ENCLOSURE 1

ATTACHMENT 2

"Exelon Quad Cities Units 1 & 2 Steam Dryer Dynamic Time History Analyses: Original, 2003 Repair and 2004 Repair Dryer Configurations using Loads from Scale Model Test Results and Plant Measurements," GENE-0000-0039-3540-01, Revision 1, Non-Proprietary, dated April 2005

GE Nuclear Energy

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GENE-0000-0039-3540-01
Revision 1
Class I
April 2005

Exelon Quad Cities Units 1 & 2 Steam Dryer Dynamic Time History Analyses: Original, 2003 Repair and 2004 Repair Dryer Configurations using Loads from Scale Model Test Results and Plant Measurements

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1. Introduction

In March of 2002, Quad Cities Unit 2, operated by Exelon, reached an uprated power level up to a maximum of 117% OLTP after its planned refueling outage and began continuous operation at this power level. On June 7, 2002, several anomalous readings related to pressure, water level, steam flow and moisture carryover were detected. Initial evaluation concluded that the steam dryer was operating in a degraded condition. After 34 days of continuous monitoring of Quad Cities Unit 2, the unit was shutdown July 11th, 2002 to perform visual inspection of the steam dryer. The inspection revealed that a large portion of one cover plate adjacent to one of the outer bank inlet hoods was missing.

The result of the root cause evaluation showed the primary factor for this event was flow regime instability that resulted in localized, high cycle pressure loadings near the main steam line (MSL) nozzles. The high vibratory stresses from the pressure loading eventually resulted in the high cycle fatigue failure of the cover plate. During the subsequent 10 day unplanned outage, Quad Cities, Unit 2 replaced both damaged and undamaged ¼" cover plates with new ½" cover plates and the Unit was returned to its pre-outage extended power uprate (EPU) operating level of 117% OLTP. The thicker ½" cover plate was designed to lower predicted stresses from both the turbulent and resonant loading. The root cause was identified at that time as high cycle fatigue caused by high frequency pressure loading.

In May 2003, Quad Cities Unit 2 experienced a significant increase in steam moisture content while operating at EPU conditions. Inspection during the June 2003 outage found significant through-wall cracks in the outer dryer bank hood coupled with cracking in the outer hood internal braces. Additional fatigue cracking was also observed in some of the tie bars between dryer banks. The primary repair implemented in June 2003, involved removing the upper portion of the 0.5-inch thick outer hood and replacing it with a 1.0-inch thick plate. Additionally, 0.5-inch thick gussets were added to the outer hoods to increase the stiffness. The gussets were attached to the outer hoods at one inch below the horizontal weld seam connecting the 0.5-inch thick plate with the new 1.0-inch thick plate on the outer hood. The diagonal braces in the outer hoods and one vertical brace in the 90-degree outer hood and one vertical brace in the 270-degree outer hood were removed. Rectangular 3-inch by 1-inch bars were welded to the tie bar angles to reduce the stresses. The root cause of the outer hood failure was attributed to low frequency high cycle fatigue.

During the March 2004 refueling outage inspections of the previously repaired Quad Cities Unit 2 steam dryer, fatigue cracks were found at the tops of several gussets welds on the dryer outer vertical hood. One gusset on the 90-degree side and two gussets on the 270-degree side were cracked in the weld between the gusset and the outer hood. These gusset cracks, were found to have traveled into the outer hood material. In addition, cracks were found in the outer hood to support ring weld, tie bar welds and perforated plate L bracket welds. Again, repairs were made to the dryer to restore structural margin. The entire front hood panel was replaced with 1.0-inch thick plate, new taller gussets were added using shop groove welds, and redesigned tie bars were installed. Additionally, specific design criteria were developed based on static analyses to prevent future crack initiation.

Concurrently, inspections were performed at the other Exelon BWR/3 unit steam dryers. Repairs based on the Quad Cities Unit 2 analyses were implemented. However, in October of 2004, during a planned outage at Dresden Unit 3, a through-wall crack in the cover plate-to-support ring weld was discovered at the cover plate corner. Static analysis showed, and time history analyses later confirmed, that when the short repair gussets and thicker top portion of the outer hood were installed in the Dresden and Quad Cities plants after the June 2003 discovery of cracks in the outer hood, that the maximum stress in the cover plate moved outward from the center of the cover plate near the outer hood to the corner of the cover plate where the crack was discovered.

In March of 2005, a 12" crack was found on Quad Cities Unit 1 at the fillet weld between the cover plate and ring near the center gusset on the 270° side. A gusset shoe repair was implemented which redistributed the load. A detailed discussion on the repair analysis is included in Reference 15.

All dryer failures were initially analyzed using static and quasi-static methods as well as frequency analyses. To better address dynamic loading issues, a response spectrum approach based on enveloping pressure time histories from three plants was employed. However, these loads were found to be overly conservative; there was also a concern that the assumed loading was generic and not plant specific.

Concurrent with earlier assessments, a series of scale model tests of the Quad Cities Unit 1 plant configuration and replacement steam dryer design were performed at GENE using an un-validated scale test apparatus and methodology. The intent of these tests was to obtain data that could be used to assist in the Quad Cities Unit 1 replacement dryer design process. Despite minor differences between Quad Cities Unit 1 and Quad Cities Unit 2 plants, the characteristics of pressure loading on the steam dryer are similar [Reference 16]. Loads from this test program have been developed for use in dynamic time history analyses. Continuum Dynamics Inc (CDI) processed these loads on the outer surfaces of the dryer through acoustic circuit analyses to develop with pressures on all surfaces of the dryer, both internal and external. Using this data, time history analyses have been performed on the original dryer configuration and the 2003 and 2004 repair configurations of the Exelon dryers.

