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Revision 5

# T Plant Complex, 221-T Building Dangerous Waste Containment Building Certification Rev. 5

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

ch2m SM

**P.O. Box 1600**
**Richland, Washington 99352**

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D. Messinger
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By Erin C Meegan at 1:17 pm, Mar 20, 2018

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# T Plant Complex, 221-T Building Dangerous Waste Containment Building Certification Rev. 5

**Prepared by**

**David S. Messinger, P.E.**
**Fluor Federal Services**

**March 2005**

**Prepared for**

**FLUOR HANFORD COMPANY**

DAVID S. MESSINGER
STATE OF WASHINGTON
28871
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES: 9-18-06

David S. Messinger — 3/19/05
David S. Messinger, PE, FFS Technical Author — Date

A Sherwood — 3/23/05
Ana R. Sherwood, FH Environment Protection — Date

Brett M. Barnes — 3/23/05
Brett M.Barnes, FH Environmental Compliance Officer — Date

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# CONTAINMENT BUILDING CERTIFICATION IN ACCORDANCE WITH 40 CFR 264, SUBPART DD

**CERTIFICATION:**

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I, David S. Messinger, Professional Engineer, do hereby certify that I have reviewed the pertinent internal work requirements/processes and documents and have made sufficient on-site inspections to determine that the 221-T canyon deck, railroad tunnel and cells 3- L, 7-L, 8-R, 9-L, 10-L, 13-L, 13-R, 14-R, 15-L, 16-R and 17-R, within the 221-T building meet the requirements stipulated in 40 Code of Federal Regulations (40 CFR), Part 264, Subpart DD, section 264.1101, paragraphs (a) and (c), for the storage of non-liquid (no free liquids) dangerous waste.

**COMPLIANCE DETERMINATION:**

**BACKGROUND:**

---

The 221-T building is located within the T Plant Complex, 200 West Area of the Hanford Site (Figure 1). The 221-T is a large reinforced concrete building constructed about 1948. It is similar in construction to other "canyon" type facilities located on the Hanford Site (i.e., 221-B and 221-U). The 221-T building has inside dimensions of about 58 feet wide by approximately 800 feet in length and consists of 20 sections, each approximately 40 feet long. The internal height above ground or deck level is approximately 40 feet and the building extends approximately 40 feet below ground level (Figures 2 and 3). Each section contains two process cells located below ground level. Drawings for the various sections making up the 221-T building are identified on the Structural Key Plan Drawing W-70064. Sections 1 and 2, which include the cells and the railroad tunnel are shown on Drawing W-69333. Concrete cover blocks for the cells are shown on Drawing W-69332, D-60784, H-2-88618, W-69100, H-2-32782 and H-2-32246.

Specific areas of the building covered under this certification are:

- The Canyon Deck (including cover blocks)
- The Railroad Tunnel
- Process Cells 3-L, 7-L, 8-R, 9-L, 10-L, 13-L, 13-R, 14-R, 15-L, 16-R and 17-R

Of significance in this evaluation was that the older cover blocks, which are shown in drawing W-69332 and the later drawing H-2-88618, do not provide load capacity information. It was therefore necessary to perform an analysis of these items based on information in the drawings to determine a safe load capacity.

It was also determined through review of the drawings that provisions of neither the Uniform Building Code (UBC) 1997 or the American Concrete Institute (ACI) 318-99 could be met with

respect to minimum allowable reinforcing steel in the crane gallery floor slab where it joins the shielding wall. The crane gallery cannot be certified for storage of materials until a more rigorous analysis can demonstrate that sufficient structural strength exists in this member. If such analysis finds sufficient strength in this area of the structure, then this certification can be amended accordingly.

