



RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Cesium Nitric Acid Recovery Forced Circulation Vacuum Evaporator System

Content applicable to ALARA? Yes No

ADR No.
24590-PTF-ADR-M-03-011

Rev
0

Quality Level

Q

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NOTE: Contents of this document are Dangerous Waste Permit affecting.

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SPECIFICATION No.
24590-PTF-3PS-MEVV-T0002

Rev
4

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Revision History

Revision	Reason for Revision
0	Issued for Procurement For bid only
1	Issued for Procurement Total revision
2	Issued for Purchase Incorporated Design Change: 24590-PTF-3PN-MEUV-00003 with revision of section 2.1.2 for clarification.
3	Issued for Purchase Incorporated Design Changes: 24590-PTF-3PN-MEUV-00002 with section 2.3.1.24 and Appendix H deleted. 24590-PTF-3PN-MEUV-00008 with the following additional revisions <ol style="list-style-type: none"> 1. Revised section 1.2.1 to add CNP-SKID-00006 2. Revised section 1.2.12 for clarification of Seller's responsibility 3. Rephrased section 1.3.12 for clarification 4. Moved section 1.4.24 to section 1.4.31 5. Revised section 3.1.27 to change "Appendix F" to "Appendix I" 6. Revised section 3.1.28 to clarify the scope of responsibilities for Buyer and Seller 7. Revised section 3.1.29 to clarify the reboiler design requirements 8. Revised section 3.6.2 to clarify the Seller's responsibilities 9. Revised section 3.6.7 to provide accuracy requirement 10. Moved section 3.7.11 to section 3.7.20 11. Revised section 3.7.12 to add reboiler tolerance requirements 12. Revised section 3.17.9 to delete "over the complete vessel height" at the end of the 4th sentence 13. Revised section 3.18.3.2 to add support frame assembly & rephrase the requirement 14. Revised section 7.1.6 to add support frame assembly
4	Incorporated Design Changes: 24590-PTF-3PN-MEUV-00011 24590-PTF-3PN-MEUV-00013 with revision of 3.4.3.3 for clarification. 24590-PTF-3PN-MEUV-00016 with the following revisions <ol style="list-style-type: none"> 1. Revised section J8b of appendix J to remove digitized data verification requirements that is no longer applicable. 2. Revised section J5.2 of appendix J to add "or greater" at the end of the sentence for clarification. 24590-PTF-3PN-MEUV-00020 24590-WTP-SDDR-M-06-00150

Revision	Reason for Revision
	<p>24590-WTP-SDDR-ML-05-00264 with revision of 4.2.8 to allow threaded and fitting outside of black cells.</p> <p>Deleted Appendix F and all internal references that are no longer needed.</p> <p>Revised Section 1.2.1 to add "CNP-PMP-00002" for clarification</p> <p>Revised Section 1.2.6, 3.4.3.1, 3.7.13 to remove low-pressure steam information which is no longer applicable</p> <p>Revised section 1.2.12 to indicate that seismic information is provided in Appendix J</p> <p>Revised section 1.2.14 to correct steam supply information</p> <p>Deleted section 1.3.26 to correct Buyer's scope of work.</p> <p>Revised section 1.4.9 to delete outdated acceleration values.</p> <p>Revised sections 1.4.11, 1.4.13, 1.4.15, 1.4.16, 1.4.18, 1.4.24, 1.4.25, 1.4.28, 1.4.29, & 1.4.32 to correct definitions</p> <p>Revised sections 1.6.1 and 2.1.2 for clarifications</p> <p>Revised sections 2.2.6 and 2.2.15 to be consistent with SRD.</p> <p>Revised section 2.2.25 to correct typos</p> <p>Added sections 2.2.31, 2.2.32 and 2.2.33 for references</p> <p>Added sections 2.3.1.2 from 24590-PTF-3PN-MEVV-00002 which was erroneously deleted in Rev. 2 of this specification</p> <p>Revised sections 3.1.5, 3.1.26, 3.1.27, 3.1.29, 3.4.2.1 - 3.4.2.4, 3.6.1, 3.7.1, 3.8.1, 3.9.1, 3.9.10, 3.11.1 to remove Appendix F reference which was deleted</p> <p>Revised sections 3.1.21 to remove attachments in section 2 of the MR which was deleted.</p> <p>Added 3.12.13 to incorporate 2" drain nozzle inlet to reboiler steam condensate vessel from desuperheater</p> <p>Revised section 6.6.3 to clarify the weld acceptance criteria.</p> <p>Revised Section 7.2 to clarify that the stimulant test using non-radioactive cesium is not required.</p> <p>Revised 3.2.4 to correct typos.</p> <p>Revised section 11.2 to clarify design stress/seismic report submittal requirements.</p> <p>Revised sections 3.7.20, 3.8.5, 3.9.5, 3.10.12, and 3.11.13, to correct nozzle loading requirements.</p> <p>Revised section 3.14.3 to clarify seismic analysis requirements</p> <p>Revised section 4.2.12 to include table header and correct typos.</p> <p>Added Appendix K to provide location of the 2-inch inlet drain nozzle on the reboiler steam condensate vessel.</p> <p>Revised Appendices B and C to correct steam supply conditions.</p> <p>Revised Appendix I to add a note for clarification regarding QL-1 and QL-2 used by Seller.</p>

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1 Scope

1.1 Project Description and Location

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is a complex of waste treatment facilities where the US Department of Energy (DOE) Hanford Site tank waste will be pretreated and immobilized into stable glass form via vitrification. The WTP Contractor will design, build, and startup the WTP pretreatment and vitrification facilities for the DOE Office of River Protection (ORP). The waste treatment facilities will pretreat and immobilize the low-activity waste (LAW) and high-level waste (HLW) currently stored in underground storage tanks at the Hanford Site.

The Hanford Site occupies an area of about 560 square miles and is located along the Columbia River, north of Richland, WA in the U.S.A. The WTP Facility will be constructed at the east end of the 200 East Area of the Hanford Site. The counties of Benton, Franklin, and Grant surround the Hanford Site.

1.2 Equipment, Material, and Services Required

This specification provides the requirements for the design, analysis, fabrication, quality assurance, inspection, testing, qualification, and labeling of one forced circulation vacuum evaporator system Cesium Nitric Acid recovery. This specification also provides the requirements for the supply of services, manuals, instructions, procedures, and other associated documentation.

The scope of work for the Seller includes all work defined in this specification and its addenda and attachments. Work shall include, but is not limited to, the following:

- 1.2.1 Provide fully detailed designs, drawings, diagrams, supporting calculations, supporting analyses, operating & maintenance procedures, installation instructions, and all labor, materials, equipment, and services necessary to manufacture, test, inspect, label and package one forced circulation vacuum evaporator system, including handling and servicing equipment, all fabricated to appropriate NQA-1 requirements in accordance with all specification requirements, with the deliverables being reports, calculations, procedures, data sheets, drawings and diagrams as outlined in this specification and the Material Requisition (MR). Refer to table below for what shall be included as part of evaporator system to be provided.

24590-PTF-3PS-MEVV-T0002, Rev. 4
Cesium Nitric Acid Recovery Forced Circulation Vacuum
Evaporator System

Equipment	Tag
One (1) Separator Vessel. Includes spraybars above and below the mesh pad, nozzles, vessel support pads, and support frame (CNP-SKID-00007) with anchorage and bracing. Bracing may be shipped loose and intended for field installation at Buyer's facility.	CNP-EVAP-00001
One (1) internal deentrainment separation system	Included above
One (1) stainless steel structural support frame with anchorage for the separator vessel.	Not tagged
One (1) reboiler with inlet and outlet pipe ends welded to Buyer's supplied jumper nozzles. Includes structural support frame with anchorage for the reboiler.	CNP-HX-00001
One (1) recirculation pump including motor, mechanical seal, and adjustable speed drive. The pump inlet and outlet pipe ends welded to Buyer's supplied jumper nozzles.	CNP-PMP-00001
One (1) reboiler steam condensate transfer station (CNP-SKID-00006). Equipment platform includes condensate transfer vessel (CNP-VSL-00168) and pumps (CNP-PMP-00003A & B).	CNP-SKID-00006
One (1) Rectifier vessel including internal trays. Includes structural support frame with anchorage (CNP-SKID-00002) for the rectifier.	CNP-DISTC-00001
One (1) primary condenser including tubes, tubesheet, nozzles, saddles, mounted on condenser skid with anchorage (CNP-SKID-00002).	CNP-HX-00002
One (1) Inter-Condenser including tubes, tubesheet, nozzles, and piping connecting to primary condenser and after-condenser mounted on condenser skid with anchorage (CNP-SKID-00002).	CNP-HX-00003
One (1) After-Condenser including tubes, tubesheet, and nozzles mounted on condenser skid with anchorage (CNP-SKID-00002).	CNP-HX-00004
Two (2) Steam Ejectors include piping connecting to inter-condenser and after-condenser mounted on condenser skid with anchorage (CNP-SKID-00002).	CNP-EJCTR-00010A CNP-EJCTR-00010B
One (1) Centrifugal Pump for removal of condenser system process condensate	CNP-PMP-00002
One (1) steam conditioning system skid (with anchorage). Skid contains pressure reducing valve and control and a desuperheater.	CNP-SKID-00003 "Note 1"
Lifting yokes for one (1) reboiler, and one (1) recirculation pump	"Note 1"

Note 1: Stainless steel or plastic tags (foil strip is not acceptable) shall be firmly attached by stainless steel wire or stainless steel screws to each separate item. Each tag shall be stamped with, as a minimum: (1) Purchase Order Number, (2) Purchase Order item number, and (3) Equipment/Instrument Tag number.

- 1.2.2 Provide a guarantee that all equipment listed in section 1.2.1 will perform in accordance with the requirements of this specification and all referenced codes, standards, and documentation in section 2 of this specification. Process warranty shall include demonstration of compliance of the Seller's provided evaporator system during testing per section 7.2 of this specification with the boil-off and decontamination factor requirements.
- 1.2.3 Perform sizing calculations and process performance modeling to ensure that each component of the evaporator system is properly specified.
- 1.2.4 Provide the nonreplaceable separator vessel and all internal parts (exception made for demister pad life), which shall attain a 40-year life.
- 1.2.5 Deleted.
- 1.2.6 Provide one (1) steam conditioning equipment necessary to reduce plant pressure steam to Seller's provided optimal saturated steam condition for reboiler operation. Provide specifications (i.e., pipe diameter, associated equipment and layout) for reboiler shell vacuum/vent line.
- 1.2.7 Deleted
- 1.2.8 Provide evaporator skids, equipment, components, and structural supports with the materials of construction as specified per this specification and on the attached data sheets in section 2 of the MR. The structural supports for evaporator equipment shall match with Buyer's provided embed layout and floor beams above.
- 1.2.9 Provide evaporator systems that accommodate the wall penetrations, piping layout, equipment dimension envelopes, and equipment locations as specified in Appendix F.
- 1.2.10 Provide stainless steel skid framing to match Buyer embed plates for the separator vessel. The vessel skid shall conform to the proposed embed layout dimensions shown in the Appendix D.
- 1.2.11 Provide below-the-hook lifting devices for installation, commissioning, and operation/maintenance of the demister pad assembly, reboiler, and recirculation pump. These will include lifting yokes, beams, fixtures, etc., according to Buyer design constraints for remote handling. Seller is also to provide all special lifting equipment and special tools required for installation and maintenance of the evaporator system.
- 1.2.12 Provide seismic analysis for evaporator structures, systems, and components. **The seismic response spectra and damping values for the performance of the seismic analysis are provided in the Appendix J.**
- 1.2.13 Provide the thermal and static stress analyses for the evaporator structures, systems, and components. Buyer will provide the necessary cyclic data for Seller to perform an assessment regarding the fatigue life of the equipment. However, Seller will be responsible for confirmation that the cyclic data has been

accurately interpreted before proceeding with the component fatigue analysis. The Seller shall provide a fatigue analysis to support a 40-year design life for the evaporator system. The fatigue analysis shall include all calculations and all supporting data.

- 1.2.14 Identify all interfaces and requirements for external connections with equipment and services supplied by the Buyer. The interface system data parameters for use in each of the evaporator systems shall include, as a minimum, the following:

Inlet Conditions:

- High pressure steam (see section 3.4.3.3)
- Service Water (flow rate)
- Instrument air (flow rate @ pressure)
- Cooling water (flow rate @ 75 °F)
- Operating electrical (kW)
- Installed electrical (kW)

Outlet Conditions:

- Steam Condensate (volumetric flow rate & temperature)
- Process Condensate (volumetric flow rate & temperature)
- Vent System (mass flow rate & temperature)
- Recirculation Loop (volumetric flow rate & temperature)
- Separator offgas (mass flow rate & temperature)
- Concentrated waste (volumetric flow rate & temperature)
- Rectifier offgas (mass & volumetric flow rate & temperature)
- Rectifier bottoms (volumetric flow rate & temperature)

- 1.2.15 Provide completed Instrument and Mechanical data sheets for all instruments and equipment in the 60 % design review package, utilizing Buyer's supplied instrument data sheet samples attached in the section 2 of the MR as templates. Buyer will procure the required instruments as detailed by the Seller's control documents (data sheets) for installation by others. Instrumentation shall conform to 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems*. Seller's design may differ from the Buyer proposed evaporator Piping and Instrumentation sketches in Section 2 of the material requisition with Buyer's review

- 1.2.16 Provide the following for instrumentation and controls of Seller's supplied evaporator systems, equipment, and components to support Buyer's software development. Any effect that the evaporator control strategy has on equipment operating parameters (i.e., pump flow rates, line flushes, feed and concentrate takeoff strategies, temperature, or pressure) will be mutually agreed upon prior to being implemented into the design.

- P&IDs
- Completed Buyer's Instrument data sheets
- Instrument Control philosophies
- Instrument Logic Diagrams
- Functional descriptions
- Instrument index which includes control set points

- Control and sequencing requirements (logic narratives)
- Instrumentation and controls requirements for the CNP evaporator feed cycle and concentration & eluant recovery cycle (Buyer to procure).

1.2.17 Provide a reliability analysis and documentation for the evaporator system in accordance with the following:

1.2.17.1 A complete Failure Modes and Effects Analysis (FMEA) shall be performed on all the equipment that falls within Seller's scope of supply. This shall include associated components such as vessels, remote handling equipment, pumps that have electronic control systems used for process variability (e.g., flow rate). All support systems (e.g., power, air, water, steam, etc.) will be assumed to be 100 % reliable and will not be considered in the FMEA. Structural failure modes will be limited to seismic events, based on whatever seismic analyses have been performed to support the design. The FMEA shall follow in MIL-STD-1629A as close as possible. The equivalent standard actually used to perform the FMEA shall be provided as a reference (including version and year) at the 60 % design review. Also, an explanation shall be included to demonstrate how the standard has been applied. Failure modes for a reboiler are at least as follows: (1) pin hole, (2) crack, and (3) tube rupture. In addition, Seller shall indicate the possibility of the reboiler tube rupture without precursor of pin hole or crack. Determination of the possibility of reboiler tube rupture without a precursor of a pinhole or crack can be made with a qualitative argument based on fracture mechanics. No stress analysis or fracture mechanics calculations will be required to support the qualitative assessment. Failure modes for the remaining components covered by the FMEA shall be as determined by the Seller; however, the basis for the failure mode shall be specified.

1.2.17.2 Failure rate data for the purposes of an availability assessment (performed by Seller) will be derived using the following hierarchy:

- Supplier In-Service Data
- In-Service Data of similar equipment, preferably in similar applications
- Generic Documented Failure Rate Data – data taken from recognized data sources, e.g., Dexter & Perkins, NPRD 1995, etc.

1.2.17.3 The specific data source shall be provided at the 60 % design review

1.2.17.4 A remote maintainability analysis will be undertaken in concert with the Buyer. The analysis will address corrective maintenance activities and estimate the required maintenance for the reboiler and appurtenances.

1.2.17.5 A recommended spare parts list, operations manuals, and maintenance manuals shall be provided.

- 1.2.17.6 Assume operations are 8,760 operating hours per year.
- 1.2.18 Provide an analysis of operating life for separator vessel, including its internal demister pads, and feed distribution, reboiler, recirculation pump and rectifier. Justify all assumptions and references.
- 1.2.19 Provide structural support requirements and recommended support locations for the recirculation pump (i.e., load points, weight distribution, and maximum weight, geometry of equipment, and location of center gravity). Equipment support locations shall be mutually agreed with the Buyer due to remote handling requirements in the hot cell.
- 1.2.20 Provide design and fabrication of a reboiler support frame. The support frame shall be welded to the reboiler and designed to force the thermal expansion of all nozzles upward. Upper support points can be maintained for a lateral guide support. The reboiler and frame shall be designed to be remotely removeable and maintained in the Buyer's hot cell.
- 1.2.21 Provide demonstration and recorded VHS format video tape for demister pad removal and replacement. Buyer shall be notified prior to demonstration.
- 1.2.22 Provide radiographic film with technique and reader sheets. Exposed film must be sent, along with a copy of the technique and reader sheets in accordance with section 3 of the MR. Film must be suitably packaged to preclude moisture and handling damage.
- 1.2.23 Provide any necessary special remote repair tools for the reboiler, support frame assembly and recirculation pump. Special tools shall not include tools readily available in the commercial market. Also, provide a list of commercially available tools needed.
- 1.2.24 Deleted.
- 1.2.25 Provide personnel to perform dimensional measurements for the separator vessel, reboiler, and recirculation pump at the Seller's shop.
- 1.2.26 Provide certified reports for all components subject to any heat treatment during manufacture.
- 1.2.27 Provide procedures suggesting how the integrated testing of evaporator system functionality be conducted by Buyer at the Hanford jobsite per section 7.2 of this specification. Technical support for installation, testing and commissioning will be under a separate contract.
- 1.2.28 Provide design documents in progressively complete package form. Design reviews at 30 %, 60 %, 90 % and Final Design to resolve all outstanding issues are planned to include face-to-face discussions between Buyer's personnel and Seller's personnel at Buyer's location. Future meetings will be arranged after Design Review Package Materials have been reviewed and meeting agenda have been established. The discussions are intended to help establish/clarify interface points in system requirements, review design/design progress, design documents,

exchange ideas/information, and provide design direction. See G-321-E Form for document submittal requirements.

- 1.2.29 **Perform a coupled seismic response spectra dynamic analysis that will qualify the recirculation piping, offgas piping, and provide nozzle loads & nozzle loads at the Grayloc connection on each jumper. See Appendix J for requirement details on coupled dynamic analysis.**
- 1.2.30 **Perform detailed FEA uncoupled seismic response spectra dynamic analysis of all SC-I/SC-II evaporator components (including the individual component's frames). See Appendix J for requirement details on FEA uncoupled analysis.**

1.3 Work by Others

The following items are not the responsibility of the Seller:

- 1.3.1 Provide installation labor.
- 1.3.2 Provide equipment shipment, unloading and storage at Buyer's site.
- 1.3.3 Provide Instrumentation and controls (including installation). Provide Buyer internal standards for digital control system (DCS) equipment and will specify and procure the control system equipment based on the necessary I/O requirements detailed by Seller.
- 1.3.4 Deleted.
- 1.3.5 Generate control logic in Buyer standard format using the final control loop definitions, system interlocks and alarms, system control philosophies, and control and sequencing requirements provided by Seller.
- 1.3.6 Procure the DCS components. Buyer will provide the "Device" and "I/O" address of the serial communications link for each instrument for inclusion in the Instrument Index.
- 1.3.7 Perform remote handling verification testing for the reboiler, recirculation pump, and recirculation pipework jumper functionality at Buyer's site.
- 1.3.8 Provide the appropriate seismic response spectra and damping values for Seller to perform the evaporator equipment skid seismic analyses.
- 1.3.9 Deleted.
- 1.3.10 Provide heat tracing and any necessary uninterruptible power supplies.
- 1.3.11 Provide all valves (including control valves) located in the jumpers for remote maintenance in the R5/C5 hot cell.
- 1.3.12 Provide fabrication for all piping, and jumpers. This includes the separator vessel to the recirculation pump, the recirculation pump to the reboiler nozzle,

and the reboiler nozzle to the separator vessel. The Seller shall provide reboiler nozzle extensions including pipe spools up to the first available jumper coupling point. The Seller shall install the Buyer's jumper connectors on the reboiler nozzle extensions. The Buyer shall design and layout piping for the recirculation pipework. Layout acceptability will be mutually agreed upon between the Buyer and Seller.

- 1.3.13 Provide structural supports for the evaporator piping.
- 1.3.14 Provide hot cell process equipment platform (PEP) for the reboiler and recirculation pump.
- 1.3.15 Provide the necessary cyclic data for Seller to perform an assessment regarding the fatigue life of the equipment.
- 1.3.16 Deleted.
- 1.3.17 Provide all jumpers, jumper mounted equipment, and pipework connections to the separator vessel within the black cell.
- 1.3.18 Provide all pipework between Seller's provided skids (excluding piping connecting condensers and steam ejectors).
- 1.3.19 Provide specification of process and utility piping jumper interfaces and their locations.
- 1.3.20 Provide Jumper stack-up tolerance study.
- 1.3.21 Provide shielding for penetrations through the walls and floors.
- 1.3.22 Provide hot cell remote handling equipment (including impact wrenches and standard lifting equipment).
- 1.3.23 Provide eluate lute pot (CNP-VSL-00001).
- 1.3.24 Provide break pots (CNP-BRKPT-00001 and CNP-BRKPT-00002).
- 1.3.25 Provide Vessel Vent system.
- 1.3.26 Deleted.
- 1.3.27 Provide CXP feed pumps (CXP-PMP-00001A/B).
- 1.3.28 Provide utility (i.e., air, steam, and cooling water) supply systems. However, Seller is responsible to provide steam-conditioning skid for reboiler operation.
- 1.3.29 Interface drawings for evaporator equipment skids.

1.4 Definitions

- 1.4.1 *Skid*: A skid is a group of components that can be manufactured and installed as a unit. These skid units are structurally self-supporting, allowing the skid to be handled by crane. Whenever practical, skids will contain all the equipment associated with the process, including vessels, piping, and supports.
- 1.4.2 *ALARA*: As Low As Reasonably Achievable (ALARA) documentation requirements apply to systems, structures, and components (SSCs) that have the potential to affect radiation doses, contamination levels, or releases to the environment.
- 1.4.3 *Buyer's Representative(s)*: The Buyer's designee(s), who shall witness onsite operations at the Seller and sub-seller sites and perform onsite inspections and surveillances.
- 1.4.4 *Black Cell (R5/C5)*: is a sealed concrete structure containing very high radiation and contamination where human access is prohibited during the normal operating lifetime of the cell and maintenance is not performed in the cell.
- 1.4.5 *C1*: Uncontrolled Area.
- 1.4.6 *C2*: Controlled area. Personnel must be verified free of contamination prior to exit.
- 1.4.7 *C3*: Contamination classification for plant areas that are ordinarily free of contamination, but have the potential of being contaminated.
- 1.4.8 *C5*: Contamination classification for plant areas that are considered high contamination areas. Access to C5 areas is not permitted.
- 1.4.9 *Design Basis Earthquake (DBE)*: A specification of the ground motion at the site.
- 1.4.10 *Hot Cell (R5/C5)*: A room that is restricted from personnel due to high levels of radiation and/or high levels of contamination. A hot cell is constructed with thick concrete walls usually lined internally with stainless steel sheet. Process equipment located in the hot cell is connected to wall nozzles using jumpers. Process equipment in the hot cell is skid mounted and designed for either remote maintenance using crane-mounted services or, preferably, no maintenance over the 40-year design life of the WTP.
- 1.4.11 *Important to Safety (ITS)*: SSCs that serve to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the workers and the public. ITS encompasses the broad class of facility features addressed (not necessarily explicitly) in the top-level radiological, nuclear, and process safety standards and principles that contribute to the safe operation and protection of workers and the public during all phases and aspects of facility operations (i.e., normal operation as well as accident mitigation). ITS includes SSCs designated as Safety Class (SC), Safety Significant (SS), and **additional protection class (APC)**.

- 1.4.12 *Jumper*: A remotely removable section of pipework usually incorporating connector heads and some items of process equipment (i.e., valves, instruments, etc.).
- 1.4.13 *Commercial Material (CM)*: SSC items and associated services (those that are not designated as SC or SS) that are manufactured using standard commercial practices.
- 1.4.14 *Paragraph*: When a paragraph of this specification, referenced documents, referenced codes, or referenced standards is referenced in this specification, the paragraph referenced and all subparagraphs and sub-subparagraphs of the paragraph referenced shall be considered inclusive.
- 1.4.15 *Quality (Q)*: SC and SS items. NQA-1 (1989) compliance is required. **QL-1 and QL-2 designations are used by the Seller to comply with other referenced specification requirements (i.e weld, design). These designations meet NQA-1 (Q) requirements and are not necessarily reflected in their associated Buyer's P&IDs.**
- 1.4.16 *Deleted*.
- 1.4.17 *Rad*: A unit of energy absorbed from ionizing radiation, equal to 100 ergs per gram or 0.01 joules per kilogram of irradiated material.
- 1.4.18 *Additional Protection Class*: APC SSCs are ITS SSCs that are neither SC nor SS.
- 1.4.19 *R1*: Unrestricted area.
- 1.4.20 *R2*: Radiation controlled area.
- 1.4.21 *R3*: Radiation classification for plant areas considered average. Contamination area requiring anti-contamination clothing for entry. At early design stages, when insufficient information is available regarding worker occupancy, an initial target radiation level of 2.5 mRad/hr is to be used for the R3 classification.
- 1.4.22 *R4*: Radiation area (maximum).
- 1.4.23 *R5*: Radiation classification for areas considered to be high or very high radiation areas.
- 1.4.24 *Safety Class (SC)*: SSCs that, by performing their specified safety function, prevent workers or the maximally exposed member of the public from receiving a radiological exposure that exceeds the accident exposure standards defined in the Safety Requirements Document (SRD). SC also applies to those features that, by functioning, prevent the worker or maximally exposed member of the public from receiving a chemical exposure that exceeds the ERPG-2 (AIHA 2001) chemical release standard. Those features credited for the prevention of a criticality event are also designated as SC.

- 1.4.25 *Safety Significant (SS)*: SSCs needed to achieve compliance with the radiological or chemical exposure standards for the public and workers during normal operation; and SSCs that can, if they fail or malfunction, place frequent demands on or adversely affect the function of SC SSCs.
- 1.4.26 *Seismic Category I (SC-I)*: Equipment/tanks important to safety, which have a seismic safety function. For the design of Seismic Category I equipment/tanks, no credit for inelastic energy absorption is allowed. Seismic Category I equipment/tanks shall be functional during and after a Design Basis Earthquake (DBE).
- 1.4.27 *Seismic Category II (SC-II)*: Equipment/tanks important to safety whose failure during a seismic event could prevent a Seismic Category I structure, system, or component (SSC) from performing its seismic safety function. For the design of Seismic Category II equipment/tanks, credit for inelastic energy absorption is allowed. Seismic Category II equipment/tanks shall maintain control and confinement of hazardous materials during and after a Design Basis Earthquake (DBE), but do not need to be functional.
- 1.4.28 *Seismic Category III Equipment (SC-III)*: (a) SC and SS SSCs that do not have a natural phenomena hazard (NPH) safety function. (b) SSCs that have a seismic safety function solely because they protect workers and members of the public from exposure to chemical hazards. (c) **APC** SSCs that provide primary confinement of significant inventories of radioactive materials, but in amounts less than quantities that require an SC or SS designation.
- 1.4.29 *Seismic Category IV (SC-IV)*: **APC** SSCs that have been designated as RRC do not provide primary confinement of significant inventories of radioactive materials.
- 1.4.30 *Special Tools*: Any tooling, which is not commercially available required to perform maintenance on the evaporator system.
- 1.4.31 *Reboiler and support frame assembly*: Reboiler and pipe work up to and including PUREX nozzles, remote clamp connector (Grayloc) hubs, and permanently attached frame work.
- 1.4.32 *Acronyms*
- ALARA As Low As Reasonably Achievable
 - AISC American Institute of Steel Construction
 - ANSI American National Standards Institute
 - **APC Additional Protection Class**
 - ASD Adjustable Speed Drive
 - ASD Manual of Steel Construction (Allowable Stress Design)
 - ASME American Society of Mechanical Engineers
 - ASNT American Society of Nondestructive Testing
 - ASTM American Society for Testing and Materials
 - AWS American Welding Society
 - CCTV Closed Caption Television

- CFR Code of Federal Regulations
- CM Commercial grade
- CNP Cesium Nitric Acid Recovery Process
- CTP Condensate Transfer Pump
- CXP Cesium Ion Exchange Process
- DBE Design Basis Earthquake
- DOE US Department of Energy
- DOT Department of Transportation
- **FEA Finite Element Analysis**
- GPM Gallons per minute
- HLW High Level Waste
- ERPG Emergency Response Planning Guidelines
- ITS Important to Safety
- IX Ion Exchange
- LAW Low-Activity Waste
- M Molarity
- MDS Mechanical Data Sheet
- MR Material Requisition
- MSDS Material Safety Data Sheet
- NDE Nondestructive Evaluation/Examination
- NPS Nominal Pipe Size
- NQA Nuclear Quality Assurance
- ORP DOE Office of River Protection
- PEP Process Equipment Platform
- PMI Positive Material Identification
- P&ID Piping and Instrumentation Diagram
- PTF Pretreatment Facility
- PWD Plant Wash and Disposal System
- QA Quality Assurance
- QAP Quality Assurance Program
- QAM Quality Assurance Manual
- QL Quality Level
- RCV Reboiler Condensate Vessel
- RCTS Reboiler Condensate Transfer Station
- RRC Risk Reduction Class
- SBS Submerged Bed Scrubber
- SC Safety Class
- SS Safety Significant
- SC Seismic Category
- SSCs Structures, Systems, and Components
- SSPC The Society For Protective Coatings
- RPP-WTP River Protection Project-Waste Treatment Plant
- TID Total Integrated Dose
- TEMA Tube and Exchanger Manufacturer's Association
- SDDR Supplier Deviation Disposition Request
- SG Specific Gravity
- UBC Uniform Building Code
- VT Visual Test

- WT % Weight percent
- WTP Hanford Tank Waste Treatment and Immobilization Plant

1.5 Mechanical Data Sheets

Specific design parameters and requirements for evaporator components will be shown on the individual Mechanical Data Sheet (MDS) in section 2 of the MR. The data shall be considered as preliminary. Seller shall verify thermal, hydraulic, mechanical and process designs. Where necessary, the Seller shall change the data in order to furnish complete thermal, hydraulic, mechanical, and process guarantees, including loads (Dead, operation and seismic) to structural members. Any difference between Seller's final design and Buyer's preliminary data shall be brought to Buyer's attention for resolution and approval. Seller shall supply evaporator components that meet specified materials of construction, quality level, and seismic category as described on the MDS. The nominal feed chemistries used for the design should be based on Appendix A of this specification. Process design of the evaporator system is given in Appendix C of this specification.