This report describes the dynamic time history analyses performed on the Exelon steam dryers for different un-repaired and repaired configurations. The loading used for these analyses came from both plant data measurements from the MSLs and scale model test results. Continuum Dynamics, Inc. (CDI) processed these MSL gauge measurement/venturi instrumentation line measurements through acoustic circuit analyses to develop pressure time histories on all loaded dryer surfaces, both internal and external. Both the plant data and scale model test results were run through circuit analyses (CDI). This report then correlates results with the unrepaired and repaired steam dryer failure behavior.

2 Summary

Finite element analyses were performed to evaluate the original and repaired dryer configurations. The full dryer shell model, used in previous Quad Cities and Dresden dryer evaluations [References 2-4], was modified to reflect the June 2003 and March 2004 repaired configurations and results are compared with the pre-repair configuration. The 2004 repair configuration was analyzed using loading from two sources: 1) scale model test results [Reference 14], 2) Quad Cities Unit 2 plant data [Reference 13].

Table 2-1 Comparative Summary of Stress Intensities from Time History Analyses for Different Dryer Configurations: Unaltered ANSYS results

Maximum Stress Intensity, psi					
	Dryer Configuration and Load Definition Source				
Loading	SMT* Pre-EPU	SMT* EPU	SMT* EPU	SMT* EPU	QC2 Plant EPU
Component	Orig	Orig	QC2 2003	2004	2004
Outer Hood	[[				
Inner Hood					
Top Hood					
Cover Plate					
Gusset					]]

* *SMT = scale model test. All SMT loads are from a test using the original dryer configuration*

A summary of stress intensities for each dryer configuration and loading is shown in Table 2-1. These stress values are taken directly from ANSYS output. In the previous static analysis for the 2004 repair, stresses in all critical locations affected by the repair were below the design criterion [[

]] In the time history analyses reported here, the purpose is to demonstrate that the pressure time history loads from plant data and scale model test results predict the past dryer failures for the original and 2003 repair configurations and show that the current, 2004 repair is acceptable. [[

]] [Reference 10]. This alternating stress is then compared with the fatigue curves and a determination of whether failure at each location is made with the results summarized in Table 2-2. The time history results matched reasonably well with the observed failures in the Exelon steam dryers even though higher stresses were predicted with the pre-EPU SMT loads.

Table 2-2 Failure Predictions based on Time History Analyses for Different Dryer Configurations and Loading Conditions

Failure Predictions based on Time History Analyses for different Dryer Configurations and Load Conditions				
Dryer Configuration/ Load case		**Failure locations from field experience**		
		Cover Plate	**Top Hood**	**Outer Hood**
Original SMT Pre-EPU	nominal stress intensity (psi) SCF calc peak stress intensity (psi)	[[		]]
	Failure predicted?	POSSIBLE	POSSIBLE	POSSIBLE
Original SMT EPU	nominal stress intensity (psi) SCF calc peak stress intensity (psi)	[[		]]
	Failure predicted?	YES	POSSIBLE	YES
2003 SMT EPU	nominal stress intensity (psi) SCF calc peak stress intensity (psi)	[[		]]
	Failure predicted?	YES	NO	YES
2004 SMT EPU	nominal stress intensity (psi) SCF calc peak stress intensity (psi)	[[		]]
	Failure predicted?	YES	NO	POSSIBLE
2004 QC2 plant data	nominal stress intensity (psi) SCF calc peak stress intensity (psi)	[[		]]
	Failure predicted?	NO	NO	NO

Notes:

1) [[

]]

2) SMT = scale model test

3 Dynamic Analysis Approach

3.1 Dynamic Loading, Pressure Time Histories

Quad Cities Unit 2 plant data as well as scale model data from the original dryer configuration test were used to develop the loading in these analyses. [[

]] The plant and test data were processed in acoustic circuit analyses by CDI to determine the pressure differentials on all external and internal surfaces of the dryer that experience fluctuating pressure during normal plant operation [Reference 13 & 14].

Pressures are applied to dryer components, represented by shell elements in finite element models. A different finite element model was used for each dryer configuration. [[

]]. Maximum and minimum pressure distribution for each configuration are shown in Figures 6-7 through 6-16.

3.2 Stress Recovery Methodology

An ANSYS macro was written to sweep through each time step at every element on each component of interest to determine the time and location of the maximum stress intensity. ANSYS maximum stress intensity results from this macro are presented in Table 2-1.

4 Material Properties

The dryer assembly was manufactured from solution heat-treated SS304 conforming to applicable ASTM standards at the time of manufacture. The repair plate is made from SS316L. Minimum of SS304L and 316L properties were used to conservatively envelop the properties of the original components and the repair plate. The applicable properties are shown in Table 4-1.

Table 4-1 Properties of SS304L and SS316L [Reference 5]

Material / property	Room temperature 70°F	Operating temperature 545°F
SS304L		
S_y, Yield strength, psi	25000	15940
S_u, Ultimate strength, psi	70000	57440
E, Elastic modulus, psi	28300000	25575000
SS316L		
S_y, Yield strength, psi	25000	15495
S_u, Ultimate strength, psi	70000	61600
E, Elastic modulus, psi	28300000	25575000

5 Design Criteria

For the purpose of determining whether failure would be predicted, at those locations that failed in the field, the stresses calculated based on the plant and scale test pressure time history loads are compared to the fatigue curves from the ASME Code [Reference 10]. Figure I-9.2.2 of ASME Section III [Reference 10] provides the fatigue threshold values for use in the evaluation of stainless steels. [[

]] These will be the criteria for determining if these loads predict the actual failures experienced in the field.