**ASSESSMENT PROCESS AND FINDINGS:**

---

1. *Is building completely enclosed with a floor, walls, and a roof to prevent exposure to the elements, (e.g., precipitation, wind, run-on) and to assure containment of managed waste? (Ref. 264.1101 (a)(1))*

   The 221-T building is completely enclosed with floor, walls and a roof to prevent exposure to the elements. There are very minor roof leaks (10 drops per minute) that are not considered significant. These leaks should be addressed in a normal maintenance program. (Refer to "221T Roof Leaks: Evaluation & Recommendations, Work Package 2T-00-00324, Repair Roof of 221T Canyon," dated 05/10/2001 and DOE/RL-95-36. Rev. 1, Sec. 4.6.1.1)

2. *Are the floors and containment walls designed and constructed of materials of sufficient strength and thickness to support themselves, the waste contents, and any personnel and heavy equipment that operate within the unit? (Ref. 264.1101 (a)(2))*

   The 221-T building walls, canyon deck, railroad tunnel and process cells are reinforced concrete construction adequate for containment of the waste contents (See figs. 2, 3 & 4). The canyon deck needs to be posted for allowable loads. Although loads are moved through the canyon facility with the overhead crane, waste packages, boxes, and other equipment have been placed on the deck consisting of cell cover blocks. These cover blocks do not appear to be load rated consistently and many do not appear to have a load rating at all. Inspection of the construction drawings (W-69100, H-2-88618) and subsequent calculations reveal that the cover blocks conform to ACI-318-99 and American Institute of Steel Construction (AISC) requirements for composite reinforced flexural members (beams or one-way slabs). *A structural analysis of the cover blocks has been made to verify these findings prior to certification of this deck.* (Refer to Calc. No. 101650-CA40-C-001 and Drawings W-69332, H-2-88618, H-2-32782 and H-2-32246 and DOE/RL-95-36. Rev. 1, Sec. 4.6.1.2.)

3. *Will the building elements prevent failure due to pressure gradients, settlement, compression, uplift, physical contact with the hazardous waste to which they are exposed, climatic conditions and the stresses of daily operation? (Ref. 264.1101 (a)(2))*

   The 221-T building elements are safe from failure due to pressure gradients, settlement, compression, uplift, physical contact with the hazardous waste, climatic conditions, and the stresses of daily operation. Various structural analyses have been

performed that reveal the structure is adequate for earthquake and tornado events. The building is founded in nearly 40 feet of granular soils and will not experience uplift or settling of any significant amount. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.1.1 and Sec. 4.6.1.2)

4. *Will heavy equipment operating within the building damage containment walls if equipment comes in contact with the wall? (Ref. 264.1101 (a)(2))*

The 221-T building is constructed of reinforced concrete and as such will not be significantly damaged by equipment coming in contact with the walls. Loads are moved through the 221-T building using the traveling overhead crane and as such, placement of loads is accurate and does not involve vehicles. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.1.1 and Sec. 4.6.1.2)

5. *Does the building have sufficient structural strength to prevent collapse or other failure? (Ref. 264.1101 (a)(2))*

The 221-T building was analyzed for structural adequacy in support of the Interim Storage of K Basin Sludge and found to be structurally sound. (Refer to HNF-6033, Rev. 0 and DOE/RL-95-36. Rev. 1, Sec. 4.6.1.1 and Sec. 4.6.1.2)

6. *Are all surfaces that will come in contact with hazardous waste chemically compatible with those wastes? (Ref. 264.1101 (a)(2))*

Only dry waste (mainly contaminated equipment) is being considered for storage within the 221-T building. The walls and floors are of heavy reinforced concrete construction and should not be affected by the stored materials. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.3.2)

7. *Is the building operated in such a manner as to prevent hazardous waste from coming in contact with the doors and windows? (Ref. 264.1101 (a)(2))*

Operational work requirements/processes prevent contamination from reaching the 221-T building portals either by personnel or equipment.

8. *Do the doors and windows provide an effective barrier against fugitive dust emission? (Ref. 264.1101 (a)(2))*

The 221-T building has a ventilation system that keeps the building at a negative pressure. The ventilation system discharges through large HEPA filters to prevent any fugitive dust or other airborne contamination from reaching the outside environment. The doors are structurally adequate and there are no windows. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.3.5)

9. *Will any incompatible hazardous waste or treatment reagents be placed in the unit that may cause the unit to leak, corrode or otherwise fail? (Ref. 264.1101 (a)(3))*

The 221-T building containment building areas are being considered for storage of materials that do not contain free liquids and that will primarily be contaminated equipment and materials. No incompatible waste or treatment reagents that could corrode or damage the containment area are brought into or used within the 221-T building unless special precautions are taken to prevent commingling of incompatibles. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.3.2)

