Alternative Evaluation for the REDOX (202-S) Plutonium Loadout Hood

***Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Environmental Restoration***

Submitted by: Bechtel Hanford, Inc.

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National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

Printed in the United States of America

DISCLM-5.CHP (8-91)

BHI-01299
Rev. 0
OU: N/A
TSD: N/A
ERA: N/A

APPROVAL PAGE

Title: Alternative Evaluation for the REDOX (202-S)
Plutonium Loadout Hood

Approval: J. J. McGuire,
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BHI-DIS done SEP 20 1999

BHI-01299
Rev. 0

Alternative Evaluation for the REDOX (202-S) Plutonium Loadout Hood

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Date Published

September 1999

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1.0 INTRODUCTION

The 100, 200, 300, and 1100 Areas of the Hanford Site were placed on the U.S. Environmental Protection Agency's (EPA) National Priorities List in November 1989 under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). Located in the 200 Areas is the inactive 202-S Reduction Oxidation (REDOX) Facility, which is managed by the Bechtel Hanford, Inc. (BHI) Surveillance/Maintenance & Transition project. This facility is contaminated from nuclear material processes related to nuclear material separation from Hanford Site facility operations.

This alternative evaluation report describes the alternatives and selection criteria based on the necessary protective requirements to maintain the REDOX Plutonium Loadout Hood in a safe and stable condition awaiting a final waste response action.

The U.S. Department of Energy (DOE), Richland Operations Office (RL), in cooperation with the EPA and the Washington State Department of Ecology (Ecology), are directing and managing cleanup of contaminated facilities and waste sites at the Hanford Site. This evaluation compares three alternatives for disposition of the REDOX Plutonium Loadout Hood:

1. No action
2. Stabilization of the interior surfaces of the hood
3. Removal of the hood.

The EPA has verbally instructed that unless complete removal (option 3) of the Plutonium Loadout Hood is selected, a letter report should be prepared documenting the analysis for selection of no action or contaminant stabilization. If complete removal of the hood is chosen, then EPA would require an Engineering Evaluation/Cost Analysis (EE/CA) be prepared.

2.0 PROJECT OBJECTIVE

The objective of this alternative determination document is to provide information about the options for safely dealing with the REDOX (202-S) Plutonium Loadout Hood. These options include the criteria to reduce future risks to the 202-S Facility, workers, and the environment in the event of failure of engineered containment systems at the facility as well as the associated costs.

Three options are considered in this report:

- **First option:** Includes continuing current surveillance and maintenance (S&M) of the hood with continuing routine inspections and radiological surveys.
- **Second option:** Includes stabilizing the hood interior and exterior to prevent potential contamination spread and allow shutdown of the 296-S-2 stack.
- **Third option:** Includes complete removal of the Plutonium Loadout Hood and its attached piping and components and disposal under a CERCLA removal action.

3.0 FACILITY BACKGROUND

The REDOX Facility (202-S), located in the 200 West Area of the Hanford Site, was constructed between 1950 and 1952 and became the first large-scale, continuous-flow, solvent-extraction process plant built in the United States for the recovery of plutonium from irradiated uranium fuel. The extraction process, which replaced the batch precipitation methods first used at the Hanford Site, was designed to separate uranium, plutonium, and neptunium as individual product streams from associated fission products in the irradiated fuel.

The 202-S Facility is a reinforced-concrete structure consisting of the canyon area; the galleries, storage, sample, pipe, operating, and crane cab; the silo area; the east end; and the attached service areas. The building is 142.6 m (468 ft) long and 49 m (161 ft) wide. The canyon area is 25.2 m (83 ft) high, with 18.2 m (60 ft) abovegrade. The silo area is 40.2 m (132 ft) high, with 35.6 m (117 ft) abovegrade. The Plutonium Loadout Hood is located at the west end of the North Sample Gallery (Figure 1). It received plutonium-rich solutions from the REDOX separations process and, in a two-step process, concentrated the solutions in the E-16 pre-concentrator and E-17 concentrator, respectively, to reach the required concentrations. The concentrated solution was transferred from the E-17 concentrator to the product removal cans in 30-L batches for transfer to the 234-5Z Facility for final processing.

The Plutonium Loadout Hood operated from 1951 until 1955 when it was taken out of service and flushed with nitric acid solutions. It was replaced with the 233-S Facility. The REDOX Facility continued to operate until it was shut down in 1967. Deactivation of the facility started in 1967 and was completed in 1969. Since deactivation, S&M operations have been performed at the REDOX Facility.

The Plutonium Loadout Hood (Figure 2, 3, 4, and 5) is composed of a metal frame supporting a series of LexanTM¹ panels. This enclosure isolates the process vessels and piping inside the hood from the North Sample Gallery. The Lexan part of the hood is approximately 2.55 m (8 ft 6 in.) high and sits on a raised concrete curb 15.2 cm (6 in.) high. The topmost 0.6 m (2 ft) of the hood is enclosed by stainless-steel panels. The hood is configured in an "L" shape with the base leg 3.4 m (11 ft) long and 1.5 m (5 ft) wide and the other leg 5.2 m (17 ft) long and 1.5 m (5 ft) wide. Originally, this section of the hood was 6.4 m (21 ft) long, but a section of frame and paneling at the east end was removed, along with the equipment associated with the product removal can, at the completion of loadout hood operations in 1955. A metal panel was used to cover the opening left by removing the east-end section. The two stainless-steel pipes that were originally connected to the equipment that filled the product removal cans, a fill line from the E-17 concentrator and a vacuum return line to the E-21 plutonium transfer trap tank, were cut and now extend outside the enclosure approximately 10 cm (4 in.) from the surface of the metal panel. A 15.2-cm (6-in.) cubical sump, equipped with a vacuum transfer jet, is located at the northwest corner of a depression in the hood. This sump also received drain overflow from the 233-S pipe trenches that have been isolated by the 233-S decommissioning task.

¹ Lexan is a tradename of the General Electric Company, Pittsfield, Massachusetts.

Figure 1. REDOX Sample Gallery Level.

Figure 2. Plutonium Loadout Hood.

Figure 3. Top View of the 202-S Plutonium Loadout Hood.

Figure 4. REDOX Plutonium Loadout Hood.

Figure 5. View Towards the 146 Sampler Box.

The floor of the hood area was built to accommodate several large process vessels. On the base end of the "L," the floor is depressed 1.35 m (4 ft 6 in.) deeper than the floor level in the North Sample Gallery and forms what is called the pit.

The E-16 preconcentrator and E-17 concentrator are located in this depression. A 15.2-cm (6-in.) cubical sump, equipped with a vacuum transfer jet, is located at the northwest corner of this depression. The sump also received drain overflow from the 233-S pipe trenches that have all been deactivated, isolated, and cut.

The major vessels located inside the hood that were used to concentrate plutonium nitrate solutions have all been isolated and are described in Table 1. A detailed description of the REDOX Plutonium Loadout Hood is contained in the Sampling and Analysis Plan (SAP) (DOE-RL 1998). A number of pipes connect the vessels or provide access from utility services such as the steam, vacuum transfer, or cooling water systems.

Table 1. Major Plutonium Loadout Hood Process Vessels.

Vessel Designation ^a	Vessel Use
E-16, Preconcentrator and Tower	First-step concentration of plutonium nitrate solution from E-cell
E-15, Preconcentrator Condenser	Condense E-16 vapors
E-14, Preconcentrator Condenser Receiver Tank	Receives condensed E-16 vapors from the E-15 condenser
E-17, Concentrator and Tower	Second-step concentration of plutonium nitrate solution from E-16 for loadout to the product removal cans
E-18, Plutonium Concentrator Condenser	Condense E-17 vapors
E-19, Plutonium Concentrate Condenser Receiver Tank	Collect E-18 condensed E-17 vapors
E-21, Plutonium Transfer Trap Tank	Collect vacuum transfer plutonium nitrate solutions for rework

^a The hood section that contained the equipment to fill the product removal cans was disassembled and moved to the 233-S Facility in 1955.

4.0 BACKGROUND OF PLUTONIUM LOADOUT HOOD AND EXTENT OF CONTAMINATION

In 1995, a concerted effort between BHI and RL was performed on the REDOX Facility to upgrade the existing electrical system, deactivate three secondary exhaust fans, install the remote monitoring system, and decontaminate the Sample Galleries. These tasks were performed to extend the surveillance frequency from daily to quarterly entries, and reduce the risks to personnel and the environment. The activities accomplished in the decontamination efforts in the North Sample Gallery included removal of loose contamination, removal of excess equipment and supplies, and sealing of the sampler boxes that were originally used in support of plant operations from 1952 to 1969. An isolation wall (false wall) was also constructed at

Section D of the North Sample Gallery to isolate the alpha contamination that had historically been found adjacent to the Plutonium Loadout Hood. During the following investigation and decontamination, the 146 Sampler Box located directly behind the east end of the Plutonium Loadout Hood was discovered to be highly contaminated with loose alpha from an apparent leak from a valve on the L-16 to H-4 transfer line. A criticality evaluation of the 146 Sampler Box was conducted and numerous briefings with the RL Assistant Manager for Environmental Management were held. In addition, an nondestructive analysis of the line and Plutonium Loadout Hood was performed to define the quantity and type of fissile material contained within the hood and adjacent lines. Information from this investigation recommended that BHI pursue a characterization of the hood.

The initial-phased characterization of the REDOX Plutonium Loadout Hood was conducted in accordance with the requirements of BHI Field Support Work Package No. 19980325002, *202-S Plutonium Loadout Hood Sampling*. Prior to initiating work, a readiness assessment was conducted and the successful completion is documented in the *Readiness Assessment Report for the REDOX Plutonium Loadout Hood* (BHI 1998b). Contamination levels are presented in Tables 2, 3, and 4.

Because it was expected that the levels of loose alpha surface contamination greater than 1×10^6 dpm/ 100 cm², all access into the Plutonium Loadout Hood required the use of glovebags as the engineered barrier. The hood was maintained at a slightly negative pressure relative to the North Sample Gallery, thus ensuring that sampling personnel were physically isolated from the alpha inventory contained within the hood. The sample analysis was performed by the 222-S Laboratory in accordance with the *Letter of Instruction for the Sample Analysis of the Reduction Oxidation Facility 9202-S) Plutonium Loadout Hood* (BHI 1998a). A discussion of the sample collection activities and laboratory analysis results is provided in *Interim Characterization Report for the REDOX Plutonium Loadout Hood* (BHI 1999), Sections 4.1 and 4.2, respectively. A sample of the L-16 Leak Area, Sample Box 146 exterior to the hood was taken. The following tables document the results of this characterization.

Table 2. Plutonium Loadout Hood Sump Sludge Multiphase Sample Results. (3 Pages)

HEIS Sample Number B0PC23		
Analyte	Liquid Phase	Solid Phase
Gross Alpha	2.39E+01	6.91E+01 μ Ci/g --
Gross Beta	4.70E+00 μ Ci/mL	7.49E+00 μ Ci/g --
Strontium-90	2.92E-04 μ Ci/mL	3.47E-04 μ Ci/g J --
Cobalt-60	9.40E-06 μ Ci/mL U	2.61E-04 μ Ci/g U --
Antimony-125	4.18E-05 μ Ci/mL U	6.88E-04 μ Ci/g U --
Cesium-134	9.75E-06 μ Ci/mL U	2.24E-04 μ Ci/g U --
Cesium-137	1.38E-03 μ Ci/mL	2.82E-03 μ Ci/g --
Europium-152	1.42E-04 μ Ci/mL U	5.97E-04 μ Ci/g U --
Europium-154	2.49E-05 μ Ci/mL U	8.11E-04 μ Ci/g U --
Europium-155	4.54E-04 μ Ci/mL U	5.93E-04 μ Ci/g U --

Table 2. Plutonium Loadout Hood Sump Sludge Multiphase Sample Results. (3 Pages)

HEIS Sample Number B0PC23				
Analyte	Liquid Phase		Solid Phase	
Radium-226	3.73E-04 $\mu\text{Ci/mL}$ U		5.43E-03 $\mu\text{Ci/g}$ U	--
Actinium-228	3.90E-05 $\mu\text{Ci/mL}$ U		1.44E-03 $\mu\text{Ci/g}$ U	--
Americium-241 (GEA)	1.24E+01 $\mu\text{Ci/mL}$		8.93E+00 $\mu\text{Ci/g}$	--
Neptunium-237	1.84E-04 $\mu\text{Ci/mL}$ U		2.20E-02 $\mu\text{Ci/g}$	--
Plutonium-238	7.67E-01 $\mu\text{Ci/mL}$ U		3.40E+00 $\mu\text{Ci/g}$ U	--
Plutonium-239/240	1.29E+01 $\mu\text{Ci/mL}$		7.71E+01 $\mu\text{Ci/g}$	--
Americium-241	1.14E+01 $\mu\text{Ci/mL}$		1.02E+01 $\mu\text{Ci/g}$	--
Curium-243/244	9.28E-01 $\mu\text{Ci/mL}$ U		1.07E+00 $\mu\text{Ci/g}$ U	--
Silver	5.10E+00 $\mu\text{g/mL}$ U		--	TCLP Ag 1.67E-01 $\mu\text{g/mL}$ U
Arsenic	5.10E+01 $\mu\text{g/mL}$ U		--	TCLP As 1.67E+00 $\mu\text{g/mL}$ U
Barium	2.55E+01 $\mu\text{g/mL}$ U		--	TCLP Ba 8.33E-01 $\mu\text{g/mL}$ U
Cadmium	2.44E+02 $\mu\text{g/mL}$		1.47E+02 $\mu\text{g/g}$	TCLP Cd 4.32E+00 $\mu\text{g/mL}$
Chromium	2.33E+04 $\mu\text{g/mL}$		1.63E+04 $\mu\text{g/g}$	TCLP Cr 4.22E+02 $\mu\text{g/mL}$ J
Iron	5.01E+02 $\mu\text{g/mL}$		2.29E+04 $\mu\text{g/g}$	--
Nickel	3.86E+02 $\mu\text{g/mL}$		2.52E+02 $\mu\text{g/g}$	--
Lead	5.10E+01 $\mu\text{g/mL}$ U		4.15E+01 $\mu\text{g/g}$ J	TCLP Pb 1.67E+00 $\mu\text{g/mL}$ U
Selenium	5.10E+01 $\mu\text{g/mL}$ U		--	TCLP Se 1.67E+00 $\mu\text{g/mL}$ U
Mercury	1.46E+02 $\mu\text{g/mL}$		1.19E+02 $\mu\text{g/g}$	TCLP Hg 5.31E+00 $\mu\text{g/mL}$ J
Fluoride	2.03E+02 $\mu\text{g/mL}$ J		1.71E+02 $\mu\text{g/g}$ J	--
Chloride	4.68E+03 $\mu\text{g/mL}$		3.61E+03 $\mu\text{g/g}$	--
Nitrite	1.10E+03 $\mu\text{g/mL}$ U		8.73E+02 $\mu\text{g/g}$ U	--
Nitrate	4.44E+05 $\mu\text{g/mL}$		3.53E+05 $\mu\text{g/g}$	--
Phosphate	1.22E+03 $\mu\text{g/mL}$ U		9.70E+02 $\mu\text{g/g}$ U	--
Sulfate	5.60E+04 $\mu\text{g/mL}$		7.83E+04 $\mu\text{g/g}$	--
Oxalate	1.98E+03 $\mu\text{g/mL}$ J		1.37E+03 $\mu\text{g/g}$ J	--
Aroclor -1016	6.00E-02 $\mu\text{g/mL}$ UJ		3.30E-01 $\mu\text{g/g}$ UJ	--
Aroclor -1221	6.00E-02 $\mu\text{g/mL}$ UJ		3.30E-01 $\mu\text{g/g}$ UJ	--
Aroclor -1232	6.00E-02 $\mu\text{g/mL}$ UJ		3.30E-01 $\mu\text{g/g}$ UJ	--
Aroclor -1242	6.00E-02 $\mu\text{g/mL}$ UJ		3.30E-01 $\mu\text{g/g}$ UJ	--
Aroclor -1248	6.00E-02 $\mu\text{g/mL}$ UJ		3.30E-01 $\mu\text{g/g}$ UJ	--
Aroclor -1254	5.71E-02 $\mu\text{g/mL}$ J		2.21E-01 $\mu\text{g/g}$ J	--
Aroclor -1260	6.00E-02 $\mu\text{g/mL}$ UJ		3.30E-01 $\mu\text{g/g}$ UJ	--
Hexone	2.56E+00 $\mu\text{g/mL}$ UJ		2.20E-02 $\mu\text{g/g}$ UJ	--
Asbestos	--		No solids remained from digestion, no asbestos-like material for analysis.	
Resin bead	--		No solids remained from digestion, no resin bead-like material for analysis.	

Table 2. Plutonium Loadout Hood Sump Sludge Multiphase Sample Results. (3 Pages)

HEIS Sample Number B0PC23			
Analyte	Liquid Phase		Solid Phase
Density	1.53	G/mL	1.55 g/mL
Vol %	74.3	%	25.7 %

U = Nondetectable

J = Estimated

Table 3. Tank E-17 Process Piping Leach Sample Results. (2 Pages)

HEIS Sample Number B0PC22		
Analyte	Liquid Phase	
Gross alpha	2.15 E-01 μ Ci/mL	
Gross beta	7.44 E-03 μ Ci/mL	
Strontium-90	9.65 E-05 μ Ci/mL	
Cobalt-60	7.06 E-07 μ Ci/mL	U
Antimony-125	1.90 E-06 μ Ci/mL	U
Cesium-134	5.92 E-07 μ Ci/mL	U
Cesium-137	1.61 E-06 μ Ci/mL	U
Europium-152	1.79 E-06 μ Ci/mL	U
Europium-154	1.83 E-06 μ Ci/mL	U
Europium-155	2.80 E-06 μ Ci/mL	U
Radium-226	1.26 E-05 μ Ci/mL	U
Actinium-228	3.45 E-06 μ Ci/mL	U
Americium-241 (GEA)	1.05 E-02 μ Ci/mL	
Neptunium-237	1.66 E-05 μ Ci/mL	U
Plutonium-238	1.08 E-02 μ Ci/mL	U
Plutonium-239/240	2.65 E-01 μ Ci/mL	
Americium-241	1.03 E-02 μ Ci/mL	
Curium-243/244	1.32 E-03 μ Ci/mL	U
Cadmium	5.00 E-03 μ g/mL	U
Chromium	9.61 E+00 μ g/mL	U
Iron	4.28 E+01 μ g/mL	U
Nickel	1.25 E+01 μ g/mL	U
Lead	1.00 E-01 μ g/mL	U
Mercury	1.00 E-02 μ g/mL	U
Total Leachate Volume	198 mL	

U = nondetectable

J = estimated

Table 4. Plutonium Loadout Hood Technical Smear Sample Results.

Smear Location: HEIS Sample #	Tank E19 B0PC24	Tank E16 B0PC25	Tank E21 B0PC26	Hood Floor Between E19 and E12 B0PC27	Tank E17 B0PC28	L-16 Leak Area Sample Box 146 B0PK78
$\mu\text{Ci per sample}$						
Gross alpha	2.38 E+00 J	2.98 E+00	3.66 E-01	6.24 E-02	6.78 E-01	5.34 E+01
Gross beta	2.39 E-01 J	2.69 E-01 J	3.45 E-02 J	5.44 E-03 J	4.82 E-02	4.29 E+00
Strontium-90	2.43 E-05 J	1.98 E-05 J	7.17 E-06 U	1.11 E-05 U	6.30 E-06 U	2.17 E-05
Cobalt-60	2.00 E-04 U	1.86 E-04 U	6.44 E-05 U	5.87 E-05 U	6.60 E-05 U	6.47 E-05 U
Antimony-125	6.11 E-04 U	6.31 E-04 U	1.71 E-04 U	1.61 E-04 U	1.65 E-04 U	1.69 E-04 U
Cesium-134	2.04 E-04 U	2.10 E-04 U	5.42 E-05 U	5.47 E-05 U	5.42 E-05 U	5.52 E-05 U
Cesium-137	2.67 E-04 U	2.70 E-04 U	7.91 E-05 U	7.44 E-05 U	7.56 E-05 U	7.54 E-05 U
Europium-152	5.53 E-04 U	5.35 E-04 U	1.32 E-04 U	1.33 E-04 U	1.35 E-04 U	1.54 E-04 U
Europium-154	6.28 E-04 U	6.14 E-04 U	2.04 E-04 U	1.87 E-04 U	2.05 E-04 U	1.98 E-04 U
Europium-155	4.38 E-04 U	4.47 E-04 U	1.00 E-04 U	9.62 E-05 U	9.81 E-05 U	1.98 E-04 U
Radium-226	4.74 E-03 U	4.77 E-03 U	1.31 E-03 U	1.28 E-03 U	1.29 E-03 U	1.33 E-03 U
Actinium-228	1.19 E-03 U	1.20 E-03 U	3.61 E-04 U	3.58 E-04 U	3.55 E-04 U	3.57 E-04 U
Americium-241 (GEA)	4.01 E-01	4.13 E-01	5.35 E-02	9.10 E-03	9.10 E-02	5.25 E+00
Neptunium-237	1.30 E-03 U	1.83 E-03 U	1.68 E-03 U	9.37 E-04 U	1.19 E-03 U	1.87 E-03 U
Plutonium-238	1.37 E-01 U	1.76 E-01 U	2.40 E-02 U	4.64 E-03 U	4.05 E-02 U	5.65 E+00 J
Plutonium-239/240	2.66 E+00	3.24 E+00	3.98 E-01	6.52 E-02	7.19 E-01	3.58 E+01
Americium-241	3.68 E-01	3.87 E-01	6.35 E-02	1.02 E-02	1.09 E-01	2.41 E+01
Curium-243/244	7.06 E-02 U	6.84 E-02 U	1.13 E-02 U	1.90 E-03 U	1.34 E-02 U	3.48 E+00 U

U = Nondetectable

J = Estimated

Field instrument readings (DPM alpha) taken from the hood:

6.00 E+04 top 5.20 E+06 top 1.35 E+05 top 4.50 E+05 6.00 E+05 top 3.00 E+06
6.00 E+04 side 2.70 E+05 side 1.80 E+05 side 3.60 E+05 3.00 E+05 side
8.70 E+05
4.50 E+05

Contaminants found within the Plutonium Loadout Hood interior surfaces, sump, technical smears, and tank E-17 process piping leachate include the following (per BHI 1999):

- strontium-90
- cobalt-60
- antimony-125
- cesium-134
- cesium-137
- europium-152
- cadmium
- nickel
- mercury
- nitrite
- sulfate
- europium-154
- europium-155
- radium-226
- actinium-228
- americium-241
- neptunium-237
- chromium
- lead
- fluoride
- nitrate
- oxalate
- plutonium-239/240
- americium-241
- curium-243/244
- silver
- arsenic
- barium
- iron
- selenium
- chloride
- phosphate
- aroclor-1016

- aroclor-1221
- aroclor-1232
- aroclor-1242
- aroclor-1248
- aroclor-1254
- aroclor-1260
- hexone.

Quantities detected can be reviewed in BHI (1999).

This alternative study is the next progression in the RL decision process that continues the efforts started in 1995, to ensure that the ERC continues to define, evaluate, and mitigate the identified risks that are posed by these plants and the inventories that are contained within them. The Plutonium Loadout Hood is the second in a series of plutonium-containing structures that need to be evaluated and have an action plan established that will minimize the effects of this inventory on personnel and the environment.

4.1 SAMPLE COLLECTION

This section provides a summary of the actual samples collected with their associated HEIS identifying number. In addition, quality-controlled (QC)-required samples used to assess possible cross-contamination of samples from the equipment used or during movement to the laboratory were collected using deionized water.

Samples consisted of one sample (two phases) recovered from the hood sump, one section of process line pipe, five technical smear samples taken from surfaces within the hood, and one technical smear sample taken from a suspected contaminated area outside of the hood. All samples were collected and packaged in accordance with Work Package 19980325002 and controlled as required from the point of origin to the analytical laboratory as required by BHI-EE-01, *Environmental Investigations Procedures*, EIP 3.0, "Chain of Custody."

The radiological conditions within the Plutonium Loadout Hood are summarized in BHI (1999) and are consistent with initial planning and historical data. The removable alpha contamination ranged between 3×10^5 dpm/100 cm² and 6.7×10^6 dpm/100 cm on top of the 146 sampler tank. It was determined that the sump contained a wet sludge rather than the expected dry sludge. In each case, the work package was revised to account for the change. A brief discussion of each case is provided in Sections 4.1.

4.2 CONTAMINATION SPREAD POTENTIAL

Radiological contamination has not been detected to have spread from the Plutonium Loadout Hood facility to adjoining areas within the REDOX Facility. Piping connecting the 233-S Facility to the Plutonium Loadout Hood has been cut, which further isolates the potential for contaminants from the Plutonium Hood facility spreading to other areas of the REDOX Facility.

The use of bio-indicators can be used to help determine the release of radiological contaminants. Uptake of radionuclide contaminants by the ecosystem is dependent upon the specific contaminants, soil chemistry, plant species, and animal or insect species. In general, radionuclides of a high atomic number are discriminated against by plant or animal uptake. Uranium and plutonium generally do not move readily through the food chain (due to low

ecological mobility) and are highly poisonous to humans. Cesium-137 and strontium-90 are readily absorbed by plants and through the food chain and are less poisonous to humans. The potential risk of Plutonium Loadout Hood contaminants being spread to the environment or to workers depends upon the continued integrity of the current containment and ventilation system.

4.3 PUBLIC ACCESS AND LAND USE

Public access to the 200 Area on the Hanford Site is currently restricted. The current land use consists of waste management and cleanup activities. For the purposes of conducting cleanup activities, the land areas have been grouped into operable units. An operable unit is an area of land that contains similar types of facilities and waste sites. The REDOX Facility is in the 200-RO-3 Operable Unit and any selection of alternatives for the Plutonium Loadout Hood will not change this.

4.4 SAFEGUARDS AND SECURITY

Currently, the REDOX Facility is classified as a Hazard Category 2 nuclear facility. A letter requesting disposition of the remaining special nuclear material inventory as normal operating loss has been approved by RL (BHI 1995). If during S&M of the REDOX Facility, any item or container is found that may be suspected to contain special nuclear material, notification would be made to RL and BHI management.

During S&M, the REDOX Facility and most of the ancillaries are unoccupied, locked, and/or sealed. A chain-link perimeter fence with locked access gates deters physical access. Entry into the REDOX Facility fenced areas and buildings is limited to authorized personnel with proper training. Signs are posted accordingly throughout the facility identifying restricted access. The facility is entered only for S&M activities. Access control for REDOX and other surplus facilities is described in BHI-FS-01, *Field Support Administration*, Section 1.1, "Access Control and Administration for ERC Facilities."

There are no intrusion alarms or routine security patrols within the perimeter fence of the REDOX Facility. Hanford Patrol continues to provide routine security patrols in the vicinity as part of their patrols throughout the 200 West Area. The Benton County Sheriff provides routine traffic patrol throughout the Hanford Site.

4.5 SEISMIC RISK

Seismic studies prepared in support of the *REDOX Facility Safety Analysis Report* (Kerr 1998) focused on a relatively weak portion of the canyon structure. A narrow cross section of the wall that supports the canyon roof was found to be susceptible to a relatively low-energy seismic event (0.054 g horizontal). The evaluations concluded that the canyon roof could fall into the canyon. Evaluations of the canyon deck concluded that the deck structures could survive the combined loads of an earthquake and drop off the roof structures and onto the deck. However, it was assumed that the north gallery structures of the 202-S Building (e.g., North Operating Gallery, North Pipe Gallery, and North Sample Gallery) would fail under the combined loads of

the earthquake and drop of the canyon roof structures. In 1999, an additional seismic evaluation (Rajagopal 1999) of the north gallery structures was prepared because significant dose consequences were postulated from release of inventory of the Plutonium Loadout Hood that is located in the North Sample Gallery of the 202-S Building.

The seismic evaluation (Rajagopal 1999--see Appendix A) evaluated the potential impacts of an earthquake load of a design/evaluation basis earthquake of 0.20 g horizontal with a two-thirds simultaneous vertical load (DOE Order 5420.28). While damage from the earthquake was postulated, the damage to the North Sample Gallery and the Plutonium Loadout Hood was found to be relatively minor. Consequently, the estimated dose consequence of the REDOX Safety Analysis Report (Kerr 1998) that assumed a significant release from the Plutonium Loadout Hood was erroneously considered as a risk contributor of a relatively low-level earthquake as well as from a more significant design/evaluation basis earthquake. Therefore, it is concluded that inventory within the Plutonium Loadout Hood does not pose a significant release threat because of earthquakes. Engineering analysis has determined that no bracing of the floor holding the Plutonium Loadout Hood is required.

4.6 PLUTONIUM LOADOUT HOOD INVENTORY

Nondestructive analysis (NDA) of the Plutonium Loadout Hood was performed in late 1996 and early 1997. A report summarizing the NDA (BHI 1997) documented the estimated residual inventory within the Plutonium Loadout Hood and related components.

In 1999, sampling within the Plutonium Loadout Hood was performed to verify the radiological inventory that was documented in BHI (1997). Evaluation of the sample data (Gonsky 1999 to be reported in the Safety Evaluation for the REDOX Plutonium Loadout Hood currently in draft) concluded that the assumptions and conclusions of the NDA are reasonably accurate. Relatively minor amounts of plutonium reside in surface contamination of the interior surface of the hood enclosure, floor area of the hood, and the sump within the hood. The vast majority of the plutonium residual is within the piping and vessels of the Plutonium Loadout Hood especially, in the E-16 Pre-Concentrator and E-17 Concentrator. Table 5 summarizes the plutonium content of hood.

Table 5. Estimate Of Plutonium Holdup

Component	Plutonium* (grams)	Error factor (percent/grams)	Total (grams)
Loadout Hood Sump	2.5	1.5/0.04	2.54
Floor Area	0.36	2.8/0.01	0.37
E-16 Pre-Concentrator	1450	10/145	1595
E-17 Concentrator	650	10/65	715
Pipe-trench drain line (1-inch drain)	2.0	45/0.9	2.9

*All plutonium is assumed to be plutonium-239. The lack of samples precludes accurate conclusions of isotopic distribution within the piping and vessels.

The isotopic fractions within the piping and vessels of the Plutonium Loadout Hood have not been characterized with any statistical significance. One sample of the piping that led to the former product loadout vessel was taken. The results of that sample tend to support the assumptions of BHI (1997) (e.g., weapons-grade plutonium is assumed). The surface contamination in the sump, on the surfaces of the vessels, and on the floor within the Plutonium Loadout Hood does not appear to be of weapons-grade sources. It is likely that these contaminants are from the deactivation of connecting waste lines and systems that are outside of the Plutonium Loadout Hood.

5.0 REMOVAL ACTIONS ALTERNATIVES

The alternatives presented only apply to the Plutonium Loadout Hood and the L-16 to the H-4 process line.

5.1 CONTINUED SURVEILLANCE AND MAINTENANCE ACTION

The no-action alternative consists of conducting routine inspections and radiological surveys at the Plutonium Loadout Hood. The inspections would be conducted to determine water infiltration into the hood, general condition of the hood, and routine smears of contaminants outside of the hood. Under this alternative, current S&M activities will be taken to maintain the Plutonium Loadout Hood and to prevent release of contaminants or hazardous substances and do no other actions except in an emergency basis. The current hood and ventilation system prevents spread of contaminants and would continue to receive regular schedule maintenance and testing. The 296-S-2 stack would continue to have routine flow testing, quarterly filter changes on the stack pack or when work is done on the hood, and radiological emissions would be calculated as part of the Hanford Site radioactive emissions. There would be no action taken to remove the L-16 to H-4 2.54-cm- (1-in.-) line leading to Sampler Box 146 which has had "drips" from leaky flanges that has lead to posting of airborne contamination in the REDOX North Sample Gallery area.

5.2 INTERIM STABILIZATION

The stabilization alternative consists of spraying a fixative to the exterior surfaces of the hood to fix contaminants in place. A Lexan panel will then be removed and the interior of the hood sprayed with an approved acrylic fixative (such as Bartlett^{TM2}) on all exposed surfaces. A glove bag that was used to fit over the Lexan opening for characterization of the hood could be used to spray the fixative. To prevent any disturbance of the contents in the sump during fixative spraying, only a hand-pump sprayer or low-volume airless sprayer would be used to prevent redistribution of unfixed contamination. The L-16 to H-4 2.54-cm (1-in.-) line leading to the Sampler Box would be removed, flanges removed, and capped to prevent any further "drips". This would remove the current airborne potential within the REDOX North Sample gallery.

² Bartlett is a tradename of Polymeric Barrier Systems, Plymouth, Massachusetts.

Since the hood sump is in the lowest depression of the hood and leads to piping to the REDOX Facility, any liquid (if present) currently in the sump would be removed if possible, or capped with a grout. The sump would be applied with a self-leveling cementitious grout mixture to fix contaminants and prevent no further moisture moving past the sump. Grouting of the sump in place with its contents or removal of the sump contents will require the removal of a Lexan panel.

The inventory release potential for the hood after stabilization will be recalculated using CAP-88C and the results will be provided to the EPA and the Washington State Department of Health. The CAP-88C model is approved by the EPA to estimate unabated emissions to the air. If the results show that the release potential is minimal and regulatory approval is agreed upon, then the 296-S-2 stack can be deactivated, capped, and blanked. At this point, no continued maintenance of the stack will be required except for yearly inspections of the stack cap and damper to ensure their integrity.

Any hazardous substances generated would need to be identified as transuranic (TRU) or non-TRU mixed waste. Both TRU and non-TRU contaminated waste would also be designated as mixed waste and would need to be sent to the Hanford Site Central Waste Management Complex (CWMC).

5.3 COMPLETE REMOVAL

This alternative involves complete removal of the Plutonium Loadout Hood and all internal components and exhaust system independent of a final regulatory decision on the REDOX Facility. The L-16 to H-4 line leading the 146 sampler box would also be removed. This option would require completion and approval by the lead regulatory agency (EPA) of an EE/CA as a decision document for this alternative. Waste shipments would be coordinated with the Environmental Restoration Disposal Facility planning personnel and EPA to avoid negatively impacting remedial actions at other sites in accordance with previously established milestones through the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1998).

The regulatory and approval process will be similar to the Process Hood removal planned for the 233-S Facility. The 233-S project provides an excellent experience base for this type of removal activity. The contamination levels are the same for the REDOX Plutonium Loadout Hood but the required work discipline and vigor is the same. A comprehensive safety analysis review will be required along with a extensive readiness review and approval by RL. In addition, an air monitoring plan would be required to ensure emissions from this action are estimated and documented to a level of <0.1 mrem per year to an estimated offsite individual.

Additionally, at least some of the waste and liquids generated from removal of the sump and process vessels would be TRU and hazardous waste designated materials. This waste would only have a storage option at CWMC with EPA approval. The EE/CA would also require non-TRU waste to have EPA approval to dispose of mixed waste components in accordance with the *Environmental Restoration Disposal Facility Waste Acceptance Criteria* (BHI 1998c). Currently, polychlorinated biphenols (PCB) are known to be present in paint and debris within the Plutonium Loadout Hood. Any other offsite facilities that could be utilized would require EPA approval. Waste shipments would be coordinated with ERDF planning personnel and EPA

to avoid negatively impacting remedial actions at other sites in accordance with previously established milestones through the Tri-Party Agreement (Ecology et al. 1998).

6.0 IDENTIFICATION OF STANDARDS AND REQUIREMENTS

Applicable or relevant and appropriate requirements (ARAR) are standards, requirements, criteria, or limitations promulgated under federal or state environmental laws that must be met or waived for actions conducted under CERCLA. Only the substantive provisions of requirements that are ARAR must be met (or waived) for actions conducted entirely onsite (CERCLA Sec. 121(d)(2)). To be considered materials, there are nonpromulgated standards that may be referenced to the extent necessary for the response action to be adequately protective of DOE orders, proposed regulations, and nonpromulgated regulatory guidance and interpretation.

The existing authorization basis documents for the REDOX facility to conduct current S&M and interim stabilization alternative includes waste management standards, air emission control standards and permit, radiation control standards, and waste disposal standards. Other standards including worker protection standards, DOE orders, and historical protection of artifacts and resources must be followed.

6.1 WASTE MANAGEMENT STANDARDS

The *Resource Conservation and Recovery Act of 1976* (RCRA) regulates managing and disposing of hazardous (and dangerous) waste. Authority for much of the federal RCRA program has been delegated to Washington State. Implementing state regulations contained in *Washington Administrative Code* (WAC) 173-303 requires identification and appropriate management of dangerous wastes and dangerous components of mixed wastes, and establishes standards for treatment, storage, and disposal of these wastes. Federal RCRA requirements pertaining to hazardous wastes are identified in 40 CFR 260 through 270. Federal and state RCRA requirements are applicable to any wastes managed (i.e., the physical disruption of waste residing in waste sites) as part of the stabilization alternative that meet the regulatory definition of hazardous (dangerous) or mixed waste. These regulations are applicable to all of the alternatives.

The most probable application of these requirements would be to the onsite storage of any newly containerized dangerous wastes within a waste site boundary. Pertinent standards for these storage activities are identified in WAC 173-303-630, and include requirements for waste container compatibility, container identification, container management, inspection of storage areas, segregation of incompatible wastes, and provision of secondary containment for containers holding liquid dangerous wastes.

WAC 173-304 requires identification and appropriate management of solid wastes. It is applicable to any solid waste that is generated as part of the stabilization alternative. Solid, dangerous, low-level, and/or mixed waste may be managed as waste undergoing stabilization. Actions proposed to manage such waste would be designed to satisfy waste management ARAR. Wastes that must be managed per these ARAR are those materials residing in waste sites that are

physically disturbed during stabilization activities. All wastes would be evaluated and managed in compliance with the appropriate requirements. Prior to disposal, dangerous, low-level, or mixed wastes would be managed in a protective environment with filtered ventilation to prevent releases to the environment or exposure to workers.

It is anticipated that non-TRU waste managed during the removal option would satisfy the waste acceptance criteria for ERDF (BHI 1998c). The ERDF is engineered to meet RCRA landfill performance standards under 10 CFR 61 for disposal of low-level and mixed wastes. Any TRU liquid or solid wastes are anticipated to be defined as having mixed waste characteristics and the only storage option available is through the Hanford Site CWMC with its acceptance criteria.

6.2 AIR EMISSION CONTROL STANDARDS

The *Clean Air Act of 1955* regulates both toxic and radioactive airborne emissions. Under implementing regulations found in 40 CFR 61, Subpart H, and WAC 246-247, radionuclide airborne emissions from all combined operations at the Hanford Site may not exceed 10 mrem per year to the offsite maximally exposed individual. WAC 246-247 requires verification of compliance, typically through periodic confirmatory air sampling. WAC 173-400 establishes requirements for controlling and preventing the emission of air contaminants, including dust. These regulations are applicable to all of the alternatives.

The radionuclide emission standards would apply to any fugitive, diffuse, and point-source air emissions of radionuclides generated under the stabilization or removal alternatives. If the potential exists for any nonzero radioactive emissions, best available radionuclide control technology would be required. If activities generate an increase of toxic air pollutants to the atmosphere above the small quantity emission rates, implementation of best available control technology for toxics would be required.

6.3 PROTECTION STANDARDS

Occupational Radiation Protection (10 CFR 835) establishes radiation protection standards, limits, and program requirements for protecting workers and visitors from ionizing radiation resulting from the conduct of DOE activities. It also requires that measures be taken to maintain radiation exposure as low as reasonably achievable. This regulation is applicable to activities associated with all of the alternatives.

6.4 POLYCHLORINATED BIPHENYLS

The *Toxic Substances Control Act of 1976* (TSCA) and WAC 173-303 regulates the management and disposal of PCB and PCB wastes. Implementation regulations in 40 CFR 761 contain requirements for management of waste, spills, and cleanup of PCB-contaminated paint and debris. The ERDF is authorized to accept certain PCB waste for disposal. Implementation in 40 CFR 761.62(b)(1)(I) allows for applied paint to be disposed of in solid waste landfills permitted, licensed, and registered by the EPA or designated agency. Any PCB waste that does not meet the ERDF waste acceptance criteria would require prior approval by EPA to be sent to

another approved PCB storage area, including the CWMC, that meets the substantive requirements of TSCA and would be disposed at a TSCA-approved disposal facility. These regulations apply to the removal alternative and the interim stabilization (if the sump contents are removed).

6.5 ENVIRONMENT, SAFETY, AND HEALTH STANDARDS

Worker protection standards are described in Occupational Safety and Health Administration (OSHA) regulations, national consensus standards, and DOE Orders (e.g., 29 CFR 1910, 29 CFR 1926, NFPA 990, WAC 29662, and DOE Order 5400.5 *Radiation Protection of the Public and Environment*). Exposure limits, personnel protection requirements, and decontamination methods for hazardous chemicals are established in 29 CFR 1910. The 29 CFR 1910 also requires identification and mitigation of physical hazards posed by a facility to workers including (but not limited to) confined spaces, falling hazards, fire, and electrical shock. The 29 CFR 1926 provisions establish requirements for worker safety during construction activities. Known and suspected chemical inventories in each site will be screened during the design phase against the criteria of DOE-STD-1027-92 (DOE 1992) to determine the appropriate requirements for environmental, safety, and health requirements. These regulations apply to all of the alternatives.

7.0 EVALUATION OF ALTERNATIVES

This section evaluates whether the alternative achieves adequate overall elimination, reduction, or control of risks to human health, worker protection, and the environment that are posed by the likely exposure pathway. Reducing the potential threat to acceptable levels is a threshold requirement and is the primary objective of the S&M program.

The continued S&M action alternative provides no additional protection of human health, worker protection, and the environment except radioactive decay of contaminants over time and confinement of contaminants by the operating exhaust system and hood confinement structure. The interim stabilization and complete removal action alternatives protect human health and the environment by taking action to stabilize or remove hazards posed by contaminants within the Plutonium Loadout Hood.

7.1 LONG-TERM EFFECTIVENESS

This section assesses whether the alternative leaves an unacceptable risk before final remedial action of the REDOX Facility. The continued S&M alternative would likely increase risk in the long-term because of hood deterioration, aging stack, compliance upgrades required for the stack, and general facility aging. This may result in a migration of contamination outside of the hood, into the REDOX Facility North Sample Gallery, or potentially release to the environment.

The remaining alternatives would be more effective at addressing threats posed by contaminants in the Plutonium Loadout Hood. With the stabilization alternative, the contamination is left in

place but "fixed" to prevent spread of contaminants past the hood boundary area. The removal alternative would remove contamination and eliminate the potential risk of the contamination currently in the Plutonium Loadout Hood.

7.2 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

These criteria assess the potential reduction of contaminant toxicity, mobility, or volume through treatment and assess whether the alternative permanently or significantly reduces the hazard posed by presence of the contaminant. The continued S&M alternative provides no near-term reduction in toxicity, mobility, or volume through treatment. Mobility of hazardous substances will eventually increase because of aging of the current facility. The interim stabilization alternative(s) would not provide a reduction of contaminant toxicity, but would minimize mobility of waste materials outside of the hood confinement structure. The disposal alternative will also eliminate the toxicity and mobility of contaminants by removal of the entire hood assembly and process vessels from the facility but would generate an increase of waste volume by removal of the entire hood.

Treatment, other than fixatives in place or during removal of the hood is not considered; however, other treatment may be required to meet waste disposal criteria for the material removed and disposed.