6 Dynamic Analyses

Time history analyses were performed using ANSYS Version 6.1 [Reference 7] and Version 8.1 [Reference 8]. [[

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Time history analyses were performed on the following dryer configurations and loading as discussed in Section 3:

1. Original dryer with Scale Model Test (SMT) results using Pre-EPU loads
2. Original dryer with SMT results using EPU loads
3. 2003 repair dryer with SMT results using EPU loads
4. 2004 repair dryer with SMT results using EPU loads
5. 2004 repair dryer with Quad Cities Unit 2 plant data at EPU

6.1 Finite Element Models

Each dryer configuration analyzed uses a different finite element model. Reference 11 describes in detail the different dryer finite element models. A brief description of each is included in this section: 1) original dryer, 2) 2003 repair configuration, and 3) 2004 repair configuration.

6.1.1 Original Dryer

The unrepaired dryer configuration finite element model is shown in Figure 6-1. [[

]]

6.1.2 2003 Repair Dryer

The original dryer was modified to add the short gussets and the thicker 1.0- inch top portion of the outer hood. The tie-bars are modeled with section area and modulus equal to the section properties of the 2" x 2" x 3/8" angle irons with the additional 3" x 1" bars [consistent with Reference 1]. Thus, the finite element model accounted for the tie bar stiffness. The diagonal braces were removed from the outer banks during the 2003 dryer repair. Two vertical braces were also removed from the outer banks during the 2003 dryer repair, one on each side of the dryer. These changes are incorporated in the full dryer finite element model. [[

]]

The 2003 repair configuration used in this analysis is the Quad Cities Unit 2 configuration with the short gussets welded to the outer hood below the weld seam at the 1.0-inch thick repair plate. This model is shown in Figure 6-2.

6.1.3 2004 Repair Dryer

For this configuration, the front vertical portion of the outer hood is now 1.0-inch thick and the short, 30-inch high gussets have been replaced with tall 53-inch high gussets, which are welded to the outer hood and come within 6 inches of the top of the outer hood. This model is shown in Figures 6-3 to 6-5. [[

]] The boundary conditions are shown in Figure 6-6.

6.2 Stress Analysis Results

The maximum stresses from the time history analyses are summarized in Table 2-1. Plots of stresses in the outer hood, inner hood, top hood, cover plate, base plate, and gussets are shown in Figures 6-17 to 6-37. The plots correspond to the load cases as shown in Table 6-1 below. Most of the plots show the maximum stress intensity at the time the highest stress occurred in the component of interest. A GENE program was developed to sweep through the results to find the maximum stress in each component. [[

]] In the analysis for the original dryer, the maximum stress in the outer hood is plotted versus time (Figure 6-19) and the maximum outer hood stress is plotted on each side of the dryer (Figure 6-20).

Table 6-1 Stress Results: Summary of Plots

Dryer Model	Load Definition	Maximum Stress Plots	Stress VS Location Plots
Original	SMT Pre-EPU	6-17, 6-19, 6-21 to 6-13	na
Original	SMT EPU	6-18 to 6-23	na
2003 repair	SMT EPU	6-24, 6-26, 6-28 to 6-31	6-25 (outer hood), 6-27 (inner hood)
2004 Repair	SMT EPU	6-32, 6-34 to 6-36, 6-38, 6-39	6-33 (outer hood), 6-37 (cover plate)
2004 Repair	QC2 Plant Data	6-40 to 6-43, 6-45, 6-46	6-44 (cover plate)

7 Fatigue Assessment

Peak stress intensities were determined by [[

]] Figure 6-25 is an example of how stress intensity attenuates with distance from the maximum stress intensity location. The fatigue evaluation results are shown in Table 2-2. These results also demonstrate that both in plant data and scale model test loads accurately predict the observed failures in the Exelon steam dryers. The results are consistent with the actual FEM results given in Table 2-1.

8 Conclusions

Results from the time history analyses based on loads from scale model testing and plant data correlated reasonably well with field failures. For the original dryer configuration, time history analysis with SMT Pre-EPU load condition has a possibility of crack initiation at the cover plate and the outer hood as well as the top hood. No field failure has been identified with Pre-EPU loading condition. For the SMT EPU condition, time history analysis results predict failure in the cover plate, outer hood and in the top hood. In 2003, the Quad Cities Unit 2 failure (with original configuration) occurred at the 5-inch by 7-in brace bracket which connects the top hood and the outer hood. For the 2003 repaired dryer configuration with SMT EPU loads, time history analysis results predict failure in the cover plate corners which is consistent with the Dresden 3 cover plate cracking found in the fall of 2004. For the Quad Cities Unit 1 12" crack at the fillet weld between the cover plate and ring at the gusset, finite element results show low stress and do not predict failure at this location. However, the 2003 repaired model does not reflect the eccentricity between the weld at the cover plate/ring and the end of the gusset. In the finite element model, the load is carried from the toe of the gusset directly to the support ring. The low stress in this location is due to this modeling assumption [Reference 15]. For the 2004 repaired dryer configuration, time history analysis predicts possible failure for SMT EPU loading condition and no failure for in-plant loading condition. [[