10. *Does the containment building have a primary barrier designed to withstand the movement of personnel, waste, and handling equipment in the unit during the operating life of the unit and appropriate for the physical and chemical characteristics of the waste to be managed? (Ref. 264.1101(a)(4))*

The 221-T building containment primary barrier consists of the concrete canyon deck, the concrete floor of the railroad tunnel and the concrete floor of process cells 3-L, 7-L, 8-R, 9-L, 10-L, 13-L, 13-R, 14-R, 15-L, 16-R and 17-R. The canyon deck, tunnel, and cell floors will serve as the floor for the storage areas. The canyon deck consists of 6-foot thick concrete cover-blocks that cover the process cells. The floor in the railroad tunnel and process cells is approximately 8 feet thick reinforced concrete. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.2.1)

11. *Are there controls and procedures in place to maintaining the primary barrier to be free of significant cracks, gaps, corrosion, or other deterioration that could cause hazardous waste to be released from the primary barrier? (Ref. 264.1101 (c)(1)(i))*

Controls and practices used to maintain the primary barrier include daily surveillance of the canyon deck and railroad tunnel (if personnel enter the 221-T canyon) looking for cracks, gaps, corrosion, or other deterioration that could cause releases of waste. The cover blocks forming the canyon deck contain an intentional 1-inch gap around the perimeter of the cover block to provide for positive airflow down through the deck to the exhaust and filter system. These gaps are not significant to the form of waste being stored. The existing floor drains in the 7-L, 8-R, 9-L, 13-R, 14-R, 16-R and 17-R process cells have been sealed to eliminate the possibility of small stored items or waste from entering the drainage system. Cells 3-L, 10-L, 13-L and 15-L are equipped with a freestanding carbon-steel liner (originally designed as a secondary containment assembly for the Spent Nuclear Fuel sludge handling system for the storage of KE sludge) which prevent small stored items or waste from entering the cell drainage system. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.3.1)

12. *Are there controls and procedures in place to maintain the level of the stored/treated hazardous waste within the containment walls of the unit so that the height of any containment wall is not exceeded? (Ref. 264.1101 (c)(1)(ii))*

The 221-T building containment walls are about 25 feet high above deck level to the crane rails and the walls are a minimum of five feet thick. The waste being stored within the 221-T building will not reach this height. The process cells located below deck level are about 23 feet deep but the ventilation duct is located about 8 feet above the bottom of the cells. Waste must not be placed in such a manner as to obstruct the ventilation inlet duct. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.3.3)

13. *Are there controls and procedures in place to prevent tracking of hazardous waste out of the unit by personnel or by equipment used in handling the waste, including an area designated for the decontamination of equipment and collection of rinsate? (Ref. 264.1101 (c)(1)(iii))*

Extensive requirements are in place to prevent the tracking out of contamination, including administrative access controls and monitoring. Protective clothing is required for personnel inside the 221-T canyon. Exiting the canyon requires step-off pads to control where the contamination ends, removal of all protective clothing, and monitoring to determine if any contamination has reached the underlying clothing. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.3.4)

14. *Are there controls and procedures in place to control fugitive dust emissions such that any openings (doors, windows, vents, cracks, etc.) exhibit no visible emissions (see 40 CFR part 60 appendix A, Method 22) and are all associated particulate collection devices (e.g., fabric filter, electrostatic precipitator) operated and maintained with sound air pollution control practices? (see 40 CFR Part 60 subpart 292). This state of no visible emissions must be maintained effectively at all times during routine operating and maintenance conditions, including when vehicles and personnel are entering and exiting the building? (Ref. 264.1101 (c)(1)(iv))*

Fugitive dust emissions are controlled through the use of negative pressure differentials and filters. Contaminated areas are kept at a lower pressure than non-contaminated area, resulting in airflow from less contaminated areas to the contaminated area, and effectively preventing the release of fugitive emissions. The 221-T canyon ventilation system consists of the 291-T exhaust system for exhausting the main canyon and 221-TA supply fans to supply air to the canyon. The HEPA filters on the 291-T exhaust system must each pass dioctyl salicylate aerosol testing requirements of 99.95% efficiency. (Refer to DOE/RL-95-36. Rev. 1, Sec. 4.6.3.5)

15. *Are inspections of "data gathered from monitoring equipment and leak detection equipment as well as the containment building and the area immediately surrounding the containment building performed at least once every seven days to detect signs of releases of hazardous waste? (Ref. 264.1101(c)(4))*

Building differential pressure is monitored on a weekly basis to ensure negative air pressure is maintained within the 221-T building. Daily inspections of the containment building areas to detect releases are executed when waste handling activities are being performed in that area. This practice is in keeping with ALARA principles to prevent higher than necessary radiation exposure to facility personnel.