1.6 Safety/Quality/Seismic Classifications

- 1.6.1 The quality level (QL) and seismic category (SC) of the major components of the evaporator system are specified on the data sheets **in section 2 of the MR and Appendix I of this specification.**
- 1.6.2 Seismic category (SC) classification requirements are specified in 24590-WTP-3PS-SS90-T0001, Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks and 24590-WTP-3PS-FB01-T0001, Specification for Seismic Qualification for Seismic Category III/IV Equipment and Tanks.

2 Applicable Documents

2.1 General

- 2.1.1 Work shall be done in accordance with the referenced codes, standards, and documents listed below, which are an integral part of this specification.
- 2.1.2 When specific chapters, sections, parts, or paragraphs are listed following a code, industry standard, or reference document, only those chapters, sections, parts, or paragraphs of the document are applicable and shall be applied. If a date or revision is not listed, the latest issue, including addenda, at the time of award shall apply. See Section 4.2.12 for pre-approved equivalencies. For codes and standards listed below, the specific revisions or effective dates **identified, as well as the specific revisions or effective dates** of codes and standards that they incorporate by reference (daughter codes and standards), shall **apply**. When more than one code, standard, or referenced document covers the same topic, the requirements for all must be met with the most stringent governing. For commercial grade quality items, Seller may use any year of the ASME or ASTM standards for materials.

2.1.2.1 CNP separator vessel (CNP-EVAP-00001) and CNP reboiler condensate transfer vessel (CNP-VSL-00168) can be fabricated to ASME Section VIII, Division 1, 2004 Edition

2.2 Codes and Industry Standards

- 2.2.1 ASME B31.3-1996, Process Piping
- 2.2.2 ASME B16.5-1988, Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Addenda A
- 2.2.3 ASME B16.47-1990, Large Diameter Steel Flanges NPS 26 through NPS 60 Addenda A
- 2.2.4 ASME B18.15-1985, Forged Eye Bolts
- 2.2.5 ASME Boiler and Pressure Vessel Code, Section VIII, Div. 1, Rules for Construction of Pressure Vessel
- 2.2.6 ASME Boiler and Pressure Vessel Code, Section IX-1995 or later, Welding and Brazing Qualifications
- 2.2.7 ASME NQA-1-1989, Quality Assurance Program Requirements for Nuclear Facility Applications
- 2.2.8 ASME Y14.100, Engineering Drawing Practices
- 2.2.9 AISC ASD, 9th Edition, Manual of Steel Construction, Allowable Stress Design
- 2.2.10 AISC N690-1994, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities
- 2.2.11 ANSI N14.6, For Radioactive Materials-Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More
- 2.2.12 ASTM F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- 2.2.13 ASTM F594, Standard Specification for Stainless Steel Nuts
- 2.2.14 AWS D1.6, Structural Welding Code-Stainless Steel
- 2.2.15 AWS D9.1-1984 or later, Sheet Metal Welding Code
- 2.2.16 IEEE Std 1023-88, IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations
- 2.2.17 MIL-STD-1629A, Military Standard, Procedures for Performing A Failure Mode, Effects and Criticality Analysis
- 2.2.18 UBC-1997, Uniform Building Code

- 2.2.19 10 CFR 835, Occupational Radiation Protection
- 2.2.20 49 CFR 173, General Requirements for Shipments and Packaging. Code of Federal Regulations. U.S. Department of Transportation, Washington, D.C.
- 2.2.21 29 CFR 1910, Occupational Safety and Health Standards
- 2.2.22 NFPA 101, Code for Safety to Life from Fire in Buildings and Structures
- 2.2.23 NFPA 70-1999, National Electric Code
- 2.2.24 WAC 296-24, General Safety and Health Standards
- 2.2.25 ASTM E709, Standard Guide for Magnetic Particle Examination
- 2.2.26 API 610, Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
- 2.2.27 **ASCE 4-98, Seismic Analysis of Safety Related Nuclear Structures and Commentary.**
- 2.2.28 **ASTM A194 Editions 1991 through 2005a, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both**
- 2.2.29 **ASTM A564 Editions 1988b, 1989, 1991, 1992, 1992a, 1994, 1995, 1997, 1999, 2001, 2002, 2002a, 2004, Standard Specification for Hot Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes**
- 2.2.30 **ASTM A582, Any Year, Standard Specification for Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled and Cold-Finished.**
- 2.2.31 **SSPC-SP10, Near White Metal Blast Cleaning**
- 2.2.32 **SSPC-SP11, Power Tool Cleaning to Bare Metal**
- 2.2.33 **API 610-1995 Centrifugal Pumps for General Refinery Service**

2.3 Reference Documents

2.3.1 Interfacing References

- 2.3.1.1 24590-WTP-3PS-G000-T0001, General Specification for Supplier Quality Assurance Program Requirements
- 2.3.1.2 24590-WTP-3PS-G000-T0002, Specification for Positive Material Identification (PMI)
- 2.3.1.3 24590-WTP-3PS-G000-T0003, General Specification for Packaging, Shipping, Handling, and Storage Requirements

- 2.3.1.4 24590-WTP-3PS-NWP0-T0001, Engineering Specification for General Welding and NDE Requirements for Supplier Fabricated Piping
- 2.3.1.5 24590-WTP-3PS-P000-T0001, Engineering Specification for Piping Material Classes General Description and Summary
- 2.3.1.6 24590-WTP-3PS-SS00-T0002, Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel
- 2.3.1.7 24590-WTP-3PS-SS90-T0001, Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks
- 2.3.1.8 24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks
- 2.3.1.9 24590-WTP-3PS-EVV1-T0001, Specification for Low Voltage Adjustable Speed Drives
- 2.3.1.10 24590-WTP-3PS-MUMI-T0002, Specification for Low Voltage Induction Motors
- 2.3.1.11 24590-WTP-3PS-MPC0-T0002, Engineering Specification for General Centrifugal Pumps to Meet Requirements of ASME B73.2M-1991 for Commercial (CM) Components
- 2.3.1.12 24590-WTP-3PS-M000-T0002, General Specification for Mechanical Handling Equipment Design and Manufacture
- 2.3.1.13 24590-WTP-3PS-MJJ0-T0001, Engineering Specification for Lifting Beams for Mechanical Handling Equipment Important to Safety Quality Level II
- 2.3.1.14 24590-WTP-3PS-MV00-T0001, Engineering Specification for Pressure Vessel Design and Fabrication
- 2.3.1.15 24590-WTP-3PS-MV00-T0002, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels
- 2.3.1.16 24590-WTP-3PS-MES0-T0001, Engineering Specification for Shell and Tube Heat Exchangers
- 2.3.1.17 24590-WTP-3PS-MVB2-T0001, Engineering Specification for Welding of Pressure Vessels, Heat Exchangers, and Boilers
- 2.3.1.18 24590-WTP-3PS-JQ07-T0001, Engineering Specification for Instrumentation for Package Systems

- 2.3.1.19 24590-WTP-3PS-PS02-T0001, Engineering Specification for Shop Fabrication of Piping
- 2.3.1.20 24590-WTP-3PS-SS00-T0001, Engineering Specification for Welding of Carbon Structural Steel
- 2.3.1.21 24590-WTP-3PS-EKP0-T0001, Engineering Specification for Electrical Requirements for Packaged Equipment
- 2.3.1.22 24590-WTP-3PS-PP00-T0002, Engineering Specification for Dimensional Record Program
- 2.3.1.23 24590-PTF-S0C-S15T-00005, Seismic Analysis of Pretreatment Building – In structure Response Spectra (ISRS)
- 2.3.1.24 **24590-WTP-3PS-MPC0-T0002, Engineering Specificaiton for General Centrifugal Pumps to Meet Requirements of ASME B73.1M-1991 and ASME B73.2M-1991 for Commercial (CM) Components**

2.3.2 Developmental References

- 2.3.2.1 24590-PTF-3YD-CNP-00001, System Description for Cesium Nitric Acid Recovery Process-System CNP
- 2.3.2.2 24590-WTP-3PS-MV00-T0003, Engineering Specification for Pressure Vessel Fatigue Analysis

2.4 Reference Drawings / Data Sheets

- 2.4.1 24590-WTP-MV-M59T-00001, Pressure Vessel Tolerances Standard Details
- 2.4.2 24590-WTP-MV-M59T-00007, Thermowell Connection Standard Details
- 2.4.3 24590-WTP-MV-M59T-00009, Lifting Lugs Standard Details
- 2.4.4 24590-WTP-MV-M59T-00010, Tailing Lug Standard Details
- 2.4.5 24590-WTP-MV-M59T-00011, Wash Rings Standard Details
- 2.4.6 24590-WTP-MV-M59T-00012, Grounding Lug Standard Details
- 2.4.7 24590-WTP-MV-M59T-00016001, Vessel Connections Standard Details Sheet 1 of 3
- 2.4.8 24590-WTP-MV-M59T-00016002, Vessel Connections Standard Details Sheet 2 of 3
- 2.4.9 24590-WTP-MV-M59T-00016003, Vessel Connections Standard Details Sheet 3 of 3

24590-PTF-3PS-MEVV-T0002, Rev. 4
Cesium Nitric Acid Recovery Forced Circulation Vacuum
Evaporator System

- 2.4.10 24590-WTP-MV-M59T-00017, Vessel Inspection Manway Standard Details
- 2.4.11 24590-WTP-MV-M59T-00018, Vessel Name Plate Standard Details
- 2.4.12 24590-WTP-MV-M59T-00026, Anchor Bolt Chair Details for Vertical Vessels
- 2.4.13 24590-WTP-M0-M10T-00004, HLW & PTF Vitrification Systems HSH, RWH, PFH, PIH Design Proposal Drawing 3 Ton Capacity Lifting Hook
- 2.4.14 24590-WTP-M6-50-00001, P&ID Symbol and Legend Sheet 1 of 6
- 2.4.15 24590-WTP -M6-50-00002, P&ID Symbol and Legend Sheet 2 of 6
- 2.4.16 24590-WTP -M6-50-00003, P&ID Symbol and Legend Sheet 3 of 6
- 2.4.17 24590-WTP -M6-50-00004, P&ID Symbol and Legend Sheet 4 of 6
- 2.4.18 24590-WTP -M6-50-00005, P&ID Symbol and Legend Sheet 5 of 6
- 2.4.19 24590-WTP -M6-50-00006, P&ID Symbol and Legend Sheet 6 of 6
- 2.4.20 24590-PTF-M6-CNP-00008, P&ID PTF Cesium Nitric Acid Recovery Process System Evaporator Vessel
- 2.4.21 24590-PTF-M6-CNP-00010, P&ID PTF Cesium Nitric Acid Recovery Process System Rectifier and Condensers
- 2.4.22 24590-PTF-M6-CNP-00011, P&ID PTF Cesium Nitric Acid Recovery Process System Reboiler Condensate Collection & Transfer
- 2.4.23 24590-PTF-P1-P01T-00001, Pretreatment Building General Arrangement Plan at El. 0'-0"
- 2.4.24 24590-PTF-P1-P01T-00002, Pretreatment Building General Arrangement Plan at El. 28'-0"
- 2.4.25 24590-PTF-P1-P01T-00003, Pretreatment Building General Arrangement Plan at El. 56'-0"
- 2.4.26 24590-PTF-P1-P01T-00004, Pretreatment Building General Arrangement Plan at El. 77'-0"
- 2.4.27 24590-PTF-DD-S13T-00002, Pretreatment Facility Structural Concrete Embed Plates
- 2.4.28 24590-PTF-DD-S13T-00022, Pretreatment Facility Structural Concrete Embedments Key Plan Elevation 0 ft – 0 in
- 2.4.29 24590-PTF-DD-S13T-00024, Pretreatment Facility Structural Concrete Embedments Plan EL. 0'-0" SH2

- 2.4.30 24590-PTF-DD-S13T-00036, Pretreatment Facility Structural Concrete Embedments EL. 0'-0" Vessels SH 1
- 2.4.31 24590-PTF-DD-S13T-00039, Pretreatment Facility Structural Concrete Embedments EL. 0'-0" Vessels SH 2
- 2.4.32 24590-PTF-DD-S13T-00044, Pretreatment Facility Structural Concrete Embedment Details EL 0 ft – 0 in Vessels Sh 3
- 2.4.33 24590-PTF-MJD-PIH-00001, Mechanical Handling Data Sheet for Overhead Mast Power Manipulator
- 2.4.34 24590-PTF-M0-PIH-00008, Pretreatment System PIH Design Proposal Drawing 30 Ton Capacity Lifting Hook
- 2.4.35 24590-WTP-M0-M10T-00012001, WTP Vitrification Facility Design Proposal Drawing Remote Impact Wrench
- 2.4.36 24590-WTP-M61-P23T-00056, WTP Details Lower Holder Bottom Outlet Electrical Connector 2"
- 2.4.37 24590-PTF-DD-S13T-00023, Pretreatment Facility Structural Concrete Embedments Plan El. 0'-0" Sh 1
- 2.4.38 24590-PTF-SS-S15T-00033, Pretreatment Facility Structural Steel Framing Floor Plan 56'-0" SH 2
- 2.4.39 24590-PTF-SS-S15T-00311, Pretreatment Facility Structural Misc Support Steel El. 0'-0" Plan Sh 1
- 2.4.40 24590-PTF-SS-S15T-00312, Pretreatment Facility Structural Misc Support Steel El. 0'-0" Plan Sh 2
- 2.4.41 24590-WTP-PW-P30T-00001, WTP End Prep Detail for Field Butt Welds
- 2.4.42 24590-WTP-M0-50-00016, WTP Remote Fasteners
- 2.4.43 24590-WTP-M61-P23T-00057, WTP Assembly Lower Holder Electrical Connector 2 Inch.
- 2.4.44 24590-WTP-M61-P23T-00005, WTP Details - Nozzles PUREX Male Connector 1", 2", 3", 4"
- 2.4.45 24590-WTP-M61N-P23T-00006, Nozzles PUREX Connector 1", 2", 3", 4"
- 2.4.46 24590-WTP-M61-P23T-00040, WTP Details - Kickoff Plates PUREX Connector 1", 2", 3", 4"

3 Design Requirements

3.1 General

- 3.1.1 As Low As Reasonably Achievable (ALARA) principles shall be factored into the design and maintenance of the evaporator system per 10 CFR 835, *Occupational Radiation Protection*.
- 3.1.2 Unless otherwise specified, the evaporator system shall be designed and fabricated per applicable documents listed in section 2.0 of this specification, and the data sheets in section 2 of the MR. No changes, substitutions, or deviations shall be made without Buyer's concurrence.
- 3.1.3 The evaporator system design shall comply with the requirements stipulated in this specification. Seller shall conform with Buyer's requirements for hot cell wall penetrations, recirculation piping/jumper configuration, layout, and dimensions. Seller shall confirm locations for all evaporator equipment are adequate for system functionality. Seller shall submit any variances to these requirements during design review stage for concurrence.
- 3.1.4 The evaporator piping and instrumentation sketches provided in the Section 2 of the MR illustrate the conceptual piping and instrument control of the evaporator system. All evaporator system components shall have adequate control features to bring evaporator operations to a safe and stable 'shutdown' condition during an abnormal event. Seller's control design philosophy can differ from Buyer's conceptual control; however, the Seller's control system design shall conform to Buyer's specification 24590-WTP-3PS-JQ07-T0001.
- 3.1.5 General Arrangement drawings should be used to convey approximate equipment locations for skids.
- 3.1.6 The Seller shall be responsible for the evaporator system design including component specification such as design parameters, sizing and environmental protection (temperature, humidity, etc.) as required.
- 3.1.7 Deleted.
- 3.1.8 All heat exchangers including the reboiler and condensers shall comply with ASME section VIII and TEMA standard, Class B. "Code Stamp & National Board Registration" shall be provided for all Seller's provided heat exchangers.
- 3.1.9 Seller shall comply with nozzle loading requirements specified in the 24590-WTP-3PS-MV00-T0001, *Engineering Specification for Pressure Vessel Design and Fabrication* for vessels. Recirculation pump allowable nozzle loading shall comply with API 610.
- 3.1.10 Gusset plates cannot be utilized to accommodate the required nozzle loading on safety class vessels and heat exchangers.

- 3.1.11 The equipment shall be designed such that personnel sound level exposure outside of R5/C5 area shall not exceed 85 dBA. Seller shall clearly state how the specified sound level limit will be met.
- 3.1.12 All calculations, modeling, analyses, drawings, and documentation shall utilize U.S. customary units.
- 3.1.13 Design of the evaporator systems shall incorporate the latest and best-proven technology, components, and materials for the required service conditions and performance.
- 3.1.14 The evaporator system model analysis, thermal analysis, design analysis, and seismic analysis shall be verified such that the final system, equipment and component design meet the requirements of this specification as well as its addenda and attachments.
- 3.1.15 Evaporator system equipment shall be furnished as discrete skid mounted units that are ready to integrate with the Buyer's structures, systems, and components.
- 3.1.16 The evaporator system shall utilize common component types and equipment manufacturers as applicable.
- 3.1.17 The evaporator system operates on a batch-wise process continuously. The evaporator system shall be designed in accordance with following feed conditions:
- Design CXP eluate feed flow of 6.9 to 10 gpm (non-constant feed rate)
 - Design feed temperature of 77 °F
 - Eluate feed pH of 0 - 9
 - Eluate feed cycle duration (range: 18 – 25 hours, every 33 hours)
- 3.1.18 Design cooling water temperature of 75 °F shall be used for designing/sizing all condensers.
- 3.1.19 Evaporator systems and components should be designed to prevent the migration of contamination into the utility / reagent systems.
- 3.1.20 Human factors and ergonomics shall be designed into all evaporator equipment requiring manual operations per IEEE Std 1023, *IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations*.
- 3.1.21 Quality level, seismic category, materials of construction, design pressure, and design temperature shall be in accordance with the data sheets in section 2 of the MR. If a change to the requirements for materials and/or the equipment types to be used during the execution of the contract is dictated because of design analyses, then the Seller is required to provide Buyer its recommendation for review and concurrence prior to incorporation into the design of the evaporator systems.

- 3.1.22 All equipment in the evaporator system requiring maintenance or removal shall have flushing and draining capability to facilitate decontamination. Design features shall minimize the need for decontamination by including sloping features, replacing sharp bends with gradual bends, etc. where practical, consistent with ALARA practices.
- 3.1.23 Provision for temperature instrumentation shall be jumper nozzles incorporating the required thermowell details.
- 3.1.24 Nozzle and flange alignment shall be within ± 0.5 degrees of nominal design specifications.
- 3.1.25 Jumper nozzle connections shall be included in the evaporator system to interface with the Buyer supplied jumpers.
- 3.1.26 **Deleted**
- 3.1.27 Seller's reboiler frame design shall not protrude into the crane path.
- 3.1.28 The hub type (remote clamp) connectors and PUREX nozzles are the only government-furnished equipment, which will be sent to Seller for installation. Buyer will provide Seller hydro test blanks for the remote clamp connectors (Grayloc) and the remote PUREX and other connectors for installation on the axial flow pump and reboiler.
- 3.1.29 Nozzles for the reboiler and support frame assembly are to be designed to maintain positional tolerance during operational loading conditions and maintain structural integrity during and after a DBE.
- 3.1.30 All adjustable speed drives for pumps can be designed for non-radiation environment.
- 3.1.31 Seller's fabrication drawings shall be used as the document of record for fabrication of the components. Seller's specification drawings are not required to be revised and maintained in total agreement with approved fabrication drawings.
- 3.1.32 Regarding Buyer's specification 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packing, Handling, and Storage requirements*, the center of gravity and sling points are not needed for the separator vessel support tower because awkward hollow parts do not allow a meaningful center of gravity to be determined or designed. Multiple sling configurations are possible to affect a successful lift and should be at the discretion of site construction supervisor.
- 3.1.33 Seller shall provide the evaporator system in the skids for ease of transportation, installation, and replacement. Seller is responsible for equipment skid sizing and layout to fit Buyer's facility. For the baseline design, the evaporator system will comprise the following skids:
- Separator vessel skid
 - Reboiler skid inclusive of reboiler
 - Rectifier skid inclusive of rectifier

- Condenser skid which includes steam ejectors, primary, inter, and after-condensers
- Steam conditioning system which includes a pressure reducing valve and control and a desuperheater

3.2 Basic Function

The Cesium Nitric Acid Recovery System (CNP) supports the Cesium Ion Exchange System (CXP) and must be available at all times to maintain the CXP system in a continuous operation to maintain LAW throughput. The design CXP loading cycle is 33 hours. In order to have continuous processing of LAW the complete regeneration of a Cs ion exchange (IX) resin bed must be completed in under 33 hours. A regeneration of a resin bed requires multiple steps, of which elution and post elution rinse are sent to the CNP system for evaporation. The CNP system will maintain a constant volume of eluant for each regeneration step, thus the volume of rinse water sent to the CNP system must be disposed of to the PWD system. The PWD vessels are located at the 0 foot elevation and are approximately 45.5 ft high. The separator vessel is initially charged with a 5M to 8M HNO₃ solution in order to attain the correct vapor liquid equilibrium to recover a 0.5M HNO₃ rectifier bottoms product to be re-used in the CXP system as eluant. The recovered eluant vessel, which receives the rectifier bottoms product, is located on the 0 foot elevation. The vessel has a liquid operating level of approximately 15.3 ft at a maximum, however the level will cycle through the elution and rinse steps. The change in volume depends on the rinse volume used in the IX system. The volume of eluant and rinse will be provided as input to the CNP system each cycle.

The CNP system will receive and concentrate multiple eluate batches until a specified density is met which correlates to a specific solubility limit. Once the specified density is met, the system is shut down and the concentrate is transferred out of the system. A fresh charge volume of nitric acid is then added to the evaporator system and the process restarted.

The control for the evaporator system should allow for the system to be fully automated, receiving inputs from the CXP system for the eluate flow rates and volumes that will be received, and initiation of receipt and standby modes of operation. The CNP system will require automated control during possible upset conditions to ensure a safe working environment is maintained for workers and the public and that the environment is protected.

3.3 Performance

- 3.3.1 The evaporator system shall be capable of continuous operation while achieving a process boil off rate ranging from 6.9 to 10 gpm. All water/fluid addition to demister pads spray, and reflux via the rectifier separation trays and primary condenser shall be in addition to the evaporation rate.
- 3.3.2 The evaporator system shall have the ability to be placed on "total reflux" mode.
- 3.3.3 The evaporator system shall be capable of transferring from a cold shutdown state to a hot standby state in under 4 hours.
- 3.3.4 The evaporator system shall require a hot standby mode to accommodate receiving an initial 5-8 M HNO₃ charge (preliminary estimate of 4300 gallons as appropriate), an elution batch (6200 gallons) and rinse water feed (1200 gallons) for 18 to 25 hours every 33 hours.

- 3.3.5 The evaporator system shall maintain constant recovered eluant working volumes; excess water & nitric acid is to be purged from the system as a rectifier overhead product.
- 3.3.6 Evaporator system operating parameters shall minimize reboiler fouling by using low differential temperature and high tube velocity to the extent practical in the design.
- 3.3.7 The evaporator system shall be able to cool concentrate to a temperature, which will allow for transfer with a steam-emptying ejector. This should be performed by pulling a stronger vacuum on the system.
- 3.3.8 The evaporator system shall produce a maximum concentrated waste specific gravity of 1.37 (for NaNO_3 at 80% of its solubility limit), which is exclusive of any solids present in the waste.
- 3.3.9 The evaporator system shall produce a rectifier bottoms product of 0.5 M HNO_3 .
- 3.3.10 All evaporator system components within the R5/C5 black cell (except the demister pads) shall be nonreplaceable components with a design life of 40 years. The reboilers and recirculation pump in the R5/C5 hot cell shall be remotely replaceable.

3.4 Design Conditions

3.4.1 General

- 3.4.1.1 For nominal conditions refer to Appendix A and Appendix B for the evaporator stream data and simplified thru-put flow diagram, respectively. Appendix C provides data that defines the system performance operating conditions and requirements.
- 3.4.1.2 All equipment skids shall meet applicable Department of Transportation (DOT) requirements for road transportation per 49 CFR 173.

3.4.2 Physical Constraints/Interfaces

- 3.4.2.1 The evaporator separator vessel (CNP-EVAP-00001) with demister pads shall be located in the R5/C5 black cell, room P-0112 on the 0-ft floor elevation. The demister pad assembly shall be accessed through a sealed, shielded aperture in the 56 ft floor (10-ft diameter maximum).
- 3.4.2.2 The Reboiler and recirculation pump shall be located in the R5/C5 hot cell, room P-0123 on the 0-ft floor elevation. The reboiler assembly (including the residual process fluids left inside reboiler after flushing and draining) shall not weigh more than 25 tons including all lifting fixtures and lifting beams. The available space for the reboiler (excluding nozzles) has dimensions of 4 ft diameter by 15 ft high. All equipment assembly must fit through a 13 ft by 13

ft air lock door while supported by buyer-supplied cart and shall not exceed 21 ft length.

- 3.4.2.3 The evaporator primary condenser (CNP-HX-00002) and secondary condenser system (CNP-HX-00003, -00004, and CNP-EJCTR-00009A/B, -00010A/B) shall be designed to fit on the 77-ft floor elevation.
- 3.4.2.4 The rectifier (CNP-DISTC-00001) shall be designed to fit on the 56-ft floor elevation.

3.4.3 Buyer Supplied Utilities

Values for all utility supply pressures and temperatures are nominal values.

- 3.4.3.1 Plant service air and instrument air will be supplied at approximately 100 psig and 65 °F.
- 3.4.3.2 **Deleted**
- 3.4.3.3 **High pressure steam supply conditions:**
 - 3.4.3.3.1 **Minimum operating condition: 110 psig @ 344°F**
 - 3.4.3.3.2 **Normal operating condition: 118 psig @ 349°F**
 - 3.4.3.3.3 **Maximum operating condition: 135 psig @ 358°F**
 - 3.4.3.3.4 **Design condition: 163 psig @ 372°F**
- 3.4.3.4 Cooling water will be supplied at approximately 45 psig and 75 °F with a peak summer maximum of 83 °F. The cooling water temperature of 75 °F is valid for 85 % of the time through a year.
- 3.4.3.5 Demineralized water will be supplied at approximately 72.5 psig and 75 °F for demister pad and separation tray spray in the event that sufficient process condensate is unavailable.
- 3.4.3.6 Water, 5 M nitric acid at approximately 75 psig and 77 °F, or up to 50 % wt caustic (2 M to 5 M typically) at approximately 75 psig and 77 °F can be supplied for the Seller's flushing system.

3.5 Environmental Conditions

3.5.1 Storage

Prior to installation, the evaporator system may be stored outdoors at ambient temperature extremes ranging from -30 °F dry-bulb to 117 °F dry-bulb and with a relative humidity of 0-100 %.

3.5.2 Evaporator Separator Vessel

The separator vessel (CNP-EVAP-00001) will be installed indoors in an R5/C5 black cell maintained between 59 to 113 °F dry-bulb temperature during normal operation. Radiation exposure for the separator vessel will be 1,000 Rad/hr or more.

3.5.3 Reboiler and Recirculation Pump

The reboiler (CNP-HX-00001) and recirculation pump (CNP-PMP-00001) will be installed indoors in an R5/C5 hot cell maintained between 59 to 113 °F dry-bulb temperature during normal operation. Radiation exposure will be 1,000 Rad/hr or more.

3.5.4 Primary and secondary condensers

The primary condenser (CNP-HX-00002) and secondary condensers (CNP-HX-00003, -00004, CNP-EJCTR-00009A/B, -00010A/B), and process condensate pump (CNP-PMP-00002) will be installed indoors in an R3/C3 area maintained between 59 to 113 °F dry-bulb temperature during normal operation. Radiation exposure will be 2.5 mRad/hr or less during normal operation.

3.5.5 Rectifier

The rectifier (CNP-DISTC-00001) will be installed indoors in an R5/R3/C3 area. The R5/R3/C3 areas are maintained between 59 to 113 °F dry-bulb temperature during normal operation. Radiation exposure will be 1000 Rad/hr.

3.6 Recirculation Pump

- 3.6.1 For recirculation pump requirements, refer to individual MDS in section 2 of the MR.
- 3.6.2 The recirculation pump shall be axial-flow type mounted vertically in an elbow of the recirculation loop. The remote handling structural support requirements for the recirculation pump will be provided by the Buyer.
- 3.6.3 The recirculation pump shall be provided with a pump motor and an adjustable speed drive (ASD). Motors shall be provided with radiation resistant insulation, rated for 10^9 Total Integrated Dose (TID) rad (gamma). The ASD shall be compliant with specification *24590-WTP-3PS-EVV1-T0001, Engineering Specification for LAW Voltage Adjustable Speed Drives* and specification *24590-WTP-3PS-MUMI-T0002, Engineering Specification for Low Voltage Induction Motors*.
- 3.6.4 The recirculation pump shall have dual mechanical seals that will be lubricated/flushed with water. Flush piping will be based on API Plan 53. Seller shall coordinate with Buyer for details.
- 3.6.5 Inlet and outlet pipe ends of the recirculation pumps shall be butt welded to Buyer's supplied jumper nozzle flanges at the Seller's facility.

- 3.6.6 Pump nozzle loading shall comply with API 610.
- 3.6.7 The recirculation pump nozzle locations shall be within (\pm) 1/4-inch tolerance. However, the tolerance measurement device shall have a minimum of 1/1000-inch accuracy.
- 3.6.8 Deleted.
- 3.6.9 The recirculation pump shall be designed with the following features to ensure ease of process operating with a long expected mechanical lifetime:
- Low operating speed, high flow, and low head process conditions.
 - Low casing fluid velocity to minimize wear on the casing.
 - Top mounted motor and vertical removal design for easy crane access.
 - The recirculation pump motor, impeller, shafting, and seals shall be remotely removable as one unit by using a single crane hook and crane mounted impact wrench with CCTV cameras.
- 3.6.10 The recirculation pump shall be designed for the following operating conditions. All fluid properties are referenced at 77 °F.
- (Seller provided flow rate gpm)
 - (Seller provided viscosity cP)
 - 1.0 to 1.37 SG
 - 59 to 140 °F

3.7 Reboiler

- 3.7.1 For reboiler requirements, refer to individual MDS in section 2 of the MR.
- 3.7.2 The reboiler shall be designed in accordance with Buyer's specification 24590-WTP-3PS-MES0-T0001, *Specification for Shell and Tube Heat Exchangers*.
- 3.7.3 The reboiler (CNP-HX-00001) shall be of all welded construction on both tube and shell sides.
- 3.7.4 Reboiler tubes shall be seamless and welded to the tubesheet(s) with full strength welds. The tubes shall include a corrosion allowance of 0.04 inch for the process side.
- 3.7.5 The reboiler shall be capable of sustaining a process evaporation rate of 6.9 to 10 gpm plus demister spray.
- 3.7.6 Reboiler process fluid velocity shall be greater than 4.0 ft/sec and not exceed 10 ft/sec.
- 3.7.7 The reboiler shall be designed for remote installation and replacement as one unit.
- 3.7.8 Deleted.