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9 References

1. Quad Cities Unit 2 Steam Dryer Tie Bar Repair Analysis, GENE-0000-0026-8156-LTR1, Rev. 0, March 2004.
2. Stress Analyses for the Quad Cities Unit 2 Steam Dryer Repair, GENE 0000-0018-0985-01, Rev. 0, June 2003
3. Dresden and Quad Cities Steam Dryer Modification for Extended Power Uprate, GENE-B13-02098-00-05, Rev. 0, June 2001
4. Repair Drawings: 234C6597 Outer Hood Assembly, 234C6598 Outer Hood, 234C6599 Gussets.
5. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, 1989 Edition with no Addenda.
6. Quad Cities Unit 2 Steam Dryer Repair Analysis Design Criteria, GENE DRF 0000-0026-8110/ Section 0000-0026-8161, Rev. 0, March 2004.
7. ANSYS Release 6.1, ANSYS Incorporated, 2002.
8. ANSYS Release 8.1, ANSYS Incorporated, 2004.
9. Recommended Weld Quality and Stress Concentration Factors for use in the Structural Analysis of Exelon Replacement Steam Dryer, GENE DRF 0000-0034-6079, Rev 0.
10. American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, Appendix I, 1989 Edition with no Addenda, Fatigue Curve: Figure I-9.2.2.
11. Comparison of Dryer Outer Component Stresses in the Quad Cities Units 1&2 and Dresden Units 2&3, DRF # 0000-0026-8110
12. "Damping Value for Steam Dryer Structural Dynamic Analysis, DRF Section 0000-0034-1855
13. Quad Cities Unit 2 plant CDI data: F384/0201,DRF 39-3448,Section 39-4450
14. SMT CDI data: Original PRE-EPU F384/0311,DRF 39-3448,Section 39-9443
    Original EPU F384/0284,DRF 39-3448, Section 39-4450
15. Quad Cities 1 RFO-18 Steam Dryer Gusset Shoe Extension Stress Analysis, DRF Section# 0000-0038-8234, Rev. 1.
16. NEDC-33192P, Class III, April 2005, "Engineering Report for QC Unit 1 Scaled Model Testing".

