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609718

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Document Number: WHC-SD-WM-ETP-152, Rev. 0

Document Title: ENGINEERING TASK PLAN FOR TANK 241-C-106 CONTINGENCY
CHILLER DEFINITIVE DESIGN

Release Date: 5/22/95

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

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SUPPORTING DOCUMENT		1. Total Pages 20
2. Title Engineering Task Plan For Tank 241-C-106 Contingency Chiller Definitive Design	3. Number WHC-SD-WM-ETP-152	4. Rev No. 0
5. Key Words Contingency Chiller System, 241-C-106	6. Author Name: G. E. Rensink <i>G. E. Rensink</i> 5/19/95 Signature Organization/Charge Code 71620/N2673	
7. Abstract This document is the Engineering Task Plan for completing the Contingency Chiller system definitive design for Tank 241-C-106.		
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9. Impact Level N/A		

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Engineering Task Plan For
Waste Tank 241-C-106
Contingency Chiller
Definitive Design Report

G. E. Rensink
J. R. Kriskovich

May 1995

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1.0 INTRODUCTION

This document identifies the scope, cost, schedule and responsible organizations for completing a design of a contingency ventilation inlet air cooling system for Tank 241-C-106. The air cooling system, described in Rensink (1995), consists of a chiller, cooling coils, and supporting equipment that, when installed will be capable of assuring that the waste temperatures in Tank 241-C-106 are maintained within acceptable limits for safe storage.

The effort described herein is scheduled for completion by May 31, 1995 to support Performance Based Incentive (PBI) Milestone SI-2x.

2.0 SCOPE

The scope of the work includes all activities under the cognizance of Equipment Engineering required to complete a definitive design of the manually controlled chiller system (Rensink 1995) for Tank 241-C-106. This effort is described herein and is summarized in a logic diagram and schedule (see Appendix A, Figures 1.0 and 2.0 respectively).

A major part of this effort is the completion of a chiller installation design report in support of PBI milestone SI-2x. The total effort includes activities, other than the design report, that are required to support chiller installation. These include activities such as securing environmental permits that may continue beyond the May 31, 1995 PBI scheduled complete date. These ongoing activities are identified with an asterisk in Figure 2.0.

The design will identify the modifications and components required to complete fabrication and installation of an operative chiller system in the 241-C-106 ventilation system inlet duct. Support activities will include safety class determination, completing the Unresolved Safety Question (USQ) process, identification of state and federal permits required (if any), system functional requirements, system design requirements, equipment specifications and other required procurement documents, supporting analyses (heat transfer, stress and seismic), design verification per WHC-CM-6-1, and shareholder information exchanges.

The report will include a list that identifies additional activities that will support chiller system installation, e.g., Engineering Task Plan, Plant Operating Procedures etc. These items will require additional funding over and above the funding required to complete chiller system definitive design, e.g., the activities and funding support identified in this Engineering Task Plan. This activity is described as "develop list of to do items" in Appendix A Figures 1.0 and 2.0.

The engineering approach to this task will be in accordance with the intent and principles of the Systems Engineering process.

3.0 DESCRIPTION

3.1 Physical Description

Tank 241-C-106 is a high heat single-shell tank. Evaporative cooling, aided by forced ventilation of the tank, is the primary method being used to remove heat that is generated by the waste. A pool of water is currently being maintained over the waste surface at all times to enable cooling by evaporation.

If the drainable liquid above the waste is lost due to a large leak, the temperature of the waste will increase. The increase in waste temperature may jeopardize tank structural integrity. The availability of a ventilation inlet air cooling system will assure that waste temperatures will be maintained within acceptable limits in the event of a loss of the drainable liquid above the waste.