7.3 IMPLEMENTABILITY

The implementability criteria assesses whether the alternatives are technically and administratively feasible; all alternatives are feasible. Components of all the alternatives represent established technologies and methods that are routinely implemented at the Hanford Site.

7.4 COST

The cost criterion evaluates whether the alternatives are cost effective.

Any wastes generated during the stabilization or removal alternatives are estimated to include the following disposal costs:

1. TRU designated waste \$215 per cubic foot with disposal at the CWMC
2. Mixed non-TRU waste not going to ERDF at \$78 per cubic foot
3. Mixed non-TRU waste with disposal at \$27 per cubic foot at the ERDF.

Table 5. Disposal Costs.

Alternative	Waste Cost	Engineering/Safety Approval/Air Permit/Criticality Evaluation/Work Package Preparation	Implementation	Total Cost
S&M for 10 years	\$0	\$5,000 total or \$500 per year	\$140,000 for routines, smears, and stack inspections over 10 years with no contingency for emergencies or stack failures	\$14,500 per year or \$145,000 over 10 years
Interim stabilization	\$2,200 1 barrel TRU	\$128,000	\$345,800 for stabilization and deactivating stack	\$476,000
Complete removal	\$72,600 for 33 barrels of TRU and 13 barrels of ERDF-bound waste	\$756,600 (based on experience from 233-S)	\$2,083,400 (based on experience from 233-S)	\$2,912,600

8.0 RECOMMENDED ACTION ALTERNATIVE

The current S&M alternative is the lowest cost per year but carries the highest risk of contamination spread of the three alternatives. This option also depends upon no further contamination "drips" of the L-16 to H-4 line behind the Plutonium Loadout Hood. Also, the stack for the Plutonium Loadout Hood is aging and does not meet current American Nuclear Society Institute (ANSI 13.1) code which EPA has adopted as guidance for stacks. It is possible that within 2 or 3 years, a major upgrade cost would be incurred to modify the 296-S-2 stack.

The interim stabilization alternative carries an initial cost that is approximately three times order of magnitude higher than the current S&M alternative; however, much of this cost would have to be incurred at some point so decontamination and remediation of the Plutonium Loadout Hood could be conducted. Therefore, any action to interim stabilize the hood at the present time would only aid the final remediation effort. The cost (if incurred currently) would not only protect future remediation personnel, but also workers performing S&M during the interim period. This option would also remove the 296-S-2 stack and eliminate the need for future costly upgrades of the exhaust system.

In the future, when the Canyon Disposition Initiative (CDI) is evaluated for the REDOX Facility, the interim stabilization alternative recommended by this report would not adversely impact any decision for the CDI efforts planned for this plant. Because the North Sample Gallery is outside the boundary wall of the canyon structure, it is anticipated that this section of the building will be fully decontaminated and removed during the CDI process. Therefore, the interim stabilization would again aid in the final effort.

The removal alternative carries a higher cost than either of the first two alternatives. This

alternative completely removes the risk of contaminants spread and also removes the 296-S-2 stack. The level of worker discipline and management support required to conduct this work would require an extensive Operation Readiness Review by the ERC and RL. In addition, to meet verbal objectives stated by EPA in Section 1.0, an EE/CA would need to be prepared and submitted for the removal action to take place.

Based on overall protection and short- and long-term effectiveness until the REDOX Facility final cleanup decision has been made, the recommended alternative for the Plutonium Loadout Hood is the interim stabilization alternative. This alternative provides for continued maintenance of the facility as well as the identification and response to potential release of hazardous substances that could adversely impact human health and the environment. The stabilization alternative is protective of workers, the public, and the environment and allows for a coordinated cleanup of the REDOX Facility in the future when detailed remedial action is planned.

9.0 REFERENCES

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- 29 CFR 1910, "Occupational Safety and Health Standards," *Code of Federal Regulations*, as amended.
- 29 CFR 1926, "Occupational Safety and Health Standards for the Construction Industry," *Code of Federal Regulations*, as amended.
- 40 CFR 61, "National Emissions Standards in Hazardous Air Pollutants," *Code of Federal Regulations*, as amended.
- 40 CFR 260, "Hazardous Waste Management System: General," *Code of Federal Regulations*, as amended.
- 40 CFR 261, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, as amended.
- 40 CFR 262, "Standards Applicable to Generators of Hazardous Waste," *Code of Federal Regulations*, as amended.
- 40 CFR 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities," *Code of Federal Regulations*, as amended.
- 40 CFR 268, "Land Disposal Requirements," *Code of Federal Regulations*, as amended.
- 40 CFR 761, "Polychlorinated Biphenyls (PCB's) Manufacturing, Processing Distribution in Commerce, and Use Prohibition," *Code of Federal Regulations*, as amended.
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Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq., as amended.

Toxic Substances Control Act of 1976, 15 U.S.C. 2601, et seq., as amended.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 173-304, "Minimum Functional Standards for Solid Waste Handling," *Washington Administrative Code*, as amended.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, as amended.

WAC 173-303-630, "Use and Management of Containers," *Washington Administrative Code*, as amended.

WAC 246-247, "Radiation Protection – Air Emissions," *Washington Administrative Code*, as amended.

APPENDIX A

SEISMIC CALCULATIONS

Originator R. S. Rajagopal ¹⁸¹ Date 8-20-99 Calc. No. 0200W-CA-C0156 Rev. No. 0
Project RERP Job No. 22192 Checked MP Date 7/2/99
Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 1

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BHI-01299

Rev. 0

CALCULATION COVER SHEET

Project Title Richland Environmental Restoration Project (RERP) **Job No.** 22192

Area 0200 W

Discipline Civil / Structural

*Calc. No. 0200W-CA-C0156

Subject Evaluation of REDOX- North Gallery Structure for Protection of Pu Loadout Hood

Computer Program None

Program No. N/A

Committed Calculation ☒

Preliminary ☐

Superseded ☐[illegible]

SUMMARY OF REVISION

*Obtain Calc. No. from DIS

11/98

DE01-437.03

Bechtel Hanford, Inc.

CALCULATION SHEET

Originator R. S. Rajaopai ¹⁸¹ Date 8-20-99 Calc. No. 0200W-CA-C0156 Rev. No. 0
Project RERP Job No. 22192 Checked DP Date 7/2/99
Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 2

1.0 PURPOSE:

The purpose of this calculation is to evaluate the ability of the walls and slabs of the North Gallery portion of the REDOX building to withstand seismic forces. In addition, the purpose is also to evaluate the roof slab of the North Gallery for the potential load drop effects from the postulated failure of North Canyon walls above El. 133'-4" (Crane rail elevation). These evaluations are performed for verification of the seismic safety of the Plutonium Loadout Hood located on the floor at El. 88'-0" towards the west end of the North Sample Gallery.

2.0 BACKGROUND:

The Pu Loadout Hood is located on the floor at El. 88'-0" in the North Sample Gallery of the REDOX building. A seismic evaluation of the North Gallery of REDOX is performed for verification of the seismic safety of the Pu Loadout Hood.

Previously, in January 1997, Pete Carrato had performed a seismic capability evaluation of the REDOX building (see report attached to DIS chron. # 043500, Reference 7). The seismic load considered in the evaluation was based on the previous Hanford Plant Standards, SDC 4.1, Figure 5 seismic ground spectrum for 10% damping, having peak spectral value of 0.2 g, & ZPA value of 0.12 g. The evaluation indicated that the walls above the crane girder elevation (El. 133'-4") and the roof structure will not withstand the seismic forces resulting from the above spectrum. However, subsequent calculations [Calculation Nos. 0200W-CA-C0027 (Ref 8) and 0200W-CA-C0033 (Ref 9)] indicated that the potential load drop due to collapse of the roof, roof truss, and the walls above El. 133'-4", will not impair the structural integrity of the REDOX Canyon cell cover blocks at El. 105'-6". Thus, the radiologic inventories inside the canyon cells are protected against seismic forces.

Presently, additional evaluation efforts are undertaken to determine the structural adequacy of the REDOX North Gallery walls and slabs against seismic forces and potential load drop effects. This evaluation is performed to verify protection of the Pu Loadout Hood against seismic forces. Evaluation is also performed for the potential load drop effects of the postulated failure of North Canyon wall on the North Gallery roof slab. The load drop scenario is pictorially shown on sheet 3.

CALCULATION SHEET

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Originator RLS Raagoo	Date 9-18-1993	Calc. No. 0200W-CA-C0156	Rev. No. 0
Project BERP	Job No. 22192	Checked RLS	Date 1/2/94
Subject Evaluation of REDOX - North Gallery, Structure for Full Load Hood Projection			Sheet No. 1

Step 1

Step 2

Step 3

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CALCULATION SHEET

Originator R. S. Rajagopal ¹⁸¹ Date 8-20-99 Calc. No. 0200W-CA-C0156 Rev. No. 0
Project RRP Job No. 22192 Checked MP Date 9/2/99
Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 4

4.0 APPROACH:

- (1) Determine structural capacities (Moment and Shear capacities) of the walls and slabs of the North gallery walls and slabs from the structural details shown on the drawings listed in Section 10.0 and using ACI-318 code (Ref. 3) and Reference 2.
- (2) Determine input seismic response spectra for "Existing PC3 Structures" in 200 West area from References 11, 12 and 13.
- (3) Perform seismic analysis for the determination of seismic forces (Moments and Shears) using the "GT STRUDL" model of Pete Carrato (Ref. 7) with the seismic spectra defined in 2 above.
- (4) Perform Load drop evaluation using the methodology provided in Reference 10.
- (5) Compare the structural capacity against the demand of the seismic forces and load drop effects to verify the structural adequacy of the walls and slabs of the North gallery in the REDOX building.

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CALCULATION SHEET

BHI-01299

Rev. 0

Originator R.S. RajagopalDate 7-15-99Calc. No. C 0156Rev. No. 0Project RERPJob No. 22195Checked JKDate 7/27/99Subject Evolution of REDOX North Gallery Structure forSheet No. 5Pu Loadout Hood Protection,4.0 STRUCTURAL CAPACITIESREDOX - NORTH GALLERY WALLS & SLABS Typical North-South Section (View Looking East)

Structural Moment and Shear Capacities of the North gallery Walls (Locations ① - ⑩) and Slabs (Locations ⑪ - ⑭) are calculated for structural evaluation. The rebar sizes and spacings for these locations are tabulated on the next sheet. This information is obtained from the referenced Hanford Site drawings.

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CALCULATION SHEET

Originator R. S. RajagopalDate 7-15-99Calc. No. 02056Rev. No. 0Project ERTJob No. 22192Checked OKDate 11/2/99Subject Evaluation of REDOX North Gallery Structure for
Fire Loadout Hand ProtectionSheet No. 6

4.0 Structural Capacities of REDOX-North Gallery Walls & Slabs (Cont'd)

WALL / SLAB INFORMATION FROM DRAWINGS

WALL/ SLAB NO.	LOCATION	WALL/ SLAB THICKNESS	REBARS	REFERENCE DRAWINGS
①	Canyon Wall Bet. Found. & El. 88'-0"	60"	1"sq. @ 9"C. @ Each Face	Sect. 180-180 Dwg. H-2-8376
②	Canyon Wall Bet. El. 88'-0" & 100'-0"	60"	1"sq. @ 9"C. @ Each Face	Sect. 180-180 Dwg. H-2-8376
③	Canyon Wall Bet. El. 100'-0" & 112'-0"	46"	1"sq. @ 9"C. @ Each Face	Sect. 180-180 Dwg. H-2-8376
④	Canyon Wall Bet. El. 112'-0" & 133'-4"	46"	1"sq. @ 9"C. @ Each Face	Sect. 180-180 Dwg. H-2-8376
⑤	Canyon Wall Bet. El. 133'-4" & 148'-6"	18"	3/4" φ @ 9"C. @ Each Face	Sect. 180-180 Dwg. H-2-8376
⑥	Canyon Wall Bet. El. 148'-6" & 157'-7"	8"	1/2" φ @ 9"C. @ Each Face	Sect. 180-180 Dwg. H-2-8376
⑦	North Wall Bet. Found. & El. 88'-0"	24"	1 1/8"sq. @ 9"C. @ Each Face	Sect. 168-168/169-169 Dwg. H-2-8289
⑧	North Wall Bet. El. 88'-0" & 100'-0"	24"	1"sq. @ 9"C. @ Each Face	Sect. 168-168/169-169 Dwg. H-2-8289
⑨	North Wall Bet. El. 100'-0" & 112'-0"	24"	1"sq. @ 9"C. @ Each Face	Sect. 168-168/169-169 Dwg. H-2-8289
⑩	North Wall Bet. El. 112'-0" & 130'-6"	24"	1"sq. @ 9"C. @ Each Face	Sect. 168-168/169-169 Dwg. H-2-8289
⑪	Slab @ El. 88'-0"	12"	1"sq. @ 9"C. Top & Bot.	Dwg. H-2-7726 & Dwg. H-2-8391
⑫	Slab @ El. 100'-0"	12"	1"sq. @ 9"C. Top & Bot.	Dwg. H-2-7728
⑬	Slab @ El. 112'-0"	12"	1"sq. @ 9"C. Top & Bot.	Dwg. H-2-7756
⑭	Slab @ El. 130'-6" (Roof)	18"	1"sq. @ 9"C. Top & Bot.	Dwg. H-2-7757

Originator R.S. Rajagopal ¹⁸¹ Date 7-16-99 Calc. No. 0200W-CA-00156 Rev. No. 0
 Project RERP Job No. 22192 Checked JK Date 3/7/99
 Subject Evaluation of REDOX-North Gallery Structure for Sheet No. 7
Pu Woodout Hood Protection

4.0 Structural Capacities of REDOX-North Gallery Walls & Slabs (Cont'd)

Moment and Shear Capacities are Computed using
 (a) Material Properties without Dynamic Increase factor
 (b) Material Properties with Dynamic Increase Factor.

Material Properties used on Sheets 5 & 6 of Ref. 8
 are repeated as follows:

(a) Without Dynamic Increase factor (DIF)

$$f'_c = 4500 \text{ PSI (Concrete)}$$

$$f_y = 40000 \text{ PSI (Rebar)}$$

$$E_c = 57000 (4500)^{1/2} = 3,824,000 \text{ PSI} = 3824 \text{ KSI (Conc.)}$$

$$E_s = 29000 \text{ KSI (Steel rebar)}$$

$$n = E_s / E_c = 29000 / 3824 = \underline{7.6}$$

(b) With Dynamic Increase factor (DIF)

DIF = 1.25 for Concrete, DIF = 1.20 for Steel Rebar

$$f'_{c-dyn} = (1.25)(4500) = 5625 \text{ PSI (Concrete)}$$

$$f_{y-dyn} = (1.20)(40000) = 48000 \text{ PSI (Rebar)}$$

$$E_c = 57000 (5625)^{1/2} = 4,275,000 \text{ PSI} = 4275 \text{ KSI (Conc.)}$$

$$E_s = 29000 \text{ KSI (steel rebar)}$$

$$n = E_s / E_c = 29000 / 4275 = \underline{6.8}$$

Originator R.S. Rajagopal Date 7-16-99 Calc. No. 02007A-01 Rev. No. 0
 Project RERP Job No. 22192 Checked AS Date 7/27/99
 Subject Evaluation of REDOX-North Gallery Structure for Sheet No. 8
Pu Loadout Hood Protection

4.0 Structural Capacities of REDOX-North Gallery Walls & Slabs (Cont'd)

$$T = A_{st} f_y$$

Ref. 2 and Ref. 3 (ACI 318-95)

$$C = 0.85 f'_c b a$$

$$T = C \Rightarrow a = \frac{A_{st} f_y}{0.85 f'_c b}$$

- Ultimate Moment Capacity = $M_{cap}^u = A_{st} f_y (d - \frac{a}{2})$

- Ultimate Shear Capacity = $V_{cap}^u = b \cdot d \cdot v_c$

$$v_c = 2 \sqrt{f'_c} = 2 \sqrt{4500} = 134 \text{ PSI w/o DIF}$$

$$= 2 \sqrt{5625} = 150 \text{ PSI w/DIF}$$

$$d_2 = \text{Cover} + \frac{\text{bar Dia.}}{2}$$

Per Spec. HW-4301 (Ref. 5) Sect. 6.2.3

Cover for walls & slabs = $\frac{3}{4}$ " min.

Per Ref. 1 (1) ACI-97 (1903.3.2) using $\frac{3}{4}$ " aggregate, cover = $\frac{3}{4} / \frac{3}{4} = 1$ "

Reinf.: $\frac{1}{2}$ " ϕ Bar, $d_2 = \frac{0.5}{2} + 1 = 1.25$ "

$\frac{3}{4}$ " ϕ Bar, $d_2 = \frac{0.75}{2} + 1 = 1.38$ "

1" Sq, $d_2 = 1.414/2 + 1 = 1.71$ "

$\frac{1}{8}$ " 5F, $d_2 = \frac{(1.414)(1.125)}{2} + 1 = 1.80$ "

• Except. for Sect. 180-180 of Div. 4-2-2376, for 60" wall which shows 6" clearance, for which cover = 6"

• Cover for concrete deposits against ground = 3"

CALCULATION SHEET

Originator R.S. Lagazant ¹⁸¹ Date 7-19-99 Calc. No. 0200W-CA-
 Project RRP Job No. 22192 Checked af Rev. No. 0
 Subject Evaluation of REDOX - North Gallery Structure for Date 7/8/99
Fire Loadout Hood Protection Sheet No. 9

4.0 Structural Capacities of REDOX - North Gallery Walls & Slabs (Cont'd)
 MOMENT & SHEAR CAPACITIES PER FOOT WIDTH OF WALL/SLAB (w/o DIF)

WALL OR SLAB	A_{st} (in ²)	d_1 (in)	d_2 (in)	$d = d_1 + d_2$ (in)	$a = \frac{A_{st} f_y}{0.85 f'_c b}$ (in)	$M_{cap}^u = A_{st} f_y (d - \frac{a}{2})$ (K"/ft width)	$V_{cap}^u = b d v_c$ (K/ft width)
①	1.33	60	6.71	53.29	1.16	2804 K" = 234 kft	85.7 ^k
②	1.33	60	6.71	53.29	1.16	2804 K" = 234 kft	85.7 ^k
③	1.33	46	1.71	44.29	1.16	2325 K" = 194 kft	71.2 ^k
④	1.33	46	1.71	44.29	1.16	2325 K" = 194 kft	71.2 ^k
⑤	0.59	18	1.38	16.62	0.51	386 K" = 32 kft	26.7 ^k
⑥	0.27	8	1.25	6.75	0.24	72 K" = 6 kft	10.9 ^k
⑦	1.69	24	1.80	22.20	1.47	1451 K" = 121 kft	35.7 ^k
⑧	1.33	24	1.71	22.29	1.16	1155 K" = 96 kft	35.8 ^k
⑨	1.33	24	1.71	22.29	1.16	1155 K" = 96 kft	35.8 ^k
⑩	1.33	24	1.71	22.29	1.16	1155 K" = 96 kft	35.8 ^k
⑪	1.33	12	3.71	8.29	1.16	410 K" = 34 kft	13.3 ^k
⑫	1.33	12	1.71	10.29	1.16	517 K" = 43 kft	16.6 ^k
⑬	1.33	12	1.71	10.29	1.16	517 K" = 43 kft	16.6 ^k
⑭	1.33	18	1.71	16.29	1.16	836 K" = 70 kft	26.2 ^k

$$b = 12", f_y = 40.0 \text{ KSI}, f'_c = 4.5 \text{ KSI}, v_c = 0.134 \text{ KSI}$$

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CALCULATION SHEET

Originator R. S. Rajagopal Date 8-16-99 Calc. No. 0200W-CA-C0156 Rev. No. 0
 Project RERP Job No. 22192 Checked AK Date 7/8/99
 Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 10

5.0 SEISMIC EVALUATION:SEISMIC INPUT:

The seismic input is defined in terms of Acceleration Ground Response Spectra. For the previous analysis (Ref 7) the spectra was based on the previous Hanford Plant Standard, Figure 5 of SDC 4.1 (Ref 14) seismic ground spectrum for 10% damping, having peak spectral value of 0.2 g and ZPA value of 0.12 g.

For the present analysis, the ground spectra are derived based on the site-specific seismic hazard analysis for 200 West area of the Hanford site from References 11 and 12. The structure is considered as "Existing PC3 structure" which will have 1000 year return period per Section 1.3 and Table 2-1 of Reference 13. The peak ground accelerations (PGA) obtained from Tables 5-1 and 5-2 of Reference 12, for 1000 years return period for 200 West area, are 0.188 g (horizontal) and 0.122 g (vertical). The damping value considered is 10% based on existing SSC for Response Level 3, per Section 2.3.3 and Table 2-3 of Reference 13. The ground spectra computations for 10% damping value are shown in the following table.

GROUND RESPONSE SPECTRA FOR 10% DAMPING

HORIZONTAL SPECTRUM				VERTICAL SPECTRUM			
Frequency (Hz)	Period (Sec)	Spectral Shape (Ref 12, Pg B-3)	Hor. Spect. = (Hor. PGA = 0.188 g) (Hor. Spect. Shape)	Frequency (Hz)	Period (Sec)	Spectral Shape (Ref 12, Pg B-6)	Ver. Spect. = (Hor. PGA = 0.188 g) (Ver. Spect. Shape)
33.3	0.030	1.000	0.188 g	50.0	0.020	0.648	0.122 g
13.3	0.075	1.267	0.238 g	13.3	0.075	0.968	0.182 g
10.0	0.100	1.422	0.267 g	10.0	0.100	0.999	0.188 g
5.0	0.200	1.703	0.320 g	5.0	0.200	0.947	0.178 g
3.33	0.300	1.604	0.302 g	3.33	0.300	0.811	0.152 g
2.0	0.500	1.237	0.233 g	2.0	0.500	0.481	0.090 g
1.0	1.000	0.776	0.146 g	1.0	1.000	0.338	0.064 g
0.5	2.000	0.417	0.078 g	0.5	2.000	0.238	0.045 g
0.25	4.000	0.152	0.029 g	0.25	4.000	0.105	0.020 g

The plots of Horizontal and Vertical ground response spectra are shown on the next sheet. Also shown on the plot is the horizontal response spectrum that was previously used.

Originator R.S. Rajagopal Date 8-17-99 Calc. No. 0201N-2A-001-01 Rev. No. 0
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Pu Loadout Hood Protection.

PLOTS OF SEISMIC GROUND SPECTRA (FOR 10% DAMPING)

- ① —○— Horizontal Ground Spectrum for
"Existing PC3 Structure" in 200W Area.
- ② —△— Vertical Ground Spectrum for
"Existing PC3 Structure" in 200W Area.
- ③ - - - - Horizontal Ground Spectrum Used
in Previous Analysis (Ref. 7) based on Figure 5
of Previous Hanford plant standard SDC 4.1 (Ref. 14)

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Originator R. S. Rajagopal Date 8-18-99 Calc. No. 0200W- CA-C0156 Rev. No. 0
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 Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 12

5.0 SEISMIC EVALUATION (Cont'd):SEISMIC ANALYSIS:(a) Seismic Model:

The "GT-Strudl" finite element model used in the previous seismic analysis (Ref. 7) is again used for the calculation of seismic forces and moments in the North Gallery walls and slabs of the REDOX building. The seismic model excerpted from the Reference 7 is included in Attachment G.

(b) Original Model with Original Spectrum (Spectrum Curve 3, Sheet 11):

[Attachment A – Input, Attachment B – Output]

For verification of the model, the analysis was rerun with the same input spectrum as was previously used in Ref 7. The input is included in the Attachment A and the output is included in the Attachment B. The results of the previous analysis (Ref. 7) for the North Gallery walls and slabs, with the output shown in the Attachments B are tabulated on the next sheet for comparison. From this comparison it is seen that the output results of the rerun analysis (Attachment B) are same as that of the previous analysis (Ref. 7) as expected.

(c) Corrected Model with Original Spectrum (Spectrum Curve 3, Sheet 11):

[Attachment C – Input, Attachment D – Output]

During the verification process, however, it was noticed that the vertical coordinate of one of the node points (Node Point no. 11) of the model was not correct. The vertical coordinate of the model was corrected and the analysis was rerun using the same previous spectrum, see Attachment C for the input. The output of the corrected model is shown in Attachment D. The results of the corrected model are also compared with the results of the previous analysis (Ref. 7) and that of the rerun analysis (Attachment B) in the table on the next sheet. From this comparison it is seen that the effect of the incorrect coordinate of the node point no. 11 is insignificant, and the moments and shears values from the corrected model, in general, are slightly lower.

(d) Corrected Model with "Existing PC3 Structures" Spectrum (Spectrum Curve 1, Sheet 11):

[Attachment E – Input, Attachment F – Output]

The seismic load is based on the response spectra approved by DOE for Hanford site, see Westinghouse report WHC-SD-W236A-TI-001 Rev 1A (Ref 12). The response spectrum for 10% damping, for "PC3 Existing Structures" in 200W area of the Hanford site is considered for the evaluation. The spectrum has peak spectral value of 0.32 g and ZPA value of 0.188 g. The North Gallery walls and slabs are assessed for the seismic forces resulting from the spectrum defined above.

The corrected model is used for the present analysis. The input for the present analysis is shown in Attachment E, and the output is shown in Attachment F. The table shown on the next sheet also includes the results of the present analysis for the North Gallery Walls and Slabs.

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CALCULATION SHEET

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5.0 SEISMIC EVALUATION (Cont'd):

COMPARISON OF RESULTS OF PREVIOUS AND PRESENT ANALYSES

Wall/Slab No.	Location	Element No.	Previous Analysis Results (Ref. 7)		Rerun of Previous Analysis (Attachment B)		Rerun of Previous Analysis with Corrected Co-ordinate (Attach. D)		Present Analysis with Corrected Co-ordinate (Attach. F)	
			Moment (K ft)	Shear (K)	Moment (K ft)	Shear (K)	Moment (K ft)	Shear (K)	Moment (K ft)	Shear (K)
1	Canyon Wall bet. Found. & El. 88'-0"	401	3345.57	122.25	3345.57	122.25	3247.55	118.03	4386.46	160.75
2	Canyon Wall bet. El. 88'-0" & 100'-0"	404	1967.89	138.57	1967.89	138.57	1921.52	133.58	2683.63	180.64
3	Canyon Wall bet. El. 100'-0" & 112'-0"	409	1331.08	87.79	1331.08	87.79	1294.02	85.43	1986.55	128.76
4	Canyon Wall bet. El. 112'-0" & 130'-6"	410	1149.46	49.40	1149.46	49.40	1121.10	48.33	1706.87	72.68
5	Canyon Wall bet. El. 133'-4" & 148'-6"	416	950.06	49.57	950.06	49.57	927.86	48.33	1392.59	73.40
6	Canyon Wall bet. El. 148'-6" & 157'-7"	420	212.29	45.38	212.29	45.38	207.35	44.42	305.30 *	65.95
7	North Wall bet. Found. & El. 88'-0"	502	248.84	30.43	248.84	30.43	241.71	29.54	327.06	39.87
8	North Wall bet. El. 88'-0" & 100'-0"	504	49.05	7.20	49.05	7.20	47.99	6.95	68.04	9.47
9	North Wall bet. El. 100'-0" & 112'-0"	509	102.36	8.31	102.36	8.31	99.12	7.99	146.22	10.78 *
10	North Wall bet. El. 112'-0" & 130'-6"	513	327.77	27.40	327.77	27.40	321.49	26.82	493.43	41.54 *
11	Floor Slab @ El. 88'-0"	MS5-3	82.96	7.08	82.96	7.08	80.64	6.88	109.69	9.37 *
12	Floor Slab @ El. 100'-0"	MS6-1	103.45	8.85	103.45	8.85	101.02	8.64	140.44	12.01 *
13	Floor Slab @ El. 112'-0"	MS7-3	169.38	16.56	169.38	16.56	166.24	16.25	246.44	24.07
14	Roof Slab @ El. 130'-6"	MS8-1	509.78	40.65	509.78	40.65	499.84	39.85	768.94	61.27 *

* These shears coincide with same load case and element as the governing moment for comparison purposes. These shears do not agree with those shown on Sheet 14 which are the worst case shears (not necessarily coincident with worst case moment)

Originator R.S. Rajagopal ¹⁸¹ Date 7/22/99 Calc. No. 0200W-CA-CC156 Rev. No. 0
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5.0 SEISMIC EVALUATION (CONT'D):

"CAPACITY" VS. "DEMAND" OF NORTH GALLERY WALLS & SLABS FOR SEISMIC LOADS:

Note: The moment and shear capacities of the walls and slabs sections are from Sheet 9.
 The seismic demand are obtained from "GT STRUDL" output shown in Attachment F.

WALL OR SLAB	LOCATION	ELEMENT NO. IN FE MODEL	MOMENT (K.Ft./Ft. width)		SHEAR (K/Ft. width)		CAPACITY-DEMAND RATIO	
			DEMAND	CAPACITY	DEMAND	CAPACITY	MOMENT	SHEAR
①	Canyon Wall Bet. Found. & EL. 88'-0"	401-403	4386/18.42 = 238	234	1607/18.42 = 8.7	85.7	0.983 x 1.0	9.9
②	Canyon Wall Bet. EL. 88'-0" & 100'-0"	404-407	2684/18.42 = 146	234	180.6/18.42 = 9.8	85.7	1.6	8.7
③	Canyon Wall Bet. EL. 100'-0" & 112'-0"	408-409 (USE 409 - SMALLER SECTION)	1987/18.42 = 108	194	129.8/18.42 = 7.0	71.2	1.8	10.2
④	Canyon Wall Bet. EL. 112'-0" & 133'-4"	410-415	1707/18.42 = 93	194	72.7/18.42 = 3.9	71.2	2.1	18.3
⑤	Canyon Wall Bet. EL. 133'-4" & 148'-6"	416-419	1393/18.42 = 76	32	73.4/18.42 = 4.0	26.7	0.4 (NG)	6.7
⑥	Canyon Wall Bet. EL. 148'-6" & 157'-7"	420, 421 & MRS-14	316/18.42 = 17	6	65.9/18.42 = 3.6	10.9	0.35 (NG)	3.0
⑦	North Wall Bet. Found. & EL. 88'-0"	502-503	327/18.42 = 18	121	39.9/18.42 = 2.3	35.7	6.7	15.5
⑧	North Wall Bet. EL. 88'-0" & 100'-0"	504-506	68/18.42 = 3.7	96	9.5/18.42 = 0.5	35.8	26.0	71.6
⑨	North Wall Bet. EL. 100'-0" & 112'-0"	507-509	144/18.42 = 7.9	96	15.9/18.42 = 0.9	35.8	12.1	39.8
⑩	North Wall Bet. EL. 112'-0" & 130'-6"	510-513	493/18.42 = 27	96	49.8/18.42 = 2.7	35.8	3.6	13.2
⑪	Slab @ EL. 88'-0" (Floor)	MS5-1, MS5-2, MS5-3	110/18.42 = 6.0	34	9.5/18.42 = 0.5	13.3	5.7	26.6
⑫	Slab @ EL. 100'-0" (Floor)	MS6-1, MS6-2, MS6-3	140/18.42 = 7.6	43	12.2/18.42 = 0.7	16.6	5.7	23.7
⑬	Slab @ EL. 112'-0" (Floor)	MS7-1, MS7-2, MS7-3	246/18.42 = 13.4	43	24.1/18.42 = 1.3	16.6	3.2	12.8
⑭	Slab @ EL. 130'-6" (Roof)	MS8-1, MS8-2, MS8-3	769/18.42 = 41.7	70	61.9/18.42 = 3.4	26.2	1.7	7.7

* TRIBUTARY WIDTH = 18.42 ft. (See Sheet 89 of Ref. 8, and Sheet F11 of Attachment F)

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CALCULATION SHEET

Originator R. S. Rajagopal ^{RS} Date 8-20-99 Calc. No. 0200W-CA-C0156 Rev. No. 0
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5.0 SEISMIC EVALUATION (Cont'd)

Discussions on the Seismic Evaluation:

The Capacity-Demand ratio for moments and shears far exceed unity for all walls and slabs except for the 5'-0" thick canyon wall just above the foundation level. For this canyon wall the Capacity-Demand ratio is 0.983, which is only less than 2% below unity. It is judged that this slight under capacity is not a concern because of the following reasoning. The seismic model for simplicity does not include the soil-structure interaction effects, and hence the seismic demand on the wall is over estimated. In actuality, the building is deeply embedded below the grade (Grade is at El. 96'-0" and foundation is at El. 73'-3"). There is significant amount of lateral restraint and hence there is no potential for building collapse.

However, the capacity-demand ratio for the walls above El. 133'-4" is far lower than unity and there are no lateral restraints. Hence the walls can form plastic hinge and potentially collapse on the North Gallery roof at El. 130'-6". The roof slab is evaluated for this potential load drop effect of the collapse scenario in Section 6.0 of this calculation package.

Originator R.S. Rajagopal Date 7-21-99 Calc. No. 000 Rev. No. 0
 Project RERF Job No. 22192 Checked 2/2 Date 1/2/00
 Subject Evaluation of Redox North Gallery Structure for Fire Loadout Hand Protection Sheet No. 16

6.0 LOAD DROP EVALUATION

(SEE SHEET 3 FOR THE POSTULATED LOAD DROP SCENARIO).

Consider one foot width.

$$H = \text{Height of Load Drop (A to A')} = 8'-11" = 8.92'$$

$$\begin{aligned}
 W_m &= \text{Weight of Dropped Load} = \\
 &= 0.15 \text{ Kcf} \cdot [(0.67)(1.0)(9.08) + (1.5)(1.0)(15.17)] \\
 &= 0.91 + 1.71 \\
 &= \underline{2.62 \text{ K}}
 \end{aligned}$$

$$\begin{aligned}
 V_s &= \text{Velocity of Drop} = \sqrt{2gH} = (2 \times 32.2 \times 8.92)^{\frac{1}{2}} \\
 &= \underline{24.0 \text{ ft/sec}} = \underline{288.0 \text{ in/sec.}}
 \end{aligned}$$

Originator R.S. Rajagopal Date 7-21-99 Calc. No. 0205W-CA-00156 Rev. No. 0
 Project RELAP Job No. 22192 Checked AK Date 7/27/99
 Subject Evaluation of REDOX-North Gallery Structure for Sheet No. 17
Pu Load and Hood Protection

6.0 LOAD DROP EVALUATION (Cont'd):

LOCAL EFFECT OF LOAD DROP

(Ref.: Sect. 2.0 of Bechtel Design Guide C-2.45, Ref. 10)

Consider the load drop to be of type solid steel falling on reinforced concrete element and use Eq 2-1 of Ref. 10 to determine the thickness for threshold of spalling.

$$T_s = 15.5 \frac{W^{0.4} V_s^{0.5}}{\sqrt{f'_c} D^{0.2}}$$

$$W = 2620 \text{ lbs}$$

$$V_s = 24 \text{ ft/sec}$$

$$f'_c = 5625 \text{ Psi}$$

$$D = \text{Equivalent missile diameter in inches}$$

$$A_i = \text{Area of incidence} = 12' \times 8' = 96 \text{ in}^2$$

$$D = \sqrt{\frac{4A_i}{\pi}} = \sqrt{\frac{(4)(96)}{\pi}} = 11.06 \text{ in}$$

$$\therefore T_s = \frac{(15.5)(2620)^{0.4}(24)^{0.5}}{(5625)^{0.5}(11.06)^{0.2}}$$

$$= \frac{(15.5)(23.3)(4.9)}{(75)(1.61)} = \underline{14.7''}$$

Appendix B, Section 2.1.2 of Ref. 10 recommends increasing value of T_s by 10% (for Missiles outside of Table 1-1) for Precluding Spalling.

$$\therefore T_a = (1.1)(14.7) = 16.2'' < 18'' \text{ Slab } \therefore \text{No Spalling}$$

Since "Spalling" governs over "Perforation", then there is additionally No Perforation of the roof slab.

Originator R.S. Rajagopal Date 8-7-99 Calc. No. C0156 Rev. No. 0
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 Subject Evaluation of REDOX-North Gallery Structure for Sheet No. 18
Pu Loadout Hood Protection

6.0 LOAD DROP EVALUATION (cont'd)

STRUCTURAL RESPONSES DUE TO LOAD DROP

(Ref: Sects. 3.0 & 4.0 Bechtel Design guide C-2.45, Ref 10)

Determination of Effective mass of Slab @ EL. 135'-6" :

$$M_e = k \left[\frac{T_n}{2\pi} \right]^2 \quad (\text{Eq. 3.1, Ref 10})$$

$$T_n = \frac{2\pi}{C_n} \left(\frac{ML^4}{E I_e} \right)^{\frac{1}{2}}$$

$M \Rightarrow$ • 18" Slab (11.5 ft x 150 psf) = 225 psf
 • Built up Roofing + 3" Insul. = 10 psf
 (See Drawgs H-2-7472 & H-2-7443
 = 8 + 2 = 10 psf)

For 1' width of slab $W = \frac{235 \text{ lbs/ft}}{12} = 0.235 \text{ k/ft} = 0.0196 \text{ k/in}$

$$M = \frac{W L^2}{2} = \frac{0.0196 \times (20.92)^2}{2} = 0.0000597 \text{ ksec}^2/\text{in}^2$$

$C_n = 22.4$ Fixed-Fixed Case (Table 4.5 Ref. 10), $L = 20.92'$
 $E = 4275 \text{ Ksi}$ (Dynamic)

Effective Moment of Inertia, I_e (Sect. 4.2, Pages 45 & 46 Ref. 10)

$$I_e = \left(\frac{M_{cr}}{M_a} \right)^3 I_g + \left[1 - \left(\frac{M_{cr}}{M_a} \right)^3 \right] I_c \leq \frac{1}{2} (I_g + I_c) \quad (\text{Eq. 4.2 Ref. 10})$$

$$I_g = \frac{bd^3}{12} = \frac{(12)(18)^3}{12} = 5832 \text{ in}^4$$

$I_c = F' I_g$ Consider mid span, $\rho_t / \rho_b = \frac{(A_s = 1.33)}{(12)(16.29)} = 0.0068$

$$n = \frac{E_s}{E_c} = 6.8, \rho_t / \rho_b = 1.0$$

$F' = 0.25$ from Fig. 4-1 of Ref. 10

$$\therefore I_c = (0.25)(5832) = 1458 \text{ in}^4$$

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 Subject Evaluation of REDOX - North Gallery Structure for Pu Loadout Hood Protection Sheet No. 19

S.O. LOAD DROP EVALUATION (CONT'D):

STRUCTURAL RESPONSE DUE TO LOAD DROP (CONT'D)

$$M_{cr} = 1.25 b t^2 \sqrt{f'_c}$$

$$= (1.25) (12) (18)^2 \sqrt{5625} = 364.5 \text{ k"} = 30.4 \text{ kft}$$

$M_a = M_u$ for members deforming plastically

$$M_u = \phi A_s f_y (d - \frac{a}{2}) \quad (\text{Eq. 4-3 Ref. 10})$$

Area of Reinforcement, A_s :

Roof Slab. El. 130'-6"

- @ Slab mid span @ bottom -
1" Φ @ 9" c. $A_s = 1.33 \text{ in}^2$

- @ Slab Ends @ top -
1" Φ @ 9" c. + 1" Φ @ 9" c.

$$A_s = (2)(1.33) = 2.66 \text{ in}^2$$

Ref: Dwg. H-2-7757

Dwg. H-2-8289 Sect. 168-168

Dwg. H-2-8376 Sect. 180-180

calculation of M_u :

LOCATION	ϕ	b	d	f'_c	f_y	A_s	$a = \frac{A_s f_y}{0.85 f'_c b}$	$M_u = \phi A_s f_y (d - \frac{a}{2})$
SLAB MIDSPAN	0.9	12 in.	16.29 in.	5.625 ksi	48 ksi	1.33 in ²	1.11"	904 k" = 75.3 kft
SLAB ENDS	0.9	12 in.	16.29 in.	5.625 ksi	48 ksi	2.66 in ²	2.23"	1744 k" = 145.3 kft.

$M_a = M_u$ @ mid span because mid span gets excited for dynamic loads. = 75.3 kft

$$\frac{M_{cr}}{M_a} = \frac{30.4}{75.3} = 0.404$$

Originator R.S. Rajagopal Date 8-8-99 Calc. No. 0200W-CA-
 Project REFP Job No. 22192 Checked AK Rev. No. 0
 Subject Evaluation of REDOX - North Gallery Structure for Date 7/8/99
Pu Loadout Hood Protection. Sheet No. 20

6.0 LOAD DROP EVALUATION (Cont'd)

STRUCTURAL RESPONSE DUE TO LOAD DROP (CONT'D)

$$I_e = (0.404)^3 (5832) + [1 - (0.404)^3] (1458)$$

$$= 385 + 1362 = 1747 \text{ in}^4 \leftarrow \text{Governs}$$

$$\frac{1}{2} (I_g + I_e) = \frac{1}{2} (5832 + 1458) = 3645 \text{ in}^4$$

$$T_n = \frac{2\pi}{22.4} \left[\frac{(0.0000507)(20.92 \times 12)^4}{(4275)(1747)} \right]^{\frac{1}{2}}$$

$$= \frac{2\pi}{22.4} (0.02696)^{\frac{1}{2}} = 0.0461 \text{ Sec.}$$

Compute effective mass:

$$M_e = K \left[\frac{T_n}{2\pi} \right]^2 \quad (\text{Eq. 3.1, Ref. 10})$$

(Ref. 4 AISC Manual, Pg. 2-301, Case 17)

$$\Delta = \frac{Pa^3b^3}{3EI L^3}$$

$$K = \frac{P}{\Delta} = \frac{3EI L^3}{(\frac{1}{4}L)^3 (\frac{3}{4}L)^3}$$

$$K = \frac{455.1 EI}{L^3}$$

$$= \frac{(455.1)(4275)(1747)}{(20.92 \times 12)^3} = 214.84 \text{ K/in.}$$

$$M_e = (214.84) (0.0461 / 2\pi)^2 = 0.0116 \text{ Ksec}^2/\text{in} \leftarrow$$

$$\text{Lower bound } M_e = M_b (D + 2t)$$

$$= \frac{235 \text{ lbs/in}^2}{9} (8" + 36") = 0.0022 \text{ Ksec}^2/\text{in}$$

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 Subject Evaluation of REDOX - North Gallery Structure for Fu Loadout Hand Protection. Sheet No. 21

6.0 LOAD DROP EVALUATION (Cont'd):

STRUCTURAL RESPONSE DUE TO LOAD DROP (CONT'D).