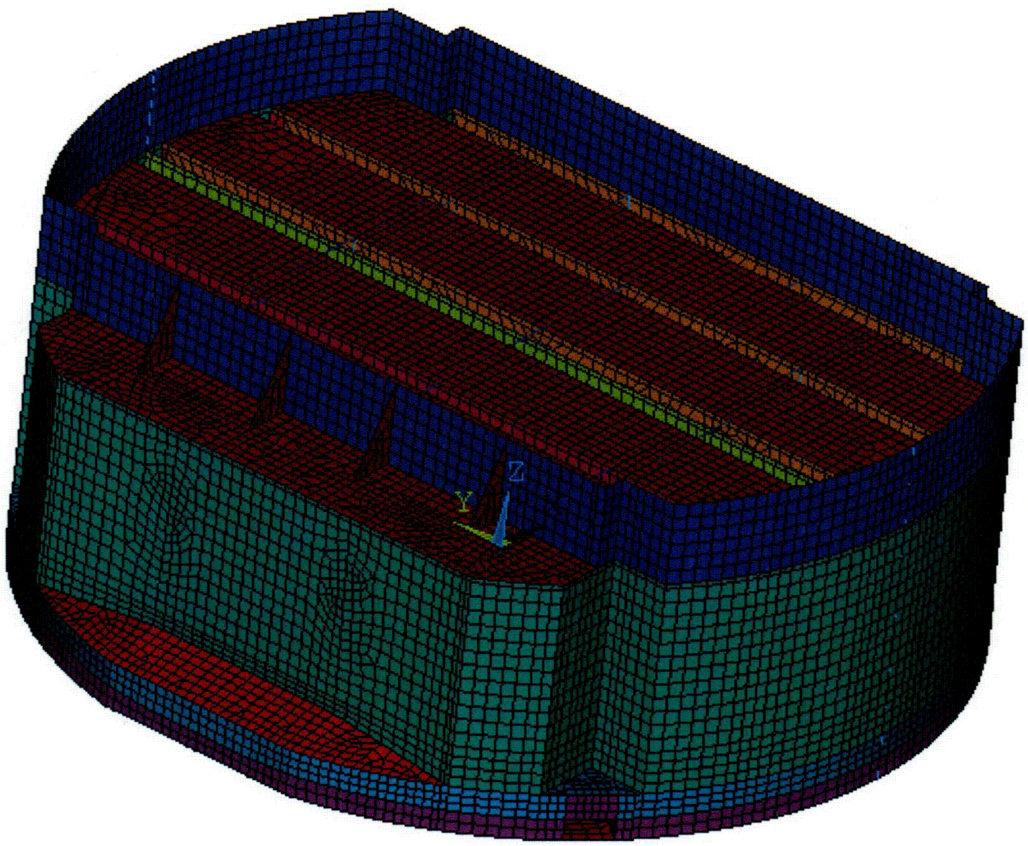

Figure 6-1 Original Dryer Configuration Finite Element Model

C01

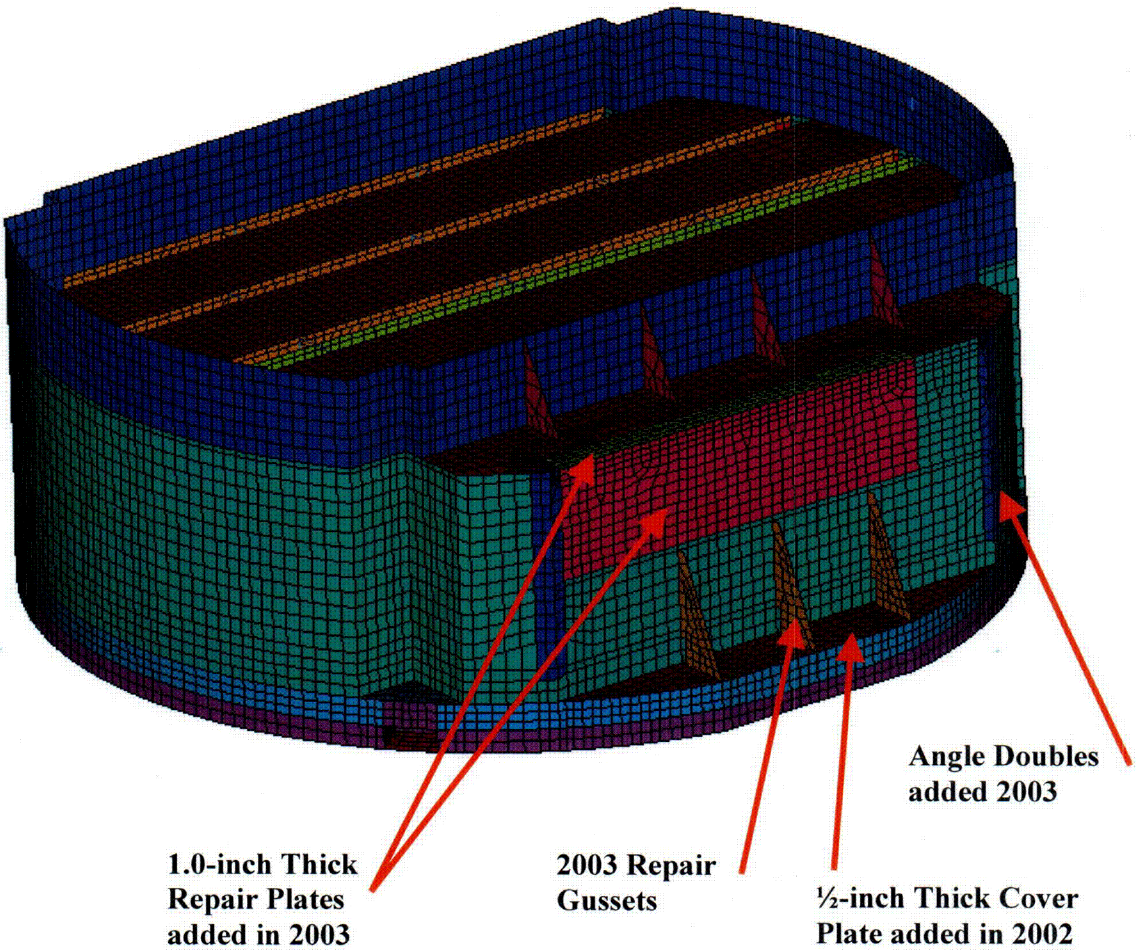

Figure 6-2 2003 Repair Dryer Configuration Finite Element Model

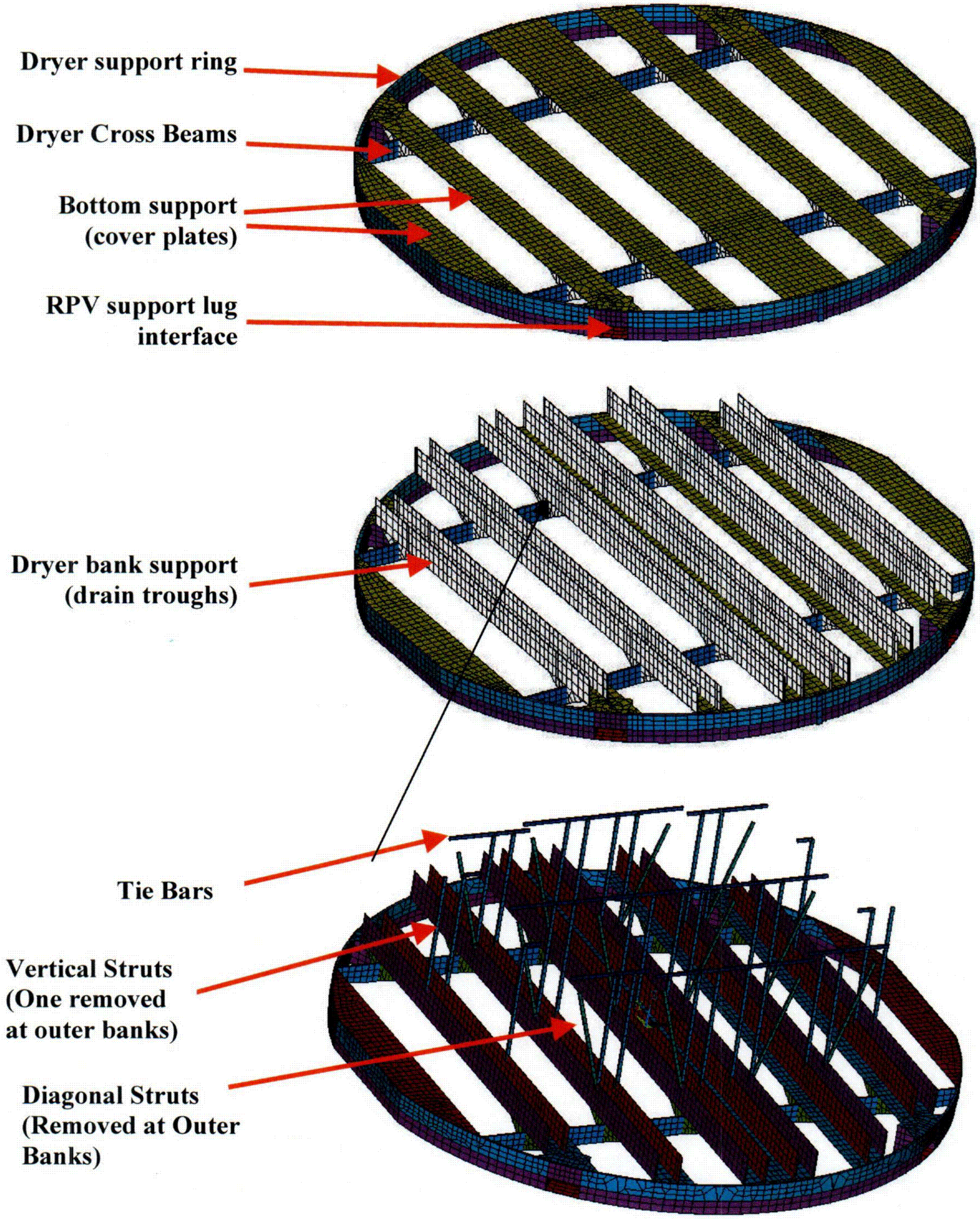