- 3.7.9 The maximum dimensions for the reboiler shall be 4 ft diameter and 15 ft height. The reboiler design shall be a U-tube heat exchanger with side bottom process fluid inlet and outlet.
- 3.7.10 The reboiler process fluid inlet and outlet nozzle diameters shall be 14 inches. Inlet and outlet pipe ends of the reboiler shall be butt welded to Buyer's supplied jumper nozzle flanges at the Seller's facility.
- 3.7.11 Deleted.
- 3.7.12 The reboiler nozzle locations and support frame dimensions shall be within (\pm) 1/4-inch diametric tolerance from a master dowel defined by the Buyer. Nozzles shall be perpendicular/parallel within 0.5 degrees or 1/4 inch whichever is smaller relative to the datum formed by the lower base plate of the reboiler and support frame assembly. The tolerance measurement device shall have a minimum of 1/1000-inch accuracy. Seller shall supply as built nozzle locations as soon as possible to facilitate the Fabrication of the Buyer's Jumpers.
- 3.7.13 The Seller is responsible for providing a steam-conditioning skid. The skid will include a pressure reducing valve and control and a desuperheater to produce Seller's specified saturated pressure steam for reboiler operation.
- 3.7.14 Deleted.
- 3.7.15 The reboiler shall be designed such that the static pressure of the process fluid above the reboiler is sufficient to suppress the boiling in the reboiler tubes. Boiling shall occur only near or at the liquid surface in the evaporator separator vessel.
- 3.7.16 The temperature rise of the process fluid as it passes through the reboiler shall be approximately 2 – 4 °F design basis to minimize the potential for tube fouling.
- 3.7.17 Reboiler will be installed without insulation. Reboiler duty and steam demand calculations shall include heat loss from all reboiler surfaces without insulation.
- 3.7.18 The reboiler and support frame assembly shall be designed for remote installation and replacement as one unit.
- 3.7.19 The reboiler and support frame assembly shall be transported horizontally into the hotcell staging area on a transporter skid at which it will be maneuvered to a vertical orientation for installation.
- 3.7.20 Seller shall comply with nozzle loading requirements specified in **Appendix J of this specification.**

3.8 Evaporator Separator Vessel

- 3.8.1 For separator vessel requirements, refer to individual MDS in section 2 of the MR.

- 3.8.2 The separator vessel shall be designed in accordance with Buyer's specification 24590-WTP-3PS-MV00-T0001, *Specification for Pressure Vessel Design and Fabrication*.
- 3.8.3 The separator vessel shall be designed to maximize liquid – vapor separation and to achieve a 10-gpm-evaporation rate plus any excess fluid for demister spray.
- 3.8.4 The separator vessel shall incorporate nozzle connections for temperature (including thermowells), pressure, level, and density instrumentation as required. The Seller shall propose reliable measurement instrumentation for Buyer to review.
- 3.8.5 Seller shall comply with nozzle loading requirements for vessels/reboilers specified in **Appendix J of this specification**
- 3.8.6 The top section of the separator vessel shall incorporate lateral guides to the 56 ft floor and black cell walls to minimize horizontal forces and base overturning moments during a seismic event.
- 3.8.7 The centerline elevation of the separator vessel offgas nozzles shall be no higher than 47 ft-0 inch plant elevation.
- 3.8.8 The separator vessel head shall be removable for access to the demister pads section.
- 3.8.9 The separator vessel shall incorporate a 2-inch inlet nozzle to supply sufficient dilution air to negate hydrogen buildup.
- 3.8.10 Spray nozzles shall be provided to allow nitric acid cleaning of the demister mesh. The placement of spray nozzles shall accommodate demister section removal and not hinder maintenance operations.
- 3.8.11 A spray pipe with nozzles located below the lower demister pad shall be provided to spray demin water or recycled condensate into the steam flow to assist in mesh performance.
- 3.8.12 To improve demister efficiency and facilitate decontamination, the demister pad shall be sprayed from above and below with recycled condensate or 5 M nitric acid from a spray control system located at the 56 ft elevation.
- 3.8.13 Differential pressure across a series of separation trays and the demisters pad section shall not significantly elevate boiling point.
- 3.8.14 All nozzle connection points shall be provided clear and below any surrounding floor structural steel at 56 ft plant elevation.

3.9 Rectifier

- 3.9.1 For rectifier requirements, refer to individual MDS in section 2 of the MR.

- 3.9.2 The rectifier shall be designed in accordance with Buyer's specification 24590-WTP-3PS-MES0-T0001, *Specification for Shell and Tube Heat Exchangers*.
- 3.9.3 The rectifier shall incorporate nozzle connections, which allow for rinsing and decontamination with process condensate, nitric acid, or sodium hydroxide.
- 3.9.4 The rectifier shall be equipped with piped vents.
- 3.9.5 Seller shall comply with nozzle loading requirements specified in **Appendix J of this specification**

3.10 Primary Condenser

- 3.10.1 For primary condenser requirements, refer to individual MDS in section 2 of the MR.
- 3.10.2 The primary condenser shall be designed in accordance with Buyer's specification 24590-WTP-3PS-MES0-T0001, *Specification for Shell and Tube Heat Exchangers*.
- 3.10.3 The primary condenser (CNP-HX-00002) shall be of all welded construction on the process fluid side. Tubes shall be welded to the tubesheet(s) with full strength welds.
- 3.10.4 Deleted.
- 3.10.5 The condenser shall be designed with hinged bonnets to allow isolation of leaking tubes utilizing contact maintenance techniques.
- 3.10.6 The condenser shall be designed for retubing as part of the maintenance strategy.
- 3.10.7 The condenser shall be designed to maximize vapor condensation from the offgas streams at a nominal rate of at least 10 gpm plus any excess fluid for demisters.
- 3.10.8 Average cooling water temperature rise of 18 °F shall be used for condenser design.
- 3.10.9 Cooling water (tube side) pressure must exceed the process vapor (shell side) pressure.
- 3.10.10 The primary condenser shall be compatible with process condensate that has a pH of 0 to 9, and a temperature of 240 °F (In the event of Rectifier failure). It shall also be compatible with 5 M nitric acid used for washing and decontamination.
- 3.10.11 The primary condenser will be installed without insulation. The primary condenser duty and cooling water demand calculations shall include heat gain from all primary condenser surfaces without insulation.
- 3.10.12 Seller shall comply with nozzle loading requirements specified in **Appendix J of this specification**

- 3.10.13 A pump shall be incorporated into the primary condenser and secondary condenser system to remove discharged process condensate.
- 3.10.14 The process condensate pump shall be designed in accordance with Buyer's specification 24590-WTP-3PS-MPC0-T0002, *Specification for General Centrifugal Pumps to Meet Requirements of ASME B73.1M-1991 and ASME B73.2M 1991 for Commercial (CM) Components.*

3.11 Secondary Condenser System

- 3.11.1 The secondary condenser system shall consist of an inter-condenser, after-condenser, and four steam ejectors. For secondary condenser system requirements, refer to individual MDS in section 2 of the MR.
- 3.11.2 The inter-condenser and after-condenser shall be designed in accordance with Buyer's specification 24590-WTP-3PS-MES0-T0001, *Specification for Shell and Tube Heat Exchangers.*
- 3.11.3 Deleted.
- 3.11.4 The inter-condenser and after-condenser shall be of all welded construction on the process fluid side. Tubes shall be welded to the tubesheet(s) with full strength welds.
- 3.11.5 Deleted.
- 3.11.6 The evaporator separator vessel pressure shall be maintained by a two-stage vacuum ejector system. The first stage shall maintain a vacuum on the primary condenser and consists of a steam ejector, air in-bleed control valve, and an inter-condenser. The vapor discharged from the inter-condenser enters the second stage of the vacuum system. The second stage shall consist of a second steam ejector and an after-condenser.
- 3.11.7 The secondary condenser system shall provide capability for operating at a vacuum as low as achievable.
- 3.11.8 The two-stage vacuum system shall be designed to control the separator vessel pressure at 1.45 psia and pull a strong enough vacuum to cool evaporator contents adequately to transfer contents with a steam ejector.
- 3.11.9 The desired vacuum within the separator vessel shall be controlled by the air in-bleed into the suction of the 1st stage vacuum ejector.
- 3.11.10 Process condensate from each condenser shall be hydraulically connected to the process condensate vessel.
- 3.11.11 All components of the condenser skid will be installed without insulation. The duty, cooling water demand, and steam demand calculations shall include heat loss from all surfaces without insulation.
- 3.11.12 Cooling water pressure must exceed the process vapor pressure.

- 3.11.13 Seller shall comply with nozzle loading requirements specified in **Appendix J of this specification**

3.12 Reboiler Condensate Transfer Station (RCTS)

- 3.12.1 The Seller shall supply a RCTS, which collects steam condensate drained from the reboiler.
- 3.12.2 The RCTS shall be designed to support continuous steady state operation in maintaining nominal operating level while receiving and supplying steam condensate to the steam-conditioning skid and to a condensate receipt vessel.
- 3.12.3 The reboiler condensate vessel (RCV) shall be designed in accordance with Specification 24590-WTP-3PS-MV00-T0001, *Specification for Pressure Vessel Design and Fabrication*.
- 3.12.4 The RCV shall comply with nozzle loading requirements specified in Buyer's specification 24590-WTP-3PS-MV00-T0001, *Specification for Pressure Vessel Design and Fabrication*.
- 3.12.5 The RCV design and configuration shall support installation of differential pressure level instrumentation and associated flanged "direct connect" diaphragm seal pressure transmitters.
- 3.12.6 The RCV shall be a vertical oriented vessel constructed of 304L stainless steel with a capacity of 225 gallons.
- 3.12.7 The RCV shall be designed to be attached to a mounting ring which will be installed using anchor bolts.
- 3.12.8 The RCV shall be designed to support a minimum operating volume of 80 gallons.
- 3.12.9 The condensate transfer pumps (CTP) shall be vertical turbine pumps with a bypass valve to limit the pump discharge pressure allowing prevention of motor overload. The pumps along with their motors shall be mounted on the transfer station.
- 3.12.10 API Plan 11 single mechanical seals shall be incorporated in each CTP.
- 3.12.11 The CTP's shall be designed to comply with pump nozzle loading requirements specified in API 610.
- 3.12.12 The CTP's and accessories shall be made of 300 series stainless steel. The pump materials of construction for wetted parts shall be cast high alloy steel 316 SS.
- 3.12.13 **A 2-inch nozzle on the side of each reboiler steam condensate vessel shall be provided for an additional condensate drain from the reboiler steam conditioning system desuperheater to function. Location of the 2-inch inlet drain nozzle is provided in Appendix K.**

3.13 Mechanical Handling Requirements

- 3.13.1 Equipment located in the R5/C5 hot cell shall be designed in accordance with Buyer's specification 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design & Manufacture*.
- 3.13.2 Seller designed equipment shall incorporate jumper connector nozzles to facilitate process, utility, instrument, and power connections to the Buyer supplied jumpers and systems.
- 3.13.3 The reboiler and recirculation pump shall incorporate jumper nozzles for process pipework (e.g., pump suction and discharge connections, utilities, instrumentation, and power, as required).
- 3.13.4 Seller shall identify all interface points for systems requiring connection to the Buyer's process piping, jumpers, and utility systems.
- 3.13.5 The nozzle tolerance requirements for reboiler and recirculation pumps in the R5/C5 hot cell shall be $\pm 1/4$ inch for location and $\pm 1/2^\circ$ for angular tilt. The nozzle tolerance measurement device shall have a minimum of $\pm 1/1000$ -inch accuracy. The Buyer's jumpers shall be built to as-built dimensions (x, y, z, and angular tilt) and replaced with equipment as necessary.
- 3.13.6 Deleted.
- 3.13.7 Deleted.

3.14 Loadings

- 3.14.1 The evaporator equipment assemblies shall be self-supporting, capable of carrying the static loads of components, and capable of handling stresses imposed during shipment, installation, operation and an earthquake.
- 3.14.2 Loads to be considered for the structural design of evaporator vessel, equipment, and components shall be in accordance with applicable codes, standards, and reference documents listed in section 2 of this specification.
- 3.14.3 All support structures with SC-I and SC-II designation shall be seismically analyzed with provided ISRS curves **as specified in Appendix J** and qualified in accordance with AISC N690.
- 3.14.4 All support structures with SC-III and SC-IV designation shall be seismically analyzed and qualified in accordance with the AISC ASD and UBC zone 2B.
- 3.14.5 Seller shall complete a seismic analysis of the evaporator package designs, including skids, and skid anchorage, equipment and pressure vessel anchorage, piping anchorage. Loadings shall be calculated in accordance with the appropriate requirements of Buyer's specifications 24590-WTP-3PS-SS90-T0001, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks, and 24590-WTP-3PS-FB01-T0001, Structural Design Loads for Seismic Category III & IV Equipment and Tanks. Analysis shall show

that the evaporator system and components are capable of withstanding seismic loadings.

- 3.14.6 The separator vessel, heat exchangers, and rectifier shall be seismically analyzed and qualified by the Seller per Buyer's specification 24590-WTP-3PS-MV00-T0002, *Engineering Specification for Seismic Qualification Criteria for Pressure Vessels*, Buyer's specification 24590-WTP-3PS-MV00-T0001, *Specification for Pressure Vessel Design and Fabrication*.
- 3.14.7 The Seller shall perform thermal and static stress analyses for all evaporator structures, systems, and components.
- 3.14.8 Except for the reboiler and recirculation pump, all equipment skids shall be designed for a maximum floor loading of 160 lbs/ft². Refer to drawings in section 2.4 for structural concrete embed details.
- 3.14.9 The embed location for the reboiler is detailed on drawings in section 2.4. Each embed has a support post which connects to the PEP. To avoid displacement in skid under the heavy reboiler weight, reboiler frame shall rest upon support posts with the embeds underneath. These embeds are type "D" which have been designed for ultimate compressive strength of 100 kips.
- 3.14.10 The flow meter unit of the CNP steam conditioning skid is SC-III and may not be qualified at the accelerations defined in the Buyer's specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks, and 24590-WTP-3PS-FB01-T0001. Equivalent test can be performed and considered successful if there is no physical damage to the instrument. For the equivalent test, the flow meter units will undergo a frequency sweep (0 to 500 Hz) to determine their resonant frequency. Once the resonant frequency is determined, the units are tested at 1 g vertical and then 1 g horizontal for a period of twenty minutes each, all while being excited at the resonant frequency.

3.15 Electrical Requirements

- 3.15.1 The electric motor drive shall conform to the requirements set forth in Buyer's specification 24590-WTP-3PS-EVV1-T0001, *Engineering Specification for Low Voltage Adjustable Speed Drives*.
- 3.15.2 The recirculation pump motor shall conform to the requirements set forth in Buyer's specification 24590-WTP-3PS-MUMI-T0002, *Engineering Specification for Low Voltage Induction Motors*.
- 3.15.3 Seller shall comply with the requirements set forth in Buyer's specification 24590-WTP-3PS-EKP0-T0001, *Engineering Specification for Electrical Requirements for Packaged Equipment*.

3.16 Instrumentation and Control Requirements

3.16.1 General

- 3.16.1.1 All controls, control systems, control panels, alarm systems, analyzers, instrumentation, and their installation into the evaporator system shall conform to the requirements set forth in Buyer's specification 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems*.
- 3.16.1.2 The Seller shall provide completed Buyer's instrument data sheets. The Buyer will use this information for procurement and installation of required instrumentation.
- 3.16.1.3 The Seller shall provide functional test set points and recommended operating set points with the packaged systems.
- 3.16.1.4 The Seller shall provide a control philosophy, which shall consist of the control loop definitions, system interlocks, alarms, and control philosophy.
- 3.16.1.5 The Buyer will use the Seller's control philosophies and logic narratives to provide the logic programming which will integrate the Seller's control requirements into the Buyer's overall control system.
- 3.16.1.6 Deleted.
- 3.16.1.7 The following table describes the work processes and the division of the responsibilities:

	Buyer's Responsibility	Seller's Responsibility
Blank Instrument Data Sheet	•	
Complete Instrument Data Sheet	*	•
Instrument Installation Details	•	
Instrumentation Procurement	•	
Instrumentation Installation	•	
Functional Test Set Points		•
Operating Set Points		•
Control Philosophies		•
Software Requirements Specification	•	
Logic Programming	•	
DCS Hardware	•	

*Buyer will provide, Seller will complete

3.16.2 Other

The Seller shall provide accuracy requirements of the measured range of instrumentation as specified in Buyer's specification 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems*.

3.17 Lifting Requirements

- 3.17.1 Seller shall identify the weight and center of gravity of each equipment skid.
- 3.17.2 Seller shall provide yokes for the separator vessel, reboiler, and recirculation pump for installation and remote maintenance. Each yoke will be made of structural steel except for components that directly contact Evaporator Equipment during lift; contact components shall be made of 304SS. The yokes shall be designed for balanced lifting and handling by a single hook crane. The yokes shall be designed in accordance with ANSI N14.6
- 3.17.3 All evaporator equipment and skids shall have lift points and attachment mechanism. Lifting bail design shall comply with proposal hook design.
- 3.17.4 All lifting attachments shall have either a safety factor of three (3), based on the material yield strength, or five (5), based on the material ultimate strength, whichever is more conservative. The lifting points shall have a label clearly identifying its safe working load. If forged bolts are used, they shall be used in accordance with ASME B18.15.
- 3.17.5 The reboiler and support assembly shall be designed for horizontal transportation in the hot cell. The reboiler and support assembly shall have tailing lug and tilt-up features for vertical installation with a 2-ton hoist for tailing operation.
- 3.17.6 The maximum hook height is 27 ft-6 in. The bottom of the reboiler, while in the vertical orientation, shall be above 5 ft-0 in.
- 3.17.7 The lifting lugs shall be designed to permit lifting the equipment skid without distortion or damage to the components of the equipment skid.
- 3.17.8 All lifting points shall be proof tested. Test and examination certificates shall be provided to the Buyer review.
- 3.17.9 The reboiler and support frame assembly shall be lift tested by the Seller to demonstrate proper vertical orientation using the Seller-supplied lifting fixture. This testing includes verification of all tilt up features. The reboiler shall be balanced after fabrication. Actual vertical lift (with vessel empty) shall not be more than 1/4 inch from true vertical. Permanent deflection or a change in the assembly alignment is unacceptable. The Seller shall notify the Buyer a minimum of 15 working days in advance of reboiler and support frame assembly lift test. The Buyer may send representatives to witness the inspections or perform an independent inspection.

3.18 Accessibility and Maintenance

3.18.1 General Maintenance Requirements

Accessibility and maintenance requirements shall be per this specification and its addenda and attachments.

3.18.2 R5/C5 Black Cell Equipment Maintenance Requirements

3.18.2.1 No equipment requiring maintenance, with the exception of demister pads, shall be located inside the R5/C5 black cell. The nonreplaceable 40-year life components shall include the separator vessel and all its internal parts (except demister pads) and their supporting structures/anchorage.

3.18.2.2 Demister pad assembly shall be remotely removable and replaceable through a 10-foot diameter opening from the 56-foot elevation floor, which is directly above the black cell. The demister pad, support, and frame shall be designed and fabricated such that they can be removed. The demister pad assembly design shall be installed as an integral unit. If the spray down mechanism's water connections are incorporated into the pad assembly, the connections shall utilize a quick disconnect type connection for the water source. Due to potential radiation and contamination concerns, viewing and removal of the of the demister pad will be accomplished with the top demister pad submerged approximately 6-inch below the water during the maintenance duration. Seller shall demonstrate and record on VHS format videotape demister pad removal and replacement in their shop test.

3.18.3 R5/C5 Hot Cell Equipment Maintenance Requirements

3.18.3.1 The reboiler and recirculation pump in the R5/C5 hot cell shall be designed to be remotely removable and replaceable.

3.18.3.2 The reboiler and support frame assembly and recirculation pump in R5/C5 hot cell shall be designed in accordance with the requirements stated within this specification.

3.18.3.3 The reboiler shall not weigh more than 25 tons, including all required lifting fixtures.

3.18.3.4 All fittings, pipe connections, electrical power, and control connections for equipment in R5/C5 hot cell shall be engineered on jumpers suitable for remote operation using a crane hook and crane mounted impact wrench, and/or power manipulator, see Ref. 2.4.41, with CCTV cameras.

3.18.3.5 The reboiler and recirculation pump shall be made suitable for remote operation utilizing features such as trunnions, guide pins, location dowels, captive bolts, and lead-ins on bolts, and be able to

be removed using a crane hook and crane mounted impact wrench with CCTV cameras. Refer to drawings in section 2.4 for remote impact wrench, crane, and hook details.

- 3.18.3.6 The use of shims to position the reboiler and support frame assembly or recirculation pump in the R5/C5 hot cell is not allowed. All surfaces shall be machined to locate equipment and support remote handling and replaceability.
- 3.18.3.7 Due to the requirement of a 12-foot reserved path for equipment removal in the hot cell, Seller shall comply with the location requirements for the reboiler and support frame assembly and recirculation pump as shown in sketches in Appendix F.
- 3.18.3.8 All services to or from the recirculation pump shall be provided using jumper connections.
- 3.18.3.9 The maximum height of any 2-inch hex nut (jumper connector), oriented vertically, is 24 ft-6 inches in plant elevation.
- 3.18.3.10 The maximum height of any 2-inch hex nut (jumper connector), oriented horizontally, is 25 ft-6 inches in plant elevation.
- 3.18.3.11 The maximum height of the 2-ton slewing hoist is 28 ft-6 inches.
- 3.18.3.12 The maximum height and hook approach of the 30-ton hook is distinctly different than the 2-ton hoist. Refer to the crane data sheet, 24590-PTF-MJD-PIH-00001 for details.
- 3.18.3.13 Hot Cell Equipment capable of disassembly in the Hot Cell via remote crane operations shall employ nut cups with tabs or alternate design with Buyer approval. See section 2 of the material requisition for details on remote fasteners.

4 Materials

4.1 Positive Material Identification

Refer to Buyer's specification 24590-WTP-3PS-G000-T0002, *Specification for Positive Material Identification (PMI)* for PMI requirements. Seller shall submit documentation of all PMI test results which show chemical properties and material classification.

4.2 Construction

- 4.2.1 Seller shall specify surface finish for all materials and submit to Buyer for review.

- 4.2.2 Seller shall maintain a record of ASTM numbers, material test reports, and manufacturer material certifications for materials used for construction of evaporator equipment/skids. Seller shall provide copies to the Buyer.
- 4.2.3 All stainless steel bolts and studs shall conform to ASTM F593.
- 4.2.4 All stainless steel nuts shall conform to ASTM F594.
- 4.2.5 Seller shall provide Material Safety Data Sheets (MSDSs) for all materials installed or used.
- 4.2.6 Process fluids may contain caustic solutions (50 wt % caustic), and 5 M nitric acid solutions may also be used for decontamination of the pipework, recirculation pump, valves, and instruments/instrument tubing.
- 4.2.7 All flanges and pipe fittings shall conform to ASME B31.3 1996 and be weld-neck and long radius type, respectively, unless otherwise specified. Flanges shall also be in accordance with ASME B16.5, and B16.47 Series A, as applicable.
- 4.2.8 No threaded flanges or fittings shall be used **in the black cell. Threaded flanges or fitting can be used for the condenser condensate centrifugal pump CNP-PMP-00002 since it is not located in a black cell.**
- 4.2.9 Certified material test reports shall be supplied for all alloy, stainless, and carbon steel construction materials that make up the separator vessel, distillation column, condensate collection vessel, heat exchangers, piping, and equipment skids.
- 4.2.10 Selection of materials for threaded components shall minimize galling. The Seller shall also consider different material selection, sleeving, etc., where practical.
- 4.2.11 All materials used in the construction of the evaporator equipment shall be new and unused. Where specific criteria are not provided, material section shall be determined by the Seller and have properties and composition suitable for the specific service conditions and consistent with this specification and its addenda and attachments.
- 4.2.12 The alternate ASTM editions can be used in place of the ASTM standards listed below on the date the purchase order went into effect.

Alternate Materials	Specified Materials
ASTM A182-98, A182-01	ASTM A182/A182M-99
ASTM A312-04	ASTM A312/A312M-00c
ASTM A403-95	ASTM A403/A403M-99
ASTM A403-99	ASME Section II Part A, 2001 Edition 2002 Addenda, SA-403 / ASTM A403-95

24590-PTF-3PS-MEVV-T0002, Rev. 4
Cesium Nitric Acid Recovery Forced Circulation Vacuum
Evaporator System

ASTM A182-98	ASME Section II Part A, 2001 Edition 2002 Addenda, SA-182 / ASTM A182-99
ASME 2001 Edition SA-312, 2003 Addenda SA-312 ASME 1995 Edition SA-312, 1995 Addenda SA-312	ASME Section II Part A, 2001 Edition 2002 Addenda, SA-312 / ASTM A312-00c
ASME 1998 Edition SA-240, 2003 Addenda SA-240 ASME 1997 Addenda SA-240	ASME Section II Part A, 2001 Edition 2002 Addenda, SA-240 / ASTM A240-97a
ASTM A240-00, -02, -03, -03c, - 04a	ASTM A240/A240M-03b
ASME SFA 5.22 Part C - 1995 Edition 1996 Addenda	ASME SFA 5.22, Section II, Part C 2001 Edition 2002 Addenda
ASTM A480-03c	ATM A480-03b
ASTM 554-98, -03	ASTM 554-98el
ASME SFA-5.9, SFA5.22 Sec III, Subsec NB, 1995 Edition, 1996 Addenda	ASME Code, Section II, 2001 Edition with 2002 Addenda (weld wire)
ASME A240-00, -03 /A240-01	ASME A240/A240M-03b

4.3 Vessels

Vessel materials shall conform to individual MDS in section 2 of the MR.

4.4 Pipework

Pipework material shall meet the piping material requirements in Buyer's specification 24590-WTP-3PS-P000-T0001, *Specification for Piping Material Classes*.

4.5 Prohibited Materials

- 4.5.1 Mercury and other low melting point metals, their alloys, or materials containing such metals as their basic constituents shall not be used in the construction of any components of the evaporator systems.
- 4.5.2 Molybdenum and halides shall not be used in direct contact with stainless steel.
- 4.5.3 Asbestos shall not be included in any component of the evaporator system.
- 4.5.4 Halide containing materials shall not be used in any component of the evaporator system.

4.5.5 “Teflon” or compounds thereof must be qualified for use with the radiation levels specified in this specification.

4.6 Storage of Special Materials (e.g., stainless steel) prior to work

4.6.1 The Seller shall meet the storage requirements in Buyer’s specification 24590-WTP-3PS-G000-T0003, *General Specification for Packaging, Handling, and Storage Requirements*.

4.6.2 Stainless steel is susceptible to corrosion caused by the contact and interaction with incompatible materials. All stainless steel material shall be stored in separate areas away from other materials.

5 Fabrication

The Seller shall obtain written Final Design Review from the Buyer prior to the start of fabrication activities.

5.1 General

5.1.1 Fabrication of vessels shall be performed in accordance with Buyer’s specification 24590-WTP-3PS-MV00-T0001, *Specification for Pressure Vessel Design and Fabrication*.

5.1.2 Fabrication of pipework shall be performed in accordance with Buyer’s specification 24590WTP-3PS-PS02-T0001, *Specification for Shop Fabrication of Piping*.

5.1.3 Deleted.

5.1.4 All fabrication shall be performed by personnel qualified in accordance with this specification and applicable documents in section 2 of this specification.

5.2 Welding

5.2.1 Seller shall develop detailed welding, weld inspection, NDE, and weld repair procedures for fabrication of the evaporator vessel, equipment, and structural supports. Seller shall submit them to the Buyer for review prior to fabrication. Procedures shall include acceptance criteria. The procedures shall conform to the following, as applicable:

- Buyer’s Specification 24590-WTP-3PS-SS00-T0002
- Buyer’s Specification 24590-WTP-3PS-NWP0-T0001
- Buyer’s Specification 24590-WTP-3PS-MVB2-T0001
- Buyer’s Specification 24590-WTP-3PS-SS00-T0001
- ASME Boiler and Press Vessel Code, section VIII, Div. 1
- ASME B31.3-1996
- AWS D1.6
- AWS D9.1

- 5.2.2 Welding, weld inspection, NDE, and weld repair shall be carried out in accordance with the applicable procedures developed per section 5.2.1 above.
- 5.2.3 Each procedure shall be prepared and qualified in accordance with the requirements of the listed specification and standards in 5.2.1 above or ASME section IX, whichever is more stringent.
- 5.2.4 Welder qualifications shall be performed in accordance with ASME section IX or AWS as required.
- 5.2.5 Personnel performing weld inspection shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, section VIII, Div. 1 and Buyer's specification 24590-WTP-3PS-SS00-T0002, *Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*.
- 5.2.6 Repairs required as a result of weld rejection by either the Buyer's or Seller's final inspection shall be fully documented in accordance with Seller's Quality Assurance Program (QAP). Weld repairs shall be performed in accordance with ASME Boiler and Pressure Vessel Code, section VIII. Weld repair records shall be included with Seller's quality verification document package to be submitted to Buyer.

6 Inspections and Examinations

6.1 Nondestructive Examinations

- 6.1.1 Unless otherwise specified, all vessel welds shall be inspected in accordance with the requirements outlined in the Buyer's specification 24590-WTP-3PS-MV00-T0001, *Specification for Pressure Vessel Design and Fabrication*.
- 6.1.2 Unless otherwise specified all pipework welds shall be inspected in accordance with the requirements outlined in Buyer's specification 24590-WTP-3PS-PS02-T0001, *Specification for Shop Fabrication of Piping*.

6.2 Dimensional Inspections

- 6.2.1 Refer to Buyer's specification 24590-WTP-3PS-PP00-T0002, *Specification for Dimensional Record Program*, for final dimensional measurement requirements. Third party validation of special dimensional inspection is not required.
- 6.2.2 Buyer's specification 24590-WTP-3PS-PP00-T0002, *Specification for Dimensional Record Program*, is applicable only to the recirculation pump and reboiler and support frame assembly and does not apply to any other components.
- 6.2.3 For the recirculation pump, a dimensional record is required for removable pump features that are not part of the process jumper. The process portion of the

recirculation pump will be installed in a jumper, and the jumper dimensional record will be performed by the Buyer.

- 6.2.4 For the reboiler, all remote connector nozzles shall be measured to precise as-built dimensions.
- 6.2.5 Seller shall furnish personnel to perform measurement activities.