Energy Balance Solution = (Section 3.5 of Ref. 10)

$$\text{Kinetic Energy, } E_s = \frac{M_m^2 V_s^2}{2(M_m + M_e)} \quad (Eq. 3-16, Ref. 10)$$

For Kinetic energy of the System
after a plastic impact

$$V_s = 24.0 \text{ ft./sec.} = \underline{288 \text{ in./sec}}$$

$$M_e = \underline{0.0116 \text{ KSec}^2/\text{in.}}$$

$$M_m = \left[(9'-1" \times 8" \times 150 \text{ pcf}) + \left(\frac{15'-2"}{2} \times 18" \times 150 \text{ pcf} \right) \right] / g$$

$$= (0.91 \text{ K} + 1.71 \text{ K}) / 386.4 = \underline{0.0068 \text{ KSec}^2/\text{in.}}$$

$$E_s = \frac{(0.0068)^2 (288)^2}{(2)(0.0068 + 0.0116)} = \underline{104.22 \text{ K'in.}}$$

$$X_e = \frac{Ra^3b^3}{3EIL^3} = \frac{RL^3}{455.1EI}$$

$$M_u^+ = \frac{Rab}{L} - M_u^-$$

$$R = \frac{(M_u^+ + M_u^-)L}{ab}$$

$$= \frac{(M_u^+ + M_u^-)(L)}{\left(\frac{1}{4}L\right)\left(\frac{3}{4}L\right)} = \frac{16(M_u^+ + M_u^-)}{3L}$$

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CALCULATION SHEET

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 Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection. Sheet No. 22

6.0 LOAD DROP EVALUATION (Cont'd):

STRUCTURAL RESPONSE DUE TO LOAD DROP (CONT'D)

$$M_u^+ = 75.3 \text{ k-ft} \quad M_u^- = 145.3 \text{ k-ft}$$

$$R = \frac{(16)(75.3 + 145.3)}{(3)(20.92)} = 56.2 \text{ k}$$

$$X_e = \frac{RL^3}{455.1EI_e} = \frac{(56.2)(20.92 \times 12)^3}{(455.1)(4275)(1747)} = 0.261''$$

X_0 = Deflection due to other loads
 i.e., dead load and roof load of 235^{#/ft}

$$X_0 = \frac{wL^4}{384EI} = \frac{(0.235)(20.92 \times 12)^4}{(384)(4275)(1747)} = 0.027''$$

$$X_m = \frac{E_s}{K(X_e - X_0)} + \frac{X_e + X_0}{2} \quad X_m > X_e \text{ (Eq. 3-20, Ref 10)}$$

$$= \frac{104.22}{(214.84)(0.261 - 0.027)} + \frac{(0.261 + 0.027)}{2}$$

$$= 2.073 + 0.144 = 2.22'' > X_e \text{ (OK)}$$

Ductility Ratio, $\mu = \frac{E_s}{R(X_e - X_0)} + \frac{X_0}{2X_e} + \frac{1}{2} \text{ (Eq. 3-21, Ref 10)}$

$$\mu = \frac{104.22}{(56.2)(0.261 - 0.027)} + \frac{0.027}{(2)(0.261)} + 0.5$$

$$\mu = 7.92 + 0.05 + 0.50 = 8.47$$

The ductility ratio is
 less than permissible
 value of 10 per
 Table 4-4 Ref. 10
 (OK)

Originator R.S. Rajagopal Date 8-8-99 Calc. No. 0200W.CA-0156 Rev. No. 0
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 Subject Evaluation of PGDox-North Gallery Structure for Sheet No. 2.3
Pu Loadout Hood Protection

6.0 LOAD DROP EVALUATION (Cont'd)

STRUCTURAL RESPONSE DUE TO LOAD DROP (CONT'D):

The computed value of ductility ratio $\mu = 8.61$ is less than the permissible value of $\mu = 10$ per Table 4-4 of Ref 10.

However, to better assess the ductility of the roof slab, perform angular rotation check per equation 4-2 of Ref 10.

Per Eq 4-2 of Ref. 10
 Upper limit of plastic hinge rotation, r_θ is

$$r_\theta = 0.0065 \frac{d}{c} \leq 0.07$$

$$a = 1.11" \text{ (Sheet 19)}$$

$$f'_c = 5625 \text{ PSI}$$

$$\beta_1 = 0.85 - 0.05 \left(\frac{f'_c - 4000}{1000} \right) \geq 0.65 \quad (\text{Ref. 2 Eq. 3.4-4})$$

$$= 0.85 - 0.05 \left(\frac{5625 - 4000}{1000} \right) = 0.77$$

$$\text{Neutral Axis } x = \frac{a}{\beta_1} = \frac{1.11}{0.77} = 1.44"$$

$$d = 16.29" \quad c = x = 1.44$$

$$\therefore r_\theta = (0.0065) \left(\frac{16.29}{1.44} \right) = 0.0735 \text{ use } 0.07$$

$$\therefore \text{Deflection @ Conc. Load Point} = (0.07) (5.18') = 0.363' = 4.36"$$

$$\text{The Value of Max. displacement } X_m = 2.19 < 4.36" \text{ (OK)}$$

$$\therefore \text{CAPACITY-DEMAND RATIO} = \frac{4.36}{2.19} = 1.99 \text{ (OK)}$$

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CALCULATION SHEET

Originator R. S. Rajagopal Date 8-20-99 Calc. No. 0200W-CA-C0156 Rev. No. 0
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 Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 24

7.0 COMBINED SEISMIC AND LOAD DROP EFFECTS ON NORTH GALLERY ROOF SLAB

- Seismic Demand / Capacity Ratio, r_s :

- Horizontal Seismic Load

Maximum Moment = 41.7 Kft. (Sheet 14)Maximum Moment Capacity = 70.0 Kft. (Sheet 14)

$$\text{Horizontal Seismic Demand / Capacity Ratio} = (41.7) / (70.0) = \underline{0.60}$$

- Vertical Seismic Load

Roof load, $w = 235$ lbs / ft (Sheet 18), Span $L = 20.92$ ft (Sheet 18)Vertical seismic spectral peak acceleration $S_a = 0.188g$ (Sheet s 10 & 11)

(Conservatively use this vertical acceleration for computation of maximum moment for vertical seismic loads. This is based on the assumption the REDOX building structure is vertically rigid with massive walls, but, the roof slab is not vertically rigid)

$$\text{Maximum Moment} = (w)(1+S_a)(L)^2 / (12) = (0.235)(1.188)(20.92)^2 / (12) = \underline{10.2} \text{ Kft.}$$

Maximum Moment Capacity = 70.0 Kft (Sheet 14)

(Note that, maximum moment at the ends with rebar cross section at the mid-span is considered for conservative evaluation. Note that the rebar cross section at ends are higher than at the mid-span which add to the conservatism)

$$\text{Vertical Seismic Demand / Capacity Ratio} = 10.2 / 70.0 = \underline{0.15}$$

- Adding the Horizontal and Vertical Seismic Demand / Capacity Ratios by absolute sum method, $r_s = 0.60 + 0.15 = \underline{0.75}$

- Load Drop Demand / Capacity Ratio, r_l :

- Load Drop Capacity / Demand Ratio = 1.99 (Sheet 23)
 - Load Drop Demand / Capacity Ratio = Reciprocal of the above
 $r_l = 1/1.99 = \underline{0.50}$

(Conservatively the Demand / Capacity ratio is considered at the load drop point)

- Combined Seismic and Load Drop Demand / Capacity Ratio, r :

Since seismic and Load drop are not concurrent events, combine by Square Root of the Sum of the Squares method.

$$r = [(r_s)^2 + (r_l)^2]^{1/2} = [(0.75)^2 + (0.50)^2]^{1/2} = \underline{0.90} < \underline{1.00} \text{ (OK)}$$

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CALCULATION SHEET

Originator R. S. Rajagopal ^{HSL} Date 8-20-99 Calc. No. 0200W-CA-C0156 Rev. No. 0
Project RERP Job No. 22192 Checked AK Date 12/99
Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 25

8.0 SUMMARY AND CONCLUSIONS:

The Pu Loadout Hood is located on the floor at El. 88'-0" towards the west end of the North Sample Gallery in the REDOX building. To support the safety evaluation of the Pu Loadout Hood, a seismic evaluation of the REDOX building North Gallery was performed. The following paragraphs provide a summary of the seismic evaluation and conclusions.

- The seismic model for the REDOX building developed by Pete Carrato in his report (Ref 7), dated January 1997(CCN 043500) was used.
- The seismic forces are based on an input ground acceleration spectrum for 10% damping for "Existing PC3 Structures" in 200 West area of Hanford site [(Ref. Westinghouse report WHC-SD-W236A-TI-001 Rev 1A (Reference 12)]. The horizontal spectrum has a peak spectral value of 0.32 g and ZPA of 0.188 g.
- The current seismic evaluation indicate that the walls and slabs of the North Gallery have adequate structural strength to withstand the above seismic forces, except the North Canyon walls above the crane rail El. 133'-4". The north canyon walls can potentially form plastic hinges and collapse on the North gallery roof at El. 130'-6".
- The North Gallery roof (El. 130'-6") has been evaluated for the above potential load drop effects of the north canyon walls collapse scenario. The evaluation indicates that the roof slab at El. 130'-6" is structurally adequate to withstand the load drop effects simultaneously with horizontal and vertical seismic forces.
- The load drop does not affect the Pu Loadout Hood situated at El. 88'-0" which is covered by the roof slab at El. 130'-6", and, other floor slabs at El. 100'-0" & 112'-0".

Based on the above discussions, it is concluded that the Pu Loadout Hood in the North Gallery of the REDOX building is adequately protected against the effects of seismic forces and the effects of potential load drop scenario.

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CALCULATION SHEET

Originator R. S. Rajagopal Date 8-8-1999 Calc. No. 0200W-CA-C0156 Rev. No. 0
 Project RERP Job No. 22192 Checked AK Date 2-8-99
 Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 26

9.0 REFERENCES:

- (1) UBC-1997 "Uniform Building Code", Volume 2 Structural Engineering Design Provisions
- (2) C. K. Wang and C. G. Salmon "Reinforced Concrete Design" Fourth Edition, Harper & Row, Publishers, New York
- (3) ACI 318-95 "Building Code Requirements for Structural Concrete (ACI 318-95) and Commentary (ACI 318R-95)
- (4) AISC- Manual of Steel Construction (ASD) - 9th Edition
- (5) HW-4301 "Specification for Reinforcing Steel for Concrete"
- (6) HW-4302 "Specification for Forming, Placing, Finishing, & Curing of Plain & Reinforced Concrete"
- (7) P. Carrato "Redox Building Seismic Analysis" January 1997. CCN- 043500
- (8) BHI Calculation 0200W-CA-C0027 Rev 0 "Load Drop Evaluation of 202-S Canyon Roof Structure" February 1997.
- (9) BHI Calculation 0200W-CA-C0033 Rev 0 "Redox (202 S)- Combined Seismic and Load Drop Effects on Cell Covers" December 1997.
- (10) Bechtel Design Guide C-2.45 Rev 0 "Design of Structures for Tornado Missile Impact" April 1982
- (11) BHI Calculation 0000X-CA-G0001 Rev 0 "Ground Response Spectra for PC3 Structures" December 1997
- (12) Report WHC-SD-W236A-TI-002 Rev 1A "Probabilistic Seismic Hazard Analysis DOE Hanford Site, Washington" by Ann M. Tallman for Geomatrix Consultants Inc. 1996 / 1997.
- (13) DOE Standard DOE-STD-1020-94 (April 1994), Change Notice # 1, January 1996 "Natural Phenomena Hazards Design and Evaluation Criteria for DOE Facilities"
- (14) Hanford Plant Standards- Design Criteria Standards: SDC-4.1 "Design Loads for Facilities" Rev 12, (Page 32, Figure 5)

Bechtel Hanford, Inc.

CALCULATION SHEET

Originator R. S. Rajagopal Date 8-8-1999 Calc. No. 0200W- CA-C0156 Rev. No. 0
 Project RERP Job No. 22192 Checked AM Date 7/2/99
 Subject Evaluation of REDOX-North Gallery Structure for Pu Loadout Hood Protection Sheet No. 27

10.0 LIST OF DRAWINGS:

Note: *The drawings are too numerous to list for the REDOX building. Figure 8 of Reference 8 provides a summary of the list of Architectural and Structural drawings that are pertinent.. However the following list provides a list of drawings that are relevant for this calculation package.*

- H-2-7443 Structural Details Steel Truss No. 1 Canyon
- H-2-7472 Arch. Cross Section C13-C13 on East End and North & South Service area
- H-2-7474 Arch. Cross Section C14-C14 thru Waste Line Tunnel Galleries ...
- H-2-7475 Arch. Cross Section C15-C15 thru Cells Galleries on West End...
- H-2-7726 Structural Concrete- Plan- Sample Gallery & AQ Make up West End of Canyon
- H-2-7728 Structural Concrete- Plan- Pipe Gallery & AQ Make up West End of Canyon
- H-2-7756 Structural Concrete- Plan- Operating Gallery & AQ Make up West End of Canyon
- H-2-7757 Structural Concrete- Plan- Cab Gallery & AQ Make up West End of Canyon
- H-2-7782 Architectural Index Sheet
- H-2-7783 Structural Index Sheet
- H-2-7926 Structural Concrete- Details- Foundation – Canyon Area- Sheet # 1
- H-2-7928 Structural Concrete- Plan- Storage Gallery & Canyon Foundation West End of CN
- H-2-7929 Structural Concrete- Longitudinal Section- Foundation- West End of Canyon
- H-2-8109 Arch. Exp. Joints & Flashing Details
- H-2-8289 Structural Concrete- Wall Sections Canyon & Silo Area Sheet # 1
- H-2-8376 Structural Concrete- Wall Sections Silo Area Sheet # 3
- H-2-8391 Structural Concrete- Plan, Sect.,- Details N. Sample Gallery Level West End CN Area

BHI-01299

Rev. 0

ATTACHMENT: A

ORIGINATOR: R. S. Rajagopal *RSR* DATE: August 19, 1999

CHECKED BY: C. A. Palmquist *CP* DATE: 9/8/99

CALC. NO. 0200W-CA-C0156 REV. NO. 0

SHEET NO. A1 OF TOTAL 10 SHEETS

ATTACHMENT "A"

**REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

STRU DL 'REDOX BUILDING' '2-D ANALYSIS OF TYPICAL SLICE'

\$\$

\$\$ TRUSS CONNECTED TO BUILDING BY SP K=136 KIP/IN

\$\$ AT ONE END. SLOTTED HOLE END FREE

UNITS INCH KIPS DEGREES FAH

\$\$

JOINT COORDINATES GLOBAL

\$\$ SOUTH WALL

1	704.00	0.00
2	704.00	57.00
3	704.00	114.00
4	704.00	171.00
5	704.00	219.00
6	704.00	267.00
7	704.00	315.00
8	704.00	363.21
9	704.00	411.42
10	704.00	459.63
11	704.00	410.00
12	704.00	553.21
13	704.00	600.00
14	704.00	651.50
15	704.00	703.00
16	713.00	721.00
17	713.00	778.33
18	713.00	835.67
19	713.00	893.00
20	718.00	903.00
21	718.00	960.00
22	718.00	1017.00

\$\$ DUMMY JOINT FOR TRUSS

30	709.00	903.00
----	--------	--------

\$\$ SOUTH CANYON WALL

101	501.00	0.00
102	501.00	57.00
103	501.00	114.00
104	501.00	171.00
105	501.00	219.00
106	501.00	267.00
107	501.00	315.00
108	501.00	363.00
109	511.00	387.00
110	511.00	459.63
111	511.00	410.00
112	511.00	553.21
113	511.00	600.00
114	511.00	625.00
115	521.00	655.00
116	521.00	721.00

\$\$ SOUTH PIPE TUNNEL WALL

201	315.00	0.00
202	315.00	55.50
203	315.00	111.00
204	315.00	162.00
205	315.00	213.00
206	315.00	264.00
207	315.00	315.00

Sheet A2 of A10

ATTACHMENT- A: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

	208	267.00	363.00
\$\$	NORTH PIPE TUNNEL WALL		
	301	183.00	0.00
	302	183.00	55.50
	303	183.00	111.00
	304	183.00	162.00
	305	183.00	213.00
	306	183.00	264.00
	307	183.00	315.00
	308	231.00	363.00
\$\$	NORTH CANYON WALL		
	401	0.00	0.00
	402	0.00	57.00
	403	0.00	114.00
	404	0.00	171.00
	405	0.00	219.00
	406	0.00	267.00
	407	0.00	315.00
	408	0.00	363.00
	409	-28.00	403.00
	410	-28.00	459.00
	411	-28.00	513.75
	412	-28.00	568.50
	413	-28.00	623.25
	414	-28.00	678.00
	415	-28.00	703.00
	416	-37.00	721.00
	417	-37.00	778.00
	418	-37.00	835.67
	419	-37.00	893.00
	420	-42.00	903.00
	421	-42.00	960.00
	422	-42.00	1017.00
\$\$	DUMMY JOINT FOR TRUSS CONNECTION		
	430	-33.00	903.00
\$\$	NORTH GALLERY WALL		
	502	-274.00	57.25
	503	-274.00	114.13
	504	-274.00	171.00
	505	-274.00	219.00
	506	-274.00	267.00
	507	-274.00	315.00
	508	-274.00	363.00
	509	-274.00	411.00
	510	-274.00	459.00
	511	-274.00	513.75
	512	-274.00	568.50
	513	-274.00	623.25
	514	-274.00	678.00
\$\$	SLAB S1 @ SOUTH GALLERY		
	'S1-1'	568.67	171.00
	'S1-2'	636.33	171.00
\$\$	SLAB S2 @ SOUTH GALLERY		
	'S2-1'	568.67	315.00
	'S2-2'	636.33	315.00
\$\$	SLAB S3 @ SOUTH GALLERY		
	'S3-1'	568.67	459.63

Sheet A3 of A10

ATTACHMENT- A: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

'S3-2'	636.33	459.63
\$\$ SLAB S4 @ SOUTH GALLERY		
'S4-1'	568.67	600.00
'S4-2'	636.33	600.00
\$\$ SLAB S5 @ NORTH GALLERY		
'S5-1'	-91.33	171.00
'S5-2'	-182.67	171.00
\$\$ SLAB S6 @ NORTH GALLERY		
'S6-1'	-91.33	315.00
'S6-2'	-182.67	315.00
\$\$ SLAB S7 @ NORTH GALLERY		
'S7-1'	-91.33	459.00
'S7-2'	-182.67	459.00
\$\$ SLAB S8 @ NORTH GALLERY		
'S8-1'	-91.33	678.00
'S8-2'	-182.67	678.00
\$\$ SLAB S9 @ PIPE TUNNEL		
'S9-1'	249.00	111.00
\$\$ ROOF TRUSS BOTTOM CHORD		
'T-1'	709.00	909.50
'T-2'	634.00	909.50
'T-3'	486.00	909.50
'T-4'	338.00	909.50
'T-5'	190.00	909.50
'T-6'	42.00	909.50
'T-7'	-33.00	909.50
'T-8'	709.00	1003.50
'T-9'	634.00	1003.50
'T-10'	560.00	1003.50
'T-11'	486.00	1003.50
'T-12'	412.00	1003.50
'T-13'	338.00	1003.50
'T-14'	264.00	1003.50
'T-15'	190.00	1003.50
'T-16'	116.00	1003.50
'T-17'	42.00	1003.50
'T-18'	-33.00	1003.50
\$\$ ROOF SLAB		
'RS-1'	718.00	1021.00
'RS-2'	709.00	1021.00
'RS-3'	634.00	1021.00
'RS-4'	560.00	1021.00
'RS-5'	486.00	1021.00
'RS-6'	412.00	1021.00
'RS-7'	338.00	1021.00
'RS-8'	264.00	1021.00
'RS-9'	190.00	1021.00
'RS-10'	116.00	1021.00
'RS-11'	42.00	1021.00
'RS-12'	-33.00	1021.00
'RS-13'	-42.00	1021.00

\$\$

TYPE PLANE FRAME

\$\$ MEMBER FOR SOUTH GALLERY WALL

MEMBER INCIDENCES

1 1 2

GENERATE 20 MEMBERS ID 2 FROM 2 INC 1 TO 3 INC 1

Sheet A4 of A10

ATTACHMENT- A: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

$$      MEMBER FOR SOUTH CANYON WALL
MEMBER INCIDENCES
      101      101      102
GENERATE 14 MEMBERS ID 102 FROM 102 INC 1 TO 103 INC 1
$$      MEMBER FOR SOUTH PIPE TUNNEL WALL
MEMBER INCIDENCES
      201      201      202
GENERATE 6 MEMBERS ID 202 FROM 202 INC 1 TO 203 INC 1
$$      MEMBER FOR NORTH PIPE TUNNEL WALL
MEMBER INCIDENCES
      301      301      302
GENERATE 6 MEMBERS ID 302 FROM 302 INC 1 TO 303 INC 1
$$      MEMBER FOR NORTH CANYON WALL
MEMBER INCIDENCES
      401      401      402
GENERATE 20 MEMBERS ID 402 FROM 402 INC 1 TO 403 INC 1
$$      MEMBER FOR NORTH GALLERY WALL
MEMBER INCIDENCES
      502      502      503
GENERATE 11 MEMBERS ID 503 FROM 503 INC 1 TO 504 INC 1
MEMBER INCIDENCES
$$      SLAB @ 88' SOUTH GALLERY
      'MS1-1'      104      'S1-1'
      'MS1-2'      'S1-1'      'S1-2'
      'MS1-3'      'S1-2'      4
$$      SLAB @ 100' SOUTH GALLERY
      'MS2-1'      107      'S2-1'
      'MS2-2'      'S2-1'      'S2-2'
      'MS2-3'      'S2-2'      7
$$      SLAB @ 112' 1 1/4" SOUTH GALLERY
      'MS3-1'      110      'S3-1'
      'MS3-2'      'S3-1'      'S3-2'
      'MS3-3'      'S3-2'      10
$$      SLAB @ 124' SOUTH GALLERY
      'MS4-1'      113      'S4-1'
      'MS4-2'      'S4-1'      'S4-2'
      'MS4-3'      'S4-2'      13
$$      SLAB @ 83' NORTH GALLERY
      'MS5-1'      404      'S5-1'
      'MS5-2'      'S5-1'      'S5-2'
      'MS5-3'      'S5-2'      504
$$      SLAB @ 100' NORTH GALLERY
      'MS6-1'      407      'S6-1'
      'MS6-2'      'S6-1'      'S6-2'
      'MS6-3'      'S6-2'      507
$$      SLAB @ 112' NORTH GALLERY
      'MS7-1'      410      'S7-1'
      'MS7-2'      'S7-1'      'S7-2'
      'MS7-3'      'S7-2'      510
$$      SLAB @ 130' 6" NORTH GALLERY
      'MS8-1'      414      'S8-1'
      'MS8-2'      'S8-1'      'S8-2'
      'MS8-3'      'S8-2'      514
$$      SLAB @ 83' PIPE TUNNEL
      'MS9-1'      303      'S9-1'
      'MS9-2'      'S9-1'      203
$$      PIPE TUNNEL ROOF @ 105'6"

```

Sheet A5 of A10

ATTACHMENT- A: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

      'MTR-1'          308          208
$$
TYPE PLANE TRUSS
MEMBER INCIDENCES
$$   COVERS ON CELL
      'CC-1'          208          108
      'CC-2'          408          308
$$   TRUSS MEMBERS BOTTOM CHORD
      'MT-1'          'T-1'          'T-2'
GENERATE 5 MEMBERS ID 'MT-2' INC 1 FROM 'T-2' INC 1 TO 'T-3' INC 1
$$   TRUSS MEMBERS TOP CHORD
MEMBER INCIDENCES
      'MT-7'          'T-8'          'T-9'
GENERATE 9 MEMBERS ID 'MT-8' INC 1 FROM 'T-9' INC 1 TO 'T-10' INC 1
$$   TRUSS MEMBERS DIAGONALS AND VERTICALS
MEMBER INCIDENCES
      'MT-17'         'T-1'          'T-8'
      'MT-18'         'T-2'          'T-8'
      'MT-19'         'T-2'          'T-9'
      'MT-20'         'T-2'          'T-10'
      'MT-21'         'T-3'          'T-10'
      'MT-22'         'T-3'          'T-11'
      'MT-23'         'T-3'          'T-12'
      'MT-24'         'T-4'          'T-12'
      'MT-25'         'T-4'          'T-13'
      'MT-26'         'T-4'          'T-14'
      'MT-27'         'T-5'          'T-14'
      'MT-28'         'T-5'          'T-15'
      'MT-29'         'T-5'          'T-16'
      'MT-30'         'T-6'          'T-16'
      'MT-31'         'T-6'          'T-17'
      'MT-32'         'T-6'          'T-18'
      'MT-33'         'T-7'          'T-18'
$$
TYPE PLANE FRAME
MEMBER INCIDENCES
$$   CONNECTION TO BUILDING STRUCTURE SOUTH SIDE
      'MTC-1'         19            30
      'MTC-2'         20            30
$$   'MTC-3' MODALLED AS TRUSS MEM - NO LATERAL TRANSFER
$$   CONNECTION TO BUILDING STRUCTURE NORTH SIDE
      'MTC-11'        419            430
      'MTC-12'        420            430
      'MTC-13'        430            'T-7'
$$
TYPE PLANE TRUSS
MEMBER INCIDENCES
$$   ROOF SLAB MEMBER
      'MRS-1'         22            'RS-1'
$$   CONNECTION BETWEEN TRUSS AND BUILDING - AXIAL LOAD ONLY
      'MTC-3'         30            'T-1'
$$
TYPE PLANE FRAME
MEMBER INCIDENCES
      'MRS-2'         'RS-1'          'RS-2'
GENERATE 11 MEMBERS ID 'MRS-3' INC 1 FROM 'RS-2' INC 1 TO 'RS-3' INC 1
MEMBER INCIDENCES

```

Sheet A6 of A10

ATTACHMENT- A: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

'MRS-14'      'RS-13'      422
$$ CONNECTION BETWEEN ROOF SLAB AND TRUSS
TYPE PLANE TRUSS
MEMBER INCIDENCES
'MTRS-1'      'T-8'      'RS-2'
GENERATE 10 MEMBERS ID 'MTRS-2' INC 1 FROM 'T-9' INC 1 TO 'RS-3' INC 1
$$
$$ PROPERTIES BLOCK
$$ FOR CONC MEMBER PROPERTIES BASED ON WIDTH OF 18'5" (221")
UNITS INCH KIPS DEGREES FAH
$$ SOUTH GALLER WALL UPTO CRANE LEVEL
MEMBER PROPERTIES PRISMATIC
1 TO 15      AX      7956.00      AY      6630.00      IZ
859248.00
$$ SOUTH GALLERY WALL FROM CRANE LEVEL TO TRUSS
MEMBER PROPERTIES PRISMATIC
16 TO 19      AX      3978.00      AY      3315.00      IZ
107406.00
$$ SOUTH GALLERY WALL FROM TRUSS TO ROOF
MEMBER PROPERTIES PRISMATIC
20 21      AX      1768.00      AY      1473.00      IZ
9429.00
$$ PAPER JOINT @ SOUTH WALL - AXIAL MEM. ONLY
MEMBER PROPERTIES PRISMATIC
'MRS-1'      AX      1768.00
$$ SOUTH CANYON WALL UPTO CANYON FL.
MEMBER PROPERTIES PRISMATIC
101 TO 107      AX      14586.00      AY      12155.00      IZ
5294718.00
$$ SOUTH CANYON WALL CANYON FL TO JOG AREA
MEMBER PROPERTIES PRISMATIC
108 TO 113      AX      10166.00      AY      8472.00      IZ
1792605.00
$$ SOUTH CANYON WALL - JOG AREA
MEMBER PROPERTIES PRISMATIC
114      AX      7956.00      AY      6630.00      IZ
859248.00
$$ SOUTH CANYON WALL - JOG TO TOP
MEMBER PROPERTIES PRISMATIC
115      AX      5746.00      AY      4788.00      IZ
323691.00
$$ PIPE TUNNEL - SOUTH AND NORTH WALL
MEMBER PROPERTIES PRISMATIC
201 TO 207 301 TO 307      AX      3978.00      AY      3315.00      IZ
107406.00
$$ PIPE TUNNEL ROOF
MEMBER PROPERTIES PRISMATIC
'MTR-1'      AX      9024.00      AY      7520.00      IZ
1732608.00
$$ NORTH CANYON WALL UPTO CANYON FLOOR
MEMBER PROPERTIES PRISMATIC
401 TO 407      AX      13260.00      AY      11050.00      IZ
3978000.00
$$ NORTH CANYON WALL FROM FLOOR TO CRANE LEVEL
MEMBER PROPERTIES PRISMATIC
408 TO 415      AX      10166.00      AY      8472.00      IZ
1792605.00

```

Sheet A7 of A10

ATTACHMENT- A: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

$$      NORTH CANYON WALL FROM CRANE LEVEL TO TRUSS SUPPORT
MEMBER PROPERTIES PRISMATIC
416 TO 419                      AX      3978.00    AY      3315.00    IZ
107406.00
$$      NORTH CANYON WALL FROM TRUSS SUPPORT TO ROOF
MEMBER PROPERTIES PRISMATIC
420 421 'MRS-14'                AX      1768.00    AY      1473.00    IZ
9429.00
$$      NORTH GALLERY WALL
MEMBER PROPERTIES PRISMATIC
502 TO 513                      AX      5304.00    AY      4420.00    IZ
95472.00
$$      1' THICK SLAB
MEMBER PROPERTIES PRISMATIC
'MS1-1' TO 'MS1-3' 'MS2-1' TO 'MS2-3' 'MS3-1' TO 'MS3-3' -
'MS5-1' TO 'MS5-3' 'MS6-1' TO 'MS6-3' 'MS7-1' TO 'MS7-3' -
'MS9-1' TO 'MS9-2'                AX      2652.00    AY      2210.00    IZ
31824.00
$$      1'6" THICK SLAB
MEMBER PROPERTIES PRISMATIC
'MS4-1' TO 'MS4-3' 'MS8-1' TO 'MS8-3' -
                                AX      3978.00    AY      3315.00    IZ
107406.00
$$      ROOF SLAB
MEMBER PROPERTIES PRISMATIC
'MRS-2' TO 'MRS-13'              AX      1989.00    AY      1658.00    IZ
13425.00
$$      TRUSS CONNECTION TO STRUCTURE
MEMBER PROPERTIES PRISMATIC
'MTC-1' TO 'MTC-2' 'MTC-11' TO 'MTC-12' -
                                AX      7956.00    AY      6630.00    IZ
859248.00
$$      REDUCED STIFFNESS FOR CONNECTION TO TRUSS
MEMBER PROPERTIES PRISMATIC
'MTC-13'                        AX      7956.00    AY      0.50    IZ
859248.00
$$      COVER FOR CELLS
MEMBER PROPERTIES PRISMATIC
'CC-1' 'CC-2'                    AX      10608.00
$$      CONN BET TRUSS & BLDG - TRUSS MEM @ SOUTH END
MEMBER PROPERTIES PRISMATIC
'MTC-3'                          AX      7956.00
$$      TRUSS MEMBER
MEMBER PROPERTIES PRISMATIC
'MT-1' TO 'MT-16'                AX      12.86
MEMBER PROPERTIES PRISMATIC
'MT-17' 'MT-33'                  AX      4.80
MEMBER PROPERTIES PRISMATIC
'MT-19' 'MT-31'                  AX      3.56
MEMBER PROPERTIES PRISMATIC
'MT-22' 'MT-28'                  AX      3.56
MEMBER PROPERTIES PRISMATIC
'MT-25'                          AX      7.12
MEMBER PROPERTIES PRISMATIC
'MT-18' 'MT-32'                  AX      8.00
MEMBER PROPERTIES PRISMATIC
'MT-20' 'MT-30'                  AX      6.62

```

Sheet A8 of A10

ATTACHMENT- A: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

MEMBER PROPERTIES PRISMATIC
'MT-21' 'MT-29'          AX          4.60
MEMBER PROPERTIES PRISMATIC
'MT-23' 'MT-27'          AX          4.66
MEMBER PROPERTIES PRISMATIC
'MT-24' 'MT-26'          AX          3.24
$$      CONNECTION BETWEEN TRUSS AND ROOF SLAB
MEMBER PROPERTIES PRISMATIC
'MTRS-1' TO 'MTRS-10'    AX          2.00
$$      REDUCE CONNECTION STIFFNESS FOR LAST PURLIN
MEMBER PROPERTIES PRISMATIC
'MTRS-11'                AX          0.50
$$
$$      SUPPORT LOCATIONS
$$
STATUS SUPPORT JOINTS -
1 101 201 301 401 502
$$
$$      MATERIAL PROPERTIES
$$
UNITS INCH LB DEG FAH
CONSTANTS
      E      3.824E+06      ALL
      G      1.634E+06      ALL
      POI     1.700E-01      ALL
      DEN     8.680E-02      ALL
$$
$$      PROVIDE E, G, POI, DEN FOR STEEL MEMBERS
$$
      E      2.900E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
      G      1.115E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
      POI     3.000E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
      DEN     2.836E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
$$
$$      ADJUST DENSITY OF ROOF SLAB TO ACCOUNT FOR FINISHES ETC.
$$
      DEN     1.003E-01      'MRS-1' TO 'MRS-13'
$$
$$      LUMPED WEIGHT OF STRUCTURE AT JOINTS
$$
INERTIA OF JOINTS LUMPED
UNIT CYCLES
EIGENPROBLEM PARAMETERS
      SOLVE USING GTLANCZOS
      FREQUENCY SPE 0.0 TO 33.0
END
PERFORM ASSEMBLY FOR DYNAMICS
PERFORM EIGENVALUE ANALYSIS
$$      LIST DYNAMIC MASS SUMMARY
UNIT INCH KIPS
LIST DYNAMIC MASS
LIST DYNAMIC PARTICIPATION FACTORS
$$
UNITS FEET SECONDS
DELETE RESPONSE SPECTRA 'RSH'
STORE RESPONSE SPECTRA ACCELERATION LOG VS FREQUENCY LOG 'RSH'
DAMPING 0.10 FACTOR 32.2

```

Sheet A9 of A10

ATTACHMENT- A: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment A: REDOX (Original "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```
$$      SPECTRA IN g's
0.12 100.0 0.12 33.0 0.20 7.1 0.20 1.67 0.028 0.77
RESPONSE SPECTRA LOAD 1
SUPPORT ACCELERATION
    TRANSLATIONAL X 1.00 FILE 'RSH'
END RESPONSE SPECTRA LOADING
DAMPING RATIO 0.10 30
PERFORM RESPONSE SPECTRA ANALYSIS
COMPUTE RESPONSE SPECTRA DISPLACEMENT ACC FORCES REACTIONS -
    MODAL COMBINATION NRC TPM
$$
CREATE PSEUDO STATIC LOAD 'NS' FROM NRC TPM LOAD 1
LIST RESPONSE SPECTRUM SPECTRAL ACCELERATION
LIST RESPONSE SPECTRUM FORCES -
    MODE COMBINATION NRC TPM MEMBERS ALL
```


ATTACHMENT: B
ORIGINATOR: R. S. Rajagopal *RS* DATE: August 19, 1999
CHECKED BY: C. A. Palmquist *CP* DATE: 1/2/99
CALC. NO. 0200W-CA-C0156 REV. NO. 0
SHEET NO. B1 OF TOTAL 35 SHEETS

ATTACHMENT "B"

**REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

The governing output values used on sheet 13 are highlighted as " ← " in the following output.

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Wed Jul 21 12:36:04 1999

1GTICES/C-NP 2.5.0 MD-NT 2.0, January 1995.

Proprietary to Georgia Tech Research Corporation, U.S.A.

Reading password file C:\Program Files\GTSTRUDL 9801\gtaccess.dat
CI-i-audfile, Command AUDIT file FILE1236.aud has been activated.

*** G T S T R U D L ***

RELEASE DATE	VERSION	COMPLETION NO.
March 1998	9801 NT	3716

```

**** ACTIVE UNITS -   LENGTH   WEIGHT   ANGLE   TEMPERATURE   TIME
**** ASSUMED TO BE    INCH     POUND   Radian   FAHRENHEIT   SECOND

```

Reading global defaults file C:\Program Files\GTSTRUDL 9801\defaults.gts

```
{ 1} > $ Put any startup commands in this file
{ 1} >
```

```
( 2) > CINPUT 'C:\Hanford\Redox_1.inp'
```

```
{ 3} > STRUDL 'REDOX BUILDING' '2-D ANALYSIS OF TYPICAL SLICE'
```

```

*****
*
*      *****
*
*      *****
*
*      **      **
*
*      **      *****      *****      *****      **      **      *****      **
*
*      **      *****      *****      *****      **      **      *****      **
*
*      **      *****      **      **      **      **      **      **      **

```

Sheet B2 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

[illegible]

```

**** ACTIVE UNITS -   LENGTH   WEIGHT   ANGLE   TEMPERATURE   TIME
**** ASSUMED TO BE      INCH     POUND   RADIAN   FAHRENHEIT   SECOND

```

```
Reading global defaults file C:\Program Files\GTSTRUDL 9801\defaults.gts
{    4) > $ Put any startup commands in this file
{    4) >
```

```

( 5) > $$
( 6) > $$      TRUSS CONNECTED TO BUILDING BY SP K=136 KIP/IN
( 7) > $$      AT ONE END.  SLOTTED HOLE END FREE
( 8) > UNITS INCH KIPS DEGREES FAH
( 9) > $$
(10) > JOINT COORDINATES GLOBAL
(11) > $$      SOUTH WALL
(12) >          1          704.00          0.00
(13) >          2          704.00          57.00
(14) >          3          704.00         114.00
(15) >          4          704.00         171.00
(16) >          5          704.00         219.00
(17) >          6          704.00         267.00
(18) >          7          704.00         315.00
(19) >          8          704.00         363.21
(20) >          9          704.00         411.42
(21) >         10          704.00         459.63
(22) >         11          704.00         410.00
(23) >         12          704.00         553.21
(24) >         13          704.00         600.00
(25) >         14          704.00         651.50
(26) >         15          704.00         703.00
(27) >         16          713.00         721.00
(28) >         17          713.00         778.33
(29) >         18          713.00         835.67
(30) >         19          713.00         893.00
(31) >         20          718.00         903.00
(32) >         21          718.00         960.00
(33) >         22          718.00        1017.00
(34) > $$      DUMMY JOINT FOR TRUSS
(35) >         30          709.00         903.00
(36) > $$      SOUTH CANYON WALL
(37) >        101          501.00          0.00

```

Sheet B3 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

{ 38} >	102	501.00	57.00
{ 39} >	103	501.00	114.00
{ 40} >	104	501.00	171.00
{ 41} >	105	501.00	219.00
{ 42} >	106	501.00	267.00
{ 43} >	107	501.00	315.00
{ 44} >	108	501.00	363.00
{ 45} >	109	511.00	387.00
{ 46} >	110	511.00	459.63
{ 47} >	111	511.00	410.00
{ 48} >	112	511.00	553.21
{ 49} >	113	511.00	600.00
{ 50} >	114	511.00	625.00
{ 51} >	115	521.00	655.00
{ 52} >	116	521.00	721.00
{ 53} > \$\$	SOUTH PIPE TUNNEL WALL		
{ 54} >	201	315.00	0.00
{ 55} >	202	315.00	55.50
{ 56} >	203	315.00	111.00
{ 57} >	204	315.00	162.00
{ 58} >	205	315.00	213.00
{ 59} >	206	315.00	264.00
{ 60} >	207	315.00	315.00
{ 61} >	208	267.00	363.00
{ 62} > \$\$	NORTH PIPE TUNNEL WALL		
{ 63} >	301	183.00	0.00
{ 64} >	302	183.00	55.50
{ 65} >	303	183.00	111.00
{ 66} >	304	183.00	162.00
{ 67} >	305	183.00	213.00
{ 68} >	306	183.00	264.00
{ 69} >	307	183.00	315.00
{ 70} >	308	231.00	363.00
{ 71} > \$\$	NORTH CANYON WALL		
{ 72} >	401	0.00	0.00
{ 73} >	402	0.00	57.00
{ 74} >	403	0.00	114.00
{ 75} >	404	0.00	171.00
{ 76} >	405	0.00	219.00
{ 77} >	406	0.00	267.00
{ 78} >	407	0.00	315.00
{ 79} >	408	0.00	363.00
{ 80} >	409	-28.00	403.00
{ 81} >	410	-28.00	459.00
{ 82} >	411	-28.00	513.75
{ 83} >	412	-28.00	568.50
{ 84} >	413	-28.00	623.25
{ 85} >	414	-28.00	678.00
{ 86} >	415	-28.00	703.00
{ 87} >	416	-37.00	721.00
{ 88} >	417	-37.00	778.00
{ 89} >	418	-37.00	835.67
{ 90} >	419	-37.00	893.00
{ 91} >	420	-42.00	903.00
{ 92} >	421	-42.00	960.00
{ 93} >	422	-42.00	1017.00
{ 94} > \$\$	DUMMY JOINT FOR TRUSS CONNECTION		

Sheet B4 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

{ 95} >	430	-33.00	903.00
{ 95} > \$\$	NORTH GALLERY WALL		
{ 97} >	502	-274.00	57.25
{ 98} >	503	-274.00	114.13
{ 99} >	504	-274.00	171.00
{ 100} >	505	-274.00	219.00
{ 101} >	506	-274.00	267.00
{ 102} >	507	-274.00	315.00
{ 103} >	508	-274.00	363.00
{ 104} >	509	-274.00	411.00
{ 105} >	510	-274.00	459.00
{ 106} >	511	-274.00	513.75
{ 107} >	512	-274.00	568.50
{ 108} >	513	-274.00	623.25
{ 109} >	514	-274.00	678.00
{ 110} > \$\$	SLAB S1 @ SOUTH GALLERY		
{ 111} >	'S1-1'	568.67	171.00
{ 112} >	'S1-2'	636.33	171.00
{ 113} > \$\$	SLAB S2 @ SOUTH GALLERY		
{ 114} >	'S2-1'	568.67	315.00
{ 115} >	'S2-2'	636.33	315.00
{ 116} > \$\$	SLAB S3 @ SOUTH GALLERY		
{ 117} >	'S3-1'	568.67	459.63
{ 118} >	'S3-2'	636.33	459.63
{ 119} > \$\$	SLAB S4 @ SOUTH GALLERY		
{ 120} >	'S4-1'	568.67	600.00
{ 121} >	'S4-2'	636.33	600.00
{ 122} > \$\$	SLAB S5 @ NORTH GALLERY		
{ 123} >	'S5-1'	-91.33	171.00
{ 124} >	'S5-2'	-182.67	171.00
{ 125} > \$\$	SLAB S6 @ NORTH GALLERY		
{ 126} >	'S6-1'	-91.33	315.00
{ 127} >	'S6-2'	-182.67	315.00
{ 128} > \$\$	SLAB S7 @ NORTH GALLERY		
{ 129} >	'S7-1'	-91.33	459.00
{ 130} >	'S7-2'	-182.67	459.00
{ 131} > \$\$	SLAB S8 @ NORTH GALLERY		
{ 132} >	'S8-1'	-91.33	678.00
{ 133} >	'S8-2'	-182.67	678.00
{ 134} > \$\$	SLAB S9 @ PIPE TUNNEL		
{ 135} >	'S9-1'	249.00	111.00
{ 136} > \$\$	ROOF TRUSS BOTTOM CHORD		
{ 137} >	'T-1'	709.00	909.50
{ 138} >	'T-2'	634.00	909.50
{ 139} >	'T-3'	486.00	909.50
{ 140} >	'T-4'	338.00	909.50
{ 141} >	'T-5'	190.00	909.50
{ 142} >	'T-6'	42.00	909.50
{ 143} >	'T-7'	-33.00	909.50
{ 144} >	'T-8'	709.00	1003.50
{ 145} >	'T-9'	634.00	1003.50
{ 146} >	'T-10'	560.00	1003.50
{ 147} >	'T-11'	486.00	1003.50
{ 148} >	'T-12'	412.00	1003.50
{ 149} >	'T-13'	338.00	1003.50
{ 150} >	'T-14'	264.00	1003.50
{ 151} >	'T-15'	190.00	1003.50