Figure 6-3 2004 Repair Dryer Analysis Model – Support Structure

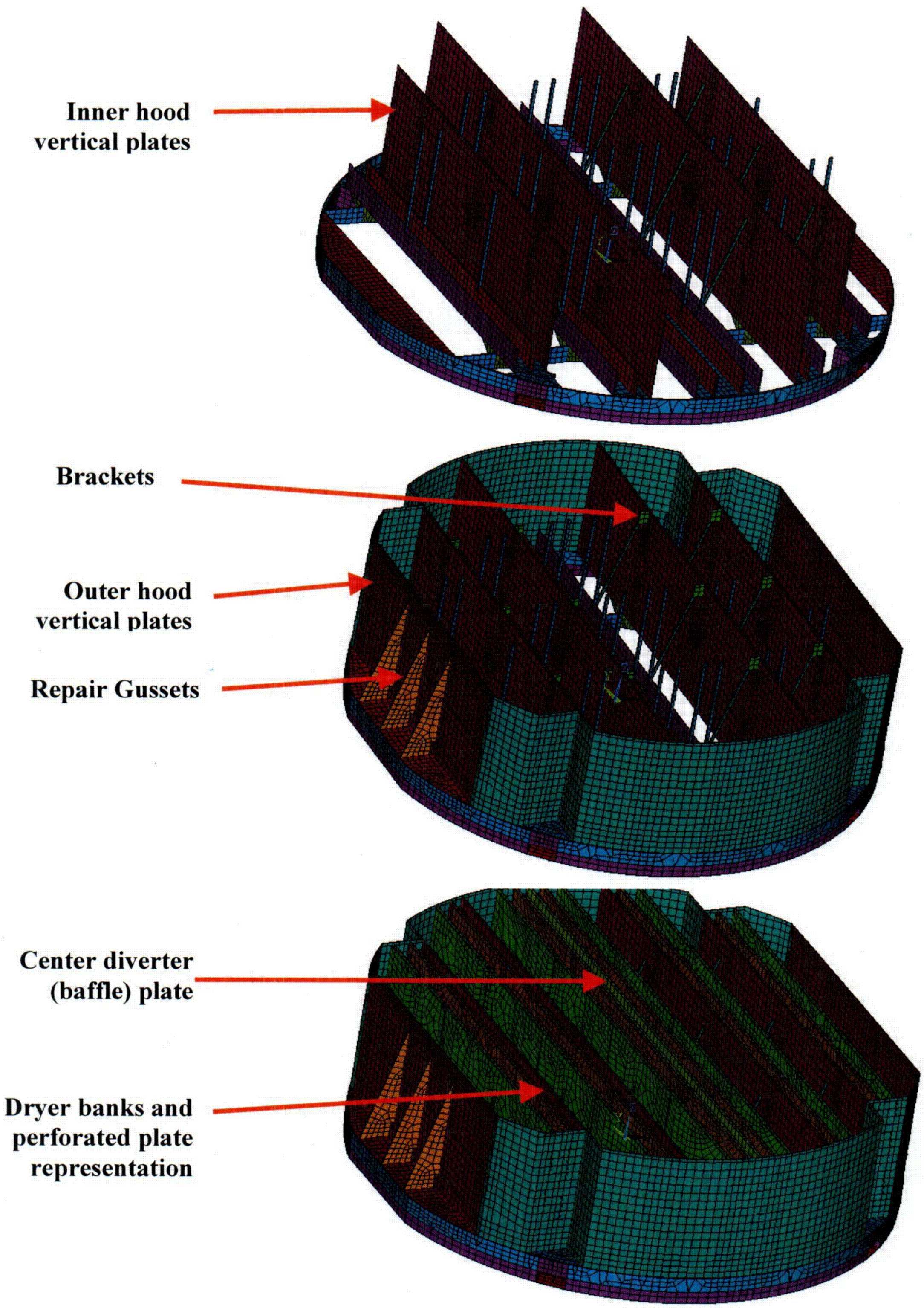

Figure 6-4 2004 Repair Dryer Analysis Model – Dryer banks and hoods

C04

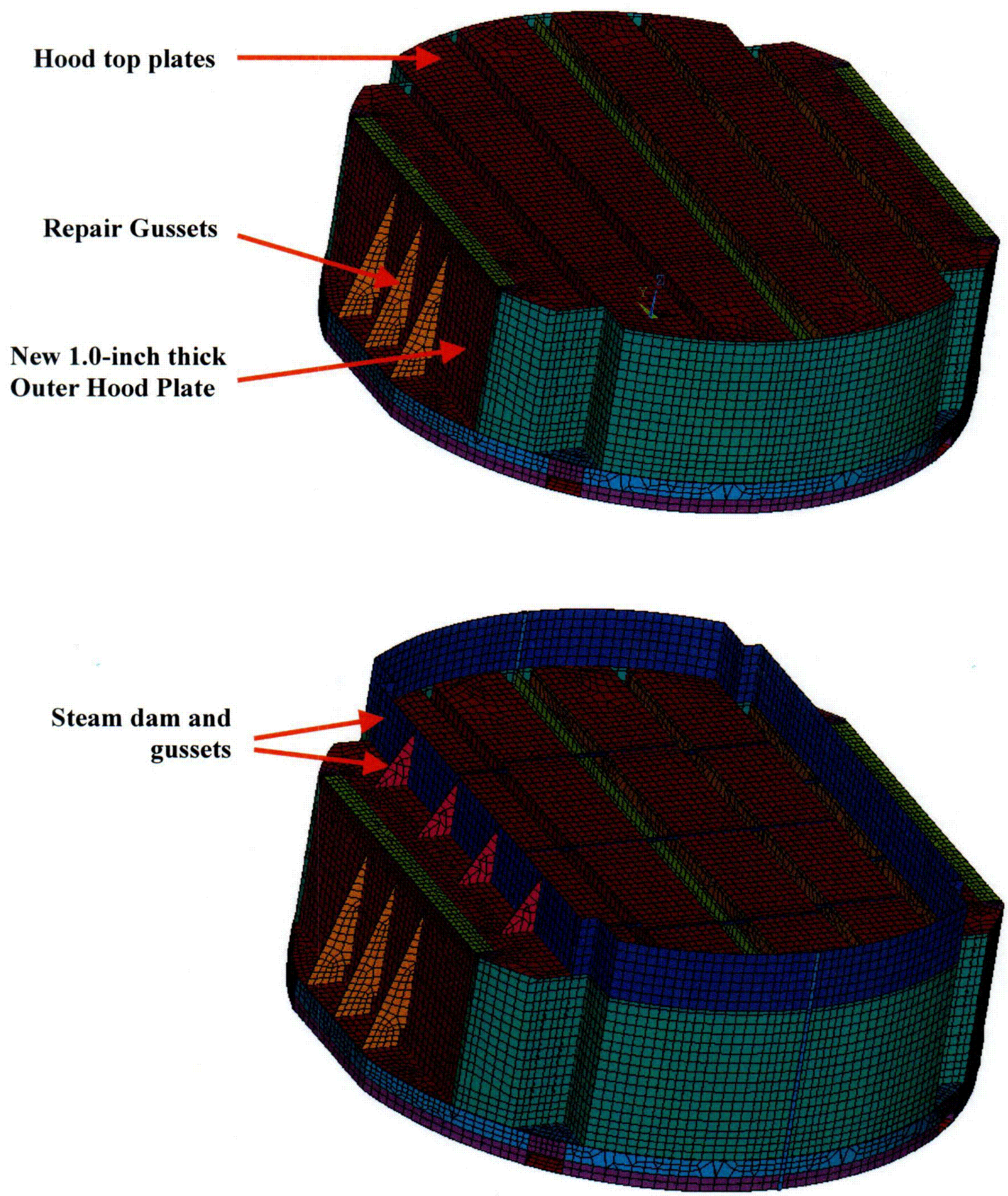

Figure 6-5 2004 Repair Dryer Analysis Model