The area immediately surrounding the 221-T building is inspected once a week to detect signs of release of waste. (Refer to Atomic Energy Act and DOE/RL-95-36. Rev. 1, Sec. 4.6.3.7)

**REFERENCES:**

**Drawings:**

| | |
|---|---|
| W-69332 | Concrete Covers |
| W-69100 | Cell Cover Forms |
| W-69333 | Concrete Sections and Details |
| W-70064 | Building 221-T, -U and -B Structural Key Plan |
| D-60784 | Curb Angles |
| H-2-32246, Rev 2 | Concrete Cell Cover Decontn Facility |
| H-2-32782, Rev 1 | Concrete Cell Cover Decontn Facility |
| H-2-88618, Rev 0 | Structural Concrete Cover Blocks |
| H-2-830348, sht. 1, Rev. 2 | Secondary Containment Assembly |

**Calculations:**

| | |
|---|---|
| HNF-6033 | Seismic Evaluation of the T-Plant 221-T Building for Interim Storage of K Basin Sludge, 200 West Area, Hanford Site. |
| 101650-CA40-C-001 | Cover Block Load Capacity |

**Codes:**

Building Code Requirements for Structural Concrete (ACI 318-99), American Concrete Institute.

Manual of Steel Construction, (ASD) Ninth Edition, American Institute of Steel Construction.

Uniform Building Code, 1997.

**Other Documents:**

| | |
|---|---|
| DOE/RL-95-36 | Hanford Facility Dangerous Waste Permit Application, T Plant Complex, Rev. 1 |
| SMA:ROOF:94:008 | Roof inspection Results from 221-T and 271-T Buildings |
| Memo from Scott Brim (5/10/2001) | 221-T Roof Leaks: Evaluation and Recommendations, Work Package 2T-00-00324, Repair Roof of 221T Canyon |
| 40 CFR 264 Subpart DD | Containment Building |