Sheet B5 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```
( 152) > 'T-16'      116.00    1003.50
( 153) > 'T-17'      42.00    1003.50
( 154) > 'T-18'     -33.00    1003.50
( 155) > $$          ROOF SLAB
( 156) > 'RS-1'      718.00    1021.00
( 157) > 'RS-2'      709.00    1021.00
( 158) > 'RS-3'      634.00    1021.00
( 159) > 'RS-4'      560.00    1021.00
( 160) > 'RS-5'      486.00    1021.00
( 161) > 'RS-6'      412.00    1021.00
( 162) > 'RS-7'      338.00    1021.00
( 163) > 'RS-8'      264.00    1021.00
( 164) > 'RS-9'      190.00    1021.00
( 165) > 'RS-10'     116.00    1021.00
( 166) > 'RS-11'      42.00    1021.00
( 167) > 'RS-12'     -33.00    1021.00
( 168) > 'RS-13'     -42.00    1021.00
( 169) > $$
( 170) > TYPE PLANE FRAME
( 171) > $$          MEMBER FOR SOUTH GALLERY WALL
( 172) > MEMBER INCIDENCES
( 173) >              1              2
( 174) > GENERATE 20 MEMBERS ID 2 FROM 2 INC 1 TO 3 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	11
11	12
12	13
13	14
14	15
15	16
16	17
17	18
18	19
19	20
20	21
21	22

```
( 175) > $$          MEMBER FOR SOUTH CANYON WALL
( 176) > MEMBER INCIDENCES
( 177) >              101          102
( 178) > GENERATE 14 MEMBERS ID 102 FROM 102 INC 1 TO 103 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES
--------	------------

Sheet B6 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

102	102	103
103	103	104
104	104	105
105	105	106
106	106	107
107	107	108
108	108	109
109	109	110
110	110	111
111	111	112
112	112	113
113	113	114
114	114	115
115	115	116

```
( 179) > $$      MEMBER FOR SOUTH PIPE TUNNEL WALL
( 180) > MEMBER INCIDENCES
( 181) >          201          201          202
( 182) > GENERATE 6 MEMBERS ID 202 FROM 202 INC 1 TO 203 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
202	202	203
203	203	204
204	204	205
205	205	206
206	206	207
207	207	208

```
( 183) > $$      MEMBER FOR NORTH PIPE TUNNEL WALL
( 184) > MEMBER INCIDENCES
( 185) >          301          301          302
( 186) > GENERATE 6 MEMBERS ID 302 FROM 302 INC 1 TO 303 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
302	302	303
303	303	304
304	304	305
305	305	306
306	306	307
307	307	308

```
( 187) > $$      MEMBER FOR NORTH CANYON WALL
( 188) > MEMBER INCIDENCES
( 189) >          401          401          402
( 190) > GENERATE 20 MEMBERS ID 402 FROM 402 INC 1 TO 403 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
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Sheet B7 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

402	402	403
403	403	404
404	404	405
405	405	406
406	406	407
407	407	408
408	408	409
409	409	410
410	410	411
411	411	412
412	412	413
413	413	414
414	414	415
415	415	416
416	416	417
417	417	418
418	418	419
419	419	420
420	420	421
421	421	422

```
( 191) > $$      MEMBER FOR NORTH GALLERY WALL
( 192) > MEMBER INCIDENCES
( 193) >          502          502          503
( 194) > GENERATE 11 MEMBERS ID 503 FROM 503 INC 1 TO 504 INC 1
```

.. /----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
503	503	504
504	504	505
505	505	506
506	506	507
507	507	508
508	508	509
509	509	510
510	510	511
511	511	512
512	512	513
513	513	514

```
( 195) > MEMBER INCIDENCES
( 196) > $$      SLAB @ 88' SOUTH GALLERY
( 197) >      'MS1-1'          104      'S1-1'
( 198) >      'MS1-2'          'S1-1'      'S1-2'
( 199) >      'MS1-3'          'S1-2'          4
( 200) > $$      SLAB @ 100' SOUTH GALLERY
( 201) >      'MS2-1'          107      'S2-1'
( 202) >      'MS2-2'          'S2-1'      'S2-2'
( 203) >      'MS2-3'          'S2-2'          7
( 204) > $$      SLAB @ 112' 1 1/4" SOUTH GALLERY
( 205) >      'MS3-1'          110      'S3-1'
( 206) >      'MS3-2'          'S3-1'      'S3-2'
( 207) >      'MS3-3'          'S3-2'          10
( 208) > $$      SLAB @ 124' SOUTH GALLERY
( 209) >      'MS4-1'          113      'S4-1'
```

Sheet B8 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```
( 210) >      'MS4-2'      'S4-1'      'S4-2'
( 211) >      'MS4-3'      'S4-2'      13
( 212) > $$      SLAB @ 83' NORTH GALLERY
( 213) >      'MS5-1'      404      'S5-1'
( 214) >      'MS5-2'      'S5-1'      'S5-2'
( 215) >      'MS5-3'      'S5-2'      504
( 216) > $$      SLAB @ 100' NORTH GALLERY
( 217) >      'MS6-1'      407      'S6-1'
( 218) >      'MS6-2'      'S6-1'      'S6-2'
( 219) >      'MS6-3'      'S6-2'      507
( 220) > $$      SLAB @ 112' NORTH GALLERY
( 221) >      'MS7-1'      410      'S7-1'
( 222) >      'MS7-2'      'S7-1'      'S7-2'
( 223) >      'MS7-3'      'S7-2'      510
( 224) > $$      SLAB @ 130' 6" NORTH GALLERY
( 225) >      'MS8-1'      414      'S8-1'
( 226) >      'MS8-2'      'S8-1'      'S8-2'
( 227) >      'MS8-3'      'S8-2'      514
( 228) > $$      SLAB @ 83' PIPE TUNNEL
( 229) >      'MS9-1'      303      'S9-1'
( 230) >      'MS9-2'      'S9-1'      203
( 231) > $$      PIPE TUNNEL ROOF @ 105' 6"
( 232) >      'MTR-1'      308      208
( 233) > $$
( 234) > TYPE PLANE TRUSS
( 235) > MEMBER INCIDENCES
( 236) > $$      COVERS ON CELL
( 237) >      'CC-1'      208      108
( 238) >      'CC-2'      408      308
( 239) > $$      TRUSS MEMBERS BOTTOM CHORD
( 240) >      'MT-1'      'T-1'      'T-2'
( 241) > GENERATE 5 MEMBERS ID 'MT-2' INC 1 FROM 'T-2' INC 1 TO 'T-3' INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MT-2	T-2	T-3
MT-3	T-3	T-4
MT-4	T-4	T-5
MT-5	T-5	T-6
MT-6	T-6	T-7

```
( 242) > $$      TRUSS MEMBERS TOP CHORD
( 243) > MEMBER INCIDENCES
( 244) >      'MT-7'      'T-8'      'T-9'
( 245) > GENERATE 9 MEMBERS ID 'MT-8' INC 1 FROM 'T-9' INC 1 TO 'T-10' INC 1
```

1

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MT-8	T-9	T-10
MT-9	T-10	T-11
MT-10	T-11	T-12
MT-11	T-12	T-13

Sheet B9 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

MT-12	T-13	T-14
MT-13	T-14	T-15
MT-14	T-15	T-16
MT-15	T-16	T-17
MT-16	T-17	T-18

```
( 246) > $$      TRUSS MEMBERS DIAGONALS AND VERTICALS
( 247) > MEMBER INCIDENCES
( 248) >          'MT-17'          'T-1'          'T-8'
( 249) >          'MT-18'          'T-2'          'T-8'
( 250) >          'MT-19'          'T-2'          'T-9'
( 251) >          'MT-20'          'T-2'          'T-10'
( 252) >          'MT-21'          'T-3'          'T-10'
( 253) >          'MT-22'          'T-3'          'T-11'
( 254) >          'MT-23'          'T-3'          'T-12'
( 255) >          'MT-24'          'T-4'          'T-12'
( 256) >          'MT-25'          'T-4'          'T-13'
( 257) >          'MT-26'          'T-4'          'T-14'
( 258) >          'MT-27'          'T-5'          'T-14'
( 259) >          'MT-28'          'T-5'          'T-15'
( 260) >          'MT-29'          'T-5'          'T-16'
( 261) >          'MT-30'          'T-6'          'T-16'
( 262) >          'MT-31'          'T-6'          'T-17'
( 263) >          'MT-32'          'T-6'          'T-18'
( 264) >          'MT-33'          'T-7'          'T-18'
( 265) > $$
( 266) > TYPE PLANE FRAME
( 267) > MEMBER INCIDENCES
( 268) > $$      CONNECTION TO BUILDING STRUCTURE SOUTH SIDE
( 269) >          'MTC-1'          19          30
( 270) >          'MTC-2'          20          30
( 271) > $$      'MTC-3' MODALLED AS TRUSS MEM - NO LATERAL TRANSFER
( 272) > $$      CONNECTION TO BUILDING STRUCTURE NORTH SIDE
( 273) >          'MTC-11'         419          430
( 274) >          'MTC-12'         420          430
( 275) >          'MTC-13'         430          'T-7'
( 276) > $$
( 277) > TYPE PLANE TRUSS
( 278) > MEMBER INCIDENCES
( 279) > $$      ROOF SLAB MEMBER
( 280) >          'MRS-1'          22          'RS-1'
( 281) > $$      CONNECTION BETWEEN TRUSS AND BUILDING - AXIAL LOAD ONLY
( 282) >          'MTC-3'          30          'T-1'
( 283) > $$
( 284) > TYPE PLANE FRAME
( 285) > MEMBER INCIDENCES
( 286) >          'MRS-2'          'RS-1'          'RS-2'
( 287) > GENERATE 11 MEMBERS ID 'MRS-3' INC 1 FROM 'RS-2' INC 1 TO 'RS-3'
INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES		
MRS-3	RS-2	RS-3	
MRS-4	RS-3	RS-4	
MRS-5	RS-4	RS-5	

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MRS-6	RS-5	RS-6
MRS-7	RS-6	RS-7
MRS-8	RS-7	RS-8
MRS-9	RS-8	RS-9
MRS-10	RS-9	RS-10
MRS-11	RS-10	RS-11
MRS-12	RS-11	RS-12
MRS-13	RS-12	RS-13

```
( 288) > MEMBER INCIDENCES
( 289) >      'MRS-14'      'RS-13'      422
( 290) > $$      CONNECTION BETWEEN ROOF SLAB AND TRUSS
( 291) > TYPE PLANE TRUSS
( 292) > MEMBER INCIDENCES
( 293) >      'MTRS-1'      'T-8'      'RS-2'
( 294) > GENERATE 10 MEMBERS ID 'MTRS-2' INC 1 FROM 'T-9' INC 1 TO 'RS-3'
INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MTRS-2	T-9	RS-3
MTRS-3	T-10	RS-4
MTRS-4	T-11	RS-5
MTRS-5	T-12	RS-6
MTRS-6	T-13	RS-7
MTRS-7	T-14	RS-8
MTRS-8	T-15	RS-9
MTRS-9	T-16	RS-10
MTRS-10	T-17	RS-11
MTRS-11	T-18	RS-12

```
( 295) > $$
( 296) > $$      PROPERTIES BLOCK
( 297) > $$      FOR CONC MEMBER PROPERTIES BASED ON WIDTH OF 18'5" (221")
( 298) > UNITS INCH KIPS DEGREES FAH
( 299) > $$      SOUTH GALLER WALL UPTO CRANE LEVEL
( 300) > MEMBER PROPERTIES PRISMATIC
( 301) > 1 TO 15      AX      7956.00      AY      6630.00      IZ
859248.00
( 302) > $$      SOUTH GALLERY WALL FROM CRANE LEVEL TO TRUSS
( 303) > MEMBER PROPERTIES PRISMATIC
( 304) > 16 TO 19      AX      3978.00      AY      3315.00      IZ
107406.00
( 305) > $$      SOUTH GALLERY WALL FROM TRUSS TO ROOF
( 306) > MEMBER PROPERTIES PRISMATIC
( 307) > 20 21      AX      1768.00      AY      1473.00      IZ
9429.00
( 308) > $$      PAPER JOINT @ SOUTH WALL - AXIAL MEM. ONLY
( 309) > MEMBER PROPERTIES PRISMATIC
( 310) > 'MRS-1'      AX      1768.00
( 311) > $$      SOUTH CANYON WALL UPTO CANYON FL.
( 312) > MEMBER PROPERTIES PRISMATIC
( 313) > 101 TO 107      AX      14586.00      AY      12155.00      IZ
5294718.00
( 314) > $$      SOUTH CANYON WALL CANYON FL TO JOG AREA
```

Sheet B11 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

( 315) > MEMBER PROPERTIES PRISMATIC
( 316) > 108 TO 113                AX      10166.00  AY      8472.00  IZ
1792605.00
( 317) > $$      SOUTH CANYON WALL - JOG AREA
( 318) > MEMBER PROPERTIES PRISMATIC
( 319) > 114                      AX      7956.00  AY      6630.00  IZ
859248.00
( 320) > $$      SOUTH CANYON WALL - JOG TO TOP
( 321) > MEMBER PROPERTIES PRISMATIC
( 322) > 115                      AX      5746.00  AY      4788.00  IZ
323691.00
( 323) > $$      PIPE TUNNEL - SOUTH AND NORTH WALL
( 324) > MEMBER PROPERTIES PRISMATIC
( 325) > 201 TO 207 301 TO 307     AX      3978.00  AY      3315.00  IZ
107406.00
( 326) > $$      PIPE TUNNEL ROOF
( 327) > MEMBER PROPERTIES PRISMATIC
( 328) > 'MTR-1'                  AX      9024.00  AY      7520.00  IZ
1732608.00
( 329) > $$      NORTH CANYON WALL UPTO CANYON FLOOR
( 330) > MEMBER PROPERTIES PRISMATIC
( 331) > 401 TO 407                AX      13260.00  AY      11050.00  IZ
3978000.00
( 332) > $$      NORTH CANYON WALL FROM FLOOR TO CRANE LEVEL
( 333) > MEMBER PROPERTIES PRISMATIC
( 334) > 408 TO 415                AX      10166.00  AY      8472.00  IZ
1792605.00
( 335) > $$      NORTH CANYON WALL FROM CRANE LEVEL TO TRUSS SUPPORT
( 336) > MEMBER PROPERTIES PRISMATIC
( 337) > 416 TO 419                AX      3978.00  AY      3315.00  IZ
107406.00
( 338) > $$      NORTH CANYON WALL FROM TRUSS SUPPORT TO ROOF
( 339) > MEMBER PROPERTIES PRISMATIC
( 340) > 420 421 'MRS-14'         AX      1768.00  AY      1473.00  IZ
9429.00
( 341) > $$      NORTH GALLERY WALL
( 342) > MEMBER PROPERTIES PRISMATIC
( 343) > 502 TO 513                AX      5304.00  AY      4420.00  IZ
95472.00
( 344) > $$      1' THICK SLAB
( 345) > MEMBER PROPERTIES PRISMATIC
( 346) > 'MS1-1' TO 'MS1-3' 'MS2-1' TO 'MS2-3' 'MS3-1' TO 'MS3-3' -
( 347) > 'MS5-1' TO 'MS5-3' 'MS6-1' TO 'MS6-3' 'MS7-1' TO 'MS7-3' -
( 348) > 'MS9-1' TO 'MS9-2'       AX      2652.00  AY      2210.00  IZ
31824.00
( 349) > $$      1'6" THICK SLAB
( 350) > MEMBER PROPERTIES PRISMATIC
( 351) > 'MS4-1' TO 'MS4-3' 'MS8-1' TO 'MS8-3' -
( 352) > _                AX      3978.00  AY      3315.00  IZ
107406.00
( 353) > $$      ROOF SLAB
( 354) > MEMBER PROPERTIES PRISMATIC
( 355) > 'MRS-2' TO 'MRS-13'      AX      1989.00  AY      1658.00  IZ
13425.00
( 356) > $$      TRUSS CONNECTION TO STRUCTURE
( 357) > MEMBER PROPERTIES PRISMATIC
( 358) > 'MTC-1' TO 'MTC-2' 'MTC-11' TO 'MTC-12' -

```

Sheet B12 of B35

ATTACHMENT-B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

[ 359] >_                               AX      7956.00  AY      6630.00  IZ
859248.00
[ 360] > $$      REDUCED STIFFNESS FOR CONNECTION TO TRUSS
[ 361] > MEMBER PROPERTIES PRISMATIC
[ 362] > 'MTC-13'                               AX      7956.00  AY      0.50  IZ
859248.00
[ 363] > $$      COVER FOR CELLS
[ 364] > MEMBER PROPERTIES PRISMATIC
[ 365] > 'CC-1' 'CC-2'                               AX      10608.00
[ 366] > $$      CONN BET TRUSS & BLDG - TRUSS MEM @ SOUTH END
[ 367] > MEMBER PROPERTIES PRISMATIC
[ 368] > 'MTC-3'                               AX      7956.00
[ 369] > $$      TRUSS MEMBER
[ 370] > MEMBER PROPERTIES PRISMATIC
[ 371] > 'MT-1' TO 'MT-16'                               AX      12.86
[ 372] > MEMBER PROPERTIES PRISMATIC
[ 373] > 'MT-17' 'MT-33'                               AX      4.80
[ 374] > MEMBER PROPERTIES PRISMATIC
[ 375] > 'MT-19' 'MT-31'                               AX      3.56
[ 376] > MEMBER PROPERTIES PRISMATIC
[ 377] > 'MT-22' 'MT-28'                               AX      3.56
[ 378] > MEMBER PROPERTIES PRISMATIC
[ 379] > 'MT-25'                               AX      7.12
[ 380] > MEMBER PROPERTIES PRISMATIC
[ 381] > 'MT-18' 'MT-32'                               AX      8.00
[ 382] > MEMBER PROPERTIES PRISMATIC
[ 383] > 'MT-20' 'MT-30'                               AX      6.62
[ 384] > MEMBER PROPERTIES PRISMATIC
[ 385] > 'MT-21' 'MT-29'                               AX      4.60
[ 386] > MEMBER PROPERTIES PRISMATIC
[ 387] > 'MT-23' 'MT-27'                               AX      4.66
[ 388] > MEMBER PROPERTIES PRISMATIC
[ 389] > 'MT-24' 'MT-26'                               AX      3.24
[ 390] > $$      CONNECTION BETWEEN TRUSS AND ROOF SLAB
[ 391] > MEMBER PROPERTIES PRISMATIC
[ 392] > 'MTRS-1' TO 'MTRS-10'                               AX      2.00
[ 393] > $$      REDUCE CONNECTION STIFFNESS FOR LAST PURLIN
[ 394] > MEMBER PROPERTIES PRISMATIC
[ 395] > 'MTRS-11'                               AX      0.50
[ 396] > $$
[ 397] > $$      SUPPORT LOCATIONS
[ 398] > $$
[ 399] > STATUS SUPPORT JOINTS -
[ 400] >_1 101 201 301 401 502
[ 401] > $$
[ 402] > $$      MATERIAL PROPERTIES
[ 403] > $$
[ 404] > UNITS INCH LB DEG FAH
[ 405] > CONSTANTS
[ 406] >      E      3.824E+06      ALL
[ 407] >      G      1.634E+06      ALL
[ 408] >      POI     1.700E-01      ALL
[ 409] >      DEN     8.680E-02      ALL
[ 410] > $$
[ 411] > $$      PROVIDE E, G, POI, DEN FOR STEEL MEMBERS
[ 412] > $$
[ 413] >      E      2.900E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'

```

Sheet B13 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```
( 414) >      G      1.115E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 415) >      POI     3.000E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 416) >      DEN     2.836E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 417) > $$
( 418) > $$      ADJUST DENSITY OF ROOF SLAB TO ACCOUNT FOR FINISHES ETC.
( 419) > $$
( 420) >      DEN     1.003E-01      'MRS-1' TO 'MRS-13'
( 421) > $$
( 422) > $$      LUMPED WEIGHT OF STRUCTURE AT JOINTS
( 423) > $$
( 424) > INERTIA OF JOINTS LUMPED
( 425) > UNIT CYCLES
( 426) > EIGENPROBLEM PARAMETERS
( 427) >      SOLVE USING GTLANCZOS
( 428) >      FREQUENCY SPE 0.0 TO 33.0
( 429) > END
( 430) > PERFORM ASSEMBLY FOR DYNAMICS
```

BANDWIDTH INFORMATION BEFORE RENUMBERING.

```
THE MAXIMUM BANDWIDTH IS 100 AND OCCURS AT JOINT RS-1
THE AVERAGE BANDWIDTH IS      11.165
THE STANDARD DEVIATION OF THE BANDWIDTH IS      21.338
-----
32.503
=====
```

BANDWIDTH INFORMATION AFTER RENUMBERING.

```
THE MAXIMUM BANDWIDTH IS 9 AND OCCURS AT JOINT S7-2
THE AVERAGE BANDWIDTH IS      5.511
THE STANDARD DEVIATION OF THE BANDWIDTH IS      1.914
-----
7.425
=====
```

```
TIME FOR CONSISTENCY CHECK FOR 176 MEMBERS      0.00 SECONDS
TIME FOR BANDWIDTH REDUCTION                    0.02 SECONDS
TIME TO GENERATE 176 ELEMENT STIF. MATRICES     0.01 SECONDS
TIME TO ASSEMBLE THE STIFFNESS MATRIX           0.04 SECONDS
TIME TO PROCESS 139 JOINTS                      0.00 SECONDS
TIME TO GENERATE REDUCED STIFFNESS MATRIX        0.01 SECONDS
TIME TO ASSEMBLE LUMPED MASS MATRIX             0.00 SECONDS
```

```
{ 431} > PERFORM EIGENVALUE ANALYSIS
```

**** STRUDL MESSAGE DY.409 - THERE ARE 24 FREQUENCIES LESS THAN OR EQUAL TO THE SPECIFIED MAXIMUM FREQUENCY

```
TIME TO SOLVE EIGENPROBLEM                      0.39 SECONDS
TIME TO TRANSFORM EIGENVECTORS TO JOINTS        0.02 SECONDS
```

```
*****
* EIGEN-SOLUTION CHECKS *
*****
```

Sheet B14 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

**** STRUDL MESSAGE - STURM SEQUENCE CHECK WAS SUCCESSFUL - THERE ARE NO MISSING MODES

MODE	EIGENVALUE	FREQUENCY	FREQUENCY	PERIOD
ESTIMATED---	(RAD/SEC)**2)	(RAD/SEC)	(CYC/SEC)	(SEC/CYC)
ACCURACY				
1	7.097526D+01	8.424682D+00	1.340830D+00	7.458069D-01
2.600567D-10				
2	2.519609D+02	1.587328D+01	2.526311D+00	3.958342D-01
5.674598D-11				
3	5.447974D+02	2.334090D+01	3.714819D+00	2.691921D-01
3.745534D-11				
4	6.913082D+02	2.629274D+01	4.184620D+00	2.389703D-01
9.499982D-12				
5	1.302664D+03	3.609243D+01	5.744289D+00	1.740859D-01
1.224987D-11				
6	2.674956D+03	5.171997D+01	8.231489D+00	1.214847D-01
7.158438D-12				
7	3.555638D+03	5.962917D+01	9.490277D+00	1.053710D-01
2.571823D-12				
8	4.411769D+03	6.642115D+01	1.057125D+01	9.459616D-02
1.898073D-12				
9	7.068505D+03	8.407440D+01	1.338086D+01	7.473363D-02
2.927154D-12				
10	7.875138D+03	8.874197D+01	1.412372D+01	7.080286D-02
3.668466D-12				
11	1.201362D+04	1.096067D+02	1.744444D+01	5.732485D-02
1.182018D-12				
12	1.501039D+04	1.225169D+02	1.949917D+01	5.128423D-02
5.945243D-13				
13	1.514236D+04	1.230543D+02	1.958470D+01	5.106028D-02
5.831781D-13				
14	1.588799D+04	1.260476D+02	2.006110D+01	4.984773D-02
4.307308D-13				
15	2.029155D+04	1.424484D+02	2.267137D+01	4.410850D-02
2.051636D-12				
16	2.030342D+04	1.424901D+02	2.267800D+01	4.409560D-02
4.470963D-13				
17	2.093213D+04	1.446794D+02	2.302644D+01	4.342833D-02
3.893172D-13				
18	2.429675D+04	1.558741D+02	2.480814D+01	4.030935D-02
6.183658D-12				
19	2.495181D+04	1.579614D+02	2.514034D+01	3.977671D-02
1.433233D-11				
20	2.953178D+04	1.718481D+02	2.735048D+01	3.656243D-02
1.142555D-09				
21	3.210842D+04	1.791882D+02	2.851869D+01	3.506472D-02
1.589993D-08				
22	3.346134D+04	1.829244D+02	2.911332D+01	3.434854D-02
1.127976D-07				
23	3.876815D+04	1.968963D+02	3.133702D+01	3.191114D-02
2.245055D-06				

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

24 3.962219D+04 1.990532D+02 3.168031D+01 3.156535D-02
5.639187D-06

ORTHOGONALITY CHECK

WITH RESPECT TO MASS

OFF DIAGONALS: MAXIMUM = 0.2180E-14
MINIMUM = 0.1148E-17
MEAN = 0.3995E-15

DIAGONALS: MAXIMUM = 0.1000E+01
MINIMUM = 0.1000E+01
MEAN = 0.1000E+01

WITH RESPECT TO STIFFNESS

OFF DIAGONALS: MAXIMUM = 0.3106E-08
MINIMUM = 0.3610E-12
MEAN = 0.2367E-09

DIAGONALS: MAXIMUM = 0.3962E+05
MINIMUM = 0.7098E+02
MEAN = 0.1545E+05

* END OF EIGEN-SOLUTION CHECKS *

TIME TO CHECK EIGENSOLUTION 0.11 SECONDS
(432) > \$\$ LIST DYNAMIC MASS SUMMARY
(433) > UNIT INCH KIPS
(434) > LIST DYNAMIC MASS

1

RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

ACTIVE UNITS INCH KIP CYC DEGF SEC

```

/-----/-----/-----/-----/-----/
-/
GLOBAL  CENTER OF MASS
  AXIS    COORDINATE      TOTAL MASS      TOTAL WEIGHT      MASS MOMENT
/-----/-----/-----/-----/-----/
-/
      X      281.6072      10.08428      3893.426      0.0000000E+00
      Y      408.0296      10.08428      3893.426      0.0000000E+00
      Z      0.0000000E+00  0.0000000E+00  0.0000000E+00  1632869.
/-----/-----/-----/-----/-----/
-/
  
```

{ 435} > LIST DYNAMIC PARTICIPATION FACTORS

1

 RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS INCH KIP CYC DEGF SEC

NORMALIZED PARTICIPATION FACTORS

% OF X DIRECTION MASS PARTICIPATING

```

-----
MODE    PERCENT    MODE    PERCENT    MODE    PERCENT    MODE
PERCENT  MODE      PERCENT  MODE      PERCENT
1      18.54630      2      37.86389      3      9.945958      4      2.770189
5      4.541338      6      2.957516
7      6.810693      8      0.1741273      9      0.3933736      10     1.177389
11     0.4826069E-01 12     1.270376
13     0.6089306E-02 14     0.6347224E-02 15     0.5457880E-01 16
0.2564591E-02 17     0.1029948E-03 18     0.4742989E-01
19     1.736298      20     0.7159292      21     0.2614425      22     1.847995
23     0.1650683E-01 24     0.5403175
  
```

TOTAL PERCENTAGE OF X DIRECTION MASS PARTICIPATING: 91.735

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

% OF Y DIRECTION MASS PARTICIPATING

MODE PERCENT	PERCENT MODE	MODE PERCENT	PERCENT MODE	MODE PERCENT	PERCENT	MODE
1	0.5300798E-03	2	0.1515265E-01	3	0.6291047	4 2.753987
5	0.1291234E-05	6	0.5801280E-02			
7	0.2053161E-03	8	0.1558688E-02	9	0.2479841E-02	10
0.4483779E-02	11	1.051496	12	0.4440144E-02		
13	0.2467421	14	2.838782	15	0.3942637	16 4.028200
17	0.4203110	18	1.746654			
19	3.351988	20	0.6141067	21	1.690389	22
0.4739766E-01	23	20.51424	24	0.2857599		

TOTAL PERCENTAGE OF Y DIRECTION MASS PARTICIPATING: 40.648

NO MASS IN Z DIRECTION

