.5 inch outer diameter vault surrounds the Type II tank primary liner, creating a 30.625 inch wide annulus.

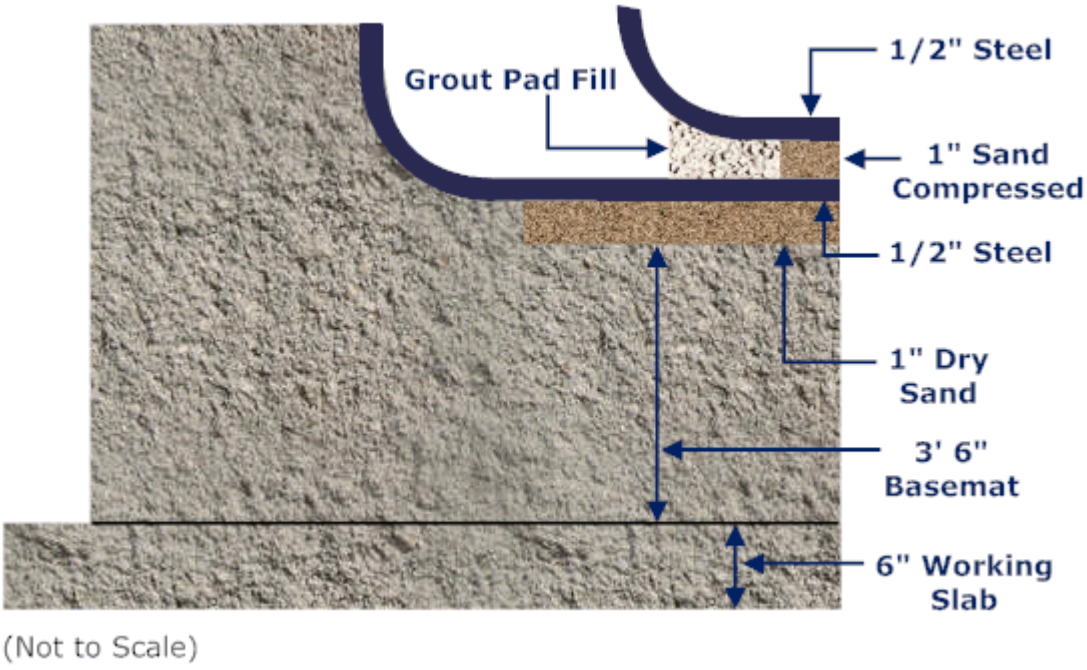
The vault is formed by 33 inch thick reinforced concrete walls and a 45 inch thick reinforced concrete roof that surrounds the primary liner and connects to the basemat. [W163018] The concrete vault extends the full height (approximately 34 feet - 6 inches) of the primary liner. The vault concrete was installed per the requirements of Spec-3019, with 2,500 psi strength at a 28 day cure time. The side walls have no vertical construction joints, but horizontal construction joints were used when necessary. There are copper water stops at the bottom of the vault wall. [W163018]

Figures 7.1-1 and 2 show both early and late stage Type II tank vault construction. Figure 7.1-3 shows Type II tank annulus construction detail.

Figure 7.1-1: Early Stage of Type II Tank Vault Construction

Figure 7.1-2: Later Stage of Type II Tank Vault Construction

Figure 7-1-3: Tank Annulus Corner Detail



[W163018]

8.0 HTF TYPE II TANK COOLING COIL DESCRIPTION

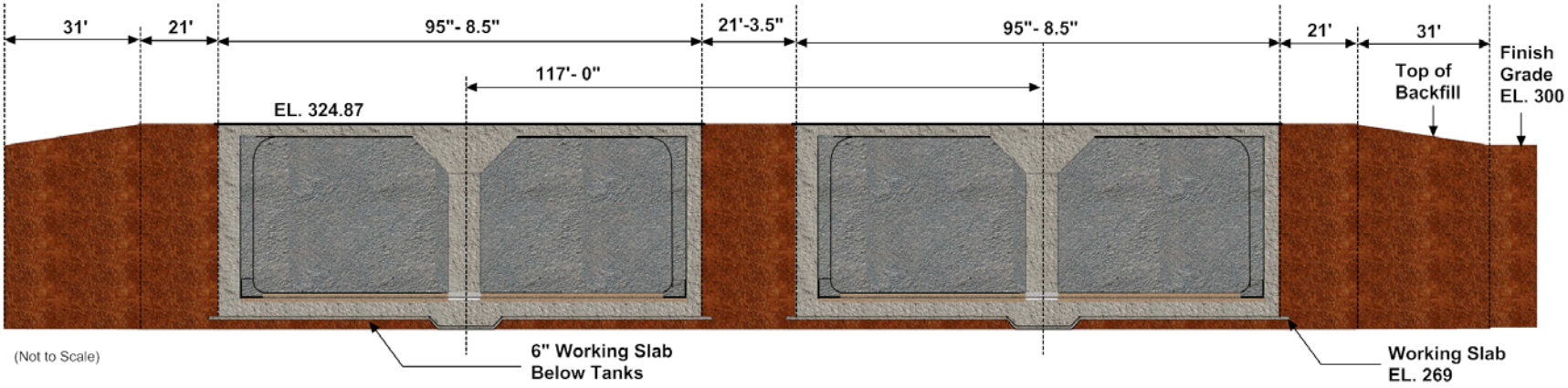
The Type II tanks are equipped with 44 cooling coils (Figure 8.1-1). The waste tanks have 40 vertical cooling coils (20 operating and 20 auxiliary) that are supported by hanger and guide rods that are welded to the top and bottom of the primary liner. [W163593] The bottom cooling coils (operating and auxiliary coils) extend across the bottom of the waste tanks, and are supported by guide rods and steel angles welded to the bottom of the primary liner. [W163658] The cooling coils are 2 inch diameter schedule 40 carbon steel seamless pipe. [W163593] The total coil length including bottom and coil leads are 14,700 feet coil length for operating coils and 14,700 feet coil length for auxiliary coils. [W163593]

Figure 8.1-1: Type II Tank Cooling Coils

9.0 HTF TYPE II TANKS SOIL AND BACKFILL DESCRIPTION

The Type II tank backfill was installed per the requirements of Spec-3537. Thus, the backfill below the working slab is test controlled compacted backfill in conformance to Spec-3051 and not to contain more than 7% material passing through a #200 sieve (0.0029 inch sieve opening). [W163048, W162675]. Figure 9.1-1 shows the backfill configuration.

Figure 9.1-1: Type II Tank Backfill Detail



[W163048]

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