**FIGURES:**

**T-PLANT COMPLEX**

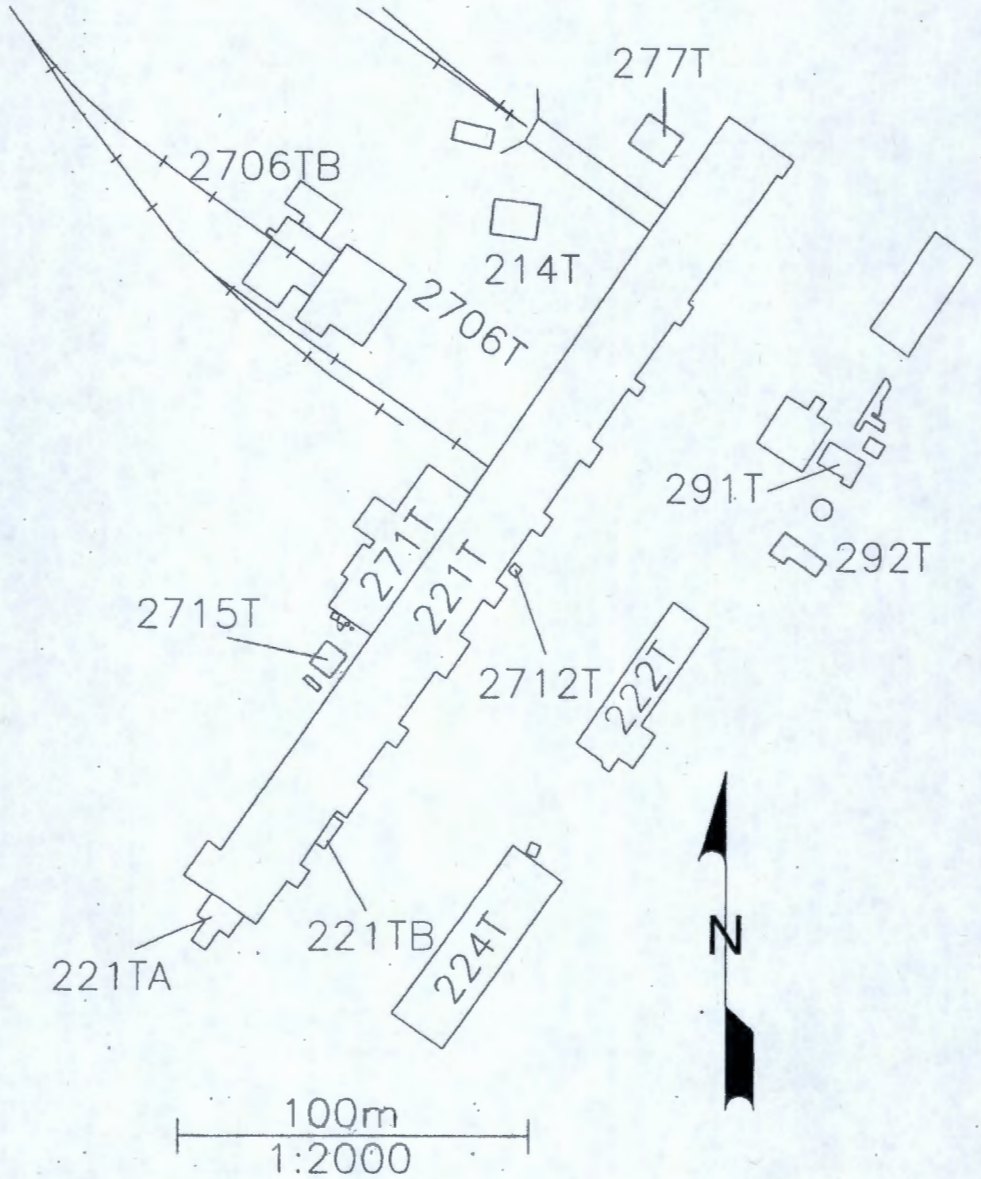


Fig. 1 – Basic T Plant Complex.