```

( 436) > $$
( 437) > UNITS FEET SECONDS
( 438) > DELETE RESPONSE SPECTRA 'RSH'
**** STRUDL ERROR DY.81 - FILE RSH DOES NOT EXIST ON USER DATA SET
( 439) > STORE RESPONSE SPECTRA ACCELERATION LOG VS FREQUENCY LOG 'RSH'
( 440) > DAMPING 0.10 FACTOR 32.2
( 441) > $$ SPECTRA IN g's
( 442) > 0.12 100.0 0.12 33.0 0.20 7.1 0.20 1.67 0.028 0.77
( 443) > RESPONSE SPECTRA LOAD 1
( 444) > SUPPORT ACCELERATION
( 445) > TRANSLATIONAL X 1.00 FILE 'RSH'
( 446) > END RESPONSE SPECTRA LOADING
( 447) > DAMPING RATIO 0.10 30
( 448) > PERFORM RESPONSE SPECTRA ANALYSIS
TIME TO COMPUTE RESPONSE SPECTRA RESULTS 0.00 SECONDS
( 449) > COMPUTE RESPONSE SPECTRA DISPLACEMENT ACC FORCES REACTIONS -
( 450) > _ MODAL COMBINATION NRC TPM
TIME FOR RESPONSE SPECTRA COMPUTATION 0.45 SECONDS
( 451) > $$
( 452) > CREATE PSEUDO STATIC LOAD 'NS' FROM NRC TPM LOAD 1
( 453) > LIST RESPONSE SPECTRUM SPECTRAL ACCELERATION

```

1

 RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS FEET KIP CYC DEGF SEC

Sheet B18 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

LOADING - 1

SPECTRAL ACCELERATIONS

MODE	ACC	MODE	ACC	MODE	ACC	MODE	ACC
MODE	ACC	MODE	ACC				
1	3.687696	2	6.440001	3	6.440000	4	6.440000
5	6.440001	6	6.131038				
7	5.847721	8	5.641710	9	5.216498	10	5.123625
11	4.776242	12	4.602650				
13	4.595957	14	4.559378	15	4.377673	16	4.377247
17	4.355112	18	4.248522				
19	4.229773	20	4.112922	21	4.056123	22	4.028389
23	3.931003	24	3.916789				

(454) > LIST RESPONSE SPECTRUM FORCES -
 (455) >_ MODE COMBINATION NRC TPM MEMBERS ALL
 1

 RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS FEET KIP CYC DEGF SEC

LOADING - 1

MEMBER FORCES

MEMBER	JOINT	RESPONSE	/-----FORCE-----
		/-----MOMENT-----/	

Sheet B19 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

TORSIONAL		TYPE BENDING-Y	AXIAL BENDING-Z	SHEAR-Y	SHEAR-Z
1 723.9748	1	NRC TPM	162.5270	26.54026	
1 601.5921	2	NRC TPM	162.5270	26.54026	
2 601.5921	2	NRC TPM	162.5169	26.39308	
2 481.6094	3	NRC TPM	162.5169	26.39308	
3 481.6094	3	NRC TPM	162.4966	25.90502	
3 366.9013	4	NRC TPM	162.4966	25.90502	
4 464.6790	4	NRC TPM	151.8851	25.46727	
4 386.0259	5	NRC TPM	151.8851	25.46727	
5 386.0259	5	NRC TPM	151.8522	24.33854	
5 323.7255	6	NRC TPM	151.8522	24.33854	
6 323.7255	6	NRC TPM	151.8127	22.92231	
6 285.4577	7	NRC TPM	151.8127	22.92231	
7 414.4480	7	NRC TPM	135.4492	31.68467	
7 320.7210	8	NRC TPM	135.4492	31.68467	
8 320.7210	8	NRC TPM	135.3956	28.87152	
8 260.6539	9	NRC TPM	135.3956	28.87152	
9 260.6539	9	NRC TPM	135.3362	25.48639	
9 244.0547	10	NRC TPM	135.3362	25.48639	

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

10 371.3631	10	NRC TPM	110.3275	33.78887
10 410.8623	11	NRC TPM	110.3275	33.78887
11 410.8623	11	NRC TPM	110.1817	29.44501
11 435.5901	12	NRC TPM	110.1817	29.44501
12 435.5901	12	NRC TPM	110.0114	23.55810
12 508.1829	13	NRC TPM	110.0114	23.55810
13 1275.257	13	NRC TPM	15.11513	66.60932
13 994.9907	14	NRC TPM	15.11513	66.60932
14 994.9907	14	NRC TPM	15.02906	59.04925
14 746.0487	15	NRC TPM	15.02906	59.04925
15 746.0487	15	NRC TPM	26.17626	48.20427
15 666.7941	16	NRC TPM	26.17626	48.20427
16 666.7941	16	NRC TPM	14.88747	48.30655
16 438.4806	17	NRC TPM	14.88747	48.30655
17 438.4806	17	NRC TPM	14.79764	41.66020
17 241.5442	18	NRC TPM	14.79764	41.66020
18 241.5442	18	NRC TPM	14.71808	32.82532
18 88.16196	19	NRC TPM	14.71808	32.82532
19 15.92260	19	NRC TPM	9.195590	3.116371

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

19 13.15434	20	NRC TPM	9.195590	3.116371
20 85.37629	20	NRC TPM	23.54141	12.54457
20 26.14533	21	NRC TPM	23.54141	12.54457
21 26.14532	21	NRC TPM	23.73512	5.504276
21 0.7126374E-05	22	NRC TPM	23.73512	5.504276
101 4215.964	101	NRC TPM	160.8116	128.0982
101 3636.893	102	NRC TPM	160.8116	128.0982
102 3636.893	102	NRC TPM	160.8033	127.8320
102 3070.140	103	NRC TPM	160.8033	127.8320
103 3070.140	103	NRC TPM	160.7868	126.9367
103 2525.370	104	NRC TPM	160.7868	126.9367
104 2623.186	104	NRC TPM	150.0263	124.2010
104 2183.218	105	NRC TPM	150.0263	124.2010
105 2183.218	105	NRC TPM	149.9996	122.1202
105 1779.877	106	NRC TPM	149.9996	122.1202
106 1779.877	106	NRC TPM	149.9674	119.3006
106 1438.436	107	NRC TPM	149.9674	119.3006
107 1571.013	107	NRC TPM	133.3757	105.3932
107 1380.694	108	NRC TPM	133.3757	105.3932

Sheet B22 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

108 1380.694	108	NRC TPM	175.6569	79.68267
108 1216.515	109	NRC TPM	175.6569	79.68267
109 1216.515	109	NRC TPM	133.3813	136.1483
109 482.7149	110	NRC TPM	133.3813	136.1483
110 624.1460	110	NRC TPM	108.3117	127.8451
110 1132.453	111	NRC TPM	108.3117	127.8451
111 1132.453	111	NRC TPM	108.5060	121.7762
111 375.8706	112	NRC TPM	108.5060	121.7762
112 375.8707	112	NRC TPM	108.6767	109.2182
112 774.6719	113	NRC TPM	108.6767	109.2182
113 94.03998	113	NRC TPM	0.5291365	16.84598
113 59.09183	114	NRC TPM	0.5291365	16.84598
114 59.09183	114	NRC TPM	3.405450	11.51375
114 28.85658	115	NRC TPM	3.405450	11.51375
115 28.85658	115	NRC TPM	0.1838033	5.246650
115 0.5825673E-05	116	NRC TPM	0.1838033	5.246650
201 210.0507	201	NRC TPM	75.32702	22.62680
201 106.0471	202	NRC TPM	75.32702	22.62680
202 106.0471	202	NRC TPM	75.32347	22.42181

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

202 13.98091	203	NRC TPM	75.32347	22.42181
203 155.1276	203	NRC TPM	47.96987	21.59093
203 64.42332	204	NRC TPM	47.96987	21.59093
204 64.42331	204	NRC TPM	47.96031	21.01898
204 27.64867	205	NRC TPM	47.96031	21.01898
205 27.64867	205	NRC TPM	47.94829	20.26044
205 111.6244	206	NRC TPM	47.94829	20.26044
206 111.6244	206	NRC TPM	47.93383	19.26447
206 192.8320	207	NRC TPM	47.93383	19.26447
207 192.8320	207	NRC TPM	46.46267	21.36943
207 72.11876	208	NRC TPM	46.46267	21.36943
301 210.0802	301	NRC TPM	75.32868	22.63699
301 106.0299	302	NRC TPM	75.32868	22.63699
302 106.0299	302	NRC TPM	75.32513	22.43199
302 13.97698	303	NRC TPM	75.32513	22.43199
303 155.0565	303	NRC TPM	47.97192	21.58355
303 64.38428	304	NRC TPM	47.97192	21.58355
304 64.38428	304	NRC TPM	47.96235	21.01184
304 27.65789	305	NRC TPM	47.96235	21.01184

Sheet B24 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

305 27.65789	305	NRC TPM	47.95031	20.25375	
305 111.6054	306	NRC TPM	47.95031	20.25375	
306 111.6054	306	NRC TPM	47.93584	19.25834	
306 192.7868	307	NRC TPM	47.93584	19.25834	
307 192.7868	307	NRC TPM	46.46034	21.37459	
307 72.04412	308	NRC TPM	46.46034	21.37459	
401 3345.573	401	NRC TPM	63.67267	122.2453	←
401 2823.858	402	NRC TPM	63.67267	122.2453	
402 2823.858	402	NRC TPM	63.65848	121.9383	
402 2331.093	403	NRC TPM	63.65848	121.9383	
403 2331.093	403	NRC TPM	63.63036	120.9438	
403 1890.654	404	NRC TPM	63.63036	120.9438	
404 1967.893	404	NRC TPM	59.06043	138.5703	
404 1589.979	405	NRC TPM	59.06043	138.5703	←
405 1589.979	405	NRC TPM	59.01290	136.5179	
405 1343.480	406	NRC TPM	59.01290	136.5179	
406 1343.480	406	NRC TPM	58.95617	133.7974	
406 1295.443	407	NRC TPM	58.95617	133.7974	
407 1353.367	407	NRC TPM	52.69728	118.5914	

Sheet B25 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

407 1458.176	408	NRC TPM	52.69728	118.5914
408 1458.176	408	NRC TPM	90.19257	52.77518
408 1331.076	409	NRC TPM	90.19257	52.77518
409 1331.076	409	NRC TPM	52.58089	87.78626 ←
409 1070.753	410	NRC TPM	52.58089	87.78626
410 1149.460	410	NRC TPM	38.44527	49.40107 ←
410 1038.229	411	NRC TPM	38.44527	49.40107
411 1038.229	411	NRC TPM	38.48089	45.00646
411 954.5264	412	NRC TPM	38.48089	45.00646
412 954.5264	412	NRC TPM	38.52438	39.85139
412 892.0784	413	NRC TPM	38.52438	39.85139
413 892.0784	413	NRC TPM	38.57757	34.16879
413 839.9167	414	NRC TPM	38.57757	34.16879
414 1121.454	414	NRC TPM	14.55901	49.87020
414 1022.515	415	NRC TPM	14.55901	49.87020
415 1022.515	415	NRC TPM	23.87736	45.76763
415 950.0551	416	NRC TPM	23.87736	45.76763
416 950.0551	416	NRC TPM	14.25832	49.57498 ←
416 720.2843	417	NRC TPM	14.25832	49.57498

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

417 720.2843	417	NRC TPM	14.10621	49.50992	
417 487.6787	418	NRC TPM	14.10621	49.50992	
418 487.6787	418	NRC TPM	13.96323	48.87549	
418 261.2441	419	NRC TPM	13.96323	48.87549	
419 47.48839	419	NRC TPM	15.10577	14.28569	
419 34.66214	420	NRC TPM	15.10577	14.28569	
420 212.2877	420	NRC TPM	14.92581	45.38221	←
420 26.65198	421	NRC TPM	14.92581	45.38221	
421 26.65198	421	NRC TPM	14.91121	44.09769	
421 215.2592	422	NRC TPM	14.91121	44.09769	
502 248.8355	502	NRC TPM	68.94424	30.43464	←
502 105.0501	503	NRC TPM	68.94424	30.43464	
503 105.0501	503	NRC TPM	68.93934	30.20913	
503 40.84610	504	NRC TPM	68.93934	30.20913	
504 49.04579	504	NRC TPM	63.99935	7.202723	←
504 27.93317	505	NRC TPM	63.99935	7.202723	
505 27.93317	505	NRC TPM	63.98718	6.209117	
505 24.07066	506	NRC TPM	63.98718	6.209117	
506 24.07066	506	NRC TPM	63.97163	5.470561	

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT StruI" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

506 35.79412	507	NRC TPM	63.97163	5.470561
507 83.52233	507	NRC TPM	57.04204	11.99370
507 67.63642	508	NRC TPM	57.04204	11.99370
508 67.63641	508	NRC TPM	57.01882	10.22073
508 79.53875	509	NRC TPM	57.01882	10.22073
509 79.53875	509	NRC TPM	56.99268	8.307423
509 102.3637	510	NRC TPM	56.99268	8.307423
510 221.8341	510	NRC TPM	41.23708	33.33727
510 79.00789	511	NRC TPM	41.23708	33.33727
511 79.00789	511	NRC TPM	41.20670	31.40112
511 83.70372	512	NRC TPM	41.20670	31.40112
512 83.70372	512	NRC TPM	41.17549	29.29694
512 208.2919	513	NRC TPM	41.17549	29.29694
513 208.2919	513	NRC TPM	41.14381	27.40430
513 327.7747	514	NRC TPM	41.14381	27.40430
MS1-1 98.74975	104	NRC TPM	6.620917	11.64965
MS1-1 33.05723	S1-1	NRC TPM	6.620917	11.64965
MS1-2 33.05723	S1-1	NRC TPM	6.298756	11.69917
MS1-2 32.90918	S1-2	NRC TPM	6.298756	11.69917

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MS1-3 32.90918	S1-2	NRC TPM	6.030550	11.65252
MS1-3 98.61684	4	NRC TPM	6.030550	11.65252
MS2-1 147.3557	107	NRC TPM	21.74870	17.47443
MS2-1 48.82403	S2-1	NRC TPM	21.74870	17.47443
MS2-2 48.82403	S2-1	NRC TPM	20.79790	17.54149
MS2-2 50.09531	S2-2	NRC TPM	20.79790	17.54149
MS2-3 50.09531	S2-2	NRC TPM	19.86061	17.47210
MS2-3 148.6055	7	NRC TPM	19.86061	17.47210
MS3-1 208.5705	110	NRC TPM	24.07740	25.64693
MS3-1 85.32948	S3-1	NRC TPM	24.07740	25.64693
MS3-2 85.32948	S3-1	NRC TPM	23.32876	25.78790
MS3-2 60.08401	S3-2	NRC TPM	23.32876	25.78790
MS3-3 60.08402	S3-2	NRC TPM	22.66013	25.74021
MS3-3 205.2216	10	NRC TPM	22.66013	25.74021
MS4-1 852.8647	113	NRC TPM	89.31910	109.1345
MS4-1 328.6524	S4-1	NRC TPM	89.31910	109.1345
MS4-2 328.6524	S4-1	NRC TPM	85.99980	109.3420
MS4-2 288.7262	S4-2	NRC TPM	85.99980	109.3420
MS4-3 288.7262	S4-2	NRC TPM	82.52366	109.1630

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MS4-3 903.9714	13	NRC TPM	82.52366	109.1630	
MS5-1 79.72475	404	NRC TPM	22.04126	7.128978	
MS5-1 25.64626	S5-1	NRC TPM	22.04126	7.128978	
MS5-2 25.64626	S5-1	NRC TPM	22.27713	7.193459	
MS5-2 29.18155	S5-2	NRC TPM	22.27713	7.193459	
MS5-3 29.18155	S5-2	NRC TPM	22.57224	7.081993	
MS5-3 82.95523	504	NRC TPM	22.57224	7.081993	←
MS6-1 103.4544	407	NRC TPM	14.04726	8.845980	←
MS6-1 36.22622	S6-1	NRC TPM	14.04726	8.845980	
MS6-2 36.22622	S6-1	NRC TPM	12.33524	8.977871	
MS6-2 32.14117	S6-2	NRC TPM	12.33524	8.977871	
MS6-3 32.14117	S6-2	NRC TPM	10.63202	8.888132	
MS6-3 99.72919	507	NRC TPM	10.63202	8.888132	
MS7-1 167.0196	410	NRC TPM	36.97212	16.36041	
MS7-1 81.19668	S7-1	NRC TPM	36.97212	16.36041	
MS7-2 81.19668	S7-1	NRC TPM	35.90671	16.46867	
MS7-2 44.61335	S7-2	NRC TPM	35.90671	16.46867	
MS7-3 44.61335	S7-2	NRC TPM	34.82758	16.56484	
MS7-3 169.3819	510	NRC TPM	34.82758	16.56484	←

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MS8-1 509.7793	414	NRC TPM	27.13373	40.65290 ←
MS8-1 295.7795	S8-1	NRC TPM	27.13373	40.65290
MS8-2 295.7795	S8-1	NRC TPM	25.94200	40.88557
MS8-2 21.44129	S8-2	NRC TPM	25.94200	40.88557
MS8-3 21.44129	S8-2	NRC TPM	26.00677	41.10815
MS8-3 327.7747	514	NRC TPM	26.00677	41.10815
MS9-1 151.3947	303	NRC TPM	0.6711839	27.52709
MS9-1 0.1145539	S9-1	NRC TPM	0.6711839	27.52709
MS9-2 0.1145539	S9-1	NRC TPM	0.6658908	27.52707
MS9-2 151.4033	203	NRC TPM	0.6658908	27.52707
MTR-1 72.04412	308	NRC TPM	126.6164	48.03632
MTR-1 72.11876	208	NRC TPM	126.6164	48.03632
CC-1	108	NRC TPM	127.4505	
CC-2	308	NRC TPM	126.8689	
MT-1	T-2	NRC TPM	1.672629	
MT-2	T-3	NRC TPM	22.07281	
MT-3	T-4	NRC TPM	35.17310	
MT-4	T-5	NRC TPM	37.90947	
MT-5	T-6	NRC TPM	34.00410	
MT-6	T-7	NRC TPM	6.833693	
MT-7	T-9	NRC TPM	11.47881	
MT-8	T-10	NRC TPM	11.49315	
MT-9	T-11	NRC TPM	29.06396	

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MT-10	T-12	NRC TPM	29.07311	
MT-11	T-13	NRC TPM	37.21357	
MT-12	T-14	NRC TPM	37.21556	
MT-13	T-15	NRC TPM	35.38402	
MT-14	T-16	NRC TPM	35.37710	
MT-15	T-17	NRC TPM	23.80730	
MT-16	T-18	NRC TPM	23.79427	
MT-17	T-8	NRC TPM	25.85523	
MT-18	T-8	NRC TPM	18.38594	
MT-19	T-9	NRC TPM	1.442800	
MT-20	T-10	NRC TPM	16.78898	
MT-21	T-10	NRC TPM	11.78879	
MT-22	T-11	NRC TPM	1.926043	
MT-23	T-12	NRC TPM	9.815539	
MT-24	T-12	NRC TPM	5.252880	
MT-25	T-13	NRC TPM	2.775547	
MT-26	T-14	NRC TPM	4.843285	
MT-27	T-14	NRC TPM	9.349350	
MT-28	T-15	NRC TPM	1.963156	
MT-29	T-16	NRC TPM	11.66069	
MT-30	T-16	NRC TPM	17.70263	
MT-31	T-17	NRC TPM	20.12969	
MT-32	T-18	NRC TPM	38.13107	
MT-33	T-18	NRC TPM	17.99386	
MTC-1	19	NRC TPM	15.65422	14.76269
72.24883				
MTC-1	30	NRC TPM	15.65422	14.76269
59.28920				
MTC-2	20	NRC TPM	12.65717	17.88136
72.23995				

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MTC-2	30	NRC TPM	12.65717	17.88136
59.28920				
MTC-11	419	NRC TPM	13.24266	44.66620
213.7623				
MTC-11	430	NRC TPM	13.24266	44.66620
174.0684				
MTC-12	420	NRC TPM	39.64884	4.893496
177.6389				
MTC-12	430	NRC TPM	39.64884	4.893496
174.1316				
MTC-13	430	NRC TPM	18.01954	8.385284
4.542029				
MTC-13	T-7	NRC TPM	18.01954	8.385284
0.2890849E-07				
MRS-1	RS-1	NRC TPM	23.83928	
MTC-3	T-1	NRC TPM	25.85531	
MRS-2	RS-1	NRC TPM	0.3525678	23.86689
0.1336482E-07				
MRS-2	RS-2	NRC TPM	0.3525678	23.86689
17.90016				
MRS-3	RS-2	NRC TPM	2.712735	1.834662
17.90017				
MRS-3	RS-3	NRC TPM	2.712735	1.834662
8.074433				
MRS-4	RS-3	NRC TPM	6.897895	1.122834
8.074436				
MRS-4	RS-4	NRC TPM	6.897895	1.122834
3.189288				
MRS-5	RS-4	NRC TPM	11.05436	1.511232
3.189292				
MRS-5	RS-5	NRC TPM	11.05436	1.511232
12.33987				
MRS-6	RS-5	NRC TPM	15.20985	0.4680283
12.33987				
MRS-6	RS-6	NRC TPM	15.20985	0.4680283
10.94133				

Sheet B33 of B35

ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment B: REDOX (Original "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MRS-7 10.94133	RS-6	NRC TPM	19.36399	0.9679444
MRS-7 16.09739	RS-7	NRC TPM	19.36399	0.9679444
MRS-8 16.09739	RS-7	NRC TPM	23.51642	0.8977522
MRS-8 12.79880	RS-8	NRC TPM	23.51642	0.8977522
MRS-9 12.79880	RS-8	NRC TPM	27.66679	0.8139713
MRS-9 12.31096	RS-9	NRC TPM	27.66679	0.8139713
MRS-10 12.31096	RS-9	NRC TPM	31.81472	2.215288
MRS-10 8.083985	RS-10	NRC TPM	31.81472	2.215288
MRS-11 8.083983	RS-10	NRC TPM	35.95988	8.415040
MRS-11 44.80649	RS-11	NRC TPM	35.95988	8.415040
MRS-12 44.80649	RS-11	NRC TPM	40.12989	27.85442
MRS-12 218.5967	RS-12	NRC TPM	40.12989	27.85442
MRS-13 218.5967	RS-12	NRC TPM	42.47834	14.90281
MRS-13 229.4293	RS-13	NRC TPM	42.47834	14.90281
MRS-14 229.4293	RS-13	NRC TPM	14.90436	42.81590
MRS-14 215.2592	422	NRC TPM	14.90436	42.81590
MTRS-1	RS-2	NRC TPM	25.76018	
MTRS-2	RS-3	NRC TPM	1.407006	
MTRS-3	RS-4	NRC TPM	4.254288	
MTRS-4	RS-5	NRC TPM	1.848986	
MTRS-5	RS-6	NRC TPM	4.829043	

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

MTRS-6	RS-7	NRC TPM	2.670503
MTRS-7	RS-8	NRC TPM	4.816037
MTRS-8	RS-9	NRC TPM	1.892192
MTRS-9	RS-10	NRC TPM	11.43211
MTRS-10	RS-11	NRC TPM	20.11436
MTRS-11	RS-12	NRC TPM	13.77236
(455)	>		
(456)	>		
(457)	>		
(458)	>		
(459)	>		

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ATTACHMENT- B: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

BHI-01299

Rev. 0

ATTACHMENT: C
ORIGINATOR: R. S. Rajagopal *RSR* DATE: August 19, 1999
CHECKED BY: C. A. Palmquist *CP* DATE: 9/8/99
CALC. NO. 0200W-CA-C0156 REV. NO. 0
SHEET NO. C1 OF TOTAL 10 SHEETS

ATTACHMENT "C"

**REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

**Attachment C: REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

STRUDL 'REDOX BUILDING' '2-D ANALYSIS OF TYPICAL SLICE'

\$\$

\$\$ TRUSS CONNECTED TO BUILDING BY SP K=136 KIP/IN

\$\$ AT ONE END. SLOTTED HOLE END FREE

UNITS INCH KIPS DEGREES FAH

\$\$

JOINT COORDINATES GLOBAL

\$\$

SOUTH WALL

1	704.00	0.00
2	704.00	57.00
3	704.00	114.00
4	704.00	171.00
5	704.00	219.00
6	704.00	267.00
7	704.00	315.00
8	704.00	363.21
9	704.00	411.42
10	704.00	459.63
11	704.00	510.00
12	704.00	553.21
13	704.00	600.00
14	704.00	651.50
15	704.00	703.00
16	713.00	721.00
17	713.00	778.33
18	713.00	835.67
19	713.00	893.00
20	718.00	903.00
21	718.00	960.00
22	718.00	1017.00

\$\$

DUMMY JOINT FOR TRUSS

30	709.00	903.00
----	--------	--------

\$\$

SOUTH CANYON WALL

101	501.00	0.00
102	501.00	57.00
103	501.00	114.00
104	501.00	171.00
105	501.00	219.00
106	501.00	267.00
107	501.00	315.00
108	501.00	363.00
109	511.00	387.00
110	511.00	459.63
111	511.00	510.00
112	511.00	553.21
113	511.00	600.00
114	511.00	625.00
115	521.00	655.00
116	521.00	721.00

\$\$

SOUTH PIPE TUNNEL WALL

201	315.00	0.00
202	315.00	55.50
203	315.00	111.00
204	315.00	162.00
205	315.00	213.00
206	315.00	264.00
207	315.00	315.00

Sheet C2 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment C: REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

	208	267.00	363.00
\$\$	NORTH PIPE TUNNEL WALL		
	301	183.00	0.00
	302	183.00	55.50
	303	183.00	111.00
	304	183.00	162.00
	305	183.00	213.00
	306	183.00	264.00
	307	183.00	315.00
	308	231.00	363.00
\$\$	NORTH CANYON WALL		
	401	0.00	0.00
	402	0.00	57.00
	403	0.00	114.00
	404	0.00	171.00
	405	0.00	219.00
	406	0.00	267.00
	407	0.00	315.00
	408	0.00	363.00
	409	-28.00	403.00
	410	-28.00	459.00
	411	-28.00	513.75
	412	-28.00	568.50
	413	-28.00	623.25
	414	-28.00	678.00
	415	-28.00	703.00
	416	-37.00	721.00
	417	-37.00	778.00
	418	-37.00	835.67
	419	-37.00	893.00
	420	-42.00	903.00
	421	-42.00	960.00
	422	-42.00	1017.00
\$\$	DUMMY JOINT FOR TRUSS CONNECTION		
	430	-33.00	903.00
\$\$	NORTH GALLERY WALL		
	502	-274.00	57.25
	503	-274.00	114.13
	504	-274.00	171.00
	505	-274.00	219.00
	506	-274.00	267.00
	507	-274.00	315.00
	508	-274.00	363.00
	509	-274.00	411.00
	510	-274.00	459.00
	511	-274.00	513.75
	512	-274.00	568.50
	513	-274.00	623.25
	514	-274.00	678.00
\$\$	SLAB S1 @ SOUTH GALLERY		
	'S1-1'	568.67	171.00
	'S1-2'	636.33	171.00
\$\$	SLAB S2 @ SOUTH GALLERY		
	'S2-1'	568.67	315.00
	'S2-2'	636.33	315.00
\$\$	SLAB S3 @ SOUTH GALLERY		
	'S3-1'	568.67	459.63

Sheet C3 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment C: REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

'S3-2'	636.33	459.63
\$\$	SLAB S4 @ SOUTH GALLERY	
'S4-1'	568.67	600.00
'S4-2'	636.33	600.00
\$\$	SLAB S5 @ NORTH GALLERY	
'S5-1'	-91.33	171.00
'S5-2'	-182.67	171.00
\$\$	SLAB S6 @ NORTH GALLERY	
'S6-1'	-91.33	315.00
'S6-2'	-182.67	315.00
\$\$	SLAB S7 @ NORTH GALLERY	
'S7-1'	-91.33	459.00
'S7-2'	-182.67	459.00
\$\$	SLAB S8 @ NORTH GALLERY	
'S8-1'	-91.33	678.00
'S8-2'	-182.67	678.00
\$\$	SLAB S9 @ PIPE TUNNEL	
'S9-1'	249.00	111.00
\$\$	ROOF TRUSS BOTTOM CHORD	
'T-1'	709.00	909.50
'T-2'	634.00	909.50
'T-3'	486.00	909.50
'T-4'	338.00	909.50
'T-5'	190.00	909.50
'T-6'	42.00	909.50
'T-7'	-33.00	909.50
'T-8'	709.00	1003.50
'T-9'	634.00	1003.50
'T-10'	560.00	1003.50
'T-11'	486.00	1003.50
'T-12'	412.00	1003.50
'T-13'	338.00	1003.50
'T-14'	264.00	1003.50
'T-15'	190.00	1003.50
'T-16'	116.00	1003.50
'T-17'	42.00	1003.50
'T-18'	-33.00	1003.50
\$\$	ROOF SLAB	
'RS-1'	718.00	1021.00
'RS-2'	709.00	1021.00
'RS-3'	634.00	1021.00
'RS-4'	560.00	1021.00
'RS-5'	486.00	1021.00
'RS-6'	412.00	1021.00
'RS-7'	338.00	1021.00
'RS-8'	264.00	1021.00
'RS-9'	190.00	1021.00
'RS-10'	116.00	1021.00
'RS-11'	42.00	1021.00
'RS-12'	-33.00	1021.00
'RS-13'	-42.00	1021.00

\$\$

TYPE PLANE FRAME

\$\$ MEMBER FOR SOUTH GALLERY WALL

MEMBER INCIDENCES

1 1 2
 GENERATE 20 MEMBERS ID 2 FROM 2 INC 1 TO 3 INC 1

Sheet C4 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment C: REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

$$ MEMBER FOR SOUTH CANYON WALL
MEMBER INCIDENCES
      101      101      102
GENERATE 14 MEMBERS ID 102 FROM 102 INC 1 TO 103 INC 1
$$ MEMBER FOR SOUTH PIPE TUNNEL WALL
MEMBER INCIDENCES
      201      201      202
GENERATE 6 MEMBERS ID 202 FROM 202 INC 1 TO 203 INC 1
$$ MEMBER FOR NORTH PIPE TUNNEL WALL
MEMBER INCIDENCES
      301      301      302
GENERATE 6 MEMBERS ID 302 FROM 302 INC 1 TO 303 INC 1
$$ MEMBER FOR NORTH CANYON WALL
MEMBER INCIDENCES
      401      401      402
GENERATE 20 MEMBERS ID 402 FROM 402 INC 1 TO 403 INC 1
$$ MEMBER FOR NORTH GALLERY WALL
MEMBER INCIDENCES
      502      502      503
GENERATE 11 MEMBERS ID 503 FROM 503 INC 1 TO 504 INC 1
MEMBER INCIDENCES
$$ SLAB @ 88' SOUTH GALLERY
  'MS1-1'      104      'S1-1'
  'MS1-2'      'S1-1'      'S1-2'
  'MS1-3'      'S1-2'      4
$$ SLAB @ 100' SOUTH GALLERY
  'MS2-1'      107      'S2-1'
  'MS2-2'      'S2-1'      'S2-2'
  'MS2-3'      'S2-2'      7
$$ SLAB @ 112' 1 1/4" SOUTH GALLERY
  'MS3-1'      110      'S3-1'
  'MS3-2'      'S3-1'      'S3-2'
  'MS3-3'      'S3-2'      10
$$ SLAB @ 124' SOUTH GALLERY
  'MS4-1'      113      'S4-1'
  'MS4-2'      'S4-1'      'S4-2'
  'MS4-3'      'S4-2'      13
$$ SLAB @ 83' NORTH GALLERY
  'MS5-1'      404      'S5-1'
  'MS5-2'      'S5-1'      'S5-2'
  'MS5-3'      'S5-2'      504
$$ SLAB @ 100' NORTH GALLERY
  'MS6-1'      407      'S6-1'
  'MS6-2'      'S6-1'      'S6-2'
  'MS6-3'      'S6-2'      507
$$ SLAB @ 112' NORTH GALLERY
  'MS7-1'      410      'S7-1'
  'MS7-2'      'S7-1'      'S7-2'
  'MS7-3'      'S7-2'      510
$$ SLAB @ 130' 6" NORTH GALLERY
  'MS8-1'      414      'S8-1'
  'MS8-2'      'S8-1'      'S8-2'
  'MS8-3'      'S8-2'      514
$$ SLAB @ 83' PIPE TUNNEL
  'MS9-1'      303      'S9-1'
  'MS9-2'      'S9-1'      203
$$ PIPE TUNNEL ROOF @ 105'6"

```

Sheet C5 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment C: REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

```

    'MTR-1'          308          208
$$
TYPE PLANE TRUSS
MEMBER INCIDENCES
$$   COVERS ON CELL
    'CC-1'          208          108
    'CC-2'          408          308
$$   TRUSS MEMBERS BOTTOM CHORD
    'MT-1'          'T-1'          'T-2'
GENERATE 5 MEMBERS ID 'MT-2' INC 1 FROM 'T-2' INC 1 TO 'T-3' INC 1
$$   TRUSS MEMBERS TOP CHORD
MEMBER INCIDENCES
    'MT-7'          'T-8'          'T-9'
GENERATE 9 MEMBERS ID 'MT-8' INC 1 FROM 'T-9' INC 1 TO 'T-10' INC 1
$$   TRUSS MEMBERS DIAGONALS AND VERTICALS
MEMBER INCIDENCES
    'MT-17'         'T-1'          'T-8'
    'MT-18'         'T-2'          'T-8'
    'MT-19'         'T-2'          'T-9'
    'MT-20'         'T-2'          'T-10'
    'MT-21'         'T-3'          'T-10'
    'MT-22'         'T-3'          'T-11'
    'MT-23'         'T-3'          'T-12'
    'MT-24'         'T-4'          'T-12'
    'MT-25'         'T-4'          'T-13'
    'MT-26'         'T-4'          'T-14'
    'MT-27'         'T-5'          'T-14'
    'MT-28'         'T-5'          'T-15'
    'MT-29'         'T-5'          'T-16'
    'MT-30'         'T-6'          'T-16'
    'MT-31'         'T-6'          'T-17'
    'MT-32'         'T-6'          'T-18'
    'MT-33'         'T-7'          'T-18'
$$
TYPE PLANE FRAME
MEMBER INCIDENCES
$$   CONNECTION TO BUILDING STRUCTURE SOUTH SIDE
    'MTC-1'         19            30
    'MTC-2'         20            30
$$   'MTC-3' MODALLED AS TRUSS MEM - NO LATERAL TRANSFER
$$   CONNECTION TO BUILDING STRUCTURE NORTH SIDE
    'MTC-11'        419           430
    'MTC-12'        420           430
    'MTC-13'        430           'T-7'
$$
TYPE PLANE TRUSS
MEMBER INCIDENCES
$$   ROOF SLAB MEMBER
    'MRS-1'         22            'RS-1'
$$   CONNECTION BETWEEN TRUSS AND BUILDING - AXIAL LOAD ONLY
    'MTC-3'         30            'T-1'
$$
TYPE PLANE FRAME
MEMBER INCIDENCES
    'MRS-2'         'RS-1'          'RS-2'
GENERATE 11 MEMBERS ID 'MRS-3' INC 1 FROM 'RS-2' INC 1 TO 'RS-3' INC 1
MEMBER INCIDENCES

```

Sheet C6 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment C: **REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis**
 (Using Original Ground Response Spectrum for 10% Damping)

'MRS-14' 'RS-13' 422
 \$\$ CONNECTION BETWEEN ROOF SLAB AND TRUSS
 TYPE PLANE TRUSS
 MEMBER INCIDENCES
 'MTRS-1' 'T-8' 'RS-2'
 GENERATE 10 MEMBERS ID 'MTRS-2' INC 1 FROM 'T-9' INC 1 TO 'RS-3' INC 1
 \$\$
 \$\$ PROPERTIES BLOCK
 \$\$ FOR CONC MEMBER PROPERTIES BASED ON WIDTH OF 18'5" (221")
 UNITS INCH KIPS DEGREES FAH
 \$\$ SOUTH GALLERY WALL UPTO CRANE LEVEL
 MEMBER PROPERTIES PRISMATIC
 1 TO 15 AX 7956.00 AY 6630.00 IZ
 859248.00
 \$\$ SOUTH GALLERY WALL FROM CRANE LEVEL TO TRUSS
 MEMBER PROPERTIES PRISMATIC
 16 TO 19 AX 3978.00 AY 3315.00 IZ
 107406.00
 \$\$ SOUTH GALLERY WALL FROM TRUSS TO ROOF
 MEMBER PROPERTIES PRISMATIC
 20 21 AX 1768.00 AY 1473.00 IZ
 9429.00
 \$\$ PAPER JOINT @ SOUTH WALL - AXIAL MEM. ONLY
 MEMBER PROPERTIES PRISMATIC
 'MRS-1' AX 1768.00
 \$\$ SOUTH CANYON WALL UPTO CANYON FL.
 MEMBER PROPERTIES PRISMATIC
 101 TO 107 AX 14586.00 AY 12155.00 IZ
 5294718.00
 \$\$ SOUTH CANYON WALL CANYON FL TO JOG AREA
 MEMBER PROPERTIES PRISMATIC
 108 TO 113 AX 10166.00 AY 8472.00 IZ
 1792605.00
 \$\$ SOUTH CANYON WALL - JOG AREA
 MEMBER PROPERTIES PRISMATIC
 114 AX 7956.00 AY 6630.00 IZ
 859248.00
 \$\$ SOUTH CANYON WALL - JOG TO TOP
 MEMBER PROPERTIES PRISMATIC
 115 AX 5746.00 AY 4788.00 IZ
 323691.00
 \$\$ PIPE TUNNEL - SOUTH AND NORTH WALL
 MEMBER PROPERTIES PRISMATIC
 201 TO 207 301 TO 307 AX 3978.00 AY 3315.00 IZ
 107406.00
 \$\$ PIPE TUNNEL ROOF
 MEMBER PROPERTIES PRISMATIC
 'MTR-1' AX 9024.00 AY 7520.00 IZ
 1732608.00
 \$\$ NORTH CANYON WALL UPTO CANYON FLOOR
 MEMBER PROPERTIES PRISMATIC
 401 TO 407 AX 13260.00 AY 11050.00 IZ
 3978000.00
 \$\$ NORTH CANYON WALL FROM FLOOR TO CRANE LEVEL
 MEMBER PROPERTIES PRISMATIC
 408 TO 415 AX 10166.00 AY 8472.00 IZ
 1792605.00

Sheet C7 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment C: REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

```

$$      NORTH CANYON WALL FROM CRANE LEVEL TO TRUSS SUPPORT
MEMBER PROPERTIES PRISMATIC
416 TO 419          AX      3978.00  AY      3315.00  IZ
107406.00
$$      NORTH CANYON WALL FROM TRUSS SUPPORT TO ROOF
MEMBER PROPERTIES PRISMATIC
420 421 'MRS-14'    AX      1768.00  AY      1473.00  IZ
9429.00
$$      NORTH GALLERY WALL
MEMBER PROPERTIES PRISMATIC
502 TO 513          AX      5304.00  AY      4420.00  IZ
95472.00
$$      1' THICK SLAB
MEMBER PROPERTIES PRISMATIC
'MS1-1' TO 'MS1-3' 'MS2-1' TO 'MS2-3' 'MS3-1' TO 'MS3-3' -
'MS5-1' TO 'MS5-3' 'MS6-1' TO 'MS6-3' 'MS7-1' TO 'MS7-3' -
'MS9-1' TO 'MS9-2'    AX      2652.00  AY      2210.00  IZ
31824.00
$$      1'6" THICK SLAB
MEMBER PROPERTIES PRISMATIC
'MS4-1' TO 'MS4-3' 'MS8-1' TO 'MS8-3' -
AX      3978.00  AY      3315.00  IZ
107406.00
$$      ROOF SLAB
MEMBER PROPERTIES PRISMATIC
'MRS-2' TO 'MRS-13'  AX      1989.00  AY      1658.00  IZ
13425.00
$$      TRUSS CONNECTION TO STRUCTURE
MEMBER PROPERTIES PRISMATIC
'MTC-1' TO 'MTC-2' 'MTC-11' TO 'MTC-12' -
AX      7956.00  AY      6630.00  IZ
859248.00
$$      REDUCED STIFFNESS FOR CONNECTION TO TRUSS
MEMBER PROPERTIES PRISMATIC
'MTC-13'            AX      7956.00  AY      0.50  IZ
859248.00
$$      COVER FOR CELLS
MEMBER PROPERTIES PRISMATIC
'CC-1' 'CC-2'        AX      10608.00
$$      CONN BET TRUSS & BLDG - TRUSS MEM @ SOUTH END
MEMBER PROPERTIES PRISMATIC
'MTC-3'              AX      7956.00
$$      TRUSS MEMBER
MEMBER PROPERTIES PRISMATIC
'MT-1' TO 'MT-16'    AX      12.86
MEMBER PROPERTIES PRISMATIC
'MT-17' 'MT-33'      AX      4.80
MEMBER PROPERTIES PRISMATIC
'MT-19' 'MT-31'      AX      3.56
MEMBER PROPERTIES PRISMATIC
'MT-22' 'MT-28'      AX      3.56
MEMBER PROPERTIES PRISMATIC
'MT-25'              AX      7.12
MEMBER PROPERTIES PRISMATIC
'MT-18' 'MT-32'      AX      8.00
MEMBER PROPERTIES PRISMATIC
'MT-20' 'MT-30'      AX      6.62

```

Sheet C8 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment C: REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

```

MEMBER PROPERTIES PRISMATIC
'MT-21' 'MT-29'          AX          4.60
MEMBER PROPERTIES PRISMATIC
'MT-23' 'MT-27'          AX          4.66
MEMBER PROPERTIES PRISMATIC
'MT-24' 'MT-26'          AX          3.24
$$      CONNECTION BETWEEN TRUSS AND ROOF SLAB
MEMBER PROPERTIES PRISMATIC
'MTRS-1' TO 'MTRS-10'    AX          2.00
$$      REDUCE CONNECTION STIFFNESS FOR LAST PURLIN
MEMBER PROPERTIES PRISMATIC
'MTRS-11'                AX          0.50
$$
$$      SUPPORT LOCATIONS
$$
STATUS SUPPORT JOINTS -
1 101 201 301 401 502
$$
$$      MATERIAL PROPERTIES
$$
UNITS INCH LB DEG FAH
CONSTANTS
      E      3.824E+06      ALL
      G      1.634E+06      ALL
      POI     1.700E-01      ALL
      DEN     8.680E-02      ALL
$$
$$      PROVIDE E, G, POI, DEN FOR STEEL MEMBERS
$$
      E      2.900E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
      G      1.115E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
      POI     3.000E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
      DEN     2.836E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
$$
$$      ADJUST DENSITY OF ROOF SLAB TO ACCOUNT FOR FINISHES ETC.
$$
      DEN     1.003E-01      'MRS-1' TO 'MRS-13'
$$
$$      LUMPED WEIGHT OF STRUCTURE AT JOINTS
$$
INERTIA OF JOINTS LUMPED
UNIT CYCLES
EIGENPROBLEM PARAMETERS
      SOLVE USING GTLANCZOS
      FREQUENCY SPE 0.0 TO 33.0
END
PERFORM ASSEMBLY FOR DYNAMICS
PERFORM EIGENVALUE ANALYSIS
$$      LIST DYNAMIC MASS SUMMARY
UNIT INCH KIPS
LIST DYNAMIC MASS
LIST DYNAMIC PARTICIPATION FACTORS
$$
UNITS FEET SECONDS
DELETE RESPONSE SPECTRA 'RSH'
STORE RESPONSE SPECTRA ACCELERATION LOG VS FREQUENCY LOG 'RSH'
DAMPING 0.10 FACTOR 32.2

```

Sheet C9 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment C: REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

$$      SPECTRA IN g's
0.12 100.0 0.12 33.0 0.20 7.1 0.20 1.67 0.028 0.77
RESPONSE SPECTRA LOAD 1
SUPPORT ACCELERATION
    TRANSLATIONAL X 1.00 FILE 'RSH'
END RESPONSE SPECTRA LOADING
DAMPING RATIO 0.10 30
PERFORM RESPONSE SPECTRA ANALYSIS
COMPUTE RESPONSE SPECTRA DISPLACEMENT ACC FORCES REACTIONS -
    MODAL COMBINATION NRC TPM
$$
CREATE PSEUDO STATIC LOAD 'NS' FROM NRC TPM LOAD 1
LIST RESPONSE SPECTRUM SPECTRAL ACCELERATION
LIST RESPONSE SPECTRUM FORCES -
    MODE COMBINATION NRC TPM MEMBERS ALL

```

Sheet C10 of C10

ATTACHMENT- C: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

ATTACHMENT: D
ORIGINATOR: R. S. Rajaopala *RSR* DATE: August 19, 1999
CHECKED BY: C. A. Palmquist *CP* DATE: 2/8/99
CALC. NO. 0200W-CA-C0156 REV. NO. 0
SHEET NO. D1 OF TOTAL 35 SHEETS

ATTACHMENT "D"

**REDOX (Corrected Coordinates In "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

*The governing output values used on sheet 13 are highlighted as "←" in
the following output.*

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

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Wed Jul 21 12:36:41 1999

1GTICES/C-NP 2.5.0 MD-NT 2.0, January 1995.

Proprietary to Georgia Tech Research Corporation, U.S.A.

Reading password file C:\Program Files\GTSTRUDL 9801\gtaccess.dat
 CI-w-audexist, Audit file FILE1236.aud already exists; select another file name.

*** G T S T R U D L ***

RELEASE DATE	VERSION	COMPLETION NO.
March 1998	9801 NT	3716

ACTIVE UNITS -	LENGTH	WEIGHT	ANGLE	TEMPERATURE	TIME
ASSUMED TO BE	INCH	POUND	RADIAN	FAHRENHEIT	SECOND

Reading global defaults file C:\Program Files\GTSTRUDL 9801\defaults.gts

{ 1) > \$ Put any startup commands in this file
 { 1) >

{ 2) > CINPUT 'C:\Hanford\Redox_4.inp'

{ 3) > STRUDL 'REDOX BUILDING' '2-D ANALYSIS OF TYPICAL SLICE'

```

*****
*
* *****
* *****
* ** **
* ** ***** ** ** ** **
* ** ***** ** ** **
*****

```

Sheet D2 of D35

ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

[illegible]

(36) > \$\$ SOUTH CANYON WALL

A-89

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

(37) >	101	501.00	0.00
(38) >	102	501.00	57.00
(39) >	103	501.00	114.00
(40) >	104	501.00	171.00
(41) >	105	501.00	219.00
(42) >	106	501.00	267.00
(43) >	107	501.00	315.00
(44) >	108	501.00	363.00
(45) >	109	511.00	387.00
(46) >	110	511.00	459.63
(47) >	111	511.00	510.00
(48) >	112	511.00	553.21
(49) >	113	511.00	600.00
(50) >	114	511.00	625.00
(51) >	115	521.00	655.00
(52) >	116	521.00	721.00
(53) > \$\$	SOUTH PIPE TUNNEL WALL		
(54) >	201	315.00	0.00
(55) >	202	315.00	55.50
(56) >	203	315.00	111.00
(57) >	204	315.00	162.00
(58) >	205	315.00	213.00
(59) >	206	315.00	264.00
(60) >	207	315.00	315.00
(61) >	208	267.00	363.00
(62) > \$\$	NORTH PIPE TUNNEL WALL		
(63) >	301	183.00	0.00
(64) >	302	183.00	55.50
(65) >	303	183.00	111.00
(66) >	304	183.00	162.00
(67) >	305	183.00	213.00
(68) >	306	183.00	264.00
(69) >	307	183.00	315.00
(70) >	308	231.00	363.00
(71) > \$\$	NORTH CANYON WALL		
(72) >	401	0.00	0.00
(73) >	402	0.00	57.00
(74) >	403	0.00	114.00
(75) >	404	0.00	171.00
(76) >	405	0.00	219.00
(77) >	406	0.00	267.00
(78) >	407	0.00	315.00
(79) >	408	0.00	363.00
(80) >	409	-28.00	403.00
(81) >	410	-28.00	459.00
(82) >	411	-28.00	513.75
(83) >	412	-28.00	568.50
(84) >	413	-28.00	623.25
(85) >	414	-28.00	678.00
(86) >	415	-28.00	703.00
(87) >	416	-37.00	721.00
(88) >	417	-37.00	778.00
(89) >	418	-37.00	835.67
(90) >	419	-37.00	893.00
(91) >	420	-42.00	903.00
(92) >	421	-42.00	960.00
(93) >	422	-42.00	1017.00

Sheet D4 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

```

( 94) > $$      DUMMY JOINT FOR TRUSS CONNECTION
( 95) >          430      -33.00      903.00
( 96) > $$      NORTH GALLERY WALL
( 97) >          502      -274.00      57.25
( 98) >          503      -274.00      114.13
( 99) >          504      -274.00      171.00
(100) >          505      -274.00      219.00
(101) >          506      -274.00      267.00
(102) >          507      -274.00      315.00
(103) >          508      -274.00      363.00
(104) >          509      -274.00      411.00
(105) >          510      -274.00      459.00
(106) >          511      -274.00      513.75
(107) >          512      -274.00      568.50
(108) >          513      -274.00      623.25
(109) >          514      -274.00      678.00
(110) > $$      SLAB S1 @ SOUTH GALLERY
(111) > 'S1-1'      568.67      171.00
(112) > 'S1-2'      636.33      171.00
(113) > $$      SLAB S2 @ SOUTH GALLERY
(114) > 'S2-1'      568.67      315.00
(115) > 'S2-2'      636.33      315.00
(116) > $$      SLAB S3 @ SOUTH GALLERY
(117) > 'S3-1'      568.67      459.63
(118) > 'S3-2'      636.33      459.63
(119) > $$      SLAB S4 @ SOUTH GALLERY
(120) > 'S4-1'      568.67      600.00
(121) > 'S4-2'      636.33      600.00
(122) > $$      SLAB S5 @ NORTH GALLERY
(123) > 'S5-1'      -91.33      171.00
(124) > 'S5-2'     -182.67      171.00
(125) > $$      SLAB S6 @ NORTH GALLERY
(126) > 'S6-1'      -91.33      315.00
(127) > 'S6-2'     -182.67      315.00
(128) > $$      SLAB S7 @ NORTH GALLERY
(129) > 'S7-1'      -91.33      459.00
(130) > 'S7-2'     -182.67      459.00
(131) > $$      SLAB S8 @ NORTH GALLERY
(132) > 'S8-1'      -91.33      678.00
(133) > 'S8-2'     -182.67      678.00
(134) > $$      SLAB S9 @ PIPE TUNNEL
(135) > 'S9-1'      249.00      111.00
(136) > $$      ROOF TRUSS BOTTOM CHORD
(137) > 'T-1'      709.00      909.50
(138) > 'T-2'      634.00      909.50
(139) > 'T-3'      486.00      909.50
(140) > 'T-4'      338.00      909.50
(141) > 'T-5'      190.00      909.50
(142) > 'T-6'       42.00      909.50
(143) > 'T-7'      -33.00      909.50
(144) > 'T-8'      709.00      1003.50
(145) > 'T-9'      634.00      1003.50
(146) > 'T-10'     560.00      1003.50
(147) > 'T-11'     486.00      1003.50
(148) > 'T-12'     412.00      1003.50
(149) > 'T-13'     338.00      1003.50
(150) > 'T-14'     264.00      1003.50

```

Sheet D5 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

```
( 151) > 'T-15'      190.00    1003.50
( 152) > 'T-16'      116.00    1003.50
( 153) > 'T-17'       42.00    1003.50
( 154) > 'T-18'     -33.00    1003.50
( 155) > $$          ROOF SLAB
( 156) > 'RS-1'      718.00    1021.00
( 157) > 'RS-2'      709.00    1021.00
( 158) > 'RS-3'      634.00    1021.00
( 159) > 'RS-4'      560.00    1021.00
( 160) > 'RS-5'      486.00    1021.00
( 161) > 'RS-6'      412.00    1021.00
( 162) > 'RS-7'      338.00    1021.00
( 163) > 'RS-8'      264.00    1021.00
( 164) > 'RS-9'      190.00    1021.00
( 165) > 'RS-10'     116.00    1021.00
( 166) > 'RS-11'      42.00    1021.00
( 167) > 'RS-12'     -33.00    1021.00
( 168) > 'RS-13'     -42.00    1021.00
( 169) > $$
( 170) > TYPE PLANE FRAME
( 171) > $$          MEMBER FOR SOUTH GALLERY WALL
( 172) > MEMBER INCIDENCES
( 173) >              1          1          2
( 174) > GENERATE 20 MEMBERS ID 2 FROM 2 INC 1 TO 3 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
10	11
11	12
12	13
13	14
14	15
15	16
16	17
17	18
18	19
19	20
20	21
21	22

```
( 175) > $$          MEMBER FOR SOUTH CANYON WALL
( 176) > MEMBER INCIDENCES
( 177) >              101          101          102
( 178) > GENERATE 14 MEMBERS ID 102 FROM 102 INC 1 TO 103 INC 1
```

/----- MEMBER INCIDENCES -----/

Sheet D6 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MEMBER	INCIDENCES	
102	102	103
103	103	104
104	104	105
105	105	106
106	106	107
107	107	108
108	108	109
109	109	110
110	110	111
111	111	112
112	112	113
113	113	114
114	114	115
115	115	116

```
( 179) > $$      MEMBER FOR SOUTH PIPE TUNNEL WALL
( 180) > MEMBER INCIDENCES
( 181) >          201          201          202
( 182) > GENERATE 6 MEMBERS ID 202 FROM 202 INC 1 TO 203 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
202	202	203
203	203	204
204	204	205
205	205	206
206	206	207
207	207	208

```
( 183) > $$      MEMBER FOR NORTH PIPE TUNNEL WALL
( 184) > MEMBER INCIDENCES
( 185) >          301          301          302
( 186) > GENERATE 6 MEMBERS ID 302 FROM 302 INC 1 TO 303 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
302	302	303
303	303	304
304	304	305
305	305	306
306	306	307
307	307	308

```
( 187) > $$      MEMBER FOR NORTH CANYON WALL
( 188) > MEMBER INCIDENCES
( 189) >          401          401          402
( 190) > GENERATE 20 MEMBERS ID 402 FROM 402 INC 1 TO 403 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
--------	------------	--

Sheet D7 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

402	402	403
403	403	404
404	404	405
405	405	406
406	406	407
407	407	408
408	408	409
409	409	410
410	410	411
411	411	412
412	412	413
413	413	414
414	414	415
415	415	416
416	416	417
417	417	418
418	418	419
419	419	420
420	420	421
421	421	422

```
( 191) > $$      MEMBER FOR NORTH GALLERY WALL
( 192) > MEMBER INCIDENCES
( 193) >          502          502          503
( 194) > GENERATE 11 MEMBERS ID 503 FROM 503 INC 1 TO 504 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
503	503	504
504	504	505
505	505	506
506	506	507
507	507	508
508	508	509
509	509	510
510	510	511
511	511	512
512	512	513
513	513	514

```
( 195) > MEMBER INCIDENCES
( 196) > $$      SLAB @ 88' SOUTH GALLERY
( 197) >      'MS1-1'          104      'S1-1'
( 198) >      'MS1-2'          'S1-1'      'S1-2'
( 199) >      'MS1-3'          'S1-2'          4
( 200) > $$      SLAB @ 100' SOUTH GALLERY
( 201) >      'MS2-1'          107      'S2-1'
( 202) >      'MS2-2'          'S2-1'      'S2-2'
( 203) >      'MS2-3'          'S2-2'          7
( 204) > $$      SLAB @ 112' 1 1/4" SOUTH GALLERY
( 205) >      'MS3-1'          110      'S3-1'
( 206) >      'MS3-2'          'S3-1'      'S3-2'
( 207) >      'MS3-3'          'S3-2'          10
( 208) > $$      SLAB @ 124' SOUTH GALLERY
```

Sheet D8 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```
( 209) >      'MS4-1'      113      'S4-1'
( 210) >      'MS4-2'      'S4-1'      'S4-2'
( 211) >      'MS4-3'      'S4-2'      13
( 212) > $$      SLAB @ 83' NORTH GALLERY
( 213) >      'MS5-1'      404      'S5-1'
( 214) >      'MS5-2'      'S5-1'      'S5-2'
( 215) >      'MS5-3'      'S5-2'      504
( 216) > $$      SLAB @ 100' NORTH GALLERY
( 217) >      'MS6-1'      407      'S6-1'
( 218) >      'MS6-2'      'S6-1'      'S6-2'
( 219) >      'MS6-3'      'S6-2'      507
( 220) > $$      SLAB @ 112' NORTH GALLERY
( 221) >      'MS7-1'      410      'S7-1'
( 222) >      'MS7-2'      'S7-1'      'S7-2'
( 223) >      'MS7-3'      'S7-2'      510
( 224) > $$      SLAB @ 130' 6" NORTH GALLERY
( 225) >      'MS8-1'      414      'S8-1'
( 226) >      'MS8-2'      'S8-1'      'S8-2'
( 227) >      'MS8-3'      'S8-2'      514
( 228) > $$      SLAB @ 83' PIPE TUNNEL
( 229) >      'MS9-1'      303      'S9-1'
( 230) >      'MS9-2'      'S9-1'      203
( 231) > $$      PIPE TUNNEL ROOF @ 105' 6"
( 232) >      'MTR-1'      308      208
( 233) > $$
( 234) > TYPE PLANE TRUSS
( 235) > MEMBER INCIDENCES
( 236) > $$      COVERS ON CELL
( 237) >      'CC-1'      208      108
( 238) >      'CC-2'      408      308
( 239) > $$      TRUSS MEMBERS BOTTOM CHORD
( 240) >      'MT-1'      'T-1'      'T-2'
( 241) > GENERATE 5 MEMBERS ID 'MT-2' INC 1 FROM 'T-2' INC 1 TO 'T-3' INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MT-2	T-2	T-3
MT-3	T-3	T-4
MT-4	T-4	T-5
MT-5	T-5	T-6
MT-6	T-6	T-7

```
( 242) > $$      TRUSS MEMBERS TOP CHORD
( 243) > MEMBER INCIDENCES
( 244) >      'MT-7'      'T-8'      'T-9'
( 245) > GENERATE 9 MEMBERS ID 'MT-8' INC 1 FROM 'T-9' INC 1 TO 'T-10' INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MT-8	T-9	T-10
MT-9	T-10	T-11
MT-10	T-11	T-12
MT-11	T-12	T-13

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ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

MT-12	T-13	T-14
MT-13	T-14	T-15
MT-14	T-15	T-16
MT-15	T-16	T-17
MT-16	T-17	T-18