6.3 Visual Weld Inspections

- 6.3.1 The Seller shall develop and implement a procedure to perform visual weld inspections (visual tests, VT) to inspect each weld. The inspection procedure shall be developed in accordance with Buyer's specification 24590-WTP-3PS-MVB2-T0001, *Specification for Welding Pressure Vessels, Heat Exchangers and Boilers* and ASME B31.3 1996, and shall include inspection materials and acceptance criteria.
- 6.3.2 Acceptance criteria for visual weld inspections for the separator vessel and heat exchangers shall be in accordance with Buyer's specification 24590-WTP-3PS-MVB2-T0001, *Specification for Welding Pressure Vessels, Heat Exchangers and Boilers* and for pipework shall be in accordance with ASME B31.3 1996.
- 6.3.3 The Seller shall prepare a visual weld inspection report for each fabricated item.
- 6.3.4 Deleted.
- 6.3.5 Deleted.
- 6.3.6 The Seller shall notify the Buyer in advance of inspections. The Buyer may send representatives to witness inspections or perform independent inspections.

6.4 Liquid Penetrant Test

- 6.4.1 The Seller shall develop and implement a procedure to perform a liquid penetrant test (PT) to inspect each weld. The procedure shall be developed in accordance with Buyer's specification 24590-WTP-3PS-MVB2-T0001, *Specification for Welding Pressure Vessels, Heat Exchangers and Boilers* and ASME B31.3 1996, and shall include inspection materials, dwell time for dye and developer, and acceptance criteria.
- 6.4.2 Acceptance criteria for PT inspection shall be in accordance with Buyer's specification 24590-WTP-3PS-MVB2-T0001, *Specification for Welding Pressure Vessels, Heat Exchangers and Boilers* and for pipework shall be in accordance with ASME B31.3 1996.
- 6.4.3 The Seller shall prepare a liquid penetrant test report for each weld connection on each fabricated item.
- 6.4.4 Deleted.
- 6.4.5 Deleted.

6.4.6 The Seller shall notify the Buyer in advance of testing. The Buyer may send representatives to witness testing.

6.5 Radiography

6.5.1 Radiographic examinations shall be carried out on all primary containment pipework butt-welds using 100 % radiography for QL components.

6.5.2 The Seller shall develop and implement a procedure to perform radiographic weld examinations of piping butt-welds. The procedure shall be developed in accordance with ASME B31.3 1996, and shall include examination materials and acceptance criteria.

6.5.3 Deleted.

6.5.4 Deleted.

6.5.5 The Seller shall provide radiographic film with technique and reader sheets. Exposed film must be sent, along with a copy of the technique and reader sheets in accordance with section 3 of the MR. Film must be suitably packaged to preclude moisture and handling damage.

6.5.6 The Seller shall notify the Buyer in advance of examinations. The Buyer may send representatives to witness examinations.

6.6 Magnetic Particle Examination

6.6.1 The Seller shall develop and implement a procedure to perform magnetic particle examination. The procedure shall be submitted to the Buyer for review prior to fabrication.

6.6.2 Magnetic particle examination (MT) shall be in accordance with ASTM Specification E709.

6.6.3 **Welds specified under AWS D1.1 will be evaluated and accepted under criteria of AWS D1.1 Table 6.1.**

6.7 Final Inspection

6.7.1 The Seller shall develop and implement a procedure for final inspection of each fabricated item. The inspections shall be performed after completion of all fabrication, cleaning, and testing, and just prior to final packaging. The inspections shall include inspection of all surfaces for contamination. Visible evidence of contamination is not acceptable.

6.7.2 The Seller shall prepare a final inspection report for each item, which documents the results of the final inspection. The Seller shall include the final inspection report in the documentation package for each piece.

6.8 Inspection and Test Status

The Seller shall maintain a positive system for identifying inspection and testing status of items and systems.

6.9 Control of Nonconforming Items

The Seller shall use the Supplier Deviation Disposition Request per MR section 2 to notify the Buyer of fabricated items and fabrication activities not conforming to the requirements. Any nonconforming work shall be redone by the Seller at Seller's cost.

7 Testing

7.1 Shop Tests

- 7.1.1 The Buyer reserves the right to witness all shop tests and shall be given a minimum of 10 working days written notice prior to each test date.
- 7.1.2 All pipework shall be hydrostatically tested in accordance with ASME B31.3 1996. Test water used for hydrostatic testing shall be tested for chlorides. The chloride content of the test water shall not exceed 50 ppm and the water temperature shall not exceed 120 °F. Buyer shall review all test pressures prior to commencement of any testing. The testing results shall be documented and provided to Buyer.
- 7.1.3 Testing of vessels shall be performed in accordance with Buyer's specification 24590-WTP-3PS-MV00-T0001, *Specification for Pressure Vessel Design and Fabrication*.
- 7.1.4 Functional tests of evaporator equipment/skids shall be performed by the Seller.
- 7.1.5 Seller shall demonstrate and record on VHS format videotape demister pad removal. Test shall be done with equipment representative of what will actually be installed and utilized in the Buyer's facility.
- 7.1.6 Seller will furnish lifting yokes details for the separator vessel, reboiler and support frame assembly, and recirculation pump. All Seller supplied lifting yokes shall be load tested to 1.5 times the design load.
- 7.1.7 Each evaporator equipment skid shall be lift tested by the Seller to demonstrate proper vertical orientation using the Seller-supplied tooling and fixtures. This testing includes verification of all tilt up features. During the lift test the deflection at the midpoint of each skid shall be monitored and recorded to ensure that proper alignment is maintained. The centerline of the evaporator skid shall be within ± 1 inch of true vertical when measured from the lift point. Permanent deflection or a change in the evaporator skid alignment is unacceptable.
- 7.1.8 Seller shall furnish blind flanges or other acceptable closures for the nozzles, as required for hydrotesting. Closures shall be removed after testing, unless they are required for shipment.

7.1.9 Deleted.

7.1.10 All test results shall be documented, certified, and submitted to the Buyer for review.

7.2 Integrated Acceptance Tests

An Integrated Acceptance Test (**stimulant test**) using stable (**non-radioactive**) cesium is **not required**. The specified requirements provided in this section shall be used only for determining minimum separator decontaminator factor.

7.2.1 Performance

7.2.1.1 Limiting the entrainment of radionuclides from the evaporator rectifier to the primary condenser is an important safety function. During cold commissioning, the performance of the evaporator system will be measured using surrogate chemicals to determine the degree of entrainment from the evaporator to the primary condenser. Stable (nonradioactive) cesium will be the surrogate of choice for simulating radionuclide carryover to the condensing system.

7.2.1.2 Steady state operation is defined as:

- Liquid density of the concentrate ranges from 72.4 to 85.5 lbm/ft³ at operating temperature.
- Sodium cation and nitrate, chloride anions are the predominate soluble chemical analytes in the concentrate.

7.2.1.3 The following criteria must be met prior to final acceptance of the evaporator system design:

At steady state operation, the **concentration of stable (nonradioactive) cesium in the evaporator bottoms shall be at least 5,000,000 times greater than that in the recovered eluant (i.e., the decontamination factor or DF shall be at least 5,000,000:1). This minimum DF shall be met over each eluant recovery cycle over the batch concentration cycle of the evaporators.**

7.2.1.4 The performance testing and acceptance criteria shall apply over a boil-off range from 6.9 gpm to 10 gpm of total condensate, as measured in the condensate receiver vessel and recovered nitric acid collection vessel.

7.2.1.5 Performance testing shall be corrected for uncertainty in instrument and analytical measurements.

7.2.2 A full simulation of abnormal shutdown conditions.

8 Preparation for Shipment

8.1 General Requirements

- 8.1.1 The evaporator equipment/skids shall be packaged/prepared for shipment, handled, and stored in accordance with the following requirements in
- Material Requisition.
 - Buyer's Specification 24590-WTP-3PS-G000-T0003, *General Specification for Packaging, Handling, and Storage Requirements*.
 - Buyer's Specification 24590-WTP-3PS-PS02-T0001, *Specification for Shop Fabrication of Piping*.
 - Buyer's Specification 24590-WTP-MV00-T0001, *Pressure Vessel Design and Fabrication*.
- 8.1.2 Seller shall ensure that appropriate documentation is prepared and, if required, signed by the appropriate person(s). The shipping documentation shall accurately reflect specific traceability to the items being shipped.
- 8.1.3 Seller shall ensure that appropriate documentation is prepared for the evaporator equipment/skids. At a minimum, documentation shall include the following information, as applicable:
- Manufacturer name, model number, and serial number.
 - Skid number.
 - Plant item number.
- 8.1.4 Solvents and cleaning solutions used on stainless steel shall have a halogen content of less than 200 ppm.
- 8.1.5 The Recirculation pump will be shipped only in a temporary shipping skid not meant for installation. The reboiler and support frame assembly shall be transported from the Seller's site to the Buyer's site in the horizontal orientation due to air lock size limits.
- 8.1.6 The separator vessel will be shipped on a temporary shipping skid not meant for installation.
- 8.1.7 The separator vessel support skid (CNP-SKID-00007) including any field welded attachments will be shipped together but separate from the separator vessel.
- 8.1.8 Lifting weight shall be clearly marked on both the equipment skid and its shipping documentation.
- 8.1.9 Regarding Buyer's Specification 24590-WTP-3PS-PS02-T0001, *Specification for Shop Fabrication of Piping*, polyethylene wrap can be used and subsequent blocking using Styrofoam cushioning and equivalent backed by plywood/wood to provide protection against damage or access by elements. Special end caps are not required.

8.2 Painting

- 8.2.1 Stainless steel or exotic alloy metals shall not have coating applied.
- 8.2.2 Seller shall submit the information requested on Form H (see appendix H) along with technical data sheet and MSDS. Supplier shall provide Certificate of Conformance verifying application of coating in compliance with coating manufacturers technical product data sheet.
- 8.2.3 All painting and coating shall be applied in accordance with the manufacturer's directions for application.
- 8.2.4 Exposed carbon steel surface shall be primed and painted with enamel base coating in accordance with the coating manufacturers surface and application requirements. All visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products and other foreign matter shall be removed prior to application of primer. See section 8.2.13 and 8.2.14 for custom fabricated equipment.
- 8.2.5 In the absence of standard manufacturer's colors, the finish coat of all carbon steel items and equipment shall be ANSI 70 Gray. Contrasting colors shall be used for fasteners and bails.
- 8.2.6 Repainting by the Seller, or custom finishing by the manufacturer shall not be required when commercially available components and equipment which are normally mass produced, inventoried, and supplied from stock, have been coated with the manufacturer's standard coating system.
- 8.2.7 Surfaces exposed to the environment, but inaccessible after assembly, shall be coated prior to assembly.
- 8.2.8 Painting of interior and enclosed surfaces of the equipment, such as inside a welded box section, is not required.
- 8.2.9 Machined carbon steel mating surfaces and other surfaces not protected by coating system (such as seal surfaces, threaded surfaces, lifting hooks, hook nuts, wheel treads, gears, shafts, pinions, and couplings), shall be protected with a solvent cutback asphalt temporary preservative (Dauber Chemical Tectyl 891, EF Houghton Chemical Rust Veto 342 or Buyer's accepted equivalent) for shipment and storage. The Seller shall specify which preservatives must be removed and how the preservatives are removed by the Buyer before operation of the equipment.
- 8.2.10 Welds shall be coated only after completion of the required tests. Required tests include leak tightness, hydrostatic testing or other NDE of the welds.
- 8.2.11 Filler, sealant, and caulking compounds shall be compatible with the coating system.
- 8.2.12 Items covered by 8.2.13 and 8.2.14, shall be surface prepared in accordance with SSPC SP10. For repair, the surfaces shall be prepared in accordance with SSPC SP11.

8.2.13 For support frames such as the steam conditioning skid and reboiler transporter, Seller shall use two coats (P04) of Epoxy with 4-6 mils per coat. Acceptable coating products for P04 are as follows:

- 8.2.13.1 Amercoat 385 from Ameron
- 8.2.13.2 Carboguard 890 from Carbonline
- 8.2.13.3 224HS from Devoe
- 8.2.13.4 Protecto-Coat 330 or 300 from Dudick
- 8.2.13.5 Intergard 475HS from International
- 8.2.13.6 Macropoxy 646 from Sherwin Williams

8.2.14 For the reboiler and recirculation pump lifting beams, the Seller shall use three coats with 1st coat (P02) of Epoxy Primer with 3-5 mils and (P06) Epoxy Novolac with 5-10 mils for 2nd and 3rd coats. Acceptable coating products for P02 are as follows:

- 8.2.14.1 Amercoat 68HS from Ameron
- 8.2.14.2 Carbozinc 859 from Carbonline
- 8.2.14.3 313 from Devoe
- 8.2.14.4 Interzinc 52 from International
- 8.2.14.5 Zinc Clad IV from Sherwin Williams

Acceptable coating products for P06 are as follows:

- 8.2.14.6 Amercoat 91 from Ameron
- 8.2.14.7 Phenoline 1205 FR from Carbonline
- 8.2.14.8 253 from Devoe
- 8.2.14.9 Protecto-Coat 100XT from Dudick
- 8.2.14.10 Intertherm 875 HS from International
- 8.2.14.11 macropoxy 646 from Sherwin Williams

8.3 Tagging

8.3.1 Tagging of evaporator components, equipment, and skids shall be per this specification and the applicable documents listed in section 2 of this specification. Plant item numbers for evaporator component/equipment shall be per the data sheets that are in section 2 of the MR.

- 8.3.2 Instruments shall have nameplates installed per section 8 of Buyer's specification 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems*.
- 8.3.3 The recirculation pump motor shall have a nameplate per section 3 of Buyer's specification 24590-WTP-3PS-MUMI-T0002, *Engineering Specification for Low Voltage Induction Motors*.
- 8.3.4 Packages shall be suitably marked on the outside to facilitate identification of the purchase order, the procurement specification, the package contents, and any special handling instructions.
- 8.3.5 Slings points and orientation for storage shall be clearly marked.
- 8.3.6 Deleted.
- 8.3.7 A stainless steel nameplate shall be rigidly attached to the evaporator equipment skid packages in a prominent position for ease of visibility, and shall include the following:
- Manufacturer's name.
 - Shop location.
 - Date of manufacture.
 - Serial number.
 - Skid number.
 - Weight of assembly.
 - Purchase order number.

9 Quality Assurance

9.1 General Commercial Designation (CM) Requirements

- 9.1.1 The Seller's Quality Assurance Program (QAP) Requirements are included in 24590-WTP-3PS-G000-T0001, *Supplier Quality Assurance Program*.
- 9.1.2 Seller's QAP Manual shall be submitted to buyer for review in accordance with 24590-WTP-3PS-G000-T0001, *Supplier Quality Assurance Program*.
- 9.1.3 Seller's QAP, as a minimum, shall contain the requirements of DOE Order 414.1A as detailed in the Supplier Quality Assurance Program Requirements Data Sheets listed in section 2 of the MR. The very same requirements shall be passed down to any lower tier subcontractor.

9.2 Quality Level (QL) Requirements

- 9.2.1 Seller shall have in place a QA program meeting the requirements marked as applicable in the Supplier Quality Assurance Program Requirements Data Sheet(s) attached to the MR, and Buyer's specification 24590-WTP-3PS-G000-T0001.

- 9.2.2 Seller shall demonstrate that its quality program is in compliance with the procurement quality requirements listed in the Supplier Quality Assurance Program Requirements Data Sheet(s). The Supplier shall allow the Buyer, its agent, and DOE access to their facilities and records pertaining to this purchase order for the purpose of QA Audits and Surveillance at mutually agreed times.
- 9.2.3 All items shall be manufactured in accordance with the Supplier's Quality Assurance Program that has been previously evaluated and accepted by the RPP-WTP Quality Organization. The very same requirements shall be passed down to any lower tier subcontractor.
- 9.2.4 Seller shall submit their QA program and work plan to Buyer for review prior to commencement of work. The plan shall include documents and procedures to implement the work and include a matrix of essential Quality Assurance elements cross-referenced with the documents/procedures.

10 Configuration Management

Equipment and/or components covered by this specification are identified with Plant Item Numbers shown in the attached data sheets in section 2 of the MR. Each item shall be identified in accordance with section 8.3 of this specification.

11 Documentation and Submittals

11.1 General

- 11.1.1 Seller shall submit to Buyer all detailed designs, drawings, documentation, procedures, instructions, calculations, analyses, manufacturer documentation, manufacturer data, inspection reports, test reports, certifications, certificates, manuals, MSDSs, video tapes, and drawings required per this specification, the applicable codes, standards, and reference documents in section 2 of this specification, and the MR.
- 11.1.2 All detailed designs, drawings, assembly drawings, shop drawings, final P&IDs, MDSs, supporting calculation, supporting analyses, and all other requirements in the 60 % design stage shall be issued to the Buyer for review prior to fabrication of evaporator vessels and equipment.
- 11.1.3 Seller shall submit to Buyer Engineering and Quality Verification documents in the forms and quantities shown in Form G-321-E, *Engineering Document Requirements*, and Form G-321-V, *Quality Verification Document Requirements* attached to the MR, section 3.
- 11.1.4 Seller shall submit a report identifying any deviations and/or conflicts per section 2 of the MR to the Buyer for review.

11.1.5 Each documentation transmittal package shall have a documentation inventory sheet attached listing all documents and the number of pages each.

11.1.6 All documents submitted for review (e.g., General Arrangement, Shop Details, Calculations must contain their own unique NAME AND IDENTIFICATION NUMBER) Example:

Calculations for Item:
Document No: Calc TLP-PMP-00001-0001

11.1.7 Data sheets in section 2 of the MR shall be marked up by the Seller and submitted to the Buyer for review with the detailed design. Seller shall fill in all information that is marked as asterisk or TBD and markup actual overall dimensions for each evaporator component, equipment, and skid based on the detailed design.

11.1.8 All drawings shall be produced per the drawing practices set forth in ASME Y14.100, Engineering Drawing Practices.

11.2 Calculations

All calculations to be provided shall be orderly, complete, and sufficiently clear to permit verification. The body of the calculations shall include:

- A concise statement of the purpose of the calculation.
- Input data, applicable criteria, and stated assumptions.
- A list of references used, including drawings, codes, standards, and computer programs (indicate the version or issue date).
- A discussion of rationale used for design assumption basis.
- Equations used for all computations.
- Numerical calculation including identification of units used.
- A concise statement addressing the calculation results and/or recommendations.
- A table of contents for complex calculations.

Design Stress/Seismic Reports shall provided, as a minimum, the following information

11.2.1 ANSI/AISC N690 Steel Frame / Support Designs

For Finite Element Analysis (FEA) by Computer Program, submit the bases or reference to the bases that supports applicability of the computer program to the specific physical problem being solved. (i.e; application /validation to steel code formulas and allowable stresses)

11.2.2 ASME VIII, Div 2, Appendix 4, Vessel including internal supports/components

For FEA Computer Program analysis, submittal for the bases or reference to the bases supporting application of the computer program to the specific physical problem being solved. (i.e; application/validation to the ASME VIII, Div 2, Appendix 4, Maximum Shear Stress Theory.)

11.2.3 ASME B31.3 Piping Design

For FEA Computer Program analysis, submittal for the bases or reference to the bases supporting application of the computer program to the specific physical problem being solved. [i.e; application/validity to the ASME B31.3 design requirements in accordance with B31.3-96, section 300(c)(3)]

11.3 As-Built Drawings

11.3.1 Progress As-Builts

During construction, the Seller shall keep an updated marked-up set of progress as-built drawings on the jobsite as an accurate record of all deviations between the work, as shown on the Buyer reviewed drawings, and work as fabricated. These drawings shall be available to the Buyer for inspection at any time during regular business hours.

11.3.2 Final As-Builts

Seller shall furnish to Buyer final as-built drawings with AS-BUILT clearly printed on each sheet for all final work left in place. Seller shall accurately and neatly transfer all deviations from progress as-builts to final as-builts.

11.4 Dimensional Record Drawings

See 24590-WTP-3PS-PP00-T0002 for final dimensional measurement requirements. Third party validation of special dimensional inspection is not required. Seller shall furnish to Buyer dimensional record drawings for reboiler and support frame assemblies, and recirculation pumps with all their associated lifting yokes and/or lifting lugs.

11.5 Project Start

Seller shall submit drawing index and detailed schedule of engineering document submittals, material purchases, fabrication, shop test, and ready for shipment. Include bar charts or critical path method diagrams, which detail the chronological sequence of activities.

11.6 30 % Design Review

- 11.6.1 Provide drawings with outline dimensions, services, foundations, and mounting details of the evaporator system. Drawings shall show external envelope, including lugs, centerline(s), location and size for electrical cable, conduit, fluid, other service connections, isometrics, and details related to foundations and mountings.
- 11.6.2 Provide preliminary dimension, location, and layout for all evaporator components, equipment, and skids.
- 11.6.3 Provide preliminary design of the demister pad replacement methodology.

- 11.6.4 Provide preliminary system description. Describe general system functions and basis of design. It shall include a systematic process flow diagram for system operation.
- 11.6.5 Provide preliminary Piping and Instrumentation Diagrams (P&IDs).
- 11.6.6 Provide preliminary instrument control requirements. Include system interlocks and control philosophy. Provide flow charts, schematics, logic diagrams, or function diagrams showing the equipment functional controls.
- 11.6.7 Provide document that describes the proposed equipment skids, including sketches of typical skids indicating skid-to-skid and skid-to-building interfaces, as well as the components included.
- 11.6.8 Identify all large and heavy items of equipment to ensure lifting capability during construction, maintenance, and decommissioning.
- 11.6.9 Provide motor data sheets per Buyer's specifications 24590-WTP-3PS-MUMI-T0002 and 24590-WTP-3PS-EKP0-T0001.

11.7 60 % Design Review

- 11.7.1 Provide final P&IDs.
- 11.7.2 Provide final skid constructability study.
- 11.7.3 Provide final evaporator component, equipment, skid size, and layout.
- 11.7.4 Provide assembly drawings.
- 11.7.5 Provide shop detail drawings with sufficient detail to facilitate fabrication, manufacture, or installation. This includes a complete Bill of Materials (BOM), pipe spool drawings, internal piping and wiring details, cross-section details, and structural details.
- 11.7.6 Provide wiring diagrams including schematic diagrams, equipment internal wiring diagrams, and interconnection wiring diagrams for electrical items
- 11.7.7 Submit completed Instrument and Mechanical data sheets for all instruments and equipment, utilizing Buyer's supplied instrument data sheets attached in section 2 of the MR as templates.
- 11.7.8 Provide functional test setpoints and recommended operating set points for the instrumentation and control packaged systems.
- 11.7.9 Provide final instrument control requirements including control definitions, system interlocks, alarms, and control philosophies. Control and sequencing requirements of the system and its components shall be detailed as described in section 3.5 of 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems*.

- 11.7.10 Submit all final detailed drawings, calculations, analyses, and information necessary for evaporator vessels and equipment fabrication.
- 11.7.11 Submit all FMEA documentation.
- 11.7.12 Provide final motor data sheets and nameplates per Buyer's specifications 24590-WTP-3PS-MUMI-T0002 and 24590-WTP-3PS-EKPO-T0001.

11.8 90 % Design Review

- 11.8.1 Provide detailed written procedures, instructions, and drawings (including all lifting requirements) for evaporator system erection/installation.
- 11.8.2 Provide complete remote installation instructions for the utilization of the hot cell existing cranes for the needed reorientation, installation, and extraction of the reboiler.
- 11.8.3 Deleted.
- 11.8.4 Provide list of required spares.
- 11.8.5 Provide startup and commissioning spares list, including all components or equipment that may be needed during startup and commissioning.
- 11.8.6 Provide operation manuals with detailed written instructions describing how the evaporator systems and components should be operated. Manuals shall include specific instructions, procedures, and illustrations for the following:
 - 11.8.6.1 Safety Precautions – List personnel hazards and equipment or product safety precautions for all operating conditions.
 - 11.8.6.2 Operator Prestart – Include requirements to set up and prepare the system for use.
 - 11.8.6.3 Startup, Shutdown, and Post-shutdown Procedures – Include a control sequence for each of these operations.
 - 11.8.6.4 Normal Operations – Include control diagrams with data to explain operation and control of systems and specific equipment.
 - 11.8.6.5 Emergency Operations – Include emergency procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Include emergency shutdown instructions for fire, over-pressure, spills, or other foreseeable contingencies. Provide guidance on emergency operations of all utility systems including valve locations and portions of systems controlled.
 - 11.8.6.6 Operator Service Requirements – Include instructions for services to be performed by the operator, such as lubrication, adjustments, and inspections.

- 11.8.6.7 Environmental Conditions – Include a list of environmental conditions (temperature, humidity, and other relevant data), which are best suited for each product or piece of equipment and describe conditions under which equipment should not be allowed to run.
- 11.8.6.8 Lay-up Instructions – Include step-by-step instructions for lay-up.
- 11.8.7 Provide maintenance manuals with detailed written instructions to disassemble, reassemble, and maintain systems or components in an operating condition. Manuals shall include specific instructions, procedures, and illustrations for the following phases of maintenance:
 - 11.8.7.1 Preventive Maintenance - Include the following information for preventive and scheduled maintenance to minimize corrective maintenance and repair:
 - 11.8.7.1.1 Lubrication Data – Include lubrication data, other than instructions for lubrication, in accordance with operator service requirements to be included in operation manuals.
 - 11.8.7.1.2 Preventive Maintenance Plan and Schedule – Include manufacturer’s schedule for routine preventive maintenance, inspections, testing, and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair. Provide manufacturer’s projection of preventive maintenance frequency of work, and hours to complete the task. Provide surveillance and in-service inspection recommendations.
 - 11.8.7.2 Corrective Maintenance – Include manufacturer’s schedule for procedures and instructions for correcting problems and making repairs. Include the following information for performing corrective maintenance:
 - 11.8.7.2.1 Troubleshooting Guide and Diagnostic Techniques – Include step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.
 - 11.8.7.2.2 Deleted.
 - 11.8.7.2.3 Maintenance and Repair Procedures – Include instructions and list tools required to restore product or equipment to proper condition or operating standards.

- 11.8.7.2.4 Removal and Replacement Instructions – Include step-by-step procedures and list required tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide all tolerances, dimensions, settings, and adjustments required. Instructions shall include a combination of text and illustrations.
- 11.8.7.2.5 Recommended Spare Parts and Supply Lists – Include list of spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Include the cost of each item.
- 11.8.7.2.6 MSDSs – Include MSDSs for all chemicals and hazardous materials supplied as part of the product, system, or equipment. In addition, include MSDSs for all chemicals and hazardous materials required to be added (lubricants, antifreeze, etc.).
- 11.8.7.2.7 Parts Identification – Provide identification and coverage for all parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustration and separate listing shall show the index, reference, or key number, which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies, and subassemblies.
- 11.8.7.2.8 Other than Seller's Commercial Practice – End item manufacturer may add a cross-reference to implement component assemblies and parts requirements when implementation in manual form varies significantly from the style, format, and method of Seller's standard commercial practice.
- 11.8.7.2.9 Warranty Information – List and explain the various warranties and include the servicing and technical precautions prescribed by the Seller or contract documents to keep warranties in force.

- 11.8.7.2.10 Personnel Training Requirements – Provide information available from the Seller to use for training designated personnel to operate and maintain the equipment and systems properly.
- 11.8.7.3 Calibration Testing Equipment and Special Tool Information – Include information on test equipment required to perform specific tests and on special tools needed for the operation, maintenance, and repair of components.
- 11.8.8 Provide system, component, and instrumentation descriptions as identified below:
 - 11.8.8.1 System Descriptions - Include comprehensive system description describing, in detail, how the overall system functions, and the basic design basis. Include component interfaces and interactions. Provide a systematic process flow diagram for system operation.
 - 11.8.8.2 Component Descriptions – Include comprehensive component descriptions describing, in detail, how each individual process component functions and the basic design basis. Include other component interfaces and interactions. Provide a systematic process flow diagram for component operation.
 - 11.8.8.3 Instrument Descriptions – Include a list or table-describing instrument ID number, ID name, location, and basic operating function. Include separately, in systematic descriptive detail, instrument controls and logic that correspond to instrumentation and logic diagrams.
- 11.8.9 Provide design and operational requirements per the following:
 - 11.8.9.1 Design requirements – Include a list or table describing the maximum design limits and conditions required to safely operate the equipment (i.e., temperatures, pressures, etc.).
 - 11.8.9.2 Operational requirements – Include a list or table describing the normal operating ranges for equipment (i.e., temperatures, pressures, etc.).
- 11.8.10 Provide analysis and design reports, including analytical data (stress, electrical loading, fluid dynamics, etc.), which demonstrates that an item satisfies all specified requirements.
- 11.8.11 Provide seismic analysis or test data reports providing data and demonstrating suitability of materials, components, or systems in relation to the conditions imposed by the stated seismic criteria.
- 11.8.12 Provide thermal stress analysis or test data reports providing data and demonstrating suitability of materials, components, or systems in relation to the conditions imposed by thermal stresses.

- 11.8.13 Provide site storage and handling manuals including the requirements and time period for lubrication, rotation, heating, lifting, or other handling requirements to prevent damage or deterioration during storage and handling at job site. Include return shipping instructions.
- 11.8.14 Provide inspection and test plan including detailed descriptions of the inspections and tests planned during the receipt, manufacturing, and conformance verification activities. Include identification of witness and hold points.
- 11.8.15 Provide welding procedures, specifications, and supporting qualification records required for welding, hard facing, overlaying, brazing, and soldering.
- 11.8.16 Provide material control procedures including controlling issuance, handling, storage, and traceability of materials such as weld rod.
- 11.8.17 Provide PMI procedures for performing PMI testing of materials.
- 11.8.18 Provide repair procedures including controlling material removal and replacement by welding, brazing, etc., subsequent thermal treatments, and final acceptance inspection.
- 11.8.19 Provide pressure-testing procedures including hydro, air, leak, separation, or vacuum test procedures for performing hydrostatic or pneumatic structural integrity and leakage tests.
- 11.8.20 Provide inspection procedures for the purpose of determining that specified requirements (i.e., dimensions, properties, performance results, etc.) are met.
- 11.8.21 Provide radiographic testing procedures for identifying the presence and certain characteristics of discontinuities and inclusions in materials by x-ray or gamma ray exposure of photographic film.
- 11.8.22 Provide liquid penetrant testing procedures for detection of surface discontinuities in materials by application of a penetrating liquid in conjunction with suitable developing techniques.
- 11.8.23 Provide functional shop test procedures to demonstrate that design function and operational parameters are met (e.g., pump performance data, valve stroking, load, temperature rise, calibration, environment, etc.).
- 11.8.24 Provide integrated acceptance test requirements document per engineering specifications to demonstrate design function and operational parameters for the complete assembled evaporator systems.
- 11.8.25 Provide electrical test procedures to demonstrate that design function and operational parameters are met (e.g., impulse, overload, continuity, voltage, temperature rise, calibration, saturation loss, etc.)
- 11.8.26 Provide shipping preparation procedures for cleaning, packaging, and handling.

11.9 Final Design Review

Provide final design report including all design documents, manuals, and drawings that are specified in this specification. All procedures and instructions shall be completed and submitted to the Buyer a minimum of eight (8) weeks prior to evaporator components, equipment, and skid shipment.