The ventilation inlet air cooling system to be developed for maintaining waste temperatures within acceptable limits will include modifying the existing ventilation system. The modification will include the installation of a chiller coil in the existing ventilation system inlet duct downstream of the existing inlet filter (see Appendix C, Figure 3.0). The cooling coil will be plumbed into a chiller via overground piping. The chiller will be installed on a skid outside of the 241-C tank farm fence (see Appendix C, Figure 4.0). Facility power will be used to operate the chiller unit, controls and coolant circulation pump. Controls for the chiller system will be manual and located on or near the chiller. A cooling coil installed in the inlet duct will provide the mechanism for cooling the tank ventilation inlet air that enters the vapor space.

It should be noted that the chiller system design developed by Equipment Engineering will be similar and compatible with Project W-320's currently proposed ventilation system and chiller system designs.

3.2 Engineering Task Descriptions

3.2.1 Tasks:

- Hold ongoing information exchange meetings with shareholders throughout the systems engineering design process
- Produce an Engineering Task Plan that identifies the activities to be addressed and resolved in completing definitive design of the Contingency Chiller
- Interface with Tank 241-C-106 Retrieval Project W-320
- Update waste cool down analysis for Tank 241-C-106
- Perform 241-C Tank Farm walkdown
- Assess power availability in Tank Farm 241-C for chiller system operation
- Determine chiller system Safety Classification

- Initiate Unresolved Safety Question (USQ) evaluation
- Secure environmental permits if required
- Develop functional requirements
- Develop design requirements
- Perform seismic, windload and structural analyses
- Perform design verification
- Identify and generate procurement documents
- Initiate modifications to safety documents, e.g., Safety Analysis Report, Interim Operational Safety Requirements etc.
- Develop list of "to do" items
- Correlate and input task data into final report

3.3 Deliverables

3.3.1 Engineering Task Plan

This document is the Engineering Task Plan for producing the Contingency Chiller definitive design for Tank 241-C-106.

3.3.2 Engineering Report

The engineering report will contain all documents required to support the design of the Contingency Chiller system modification for Tank 241-C-106. The report will contain:

- Chiller system Safety Classification
- Waste cool down analysis
- A reference of required environmental permits
 - Provide documents that indicate the process for securing required permits (if any) are initiated. Note, approved permits are a carry over item.
- Documents that initiate changes to safety documents.
 - Generate Engineering Change Notices for safety documents, e.g., Safety Analysis Report, Interim Operational Safety Requirements etc. Note, Approved Engineering Change Notices supporting changes to safety documents are carry over items.
- Functional requirements
- Design requirements
- Seismic, wind load, structural, and supporting heat transfer analyses
- Complete USQ
- Drawings suitable for installation of all equipment
- Required procurement documents
- Design verification documentation
- Meeting minutes with shareholders and Project W-320
- List of "to do" items, e.g., develop job control installation work package, plant operating procedures, preventative maintenance procedures etc.

The effort covered by this Engineering Task Plan covers the work required through May 31, 1995, or to complete the work required to support PBI Milestone SI-2x, whichever comes first.

4.0 ORGANIZATIONS

4.1 Technical Input and Approval Organizations

Equipment Engineering - Is responsible for obtaining technical data, securing reviews and approvals of all material generated by the Engineering Task Plan and engineering report supporting definitive design of the Contingency Chiller system.

W. C. Miller

Safety Engineering - Is responsible for providing technical input, review and approval of the Engineering Task Plan and engineering report.

R. J. Cash

5.0 SCHEDULE

See Figures 1.0 and 2.0 in Appendix A. It should be noted that most of the tasks identified will be pursued on a parallel path.

6.0 COST ESTIMATE

	COST
Engineering Support	≈ \$ 136,000
Management and Clerical	≈ \$ 6,000
	TOTAL ≈ \$ 142,000

See Appendix B for resource breakdown.

7.0 REFERENCES

Rensink, G. E., Kriskovich J. R., 1995, *Waste Tank 241-C-106 Comprehensive Cooling Design Summary Report*, WHC-SD-WM-RPT-104, Rev. 0, Westinghouse Hanford Company, Richland, WA.