```
( 246) > $$      TRUSS MEMBERS DIAGONALS AND VERTICALS
( 247) > MEMBER INCIDENCES
( 248) >          'MT-17'          'T-1'          'T-8'
( 249) >          'MT-18'          'T-2'          'T-8'
( 250) >          'MT-19'          'T-2'          'T-9'
( 251) >          'MT-20'          'T-2'          'T-10'
( 252) >          'MT-21'          'T-3'          'T-10'
( 253) >          'MT-22'          'T-3'          'T-11'
( 254) >          'MT-23'          'T-3'          'T-12'
( 255) >          'MT-24'          'T-4'          'T-12'
( 256) >          'MT-25'          'T-4'          'T-13'
( 257) >          'MT-26'          'T-4'          'T-14'
( 258) >          'MT-27'          'T-5'          'T-14'
( 259) >          'MT-28'          'T-5'          'T-15'
( 260) >          'MT-29'          'T-5'          'T-16'
( 261) >          'MT-30'          'T-6'          'T-16'
( 262) >          'MT-31'          'T-6'          'T-17'
( 263) >          'MT-32'          'T-6'          'T-18'
( 264) >          'MT-33'          'T-7'          'T-18'
( 265) > $$
( 266) > TYPE PLANE FRAME
( 267) > MEMBER INCIDENCES
( 268) > $$      CONNECTION TO BUILDING STRUCTURE SOUTH SIDE
( 269) >          'MTC-1'          19          30
( 270) >          'MTC-2'          20          30
( 271) > $$      'MTC-3' MODALLED AS TRUSS MEM - NO LATERAL TRANSFER
( 272) > $$      CONNECTION TO BUILDING STRUCTURE NORTH SIDE
( 273) >          'MTC-11'         419          430
( 274) >          'MTC-12'         420          430
( 275) >          'MTC-13'         430          'T-7'
( 276) > $$
( 277) > TYPE PLANE TRUSS
( 278) > MEMBER INCIDENCES
( 279) > $$      ROOF SLAB MEMBER
( 280) >          'MRS-1'          22          'RS-1'
( 281) > $$      CONNECTION BETWEEN TRUSS AND BUILDING - AXIAL LOAD ONLY
( 282) >          'MTC-3'          30          'T-1'
( 283) > $$
( 284) > TYPE PLANE FRAME
( 285) > MEMBER INCIDENCES
( 286) >          'MRS-2'          'RS-1'          'RS-2'
( 287) > GENERATE 11 MEMBERS ID 'MRS-3' INC 1 FROM 'RS-2' INC 1 TO 'RS-3' INC
```

1

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MRS-3	RS-2	RS-3
MRS-4	RS-3	RS-4
MRS-5	RS-4	RS-5

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ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MRS-6	RS-5	RS-6
MRS-7	RS-6	RS-7
MRS-8	RS-7	RS-8
MRS-9	RS-8	RS-9
MRS-10	RS-9	RS-10
MRS-11	RS-10	RS-11
MRS-12	RS-11	RS-12
MRS-13	RS-12	RS-13

```
( 288) > MEMBER INCIDENCES
( 289) >      'MRS-14'      'RS-13'      422
( 290) > $$      CONNECTION BETWEEN ROOF SLAB AND TRUSS
( 291) > TYPE PLANE TRUSS
( 292) > MEMBER INCIDENCES
( 293) >      'MTRS-1'      'T-8'      'RS-2'
( 294) > GENERATE 10 MEMBERS ID 'MTRS-2' INC 1 FROM 'T-9' INC 1 TO 'RS-3' INC
1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MTRS-2	T-9	RS-3
MTRS-3	T-10	RS-4
MTRS-4	T-11	RS-5
MTRS-5	T-12	RS-6
MTRS-6	T-13	RS-7
MTRS-7	T-14	RS-8
MTRS-8	T-15	RS-9
MTRS-9	T-16	RS-10
MTRS-10	T-17	RS-11
MTRS-11	T-18	RS-12

```
( 295) > $$
( 296) > $$      PROPERTIES BLOCK
( 297) > $$      FOR CONC MEMBER PROPERTIES BASED ON WIDTH OF 18'5" (221")
( 298) > UNITS INCH KIPS DEGREES FAH
( 299) > $$      SOUTH GALLERY WALL UPTO CRANE LEVEL
( 300) > MEMBER PROPERTIES PRISMATIC
( 301) > 1 TO 15      AX      7956.00      AY      6630.00      IZ
859248.00
( 302) > $$      SOUTH GALLERY WALL FROM CRANE LEVEL TO TRUSS
( 303) > MEMBER PROPERTIES PRISMATIC
( 304) > 16 TO 19      AX      3978.00      AY      3315.00      IZ
107406.00
( 305) > $$      SOUTH GALLERY WALL FROM TRUSS TO ROOF
( 306) > MEMBER PROPERTIES PRISMATIC
( 307) > 20 21      AX      1768.00      AY      1473.00      IZ
9429.00
( 308) > $$      PAPER JOINT @ SOUTH WALL - AXIAL MEM. ONLY
( 309) > MEMBER PROPERTIES PRISMATIC
( 310) > 'MRS-1'      AX      1768.00
( 311) > $$      SOUTH CANYON WALL UPTO CANYON FL.
( 312) > MEMBER PROPERTIES PRISMATIC
( 313) > 101 TO 107      AX      14586.00      AY      12155.00      IZ
5294718.00
( 314) > $$      SOUTH CANYON WALL CANYON FL TO JOG AREA
```

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ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

```

( 315) > MEMBER PROPERTIES PRISMATIC
( 316) > 108 TO 113                AX      10166.00  AY      8472.00  IZ
1792605.00
( 317) > $$      SOUTH CANYON WALL - JOG AREA
( 318) > MEMBER PROPERTIES PRISMATIC
( 319) > 114                AX      7956.00  AY      6630.00  IZ
859248.00
( 320) > $$      SOUTH CANYON WALL - JOG TO TOP
( 321) > MEMBER PROPERTIES PRISMATIC
( 322) > 115                AX      5746.00  AY      4788.00  IZ
323691.00
( 323) > $$      PIPE TUNNEL - SOUTH AND NORTH WALL
( 324) > MEMBER PROPERTIES PRISMATIC
( 325) > 201 TO 207 301 TO 307    AX      3978.00  AY      3315.00  IZ
107406.00
( 326) > $$      PIPE TUNNEL ROOF
( 327) > MEMBER PROPERTIES PRISMATIC
( 328) > 'MTR-1'                AX      9024.00  AY      7520.00  IZ
1732608.00
( 329) > $$      NORTH CANYON WALL UPTO CANYON FLOOR
( 330) > MEMBER PROPERTIES PRISMATIC
( 331) > 401 TO 407                AX      13260.00  AY      11050.00  IZ
3978000.00
( 332) > $$      NORTH CANYON WALL FROM FLOOR TO CRANE LEVEL
( 333) > MEMBER PROPERTIES PRISMATIC
( 334) > 408 TO 415                AX      10166.00  AY      8472.00  IZ
1792605.00
( 335) > $$      NORTH CANYON WALL FROM CRANE LEVEL TO TRUSS SUPPORT
( 336) > MEMBER PROPERTIES PRISMATIC
( 337) > 416 TO 419                AX      3978.00  AY      3315.00  IZ
107406.00
( 338) > $$      NORTH CANYON WALL FROM TRUSS SUPPORT TO ROOF
( 339) > MEMBER PROPERTIES PRISMATIC
( 340) > 420 421 'MRS-14'        AX      1768.00  AY      1473.00  IZ
9429.00
( 341) > $$      NORTH GALLERY WALL
( 342) > MEMBER PROPERTIES PRISMATIC
( 343) > 502 TO 513                AX      5304.00  AY      4420.00  IZ
95472.00
( 344) > $$      1' THICK SLAB
( 345) > MEMBER PROPERTIES PRISMATIC
( 346) > 'MS1-1' TO 'MS1-3' 'MS2-1' TO 'MS2-3' 'MS3-1' TO 'MS3-3' -
( 347) > 'MS5-1' TO 'MS5-3' 'MS6-1' TO 'MS6-3' 'MS7-1' TO 'MS7-3' -
( 348) > 'MS9-1' TO 'MS9-2'        AX      2652.00  AY      2210.00  IZ
31824.00
( 349) > $$      1'6" THICK SLAB
( 350) > MEMBER PROPERTIES PRISMATIC
( 351) > 'MS4-1' TO 'MS4-3' 'MS8-1' TO 'MS8-3' -
( 352) > -                AX      3978.00  AY      3315.00  IZ
107406.00
( 353) > $$      ROOF SLAB
( 354) > MEMBER PROPERTIES PRISMATIC
( 355) > 'MRS-2' TO 'MRS-13'        AX      1989.00  AY      1658.00  IZ
13425.00
( 356) > $$      TRUSS CONNECTION TO STRUCTURE
( 357) > MEMBER PROPERTIES PRISMATIC
( 358) > 'MTC-1' TO 'MTC-2' 'MTC-11' TO 'MTC-12' -

```

Sheet D12 of D35

ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: **REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis**
 (Using Original Ground Response Spectrum for 10% Damping)

```

( 359) >_ AX 7956.00 AY 6630.00 IZ
859248.00
( 360) > $$ REDUCED STIFFNESS FOR CONNECTION TO TRUSS
( 361) > MEMBER PROPERTIES PRISMATIC
( 362) > 'MTC-13' AX 7956.00 AY 0.50 IZ
859248.00
( 363) > $$ COVER FOR CELLS
( 364) > MEMBER PROPERTIES PRISMATIC
( 365) > 'CC-1' 'CC-2' AX 10608.00
( 366) > $$ CONN BET TRUSS & BLDG - TRUSS MEM @ SOUTH END
( 367) > MEMBER PROPERTIES PRISMATIC
( 368) > 'MTC-3' AX 7956.00
( 369) > $$ TRUSS MEMBER
( 370) > MEMBER PROPERTIES PRISMATIC
( 371) > 'MT-1' TO 'MT-16' AX 12.86
( 372) > MEMBER PROPERTIES PRISMATIC
( 373) > 'MT-17' 'MT-33' AX 4.80
( 374) > MEMBER PROPERTIES PRISMATIC
( 375) > 'MT-19' 'MT-31' AX 3.56
( 376) > MEMBER PROPERTIES PRISMATIC
( 377) > 'MT-22' 'MT-28' AX 3.56
( 378) > MEMBER PROPERTIES PRISMATIC
( 379) > 'MT-25' AX 7.12
( 380) > MEMBER PROPERTIES PRISMATIC
( 381) > 'MT-18' 'MT-32' AX 8.00
( 382) > MEMBER PROPERTIES PRISMATIC
( 383) > 'MT-20' 'MT-30' AX 6.62
( 384) > MEMBER PROPERTIES PRISMATIC
( 385) > 'MT-21' 'MT-29' AX 4.60
( 386) > MEMBER PROPERTIES PRISMATIC
( 387) > 'MT-23' 'MT-27' AX 4.66
( 388) > MEMBER PROPERTIES PRISMATIC
( 389) > 'MT-24' 'MT-26' AX 3.24
( 390) > $$ CONNECTION BETWEEN TRUSS AND ROOF SLAB
( 391) > MEMBER PROPERTIES PRISMATIC
( 392) > 'MTRS-1' TO 'MTRS-10' AX 2.00
( 393) > $$ REDUCE CONNECTION STIFFNESS FOR LAST PURLIN
( 394) > MEMBER PROPERTIES PRISMATIC
( 395) > 'MTRS-11' AX 0.50
( 396) > $$
( 397) > $$ SUPPORT LOCATIONS
( 398) > $$
( 399) > STATUS SUPPORT JOINTS -
( 400) >_1 101 201 301 401 502
( 401) > $$
( 402) > $$ MATERIAL PROPERTIES
( 403) > $$
( 404) > UNITS INCH LB DEG FAH
( 405) > CONSTANTS
( 406) > E 3.824E+06 ALL
( 407) > G 1.634E+06 ALL
( 408) > POI 1.700E-01 ALL
( 409) > DEN 8.680E-02 ALL
( 410) > $$
( 411) > $$ PROVIDE E, G, POI, DEN FOR STEEL MEMBERS
( 412) > $$
( 413) > E 2.900E+07 'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'

```

Sheet D13 of D35

ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

```
( 414) >      G      1.115E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 415) >      POI      3.000E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 416) >      DEN      2.836E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 417) > $$
( 418) > $$$$      ADJUST DENSITY OF ROOF SLAB TO ACCOUNT FOR FINISHES ETC.
( 419) > $$$$
( 420) >      DEN      1.003E-01      'MRS-1' TO 'MRS-13'
( 421) > $$
( 422) > $$$$      LUMPED WEIGHT OF STRUCTURE AT JOINTS
( 423) > $$$$
( 424) > INERTIA OF JOINTS LUMPED
( 425) > UNIT CYCLES
( 426) > EIGENPROBLEM PARAMETERS
( 427) > SOLVE USING GTLANCZOS
( 428) > FREQUENCY SPE 0.0 TO 33.0
( 429) > END
( 430) > PERFORM ASSEMBLY FOR DYNAMICS
```

BANDWIDTH INFORMATION BEFORE RENUMBERING.

```
THE MAXIMUM BANDWIDTH IS 100 AND OCCURS AT JOINT RS-1
THE AVERAGE BANDWIDTH IS 11.165
THE STANDARD DEVIATION OF THE BANDWIDTH IS 21.338
```

```
-----
32.503
=====
```

BANDWIDTH INFORMATION AFTER RENUMBERING.

```
THE MAXIMUM BANDWIDTH IS 9 AND OCCURS AT JOINT S7-2
THE AVERAGE BANDWIDTH IS 5.511
THE STANDARD DEVIATION OF THE BANDWIDTH IS 1.914
```

```
-----
7.425
=====
```

```
TIME FOR CONSISTENCY CHECK FOR 176 MEMBERS. 0.00 SECONDS
TIME FOR BANDWIDTH REDUCTION 0.02 SECONDS
TIME TO GENERATE 176 ELEMENT STIF. MATRICES 0.01 SECONDS
TIME TO ASSEMBLE THE STIFFNESS MATRIX 0.02 SECONDS
TIME TO PROCESS 139 JOINTS 0.00 SECONDS
TIME TO GENERATE REDUCED STIFFNESS MATRIX 0.01 SECONDS
TIME TO ASSEMBLE LUMPED MASS MATRIX 0.00 SECONDS
```

```
( 431) > PERFORM EIGENVALUE ANALYSIS
```

```
**** STRUDL MESSAGE DY.409 - THERE ARE 22 FREQUENCIES LESS THAN OR EQUAL TO
THE SPECIFIED MAXIMUM FREQUENCY
```

```
TIME TO SOLVE EIGENPROBLEM 0.35 SECONDS
TIME TO TRANSFORM EIGENVECTORS TO JOINTS 0.02 SECONDS
```

```
*****
* EIGEN-SOLUTION CHECKS *
*****
```

Sheet D14 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

**** STRUDL MESSAGE - STURM SEQUENCE CHECK WAS SUCCESSFUL - THERE ARE NO MISSING MODES

MODE-----	EIGENVALUE-----	FREQUENCY-----	FREQUENCY-----	PERIOD-----
ESTIMATED---/				
	((RAD/SEC)**2)	(RAD/SEC)	(CYC/SEC)	(SEC/CYC)
ACCURACY				
1	7.112141D+01	8.433351D+00	1.342210D+00	7.450402D-01
1.448861D-10				
2	2.664496D+02	1.632328D+01	2.597931D+00	3.849217D-01
5.274981D-11				
3	5.742690D+02	2.396391D+01	3.813975D+00	2.621937D-01
3.542973D-11				
4	6.981127D+02	2.642182D+01	4.205164D+00	2.378029D-01
1.667089D-11				
5	1.359127D+03	3.686634D+01	5.867459D+00	1.704315D-01
1.480153D-11				
6	2.829025D+03	5.318858D+01	8.465226D+00	1.181303D-01
7.007373D-12				
7	3.980771D+03	6.309335D+01	1.004162D+01	9.958555D-02
2.151702D-12				
8	4.438714D+03	6.662368D+01	1.060349D+01	9.430860D-02
1.476700D-12				
9	7.281677D+03	8.533274D+01	1.358113D+01	7.363159D-02
3.393733D-12				
10	8.071715D+03	8.984273D+01	1.429891D+01	6.993538D-02
3.562982D-12				
11	1.202615D+04	1.096638D+02	1.745354D+01	5.729498D-02
8.183682D-13				
12	1.509025D+04	1.228424D+02	1.955097D+01	5.114836D-02
5.074929D-13				
13	1.514236D+04	1.230543D+02	1.958470D+01	5.106027D-02
5.447848D-13				
14	1.589059D+04	1.260579D+02	2.006273D+01	4.984366D-02
8.809449D-13				
15	2.030292D+04	1.424883D+02	2.267772D+01	4.409614D-02
1.780133D-10				
16	2.033992D+04	1.426181D+02	2.269838D+01	4.405602D-02
4.604036D-10				
17	2.093539D+04	1.446907D+02	2.302823D+01	4.342496D-02
4.843211D-11				
18	2.473314D+04	1.572677D+02	2.502994D+01	3.995216D-02
3.063666D-09				
19	2.651756D+04	1.628421D+02	2.591713D+01	3.858452D-02
1.601460D-07				
20	2.955882D+04	1.719268D+02	2.736300D+01	3.654570D-02
1.095908D-07				
21	3.222693D+04	1.795186D+02	2.857127D+01	3.500019D-02
1.234198D-05				
22	3.965578D+04	1.991376D+02	3.169373D+01	3.155198D-02
2.628008D-04				

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ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

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for the original page.

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

```

/-----/-----/-----/-----/-----/
GLOBAL  CENTER OF MASS
AXIS    COORDINATE    TOTAL MASS    TOTAL WEIGHT    MASS MOMENT
/-----/-----/-----/-----/-----/
X       268.4838      9.679881      3737.291      0.0000000E+00
Y       406.9106      9.679881      3737.291      0.0000000E+00
Z       0.0000000E+00  0.0000000E+00  0.0000000E+00  1585267.
/-----/-----/-----/-----/-----/

```

(435) > LIST DYNAMIC PARTICIPATION FACTORS

1

 RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS INCH KIP CYC DEGF SEC

NORMALIZED PARTICIPATION FACTORS

% OF X DIRECTION MASS PARTICIPATING

```

-----
MODE    PERCENT    MODE    PERCENT    MODE    PERCENT    MODE    PERCENT
MODE    PERCENT    MODE    PERCENT
1      18.46657      2      38.16778      3      7.350529      4      3.477863
5      5.428569      6      0.9735833      9      0.2912734      10     2.317298
7      8.256175      8      0.8782288      11     0.7019849E-01  12     1.013797
13     0.6517125E-02  14     0.5610686E-02  15     0.1501943E-03  16     0.9461575E-01
17     0.1340575E-02  18     0.8813852      21     0.2137198      22     0.7448741E-02
19     0.5527257      20     0.9036222

```

TOTAL PERCENTAGE OF X DIRECTION MASS PARTICIPATING: 89.359

% OF Y DIRECTION MASS PARTICIPATING

```

-----
MODE    PERCENT    MODE    PERCENT    MODE    PERCENT    MODE    PERCENT
MODE    PERCENT    MODE    PERCENT
1      0.4996426E-03  2      0.2375953E-01  3      0.9383560      4      2.563886
5      0.2472395E-04  6      0.7738022E-02

```

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ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)**

7	0.8796270E-03	8	0.2613380E-03	9	0.4690954E-02	10	0.2258782E-02
11	1.007529	12	0.6989779E-02				
13	0.2568285	14	2.968185	15	4.597464	16	0.4055185E-01
17	0.4691689	18	4.987041				
19	0.1043740	20	0.7674618	21	0.8030278	22	1.941544

TOTAL PERCENTAGE OF Y DIRECTION MASS PARTICIPATING: 21.493

NO MASS IN Z DIRECTION

```
( 436) > $$
( 437) > UNITS FEET SECONDS
( 438) > DELETE RESPONSE SPECTRA 'RSH'
**** STRUDL ERROR DY.81 - FILE RSH DOES NOT EXIST ON USER DATA SET
( 439) > STORE RESPONSE SPECTRA ACCELERATION LOG VS FREQUENCY LOG 'RSH'
( 440) > DAMPING 0.10 FACTOR 32.2
( 441) > $$ SPECTRA IN g's
( 442) > 0.12 100.0 0.12 33.0 0.20 7.1 0.20 1.67 0.028 0.77
( 443) > RESPONSE SPECTRA LOAD 1
( 444) > SUPPORT ACCELERATION
( 445) > TRANSLATIONAL X 1.00 FILE 'RSH'
( 446) > END RESPONSE SPECTRA LOADING
( 447) > DAMPING RATIO 0.10 30
( 448) > PERFORM RESPONSE SPECTRA ANALYSIS
TIME TO COMPUTE RESPONSE SPECTRA RESULTS 0.00 SECONDS
( 449) > COMPUTE RESPONSE SPECTRA DISPLACEMENT ACC FORCES REACTIONS -
( 450) > _ MODAL COMBINATION NRC TPM
TIME FOR RESPONSE SPECTRA COMPUTATION 0.49 SECONDS
( 451) > $$
( 452) > CREATE PSEUDO STATIC LOAD 'NS' FROM NRC TPM LOAD 1
( 453) > LIST RESPONSE SPECTRUM SPECTRAL ACCELERATION
```

1

RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS FEET KIP CYC DEGF SEC

```
=====
=====
LOADING - 1
=====
=====
```

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ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

SPECTRAL ACCELERATIONS

MODE MODE	ACC ACC	MODE MODE	ACC ACC	MODE MODE	ACC ACC	MODE MODE	ACC ACC
1	3.697341	2	6.440001	3	6.440001	4	6.440001
5	6.440000	6	6.074228				
7	5.738952	8	5.636002	9	5.190796	10	5.102667
11	4.775414	12	4.598592				
13	4.595957	14	4.559255	15	4.377265	16	4.375941
17	4.354999	18	4.235968				
19	4.187195	20	4.112296	21	4.053640	22	3.916238

(454) > LIST RESPONSE SPECTRUM FORCES -
 (455) >_ MODE COMBINATION NRC TPM MEMBERS ALL

 RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS FEET KIP CYC DEGF SEC

=====

LOADING - 1

=====

MEMBER FORCES

MEMBER	JOINT	RESPONSE /	FORCE-----//		
		MOMENT-----/			
		TYPE	AXIAL	SHEAR-Y	SHEAR-Z
TORSIONAL		BENDING-Y	BENDING-Z		
1	1	NRC TPM	148.5741	25.38357	
699.7699					
1	2	NRC TPM	148.5741	25.38357	
582.8599					
2	2	NRC TPM	148.5655	25.24730	
582.8599					

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ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

2 468.3287	3	NRC TPM	148.5655	25.24730
3 468.3287	3	NRC TPM	148.5483	24.76679
3 359.0931	4	NRC TPM	148.5483	24.76679
4 454.0710	4	NRC TPM	137.9618	24.40243
4 380.2281	5	NRC TPM	137.9618	24.40243
5 380.2281	5	NRC TPM	137.9338	23.20791
5 322.4542	6	NRC TPM	137.9338	23.20791
6 322.4542	6	NRC TPM	137.8999	21.70136
6 287.2884	7	NRC TPM	137.8999	21.70136
7 414.3981	7	NRC TPM	121.5321	27.57062
7 323.7735	8	NRC TPM	121.5321	27.57062
8 323.7735	8	NRC TPM	121.4859	24.80622
8 254.7437	9	NRC TPM	121.4859	24.80622
9 254.7437	9	NRC TPM	121.4342	21.56848
9 215.0248	10	NRC TPM	121.4342	21.56848
10 369.0605	10	NRC TPM	96.16090	30.71983
10 390.7328	11	NRC TPM	96.16090	30.71983
11 390.7328	11	NRC TPM	96.09931	28.72607
11 447.0115	12	NRC TPM	96.09931	28.72607

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ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

12 447.0115	12	NRC TPM	96.03635	27.31511
12 531.6601	13	NRC TPM	96.03635	27.31511
13 1218.416	13	NRC TPM	16.36575	64.15462
13 949.2530	14	NRC TPM	16.36575	64.15462
14 949.2530	14	NRC TPM	16.30457	56.68417
14 711.1724	15	NRC TPM	16.30457	56.68417
15 711.1724	15	NRC TPM	26.54800	45.82942
15 636.4388	16	NRC TPM	26.54800	45.82942
16 636.4388	16	NRC TPM	16.19186	46.19292
16 419.1421	17	NRC TPM	16.19186	46.19292
17 419.1421	17	NRC TPM	16.11163	39.75980
17 232.5078	18	NRC TPM	16.11163	39.75980
18 232.5078	18	NRC TPM	16.03276	31.29250
18 88.36362	19	NRC TPM	16.03276	31.29250
19 15.90376	19	NRC TPM	9.219395	3.027350
19 13.25086	20	NRC TPM	9.219395	3.027350
20 85.00239	20	NRC TPM	22.36645	12.34411
20 26.82868	21	NRC TPM	22.36645	12.34411
21 26.82867	21	NRC TPM	22.54309	5.648140

Sheet D21 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

21	22	NRC TPM	22.54309	5.648140
0.8285024E-05				
101	101	NRC TPM	147.3559	121.9660
4075.065				
101	102	NRC TPM	147.3559	121.9660
3525.601				
102	102	NRC TPM	147.3481	121.7073
3525.601				
102	103	NRC TPM	147.3481	121.7073
2988.395				
103	103	NRC TPM	147.3327	120.8131
2988.395				
103	104	NRC TPM	147.3327	120.8131
2472.927				
104	104	NRC TPM	136.6096	117.9179
2567.984				
104	105	NRC TPM	136.6096	117.9179
2152.030				
105	105	NRC TPM	136.5847	115.7284
2152.030				
105	106	NRC TPM	136.5847	115.7284
1770.743				
106	106	NRC TPM	136.5547	112.7762
1770.743				
106	107	NRC TPM	136.5547	112.7762
1446.011				
107	107	NRC TPM	119.9562	100.9830
1577.013				
107	108	NRC TPM	119.9562	100.9830
1394.202				
108	108	NRC TPM	157.2612	71.36380
1394.202				
108	109	NRC TPM	157.2612	71.36380
1246.758				
109	109	NRC TPM	119.9876	121.0403
1246.758				
109	110	NRC TPM	119.9876	121.0403
574.5135				

Sheet D22 of D35

ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

110 737.5591	110	NRC TPM	94.65550	121.9409
110 272.8930	111	NRC TPM	94.65550	121.9409
111 272.8930	111	NRC TPM	94.76745	116.7697
111 278.3890	112	NRC TPM	94.76745	116.7697
112 278.3890	112	NRC TPM	94.87207	110.9461
112 668.0873	113	NRC TPM	94.87207	110.9461
113 88.26084	113	NRC TPM	0.5169822	16.10189
113 54.75903	114	NRC TPM	0.5169822	16.10189
114 54.75903	114	NRC TPM	3.164844	10.86244
114 26.15787	115	NRC TPM	3.164844	10.86244
115 26.15786	115	NRC TPM	0.1716160	4.755975
115 0.3507811E-05	116	NRC TPM	0.1716160	4.755975
201 204.8771	201	NRC TPM	73.22595	22.06326
201 103.3763	202	NRC TPM	73.22595	22.06326
202 103.3763	202	NRC TPM	73.22245	21.87253
202 12.70634	203	NRC TPM	73.22245	21.87253
203 150.9895	203	NRC TPM	46.55099	21.06494
203 62.40337	204	NRC TPM	46.55099	21.06494
204 62.40337	204	NRC TPM	46.54179	20.47755

Sheet D23 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

204 27.08814	205	NRC TPM	46.54179	20.47755
205 27.08814	205	NRC TPM	46.53028	19.68454
205 108.8308	206	NRC TPM	46.53028	19.68454
206 108.8308	206	NRC TPM	46.51647	18.66412
206 187.4967	207	NRC TPM	46.51647	18.66412
207 187.4967	207	NRC TPM	45.03674	20.80206
207 69.95593	208	NRC TPM	45.03674	20.80206
301 204.9005	301	NRC TPM	73.22771	22.07143
301 103.3628	302	NRC TPM	73.22771	22.07143
302 103.3628	302	NRC TPM	73.22421	21.88067
302 12.70993	303	NRC TPM	73.22421	21.88067
303 150.9342	303	NRC TPM	46.55322	21.05910
303 62.37303	304	NRC TPM	46.55322	21.05910
304 62.37303	304	NRC TPM	46.54401	20.47200
304 27.09489	305	NRC TPM	46.54401	20.47200
305 27.09489	305	NRC TPM	46.53248	19.67936
305 108.8161	306	NRC TPM	46.53248	19.67936
306 108.8161	306	NRC TPM	46.51865	18.65947
306 187.4620	307	NRC TPM	46.51865	18.65947

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ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

307 187.4620	307	NRC TPM	45.03556	20.80649
307 69.89673	308	NRC TPM	45.03556	20.80649
401 3247.654	401	NRC TPM	62.52801	118.0295 ←
401 2744.846	402	NRC TPM	62.52801	118.0295
402 2744.846	402	NRC TPM	62.51831	117.7395
402 2270.199	403	NRC TPM	62.51831	117.7395
403 2270.199	403	NRC TPM	62.49905	116.7670
403 1846.400	404	NRC TPM	62.49905	116.7670
404 1921.518	404	NRC TPM	57.98169	133.5815 ←
404 1558.034	405	NRC TPM	57.98169	133.5815
405 1558.034	405	NRC TPM	57.94955	131.3825
405 1319.310	406	NRC TPM	57.94955	131.3825
406 1319.310	406	NRC TPM	57.91116	128.4557
406 1266.893	407	NRC TPM	57.91116	128.4557
407 1324.908	407	NRC TPM	51.76289	112.3938
407 1413.287	408	NRC TPM	51.76289	112.3938
408 1413.287	408	NRC TPM	88.52796	50.47084
408 1294.016	409	NRC TPM	88.52796	50.47084
409 1294.016	409	NRC TPM	51.75560	85.43092 ←

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ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

409 1042.915	410	NRC TPM	51.75560	85.43092
410 1121.097	410	NRC TPM	38.04102	48.32735
410 1012.617	411	NRC TPM	38.04102	48.32735
411 1012.617	411	NRC TPM	38.12334	44.21610
411 930.9613	412	NRC TPM	38.12334	44.21610
412 930.9613	412	NRC TPM	38.21098	39.28943
412 870.5281	413	NRC TPM	38.21098	39.28943
413 870.5281	413	NRC TPM	38.30481	33.75012
413 820.7187	414	NRC TPM	38.30481	33.75012
414 1094.980	414	NRC TPM	15.79059	48.72178
414 998.5789	415	NRC TPM	15.79059	48.72178
415 998.5789	415	NRC TPM	23.97156	44.85093
415 927.8629	416	NRC TPM	23.97156	44.85093
416 927.8629	416	NRC TPM	15.54502	48.32556
416 704.0753	417	NRC TPM	15.54502	48.32556
417 704.0753	417	NRC TPM	15.40936	48.21631
417 477.3570	418	NRC TPM	15.40936	48.21631
418 477.3570	418	NRC TPM	15.27793	47.61391
418 255.7181	419	NRC TPM	15.27793	47.61391

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ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

419 46.48323	419	NRC TPM	14.88875	13.99131
419 33.84514	420	NRC TPM	14.88875	13.99131
420 207.3488	420	NRC TPM	14.88417	44.41880 ←
420 25.94268	421	NRC TPM	14.88417	44.41880
421 25.94267	421	NRC TPM	14.87057	43.15236
421 211.0225	422	NRC TPM	14.87057	43.15236
502 241.7060	502	NRC TPM	67.63821	29.53745 ←
502 102.1538	503	NRC TPM	67.63821	29.53745
503 102.1538	503	NRC TPM	67.63345	29.31079
503 39.43371	504	NRC TPM	67.63345	29.31079
504 47.98573	504	NRC TPM	62.78803	6.946240 ←
504 27.24990	505	NRC TPM	62.78803	6.946240
505 27.24990	505	NRC TPM	62.77636	5.984046
505 23.13253	506	NRC TPM	62.77636	5.984046
506 23.13253	506	NRC TPM	62.76145	5.066161
506 33.65217	507	NRC TPM	62.76145	5.066161
507 82.01856	507	NRC TPM	55.95660	11.79092
507 66.35854	508	NRC TPM	55.95660	11.79092
508 66.35854	508	NRC TPM	55.93439	9.947743

Sheet D27 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

508 77.62319	509	NRC TPM	55.93439	9.947743
509 77.62319	509	NRC TPM	55.90938	7.989813
509 99.12707	510	NRC TPM	55.90938	7.989813 ←
510 217.2933	510	NRC TPM	40.42787	32.66238
510 77.24973	511	NRC TPM	40.42787	32.66238
511 77.24972	511	NRC TPM	40.39962	30.80514
511 82.10612	512	NRC TPM	40.39962	30.80514
512 82.10612	512	NRC TPM	40.37063	28.72746
512 204.4629	513	NRC TPM	40.37063	28.72746
513 204.4629	513	NRC TPM	40.34121	26.81743
513 321.4860	514	NRC TPM	40.34121	26.81743 ←
MS1-1 95.94116	104	NRC TPM	6.328030	11.31565
MS1-1 32.13077	S1-1	NRC TPM	6.328030	11.31565
MS1-2 32.13077	S1-1	NRC TPM	6.117498	11.36677
MS1-2 31.96027	S1-2	NRC TPM	6.117498	11.36677
MS1-3 31.96027	S1-2	NRC TPM	5.949129	11.31876
MS1-3 95.78730	4	NRC TPM	5.949129	11.31876
MS2-1 144.1996	107	NRC TPM	19.23200	17.09662
MS2-1 47.79197	S2-1	NRC TPM	19.23200	17.09662

Sheet D28 of D35

ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

MS2-2 47.79197	S2-1	NRC TPM	18.30879	17.16765
MS2-2 49.01332	S2-2	NRC TPM	18.30879	17.16765
MS2-3 49.01332	S2-2	NRC TPM	17.42957	17.09662
MS2-3 145.4205	7	NRC TPM	17.42957	17.09662
MS3-1 209.1889	110	NRC TPM	31.27639	25.67324
MS3-1 85.81319	S3-1	NRC TPM	31.27639	25.67324
MS3-2 85.81319	S3-1	NRC TPM	31.15229	25.82949
MS3-2 59.84162	S3-2	NRC TPM	31.15229	25.82949
MS3-3 59.84162	S3-2	NRC TPM	31.13084	25.77378
MS3-3 205.1753	10	NRC TPM	31.13084	25.77378
MS4-1 743.9662	113	NRC TPM	91.50966	95.36941
MS4-1 285.8461	S4-1	NRC TPM	91.50966	95.36941
MS4-2 285.8461	S4-1	NRC TPM	88.25334	95.56870
MS4-2 253.6837	S4-2	NRC TPM	88.25334	95.56870
MS4-3 253.6837	S4-2	NRC TPM	84.84252	95.40062
MS4-3 791.4054	13	NRC TPM	84.84252	95.40062
MS5-1 77.55231	404	NRC TPM	20.95688	6.931415
MS5-1 24.94038	S5-1	NRC TPM	20.95688	6.931415
MS5-2 24.94038	S5-1	NRC TPM	21.32795	6.999121

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ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MS5-2 28.40603	S5-2	NRC TPM	21.32795	6.999121
MS5-3 28.40603	S5-2	NRC TPM	21.73500	6.882010
MS5-3 80.64848	504	NRC TPM	21.73500	6.882010 ←
MS6-1 101.0208	407	NRC TPM	14.05675	8.638264 ←
MS6-1 35.37224	S6-1	NRC TPM	14.05675	8.638264
MS6-2 35.37224	S6-1	NRC TPM	12.30624	8.768671
MS6-2 31.40529	S6-2	NRC TPM	12.30624	8.768671
MS6-3 31.40529	S6-2	NRC TPM	10.57911	8.681145
MS6-3 97.41452	507	NRC TPM	10.57911	8.681145
MS7-1 163.9409	410	NRC TPM	36.00574	16.04957
MS7-1 79.70475	S7-1	NRC TPM	36.00574	16.04957
MS7-2 79.70475	S7-1	NRC TPM	34.96987	16.16706
MS7-2 43.77433	S7-2	NRC TPM	34.96987	16.16706
MS7-3 43.77433	S7-2	NRC TPM	33.92634	16.24926
MS7-3 166.2390	510	NRC TPM	33.92634	16.24926 ←
MS8-1 499.8418	414	NRC TPM	26.42525	39.84654 ←
MS8-1 290.0349	S8-1	NRC TPM	26.42525	39.84654
MS8-2 290.0349	S8-1	NRC TPM	25.28202	40.09459
MS8-2 20.92999	S8-2	NRC TPM	25.28202	40.09459

Sheet D30 of D35

ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

MS8-3 20.92999	S8-2	NRC TPM	25.39447	40.30805
MS8-3 321.4860	514	NRC TPM	25.39447	40.30805
MS9-1 147.5999	303	NRC TPM	0.5514828	26.83696
MS9-1 0.3214396E-01	S9-1	NRC TPM	0.5514828	26.83696
MS9-2 0.3214403E-01	S9-1	NRC TPM	0.5429780	26.83695
MS9-2 147.6066	203	NRC TPM	0.5429780	26.83695
MTR-1 69.89673	308	NRC TPM	115.6032	46.61635
MTR-1 69.95593	208	NRC TPM	115.6032	46.61635
CC-1	108	NRC TPM	115.8753	
CC-2	308	NRC TPM	116.8265	
MT-1	T-2	NRC TPM	1.349934	
MT-2	T-3	NRC TPM	23.52294	
MT-3	T-4	NRC TPM	36.53832	
MT-4	T-5	NRC TPM	39.11643	
MT-5	T-6	NRC TPM	34.62096	
MT-6	T-7	NRC TPM	5.610867	
MT-7	T-9	NRC TPM	12.52931	
MT-8	T-10	NRC TPM	12.57122	
MT-9	T-11	NRC TPM	30.78473	
MT-10	T-12	NRC TPM	30.80796	
MT-11	T-13	NRC TPM	38.40993	
MT-12	T-14	NRC TPM	38.40605	
MT-13	T-15	NRC TPM	36.03651	
MT-14	T-16	NRC TPM	36.00802	

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ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MT-15	T-17	NRC TPM	23.57310	
MT-16	T-18	NRC TPM	23.53853	
MT-17	T-8	NRC TPM	23.88051	
MT-18	T-8	NRC TPM	20.01964	
MT-19	T-9	NRC TPM	1.964458	
MT-20	T-10	NRC TPM	17.92210	
MT-21	T-10	NRC TPM	12.17838	
MT-22	T-11	NRC TPM	2.621411	
MT-23	T-12	NRC TPM	10.47821	
MT-24	T-12	NRC TPM	7.341926	
MT-25	T-13	NRC TPM	2.928129	
MT-26	T-14	NRC TPM	7.111910	
MT-27	T-14	NRC TPM	10.43029	
MT-28	T-15	NRC TPM	2.715806	
MT-29	T-16	NRC TPM	12.40382	
MT-30	T-16	NRC TPM	18.45983	
MT-31	T-17	NRC TPM	19.72946	
MT-32	T-18	NRC TPM	37.68369	
MT-33	T-18	NRC TPM	17.91838	
MTC-1	19	NRC TPM	15.20207	14.62922
72.46995				
MTC-1	30	NRC TPM	15.20207	14.62922
59.72874				
MTC-2	20	NRC TPM	12.35846	16.82090
71.77422				
MTC-2	30	NRC TPM	12.35846	16.82090
59.72874				
MTC-11	419	NRC TPM	13.10440	43.72967
209.2419				
MTC-11	430	NRC TPM	13.10440	43.72967
170.2917				

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ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
 (Using Original Ground Response Spectrum for 10% Damping)

MTC-12 173.5191	420	NRC TPM	38.76161	4.702535
MTC-12 170.1299	430	NRC TPM	38.76161	4.702535
MTC-13 3.707520	430	NRC TPM	17.94607	6.844652
MTC-13 0.3612327E-06	T-7	NRC TPM	17.94607	6.844652
MRS-1	RS-1	NRC TPM	22.63780	
MTC-3	T-1	NRC TPM	23.88249	
MRS-2 0.3562712E-07	RS-1	NRC TPM	0.3450047	22.66289
MRS-2 16.99717	RS-2	NRC TPM	0.3450047	22.66289
MRS-3 16.99717	RS-2	NRC TPM	2.654543	1.727326
MRS-3 8.942825	RS-3	NRC TPM	2.654543	1.727326
MRS-4 8.942830	RS-3	NRC TPM	6.749925	1.091538
MRS-4 4.032241	RS-4	NRC TPM	6.749925	1.091538
MRS-5 4.032245	RS-4	NRC TPM	10.81723	1.718182
MRS-5 14.43072	RS-5	NRC TPM	10.81723	1.718182
MRS-6 14.43072	RS-5	NRC TPM	14.88359	0.6178546
MRS-6 12.11731	RS-6	NRC TPM	14.88359	0.6178546
MRS-7 12.11731	RS-6	NRC TPM	18.94862	1.138842
MRS-7 16.79025	RS-7	NRC TPM	18.94862	1.138842
MRS-8 16.79025	RS-7	NRC TPM	23.01200	1.139786
MRS-8 13.69452	RS-8	NRC TPM	23.01200	1.139786

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ATTACHMENT-D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MRS-9 13.69453	RS-8	NRC TPM	27.07335	0.8768210
MRS-9 14.31470	RS-9	NRC TPM	27.07335	0.8768210
MRS-10 14.31469	RS-9	NRC TPM	31.13233	2.262422
MRS-10 8.628003	RS-10	NRC TPM	31.13233	2.262422
MRS-11 8.628000	RS-10	NRC TPM	35.18861	8.236533
MRS-11 43.92697	RS-11	NRC TPM	35.18861	8.236533
MRS-12 43.92697	RS-11	NRC TPM	39.26922	27.32346
MRS-12 214.1840	RS-12	NRC TPM	39.26922	27.32346
MRS-13 214.1840	RS-12	NRC TPM	41.56732	14.86203
MRS-13 224.8905	RS-13	NRC TPM	41.56732	14.86203
MRS-14 224.8905	RS-13	NRC TPM	14.86375	41.89764
MRS-14 211.0225	422	NRC TPM	14.86375	41.89764
MTRS-1	RS-2	NRC TPM	24.32860	
MTRS-2	RS-3	NRC TPM	1.911050	
MTRS-3	RS-4	NRC TPM	5.766903	
MTRS-4	RS-5	NRC TPM	2.522465	
MTRS-5	RS-6	NRC TPM	5.341441	
MTRS-6	RS-7	NRC TPM	2.817596	
MTRS-7	RS-8	NRC TPM	5.309811	
MTRS-8	RS-9	NRC TPM	2.623156	
MTRS-9	RS-10	NRC TPM	11.57690	
MTRS-10	RS-11	NRC TPM	19.71387	