APPENDIX A
EVAPORATOR
STREAM DATA

Cesium Concentrate Product Stream

	Units	
Total	kg/day	8.10E+03
SpG		1.46E+00
Volume	liters	5.67E+03
Liquids		
Total	kg	8.10E+03
Na Molarity	gmol/liter	5.08E+00
SpG		1.46E+00
Volume	liters	5.67E+03
pH		
129-I	kg	3.42E-03
134-Cs	kg	1.16E-05
137-Cs	kg	1.00E+01
14-C	kg	6.02E-06
126-Sn	kg	9.73E-05
233-U	kg	1.51E-05
235-U	kg	2.75E-02
152-Eu	kg	8.83E-08
154-Eu	kg	1.31E-05
155-Eu	kg	7.56E-07
237-Np	kg	4.28E-03
238-Pu	kg	2.36E-07
239-Pu	kg	3.51E-04
240-Pu	kg	2.45E-05
241-Am	kg	2.68E-04
241-Pu	kg	3.23E-06
242-Cm	kg	1.26E-08
243-Am	kg	3.97E-07
243-Cm	kg	2.09E-07
244-Cm	kg	1.74E-06
3-H	kg	5.63E-09
60-Co	kg	9.79E-09
90-Sr	kg	1.27E-04
99-Tc	kg	7.62E-01
Ag+	kg	5.45E-03
Al+3	kg	2.80E+01
B+3	kg	3.39E-02
Ba+2	kg	1.46E-02
Bi+3	kg	3.15E-02
Ca+2	kg	1.09E-01
Cd+2	kg	5.06E-03
Cl-	kg	6.40E+00
CO3-2	kg	4.74E+01
Cr(TOTAL)	kg	1.20E+00
Cs+	kg	5.36E+00
F-	kg	6.33E+00
Fe+3	kg	1.61E-01
Hg+2	kg	6.64E-03

K+	kg	1.23E+01
La+3	kg	3.03E-03
Li+	kg	4.35E-03
Mg+2	kg	1.99E-02
Mn+4	kg	1.04E-02
Mo+6	kg	2.64E-02
Na+	kg	6.62E+02
NH3	kg	3.72E+00
Ni+2	kg	3.13E-02
NO2-	kg	9.86E+01
NO3-	kg	2.79E+03
OH(BOUND)	kg	4.41E+01
OH-	kg	5.83E+01
Pb+2	kg	8.38E-02
Phosphor containing components	kg	1.07E+01
Se+6	kg	2.07E-02
Si+4	kg	6.80E-01
SO4-2	kg	6.87E+00
Sr+2	kg	6.90E-03
Ti+4	kg	1.95E-03
TOC	kg	5.58E+00
U(TOTAL)	kg	3.81E-02
Zn+2	kg	4.49E-03
Zr+4	kg	3.10E-01
H2O	kg	4.25E+03
H+	kg	4.50E+01
CO2	kg	0.00E+00

Cesium Eluate Stream

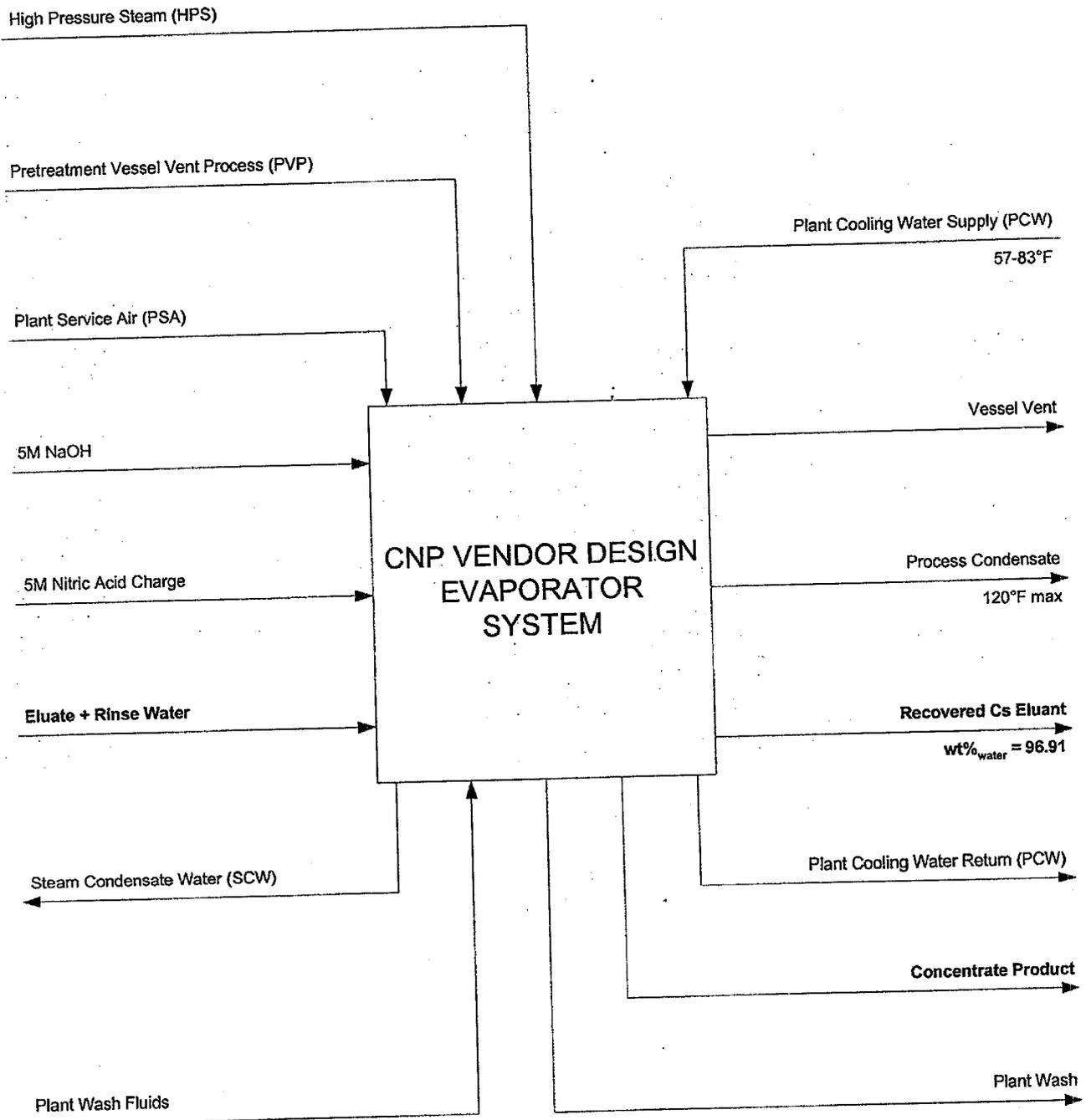
	Units	Eluate Stream Sent to the Evaporator	Rinse Stream displaced to Evaporator
Total	kg/day	1.72E+04	3.29E+03
SpG		1.02E+00	1.02E+00
Volume	liters/day	1.68E+04	3.24E+03
Liquids			
Total	kg/day	1.72E+04	3.29E+03
Na Molarity	gmol/liter	9.24E-02	3.97E-02
SpG		1.02E+00	1.02E+00
Volume	liters/day	1.68E+04	3.24E+03
pH		3.74E-01	5.17E-01
129-I	kg/day	1.90E-04	5.46E-08
134-Cs	kg/day	6.44E-07	3.40E-13
137-Cs	kg/day	5.57E-01	2.94E-07
14-C	kg/day	3.34E-07	9.63E-11
126-Sn	kg/day	5.40E-06	1.56E-09
233-U	kg/day	8.37E-07	2.41E-10
235-U	kg/day	1.53E-03	4.39E-07
152-Eu	kg/day	4.91E-09	1.41E-12
154-Eu	kg/day	7.26E-07	2.09E-10
155-Eu	kg/day	4.20E-08	1.21E-11
237-Np	kg/day	2.38E-04	6.84E-08
238-Pu	kg/day	1.31E-08	3.78E-12
239-Pu	kg/day	1.95E-05	5.61E-09
240-Pu	kg/day	1.36E-06	3.91E-10
241-Am	kg/day	1.49E-05	4.29E-09
241-Pu	kg/day	1.79E-07	5.16E-11
242-Cm	kg/day	6.97E-10	2.01E-13
243-Am	kg/day	2.21E-08	6.36E-12
243-Cm	kg/day	1.16E-08	3.35E-12
244-Cm	kg/day	9.65E-08	2.78E-11
3-H	kg/day	3.12E-10	9.00E-14
60-Co	kg/day	5.43E-10	1.57E-13
90-Sr	kg/day	7.05E-06	2.03E-09
99-Tc	kg/day	4.23E-02	1.22E-05
Ag+	kg/day	3.03E-04	8.71E-08
Al+3	kg/day	1.56E+00	4.48E-04
B+3	kg/day	1.88E-03	5.41E-07
Ba+2	kg/day	8.14E-04	2.34E-07
Bi+3	kg/day	1.75E-03	5.03E-07
Ca+2	kg/day	6.08E-03	1.75E-06
Cd+2	kg/day	2.81E-04	8.09E-08
Cl-	kg/day	3.55E-01	1.02E-04
CO3-2	kg/day	2.63E+00	7.58E-04
Cr(TOTAL)	kg/day	6.64E-02	1.91E-05

Cs+	kg/day	2.98E-01	1.57E-07
F-	kg/day	3.52E-01	1.01E-04
Fe+3	kg/day	8.92E-03	2.57E-06
Hg+2	kg/day	3.69E-04	1.06E-07
K+	kg/day	6.83E-01	1.97E-04
La+3	kg/day	1.68E-04	4.85E-08
Li+	kg/day	2.42E-04	6.96E-08
Mg+2	kg/day	1.10E-03	3.18E-07
Mn+4	kg/day	5.75E-04	1.66E-07
Mo+6	kg/day	1.47E-03	4.23E-07
Na+	kg/day	3.68E+01	4.73E-03
NH3	kg/day	2.07E-01	5.95E-05
Ni+2	kg/day	1.74E-03	5.01E-07
NO2-	kg/day	5.48E+00	1.58E-03
NO3-	kg/day	4.58E+02	6.14E+01
OH(BOUND)	kg/day	2.45E+00	7.06E-04
OH-	kg/day	3.24E+00	9.32E-04
Pb+2	kg/day	4.65E-03	1.34E-06
Phosphor containing components	kg/day	5.97E-01	1.72E-04
Se+6	kg/day	1.15E-03	3.31E-07
Si+4	kg/day	3.78E-02	1.09E-05
SO4-2	kg/day	3.82E-01	1.10E-04
Sr+2	kg/day	3.83E-04	1.10E-07
Ti+4	kg/day	1.08E-04	3.12E-08
TOC	kg/day	3.10E-01	8.92E-05
U(TOTAL)	kg/day	2.12E-03	6.10E-07
Zn+2	kg/day	2.49E-04	7.18E-08
Zr+4	kg/day	1.72E-02	4.96E-06
H2O	kg/day	1.67E+04	3.23E+03
H+	kg/day	7.16E+00	9.92E-01
CO2	kg/day	0.00E+00	0.00E+00

APPENDIX B

24590-PTF-3PS-MEVV-T0002 Rev. 4
Cesium Nitric Acid Recovery Forced
Vacuum Evaporator System

CNP Nitric Acid Recovery Forced Circulation Vacuum Evaporator Thru-Put Flow Chart



APPENDIX C

EVAPORATOR PROCESS DATA

	PROCESS DATA SHEET: Evaporator	PLANT ITEM No. 24590-PTF-CNP-EVAP-00001
Project:	RPP-WTP	System:
Project No.:	24590	Description:
Site:	Hanford	Supporting Calcs No.:
Building No.:	10	Associated Drawings:
		24590-PTF-MS-V17T-000014, Rev. B

UTILITIES DATA		Units	Cooling Water	High Pressure Steam	Compressed Air	Instrument Air
Temperature	°F	83			60	60
Pressure	psig	65			150	100

PROCESS DATA	Units	Feed to Evaporator		Acid Charge			Concentrate			Evaporator Overheads		Recovered Eluant		Condensate Product	
		Minimum	Maximum	Minimum	Normal	Maximum	Minimum	Normal	Maximum	Minimum (Note 6)	Maximum (Note 6)	Minimum (Note 6)	Maximum (Note 6)	Minimum (Note 6)	Maximum (Note 6)
Fluid Flow (Note 4)	lb _m /hr	3,600	5,100	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4	3600	5,100	3,000	4,500	600	600
Liquid Flow (Note 4)	gpm	6.9	10.0	Note 4	Note 4	Note 4	Note 4	Note 4	Note 4	N/A	N/A	5.9	8.9	1.2	1.22
Vapor Flow	lb _m /hr	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3600	5100	N/A	N/A	N/A	N/A
Temperature (Note 6)	°F	59	77	59	77	113	59	122 - 140	230	130	140	115	140	63	140
HNO ₃ Molarity	gmol/l	0.4	0.5	5	7.2	8	4.2	Note 2	8	0.4	0.5	0.45	0.55	0	0
Na Molarity	gmol/l	0	0.1 (Note 5)	0	0	0	0	Note 2	2.6	0	0	0	0	0	0
Density	lb _m /ft ³	62.2	64.4	72.4	76.7	78.0	72.4	Note 2	85.5	0.0045	0.0071	83.3	63.6	61.4	62.4
Specific Gravity		0.996	1.03	1.16	1.23	1.25	1.16	Note 2	1.37	N/A	N/A	0.988	1.02	0.98	1
Viscosity	cP	0.85	1.0	1.25	1.47	1.57	1.25	Note 2	2.46	0.0099	0.0103	0.55	1.18	0.46	0.95
Specific Heat	BTU/lb _m °F	0.97	1	0.68	0.69	0.75	0.68	Note 2	0.83	0.45	0.46	0.97	1	0.97	1.00
Thermal Conductivity	BTU/hr ft °F	0.32	0.37	0.27	0.28	0.33	0.27	Note 2	0.32	0.012	0.013	0.32	0.37	0.34	0.36
Latent Heat	BTU/lb _m									1,030	1,090				

- Notes:
- Minimum and maximum fluid properties are not associated with minimum and maximum fluid flow rates.
 - The evaporator concentrates in batches, thus every cycle the concentrate should range from minimum to maximum fluid properties listed, or vice versa depending on the property.
 - Vacuum system enables concentration of feed at reduced temperature.
 - The Cs concentrate is transferred out and replaced by a fresh acid charge when NaNO₃ is at 80% of its solubility limit. The estimated frequency for transferring a 1500 gallon batch of concentrate is 15 elution cycles (33 hr per cycle) 495 h. Flow rate is approximately 60 gpm.
 - Highest expected value shown. Normal concentration of Na⁺ in eluate is expected to be 0.043 M.
 - The fluid property ranges shown are the expected operating minimum and maximums. The vendor design will depict the normal operating ranges based on the designed pressure drops through the system. The maximum temperature that may be seen under accident scenario (self boiling) is 230F.
 - Only a portion of the condensed vapor is condensate, the remainder of the condensate is refluxed to the rectifier.
 - The normal operating pressure is 1.45 psia in the separator vessel.
 - See Section 3.4.3.3 for high pressure steam supply conditions

APPENDIX D

FIGURES DELETED

APPENDIX E

FIGURES DELETED

APPENDIX F

DELETED

APPENDIX G

DELETED

Appendix H Manufacturer's Standard Coating Data Sheet

The SELLER proposes the following Manufacturer's Standard (Mfg. Std.) or alternate coating system that is suitable for the exposure conditions of steel items and equipment in radiation and non-radiation areas.

1. **Equipment Description:** _____

A. Tag Number _____

B. Part(s) i.e. skirt, shell, channels, lugs, etc.* _____

C. Design/Operating Temperatures, designate °F or °C _____ °F °C

D. Does Equipment Receive Steam out (Yes/No), Temperature _____ °F °C

E. Insulated/Uninsulated _____

F. Fireproofing (Yes/No) _____

^G. Carbon Steel (CS), Stainless Steel (SS), other (List) _____

2. **^Seller:** _____

3. **^Surface Preparation:** SSPC No./Profile _____ / _____

4. **Coating System Designation:** (Code)

	First Coat	Second Coat	Third Coat
^A. Type of Coating	_____	_____	_____
^B. Coating Mfg./No.**	_____	_____	_____
^C. Dry Film Thickness (Min/Max in mils)/(µm)	_____	_____	_____
D. Wet/Film Thickness (Min/Max in mils)/(µm) _____	_____	_____	_____
E. Curing Method	_____	_____	_____
^F. Color	_____	_____	_____
G. Dry to Recoat	_____	_____	_____
H. Pot Life	_____	_____	_____
L. Thinner / %	_____	_____	_____

5. **Total DFT of System:** (Mils/µm)(Min/Max) / Min. / Max.

6. **Material Storage:** Temperature Requirements (Min/Max) _____ / _____

7. **Shelf Life:** _____ Months

8. **Application Environmental Limits:**

A. Temperature Ambient and Surface (Min/Max) _____ / _____

B. Humidity (Min/Max)

C. Surface Temp ≥5°F above Dew Point temp. (Yes/No)..... _____

9. **Protection of surfaces that will be inaccessible after equipment installation (such as underside of base plates, interior of fans, vessels or equipment housings)** _____

10. **Rust Preventative for machined faces:** (**Mfg./No.) _____

11. **Quantity of touch-up coating supplied:** None

12. **Additional information:** (attach extra page as necessary) _____

* Use additional copies of this form for each part described in 1 above that requires a different coating system. A completed copy of this data sheet shall be submitted to CONTRACTOR/BUYER with the initial vendor data submittal.
 ** Include manufacturer's technical data sheets and MSDS for each proposed coating, preservative & solvent
 ^ Mandatory data entry. Other entries should be completed where information is available from sub vendor or from coating material technical data sheets.

APPENDIX I

QUALITY LEVEL AND SEISMIC CATEGORY FOR EVAPORATOR EQUIPMENT

SSC	Description	QL	SC
Separator Vessel	CNP-EVAP-00001	QL-1	SC-I
• Demister Pad	Pad Materials	CM	SC-II
• Demister Pad Supports	Structural Supports	QL-2	SC-II
• Internal Piping/Misc.	Bubble Trays, Spray Rings, Dip Legs, Etc.	QL-2	SC-II
• External Piping	External Connections	QL-1	SC-I
• ITS Instrumentation	Instruments & Piping	QL-1	SC-I
• Support Tower	CNP-SKID-00007	QL-1	SC-I
Reboiler	CNP-HX-00001	QL-1	SC-I
• Support Frame	CNP-SKID-00005	QL-1	SC-I
Recirculation Pump	CNP-PMP-00001	QL-1	SC-I
Condensers			
• Primary Condenser	CNP-HX-00002	QL-1	SC-I
• 1st Stage Ejector	CNP-EJCTR-00010A	QL-1	SC-I
• Inter Condenser	CNP-HX-00003	QL-1	SC-I
• 2nd Stage Ejector	CNP-EJCTR-00010B	QL-1	SC-I
• After Condenser	CNP-HX-00004	QL-1	SC-I
• Support Frame	CNP-SKID-00002	QL-1	SC-I
Distillation Column			
• Support Frame	CNP-DISTC-00001	QL-1	SC-I
	CNP-SKID-00001	QL-1	SC-I
Transfer Station			
• Vessel	CNP-VSL-00168	CM	SC-III
• Desuperheater Pump	CNP-PMP-00003A	CM	SC-III
• Steam Condensate Transfer Pump	CNP-PMP-00003B	CM	SC-III
Desuperheater	CNP-SKID-00003	CM	SC-III
• External Piping	External Connections	CM	SC-III

Note: QL-1 and QL-2 designations are used by the Seller to comply with other referenced specification requirements (i.e weld, design). These designations meet NQA-1 (Q) requirements and are not necessarily reflected in their associated Buyer's P&IDs.

APPENDIX J

CNP Evaporator System Composite Analyses

J1. Seller shall perform a coupled dynamic analysis of CNP evaporator system to qualify the recirculation piping/process jumper, offgas piping, and provide nozzle loads. Seller shall provide vessel nozzle loads, Grayloc loads, and all piping/jumper support interface loads. The evaporator system model shall include the separator vessel on its frames, reboiler in its frame, recirculation pump on its frame, all interconnecting large bore piping/jumpers but excluding branch piping, separator offgas piping (connecting separator vessel and distillation column), distillation column and its frame, distillation column offgas piping (connecting distillation column and primary condenser), and condenser skid.

J2. The coupled dynamic analysis shall be performed using the revised ISRS curves (provided in this appendix) and shall account for the seismic differential movement between 0' floor, 56' floor, and 77' floor (provided in this appendix). Requirements for determining the percent critical damping for the couple dynamic analysis is provided in ASCE Std 4 Section 3.1.5 "Modeling of Damping".

J3. All piping dimensions, weights (including grayloc/guide assemblies), and support locations (including fixity) for CNP evaporator system are provided on the isometric drawings included in this appendix shall be used as the design inputs for the coupled dynamic analysis.

J4. Although Seller has provided estimated process temperatures for various system condition and components, Seller shall define and use the maximum operating temperature in dynamic analysis in lieu of design temperature for CNP evaporator system.

J5. See attachment #5 for CNP recirculation pump frame conceptual designs. Seller is responsible for qualifying all support structures above 1'-4" in elevation, including all interface plates, bolts, nuts, and dowel pins for reboiler support frame and pump support frame. Seller is responsible for providing all final frame member sizes and configuration, all weld and joint designs, dowel / bolting configuration, quantity of bolts /nuts, and frame calculations to be submitted to Buyer for review. Location of dowels and location / quantity of bolts shall be provided to Buyer for review and permission to proceed.

J5.1 Top of concrete filled steel frame elevation will be 1'-4"

J5.2 Concrete filled steel frame will be rigid, e.g. 33 hz or greater.

J5.3 Top of sole plate shall be 2'-2" in plant elevation for pump support and reboiler. Bottom of pump support and reboiler support frame shall be designed to interface with the corresponding sole plate without the use of shims.

J5.4 Seller shall qualify structural steel between 1'-4" and 2'-2". Seller must design all weld joints and provide all weld details to Buyer. Buyer will be responsible for remotability interface and fabrication drawings.

J5.5 There will be two 4" diameter Dowel Pins per frame (opposing corners) as shown on drawings which will take the shear loads. The 4" diameter dowel pin is an assumption. Seller is responsible to verify and size the dowel pin diameter with actual loads. All Dowel pin material shall be ASTM A582 Type 416.

J5.6 Seller shall qualify all plates, structural steel, dowel pins, the bolting interface, and all weld joint designs.

J5.7 Initial assumption, there are two bolts per plate. Bolts shall be 1 1/4" - 8 ACME - 2G. Stud material shall be ASTM A564 Type 630 H1150 and Nut material shall be ASTM A194 Grade 8S. Seller is to determine quantity and configuration for studs. Stud location shall be submitted to Buyer for review and permission to proceed. Note: Tightening torque from impact wrench is 400 ft-lbs \pm 25%. Loosening

torque from impact wrench is 700 ft-lbs \pm 25%. Tightening and loosening torques are not adjustable, or variable over time.

J5.8 Seller shall qualify recirculation pump frame. Seller must design all weld joints and provide all weld details to Buyer. Seller shall provide detail design of the frame in the form of a drawing that includes member sizes, configuration and weld design. The drawing shall be sufficient for Buyer to solicit a fabricator who can generate fabrication drawings. Buyer will be responsible for remotability interface for pump frame

J6. Seller shall perform detailed Finite Element Analysis uncoupled dynamic analysis using revised ISRS curves (provided in this appendix) of individual SC-I/SC-II vessel/equipment (including recirculation pumps) of each evaporator system. Internal components, supports, and piping systems shall be analyzed the same as the parent vessel/equipment.

J7. The report(s) shall be officially submitted to Bechtel for review per G321-E Category 8.0. The report(s) shall include pipe/jumper stress, nozzle loads, Grayloc loads, all piping/jumper support interface loads, pipe support design recommendations, and results of the coupled dynamic analysis of CNP evaporator system and FEA dynamic analyses for individual SC-I/SC-II components. Seller shall use the "SC-I/II Seismic Analysis Qualification and FEA Report Check List" provided in attachment #6 to document required data in their reports.

Design Stress/Seismic Reports shall provided, as a minimum, the following information

J.7.1 ANSI/AISC N690 Steel Frame / Support Designs for the CNP-EVAP-00001, CNP-PMP-00001 and CNP-HX-00001: For Finite Element Analysis (FEA) by Computer Program, submit the bases or reference to the bases that supports applicability of the computer program to the specific physical problem being solved. (i.e; application /validation to steel code formulas and allowable stresses).

J.7.2 ASME VIII, Div 2, Appendix 4, Vessel including internal supports/components: For FEA Computer Program analysis, submittal for the bases or reference to the bases supporting application of the computer program to the specific physical problem being solved. (i.e; application/validation to the ASME VIII, Div 2, Appendix 4, Maximum Shear Stress Theory.)

J.7.3 ASME B31.3 Piping Design: For FEA Computer Program analysis, submittal for the bases or reference to the bases supporting application of the computer program to the specific physical problem being solved. [i.e; application/validity to the ASME B31.3 design requirements in accordance with B31.3-96, section 300(c)(3)]

J8. Listed below are design inputs to be used

J8a. See Attachment #3 for 14" & 16" grayloc/guide assemblies design inputs provided on the isometric sketches.

J8b. Revised In-Structure Response Spectra curves (see Attachment #1)

- RGM ISRS Figures 37, 38, 39, 49, 50, 51, and 114 for separator vessel (CNP-EVAP-00001)
- RGM ISRS Figures 16, 17, 22, 23, and 144 for CNP condenser skid (CNP-SKID-00002)
- RGM ISRS Figures 37, 38, and 114 for distillation column (CNP-DISTC-00001)
- RGM ISRS Figures 67, 68, and 69 for reboiler (CNP-HX-00001). If the equipment support is not rigid, it shall be simulated or duplicated in the equipment seismic analysis model.
- RGM ISRS Figures 67, 68, and 69 for recirculation pump (CNP-PMP-00001). If the equipment support is not rigid, it shall be simulated or duplicated in the equipment seismic analysis model.

J8c. Redesign of CNP support frame to eliminate lower tie (CNP-SKID-00007-12 member) to canyon wall (see Attachment #2).

J8d. CNP Evaporator recirculation and off-gas piping isometrics (see Attachment #3)

J8e. Nozzle loading for separator vessel (CNP-EVAP-00001) shall be based on actual values as listed in table 1 of Attachment #4. The Seller shall use the actual nozzle load values instead of the values shown in the table in Appendix A of the Pressure Vessel Design and Fabrication Specification, 24590-WTP-3PS-MV00-T0001. The thermal reduction factor found in 24590-WTP-3PS-MV00-T0001, Section 3.7.4, shall not be applied. The nozzle load for separator vessel offgas outlet nozzle (N03), discharge nozzle (N02) and inlet nozzle (N01) shall be per Seller's design & qualification using the results of the coupled FEA. Nozzle loads for separator vessel bubblers (N09A, N09B, N16, N21A, N21B, and N22) due to hydrogen accumulation are not available and will be provided later.

J8f. Nozzle loading for distillation column (CNP-DISTC-00001) shall be based on nozzle design loads for non-black cell vessels provided in table 2 of Attachment #4. The Seller shall use these nozzle load values instead of the values shown in the table in Appendix A of the Pressure Vessel Design and Fabrication Specification, 24590-WTP-3PS-MV00-T0001. The thermal reduction factor found in 24590-WTP-3PS-MV00-T0001, Section 3.7.4, shall not be applied. The nozzle load for distillation column inlet nozzle (N03) and outlet nozzle (N04) shall be per Seller's design & qualification using the results of the coupled FEA.

J8g. Nozzle loading for condenser vessels (CNP-HX-00002/3/4) shall be based on nozzle design loads for non-black cell vessels provided in table 2 of Attachment #4. The Seller shall use these provided values instead of the values shown in the table in Appendix A of the Pressure Vessel Design and Fabrication Specification, 24590-WTP-3PS-MV00-T0001. The thermal reduction factor found in 24590-WTP-3PS-MV00-T0001, Section 3.7.4, shall not be applied. The primary condenser offgas inlet nozzle (N03, 18" vapor inlet from distillation column) shall be per Seller's design and qualification using the results of the coupled FEA.

J8h. Nozzle loading for reboiler vessel (CNP-HX-00001) shall be based on nozzle design loads for non-black cell vessels provided in Table 4 and Table 5 (for steam nozzle NO3) of Attachment #4. The Seller shall use these nozzle load values instead of the values shown in the table in Appendix A of the Pressure Vessel Design and Fabrication Specification, 24590-WTP-3PS-MV00-T0001. The thermal reduction factor found in 24590-WTP-3PS-MV00-T0001, Section 3.7.4, shall not be applied. The reboiler process inlet nozzle (N01) and outlet nozzle (N02) shall be per Seller's design and qualification using the results of the coupled FEA.

J8i. Nozzle loads for recirculation pumps shall be per Seller's design & qualification using the results of the coupled FEA.