WHC, 1995, *Standard Engineering Practices*, WHC-CM-6-1, Release 63, Westinghouse Hanford Company, Richland, WA.

APPENDIX A

**ACTIVITIES SCHEDULE
FIGURES 1 AND 2**

241-C-106 CHILLER INSTALLATION LOGIC

FIGURE 1.0

241-C-106 DEFINITIVE CHILLER DESIGN

FIGURE 2.0

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Milestone

Summary

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APPENDIX B

RESOURCE BREAKDOWN

1) Shareholder Meetings:

PROCUREMENT

Meagher ≈ 5 Hrs.

PROJECT W320

Swenson ≈ 5 Hrs.

Ball ≈ 5 Hrs.

Harris ≈ 5 Hrs.

DESIGN

Jenkins ≈ 8 Hrs.

Kriskovich ≈ 8 Hrs.

Rensink ≈ 8 Hrs.

Morris ≈ 5 Hrs.

Langdon ≈ 5 Hrs.

Nguyen ≈ 5 Hrs.

ANALYSES

Ogden ≈ 5 Hrs.

Thurgood ≈ 5 Hrs.

Bander ≈ 5 Hrs.

PROJECT SAR ENGINEERING

Conner ≈ 5 Hrs.

TWRS SAR ENGINEERING

Schlusser ≈ 5 Hrs

ENVIRONMENTAL COMPLIANCE (permits)

Geier ≈ 5 Hrs.

Campbell ≈ 5 Hrs.

Tollefson ≈ 5 Hrs.

SAFETY ENGINEERING

Lipke ≈ 5 Hrs.

WASTE STORAGE ENGINEERING

Raymond ≈ 5 Hrs.

EAST TANK FARM TRANSITION PROJECT

Wicks ≈ 5 Hrs.

Dodd ≈ 5 Hrs.

TOTAL Hrs. ≈ 119 Hrs.

2) Plant Forces Work Review (PFWR)

Jenkins - Design	≈	2 Hrs.
Rensink - Design	≈	8 Hrs.
Kriskovich - Design	≈	8 Hrs.
Crawford - Plant Modification	≈	4 Hrs.
Harris - Project W320	≈	4 Hrs.
Cash - Safety Program	≈	2 Hrs.
Shaw - Project W320	≈	4 Hrs.

TOTAL Hrs. ≈ 32 Hrs.

3) Task Plan

Jenkins - Design	≈	8 Hrs.
Cash - Safety Program	≈	8 Hrs.
Rensink - Design	≈	40 Hrs.

TOTAL Hrs. ≈ 56

4) Update Waste Cool Down Analyses

Jenkins - Design	≈	8 Hrs.
Ogden - Analyst	≈	80 Hrs.
Thurgood - Analyst	≈	80 Hrs.
Bander - Analyst	≈	80 Hrs.

TOTAL Hrs. ≈ 248

5) C Farm Walkdown

Jenkins - Design	≈	8 Hrs.
Rensink - Design	≈	8 Hrs.
Anderson - Designer	≈	8 Hrs.

TOTAL Hrs. ≈ 24

6) Safety Class Determination

Jenkins - Design	≈	4 Hrs.
Minteer - Design	≈	32 Hrs.

TOTAL Hrs. ≈ 36

7) USQ Determination

Jenkins - Design ≈ 4 Hrs.
Minteer - Design ≈ 40 Hrs.
Kriskovich - Design ≈ 4 Hrs.
Rensink - Design ≈ 4 Hrs.

TOTAL Hrs. ≈ 52

8) Power Availability Analysis

Jenkins - Design ≈ 2 Hrs.
Langdon - Design ≈ 16 Hrs.
Nguyuen - Electrical Design ≈ 32 Hrs.
Kriskovich - Design ≈ 2 Hrs.
Rensink - Design ≈ 2 Hrs.