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ATTACHMENT- D: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment D: REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Original Ground Response Spectrum for 10% Damping)

MTRS-11 RS-12 NRC TPM 13.48290
{ 455} >

{ 456} >

{ 457} >

{ 458} >

{ 459} >

ATTACHMENT: EORIGINATOR: R. S. Rajagopal *RS*DATE: August 19, 1999CHECKED BY: C. A. Palmquist *CAF*DATE: 1/8/99CALC. NO. 0200W-CA-C0156REV. NO. 0SHEET NO. E1 OF TOTAL 10 SHEETS**ATTACHMENT "E"****REDOX (Corrected Coordinates in "GT Strudl" Model) Input for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"-10% Damping)**

Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

STRUDL 'REDOX BUILDING' '2-D ANALYSIS OF TYPICAL SLICE'

\$\$

\$\$ TRUSS CONNECTED TO BUILDING BY SP K=136 KIP/IN

\$\$ AT ONE END. SLOTTED HOLE END FREE

UNITS INCH KIPS DEGREES FAH

\$\$

JOINT COORDINATES GLOBAL

\$\$ SOUTH WALL

1	704.00	0.00
2	704.00	57.00
3	704.00	114.00
4	704.00	171.00
5	704.00	219.00
6	704.00	267.00
7	704.00	315.00
8	704.00	363.21
9	704.00	411.42
10	704.00	459.63
11	704.00	510.00
12	704.00	553.21
13	704.00	600.00
14	704.00	651.50
15	704.00	703.00
16	713.00	721.00
17	713.00	778.33
18	713.00	835.67
19	713.00	893.00
20	718.00	903.00
21	718.00	960.00
22	718.00	1017.00

\$\$ DUMMY JOINT FOR TRUSS

30	709.00	903.00
----	--------	--------

\$\$ SOUTH CANYON WALL

101	501.00	0.00
102	501.00	57.00
103	501.00	114.00
104	501.00	171.00
105	501.00	219.00
106	501.00	267.00
107	501.00	315.00
108	501.00	363.00
109	511.00	387.00
110	511.00	459.63
111	511.00	510.00
112	511.00	553.21
113	511.00	600.00
114	511.00	625.00
115	521.00	655.00
116	521.00	721.00

\$\$ SOUTH PIPE TUNNEL WALL

201	315.00	0.00
202	315.00	55.50
203	315.00	111.00
204	315.00	162.00
205	315.00	213.00
206	315.00	264.00
207	315.00	315.00

Sheet E2 of E10

ATTACHMENT- E: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

	208	267.00	363.00
\$\$	NORTH PIPE TUNNEL WALL		
	301	183.00	0.00
	302	183.00	55.50
	303	183.00	111.00
	304	183.00	162.00
	305	183.00	213.00
	306	183.00	264.00
	307	183.00	315.00
	308	231.00	363.00
\$\$	NORTH CANYON WALL		
	401	0.00	0.00
	402	0.00	57.00
	403	0.00	114.00
	404	0.00	171.00
	405	0.00	219.00
	406	0.00	267.00
	407	0.00	315.00
	408	0.00	363.00
	409	-28.00	403.00
	410	-28.00	459.00
	411	-28.00	513.75
	412	-28.00	568.50
	413	-28.00	623.25
	414	-28.00	678.00
	415	-28.00	703.00
	416	-37.00	721.00
	417	-37.00	778.00
	418	-37.00	835.67
	419	-37.00	893.00
	420	-42.00	903.00
	421	-42.00	960.00
	422	-42.00	1017.00
\$\$	DUMMY JOINT FOR TRUSS CONNECTION		
	430	-33.00	903.00
\$\$	NORTH GALLERY WALL		
	502	-274.00	57.25
	503	-274.00	114.13
	504	-274.00	171.00
	505	-274.00	219.00
	506	-274.00	267.00
	507	-274.00	315.00
	508	-274.00	363.00
	509	-274.00	411.00
	510	-274.00	459.00
	511	-274.00	513.75
	512	-274.00	568.50
	513	-274.00	623.25
	514	-274.00	678.00
\$\$	SLAB S1 @ SOUTH GALLERY		
	'S1-1'	568.67	171.00
	'S1-2'	636.33	171.00
\$\$	SLAB S2 @ SOUTH GALLERY		
	'S2-1'	568.67	315.00
	'S2-2'	636.33	315.00
\$\$	SLAB S3 @ SOUTH GALLERY		
	'S3-1'	568.67	459.63

Sheet E3 of E10

ATTACHMENT- E: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

'S3-2'	636.33	459.63
\$\$ SLAB S4 @ SOUTH GALLERY		
'S4-1'	568.67	600.00
'S4-2'	636.33	600.00
\$\$ SLAB S5 @ NORTH GALLERY		
'S5-1'	-91.33	171.00
'S5-2'	-182.67	171.00
\$\$ SLAB S6 @ NORTH GALLERY		
'S6-1'	-91.33	315.00
'S6-2'	-182.67	315.00
\$\$ SLAB S7 @ NORTH GALLERY		
'S7-1'	-91.33	459.00
'S7-2'	-182.67	459.00
\$\$ SLAB S8 @ NORTH GALLERY		
'S8-1'	-91.33	678.00
'S8-2'	-182.67	678.00
\$\$ SLAB S9 @ PIPE TUNNEL		
'S9-1'	249.00	111.00
\$\$ ROOF TRUSS BOTTOM CHORD		
'T-1'	709.00	909.50
'T-2'	634.00	909.50
'T-3'	486.00	909.50
'T-4'	338.00	909.50
'T-5'	190.00	909.50
'T-6'	42.00	909.50
'T-7'	-33.00	909.50
'T-8'	709.00	1003.50
'T-9'	634.00	1003.50
'T-10'	560.00	1003.50
'T-11'	486.00	1003.50
'T-12'	412.00	1003.50
'T-13'	338.00	1003.50
'T-14'	264.00	1003.50
'T-15'	190.00	1003.50
'T-16'	116.00	1003.50
'T-17'	42.00	1003.50
'T-18'	-33.00	1003.50
\$\$ ROOF SLAB		
'RS-1'	718.00	1021.00
'RS-2'	709.00	1021.00
'RS-3'	634.00	1021.00
'RS-4'	560.00	1021.00
'RS-5'	486.00	1021.00
'RS-6'	412.00	1021.00
'RS-7'	338.00	1021.00
'RS-8'	264.00	1021.00
'RS-9'	190.00	1021.00
'RS-10'	116.00	1021.00
'RS-11'	42.00	1021.00
'RS-12'	-33.00	1021.00
'RS-13'	-42.00	1021.00
\$\$		
TYPE PLANE FRAME		
\$\$ MEMBER FOR SOUTH GALLERY WALL		
MEMBER INCIDENCES		
1	1	2
GENERATE 20 MEMBERS ID 2 FROM 2 INC 1 TO 3 INC 1		

Sheet E4 of E10

ATTACHMENT- E: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```

$$      MEMBER FOR SOUTH CANYON WALL
MEMBER INCIDENCES
      101      101      102
GENERATE 14 MEMBERS ID 102 FROM 102 INC 1 TO 103 INC 1
$$      MEMBER FOR SOUTH PIPE TUNNEL WALL
MEMBER INCIDENCES
      201      201      202
GENERATE 6 MEMBERS ID 202 FROM 202 INC 1 TO 203 INC 1
$$      MEMBER FOR NORTH PIPE TUNNEL WALL
MEMBER INCIDENCES
      301      301      302
GENERATE 6 MEMBERS ID 302 FROM 302 INC 1 TO 303 INC 1
$$      MEMBER FOR NORTH CANYON WALL
MEMBER INCIDENCES
      401      401      402
GENERATE 20 MEMBERS ID 402 FROM 402 INC 1 TO 403 INC 1
$$      MEMBER FOR NORTH GALLERY WALL
MEMBER INCIDENCES
      502      502      503
GENERATE 11 MEMBERS ID 503 FROM 503 INC 1 TO 504 INC 1
MEMBER INCIDENCES
$$      SLAB @ 88' SOUTH GALLERY
      'MS1-1'      104      'S1-1'
      'MS1-2'      'S1-1'      'S1-2'
      'MS1-3'      'S1-2'      4
$$      SLAB @ 100' SOUTH GALLERY
      'MS2-1'      107      'S2-1'
      'MS2-2'      'S2-1'      'S2-2'
      'MS2-3'      'S2-2'      7
$$      SLAB @ 112' 1 1/4" SOUTH GALLERY
      'MS3-1'      110      'S3-1'
      'MS3-2'      'S3-1'      'S3-2'
      'MS3-3'      'S3-2'      10
$$      SLAB @ 124' SOUTH GALLERY
      'MS4-1'      113      'S4-1'
      'MS4-2'      'S4-1'      'S4-2'
      'MS4-3'      'S4-2'      13
$$      SLAB @ 83' NORTH GALLERY
      'MS5-1'      404      'S5-1'
      'MS5-2'      'S5-1'      'S5-2'
      'MS5-3'      'S5-2'      504
$$      SLAB @ 100' NORTH GALLERY
      'MS6-1'      407      'S6-1'
      'MS6-2'      'S6-1'      'S6-2'
      'MS6-3'      'S6-2'      507
$$      SLAB @ 112' NORTH GALLERY
      'MS7-1'      410      'S7-1'
      'MS7-2'      'S7-1'      'S7-2'
      'MS7-3'      'S7-2'      510
$$      SLAB @ 130' 6" NORTH GALLERY
      'MS8-1'      414      'S8-1'
      'MS8-2'      'S8-1'      'S8-2'
      'MS8-3'      'S8-2'      514
$$      SLAB @ 83' PIPE TUNNEL
      'MS9-1'      303      'S9-1'
      'MS9-2'      'S9-1'      203
$$      PIPE TUNNEL ROOF @ 105'6"

```

Sheet E5 of E10

ATTACHMENT- E: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```

      'MTR-1'          308          208
$$
TYPE PLANE TRUSS
MEMBER INCIDENCES
$$   COVERS ON CELL
      'CC-1'          208          108
      'CC-2'          408          308
$$   TRUSS MEMBERS BOTTOM CHORD
      'MT-1'          'T-1'          'T-2'
GENERATE 5 MEMBERS ID 'MT-2' INC 1 FROM 'T-2' INC 1 TO 'T-3' INC 1
$$   TRUSS MEMBERS TOP CHORD
MEMBER INCIDENCES
      'MT-7'          'T-8'          'T-9'
GENERATE 9 MEMBERS ID 'MT-8' INC 1 FROM 'T-9' INC 1 TO 'T-10' INC 1
$$   TRUSS MEMBERS DIAGONALS AND VERTICALS
MEMBER INCIDENCES
      'MT-17'         'T-1'          'T-8'
      'MT-18'         'T-2'          'T-8'
      'MT-19'         'T-2'          'T-9'
      'MT-20'         'T-2'          'T-10'
      'MT-21'         'T-3'          'T-10'
      'MT-22'         'T-3'          'T-11'
      'MT-23'         'T-3'          'T-12'
      'MT-24'         'T-4'          'T-12'
      'MT-25'         'T-4'          'T-13'
      'MT-26'         'T-4'          'T-14'
      'MT-27'         'T-5'          'T-14'
      'MT-28'         'T-5'          'T-15'
      'MT-29'         'T-5'          'T-16'
      'MT-30'         'T-6'          'T-16'
      'MT-31'         'T-6'          'T-17'
      'MT-32'         'T-6'          'T-18'
      'MT-33'         'T-7'          'T-18'
$$
TYPE PLANE FRAME
MEMBER INCIDENCES
$$   CONNECTION TO BUILDING STRUCTURE SOUTH SIDE
      'MTC-1'          19           30
      'MTC-2'          20           30
$$   'MTC-3' MODALLED AS TRUSS MEM - NO LATERAL TRANSFER
$$   CONNECTION TO BUILDING STRUCTURE NORTH SIDE
      'MTC-11'         419          430
      'MTC-12'         420          430
      'MTC-13'         430          'T-7'
$$
TYPE PLANE TRUSS
MEMBER INCIDENCES
$$   ROOF SLAB MEMBER
      'MRS-1'          22           'RS-1'
$$   CONNECTION BETWEEN TRUSS AND BUILDING - AXIAL LOAD ONLY
      'MTC-3'          30           'T-1'
$$
TYPE PLANE FRAME
MEMBER INCIDENCES
      'MRS-2'          'RS-1'          'RS-2'
GENERATE 11 MEMBERS ID 'MRS-3' INC 1 FROM 'RS-2' INC 1 TO 'RS-3' INC 1
MEMBER INCIDENCES

```

Sheet E6 of E10

ATTACHMENT- E: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```

      'MRS-14'      'RS-13'      422
$$      CONNECTION BETWEEN ROOF SLAB AND TRUSS
TYPE PLANE TRUSS
MEMBER INCIDENCES
      'MTRS-1'      'T-8'      'RS-2'
GENERATE 10 MEMBERS ID 'MTRS-2' INC 1 FROM 'T-9' INC 1 TO 'RS-3' INC 1
$$
$$      PROPERTIES BLOCK
$$      FOR CONC MEMBER PROPERTIES BASED ON WIDTH OF 18'5" (221")
UNITS INCH KIPS DEGREES FAH
$$      SOUTH GALLERY WALL UPTO CRANE LEVEL
MEMBER PROPERTIES PRISMATIC
1 TO 15      AX      7956.00      AY      6630.00      IZ
859248.00
$$      SOUTH GALLERY WALL FROM CRANE LEVEL TO TRUSS
MEMBER PROPERTIES PRISMATIC
16 TO 19      AX      3978.00      AY      3315.00      IZ
107406.00
$$      SOUTH GALLERY WALL FROM TRUSS TO ROOF
MEMBER PROPERTIES PRISMATIC
20 21      AX      1768.00      AY      1473.00      IZ
9429.00
$$      PAPER JOINT @ SOUTH WALL - AXIAL MEM. ONLY
MEMBER PROPERTIES PRISMATIC
'MRS-1'      AX      1768.00
$$      SOUTH CANYON WALL UPTO CANYON FL.
MEMBER PROPERTIES PRISMATIC
101 TO 107      AX      14586.00      AY      12155.00      IZ
5294718.00
$$      SOUTH CANYON WALL CANYON FL TO JOG AREA
MEMBER PROPERTIES PRISMATIC
108 TO 113      AX      10166.00      AY      8472.00      IZ
1792605.00
$$      SOUTH CANYON WALL - JOG AREA
MEMBER PROPERTIES PRISMATIC
114      AX      7956.00      AY      6630.00      IZ
859248.00
$$      SOUTH CANYON WALL - JOG TO TOP
MEMBER PROPERTIES PRISMATIC
115      AX      5746.00      AY      4788.00      IZ
323691.00
$$      PIPE TUNNEL - SOUTH AND NORTH WALL
MEMBER PROPERTIES PRISMATIC
201 TO 207 301 TO 307      AX      3978.00      AY      3315.00      IZ
107406.00
$$      PIPE TUNNEL ROOF
MEMBER PROPERTIES PRISMATIC
'MTR-1'      AX      9024.00      AY      7520.00      IZ
1732608.00
$$      NORTH CANYON WALL UPTO CANYON FLOOR
MEMBER PROPERTIES PRISMATIC
401 TO 407      AX      13260.00      AY      11050.00      IZ
3978000.00
$$      NORTH CANYON WALL FROM FLOOR TO CRANE LEVEL
MEMBER PROPERTIES PRISMATIC
408 TO 415      AX      10166.00      AY      8472.00      IZ
1792605.00

```

Sheet E7 of E10

ATTACHMENT- E: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)**

```

$$      NORTH CANYON WALL FROM CRANE LEVEL TO TRUSS SUPPORT
MEMBER PROPERTIES PRISMATIC
416 TO 419          AX      3978.00  AY      3315.00  IZ
107406.00
$$      NORTH CANYON WALL FROM TRUSS SUPPORT TO ROOF
MEMBER PROPERTIES PRISMATIC
420 421 'MRS-14'    AX      1768.00  AY      1473.00  IZ
9429.00
$$      NORTH GALLERY WALL
MEMBER PROPERTIES PRISMATIC
502 TO 513          AX      5304.00  AY      4420.00  IZ
95472.00
$$      1' THICK SLAB
MEMBER PROPERTIES PRISMATIC
'MS1-1' TO 'MS1-3' 'MS2-1' TO 'MS2-3' 'MS3-1' TO 'MS3-3' -
'MS5-1' TO 'MS5-3' 'MS6-1' TO 'MS6-3' 'MS7-1' TO 'MS7-3' -
'MS9-1' TO 'MS9-2'    AX      2652.00  AY      2210.00  IZ
31824.00
$$      1'6" THICK SLAB
MEMBER PROPERTIES PRISMATIC
'MS4-1' TO 'MS4-3' 'MS8-1' TO 'MS8-3' -
AX      3978.00  AY      3315.00  IZ
107406.00
$$      ROOF SLAB
MEMBER PROPERTIES PRISMATIC
'MRS-2' TO 'MRS-13'  AX      1989.00  AY      1658.00  IZ
13425.00
$$      TRUSS CONNECTION TO STRUCTURE
MEMBER PROPERTIES PRISMATIC
'MTC-1' TO 'MTC-2' 'MTC-11' TO 'MTC-12' -
AX      7956.00  AY      6630.00  IZ
859248.00
$$      REDUCED STIFFNESS FOR CONNECTION TO TRUSS
MEMBER PROPERTIES PRISMATIC
'MTC-13'            AX      7956.00  AY      0.50  IZ
859248.00
$$      COVER FOR CELLS
MEMBER PROPERTIES PRISMATIC
'CC-1' 'CC-2'        AX      10608.00
$$      CONN BET TRUSS & BLDG - TRUSS MEM @ SOUTH END
MEMBER PROPERTIES PRISMATIC
'MTC-3'              AX      7956.00
$$      TRUSS MEMBER
MEMBER PROPERTIES PRISMATIC
'MT-1' TO 'MT-16'    AX      12.86
MEMBER PROPERTIES PRISMATIC
'MT-17' 'MT-33'      AX      4.80
MEMBER PROPERTIES PRISMATIC
'MT-19' 'MT-31'      AX      3.56
MEMBER PROPERTIES PRISMATIC
'MT-22' 'MT-28'      AX      3.56
MEMBER PROPERTIES PRISMATIC
'MT-25'              AX      7.12
MEMBER PROPERTIES PRISMATIC
'MT-18' 'MT-32'      AX      8.00
MEMBER PROPERTIES PRISMATIC
'MT-20' 'MT-30'      AX      6.62

```

Sheet E8 of E10

ATTACHMENT- E: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```

MEMBER PROPERTIES PRISMATIC
'MT-21' 'MT-29'          AX          4.60
MEMBER PROPERTIES PRISMATIC
'MT-23' 'MT-27'          AX          4.66
MEMBER PROPERTIES PRISMATIC
'MT-24' 'MT-26'          AX          3.24
$$      CONNECTION BETWEEN TRUSS AND ROOF SLAB
MEMBER PROPERTIES PRISMATIC
'MTRS-1' TO 'MTRS-10'    AX          2.00
$$      REDUCE CONNECTION STIFFNESS FOR LAST PURLIN
MEMBER PROPERTIES PRISMATIC
'MTRS-11'                AX          0.50
$$
$$      SUPPORT LOCATIONS
$$
STATUS SUPPORT JOINTS -
1 101 201 301 401 502
$$
$$      MATERIAL PROPERTIES
$$
UNITS INCH LB DEG FAH
CONSTANTS
    E      3.824E+06      ALL
    G      1.634E+06      ALL
    POI     1.700E-01      ALL
    DEN     8.680E-02      ALL
$$
$$      PROVIDE E, G, POI, DEN FOR STEEL MEMBERS
$$
    E      2.900E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
    G      1.115E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
    POI     3.000E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
    DEN     2.836E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
$$
$$      ADJUST DENSITY OF ROOF SLAB TO ACCOUNT FOR FINISHES ETC.
$$
    DEN     1.003E-01      'MRS-1' TO 'MRS-13'
$$
$$      LUMPED WEIGHT OF STRUCTURE AT JOINTS
$$
INERTIA OF JOINTS LUMPED
UNIT CYCLES
EIGENPROBLEM PARAMETERS
    SOLVE USING GTLANCZOS
    FREQUENCY SPE 0.0 TO 33.0
END
PERFORM ASSEMBLY FOR DYNAMICS
PERFORM EIGENVALUE ANALYSIS
$$      LIST DYNAMIC MASS SUMMARY
UNIT INCH KIPS
LIST DYNAMIC MASS
LIST DYNAMIC PARTICPATION FACTORS
$$
UNITS FEET SECONDS
DELETE RESPONSE SPECTRA 'PC3'
STORE RESPONSE SPECTRA ACCELERATION LOG VS FREQUENCY LOG 'PC3'
DAMPING 0.10 FACTOR 32.2

```

Sheet E9 of E10

ATTACHMENT- E: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment E: REDOX (Corrected Coordinate in "GT Strudl" Model) Input for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```

$$      SPECTRA IN g's
0.188 100.0 0.188 33.3 0.238 13.3 0.267 10.0 0.320 5.0 0.302 3.3
0.233 2.0 0.146 1.0 0.078 0.5 0.029 0.25
RESPONSE SPECTRA LOAD 1
SUPPORT ACCELERATION
  TRANSLATIONAL X 1.00 FILE 'PC3'
END RESPONSE SPECTRA LOADING
DAMPING RATIO 0.10 30
PERFORM RESPONSE SPECTRA ANALYSIS
COMPUTE RESPONSE SPECTRA DISPLACEMENT ACC FORCES REACTIONS -
  MODAL COMBINATION NRC TPM
$$
CREATE PSEUDO STATIC LOAD 'NS' FROM NRC TPM LOAD 1
LIST RESPONSE SPECTRUM SPECTRAL ACCELERATION
LIST RESPONSE SPECTRUM FORCES -
  MODE COMBINATION NRC TPM MEMBERS ALL

```

ATTACHMENT: F
ORIGINATOR: R. S. Rajagopal *RSR* DATE: August 19, 1999
CHECKED BY: C. A. Palmquist *CP* DATE: 9/2/99
CALC. NO. 0200W-CA-C0156 REV. NO. 0
SHEET NO. F1 OF TOTAL 35 SHEETS

ATTACHMENT "F"

**REDOX (Corrected Coordinates in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"-10% Damping)**

*The governing output values used on sheet 13 are highlighted as "←" in
the following output.*

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

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Wed Jul 21 12:37:21 1999

1GTICES/C-NP 2.5.0 MD-NT 2.0, January 1995.

Proprietary to Georgia Tech Research Corporation, U.S.A.

Reading password file C:\Program Files\GTSTRUDL 9801\gtaccess.dat
 CI-i-audfile, Command AUDIT file FILE1237.aud has been activated.

*** G T S T R U D L ***

RELEASE DATE	VERSION	COMPLETION NO.
March 1998	9801 NT	3716

ACTIVE UNITS -	LENGTH	WEIGHT	ANGLE	TEMPERATURE	TIME
ASSUMED TO BE	INCH	POUND	RADIAN	FAHRENHEIT	SECOND

Reading global defaults file C:\Program Files\GTSTRUDL 9801\defaults.gts

(1) > \$ Put any startup commands in this file
 (1) >

(2) > CINPUT 'C:\Hanford\Redox_7.inp'

(3) > STRUDL 'REDOX BUILDING' '2-D ANALYSIS OF TYPICAL SLICE'

```

*****
*
* *****
* *****
* **
* **
* ** ***** **
* ** ***** **
* ** ***** **
* ** ***** **
* ** ***** **

```

Sheet F2 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

```

*  **      ***      *****      **      *      *      *      *      *
*  *****      *****      **      *****      **      *      *      *      *
*  *****      **      **      **      **      *      *      *      *
*  **      *****      **      **      *      *****      *****      *****
*  **      *****      **      **      *      *      *      *      *      *
*  **
*  **
*
*  **      OWNED BY AND PROPRIETARY TO THE
*  **      GEORGIA TECH RESEARCH CORPORATION
*
*
*  RELEASE DATE      VERSION      COMPLETION NO.
*  March 1998      9801 NT      3716
*
*****

```

```
( 4) > $ Put any startup commands in this file
( 4) >
```

```

( 5) > $$
( 6) > $$      TRUSS CONNECTED TO BUILDING BY SP K=136 KIP/IN
( 7) > $$      AT ONE END.  SLOTTED HOLE END FREE
( 8) > UNITS   INCH KIPS DEGREES FAH
( 9) > $$
(10) > JOINT   COORDINATES GLOBAL
(11) > $$      SOUTH WALL
(12) >          1          704.00          0.00
(13) >          2          704.00          57.00
(14) >          3          704.00         114.00
(15) >          4          704.00         171.00
(16) >          5          704.00         219.00
(17) >          6          704.00         267.00
(18) >          7          704.00         315.00
(19) >          8          704.00         363.21
(20) >          9          704.00         411.42
(21) >         10          704.00         459.63
(22) >         11          704.00         510.00
(23) >         12          704.00         553.21
(24) >         13          704.00         600.00
(25) >         14          704.00         651.50
(26) >         15          704.00         703.00
(27) >         16          713.00         721.00
(28) >         17          713.00         778.33
(29) >         18          713.00         835.67
(30) >         19          713.00         893.00
(31) >         20          718.00         903.00
(32) >         21          718.00         960.00
(33) >         22          718.00        1017.00
(34) > $$      DUMMY JOINT FOR TRUSS
(35) >          30          709.00         903.00
(36) > $$      SOUTH CANYON WALL
(37) >        101          501.00          0.00

```

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

(38) >	102	501.00	57.00
(39) >	103	501.00	114.00
(40) >	104	501.00	171.00
(41) >	105	501.00	219.00
(42) >	106	501.00	267.00
(43) >	107	501.00	315.00
(44) >	108	501.00	363.00
(45) >	109	511.00	387.00
(46) >	110	511.00	459.63
(47) >	111	511.00	510.00
(48) >	112	511.00	553.21
(49) >	113	511.00	600.00
(50) >	114	511.00	625.00
(51) >	115	521.00	655.00
(52) >	116	521.00	721.00
(53) > \$\$	SOUTH PIPE TUNNEL WALL		
(54) >	201	315.00	0.00
(55) >	202	315.00	55.50
(56) >	203	315.00	111.00
(57) >	204	315.00	162.00
(58) >	205	315.00	213.00
(59) >	206	315.00	264.00
(60) >	207	315.00	315.00
(61) >	208	267.00	363.00
(62) > \$\$	NORTH PIPE TUNNEL WALL		
(63) >	301	183.00	0.00
(64) >	302	183.00	55.50
(65) >	303	183.00	111.00
(66) >	304	183.00	162.00
(67) >	305	183.00	213.00
(68) >	306	183.00	264.00
(69) >	307	183.00	315.00
(70) >	308	231.00	363.00
(71) > \$\$	NORTH CANYON WALL		
(72) >	401	0.00	0.00
(73) >	402	0.00	57.00
(74) >	403	0.00	114.00
(75) >	404	0.00	171.00
(76) >	405	0.00	219.00
(77) >	406	0.00	267.00
(78) >	407	0.00	315.00
(79) >	408	0.00	363.00
(80) >	409	-28.00	403.00
(81) >	410	-28.00	459.00
(82) >	411	-28.00	513.75
(83) >	412	-28.00	568.50
(84) >	413	-28.00	623.25
(85) >	414	-28.00	678.00
(86) >	415	-28.00	703.00
(87) >	416	-37.00	721.00
(88) >	417	-37.00	778.00
(89) >	418	-37.00	835.67
(90) >	419	-37.00	893.00
(91) >	420	-42.00	903.00
(92) >	421	-42.00	960.00
(93) >	422	-42.00	1017.00
(94) > \$\$	DUMMY JOINT FOR TRUSS CONNECTION		

Sheet F4 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: **REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis**
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

(95) >	430	-33.00	903.00
(96) > \$\$	NORTH GALLERY WALL		
(97) >	502	-274.00	57.25
(98) >	503	-274.00	114.13
(99) >	504	-274.00	171.00
(100) >	505	-274.00	219.00
(101) >	506	-274.00	267.00
(102) >	507	-274.00	315.00
(103) >	508	-274.00	363.00
(104) >	509	-274.00	411.00
(105) >	510	-274.00	459.00
(106) >	511	-274.00	513.75
(107) >	512	-274.00	568.50
(108) >	513	-274.00	623.25
(109) >	514	-274.00	678.00
(110) > \$\$	SLAB S1 @ SOUTH GALLERY		
(111) >	'S1-1'	568.67	171.00
(112) >	'S1-2'	636.33	171.00
(113) > \$\$	SLAB S2 @ SOUTH GALLERY		
(114) >	'S2-1'	568.67	315.00
(115) >	'S2-2'	636.33	315.00
(116) > \$\$	SLAB S3 @ SOUTH GALLERY		
(117) >	'S3-1'	568.67	459.63
(118) >	'S3-2'	636.33	459.63
(119) > \$\$	SLAB S4 @ SOUTH GALLERY		
(120) >	'S4-1'	568.67	600.00
(121) >	'S4-2'	636.33	600.00
(122) > \$\$	SLAB S5 @ NORTH GALLERY		
(123) >	'S5-1'	-91.33	171.00
(124) >	'S5-2'	-182.67	171.00
(125) > \$\$	SLAB S6 @ NORTH GALLERY		
(126) >	'S6-1'	-91.33	315.00
(127) >	'S6-2'	-182.67	315.00
(128) > \$\$	SLAB S7 @ NORTH GALLERY		
(129) >	'S7-1'	-91.33	459.00
(130) >	'S7-2'	-182.67	459.00
(131) > \$\$	SLAB S8 @ NORTH GALLERY		
(132) >	'S8-1'	-91.33	678.00
(133) >	'S8-2'	-182.67	678.00
(134) > \$\$	SLAB S9 @ PIPE TUNNEL		
(135) >	'S9-1'	249.00	111.00
(136) > \$\$	ROOF TRUSS BOTTOM CHORD		
(137) >	'T-1'	709.00	909.50
(138) >	'T-2'	634.00	909.50
(139) >	'T-3'	486.00	909.50
(140) >	'T-4'	338.00	909.50
(141) >	'T-5'	190.00	909.50
(142) >	'T-6'	42.00	909.50
(143) >	'T-7'	-33.00	909.50
(144) >	'T-8'	709.00	1003.50
(145) >	'T-9'	634.00	1003.50
(146) >	'T-10'	560.00	1003.50
(147) >	'T-11'	486.00	1003.50
(148) >	'T-12'	412.00	1003.50
(149) >	'T-13'	338.00	1003.50
(150) >	'T-14'	264.00	1003.50
(151) >	'T-15'	190.00	1003.50

Sheet F5 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```
( 152) > 'T-16'      116.00    1003.50
( 153) > 'T-17'      42.00    1003.50
( 154) > 'T-18'     -33.00    1003.50
( 155) > $$      ROOF SLAB
( 156) > 'RS-1'     718.00    1021.00
( 157) > 'RS-2'     709.00    1021.00
( 158) > 'RS-3'     634.00    1021.00
( 159) > 'RS-4'     560.00    1021.00
( 160) > 'RS-5'     486.00    1021.00
( 161) > 'RS-6'     412.00    1021.00
( 162) > 'RS-7'     338.00    1021.00
( 163) > 'RS-8'     264.00    1021.00
( 164) > 'RS-9'     190.00    1021.00
( 165) > 'RS-10'    116.00    1021.00
( 166) > 'RS-11'     42.00    1021.00
( 167) > 'RS-12'    -33.00    1021.00
( 168) > 'RS-13'    -42.00    1021.00
( 169) > $$
( 170) > TYPE PLANE FRAME
( 171) > $$      MEMBER FOR SOUTH GALLERY WALL
( 172) > MEMBER INCIDENCES
( 173) >          1          1          2
( 174) > GENERATE 20 MEMBERS ID 2 FROM 2 INC 1 TO 3 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
2	2	3
3	3	4
4	4	5
5	5	6
6	6	7
7	7	8
8	8	9
9	9	10
10	10	11
11	11	12
12	12	13
13	13	14
14	14	15
15	15	16
16	16	17
17	17	18
18	18	19
19	19	20
20	20	21
21	21	22

```
( 175) > $$      MEMBER FOR SOUTH CANYON WALL
( 176) > MEMBER INCIDENCES
( 177) >          101          101          102
( 178) > GENERATE 14 MEMBERS ID 102 FROM 102 INC 1 TO 103 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
--------	------------	--

Sheet F6 of F35

ATTACHMENT-F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)**

102	102	103
103	103	104
104	104	105
105	105	106
106	106	107
107	107	108
108	108	109
109	109	110
110	110	111
111	111	112
112	112	113
113	113	114
114	114	115
115	115	116

```
( 179) > $$      MEMBER FOR SOUTH PIPE TUNNEL WALL
( 180) > MEMBER INCIDENCES
( 181) >          201          201          202
( 182) > GENERATE 6 MEMBERS ID 202 FROM 202 INC 1 TO 203 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
202	202	203
203	203	204
204	204	205
205	205	206
206	206	207
207	207	208

```
( 183) > $$      MEMBER FOR NORTH PIPE TUNNEL WALL
( 184) > MEMBER INCIDENCES
( 185) >          301          301          302
( 186) > GENERATE 6 MEMBERS ID 302 FROM 302 INC 1 TO 303 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
302	302	303
303	303	304
304	304	305
305	305	306
306	306	307
307	307	308

```
( 187) > $$      MEMBER FOR NORTH CANYON WALL
( 188) > MEMBER INCIDENCES
( 189) >          401          401          402
( 190) > GENERATE 20 MEMBERS ID 402 FROM 402 INC 1 TO 403 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
--------	------------	--

Sheet F7 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

402	402	403
403	403	404
404	404	405
405	405	406
406	406	407
407	407	408
408	408	409
409	409	410
410	410	411
411	411	412
412	412	413
413	413	414
414	414	415
415	415	416
416	416	417
417	417	418
418	418	419
419	419	420
420	420	421
421	421	422

```
( 191) > $$      MEMBER FOR NORTH GALLERY WALL
( 192) > MEMBER INCIDENCES
( 193) >          502          502          503
( 194) > GENERATE 11 MEMBERS ID 503 FROM 503 INC 1 TO 504 INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
503	503	504
504	504	505
505	505	506
506	506	507
507	507	508
508	508	509
509	509	510
510	510	511
511	511	512
512	512	513
513	513	514

```
( 195) > MEMBER INCIDENCES
( 196) > $$      SLAB @ 88' SOUTH GALLERY
( 197) >          'MS1-1'          104          'S1-1'
( 198) >          'MS1-2'          'S1-1'          'S1-2'
( 199) >          'MS1-3'          'S1-2'           4
( 200) > $$      SLAB @ 100' SOUTH GALLERY
( 201) >          'MS2-1'          107          'S2-1'
( 202) >          'MS2-2'          'S2-1'          'S2-2'
( 203) >          'MS2-3'          'S2-2'           7
( 204) > $$      SLAB @ 112' 1 1/4" SOUTH GALLERY
( 205) >          'MS3-1'          110          'S3-1'
( 206) >          'MS3-2'          'S3-1'          'S3-2'
( 207) >          'MS3-3'          'S3-2'          10
( 208) > $$      SLAB @ 124' SOUTH GALLERY
( 209) >          'MS4-1'          113          'S4-1'
```

Sheet F8 of F35

ATTACHMENT-F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```
( 210) >      'MS4-2'      'S4-1'      'S4-2'
( 211) >      'MS4-3'      'S4-2'      13
( 212) > $$      SLAB @ 83' NORTH GALLERY
( 213) >      'MS5-1'      404      'S5-1'
( 214) >      'MS5-2'      'S5-1'      'S5-2'
( 215) >      'MS5-3'      'S5-2'      504
( 216) > $$      SLAB @ 100' NORTH GALLERY
( 217) >      'MS6-1'      407      'S6-1'
( 218) >      'MS6-2'      'S6-1'      'S6-2'
( 219) >      'MS6-3'      'S6-2'      507
( 220) > $$      SLAB @ 112' NORTH GALLERY
( 221) >      'MS7-1'      410      'S7-1'
( 222) >      'MS7-2'      'S7-1'      'S7-2'
( 223) >      'MS7-3'      'S7-2'      510
( 224) > $$      SLAB @ 130' 6" NORTH GALLERY
( 225) >      'MS8-1'      414      'S8-1'
( 226) >      'MS8-2'      'S8-1'      'S8-2'
( 227) >      'MS8-3'      'S8-2'      514
( 228) > $$      SLAB @ 83' PIPE TUNNEL
( 229) >      'MS9-1'      303      'S9-1'
( 230) >      'MS9-2'      'S9-1'      203
( 231) > $$      PIPE TUNNEL ROOF @ 105'6"
( 232) >      'MTR-1'      308      208
( 233) > $$
( 234) > TYPE PLANE TRUSS
( 235) > MEMBER INCIDENCES
( 236) > $$      COVERS ON CELL
( 237) >      'CC-1'      208      108
( 238) >      'CC-2'      408      308
( 239) > $$      TRUSS MEMBERS BOTTOM CHORD
( 240) >      'MT-1'      'T-1'      'T-2'
( 241) > GENERATE 5 MEMBERS ID 'MT-2' INC 1 FROM 'T-2' INC 1 TO 'T-3' INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MT-2	T-2	T-3
MT-3	T-3	T-4
MT-4	T-4	T-5
MT-5	T-5	T-6
MT-6	T-6	T-7

```
( 242) > $$      TRUSS MEMBERS TOP CHORD
( 243) > MEMBER INCIDENCES
( 244) >      'MT-7'      'T-8'      'T-9'
( 245) > GENERATE 9 MEMBERS ID 'MT-8' INC 1 FROM 'T-9' INC 1 TO 'T-10' INC 1
```

1

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MT-8	T-9	T-10
MT-9	T-10	T-11
MT-10	T-11	T-12
MT-11	T-12	T-13

Sheet F9 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MT-12	T-13	T-14
MT-13	T-14	T-15
MT-14	T-15	T-16
MT-15	T-16	T-17
MT-16	T-17	T-18

```
( 246) > $$      TRUSS MEMBERS DIAGONALS AND VERTICALS
( 247) > MEMBER INCIDENCES
( 248) >          'MT-17'          'T-1'          'T-8'
( 249) >          'MT-18'          'T-2'          'T-8'
( 250) >          'MT-19'          'T-2'          'T-9'
( 251) >          'MT-20'          'T-2'          'T-10'
( 252) >          'MT-21'          'T-3'          'T-10'
( 253) >          'MT-22'          'T-3'          'T-11'
( 254) >          'MT-23'          'T-3'          'T-12'
( 255) >          'MT-24'          'T-4'          'T-12'
( 256) >          'MT-25'          'T-4'          'T-13'
( 257) >          'MT-26'          'T-4'          'T-14'
( 258) >          'MT-27'          'T-5'          'T-14'
( 259) >          'MT-28'          'T-5'          'T-15'
( 260) >          'MT-29'          'T-5'          'T-16'
( 261) >          'MT-30'          'T-6'          'T-16'
( 262) >          'MT-31'          'T-6'          'T-17'
( 263) >          'MT-32'          'T-6'          'T-18'
( 264) >          'MT-33'          'T-7'          'T-18'
( 265) > $$
( 266) > TYPE PLANE FRAME
( 267) > MEMBER INCIDENCES
( 268) > $$      CONNECTION TO BUILDING STRUCTURE SOUTH SIDE
( 269) >          'MTC-1'          19          30
( 270) >          'MTC-2'          20          30
( 271) > $$      'MTC-3' MODALLED AS TRUSS MEM - NO LATERAL TRANSFER
( 272) > $$      CONNECTION TO BUILDING STRUCTURE NORTH SIDE
( 273) >          'MTC-11'         419          430
( 274) >          'MTC-12'         420          430
( 275) >          'MTC-13'         430          'T-7'
( 276) > $$
( 277) > TYPE PLANE TRUSS
( 278) > MEMBER INCIDENCES
( 279) > $$      ROOF SLAB MEMBER
( 280) >          'MRS-1'          22          'RS-1'
( 281) > $$      CONNECTION BETWEEN TRUSS AND BUILDING - AXIAL LOAD ONLY
( 282) >          'MTC-3'          30          'T-1'
( 283) > $$
( 284) > TYPE PLANE FRAME
( 285) > MEMBER INCIDENCES
( 286) >          'MRS-2'          'RS-1'          'RS-2'
( 287) > GENERATE 11 MEMBERS ID 'MRS-3' INC 1 FROM 'RS-2' INC 1 TO 'RS-3'
INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES		
MRS-3	RS-2	RS-3	
MRS-4	RS-3	RS-4	
MRS-5	RS-4	RS-5	

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: **REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis**
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MRS-6	RS-5	RS-6
MRS-7	RS-6	RS-7
MRS-8	RS-7	RS-8
MRS-9	RS-8	RS-9
MRS-10	RS-9	RS-10
MRS-11	RS-10	RS-11
MRS-12	RS-11	RS-12
MRS-13	RS-12	RS-13

```
( 288) > MEMBER INCIDENCES
( 289) >      'MRS-14'      'RS-13'      422
( 290) > $$      CONNECTION BETWEEN ROOF SLAB AND TRUSS
( 291) > TYPE PLANE TRUSS
( 292) > MEMBER INCIDENCES
( 293) >      'MTRS-1'      'T-8'      'RS-2'
( 294) > GENERATE 10 MEMBERS ID 'MTRS-2' INC 1 FROM 'T-9' INC 1 TO 'RS-3'
INC 1
```

/----- MEMBER INCIDENCES -----/

MEMBER	INCIDENCES	
MTRS-2	T-9	RS-3
MTRS-3	T-10	RS-4
MTRS-4	T-11	RS-5
MTRS-5	T-12	RS-6
MTRS-6	T-13	RS-7
MTRS-7	T-14	RS-8
MTRS-8	T-15	RS-9
MTRS-9	T-16	RS-10
MTRS-10	T-17	RS-11
MTRS-11	T-18	RS-12