J8j. For CNP-EVAP-00001,

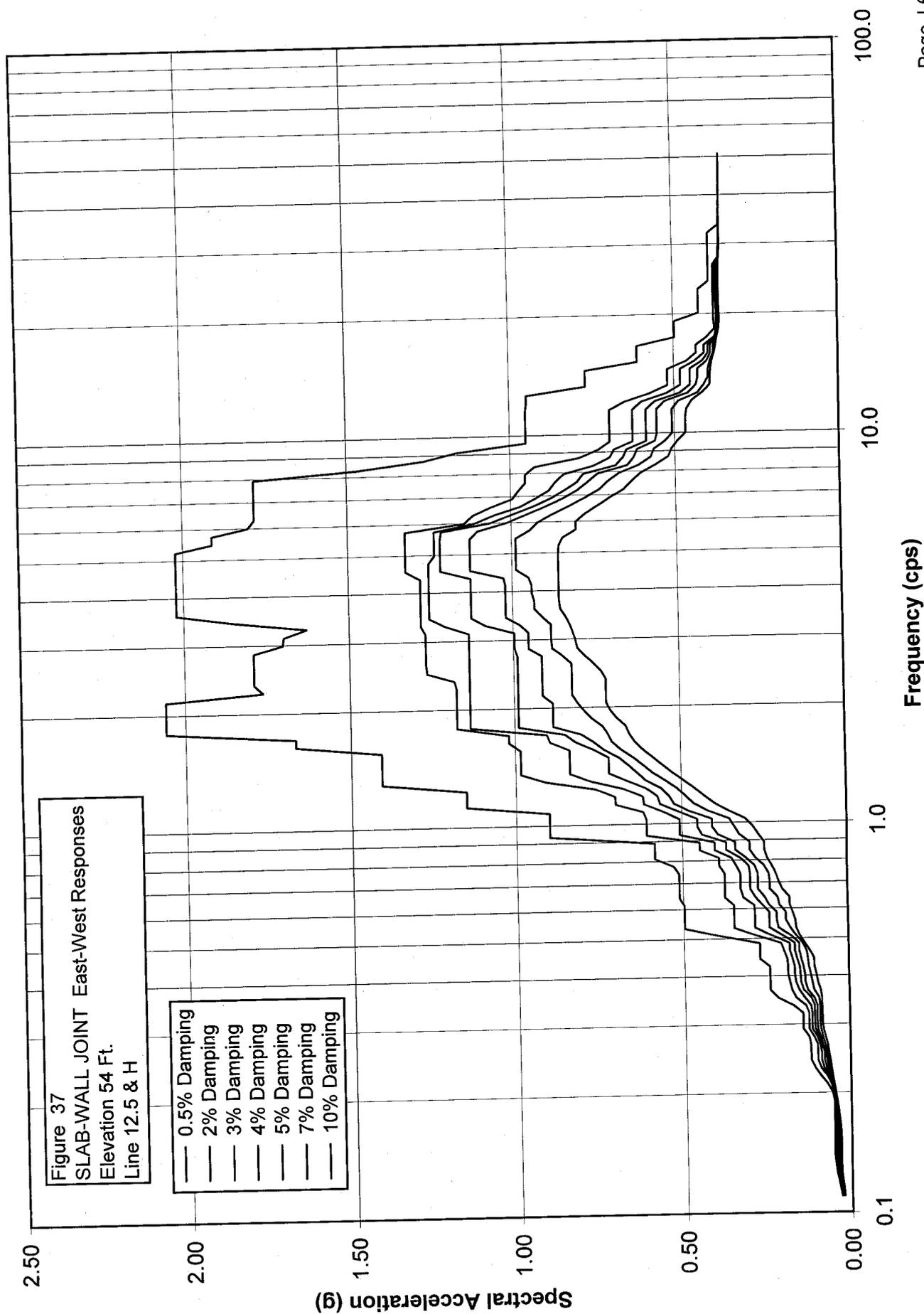
- a. The relative floor movement at location Row D/Column 9 at elevation 36' to location Row D/Column 9 at elevation 56' is: 0.04" EW; 0.10" NS, and 0.01" vertical
- b. The relative floor movement at location Row E/Column 10 at elevation 36' to location Row E/Column 10 at elevation 56' is: 0.04" EW; 0.10" NS, and 0.03" vertical
- c. The relative floor movement at location Row D/Column 9 at elevation 77' to location Row D/Column 9 at elevation 56' is: 0.04" EW; 0.08" NS, and 0.01" vertical
- d. The relative floor movement at location Row E/Column 10 at elevation 77' to location Row E/Column 10 at elevation 56' is: 0.04" EW; 0.09" NS, and 0.03" vertical

J8k. CNP recirculation pump frame conceptual design (See attachment #5).

Attachment #1

**Revised ISRS Curves
(Ref. CCN 128490 and CCN 138088)**

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTW037.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 37
 SLAB-WALL JOINT East-West Responses
 Elevation 54 Ft.
 Line 12.5 & H

0.50%		2%		3%		4%		5%		7%		10%	
Damping Freq.	Accel.												
0.1098	0.0314	0.1098	0.0288	0.1098	0.0276	0.1098	0.0268	0.1098	0.0261	0.1098	0.0248	0.1098	0.0232
0.115	0.0359	0.115	0.0331	0.115	0.0315	0.115	0.0301	0.115	0.029	0.115	0.0275	0.115	0.0254
0.1204	0.041	0.1204	0.0383	0.1204	0.0367	0.1204	0.0353	0.1204	0.034	0.1204	0.0316	0.1204	0.0288
0.1262	0.046	0.1262	0.0427	0.1262	0.0408	0.1262	0.0389	0.1262	0.0373	0.1262	0.0344	0.1262	0.0312
0.1322	0.0489	0.1322	0.0443	0.1322	0.0422	0.1322	0.0403	0.1322	0.0386	0.1322	0.0356	0.1322	0.0321
0.1385	0.0518	0.1385	0.0463	0.1385	0.0431	0.1385	0.0403	0.1385	0.0386	0.1385	0.0356	0.1385	0.0321
0.1451	0.0518	0.1451	0.0463	0.1451	0.0431	0.1451	0.0403	0.1451	0.0386	0.1451	0.0356	0.1451	0.0321
0.152	0.0518	0.152	0.0463	0.152	0.0431	0.152	0.0403	0.152	0.0386	0.152	0.0356	0.152	0.0321
0.1592	0.0518	0.1592	0.0463	0.1592	0.0431	0.1592	0.0403	0.1592	0.0386	0.1592	0.0356	0.1592	0.0324
0.1668	0.0518	0.1668	0.0463	0.1668	0.0431	0.1668	0.0403	0.1668	0.0384	0.1668	0.0362	0.1668	0.0351
0.1748	0.0518	0.1748	0.0463	0.1748	0.0431	0.1748	0.0409	0.1748	0.0404	0.1748	0.0394	0.1748	0.0379
0.1831	0.0518	0.1831	0.0463	0.1831	0.0454	0.1831	0.0447	0.1831	0.044	0.1831	0.0426	0.1831	0.0405
0.1918	0.0521	0.1918	0.0505	0.1918	0.0495	0.1918	0.0485	0.1918	0.0476	0.1918	0.0458	0.1918	0.0437
0.2009	0.0569	0.2009	0.0549	0.2009	0.0536	0.2009	0.0525	0.2009	0.0514	0.2009	0.0497	0.2009	0.0474
0.2105	0.0708	0.2105	0.0601	0.2105	0.0587	0.2105	0.0574	0.2105	0.0562	0.2105	0.054	0.2105	0.0517
0.2205	0.091	0.2205	0.0714	0.2205	0.0643	0.2205	0.0624	0.2205	0.061	0.2205	0.0586	0.2205	0.0558
0.231	0.1079	0.231	0.0908	0.231	0.0814	0.231	0.0735	0.231	0.0672	0.231	0.0631	0.231	0.0594
0.242	0.1195	0.242	0.0993	0.242	0.0884	0.242	0.0793	0.242	0.0716	0.242	0.0666	0.242	0.062
0.2535	0.1204	0.2535	0.0993	0.2535	0.0884	0.2535	0.0797	0.2535	0.0755	0.2535	0.0695	0.2535	0.0658
0.2656	0.1204	0.2656	0.0993	0.2656	0.0923	0.2656	0.088	0.2656	0.084	0.2656	0.0769	0.2656	0.0687
0.2783	0.1255	0.2783	0.1097	0.2783	0.1008	0.2783	0.095	0.2783	0.0907	0.2783	0.0836	0.2783	0.0755
0.2915	0.1424	0.2915	0.1248	0.2915	0.1148	0.2915	0.106	0.2915	0.0982	0.2915	0.0888	0.2915	0.0813
0.3054	0.1424	0.3054	0.1248	0.3054	0.1152	0.3054	0.1069	0.3054	0.0996	0.3054	0.091	0.3054	0.0842
0.3199	0.1424	0.3199	0.1248	0.3199	0.1152	0.3199	0.1069	0.3199	0.0996	0.3199	0.091	0.3199	0.0847
0.3352	0.1711	0.3352	0.1346	0.3352	0.1186	0.3352	0.1069	0.3352	0.0996	0.3352	0.091	0.3352	0.0847
0.3511	0.2174	0.3511	0.1631	0.3511	0.137	0.3511	0.1169	0.3511	0.1078	0.3511	0.0932	0.3511	0.0847
0.3678	0.2401	0.3678	0.1757	0.3678	0.1532	0.3678	0.1396	0.3678	0.1277	0.3678	0.108	0.3678	0.0887

24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery
 Forced Circulation Vacuum Evaporator System

0.3853	0.2401	0.3853	0.1802	0.3853	0.1621	0.3853	0.1466	0.3853	0.1334	0.3853	0.1123	0.3853	0.0951
0.4037	0.2401	0.4037	0.1853	0.4037	0.165	0.4037	0.1482	0.4037	0.1342	0.4037	0.1165	0.4037	0.0995
0.4229	0.2401	0.4229	0.1853	0.4229	0.165	0.4229	0.1498	0.4229	0.1383	0.4229	0.122	0.4229	0.1052
0.4431	0.2697	0.4431	0.1872	0.4431	0.1712	0.4431	0.1571	0.4431	0.1446	0.4431	0.1243	0.4431	0.1052
0.4642	0.2697	0.4642	0.1964	0.4642	0.1791	0.4642	0.1638	0.4642	0.1504	0.4642	0.128	0.4642	0.1176
0.4863	0.2697	0.4863	0.2048	0.4863	0.1795	0.4863	0.1638	0.4863	0.1504	0.4863	0.1397	0.4863	0.1335
0.5094	0.3933	0.5094	0.2804	0.5094	0.2338	0.5094	0.2006	0.5094	0.1758	0.5094	0.1597	0.5094	0.1485
0.5337	0.498	0.5337	0.3467	0.5337	0.2831	0.5337	0.2392	0.5337	0.2125	0.5337	0.1765	0.5337	0.159
0.5591	0.498	0.5591	0.3467	0.5591	0.2831	0.5591	0.2392	0.5591	0.2173	0.5591	0.1897	0.5591	0.1607
0.5857	0.498	0.5857	0.3467	0.5857	0.2831	0.5857	0.2392	0.5857	0.2173	0.5857	0.1897	0.5857	0.1683
0.6136	0.498	0.6136	0.3467	0.6136	0.2856	0.6136	0.2598	0.6136	0.2393	0.6136	0.2082	0.6136	0.1768
0.6428	0.5114	0.6428	0.3731	0.6428	0.3181	0.6428	0.2803	0.6428	0.2522	0.6428	0.2127	0.6428	0.1768
0.6734	0.5114	0.6734	0.3731	0.6734	0.3249	0.6734	0.296	0.6734	0.2724	0.6734	0.236	0.6734	0.1983
0.7055	0.5114	0.7055	0.3731	0.7055	0.3249	0.7055	0.296	0.7055	0.2724	0.7055	0.236	0.7055	0.2086
0.7391	0.5114	0.7391	0.3731	0.7391	0.3249	0.7391	0.296	0.7391	0.2724	0.7391	0.239	0.7391	0.2174
0.7743	0.528	0.7743	0.3894	0.7743	0.3374	0.7743	0.3002	0.7743	0.2812	0.7743	0.2527	0.7743	0.2293
0.8111	0.5842	0.8111	0.3894	0.8111	0.3513	0.8111	0.3253	0.8111	0.3078	0.8111	0.2783	0.8111	0.2431
0.8497	0.5842	0.8497	0.4479	0.8497	0.4022	0.8497	0.367	0.8497	0.3388	0.8497	0.2955	0.8497	0.2503
0.8902	0.5842	0.8902	0.4479	0.8902	0.4022	0.8902	0.367	0.8902	0.3388	0.8902	0.2955	0.8902	0.2503
0.9326	0.8989	0.9326	0.6071	0.9326	0.5073	0.9326	0.4398	0.9326	0.3912	0.9326	0.3262	0.9326	0.2684
0.977	0.8989	0.977	0.6071	0.977	0.5073	0.977	0.4541	0.977	0.4086	0.977	0.3405	0.977	0.2839
1.0235	0.8989	1.0235	0.6071	1.0235	0.5073	1.0235	0.4541	1.0235	0.4086	1.0235	0.3559	1.0235	0.3074
1.0723	0.8989	1.0723	0.6169	1.0723	0.5578	1.0723	0.512	1.0723	0.4768	1.0723	0.4199	1.0723	0.3581
1.1233	1.1502	1.1233	0.6991	1.1233	0.614	1.1233	0.5663	1.1233	0.5238	1.1233	0.4629	1.1233	0.4004
1.1768	1.1502	1.1768	0.7013	1.1768	0.6178	1.1768	0.574	1.1768	0.5383	1.1768	0.4888	1.1768	0.4326
1.2328	1.1502	1.2328	0.7596	1.2328	0.6754	1.2328	0.6064	1.2328	0.5615	1.2328	0.5147	1.2328	0.4624
1.2916	1.4068	1.2916	0.9098	1.2916	0.7736	1.2916	0.6645	1.2916	0.6073	1.2916	0.5502	1.2916	0.4952
1.353	1.4068	1.353	0.9837	1.353	0.8352	1.353	0.7185	1.353	0.6331	1.353	0.5866	1.353	0.5279
1.4175	1.4068	1.4175	0.9837	1.4175	0.8352	1.4175	0.7185	1.4175	0.6595	1.4175	0.6157	1.4175	0.5573
1.485	1.4068	1.485	0.9837	1.485	0.8352	1.485	0.7185	1.485	0.6887	1.485	0.6451	1.485	0.5868
1.5557	1.4068	1.5557	0.9837	1.5557	0.8352	1.5557	0.7621	1.5557	0.7323	1.5557	0.6811	1.5557	0.6154
1.6298	1.6671	1.6298	1.0185	1.6298	0.8939	1.6298	0.8172	1.6298	0.764	1.6298	0.7078	1.6298	0.6397
1.7074	1.6671	1.7074	1.0185	1.7074	0.9033	1.7074	0.8484	1.7074	0.8	1.7074	0.7196	1.7074	0.6548
1.7887	2.06	1.7887	1.175	1.7887	1.1351	1.7887	0.9877	1.7887	0.8836	1.7887	0.7359	1.7887	0.6657
1.8738	2.06	1.8738	1.175	1.8738	1.1351	1.8738	0.9877	1.8738	0.8836	1.8738	0.767	1.8738	0.691
1.963	2.06	1.963	1.175	1.963	1.1351	1.963	0.9877	1.963	0.8836	1.963	0.7893	1.963	0.7111
2.0565	2.06	2.0565	1.175	2.0565	1.1351	2.0565	0.9877	2.0565	0.8836	2.0565	0.809	2.0565	0.7233
2.1544	2.06	2.1544	1.175	2.1544	1.1351	2.1544	0.9877	2.1544	0.9145	2.1544	0.8248	2.1544	0.7233
2.257	1.7633	2.257	1.175	2.257	1.1351	2.257	0.9877	2.257	0.9145	2.257	0.8248	2.257	0.7233

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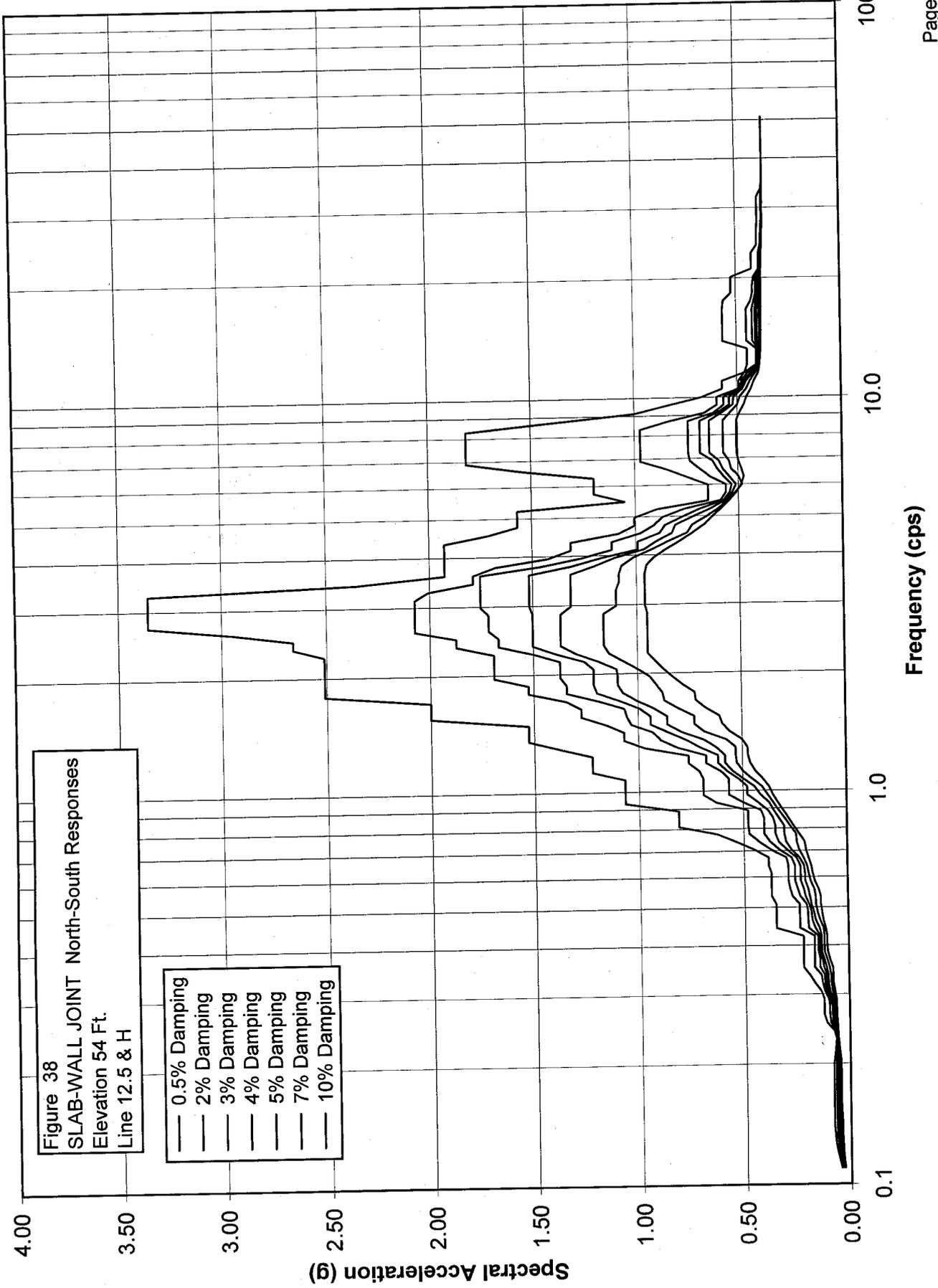
2.3645	1.7905	2.3645	1.1812	2.3645	1.1351	2.3645	0.9877	2.3645	0.9145	2.3645	0.8248	2.3645	0.7233
2.4771	1.7905	2.4771	1.2641	2.4771	1.1351	2.4771	0.9877	2.4771	0.9145	2.4771	0.8248	2.4771	0.7363
2.595	1.7905	2.595	1.2669	2.595	1.1351	2.595	0.9877	2.595	0.9145	2.595	0.8248	2.595	0.7588
2.7186	1.7905	2.7186	1.2669	2.7186	1.1351	2.7186	0.9877	2.7186	0.9145	2.7186	0.8512	2.7186	0.7851
2.848	1.7905	2.848	1.2669	2.848	1.1351	2.848	0.9964	2.848	0.9535	2.848	0.8827	2.848	0.8066
2.9836	1.7027	2.9836	1.2669	2.9836	1.1351	2.9836	0.9964	2.9836	0.9535	2.9836	0.8849	2.9836	0.8127
3.1257	1.6996	3.1257	1.2669	3.1257	1.1351	3.1257	0.9964	3.1257	0.9535	3.1257	0.8849	3.1257	0.8201
3.2745	1.6283	3.2745	1.2808	3.2745	1.2073	3.2745	1.0843	3.2745	0.9787	3.2745	0.885	3.2745	0.8282
3.4305	1.8505	3.4305	1.2808	3.4305	1.2545	3.4305	1.1266	3.4305	1.0213	3.4305	0.9111	3.4305	0.8401
3.5938	2.0228	3.5938	1.2808	3.5938	1.2545	3.5938	1.1266	3.5938	1.0213	3.5938	0.9346	3.5938	0.8563
3.7649	2.0228	3.7649	1.2808	3.7649	1.2545	3.7649	1.1266	3.7649	1.0213	3.7649	0.9346	3.7649	0.8595
3.9442	2.0228	3.9442	1.2808	3.9442	1.2545	3.9442	1.1266	3.9442	1.0213	3.9442	0.9409	3.9442	0.8595
4.132	2.0228	4.132	1.2808	4.132	1.2545	4.132	1.1266	4.132	1.0213	4.132	0.9409	4.132	0.8598
4.3288	2.0228	4.3288	1.2808	4.3288	1.2545	4.3288	1.1266	4.3288	1.0265	4.3288	0.9503	4.3288	0.8598
4.5349	2.0228	4.5349	1.3256	4.5349	1.2545	4.5349	1.2184	4.5349	1.1271	4.5349	0.987	4.5349	0.8598
4.7508	2.0228	4.7508	1.3256	4.7508	1.2545	4.7508	1.2184	4.7508	1.1271	4.7508	0.987	4.7508	0.8598
4.977	2.0228	4.977	1.3256	4.977	1.2365	4.977	1.2184	4.977	1.1271	4.977	0.987	4.977	0.8598
5.214	2.0228	5.214	1.3256	5.214	1.2365	5.214	1.2184	5.214	1.1271	5.214	0.987	5.214	0.8574
5.4623	1.9118	5.4623	1.3256	5.4623	1.2365	5.4623	1.2184	5.4623	1.1271	5.4623	0.987	5.4623	0.8452
5.7224	1.9118	5.7224	1.3256	5.7224	1.2365	5.7224	1.2141	5.7224	1.103	5.7224	0.944	5.7224	0.8044
5.9948	1.8019	5.9948	1.437	5.9948	1.1117	5.9948	1.0649	5.9948	1.0143	5.9948	0.919	5.9948	0.8044
6.2803	1.7825	6.2803	1.1158	6.2803	1.0505	6.2803	0.9983	6.2803	0.9528	6.2803	0.8733	6.2803	0.7753
6.5793	1.7825	6.5793	1.0616	6.5793	0.9721	6.5793	0.9326	6.5793	0.8937	6.5793	0.8232	6.5793	0.7371
6.8926	1.7825	6.8926	0.9948	6.8926	0.9254	6.8926	0.8781	6.8926	0.8395	6.8926	0.7757	6.8926	0.6988
7.2208	1.7825	7.2208	0.9766	7.2208	0.8836	7.2208	0.8362	7.2208	0.7973	7.2208	0.7333	7.2208	0.6574
7.5646	1.7825	7.5646	0.9553	7.5646	0.8653	7.5646	0.7978	7.5646	0.7657	7.5646	0.7059	7.5646	0.6333
7.9248	1.7825	7.9248	0.9553	7.9248	0.8374	7.9248	0.7789	7.9248	0.7357	7.9248	0.6724	7.9248	0.6047
8.3022	1.467	8.3022	0.9256	8.3022	0.7482	8.3022	0.6811	8.3022	0.6451	8.3022	0.6114	8.3022	0.5606
8.6975	1.2634	8.6975	0.7906	8.6975	0.6976	8.6975	0.6577	8.6975	0.6254	8.6975	0.5739	8.6975	0.5206
9.1116	1.1614	9.1116	0.734	9.1116	0.6851	9.1116	0.6466	9.1116	0.6147	9.1116	0.5644	9.1116	0.5109
9.5455	0.9513	9.5455	0.6972	9.5455	0.6272	9.5455	0.5869	9.5455	0.5603	9.5455	0.5292	9.5455	0.4915
10	0.9513	10	0.6972	10	0.6272	10	0.5869	10	0.5545	10	0.5075	10	0.4672
10.4762	0.9513	10.4762	0.6972	10.4762	0.6272	10.4762	0.5869	10.4762	0.5545	10.4762	0.5075	10.4762	0.4672
10.975	0.9513	10.975	0.6972	10.975	0.6272	10.975	0.5869	10.975	0.5545	10.975	0.5075	10.975	0.4672
11.4976	0.9513	11.4976	0.6972	11.4976	0.6272	11.4976	0.5869	11.4976	0.5545	11.4976	0.5075	11.4976	0.4637
12.045	0.9476	12.045	0.6512	12.045	0.5986	12.045	0.559	12.045	0.529	12.045	0.4872	12.045	0.4481
12.6186	0.9476	12.6186	0.5757	12.6186	0.5238	12.6186	0.4831	12.6186	0.4585	12.6186	0.4288	12.6186	0.4166
13.2194	0.7684	13.2194	0.5197	13.2194	0.4807	13.2194	0.452	13.2194	0.4333	13.2194	0.4097	13.2194	0.3907
13.8489	0.7684	13.8489	0.5197	13.8489	0.4807	13.8489	0.4508	13.8489	0.4275	13.8489	0.3956	13.8489	0.39

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14.5083	0.7684	14.5083	0.5197	14.5083	0.4807	14.5083	0.4508	14.5083	0.4275	14.5083	0.3953	14.5083	0.3877
15.1991	0.6109	15.1991	0.462	15.1991	0.4357	15.1991	0.4127	15.1991	0.3986	15.1991	0.389	15.1991	0.3834
15.9228	0.6109	15.9228	0.4312	15.9228	0.4068	15.9228	0.3944	15.9228	0.3869	15.9228	0.3787	15.9228	0.3756
16.681	0.6109	16.681	0.4312	16.681	0.4068	16.681	0.3944	16.681	0.3869	16.681	0.3781	16.681	0.371
17.4753	0.4963	17.4753	0.3971	17.4753	0.3731	17.4753	0.3731	17.4753	0.3729	17.4753	0.3709	17.4753	0.367
18.3074	0.4963	18.3074	0.3731	18.3074	0.3686	18.3074	0.3667	18.3074	0.3656	18.3074	0.3639	18.3074	0.3615
19.1791	0.4963	19.1791	0.3752	19.1791	0.3678	19.1791	0.3639	19.1791	0.3615	19.1791	0.3592	19.1791	0.3588
20.0923	0.4216	20.0923	0.3752	20.0923	0.3678	20.0923	0.3639	20.0923	0.3615	20.0923	0.3593	20.0923	0.3585
21.049	0.4216	21.049	0.3752	21.049	0.3678	21.049	0.3639	21.049	0.362	21.049	0.3611	21.049	0.3597
22.0513	0.4216	22.0513	0.3757	22.0513	0.3701	22.0513	0.3666	22.0513	0.3643	22.0513	0.3616	22.0513	0.3597
23.1013	0.4216	23.1013	0.3757	23.1013	0.3701	23.1013	0.3666	23.1013	0.3643	23.1013	0.3616	23.1013	0.3597
24.2013	0.3898	24.2013	0.3757	24.2013	0.3701	24.2013	0.3666	24.2013	0.3643	24.2013	0.3616	24.2013	0.3597
25.3536	0.3898	25.3536	0.3757	25.3536	0.3701	25.3536	0.3666	25.3536	0.3643	25.3536	0.3616	25.3536	0.3597
26.5609	0.3898	26.5609	0.3757	26.5609	0.3701	26.5609	0.3666	26.5609	0.3643	26.5609	0.3616	26.5609	0.3596
27.8256	0.3898	27.8256	0.3593	27.8256	0.357	27.8256	0.358	27.8256	0.3585	27.8256	0.3585	27.8256	0.3579
29.1505	0.3898	29.1505	0.3593	29.1505	0.357	29.1505	0.3561	29.1505	0.3559	29.1505	0.3559	29.1505	0.3561
30.5386	0.3898	30.5386	0.3564	30.5386	0.356	30.5386	0.3557	30.5386	0.3555	30.5386	0.3552	30.5386	0.3549
31.9927	0.3898	31.9927	0.3564	31.9927	0.356	31.9927	0.3557	31.9927	0.3555	31.9927	0.3552	31.9927	0.3549
33.516	0.3588	33.516	0.3564	33.516	0.356	33.516	0.3557	33.516	0.3555	33.516	0.3552	33.516	0.3549
35.1119	0.3567	35.1119	0.3563	35.1119	0.356	35.1119	0.3557	35.1119	0.3555	35.1119	0.3552	35.1119	0.3549
36.7838	0.3557	36.7838	0.3556	36.7838	0.3555	36.7838	0.3553	36.7838	0.3552	36.7838	0.355	36.7838	0.3548
38.5353	0.3551	38.5353	0.355	38.5353	0.3549	38.5353	0.3549	38.5353	0.3548	38.5353	0.3547	38.5353	0.3546
40.3702	0.3546	40.3702	0.3545	40.3702	0.3545	40.3702	0.3544	40.3702	0.3544	40.3702	0.3543	40.3702	0.3543
42.2924	0.3541	42.2924	0.3541	42.2924	0.3541	42.2924	0.354	42.2924	0.354	42.2924	0.354	42.2924	0.3539
44.3062	0.3537	44.3062	0.3537	44.3062	0.3537	44.3062	0.3537	44.3062	0.3537	44.3062	0.3537	44.3062	0.3536
46.4159	0.3534	46.4159	0.3534	46.4159	0.3534	46.4159	0.3534	46.4159	0.3534	46.4159	0.3534	46.4159	0.3533
48.626	0.3531	48.626	0.3531	48.626	0.3531	48.626	0.353	48.626	0.353	48.626	0.353	48.626	0.3531
50.9414	0.3528	50.9414	0.3528	50.9414	0.3528	50.9414	0.3528	50.9414	0.3528	50.9414	0.3528	50.9414	0.3528

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTWW038.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 38
 SLAB-WALL JOINT North-South Responses
 Elevation 54 Ft.
 Line 12.5 & H