TOTAL Hrs. ≈ 54 Hrs.

9) Environmental Permits

Jenkins - Design ≈ 4 Hrs.
Geier - Environmental ≈ 8 Hrs.
Rensink - Design ≈ 10 Hrs.
Kriskovich - Design ≈ 10 Hrs.
Campbell - Environmental ≈ 8 Hrs.
Tollefson - Environmental ≈ 120 Hrs.

TOTAL Hrs. ≈ 160

10) Safety Analysis

Jenkins - Design ≈ 8 Hrs.
Carpenter - Design ≈ 20 Hrs.
Conner - Project SAR ≈ 200 Hrs.
Schlosser - TWRS SAR ≈ 8 Hrs.
Kriskovich - Design ≈ 16 Hrs.
Rensink - Design ≈ 8 Hrs.

TOTAL Hrs. ≈ 260

11) Functional Requirements

Jenkins - Design ≈ 8 Hrs.
Kriskovich - Design ≈ 8 Hrs.
Rensink - Design ≈ 8 Hrs.
Morris - Design ≈ 40 Hrs.

TOTAL Hrs. ≈ 64

12) Design Requirements

Jenkins - Design ≈ 8 Hrs.
Kriskovich - Design ≈ 16 Hrs.
Rensink - Design ≈ 16 Hrs.
Morris - Design ≈ 20 Hrs.

TOTAL Hrs. ≈ 60

13) Design

Jenkins - Design ≈ 4 Hrs.
Kriskovich - Design ≈ 10 Hrs.
Rensink - Design ≈ 10 Hrs.
Humphreys - Designer ≈ 160 Hrs.
Cruz - Design ≈ 40 Hrs.
Hicks - Design ≈ 60 Hrs.

TOTAL Hrs. ≈ 264

14) Analyses (seismic, windload, structural)

Jenkins - Design ≈ 4 Hrs.
Kriskovich - Design ≈ 4 Hrs.
Cruz - Design ≈ 30 Hrs.
Hicks - Design ≈ 20 Hrs.
Nawarynski - Design ≈ 40 Hrs.
Coverdell - Design ≈ 40 Hrs.

TOTAL Hrs. ≈ 138

15) Generate Procurement Documents

Jenkins - Design	≈ 4 Hrs.
Kriskovich - Design	≈ 6 Hrs.
Rensink - Design	≈ 6 Hrs.
Hicks - Design	≈ 40 Hrs.

TOTAL Hrs. ≈ 56

16) Develop List of follow up Items

Jenkins - Design	≈ 2 Hrs.
Rensink - Design	≈ 8 Hrs.
Kriskovich - Design	≈ 8 Hrs.

TOTAL Hrs. ≈ 18

17) Design Review (Independent)

Jenkins - Design	≈ 8 Hrs.
Kriskovich - Design	≈ 16 Hrs.
Rensink - Design	≈ 16 Hrs.
Cash - Safety Program	≈ 8 Hrs.
Dodd - Tank Farm Transition Project	≈ 8 Hrs.
Harris - Project W320	≈ 8 Hrs.
Raymond - Waste Storage Engineering	≈ 8 Hrs.
Pierce - Engineering	≈ 8 Hrs.
Board - Quality Engineering	≈ 8 Hrs.
Thomas - Nuclear Safety	≈ 8 Hrs.
Crummel - Environmental Engineering	≈ 8 Hrs.
Stevens - Independent Reviewer	≈ 32 Hrs.

TOTAL Hrs. ≈ 136

18) Final Report

Jenkins - Design	≈ 4 Hrs
Kriskovich - Design	≈ 8 Hrs.
Rensink - Design	≈ 20 Hrs.

TOTAL Hrs. ≈ 32

Total Resource Hrs. ≈ 1809

APPENDIX C

**SKETCHES
FIGURES 3.0 AND 4.0**

FIGURE 3.0