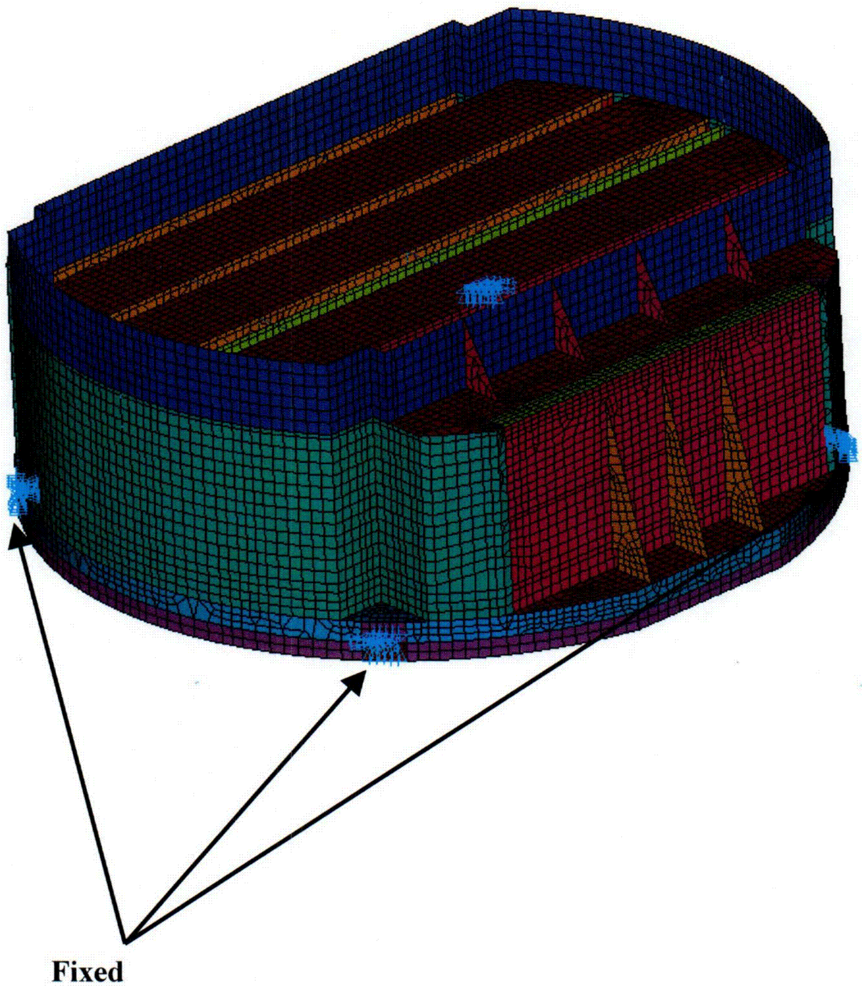

Figure 6-6 Dryer Model Boundary Conditions (same for all configurations)

C06

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Figure 6-7 Maximum and Minimum Pressure (psi), Original Model, SMT Pre-EPU