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0457	0.1098	0.0394	0.1098	0.0365	0.1098	0.0345	0.1098	0.0331	0.1098	0.0312	0.1098	0.0312	0.1098	0.0286
0.115	0.0556	0.115	0.0494	0.115	0.0467	0.115	0.0443	0.115	0.0422	0.115	0.0384	0.115	0.0384	0.115	0.0338
0.1204	0.0648	0.1204	0.0583	0.1204	0.0546	0.1204	0.0512	0.1204	0.0481	0.1204	0.0428	0.1204	0.0428	0.1204	0.0365
0.1262	0.072	0.1262	0.0618	0.1262	0.0572	0.1262	0.0533	0.1262	0.0498	0.1262	0.0438	0.1262	0.0438	0.1262	0.0384
0.1322	0.0763	0.1322	0.0653	0.1322	0.0604	0.1322	0.0565	0.1322	0.053	0.1322	0.0471	0.1322	0.0471	0.1322	0.0404
0.1385	0.0786	0.1385	0.0673	0.1385	0.0609	0.1385	0.0565	0.1385	0.053	0.1385	0.0471	0.1385	0.0471	0.1385	0.0404
0.1451	0.0789	0.1451	0.0675	0.1451	0.0612	0.1451	0.0565	0.1451	0.053	0.1451	0.0471	0.1451	0.0471	0.1451	0.0412
0.152	0.0789	0.152	0.0675	0.152	0.0612	0.152	0.0568	0.152	0.0538	0.152	0.0487	0.152	0.0487	0.152	0.0434
0.1592	0.0789	0.1592	0.0675	0.1592	0.0612	0.1592	0.0568	0.1592	0.0538	0.1592	0.049	0.1592	0.049	0.1592	0.0442
0.1668	0.0789	0.1668	0.0675	0.1668	0.0612	0.1668	0.0568	0.1668	0.0538	0.1668	0.049	0.1668	0.049	0.1668	0.0442
0.1748	0.0789	0.1748	0.0675	0.1748	0.0612	0.1748	0.0568	0.1748	0.0538	0.1748	0.049	0.1748	0.049	0.1748	0.0442
0.1831	0.0789	0.1831	0.0675	0.1831	0.0612	0.1831	0.0568	0.1831	0.0538	0.1831	0.049	0.1831	0.049	0.1831	0.0442
0.1918	0.0789	0.1918	0.0675	0.1918	0.0612	0.1918	0.0564	0.1918	0.0535	0.1918	0.049	0.1918	0.049	0.1918	0.0442
0.2009	0.0789	0.2009	0.0675	0.2009	0.0612	0.2009	0.0564	0.2009	0.0534	0.2009	0.0483	0.2009	0.0483	0.2009	0.0442
0.2105	0.0737	0.2105	0.0634	0.2105	0.0597	0.2105	0.0564	0.2105	0.0534	0.2105	0.0495	0.2105	0.0495	0.2105	0.0481
0.2205	0.0686	0.2205	0.0626	0.2205	0.0591	0.2205	0.0563	0.2205	0.0553	0.2205	0.0536	0.2205	0.0536	0.2205	0.0518
0.231	0.0653	0.231	0.063	0.231	0.0616	0.231	0.0604	0.231	0.0592	0.231	0.0573	0.231	0.0573	0.231	0.0552
0.242	0.0765	0.242	0.0692	0.242	0.0652	0.242	0.0639	0.242	0.0627	0.242	0.0606	0.242	0.0606	0.242	0.0581
0.2535	0.1105	0.2535	0.092	0.2535	0.0827	0.2535	0.0753	0.2535	0.0694	0.2535	0.0632	0.2535	0.0632	0.2535	0.0604
0.2656	0.1221	0.2656	0.0955	0.2656	0.083	0.2656	0.0753	0.2656	0.0694	0.2656	0.0652	0.2656	0.0652	0.2656	0.0619
0.2783	0.1221	0.2783	0.0955	0.2783	0.0836	0.2783	0.0789	0.2783	0.0748	0.2783	0.0679	0.2783	0.0679	0.2783	0.0626
0.2915	0.1221	0.2915	0.1011	0.2915	0.0941	0.2915	0.0879	0.2915	0.0824	0.2915	0.0732	0.2915	0.0732	0.2915	0.0631
0.3054	0.1371	0.3054	0.1191	0.3054	0.1092	0.3054	0.1006	0.3054	0.0931	0.3054	0.0811	0.3054	0.0811	0.3054	0.0706
0.3199	0.1652	0.3199	0.1286	0.3199	0.1172	0.3199	0.1073	0.3199	0.0989	0.3199	0.0856	0.3199	0.0856	0.3199	0.0757
0.3352	0.1878	0.3352	0.1337	0.3352	0.1172	0.3352	0.1073	0.3352	0.0989	0.3352	0.0865	0.3352	0.0865	0.3352	0.0771
0.3511	0.2181	0.3511	0.1647	0.3511	0.1395	0.3511	0.12	0.3511	0.1078	0.3511	0.0935	0.3511	0.0935	0.3511	0.0785
0.3678	0.2181	0.3678	0.1647	0.3678	0.1397	0.3678	0.1283	0.3678	0.1183	0.3678	0.1047	0.3678	0.1047	0.3678	0.0915

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0.3853	0.2181	0.3853	0.1647	0.3853	0.147	0.3853	0.138	0.3853	0.13	0.3853	0.1166	0.3853	0.1017
0.4037	0.2181	0.4037	0.1647	0.4037	0.1478	0.4037	0.1391	0.4037	0.1314	0.4037	0.1186	0.4037	0.1044
0.4229	0.2189	0.4229	0.1647	0.4229	0.1478	0.4229	0.1391	0.4229	0.1314	0.4229	0.1186	0.4229	0.1044
0.4431	0.3472	0.4431	0.2355	0.4431	0.1923	0.4431	0.1615	0.4431	0.1413	0.4431	0.1213	0.4431	0.1119
0.4642	0.3472	0.4642	0.2355	0.4642	0.1951	0.4642	0.1751	0.4642	0.1594	0.4642	0.1384	0.4642	0.1214
0.4863	0.3472	0.4863	0.2355	0.4863	0.1951	0.4863	0.1781	0.4863	0.1665	0.4863	0.1492	0.4863	0.1273
0.5094	0.3472	0.5094	0.2355	0.5094	0.2018	0.5094	0.1893	0.5094	0.178	0.5094	0.1574	0.5094	0.133
0.5337	0.3695	0.5337	0.2689	0.5337	0.232	0.5337	0.2061	0.5337	0.1852	0.5337	0.1574	0.5337	0.133
0.5591	0.3695	0.5591	0.281	0.5591	0.2442	0.5591	0.2148	0.5591	0.193	0.5591	0.1633	0.5591	0.1435
0.5857	0.3695	0.5857	0.2873	0.5857	0.2546	0.5857	0.228	0.5857	0.2062	0.5857	0.1801	0.5857	0.1608
0.6136	0.3695	0.6136	0.2873	0.6136	0.2546	0.6136	0.228	0.6136	0.2069	0.6136	0.1894	0.6136	0.1692
0.6428	0.3817	0.6428	0.2873	0.6428	0.2546	0.6428	0.2298	0.6428	0.2121	0.6428	0.1961	0.6428	0.1762
0.6734	0.3817	0.6734	0.2976	0.6734	0.2715	0.6734	0.2487	0.6734	0.2338	0.6734	0.2138	0.6734	0.1889
0.7055	0.4491	0.7055	0.37	0.7055	0.3283	0.7055	0.2935	0.7055	0.2706	0.7055	0.2341	0.7055	0.2005
0.7391	0.5365	0.7391	0.4265	0.7391	0.3742	0.7391	0.3318	0.7391	0.2971	0.7391	0.2451	0.7391	0.2071
0.7743	0.628	0.7743	0.4729	0.7743	0.4012	0.7743	0.3465	0.7743	0.3042	0.7743	0.2469	0.7743	0.2325
0.8111	0.813	0.8111	0.4774	0.8111	0.4012	0.8111	0.3465	0.8111	0.3042	0.8111	0.2755	0.8111	0.2586
0.8497	0.813	0.8497	0.4774	0.8497	0.4012	0.8497	0.3574	0.8497	0.3295	0.8497	0.3025	0.8497	0.2836
0.8902	0.813	0.8902	0.4774	0.8902	0.4159	0.8902	0.3821	0.8902	0.3545	0.8902	0.3296	0.8902	0.3085
0.9326	1.0682	0.9326	0.63	0.9326	0.502	0.9326	0.4299	0.9326	0.3762	0.9326	0.3568	0.9326	0.3336
0.977	1.0682	0.977	0.6921	0.977	0.5678	0.977	0.4802	0.977	0.4166	0.977	0.3823	0.977	0.3564
1.0235	1.0682	1.0235	0.6921	1.0235	0.5678	1.0235	0.4802	1.0235	0.4461	1.0235	0.4083	1.0235	0.3759
1.0723	1.0682	1.0723	0.6921	1.0723	0.5678	1.0723	0.5223	1.0723	0.499	1.0723	0.457	1.0723	0.4039
1.1233	1.2235	1.1233	0.7093	1.1233	0.6072	1.1233	0.5774	1.1233	0.5491	1.1233	0.5	1.1233	0.4397
1.1768	1.2235	1.1768	0.7609	1.1768	0.6761	1.1768	0.6181	1.1768	0.5844	1.1768	0.5279	1.1768	0.4629
1.2328	1.2235	1.2328	0.7609	1.2328	0.6761	1.2328	0.6181	1.2328	0.5848	1.2328	0.5319	1.2328	0.4733
1.2916	1.38	1.2916	0.9702	1.2916	0.8115	1.2916	0.7038	1.2916	0.6261	1.2916	0.5319	1.2916	0.4757
1.353	1.5277	1.353	1.0704	1.353	0.893	1.353	0.7708	1.353	0.6847	1.353	0.5767	1.353	0.5012
1.4175	1.5277	1.4175	1.0704	1.4175	0.9317	1.4175	0.8594	1.4175	0.7938	1.4175	0.6823	1.4175	0.5606
1.485	1.5277	1.485	1.1558	1.485	1.036	1.485	0.9419	1.485	0.8621	1.485	0.7311	1.485	0.5961
1.5557	1.9994	1.5557	1.2739	1.5557	1.0575	1.5557	0.9419	1.5557	0.8621	1.5557	0.7311	1.5557	0.6097
1.6298	1.9994	1.6298	1.2739	1.6298	1.0685	1.6298	0.9942	1.6298	0.9258	1.6298	0.8095	1.6298	0.6757
1.7074	1.9994	1.7074	1.3467	1.7074	1.1921	1.7074	1.0891	1.7074	1.0073	1.7074	0.8754	1.7074	0.7234
1.7887	2.5094	1.7887	1.5259	1.7887	1.3435	1.7887	1.198	1.7887	1.0737	1.7887	0.8849	1.7887	0.7284
1.8738	2.5094	1.8738	1.5259	1.8738	1.3435	1.8738	1.2126	1.8738	1.0986	1.8738	0.9122	1.8738	0.7848
1.963	2.5094	1.963	1.6919	1.963	1.3738	1.963	1.2126	1.963	1.0986	1.963	0.9419	1.963	0.8346
2.0565	2.5094	2.0565	1.6919	2.0565	1.3738	2.0565	1.2126	2.0565	1.1043	2.0565	1.0014	2.0565	0.8791
2.1544	2.5094	2.1544	1.6919	2.1544	1.3738	2.1544	1.2586	2.1544	1.1906	2.1544	1.0705	2.1544	0.9161
2.257	2.5118	2.257	1.6919	2.257	1.4972	2.257	1.3913	2.257	1.2957	2.257	1.1384	2.257	0.9527

2.3645	2.6594	2.3645	1.8721	2.3645	1.6678	2.3645	1.5032	2.3645	1.3686	2.3645	1.1626	2.3645	0.9527
2.4771	2.6594	2.4771	1.8721	2.4771	1.6678	2.4771	1.5032	2.4771	1.3686	2.4771	1.1626	2.4771	0.9527
2.595	2.9473	2.595	2.0725	2.595	1.7153	2.595	1.5032	2.595	1.3686	2.595	1.1626	2.595	0.9527
2.7186	3.3563	2.7186	2.0725	2.7186	1.7153	2.7186	1.5032	2.7186	1.3686	2.7186	1.1626	2.7186	0.9527
2.848	3.3563	2.848	2.0725	2.848	1.7153	2.848	1.5032	2.848	1.3686	2.848	1.1626	2.848	0.9527
2.9836	3.3563	2.9836	2.0725	2.9836	1.7536	2.9836	1.5166	2.9836	1.3191	2.9836	1.1021	2.9836	0.9624
3.1257	3.3563	3.1257	2.0725	3.1257	1.7536	3.1257	1.5166	3.1257	1.3191	3.1257	1.1021	3.1257	0.9624
3.2745	3.3563	3.2745	2.0076	3.2745	1.7536	3.2745	1.5166	3.2745	1.3191	3.2745	1.1021	3.2745	0.9624
3.4305	2.3492	3.4305	1.7893	3.4305	1.7536	3.4305	1.5166	3.4305	1.3191	3.4305	1.0863	3.4305	0.9624
3.5938	1.9258	3.5938	1.7893	3.5938	1.7536	3.5938	1.5166	3.5938	1.3191	3.5938	1.0863	3.5938	0.9624
3.7649	1.9258	3.7649	1.6814	3.7649	1.4648	3.7649	1.3142	3.7649	1.2046	3.7649	1.0723	3.7649	0.9532
3.9442	1.9258	3.9442	1.4249	3.9442	1.266	3.9442	1.1716	3.9442	1.1062	3.9442	1.0158	3.9442	0.9161
4.132	1.9258	4.132	1.3151	4.132	1.1186	4.132	0.9925	4.132	0.9639	4.132	0.9241	4.132	0.8565
4.3288	1.9258	4.3288	1.3151	4.3288	1.1186	4.3288	0.9925	4.3288	0.9036	4.3288	0.8451	4.3288	0.7892
4.5349	1.7138	4.5349	1.0833	4.5349	0.9804	4.5349	0.8879	4.5349	0.8266	4.5349	0.7534	4.5349	0.726
4.7508	1.5698	4.7508	1.006	4.7508	0.9133	4.7508	0.8601	4.7508	0.8104	4.7508	0.727	4.7508	0.671
4.977	1.5698	4.977	1.006	4.977	0.8727	4.977	0.7769	4.977	0.7266	4.977	0.659	4.977	0.6299
5.214	1.5698	5.214	0.8976	5.214	0.7649	5.214	0.6877	5.214	0.636	5.214	0.5985	5.214	0.5865
5.4623	1.0521	5.4623	0.6474	5.4623	0.5881	5.4623	0.5734	5.4623	0.5654	5.4623	0.5556	5.4623	0.546
5.7224	1.2	5.7224	0.6474	5.7224	0.5602	5.7224	0.5421	5.7224	0.5301	5.7224	0.5147	5.7224	0.5117
5.9948	1.2	5.9948	0.6474	5.9948	0.5599	5.9948	0.5327	5.9948	0.512	5.9948	0.4821	5.9948	0.4861
6.2803	1.2	6.2803	0.7482	6.2803	0.6357	6.2803	0.5707	6.2803	0.5436	6.2803	0.4982	6.2803	0.4735
6.5793	1.5424	6.5793	0.8479	6.5793	0.6847	6.5793	0.6018	6.5793	0.5757	6.5793	0.5344	6.5793	0.4848
6.8926	1.8136	6.8926	0.974	6.8926	0.7343	6.8926	0.6233	6.8926	0.5933	6.8926	0.5446	6.8926	0.4987
7.2208	1.8136	7.2208	0.974	7.2208	0.7423	7.2208	0.684	7.2208	0.6378	7.2208	0.5711	7.2208	0.5069
7.5646	1.8136	7.5646	0.974	7.5646	0.7423	7.5646	0.684	7.5646	0.6378	7.5646	0.5711	7.5646	0.5069
7.9248	1.8136	7.9248	0.974	7.9248	0.7423	7.9248	0.684	7.9248	0.6378	7.9248	0.5711	7.9248	0.5069
8.3022	1.8136	8.3022	0.974	8.3022	0.7423	8.3022	0.684	8.3022	0.6378	8.3022	0.5711	8.3022	0.5069
8.6975	1.4099	8.6975	0.8352	8.6975	0.7423	8.6975	0.684	8.6975	0.6378	8.6975	0.5711	8.6975	0.5069
9.1116	1.001	9.1116	0.6622	9.1116	0.6162	9.1116	0.5977	9.1116	0.5769	9.1116	0.5373	9.1116	0.4896
9.5455	0.8404	9.5455	0.5998	9.5455	0.5657	9.5455	0.5394	9.5455	0.5225	9.5455	0.5005	9.5455	0.4689
10	0.6745	10	0.5998	10	0.5657	10	0.5394	10	0.5187	10	0.4877	10	0.4553
10.4762	0.572	10.4762	0.4915	10.4762	0.487	10.4762	0.4816	10.4762	0.4736	10.4762	0.4556	10.4762	0.433
10.975	0.572	10.975	0.4915	10.975	0.4781	10.975	0.4658	10.975	0.4552	10.975	0.4378	10.975	0.4175
11.4976	0.4636	11.4976	0.4648	11.4976	0.4484	11.4976	0.4337	11.4976	0.4218	11.4976	0.4094	11.4976	0.3962
12.045	0.4491	12.045	0.4045	12.045	0.3965	12.045	0.3945	12.045	0.393	12.045	0.3913	12.045	0.3895
12.6186	0.4491	12.6186	0.4045	12.6186	0.3957	12.6186	0.392	12.6186	0.3903	12.6186	0.3885	12.6186	0.3869
13.2194	0.4491	13.2194	0.4045	13.2194	0.3957	13.2194	0.3907	13.2194	0.3882	13.2194	0.3853	13.2194	0.3846
13.8489	0.5669	13.8489	0.4508	13.8489	0.4226	13.8489	0.4077	13.8489	0.3984	13.8489	0.3876	13.8489	0.3834

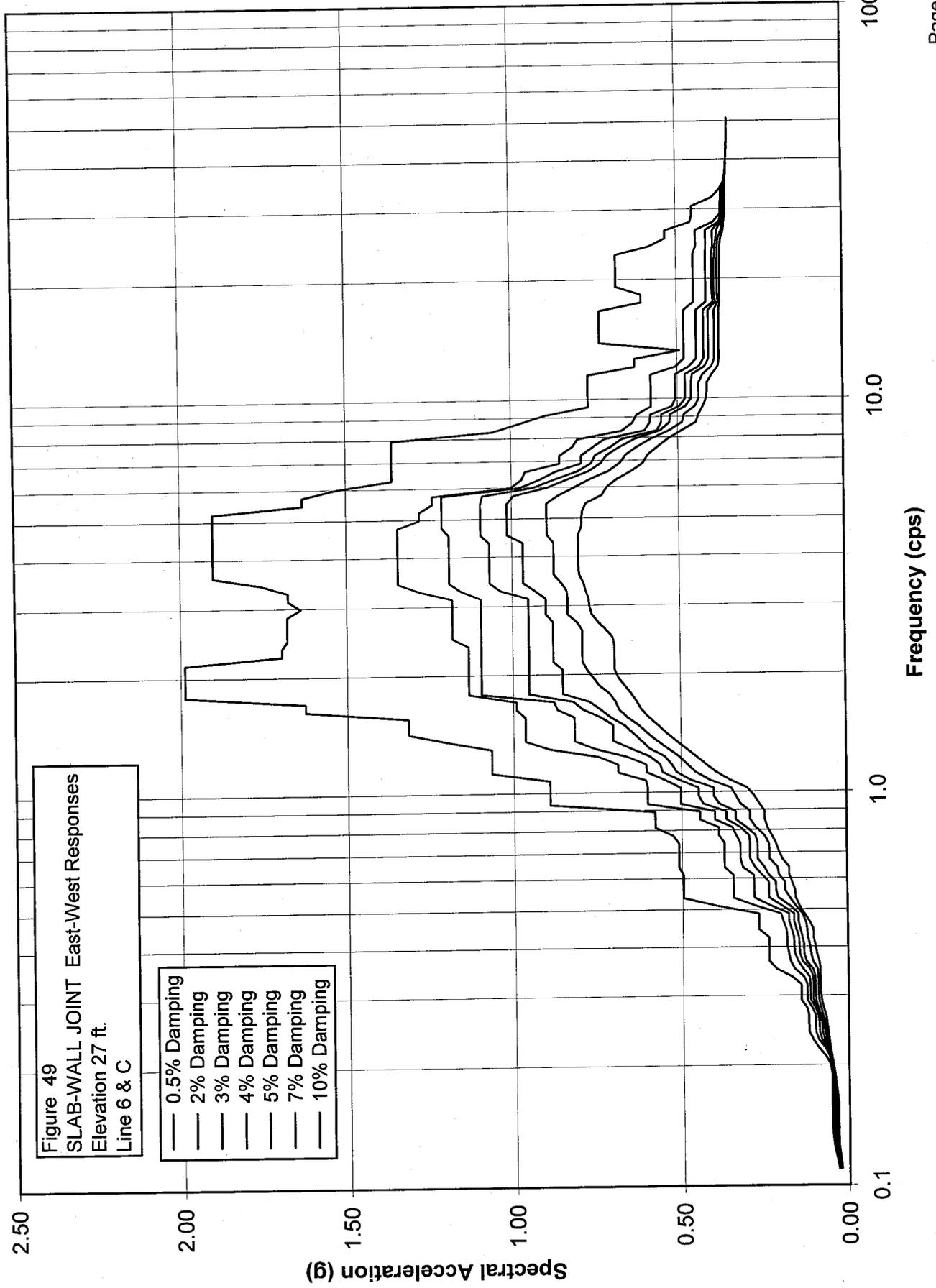
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14.5083	0.5669	14.5083	0.4508	14.5083	0.4226	14.5083	0.4077	14.5083	0.3984	14.5083	0.3876	14.5083	0.3822
15.1991	0.5669	15.1991	0.4508	15.1991	0.4226	15.1991	0.4077	15.1991	0.3984	15.1991	0.3876	15.1991	0.3777
15.9228	0.5669	15.9228	0.4508	15.9228	0.4226	15.9228	0.4077	15.9228	0.3984	15.9228	0.3876	15.9228	0.3762
16.681	0.5669	16.681	0.4508	16.681	0.4226	16.681	0.4077	16.681	0.3984	16.681	0.3876	16.681	0.3758
17.4753	0.5622	17.4753	0.4284	17.4753	0.4129	17.4753	0.4035	17.4753	0.3964	17.4753	0.3864	17.4753	0.3788
18.3074	0.5236	18.3074	0.4191	18.3074	0.4041	18.3074	0.397	18.3074	0.3916	18.3074	0.3843	18.3074	0.3788
19.1791	0.5236	19.1791	0.4191	19.1791	0.4041	19.1791	0.397	19.1791	0.3916	19.1791	0.3843	19.1791	0.3788
20.0923	0.5236	20.0923	0.4128	20.0923	0.4041	20.0923	0.397	20.0923	0.3916	20.0923	0.3843	20.0923	0.3788
21.049	0.4235	21.049	0.3889	21.049	0.3847	21.049	0.3848	21.049	0.3841	21.049	0.382	21.049	0.3788
22.0513	0.4235	22.0513	0.3889	22.0513	0.384	22.0513	0.3822	22.0513	0.3809	22.0513	0.3798	22.0513	0.3777
23.1013	0.4235	23.1013	0.3889	23.1013	0.384	23.1013	0.3822	23.1013	0.3807	23.1013	0.3785	23.1013	0.3762
24.2013	0.396	24.2013	0.3804	24.2013	0.3791	24.2013	0.3781	24.2013	0.3771	24.2013	0.3754	24.2013	0.3738
25.3536	0.396	25.3536	0.3788	25.3536	0.3776	25.3536	0.3766	25.3536	0.3757	25.3536	0.3743	25.3536	0.3729
26.5609	0.396	26.5609	0.3769	26.5609	0.3743	26.5609	0.3732	26.5609	0.3726	26.5609	0.372	26.5609	0.3715
27.8256	0.3933	27.8256	0.3748	27.8256	0.3724	27.8256	0.3717	27.8256	0.3711	27.8256	0.3703	27.8256	0.3703
29.1505	0.3933	29.1505	0.3735	29.1505	0.3724	29.1505	0.3717	29.1505	0.3711	29.1505	0.3703	29.1505	0.3699
30.5386	0.3933	30.5386	0.3735	30.5386	0.3724	30.5386	0.3717	30.5386	0.3711	30.5386	0.3702	30.5386	0.3695
31.9927	0.3933	31.9927	0.3729	31.9927	0.3707	31.9927	0.3699	31.9927	0.3693	31.9927	0.3687	31.9927	0.3687
33.516	0.3733	33.516	0.3719	33.516	0.3707	33.516	0.3699	33.516	0.3693	33.516	0.3685	33.516	0.3684
35.1119	0.3694	35.1119	0.3692	35.1119	0.3689	35.1119	0.3687	35.1119	0.3685	35.1119	0.3685	35.1119	0.3684
36.7838	0.3686	36.7838	0.3686	36.7838	0.3685	36.7838	0.3685	36.7838	0.3685	36.7838	0.3685	36.7838	0.3684
38.5353	0.3686	38.5353	0.3686	38.5353	0.3685	38.5353	0.3685	38.5353	0.3685	38.5353	0.3685	38.5353	0.3684
40.3702	0.3686	40.3702	0.3686	40.3702	0.3685	40.3702	0.3685	40.3702	0.3685	40.3702	0.3685	40.3702	0.3684
42.2924	0.3685	42.2924	0.3685	42.2924	0.3685	42.2924	0.3685	42.2924	0.3685	42.2924	0.3684	42.2924	0.3684
44.3062	0.3685	44.3062	0.3684	44.3062	0.3684	44.3062	0.3684	44.3062	0.3684	44.3062	0.3684	44.3062	0.3684
46.4159	0.3684	46.4159	0.3684	46.4159	0.3684	46.4159	0.3683	46.4159	0.3683	46.4159	0.3683	46.4159	0.3683
48.626	0.3683	48.626	0.3683	48.626	0.3683	48.626	0.3683	48.626	0.3683	48.626	0.3683	48.626	0.3683
50.9414	0.3682	50.9414	0.3682	50.9414	0.3682	50.9414	0.3682	50.9414	0.3682	50.9414	0.3682	50.9414	0.3682

RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTFWW049.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 49
 SLAB-WALL JOINT East-West Responses
 Elevation 27 ft.
 Line 6 & C

0.50%		2%		3%		4%		5%		7%		10%	
Damping Freq.	Accel.												
0.1098	0.0314	0.1098	0.0288	0.1098	0.0275	0.1098	0.0268	0.1098	0.026	0.1098	0.0248	0.1098	0.0232
0.115	0.0358	0.115	0.033	0.115	0.0314	0.115	0.03	0.115	0.029	0.115	0.0274	0.115	0.0253
0.1204	0.041	0.1204	0.0382	0.1204	0.0366	0.1204	0.0352	0.1204	0.0339	0.1204	0.0316	0.1204	0.0287
0.1262	0.0459	0.1262	0.0426	0.1262	0.0407	0.1262	0.0389	0.1262	0.0372	0.1262	0.0344	0.1262	0.0311
0.1322	0.0488	0.1322	0.0442	0.1322	0.0421	0.1322	0.0402	0.1322	0.0385	0.1322	0.0356	0.1322	0.032
0.1385	0.0518	0.1385	0.0462	0.1385	0.0431	0.1385	0.0402	0.1385	0.0385	0.1385	0.0356	0.1385	0.032
0.1451	0.0518	0.1451	0.0462	0.1451	0.0431	0.1451	0.0402	0.1451	0.0385	0.1451	0.0356	0.1451	0.032
0.152	0.0518	0.152	0.0462	0.152	0.0431	0.152	0.0402	0.152	0.0385	0.152	0.0356	0.152	0.032
0.1592	0.0518	0.1592	0.0462	0.1592	0.0431	0.1592	0.0402	0.1592	0.0385	0.1592	0.0356	0.1592	0.0322
0.1668	0.0518	0.1668	0.0462	0.1668	0.0431	0.1668	0.0402	0.1668	0.0385	0.1668	0.0361	0.1668	0.035
0.1748	0.0518	0.1748	0.0462	0.1748	0.0431	0.1748	0.041	0.1748	0.0404	0.1748	0.0393	0.1748	0.0377
0.1831	0.0518	0.1831	0.0463	0.1831	0.0454	0.1831	0.0446	0.1831	0.0439	0.1831	0.0425	0.1831	0.0404
0.1918	0.0521	0.1918	0.0505	0.1918	0.0494	0.1918	0.0485	0.1918	0.0475	0.1918	0.0457	0.1918	0.0435
0.2009	0.0569	0.2009	0.0548	0.2009	0.0536	0.2009	0.0525	0.2009	0.0514	0.2009	0.0496	0.2009	0.0472
0.2105	0.0707	0.2105	0.06	0.2105	0.0586	0.2105	0.0573	0.2105	0.0561	0.2105	0.0539	0.2105	0.0514
0.2205	0.0909	0.2205	0.0714	0.2205	0.0643	0.2205	0.0624	0.2205	0.0609	0.2205	0.0585	0.2205	0.0556
0.231	0.1078	0.231	0.0907	0.231	0.0813	0.231	0.0735	0.231	0.0672	0.231	0.0629	0.231	0.0591
0.242	0.1195	0.242	0.0992	0.242	0.0883	0.242	0.0792	0.242	0.0715	0.242	0.0664	0.242	0.0618
0.2535	0.1201	0.2535	0.0992	0.2535	0.0883	0.2535	0.0796	0.2535	0.0755	0.2535	0.0692	0.2535	0.0656
0.2656	0.1201	0.2656	0.0992	0.2656	0.0923	0.2656	0.0879	0.2656	0.084	0.2656	0.0769	0.2656	0.0686
0.2783	0.1253	0.2783	0.1095	0.2783	0.1007	0.2783	0.095	0.2783	0.0907	0.2783	0.0834	0.2783	0.0752
0.2915	0.1422	0.2915	0.1246	0.2915	0.1146	0.2915	0.1058	0.2915	0.0981	0.2915	0.0885	0.2915	0.0808
0.3054	0.1422	0.3054	0.1246	0.3054	0.1151	0.3054	0.1068	0.3054	0.0995	0.3054	0.0905	0.3054	0.0836
0.3199	0.1422	0.3199	0.1246	0.3199	0.1151	0.3199	0.1068	0.3199	0.0995	0.3199	0.0905	0.3199	0.0842
0.3352	0.1709	0.3352	0.1344	0.3352	0.1181	0.3352	0.1068	0.3352	0.0995	0.3352	0.0905	0.3352	0.0842
0.3511	0.2171	0.3511	0.1629	0.3511	0.1368	0.3511	0.1167	0.3511	0.1074	0.3511	0.0928	0.3511	0.0842
0.3678	0.2398	0.3678	0.1755	0.3678	0.1528	0.3678	0.1392	0.3678	0.1273	0.3678	0.1077	0.3678	0.0883