```
( 295) > $$
( 296) > $$      PROPERTIES BLOCK
( 297) > $$      FOR CONC MEMBER PROPERTIES BASED ON WIDTH OF 18'5" (221")
( 298) > UNITS INCH KIPS DEGREES FAH
( 299) > $$      SOUTH GALLERY WALL UPTO CRANE LEVEL
( 300) > MEMBER PROPERTIES PRISMATIC
( 301) > 1 TO 15      AX      7956.00      AY      6630.00      IZ
859248.00
( 302) > $$      SOUTH GALLERY WALL FROM CRANE LEVEL TO TRUSS
( 303) > MEMBER PROPERTIES PRISMATIC
( 304) > 16 TO 19      AX      3978.00      AY      3315.00      IZ
107406.00
( 305) > $$      SOUTH GALLERY WALL FROM TRUSS TO ROOF
( 306) > MEMBER PROPERTIES PRISMATIC
( 307) > 20 21      AX      1768.00      AY      1473.00      IZ
9429.00
( 308) > $$      PAPER JOINT @ SOUTH WALL - AXIAL MEM. ONLY
( 309) > MEMBER PROPERTIES PRISMATIC
( 310) > 'MRS-1'      AX      1768.00
( 311) > $$      SOUTH CANYON WALL UPTO CANYON FL.
( 312) > MEMBER PROPERTIES PRISMATIC
( 313) > 101 TO 107      AX      14586.00      AY      12155.00      IZ
5294718.00
( 314) > $$      SOUTH CANYON WALL CANYON FL TO JOG AREA
```

Sheet F11 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: **REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis**
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```

( 315) > MEMBER PROPERTIES PRISMATIC
( 316) > 108 TO 113                AX      10166.00  AY      8472.00  IZ
1792605.00
( 317) > $$      SOUTH CANYON WALL - JOG AREA
( 318) > MEMBER PROPERTIES PRISMATIC
( 319) > 114                AX      7956.00  AY      6630.00  IZ
859248.00
( 320) > $$      SOUTH CANYON WALL - JOG TO TOP
( 321) > MEMBER PROPERTIES PRISMATIC
( 322) > 115                AX      5746.00  AY      4788.00  IZ
323691.00
( 323) > $$      PIPE TUNNEL - SOUTH AND NORTH WALL
( 324) > MEMBER PROPERTIES PRISMATIC
( 325) > 201 TO 207 301 TO 307    AX      3978.00  AY      3315.00  IZ
107406.00
( 326) > $$      PIPE TUNNEL ROOF
( 327) > MEMBER PROPERTIES PRISMATIC
( 328) > 'MTR-1'                AX      9024.00  AY      7520.00  IZ
1732608.00
( 329) > $$      NORTH CANYON WALL UPTO CANYON FLOOR
( 330) > MEMBER PROPERTIES PRISMATIC
( 331) > 401 TO 407                AX      13260.00  AY      11050.00  IZ
3978000.00
( 332) > $$      NORTH CANYON WALL FROM FLOOR TO CRANE LEVEL
( 333) > MEMBER PROPERTIES PRISMATIC
( 334) > 408 TO 415                AX      10166.00  AY      8472.00  IZ
1792605.00
( 335) > $$      NORTH CANYON WALL FROM CRANE LEVEL TO TRUSS SUPPORT
( 336) > MEMBER PROPERTIES PRISMATIC
( 337) > 416 TO 419                AX      3978.00  AY      3315.00  IZ
107406.00
( 338) > $$      NORTH CANYON WALL FROM TRUSS SUPPORT TO ROOF
( 339) > MEMBER PROPERTIES PRISMATIC
( 340) > 420 421 'MRS-14'        AX      1768.00  AY      1473.00  IZ
9429.00
( 341) > $$      NORTH GALLERY WALL
( 342) > MEMBER PROPERTIES PRISMATIC
( 343) > 502 TO 513                AX      5304.00  AY      4420.00  IZ
95472.00
( 344) > $$      1' THICK SLAB
( 345) > MEMBER PROPERTIES PRISMATIC
( 346) > 'MS1-1' TO 'MS1-3' 'MS2-1' TO 'MS2-3' 'MS3-1' TO 'MS3-3' -
( 347) > 'MS5-1' TO 'MS5-3' 'MS6-1' TO 'MS6-3' 'MS7-1' TO 'MS7-3' -
( 348) > 'MS9-1' TO 'MS9-2'        AX      2652.00  AY      2210.00  IZ
31824.00
( 349) > $$      1'6" THICK SLAB
( 350) > MEMBER PROPERTIES PRISMATIC
( 351) > 'MS4-1' TO 'MS4-3' 'MS8-1' TO 'MS8-3' -
( 352) > -                AX      3978.00  AY      3315.00  IZ
107406.00
( 353) > $$      ROOF SLAB
( 354) > MEMBER PROPERTIES PRISMATIC
( 355) > 'MRS-2' TO 'MRS-13'      AX      1989.00  AY      1658.00  IZ
13425.00
( 356) > $$      TRUSS CONNECTION TO STRUCTURE
( 357) > MEMBER PROPERTIES PRISMATIC
( 358) > 'MTC-1' TO 'MTC-2' 'MTC-11' TO 'MTC-12' -

```

Sheet F12 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```

( 359) >_ AX 7956.00 AY 6630.00 IZ
859248.00
( 360) > $$ REDUCED STIFFNESS FOR CONNECTION TO TRUSS
( 361) > MEMBER PROPERTIES PRISMATIC
( 362) > 'MTC-13' AX 7956.00 AY 0.50 IZ
859248.00
( 363) > $$ COVER FOR CELLS
( 364) > MEMBER PROPERTIES PRISMATIC
( 365) > 'CC-1' 'CC-2' AX 10608.00
( 366) > $$ CONN BET TRUSS & BLDG - TRUSS MEM @ SOUTH END
( 367) > MEMBER PROPERTIES PRISMATIC
( 368) > 'MTC-3' AX 7956.00
( 369) > $$ TRUSS MEMBER
( 370) > MEMBER PROPERTIES PRISMATIC
( 371) > 'MT-1' TO 'MT-16' AX 12.86
( 372) > MEMBER PROPERTIES PRISMATIC
( 373) > 'MT-17' 'MT-33' AX 4.80
( 374) > MEMBER PROPERTIES PRISMATIC
( 375) > 'MT-19' 'MT-31' AX 3.56
( 376) > MEMBER PROPERTIES PRISMATIC
( 377) > 'MT-22' 'MT-28' AX 3.56
( 378) > MEMBER PROPERTIES PRISMATIC
( 379) > 'MT-25' AX 7.12
( 380) > MEMBER PROPERTIES PRISMATIC
( 381) > 'MT-18' 'MT-32' AX 8.00
( 382) > MEMBER PROPERTIES PRISMATIC
( 383) > 'MT-20' 'MT-30' AX 6.62
( 384) > MEMBER PROPERTIES PRISMATIC
( 385) > 'MT-21' 'MT-29' AX 4.60
( 386) > MEMBER PROPERTIES PRISMATIC
( 387) > 'MT-23' 'MT-27' AX 4.66
( 388) > MEMBER PROPERTIES PRISMATIC
( 389) > 'MT-24' 'MT-26' AX 3.24
( 390) > $$ CONNECTION BETWEEN TRUSS AND ROOF SLAB
( 391) > MEMBER PROPERTIES PRISMATIC
( 392) > 'MTRS-1' TO 'MTRS-10' AX 2.00
( 393) > $$ REDUCE CONNECTION STIFFNESS FOR LAST PURLIN
( 394) > MEMBER PROPERTIES PRISMATIC
( 395) > 'MTRS-11' AX 0.50
( 396) > $$
( 397) > $$ SUPPORT LOCATIONS
( 398) > $$
( 399) > STATUS SUPPORT JOINTS -
( 400) >_1 101 201 301 401 502
( 401) > $$
( 402) > $$ MATERIAL PROPERTIES
( 403) > $$
( 404) > UNITS INCH LB DEG FAH
( 405) > CONSTANTS
( 406) > E 3.824E+06 ALL
( 407) > G 1.634E+06 ALL
( 408) > POI 1.700E-01 ALL
( 409) > DEN 8.680E-02 ALL
( 410) > $$
( 411) > $$ PROVIDE E, G, POI, DEN FOR STEEL MEMBERS
( 412) > $$
( 413) > E 2.900E+07 'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'

```

Sheet F13 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```
( 414) >      G      1.115E+07      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 415) >      POI      3.000E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 416) >      DEN      2.836E-01      'MT-1' TO 'MT-33' 'MTRS-1' TO 'MTRS-11'
( 417) > $$
( 418) > $$      ADJUST DENSITY OF ROOF SLAB TO ACCOUNT FOR FINISHES ETC.
( 419) > $$
( 420) >      DEN      1.003E-01      'MRS-1' TO 'MRS-13'
( 421) > $$
( 422) > $$      LUMPED WEIGHT OF STRUCTURE AT JOINTS
( 423) > $$
( 424) > INERTIA OF JOINTS LUMPED
( 425) > UNIT CYCLES
( 426) > EIGENPROBLEM PARAMETERS
( 427) > SOLVE USING GTLANCZOS
( 428) > FREQUENCY SPE 0.0 TO 33.0
( 429) > END
( 430) > PERFORM ASSEMBLY FOR DYNAMICS
```

BANDWIDTH INFORMATION BEFORE RENUMBERING.

```
THE MAXIMUM BANDWIDTH IS 100 AND OCCURS AT JOINT RS-1
THE AVERAGE BANDWIDTH IS 11.165
THE STANDARD DEVIATION OF THE BANDWIDTH IS 21.338
-----
32.503
=====
```

BANDWIDTH INFORMATION AFTER RENUMBERING.

```
THE MAXIMUM BANDWIDTH IS 9 AND OCCURS AT JOINT S7-2
THE AVERAGE BANDWIDTH IS 5.511
THE STANDARD DEVIATION OF THE BANDWIDTH IS 1.914
-----
7.425
=====
```

```
TIME FOR CONSISTENCY CHECK FOR 176 MEMBERS 0.00 SECONDS
TIME FOR BANDWIDTH REDUCTION 0.01 SECONDS
TIME TO GENERATE 176 ELEMENT STIF. MATRICES 0.02 SECONDS
TIME TO ASSEMBLE THE STIFFNESS MATRIX 0.01 SECONDS
TIME TO PROCESS 139 JOINTS 0.00 SECONDS
TIME TO GENERATE REDUCED STIFFNESS MATRIX 0.02 SECONDS
TIME TO ASSEMBLE LUMPED MASS MATRIX 0.00 SECONDS
```

```
( 431) > PERFORM EIGENVALUE ANALYSIS
```

**** STRUDL MESSAGE DY.409 - THERE ARE 22 FREQUENCIES LESS THAN OR EQUAL TO THE SPECIFIED MAXIMUM FREQUENCY

```
TIME TO SOLVE EIGENPROBLEM 0.35 SECONDS
TIME TO TRANSFORM EIGENVECTORS TO JOINTS 0.04 SECONDS
```

```
*****
* EIGEN-SOLUTION CHECKS *
*****
```

Sheet F14 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)**

**** STRUDL MESSAGE - STURM SEQUENCE CHECK WAS SUCCESSFUL - THERE ARE NO MISSING MODES

MODE-----	EIGENVALUE-----	FREQUENCY-----	FREQUENCY-----	PERIOD-----
ESTIMATED---/				
	((RAD/SEC)**2)	(RAD/SEC)	(CYC/SEC)	(SEC/CYC)
ACCURACY				
1	7.112141D+01	8.433351D+00	1.342210D+00	7.450402D-01
1.696457D-10				
2	2.664496D+02	1.632328D+01	2.597931D+00	3.849217D-01
4.017971D-11				
3	5.742690D+02	2.396391D+01	3.813975D+00	2.621937D-01
2.935385D-11				
4	6.981127D+02	2.642182D+01	4.205164D+00	2.378029D-01
2.029262D-11				
5	1.359127D+03	3.686634D+01	5.867459D+00	1.704315D-01
1.600149D-11				
6	2.829025D+03	5.318858D+01	8.465226D+00	1.181303D-01
5.124909D-12				
7	3.980771D+03	6.309335D+01	1.004162D+01	9.958555D-02
2.577039D-12				
8	4.438714D+03	6.662368D+01	1.060349D+01	9.430860D-02
1.329917D-12				
9	7.281677D+03	8.533274D+01	1.358113D+01	7.363159D-02
3.180896D-12				
10	8.071715D+03	8.984273D+01	1.429891D+01	6.993538D-02
2.962577D-12				
11	1.202615D+04	1.096638D+02	1.745354D+01	5.729498D-02
8.730051D-13				
12	1.509025D+04	1.228424D+02	1.955097D+01	5.114836D-02
4.681636D-13				
13	1.514236D+04	1.230543D+02	1.958470D+01	5.106027D-02
5.970254D-13				
14	1.589059D+04	1.260579D+02	2.006273D+01	4.984366D-02
4.797522D-13				
15	2.030292D+04	1.424883D+02	2.267772D+01	4.409614D-02
1.134689D-10				
16	2.033992D+04	1.426181D+02	2.269838D+01	4.405602D-02
3.786660D-10				
17	2.093539D+04	1.446907D+02	2.302823D+01	4.342496D-02
6.666918D-11				
18	2.473314D+04	1.572677D+02	2.502994D+01	3.995216D-02
1.435235D-07				
19	2.651756D+04	1.628421D+02	2.591713D+01	3.858452D-02
7.168764D-09				
20	2.955882D+04	1.719268D+02	2.736300D+01	3.654570D-02
1.181763D-07				
21	3.222693D+04	1.795186D+02	2.857127D+01	3.500019D-02
2.896098D-07				
22	3.965578D+04	1.991376D+02	3.169373D+01	3.155198D-02
1.467642D-04				

Sheet F15 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

 ORTHOGONALITY CHECK

 WITH RESPECT TO MASS

OFF DIAGONALS: MAXIMUM = 0.1689E-14
 MINIMUM = 0.2052E-17
 MEAN = 0.3547E-15

DIAGONALS: MAXIMUM = 0.1000E+01
 MINIMUM = 0.1000E+01
 MEAN = 0.1000E+01

 WITH RESPECT TO STIFFNESS

OFF DIAGONALS: MAXIMUM = 0.3386E-08
 MINIMUM = 0.1094E-13
 MEAN = 0.1883E-09

DIAGONALS: MAXIMUM = 0.3966E+05
 MINIMUM = 0.7112E+02
 MEAN = 0.1373E+05

 * END OF EIGEN-SOLUTION CHECKS *

TIME TO CHECK EIGENSOLUTION
 (432) > \$\$ LIST DYNAMIC MASS SUMMARY
 (433) > UNIT INCH KIPS
 (434) > LIST DYNAMIC MASS

0.08 SECONDS

1

 RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS INCH KIP CYC DEGF SEC

Sheet F16 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

```

/-----/-----/-----/-----/-----/
-/
GLOBAL  CENTER OF MASS
AXIS    COORDINATE      TOTAL MASS      TOTAL WEIGHT      MASS MOMENT
/-----/-----/-----/-----/-----/
-/
      X      268.4838      9.679881      3737.291      0.0000000E+00
      Y      406.9106      9.679881      3737.291      0.0000000E+00
      Z      0.0000000E+00  0.0000000E+00  0.0000000E+00  1585267.
/-----/-----/-----/-----/-----/
-/

```

(435) > LIST DYNAMIC PARTICIPATION FACTORS
 1

 RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS INCH KIP CYC DEGF SEC

NORMALIZED PARTICIPATION FACTORS

% OF X DIRECTION MASS PARTICIPATING

```

-----
MODE    PERCENT    MODE    PERCENT    MODE    PERCENT    MODE
PERCENT  MODE    PERCENT  MODE    PERCENT
1      18.46657      2      38.16778      3      7.350529      4      3.477863
5      5.428569      6      0.9735833
7      8.256175      8      0.8782288      9      0.2912734      10     2.317298
11     0.7019849E-01 12     1.013797
13     0.6517125E-02 14     0.5610686E-02 15     0.1501943E-03 16
0.9461575E-01 17     0.1340575E-02 18     0.8813852
19     0.5527257      20     0.9036222      21     0.2137198      22
0.7449773E-02

```

TOTAL PERCENTAGE OF X DIRECTION MASS PARTICIPATING: 89.359

% OF Y DIRECTION MASS PARTICIPATING

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MODE PERCENT	PERCENT MODE	MODE PERCENT	PERCENT MODE	MODE PERCENT	PERCENT	MODE
1	0.4996426E-03	2	0.2375953E-01	3	0.9383560	4 2.563886
5	0.2472395E-04	6	0.7738022E-02			
7	0.8796270E-03	8	0.2613380E-03	9	0.4690954E-02	10
0.2258782E-02	11	1.007529	12	0.6989779E-02		
13	0.2568285	14	2.968185	15	4.597464	16
0.4055185E-01	17	0.4691689	18	4.987041		
19	0.1043740	20	0.7674618	21	0.8030276	22 1.941545

TOTAL PERCENTAGE OF Y DIRECTION MASS PARTICIPATING: 21.493

NO MASS IN Z DIRECTION

```

( 436) > $$
( 437) > UNITS FEET SECONDS
( 438) > DELETE RESPONSE SPECTRA 'PC3'
**** STRUDL ERROR DY.81 - FILE PC3 DOES NOT EXIST ON USER DATA SET
( 439) > STORE RESPONSE SPECTRA ACCELERATION LOG VS FREQUENCY LOG 'PC3'
( 440) > DAMPING 0.10 FACTOR 32.2
( 441) > $$ SPECTRA IN g's
( 442) > 0.188 100.0 0.188 33.3 0.238 13.3 0.267 10.0 0.320 5.0
0.302 3.3
( 443) > 0.233 2.0 0.146 1.0 0.078 0.5 0.029 0.25
( 444) > RESPONSE SPECTRA LOAD 1
( 445) > SUPPORT ACCELERATION
( 446) > TRANSLATIONAL X 1.00 FILE 'PC3'
( 447) > END RESPONSE SPECTRA LOADING
( 448) > DAMPING RATIO 0.10 30
( 449) > PERFORM RESPONSE SPECTRA ANALYSIS
TIME TO COMPUTE RESPONSE SPECTRA RESULTS 0.00 SECONDS
( 450) > COMPUTE RESPONSE SPECTRA DISPLACEMENT ACC FORCES REACTIONS -
( 451) > MODAL COMBINATION NRC TPM
TIME FOR RESPONSE SPECTRA COMPUTATION 0.49 SECONDS
( 452) > $$
( 453) > CREATE PSEUDO STATIC LOAD 'NS' FROM NRC TPM LOAD 1
( 454) > LIST RESPONSE SPECTRUM SPECTRAL ACCELERATION
1

```

 RESULTS OF LATEST ANALYSES

PROBLEM - REDOX BU TITLE - 2-D ANALYSIS OF TYPICAL SLICE

ACTIVE UNITS FEET KIP CYC DEGF SEC

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

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Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

1	1	NRC TPM	201.1614	36.15702
970.3920				
1	2	NRC TPM	201.1614	36.15702
804.3917				
2	2	NRC TPM	201.1494	35.96434
804.3917				
2	3	NRC TPM	201.1494	35.96434
642.1326				
3	3	NRC TPM	201.1254	35.28999
642.1326				
3	4	NRC TPM	201.1254	35.28999
488.1228				
4	4	NRC TPM	186.8275	35.83604
618.5902				
4	5	NRC TPM	186.8275	35.83604
513.4439				
5	5	NRC TPM	186.7884	34.18269
513.4439				
5	6	NRC TPM	186.7884	34.18269
434.6510				
6	6	NRC TPM	186.7410	32.12725
434.6510				
6	7	NRC TPM	186.7410	32.12725
393.0638				
7	7	NRC TPM	164.7368	37.87165
559.1739				
7	8	NRC TPM	164.7368	37.87165
441.8791				
8	8	NRC TPM	164.6717	34.09465
441.8791				
8	9	NRC TPM	164.6717	34.09465
357.2165				
9	9	NRC TPM	164.5989	29.73448
357.2165				
9	10	NRC TPM	164.5989	29.73448
314.7783				
10	10	NRC TPM	130.7412	47.03323
508.0317				

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)**

10 550.9773	11	NRC TPM	130.7412	47.03323
11 550.9772	11	NRC TPM	130.6540	44.03407
11 643.7210	12	NRC TPM	130.6540	44.03407
12 643.7210	12	NRC TPM	130.5649	41.65655
12 775.7785	13	NRC TPM	130.5649	41.65655
13 1670.649	13	NRC TPM	25.18997	87.30887
13 1306.260	14	NRC TPM	25.18997	87.30887
14 1306.260	14	NRC TPM	25.09494	77.39918
14 982.6647	15	NRC TPM	25.09494	77.39918
15 982.6647	15	NRC TPM	36.92836	63.43979
15 879.8358	16	NRC TPM	36.92836	63.43979
16 879.8358	16	NRC TPM	24.91553	63.46779
16 582.1096	17	NRC TPM	24.91553	63.46779
17 582.1096	17	NRC TPM	24.78508	54.88236
17 325.1920	18	NRC TPM	24.78508	54.88236
18 325.1920	18	NRC TPM	24.65595	43.43308
18 125.9827	19	NRC TPM	24.65595	43.43308
19 22.69379	19	NRC TPM	12.88404	4.342622
19 18.91504	20	NRC TPM	12.88404	4.342622

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)**

20 120.9992	20	NRC TPM	30.61166	17.49398
20 38.58914	21	NRC TPM	30.61166	17.49398
21 38.58912	21	NRC TPM	30.85774	8.124023
21 0.1232322E-04	22	NRC TPM	30.85774	8.124023
101 5645.876	101	NRC TPM	198.4775	175.2669
101 4859.971	102	NRC TPM	198.4775	175.2669
102 4859.971	102	NRC TPM	198.4670	174.9004
102 4093.843	103	NRC TPM	198.4670	174.9004
103 4093.843	103	NRC TPM	198.4462	173.6436
103 3362.897	104	NRC TPM	198.4462	173.6436
104 3493.401	104	NRC TPM	183.9114	168.5668
104 2910.782	105	NRC TPM	183.9114	168.5668
105 2910.782	105	NRC TPM	183.8777	165.5476
105 2385.343	106	NRC TPM	183.8777	165.5476
106 2385.343	106	NRC TPM	183.8370	161.5131
106 1954.743	107	NRC TPM	183.8370	161.5131
107 2128.178	107	NRC TPM	161.4364	148.2147
107 1911.197	108	NRC TPM	161.4364	148.2147
108 1911.197	108	NRC TPM	211.5146	97.92005

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

108 1711.404	109	NRC TPM	211.5146	97.92005
109 1711.404	109	NRC TPM	161.4754	163.9604
109 819.4605	110	NRC TPM	161.4754	163.9604
110 1024.941	110	NRC TPM	127.3902	165.3726
110 403.7045	111	NRC TPM	127.3902	165.3726
111 403.7045	111	NRC TPM	127.5385	158.6837
111 384.6679	112	NRC TPM	127.5385	158.6837
112 384.6679	112	NRC TPM	127.6770	151.1138
112 899.2740	113	NRC TPM	127.6770	151.1138
113 122.5572	113	NRC TPM	0.7345075	22.29863
113 76.17036	114	NRC TPM	0.7345075	22.29863
114 76.17036	114	NRC TPM	4.379027	15.07899
114 36.47077	115	NRC TPM	4.379027	15.07899
115 36.47076	115	NRC TPM	0.2447616	6.631047
115 0.5068508E-05	116	NRC TPM	0.2447616	6.631047
201 281.0765	201	NRC TPM	100.4503	30.33009
201 141.6959	202	NRC TPM	100.4503	30.33009
202 141.6959	202	NRC TPM	100.4456	30.04493
202 19.04902	203	NRC TPM	100.4456	30.04493

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)**

203 207.0053	203	NRC TPM	63.93455	28.87184
203 85.85455	204	NRC TPM	63.93455	28.87184
204 85.85455	204	NRC TPM	63.92177	28.06663
204 37.49462	205	NRC TPM	63.92177	28.06663
205 37.49462	205	NRC TPM	63.90571	27.01564
205 149.1461	206	NRC TPM	63.90571	27.01564
206 149.1461	206	NRC TPM	63.88639	25.67496
206 257.1810	207	NRC TPM	63.88639	25.67496
207 257.1809	207	NRC TPM	61.92528	28.52007
207 96.06731	208	NRC TPM	61.92528	28.52007
301 281.0952	301	NRC TPM	100.4527	30.33679
301 141.6853	302	NRC TPM	100.4527	30.33679
302 141.6853	302	NRC TPM	100.4480	30.05153
302 19.06659	303	NRC TPM	100.4480	30.05153
303 206.9639	303	NRC TPM	63.93776	28.86717
303 85.83300	304	NRC TPM	63.93776	28.86717
304 85.83300	304	NRC TPM	63.92496	28.06242
304 37.49857	305	NRC TPM	63.92496	28.06242
305 37.49857	305	NRC TPM	63.90886	27.01194

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

305 149.1347	306	NRC TPM	63.90886	27.01194	
306 149.1347	306	NRC TPM	63.88952	25.67195	
306 257.1565	307	NRC TPM	63.88952	25.67195	
307 257.1565	307	NRC TPM	61.92609	28.52394	
307 96.02198	308	NRC TPM	61.92609	28.52394	
401 4386.459	401	NRC TPM	94.41989	160.7467	←
401 3724.866	402	NRC TPM	94.41989	160.7467	
402 3724.866	402	NRC TPM	94.40491	160.3226	
402 3111.542	403	NRC TPM	94.40491	160.3226	
403 3111.542	403	NRC TPM	94.37518	158.9189	
403 2582.042	404	NRC TPM	94.37518	158.9189	
404 2683.629	404	NRC TPM	88.30268	180.6381	←
404 2244.961	405	NRC TPM	88.30268	180.6381	
405 2244.961	405	NRC TPM	88.25330	177.5726	
405 1983.251	406	NRC TPM	88.25330	177.5726	
406 1983.251	406	NRC TPM	88.19429	173.5348	
406 1957.656	407	NRC TPM	88.19429	173.5348	
407 2043.211	407	NRC TPM	79.50454	151.7182	
407 2179.768	408	NRC TPM	79.50454	151.7182	

Sheet F25 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

408 2179.768	408	NRC TPM	134.3245	75.12690
408 1986.547	409	NRC TPM	134.3245	75.12690
409 1986.547	409	NRC TPM	79.46148	128.7570 ←
409 1566.637	410	NRC TPM	79.46148	128.7570
410 1706.868	410	NRC TPM	58.82415	72.67895 ←
410 1519.256	411	NRC TPM	58.82415	72.67895
411 1519.256	411	NRC TPM	58.93327	67.03576
411 1371.858	412	NRC TPM	58.93327	67.03576
412 1371.858	412	NRC TPM	59.04910	60.05893
412 1260.336	413	NRC TPM	59.04910	60.05893
413 1260.336	413	NRC TPM	59.17296	51.95518
413 1171.999	414	NRC TPM	59.17296	51.95518
414 1649.855	414	NRC TPM	24.33258	74.75333
414 1501.312	415	NRC TPM	24.33258	74.75333
415 1501.312	415	NRC TPM	36.33976	68.71196
415 1392.593	416	NRC TPM	36.33976	68.71196
416 1392.593	416	NRC TPM	23.98030	73.40189 ←
416 1052.302	417	NRC TPM	23.98030	73.40189
417 1052.302	417	NRC TPM	23.78535	72.78535

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)**

417 709.9069	418	NRC TPM	23.78535	72.78535
418 709.9069	418	NRC TPM	23.59643	71.46213
418 377.3115	419	NRC TPM	23.59643	71.46213
419 68.62672	419	NRC TPM	21.91094	20.89878
419 49.76980	420	NRC TPM	21.91094	20.89878
420 305.2998	420	NRC TPM	22.10268	65.94611 ←
420 39.58980	421	NRC TPM	22.10268	65.94611
421 39.58979	421	NRC TPM	22.07370	63.99404
421 315.5906	422	NRC TPM	22.07370	63.99404
502 327.0619	502	NRC TPM	101.4072	39.86513 ←
502 138.8959	503	NRC TPM	101.4072	39.86513
503 138.8959	503	NRC TPM	101.3999	39.54633
503 53.25641	504	NRC TPM	101.3999	39.54633
504 68.04367	504	NRC TPM	94.90904	9.465829 ←
504 41.04341	505	NRC TPM	94.90904	9.465829
505 41.04341	505	NRC TPM	94.89130	8.101639
505 34.68852	506	NRC TPM	94.89130	8.101639
506 34.68852	506	NRC TPM	94.86865	6.921616
506 46.63928	507	NRC TPM	94.86865	6.921616

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

507 119.3806	507	NRC TPM	85.31530	15.94025 ←
507 102.4240	508	NRC TPM	85.31530	15.94025
508 102.4240	508	NRC TPM	85.28152	13.40268
508 118.0414	509	NRC TPM	85.28152	13.40268
509 118.0414	509	NRC TPM	85.24345	10.78155
509 146.2219	510	NRC TPM	85.24345	10.78155 ←
510 335.4366	510	NRC TPM	62.12356	49.79796
510 119.0233	511	NRC TPM	62.12356	49.79796
511 119.0233	511	NRC TPM	62.08074	47.25085
511 119.6652	512	NRC TPM	62.08074	47.25085
512 119.6652	512	NRC TPM	62.03682	44.31874
512 310.6389	513	NRC TPM	62.03682	44.31874
513 310.6389	513	NRC TPM	61.99229	41.54208
513 493.4268	514	NRC TPM	61.99229	41.54208 ←
MS1-1 131.9907	104	NRC TPM	9.395149	15.57082
MS1-1 44.18494	S1-1	NRC TPM	9.395149	15.57082
MS1-2 44.18494	S1-1	NRC TPM	9.028058	15.64039
MS1-2 44.00311	S1-2	NRC TPM	9.028058	15.64039
MS1-3 44.00311	S1-2	NRC TPM	8.716828	15.57429

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MS1-3 131.8269	4	NRC TPM	8.716828	15.57429
MS2-1 196.4898	107	NRC TPM	26.57507	23.28846
MS2-1 65.16748	S2-1	NRC TPM	26.57507	23.28846
MS2-2 65.16748	S2-1	NRC TPM	25.34591	23.38397
MS2-2 66.69332	S2-2	NRC TPM	25.34591	23.38397
MS2-3 66.69332	S2-2	NRC TPM	24.18965	23.28857
MS2-3 198.0155	7	NRC TPM	24.18965	23.28857
MS3-1 281.9719	110	NRC TPM	47.61780	34.61245
MS3-1 115.6400	S3-1	NRC TPM	47.61780	34.61245
MS3-2 115.6400	S3-1	NRC TPM	47.24582	34.82430
MS3-2 80.74528	S3-2	NRC TPM	47.24582	34.82430
MS3-3 80.74528	S3-2	NRC TPM	46.97997	34.74812
MS3-3 276.6799	10	NRC TPM	46.97997	34.74812
MS4-1 1001.170	113	NRC TPM	125.9154	128.3464
MS4-1 384.7266	S4-1	NRC TPM	125.9154	128.3464
MS4-2 384.7266	S4-1	NRC TPM	121.8144	128.6180
MS4-2 341.6636	S4-2	NRC TPM	121.8144	128.6180
MS4-3 341.6636	S4-2	NRC TPM	117.5592	128.3861
MS4-3 1065.200	13	NRC TPM	117.5592	128.3861

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ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MS5-1 105.5647	404	NRC TPM	28.29307	9.437026	
MS5-1 33.98245	S5-1	NRC TPM	28.29307	9.437026	
MS5-2 33.98245	S5-1	NRC TPM	28.75603	9.523378	
MS5-2 38.62722	S5-2	NRC TPM	28.75603	9.523378	
MS5-3 38.62722	S5-2	NRC TPM	29.28195	9.367605	
MS5-3 109.6945	504	NRC TPM	29.28195	9.367605	←
MS6-1 140.4419	407	NRC TPM	19.74050	12.01482	←
MS6-1 49.15977	S6-1	NRC TPM	19.74050	12.01482	
MS6-2 49.15977	S6-1	NRC TPM	17.25685	12.18775	
MS6-2 43.66436	S6-2	NRC TPM	17.25685	12.18775	
MS6-3 43.66436	S6-2	NRC TPM	14.81274	12.07166	
MS6-3 135.4386	507	NRC TPM	14.81274	12.07166	
MS7-1 242.6143	410	NRC TPM	55.09815	23.80188	
MS7-1 117.7421	S7-1	NRC TPM	55.09815	23.80188	
MS7-2 117.7421	S7-1	NRC TPM	53.68487	23.93988	
MS7-2 65.14295	S7-2	NRC TPM	53.68487	23.93988	
MS7-3 65.14295	S7-2	NRC TPM	52.25924	24.07491	
MS7-3 246.4440	510	NRC TPM	52.25924	24.07491	←
MS8-1 768.9380	414	NRC TPM	40.09366	61.26771	←

Sheet F30 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
 (Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MS8-1 446.3404	S8-1	NRC TPM	40.09366	61.26771
MS8-2 446.3404	S8-1	NRC TPM	38.82933	61.62537
MS8-2 31.50931	S8-2	NRC TPM	38.82933	61.62537
MS8-3 31.50931	S8-2	NRC TPM	39.33063	61.94218
MS8-3 493.4268	514	NRC TPM	39.33063	61.94218
MS9-1 202.3282	303	NRC TPM	0.8264268	36.78742
MS9-1 0.4879480E-01	S9-1	NRC TPM	0.8264268	36.78742
MS9-2 0.4879489E-01	S9-1	NRC TPM	0.8158386	36.78741
MS9-2 202.3334	203	NRC TPM	0.8158386	36.78741
MTR-1 96.02198	308	NRC TPM	172.0426	64.02771
MTR-1 96.06731	208	NRC TPM	172.0426	64.02771
CC-1	108	NRC TPM	171.0916	
CC-2	308	NRC TPM	175.1949	
MT-1	T-2	NRC TPM	2.024876	
MT-2	T-3	NRC TPM	35.93516	
MT-3	T-4	NRC TPM	55.85269	
MT-4	T-5	NRC TPM	59.47759	
MT-5	T-6	NRC TPM	51.94580	
MT-6	T-7	NRC TPM	8.413983	
MT-7	T-9	NRC TPM	19.09814	
MT-8	T-10	NRC TPM	19.15832	
MT-9	T-11	NRC TPM	47.02917	
MT-10	T-12	NRC TPM	47.06139	

Sheet F31 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MT-11	T-13	NRC TPM	58.55695	
MT-12	T-14	NRC TPM	58.54820	
MT-13	T-15	NRC TPM	54.40409	
MT-14	T-16	NRC TPM	54.35825	
MT-15	T-17	NRC TPM	35.11818	
MT-16	T-18	NRC TPM	35.06207	
MT-17	T-8	NRC TPM	34.40853	
MT-18	T-8	NRC TPM	30.52154	
MT-19	T-9	NRC TPM	2.941134	
MT-20	T-10	NRC TPM	27.38610	
MT-21	T-10	NRC TPM	18.63957	
MT-22	T-11	NRC TPM	3.998488	
MT-23	T-12	NRC TPM	15.92473	
MT-24	T-12	NRC TPM	10.96755	
MT-25	T-13	NRC TPM	4.529173	
MT-26	T-14	NRC TPM	10.70206	
MT-27	T-14	NRC TPM	16.11627	
MT-28	T-15	NRC TPM	4.141054	
MT-29	T-16	NRC TPM	19.25900	
MT-30	T-16	NRC TPM	28.13541	
MT-31	T-17	NRC TPM	29.40735	
MT-32	T-18	NRC TPM	56.12450	
MT-33	T-18	NRC TPM	26.52252	
MTC-1	19	NRC TPM	22.71149	20.56891
103.3058				
MTC-1	30	NRC TPM	22.71149	20.56891
85.44615				
MTC-2	20	NRC TPM	17.65244	23.37032
102.1195				

Sheet F32 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MTC-2 85.44615	30	NRC TPM	17.65244	23.37032
MTC-11 308.6962	419	NRC TPM	19.95539	64.86092
MTC-11 250.9409	430	NRC TPM	19.95539	64.86092
MTC-12 255.5544	420	NRC TPM	57.46773	6.872303
MTC-12 250.6183	430	NRC TPM	57.46773	6.872303
MTC-13 5.560268	430	NRC TPM	26.55978	10.26511
MTC-13 0.1154347E-06	T-7	NRC TPM	26.55978	10.26511
MRS-1	RS-1	NRC TPM	30.98965	
MTC-3	T-1	NRC TPM	34.41060	
MRS-2 0.4522244E-07	RS-1	NRC TPM	0.5115922	31.02460
MRS-2 23.26845	RS-2	NRC TPM	0.5115922	31.02460
MRS-3 23.26846	RS-2	NRC TPM	3.936304	2.400116
MRS-3 12.80744	RS-3	NRC TPM	3.936304	2.400116
MRS-4 12.80744	RS-3	NRC TPM	10.00918	1.527681
MRS-4 6.142187	RS-4	NRC TPM	10.00918	1.527681
MRS-5 6.142194	RS-4	NRC TPM	16.04045	2.637140
MRS-5 22.11033	RS-5	NRC TPM	16.04045	2.637140
MRS-6 22.11033	RS-5	NRC TPM	22.07035	0.9355739
MRS-6 18.61101	RS-6	NRC TPM	22.07035	0.9355739
MRS-7 18.61101	RS-6	NRC TPM	28.09836	1.724940

Sheet F33 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

**Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)**

MRS-7 25.78389	RS-7	NRC TPM	28.09836	1.724940
MRS-8 25.78389	RS-7	NRC TPM	34.12398	1.744224
MRS-8 20.77350	RS-8	NRC TPM	34.12398	1.744224
MRS-9 20.77350	RS-8	NRC TPM	40.14670	1.327171
MRS-9 21.89013	RS-9	NRC TPM	40.14670	1.327171
MRS-10 21.89013	RS-9	NRC TPM	46.16603	3.390723
MRS-10 13.04241	RS-10	NRC TPM	46.16603	3.390723
MRS-11 13.04240	RS-10	NRC TPM	52.18147	12.32558
MRS-11 65.68891	RS-11	NRC TPM	52.18147	12.32558
MRS-12 65.68891	RS-11	NRC TPM	58.23315	40.86760
MRS-12 320.3069	RS-12	NRC TPM	58.23315	40.86760
MRS-13 320.3069	RS-12	NRC TPM	61.64140	22.05524
MRS-13 336.1537	RS-13	NRC TPM	61.64140	22.05524
MRS-14 336.1537	RS-13	NRC TPM	22.05898	62.13130
MRS-14 315.5906	422	NRC TPM	22.05898	62.13130
MTRS-1	RS-2	NRC TPM	33.28173	
MTRS-2	RS-3	NRC TPM	2.859200	
MTRS-3	RS-4	NRC TPM	8.721817	
MTRS-4	RS-5	NRC TPM	3.847232	
MTRS-5	RS-6	NRC TPM	8.232406	
MTRS-6	RS-7	NRC TPM	4.358234	

Sheet F34 of F35

ATTACHMENT- F: Calc. No. 0200W-CA-C0156 Rev. No. 0 Job No. 22192

Attachment F: REDOX (Corrected Coordinate in "GT Strudl" Model) Output for Seismic Analysis
(Using Ground Response Spectrum for "Existing PC3 Structures"- 10% Damping)

MTRS-7	RS-8	NRC TPM	8.212537
MTRS-8	RS-9	NRC TPM	3.999424
MTRS-9	RS-10	NRC TPM	17.23706
MTRS-10	RS-11	NRC TPM	29.38590
MTRS-11	RS-12	NRC TPM	20.42242
{ 456}	>		
{ 457}	>		
{ 458}	>		
{ 459}	>		
{ 460}	>		

BHI-01299
Rev. 0

ATTACHMENT: G
ORIGINATOR: R. S. Rajagopal *RS* DATE: August 19, 1999
CHECKED BY: C. A. Palmquist *CP* DATE: 9/8/99
CALC. NO. 0200W-CA-C0156 REV. NO. 0
SHEET NO. G1 OF TOTAL 11 SHEETS

ATTACHMENT "G"

REDOX "GT Strudl" Model: Excerpted from Ref. 7
(Figures 1, 2A-2E, 3, 4, 5, & 6)

Y
X
17.3639 HORIZONTAL FT UNITS PER INCH
17.3639 VERTICAL FT UNITS PER INCH
ROTATION: Z 0.0 Y 0.0 X 0.0

Enter Command>

FIGURE 2A
ANALYTICAL MODEL FOR SEISMIC ANALYSIS

ATTACHMENT	<u>G</u>	Sheet No.	<u>63</u> of <u>611</u>
Calc. No.		Rev No.	<u>22192</u>
Originator		Date	
Checked By		Date	

12.2619 HORIZONTAL FT UNITS PER INCH
12.2619 VERTICAL FT UNITS PER INCH
ROTATION: Z 0.0 Y 0.0 X 0.0

L J

Enter Command>

FIGURE 2B
ANALYTICAL MODEL BELOW 133' 4"
JOINT NUMBER DESIGNATION

ATTACHMENT 9 Sheet No. 64 of 111
Calc. No. _____ Rev No. _____ Job No. 22192
Originator _____ Date _____
Checked By _____ Date _____

Y
X 10.9495 HORIZONTAL FT UNITS PER INCH
12.2619 VERTICAL FT UNITS PER INCH
ROTATION: Z 0.0 Y 0.0 X 0.0

L M

Enter Command>

FIGURE 2C
ANALYTICAL MODEL BELOW 133' 4"
MEMBER NUMBER DESIGNATION

ATTACHMENT <u>G</u>	Sheet No. <u>65</u> of <u>611</u>
Calc. No. _____	Rev No. _____ Job No. <u>22192</u>
Originator _____	Date _____
Checked By _____	Date _____

8.4312 HORIZONTAL FT UNITS PER INCH
 8.4312 VERTICAL FT UNITS PER INCH
 ROTATION: Z 0.0 Y 0.0 X 0.0

L J 'RS-3' TO 'RS-11'

Enter Command>

FIGURE 2D
ANALYTICAL MODEL ABOVE EL 133' 4"
JOINT & MEMBER DESIGNATION
(CONCRETE MEMBERS ONLY)

ATTACHMENT	G	Sheet No.	G6 of G11
Calc. No.		Rev No.	Job No. 22192
Originator		Date	
Checked By		Date

8.4312 HORIZONTAL FT UNITS PER INCH
 8.4312 VERTICAL FT UNITS PER INCH
 ROTATION: Z 0.0 Y 0.0 X 0.0

L J 'T-1' TO 'T-18'

Enter Command>

FIGURE 2E
ROOF TRUSS - JOINT DESIGNATION

ATTACHMENT	G	Sheet No.	67 of 911
Calc. No.		Rev No.	Job No. 22192
Originator		Date	
Checked By		Date

Enter Command>

L J

ATTACHMENT	G	Sheet No.	58 of 611
Calc. No.		Rev No.	Job No. 22192
Originator		Date	
Checked By		Date	

FIGURE 3
CONNECTION BETWEEN TRUSS & BLDG STRUCTURE
(NORTH SIDE - 1" • BOLTS WITH 1 1/4" • HOLES)

Enter Command> L J

ATTACHMENT	G	Sheet No.	G9 of G11
Calc. No.		Rev. No.	Job No. 22192
Originator		Date	
Checked By		Date	

FIGURE 4
CONNECTION BETWEEN TRUSS & BLDG. STRUCTURE
(SOUTH SIDE - 1" • BOLTS WITH SLOTTED HOLES)

1" DIA LD NS AT 390.03 FT-KP/IN

Enter Command>

ATTACHMENT	G	Sheet No.	G/10 of G/11
Calc. No.		Rev. No.	Job No. 22192
Originator		Date	
Checked By		Date	

FIGURE 5
BENDING MOMENT DIAGRAM AT ROOF SLAB
& NORTH WALL JUNCTION
(MONOLITHIC CONNECTION)

1/2 DIA LD NS AT 145.14 FT-KP/IN

2.5737 HORIZONTAL FT UNITS PER INCH
2.5737 VERTICAL FT UNITS PER INCH
ROTATION: Z 0.0 Y 0.0 X 0.0

FIGURE 6
BENDING MOMENT DIAGRAM AT ROOF SLAB
& SOUTH WALL CONNECTION
(PAPER JOINT BETWEEN WALL & ROOF SLAB)

ATTACHMENT	G	Sheet No.	G/1 of G/1
Calc. No.		Rev. No.	Job No. 22192
Original		Date	
Checked by		Date	

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