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Figure 6-8 Applied Pressure (psi) at time of maximum Outer Hood and Cover Plate stress, Original Model, SMT Pre-EPU

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Figure 6-9 Maximum and Minimum Pressure (psi), Original Model, SMT EPU

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Figure 6-10 Applied Pressure (psi) at time of maximum Outer Hood and Cover Plate stress, Original Model, SMT EPU

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Figure 6-11 Maximum and Minimum Pressure (psi), QC2 2003 Model, SMT EPU

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Figure 6-12 Applied Pressure (psi) at time of maximum Outer Hood and Cover Plate stress, QC2 2003 Model , SMT EPU

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Figure 6-13 Maximum and Minimum Pressure (psi), 2004 Model, SMT EPU

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Figure 6-14 Applied Pressure (psi) at time of maximum Outer Hood and Cover Plate stress, 2004 Model , SMT EPU

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Figure 6-15 Maximum and Minimum Pressure (psi), 2004 Model, Plant EPU

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Figure 6-16 Applied Pressure (psi) at time of maximum Outer Hood and Cover Plate stress, 2004 Model , Plant EPU

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Figure 6-17 Pre-EPU Original Dryer SMT Results: Outer Hood

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Figure 6-18 EPU Original Dryer SMT Results: Outer Hood

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Figure 6-19 Comparison between Pre-EPU and EPU Outer Hood Results for the Original Dryer using SMT Loads

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Figure 6-20 EPU Loads from SMT Original Dryer Outer Hood Results: Stress Intensity Comparison between two sides of the dryer

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Figure 6-21 Original Dryer SMT Pre-EPU and EPU: Cover Plate

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Figure 6-22 Original Dryer SMT Pre-EPU and EPU: Inner Hoods

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Figure 6-23 Original Dryer SMT Pre-EPU and EPU: Top Hoods

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Figure 6-24 2003 Repair Dryer SMT Loads at EPU: Outer Hood

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Figure 6-25 2003 Repair Dryer SMT Loads at EPU: Outer Hood Stress Intensity Versus Horizontal Distance from Stress Concentration

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Figure 6-26 2003 Repair Dryer SMT Loads at EPU: Inner Hood

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Figure 6-27 2003 Repair Dryer SMT Loads at EPU: Inner Hood Stress Intensity Versus Horizontal Distance from Stress Concentration

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Figure 6-28 2003 Repair Dryer SMT Loads at EPU: Top Hood

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Figure 6-29 2003 Repair Dryer SMT Loads at EPU: Cover Plate

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Figure 6-30 2003 Repair Dryer SMT Loads at EPU: Gussets

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Figure 6-31 2003 Repair Dryer SMT Loads at EPU: Base Plate

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Figure 6-32 2004 Repair Dryer SMT Loads at EPU: Outer Hood

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Figure 6-33 2004 Repair Dryer SMT Loads at EPU: Outer Hood Stress Intensity Versus Horizontal Distance from Stress Concentration

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Figure 6-34 2004 Repair Dryer SMT Loads at EPU: Inner Hood

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Figure 6-35 2004 Repair Dryer SMT Loads at EPU: Top Hood

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Figure 6-36 2004 Repair Dryer SMT Loads at EPU: Cover Plate

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Figure 6-37 2004 Repair Dryer SMT Loads at EPU: Cover Plate Stress Intensity Versus Horizontal Distance from Stress Concentration

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Figure 6-38 2004 Repair Dryer SMT Loads at EPU: Gussets

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Figure 6-39 2004 Repair Dryer SMT Loads at EPU: Base Plate

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Figure 6-40 2004 Repair Dryer QC2 Plant Loads at EPU: Outer Hood

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Figure 6-41 2004 Repair Dryer QC2 Plant Loads at EPU: Inner Hood

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Figure 6-42 2004 Repair Dryer QC2 Plant Loads at EPU: Top Hood

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Figure 6-43 2004 Repair Dryer QC2 Plant Loads at EPU: Cover Plate

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Figure 6-44 2004 Repair Dryer QC2 Plant Loads at EPU: Cover Plate Stress Intensity Versus Horizontal Distance from Stress Concentration

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Figure 6-45 2004 Repair Dryer QC2 Plant Loads at EPU: Gusset

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Figure 6-46 2004 Repair Dryer QC2 Plant Loads at EPU: Base Plate

ENCLOSURE 2

"Test and Analysis Report, Quad Cities New Design Steam Dryer, Dryer #1 Experimental Modal Analysis and Correlation with Finite Element Results," GENE-0000-0039-5860-01, Revision 1, dated May 2005

ENCLOSURE 2

ATTACHMENT 1

Affidavit and "Test and Analysis Report, Quad Cities New Design Steam Dryer, Dryer #1 Experimental Modal Analysis and Correlation with Finite Element Results," GENE-0000-0039-5860-01-P, Revision 1, GE Proprietary, dated May 2005

General Electric Company

AFFIDAVIT

I, George B. Stramback, state as follows:

(1) I am Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in GE proprietary report, GENE-0000-0039-5860-01-P, *Test and Analysis Report, Quad Cities New Design Steam Dryer, Dryer #1 Experimental Modal Analysis and Correlation with Finite Element Results*, Revision 1, Class III (GE Proprietary Information), dated May 2005. The proprietary information is delineated by a double underline inside double square brackets. Figures and large equation objects are identified with double square brackets before and after the object. In each case, the superscript notation[3] refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a., and (4)b, above.

(5) To address 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains modal analysis and comparisons to finite element model analysis of a BWR Steam Dryer. Development of this information and its application for the design, procurement and analyses methodologies and processes for the Steam Dryer Program was achieved at a significant cost to GE, on the order of two million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 25th day of May 2005.

George B. Stramback
General Electric Company