**T-PLANT SECTION 2:**

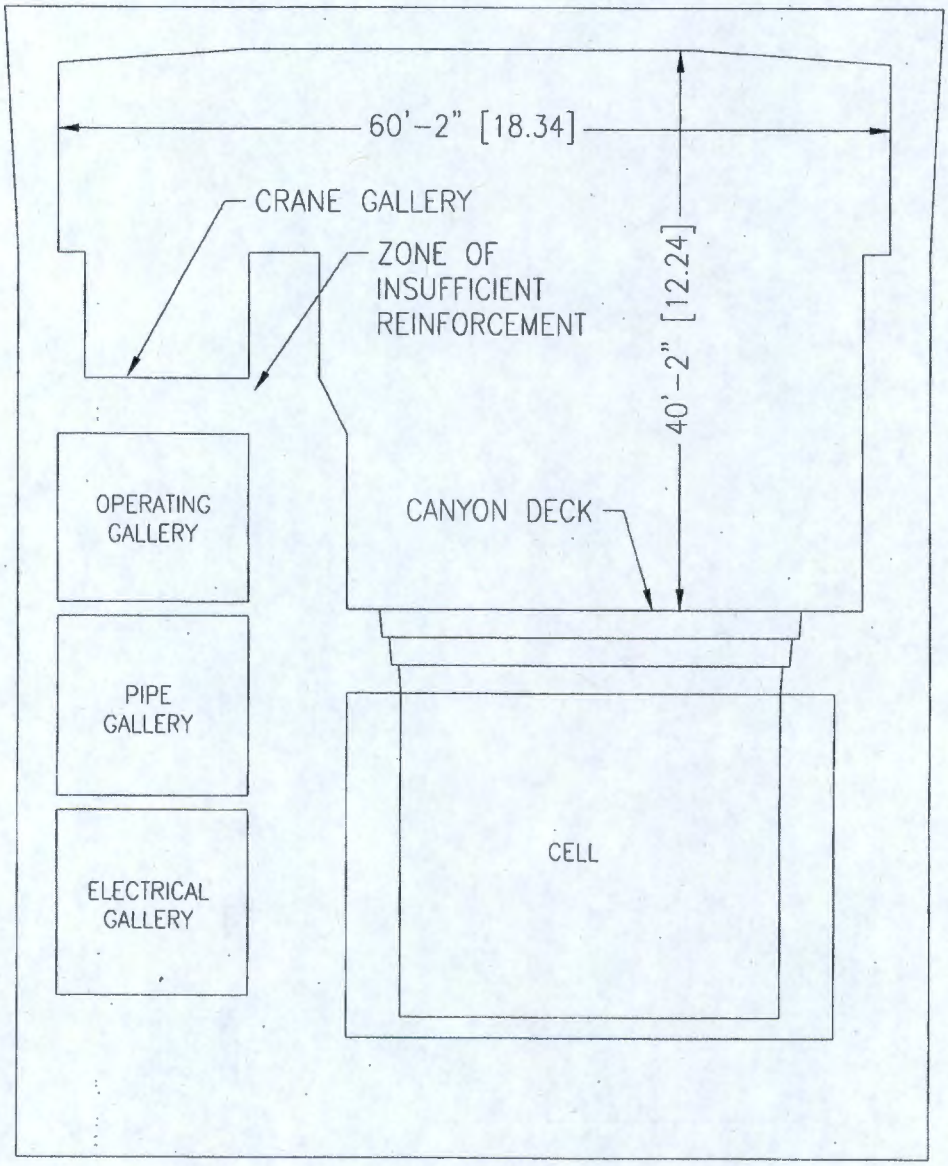


Fig. 2 – Canyon Section Looking North into Section 2.

**T-PLANT SECTION 3:**

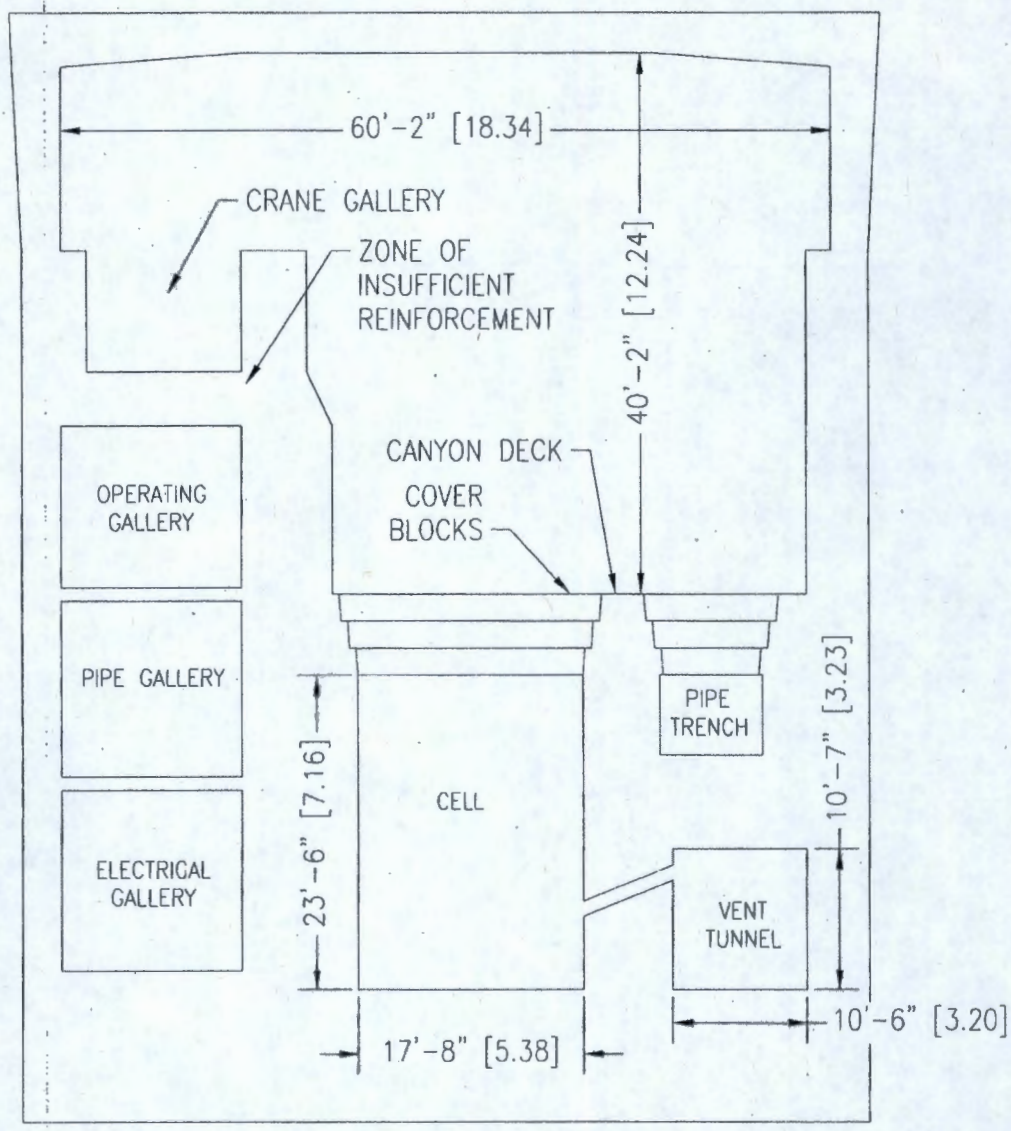


Fig. 3 – Canyon Section Looking North into Section 8.

**T-PLANT TUNNEL SECTION:**

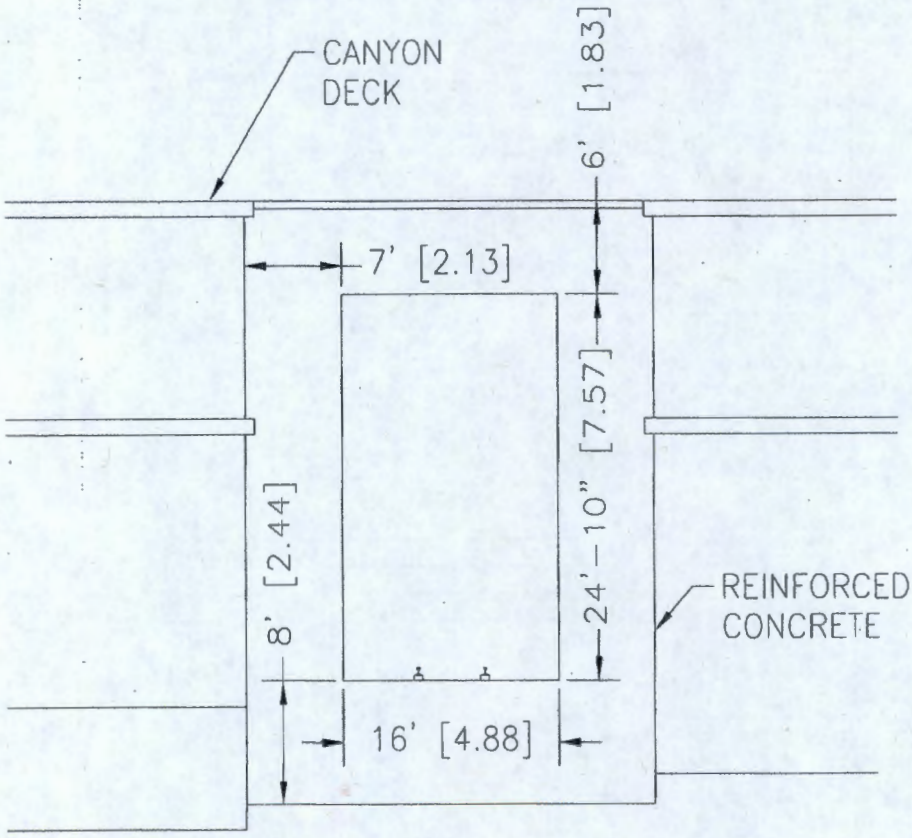


Fig. 4 – Railroad Tunnel Section Looking East into Section 2.