0.3853	0.2398	0.3853	0.18	0.3853	0.1619	0.3853	0.1464	0.3853	0.1332	0.3853	0.1121	0.3853	0.0946
0.4037	0.2398	0.4037	0.1847	0.4037	0.1644	0.4037	0.1477	0.4037	0.1336	0.4037	0.1159	0.4037	0.0992
0.4229	0.2398	0.4229	0.1847	0.4229	0.1644	0.4229	0.1497	0.4229	0.1382	0.4229	0.1216	0.4229	0.1048
0.4431	0.2692	0.4431	0.1869	0.4431	0.171	0.4431	0.1569	0.4431	0.1444	0.4431	0.1238	0.4431	0.1048
0.4642	0.2692	0.4642	0.1959	0.4642	0.1787	0.4642	0.1634	0.4642	0.15	0.4642	0.1277	0.4642	0.116
0.4863	0.2692	0.4863	0.2041	0.4863	0.1788	0.4863	0.1634	0.4863	0.15	0.4863	0.1384	0.4863	0.1318
0.5094	0.392	0.5094	0.2796	0.5094	0.2333	0.5094	0.2002	0.5094	0.1756	0.5094	0.1582	0.5094	0.1469
0.5337	0.4964	0.5337	0.3455	0.5337	0.282	0.5337	0.2378	0.5337	0.211	0.5337	0.175	0.5337	0.1575
0.5591	0.4964	0.5591	0.3455	0.5591	0.282	0.5591	0.2378	0.5591	0.2165	0.5591	0.189	0.5591	0.1594
0.5857	0.4964	0.5857	0.3455	0.5857	0.282	0.5857	0.2378	0.5857	0.2165	0.5857	0.189	0.5857	0.1675
0.6136	0.4964	0.6136	0.3455	0.6136	0.2842	0.6136	0.2585	0.6136	0.2381	0.6136	0.2071	0.6136	0.1757
0.6428	0.5096	0.6428	0.3717	0.6428	0.3166	0.6428	0.2792	0.6428	0.2511	0.6428	0.2116	0.6428	0.1757
0.6734	0.5096	0.6734	0.3717	0.6734	0.3233	0.6734	0.2945	0.6734	0.271	0.6734	0.2347	0.6734	0.1972
0.7055	0.5096	0.7055	0.3717	0.7055	0.3233	0.7055	0.2945	0.7055	0.271	0.7055	0.2347	0.7055	0.2075
0.7391	0.5096	0.7391	0.3717	0.7391	0.3233	0.7391	0.2945	0.7391	0.271	0.7391	0.2375	0.7391	0.2158
0.7743	0.5275	0.7743	0.3887	0.7743	0.3368	0.7743	0.298	0.7743	0.2779	0.7743	0.251	0.7743	0.228
0.8111	0.5803	0.8111	0.3887	0.8111	0.348	0.8111	0.3233	0.8111	0.3061	0.8111	0.2768	0.8111	0.2418
0.8497	0.5803	0.8497	0.4454	0.8497	0.4	0.8497	0.365	0.8497	0.337	0.8497	0.2941	0.8497	0.2492
0.8902	0.5803	0.8902	0.4454	0.8902	0.4	0.8902	0.365	0.8902	0.337	0.8902	0.2941	0.8902	0.2492
0.9326	0.892	0.9326	0.6018	0.9326	0.5026	0.9326	0.4355	0.9326	0.3872	0.9326	0.3226	0.9326	0.2652
0.977	0.892	0.977	0.6018	0.977	0.5026	0.977	0.4488	0.977	0.4037	0.977	0.3362	0.977	0.2804
1.0235	0.892	1.0235	0.6018	1.0235	0.5026	1.0235	0.4488	1.0235	0.4037	1.0235	0.3512	1.0235	0.3029
1.0723	0.892	1.0723	0.6075	1.0723	0.5491	1.0723	0.5065	1.0723	0.4717	1.0723	0.4154	1.0723	0.3548
1.1233	1.0658	1.1233	0.6891	1.1233	0.6044	1.1233	0.5572	1.1233	0.5151	1.1233	0.4582	1.1233	0.3964
1.1768	1.0658	1.1768	0.6891	1.1768	0.6061	1.1768	0.5648	1.1768	0.5296	1.1768	0.483	1.1768	0.4276
1.2328	1.0658	1.2328	0.7474	1.2328	0.6643	1.2328	0.5952	1.2328	0.5507	1.2328	0.508	1.2328	0.4564
1.2916	1.0658	1.2916	0.8905	1.2916	0.7571	1.2916	0.6503	1.2916	0.5954	1.2916	0.5412	1.2916	0.4866
1.353	1.1983	1.353	0.9638	1.353	0.8182	1.353	0.7039	1.353	0.6206	1.353	0.5749	1.353	0.5174
1.4175	1.3153	1.4175	0.9638	1.4175	0.8182	1.4175	0.7039	1.4175	0.6449	1.4175	0.6022	1.4175	0.545
1.485	1.3153	1.485	0.9638	1.485	0.8182	1.485	0.7039	1.485	0.6716	1.485	0.6291	1.485	0.5719
1.5557	1.3171	1.5557	0.9638	1.5557	0.8182	1.5557	0.7408	1.5557	0.7117	1.5557	0.6618	1.5557	0.5978
1.6298	1.6249	1.6298	0.9909	1.6298	0.8676	1.6298	0.7925	1.6298	0.7406	1.6298	0.6857	1.6298	0.6199
1.7074	1.6249	1.7074	0.9909	1.7074	0.8791	1.7074	0.8217	1.7074	0.7743	1.7074	0.696	1.7074	0.6329
1.7887	1.9874	1.7887	1.1332	1.7887	1.0948	1.7887	0.9523	1.7887	0.8516	1.7887	0.7134	1.7887	0.6496
1.8738	1.9874	1.8738	1.1332	1.8738	1.0948	1.8738	0.9523	1.8738	0.8516	1.8738	0.7433	1.8738	0.6691
1.963	1.9874	1.963	1.1332	1.963	1.0948	1.963	0.9523	1.963	0.8516	1.963	0.7616	1.963	0.6867
2.0565	1.9874	2.0565	1.1332	2.0565	1.0948	2.0565	0.9523	2.0565	0.8516	2.0565	0.7797	2.0565	0.6975
2.1544	1.9874	2.1544	1.1332	2.1544	1.0948	2.1544	0.9523	2.1544	0.879	2.1544	0.7931	2.1544	0.6975
2.257	1.6947	2.257	1.1332	2.257	1.0948	2.257	0.9523	2.257	0.879	2.257	0.7931	2.257	0.6975

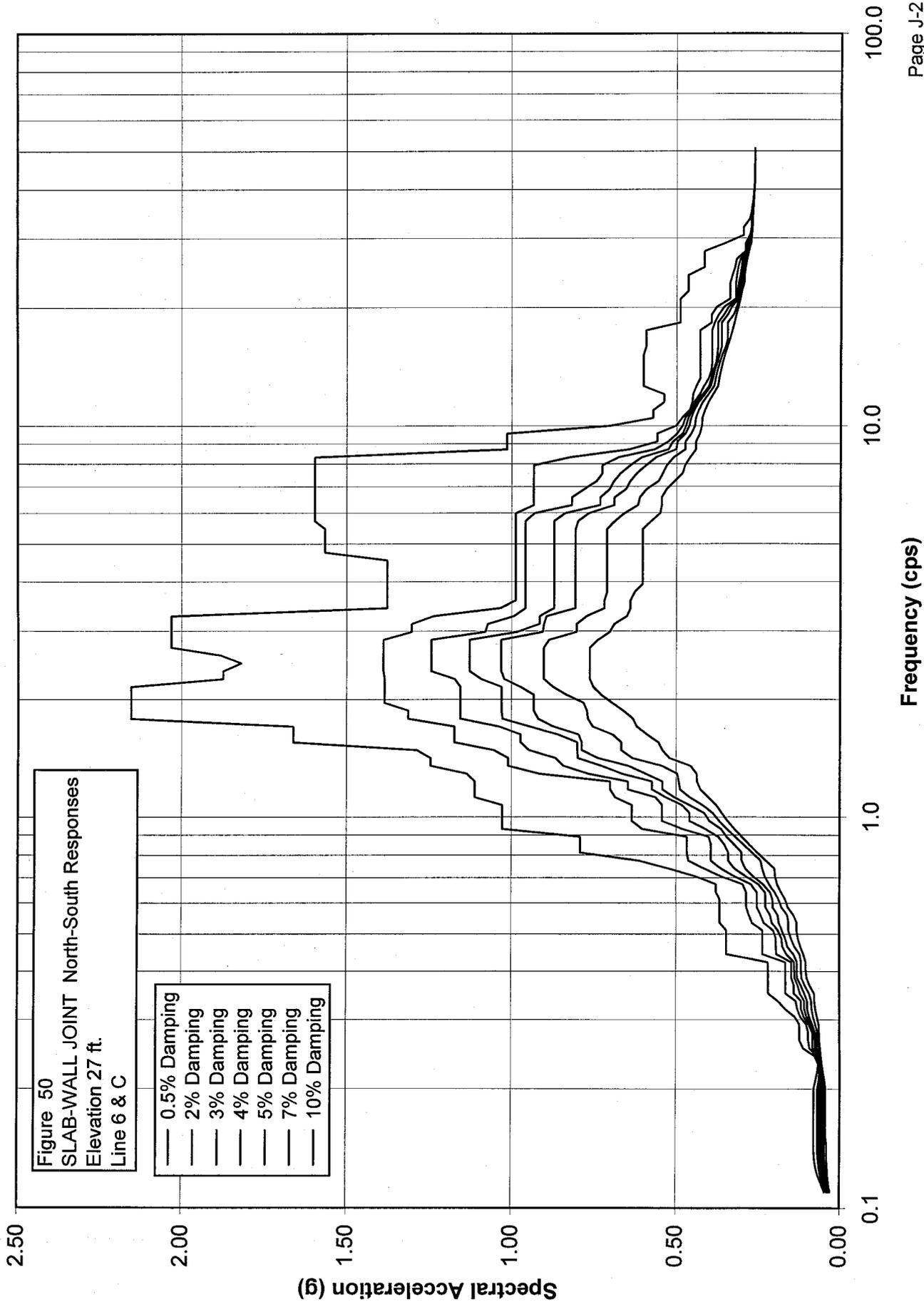
Forced Circulation Vacuum Evaporator System

2.3645	1.6947	2.3645	1.1332	2.3645	1.0948	2.3645	0.9523	2.3645	0.879	2.3645	0.7931	2.3645	0.6975
2.4771	1.6786	2.4771	1.1814	2.4771	1.0948	2.4771	0.9523	2.4771	0.879	2.4771	0.7931	2.4771	0.7021
2.595	1.6786	2.595	1.1814	2.595	1.0948	2.595	0.9523	2.595	0.879	2.595	0.7931	2.595	0.722
2.7186	1.6786	2.7186	1.1814	2.7186	1.0948	2.7186	0.9523	2.7186	0.879	2.7186	0.8094	2.7186	0.7455
2.848	1.6786	2.848	1.1814	2.848	1.0948	2.848	0.9523	2.848	0.9003	2.848	0.8358	2.848	0.7644
2.9836	1.6376	2.9836	1.1814	2.9836	1.0948	2.9836	0.9523	2.9836	0.9003	2.9836	0.8358	2.9836	0.7704
3.1257	1.6758	3.1257	1.1814	3.1257	1.0948	3.1257	0.9523	3.1257	0.9003	3.1257	0.8358	3.1257	0.7734
3.2745	1.6758	3.2745	1.2788	3.2745	1.1532	3.2745	1.0344	3.2745	0.9325	3.2745	0.8387	3.2745	0.7819
3.4305	1.7557	3.4305	1.3454	3.4305	1.1896	3.4305	1.068	3.4305	0.9678	3.4305	0.8543	3.4305	0.7879
3.5938	1.9013	3.5938	1.3454	3.5938	1.1896	3.5938	1.068	3.5938	0.9678	3.5938	0.8757	3.5938	0.801
3.7649	1.9013	3.7649	1.3454	3.7649	1.1896	3.7649	1.068	3.7649	0.9678	3.7649	0.8757	3.7649	0.8026
3.9442	1.9013	3.9442	1.3454	3.9442	1.1896	3.9442	1.068	3.9442	0.9678	3.9442	0.8757	3.9442	0.8026
4.132	1.9013	4.132	1.3454	4.132	1.1896	4.132	1.068	4.132	0.9678	4.132	0.8757	4.132	0.8026
4.3288	1.9013	4.3288	1.3454	4.3288	1.1896	4.3288	1.068	4.3288	0.9678	4.3288	0.8757	4.3288	0.8026
4.5349	1.9013	4.5349	1.3454	4.5349	1.1903	4.5349	1.0937	4.5349	1.0144	4.5349	0.8958	4.5349	0.8026
4.7508	1.9013	4.7508	1.3454	4.7508	1.2105	4.7508	1.0937	4.7508	1.0144	4.7508	0.8958	4.7508	0.7932
4.977	1.9013	4.977	1.2792	4.977	1.2105	4.977	1.0937	4.977	1.0144	4.977	0.8958	4.977	0.7926
5.214	1.9013	5.214	1.2792	5.214	1.2105	5.214	1.0937	5.214	1.0144	5.214	0.8958	5.214	0.7897
5.4623	1.6306	5.4623	1.2391	5.4623	1.2105	5.4623	1.0937	5.4623	1.0144	5.4623	0.8958	5.4623	0.7781
5.7224	1.6306	5.7224	1.2391	5.7224	1.2105	5.7224	1.0879	5.7224	0.9942	5.7224	0.8596	5.7224	0.7304
5.9948	1.5309	5.9948	1.0026	5.9948	0.9746	5.9948	0.9353	5.9948	0.8928	5.9948	0.8126	5.9948	0.7163
6.2803	1.3612	6.2803	0.9697	6.2803	0.9148	6.2803	0.8704	6.2803	0.832	6.2803	0.7655	6.2803	0.6843
6.5793	1.3612	6.5793	0.9585	6.5793	0.868	6.5793	0.8025	6.5793	0.7697	6.5793	0.71	6.5793	0.6408
6.8926	1.3612	6.8926	0.8554	6.8926	0.7904	6.8926	0.7613	6.8926	0.7324	6.8926	0.6758	6.8926	0.6062
7.2208	1.3612	7.2208	0.8554	7.2208	0.7904	7.2208	0.749	7.2208	0.7148	7.2208	0.6581	7.2208	0.5919
7.5646	1.3612	7.5646	0.8177	7.5646	0.7556	7.5646	0.7021	7.5646	0.6749	7.5646	0.6236	7.5646	0.5612
7.9248	1.3612	7.9248	0.8014	7.9248	0.7204	7.9248	0.6679	7.9248	0.6294	7.9248	0.5809	7.9248	0.5295
8.3022	1.0565	8.3022	0.6678	8.3022	0.6005	8.3022	0.5636	8.3022	0.5528	8.3022	0.526	8.3022	0.487
8.6975	0.9764	8.6975	0.6367	8.6975	0.5844	8.6975	0.5504	8.6975	0.5255	8.6975	0.4873	8.6975	0.4455
9.1116	0.8988	9.1116	0.6244	9.1116	0.5824	9.1116	0.5495	9.1116	0.5228	9.1116	0.4817	9.1116	0.4379
9.5455	0.7685	9.5455	0.5801	9.5455	0.5173	9.5455	0.4949	9.5455	0.4767	9.5455	0.4477	9.5455	0.4241
10	0.7685	10	0.5801	10	0.5062	10	0.4771	10	0.4589	10	0.4355	10	0.4135
10.4762	0.7685	10.4762	0.5801	10.4762	0.5062	10.4762	0.4771	10.4762	0.4589	10.4762	0.4355	10.4762	0.4107
10.975	0.7685	10.975	0.5801	10.975	0.5062	10.975	0.4771	10.975	0.4589	10.975	0.4355	10.975	0.4107
11.4976	0.7685	11.4976	0.5801	11.4976	0.5062	11.4976	0.4771	11.4976	0.4553	11.4976	0.4233	11.4976	0.3954
12.045	0.6292	12.045	0.5034	12.045	0.4637	12.045	0.4342	12.045	0.4171	12.045	0.3959	12.045	0.3765
12.6186	0.6292	12.6186	0.4794	12.6186	0.4422	12.6186	0.4199	12.6186	0.405	12.6186	0.3867	12.6186	0.3728
13.2194	0.4919	13.2194	0.4794	13.2194	0.4422	13.2194	0.4199	13.2194	0.405	13.2194	0.3867	13.2194	0.3728
13.8489	0.7331	13.8489	0.4794	13.8489	0.4422	13.8489	0.4199	13.8489	0.405	13.8489	0.3867	13.8489	0.3728

24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery
 Forced Circulation Vacuum Evaporator System

14.5083	0.7331	14.5083	0.4794	14.5083	0.4422	14.5083	0.4199	14.5083	0.405	14.5083	0.3867	14.5083	0.3728
15.1991	0.7331	15.1991	0.4794	15.1991	0.4422	15.1991	0.4199	15.1991	0.405	15.1991	0.3867	15.1991	0.3728
15.9228	0.7331	15.9228	0.4794	15.9228	0.4422	15.9228	0.4199	15.9228	0.405	15.9228	0.3867	15.9228	0.3728
16.681	0.7331	16.681	0.4794	16.681	0.4422	16.681	0.4199	16.681	0.405	16.681	0.3867	16.681	0.3728
17.4753	0.6074	17.4753	0.4489	17.4753	0.4111	17.4753	0.3896	17.4753	0.382	17.4753	0.3742	17.4753	0.3684
18.3074	0.6074	18.3074	0.4489	18.3074	0.4111	18.3074	0.3914	18.3074	0.386	18.3074	0.3761	18.3074	0.3684
19.1791	0.6818	19.1791	0.4489	19.1791	0.4111	19.1791	0.3933	19.1791	0.386	19.1791	0.3761	19.1791	0.3684
20.0923	0.6818	20.0923	0.4489	20.0923	0.4111	20.0923	0.3933	20.0923	0.386	20.0923	0.3761	20.0923	0.3684
21.049	0.6818	21.049	0.4489	21.049	0.4111	21.049	0.3933	21.049	0.386	21.049	0.3761	21.049	0.3684
22.0513	0.6818	22.0513	0.4489	22.0513	0.4111	22.0513	0.3933	22.0513	0.386	22.0513	0.3761	22.0513	0.3671
23.1013	0.6818	23.1013	0.4489	23.1013	0.4111	23.1013	0.3933	23.1013	0.3831	23.1013	0.3746	23.1013	0.3671
24.2013	0.5838	24.2013	0.4402	24.2013	0.4098	24.2013	0.3892	24.2013	0.3828	24.2013	0.3746	24.2013	0.3671
25.3536	0.5332	25.3536	0.4402	25.3536	0.4098	25.3536	0.3892	25.3536	0.3787	25.3536	0.3712	25.3536	0.3639
26.5609	0.5332	26.5609	0.4402	26.5609	0.4098	26.5609	0.3892	26.5609	0.3751	26.5609	0.3625	26.5609	0.3561
27.8256	0.4569	27.8256	0.3858	27.8256	0.368	27.8256	0.3656	27.8256	0.3631	27.8256	0.3587	27.8256	0.3539
29.1505	0.4509	29.1505	0.3647	29.1505	0.3631	29.1505	0.36	29.1505	0.3564	29.1505	0.3523	29.1505	0.3503
30.5386	0.4509	30.5386	0.3647	30.5386	0.3613	30.5386	0.3574	30.5386	0.3549	30.5386	0.3523	30.5386	0.3498
31.9927	0.3911	31.9927	0.362	31.9927	0.359	31.9927	0.3567	31.9927	0.3549	31.9927	0.3523	31.9927	0.3498
33.516	0.3669	33.516	0.362	33.516	0.359	33.516	0.3567	33.516	0.3549	33.516	0.3523	33.516	0.3498
35.1119	0.3532	35.1119	0.353	35.1119	0.3527	35.1119	0.3522	35.1119	0.3517	35.1119	0.3506	35.1119	0.3491
36.7838	0.3493	36.7838	0.3492	36.7838	0.3492	36.7838	0.349	36.7838	0.3489	36.7838	0.3485	36.7838	0.3478
38.5353	0.3471	38.5353	0.3471	38.5353	0.3471	38.5353	0.347	38.5353	0.347	38.5353	0.3468	38.5353	0.3465
40.3702	0.3457	40.3702	0.3457	40.3702	0.3457	40.3702	0.3457	40.3702	0.3456	40.3702	0.3455	40.3702	0.3454
42.2924	0.3447	42.2924	0.3447	42.2924	0.3447	42.2924	0.3447	42.2924	0.3447	42.2924	0.3446	42.2924	0.3445
44.3062	0.3439	44.3062	0.3439	44.3062	0.3439	44.3062	0.3439	44.3062	0.3439	44.3062	0.3438	44.3062	0.3438
46.4159	0.3432	46.4159	0.3432	46.4159	0.3432	46.4159	0.3432	46.4159	0.3432	46.4159	0.3432	46.4159	0.3431
48.626	0.3426	48.626	0.3426	48.626	0.3426	48.626	0.3426	48.626	0.3426	48.626	0.3426	48.626	0.3426
50.9414	0.342	50.9414	0.342	50.9414	0.342	50.9414	0.342	50.9414	0.342	50.9414	0.342	50.9414	0.3421

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTW050.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 50
 SLAB-WALL JOINT North-South Responses
 Elevation 27 ft.
 Line 6 & C

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.
0.1098	0.0457	0.1098	0.0394	0.1098	0.0364	0.1098	0.0343	0.1098	0.0327	0.1098	0.0308	0.1098	0.0283	0.1098	0.0263
0.115	0.0555	0.115	0.0493	0.115	0.0464	0.115	0.044	0.115	0.0419	0.115	0.0381	0.115	0.0355	0.115	0.0335
0.1204	0.0648	0.1204	0.0582	0.1204	0.0544	0.1204	0.051	0.1204	0.048	0.1204	0.0427	0.1204	0.0363	0.1204	0.0343
0.1262	0.0719	0.1262	0.0618	0.1262	0.0571	0.1262	0.0533	0.1262	0.0498	0.1262	0.0437	0.1262	0.038	0.1262	0.036
0.1322	0.0762	0.1322	0.0652	0.1322	0.0602	0.1322	0.0562	0.1322	0.0527	0.1322	0.0468	0.1322	0.041	0.1322	0.039
0.1385	0.0785	0.1385	0.0672	0.1385	0.0608	0.1385	0.0562	0.1385	0.0527	0.1385	0.0468	0.1385	0.041	0.1385	0.039
0.1451	0.0789	0.1451	0.0676	0.1451	0.0612	0.1451	0.0562	0.1451	0.0527	0.1451	0.0468	0.1451	0.041	0.1451	0.039
0.152	0.0789	0.152	0.0676	0.152	0.0612	0.152	0.0565	0.152	0.0535	0.152	0.0483	0.152	0.043	0.152	0.041
0.1592	0.0789	0.1592	0.0676	0.1592	0.0612	0.1592	0.0565	0.1592	0.0535	0.1592	0.0485	0.1592	0.0439	0.1592	0.0419
0.1668	0.0789	0.1668	0.0676	0.1668	0.0612	0.1668	0.0565	0.1668	0.0535	0.1668	0.0485	0.1668	0.0439	0.1668	0.0419
0.1748	0.0789	0.1748	0.0676	0.1748	0.0612	0.1748	0.0565	0.1748	0.0535	0.1748	0.0485	0.1748	0.0439	0.1748	0.0419
0.1831	0.0789	0.1831	0.0676	0.1831	0.0612	0.1831	0.0565	0.1831	0.0535	0.1831	0.0485	0.1831	0.0439	0.1831	0.0419
0.1918	0.0789	0.1918	0.0676	0.1918	0.0612	0.1918	0.0563	0.1918	0.0532	0.1918	0.0485	0.1918	0.0439	0.1918	0.0419
0.2009	0.0789	0.2009	0.0676	0.2009	0.0612	0.2009	0.0563	0.2009	0.0532	0.2009	0.048	0.2009	0.0439	0.2009	0.0419
0.2105	0.0736	0.2105	0.0632	0.2105	0.0596	0.2105	0.0563	0.2105	0.0532	0.2105	0.049	0.2105	0.047	0.2105	0.045
0.2205	0.0685	0.2205	0.0624	0.2205	0.0589	0.2205	0.056	0.2205	0.0549	0.2205	0.0528	0.2205	0.0508	0.2205	0.0488
0.231	0.0649	0.231	0.0625	0.231	0.0611	0.231	0.0598	0.231	0.0585	0.231	0.0564	0.231	0.0543	0.231	0.0523
0.242	0.0761	0.242	0.0688	0.242	0.065	0.242	0.0631	0.242	0.0618	0.242	0.0597	0.242	0.0572	0.242	0.0552
0.2535	0.11	0.2535	0.0917	0.2535	0.0824	0.2535	0.0752	0.2535	0.0694	0.2535	0.0624	0.2535	0.0596	0.2535	0.0576
0.2656	0.1218	0.2656	0.0952	0.2656	0.0827	0.2656	0.0752	0.2656	0.0694	0.2656	0.0645	0.2656	0.0612	0.2656	0.0592
0.2783	0.1218	0.2783	0.0952	0.2783	0.0829	0.2783	0.0782	0.2783	0.074	0.2783	0.0672	0.2783	0.0621	0.2783	0.0601
0.2915	0.1218	0.2915	0.1006	0.2915	0.0937	0.2915	0.0876	0.2915	0.0822	0.2915	0.073	0.2915	0.0629	0.2915	0.0609
0.3054	0.1364	0.3054	0.1184	0.3054	0.1083	0.3054	0.0996	0.3054	0.0922	0.3054	0.0803	0.3054	0.0681	0.3054	0.0661
0.3199	0.1646	0.3199	0.1276	0.3199	0.1162	0.3199	0.1064	0.3199	0.0979	0.3199	0.0846	0.3199	0.0735	0.3199	0.0715
0.3352	0.1871	0.3352	0.1325	0.3352	0.1162	0.3352	0.1064	0.3352	0.0979	0.3352	0.0857	0.3352	0.076	0.3352	0.074
0.3511	0.2165	0.3511	0.1635	0.3511	0.1384	0.3511	0.1191	0.3511	0.1059	0.3511	0.0919	0.3511	0.0768	0.3511	0.0748
0.3678	0.2165	0.3678	0.1635	0.3678	0.1384	0.3678	0.1265	0.3678	0.1169	0.3678	0.1046	0.3678	0.0905	0.3678	0.0885

0.3853	0.2165	0.3853	0.1635	0.3853	0.1455	0.3853	0.1364	0.3853	0.1284	0.3853	0.1147	0.3853	0.099
0.4037	0.2165	0.4037	0.1635	0.4037	0.1455	0.4037	0.1365	0.4037	0.1288	0.4037	0.1159	0.4037	0.1016
0.4229	0.218	0.4229	0.1641	0.4229	0.1455	0.4229	0.1365	0.4229	0.1288	0.4229	0.1159	0.4229	0.1016
0.4431	0.3448	0.4431	0.2339	0.4431	0.1912	0.4431	0.1606	0.4431	0.1396	0.4431	0.12	0.4431	0.1091
0.4642	0.3448	0.4642	0.2339	0.4642	0.193	0.4642	0.1732	0.4642	0.158	0.4642	0.1365	0.4642	0.1183
0.4863	0.3448	0.4863	0.2339	0.4863	0.193	0.4863	0.1761	0.4863	0.1638	0.4863	0.1467	0.4863	0.1254
0.5094	0.3448	0.5094	0.2339	0.5094	0.2005	0.5094	0.1865	0.5094	0.1748	0.5094	0.1542	0.5094	0.1297
0.5337	0.3656	0.5337	0.2669	0.5337	0.2304	0.5337	0.2052	0.5337	0.1846	0.5337	0.1542	0.5337	0.1297
0.5591	0.3656	0.5591	0.2766	0.5591	0.2401	0.5591	0.211	0.5591	0.1881	0.5591	0.1584	0.5591	0.1397
0.5857	0.3656	0.5857	0.2834	0.5857	0.2509	0.5857	0.2245	0.5857	0.2028	0.5857	0.176	0.5857	0.1563
0.6136	0.3656	0.6136	0.2834	0.6136	0.2509	0.6136	0.2245	0.6136	0.2033	0.6136	0.1849	0.6136	0.1645
0.6428	0.3762	0.6428	0.2834	0.6428	0.2509	0.6428	0.2259	0.6428	0.2103	0.6428	0.1964	0.6428	0.1774
0.6734	0.3762	0.6734	0.2949	0.6734	0.2693	0.6734	0.2462	0.6734	0.2322	0.6734	0.2135	0.6734	0.1894
0.7055	0.4391	0.7055	0.3606	0.7055	0.3194	0.7055	0.2848	0.7055	0.2628	0.7055	0.2277	0.7055	0.1953
0.7391	0.5239	0.7391	0.4137	0.7391	0.3623	0.7391	0.3207	0.7391	0.2866	0.7391	0.2356	0.7391	0.1976
0.7743	0.614	0.7743	0.4625	0.7743	0.3924	0.7743	0.3391	0.7743	0.298	0.7743	0.2405	0.7743	0.2244
0.8111	0.7914	0.8111	0.467	0.8111	0.3924	0.8111	0.3391	0.8111	0.298	0.8111	0.2659	0.8111	0.2499
0.8497	0.7914	0.8497	0.467	0.8497	0.3924	0.8497	0.3511	0.8497	0.3206	0.8497	0.2919	0.8497	0.2743
0.8902	0.7914	0.8902	0.467	0.8902	0.4001	0.8902	0.3709	0.8902	0.345	0.8902	0.3184	0.8902	0.2981
0.9326	1.0278	0.9326	0.6041	0.9326	0.4807	0.9326	0.4108	0.9326	0.3626	0.9326	0.3443	0.9326	0.321
0.977	1.0278	0.977	0.6353	0.977	0.5431	0.977	0.4591	0.977	0.3979	0.977	0.3677	0.977	0.3421
1.0235	1.0278	1.0235	0.6353	1.0235	0.5431	1.0235	0.4591	1.0235	0.414	1.0235	0.3873	1.0235	0.3602
1.0723	1.0278	1.0723	0.6353	1.0723	0.5431	1.0723	0.4819	1.0723	0.4594	1.0723	0.4189	1.0723	0.3771
1.1233	1.1107	1.1233	0.6861	1.1233	0.5637	1.1233	0.5322	1.1233	0.506	1.1233	0.4588	1.1233	0.4017
1.1768	1.1107	1.1768	0.7008	1.1768	0.6472	1.1768	0.5742	1.1768	0.5418	1.1768	0.488	1.1768	0.426
1.2328	1.1107	1.2328	0.7008	1.2328	0.6472	1.2328	0.5742	1.2328	0.5426	1.2328	0.4923	1.2328	0.4364
1.2916	1.1346	1.2916	0.9159	1.2916	0.7678	1.2916	0.6655	1.2916	0.5934	1.2916	0.4968	1.2916	0.438
1.353	1.2446	1.353	1.0101	1.353	0.8426	1.353	0.7277	1.353	0.6464	1.353	0.5439	1.353	0.4567
1.4175	1.2446	1.4175	1.0101	1.4175	0.8662	1.4175	0.7991	1.4175	0.738	1.4175	0.6344	1.4175	0.5207
1.485	1.2865	1.485	1.0536	1.485	0.9467	1.485	0.8006	1.485	0.7876	1.485	0.6676	1.485	0.5425
1.5557	1.6615	1.5557	1.1722	1.5557	0.9725	1.5557	0.8006	1.5557	0.7876	1.5557	0.6676	1.5557	0.5551
1.6298	1.6615	1.6298	1.1722	1.6298	0.9725	1.6298	0.8601	1.6298	0.7973	1.6298	0.6949	1.6298	0.5902
1.7074	1.6615	1.7074	1.1722	1.7074	1.0371	1.7074	0.9444	1.7074	0.8737	1.7074	0.7537	1.7074	0.6205
1.7887	2.1535	1.7887	1.3133	1.7887	1.1545	1.7887	1.0275	1.7887	0.92	1.7887	0.7686	1.7887	0.6322
1.8738	2.1535	1.8738	1.3133	1.8738	1.1545	1.8738	1.0307	1.8738	0.9325	1.8738	0.7721	1.8738	0.6615
1.963	2.1535	1.963	1.3856	1.963	1.1545	1.963	1.0307	1.963	0.9325	1.963	0.7827	1.963	0.6963
2.0565	2.1535	2.0565	1.3856	2.0565	1.1545	2.0565	1.0307	2.0565	0.9325	2.0565	0.8343	2.0565	0.7285
2.1544	2.1535	2.1544	1.3856	2.1544	1.1545	2.1544	1.0307	2.1544	0.9732	2.1544	0.8748	2.1544	0.7529
2.257	1.8736	2.257	1.3856	2.257	1.1724	2.257	1.0924	2.257	1.0227	2.257	0.9021	2.257	0.7632

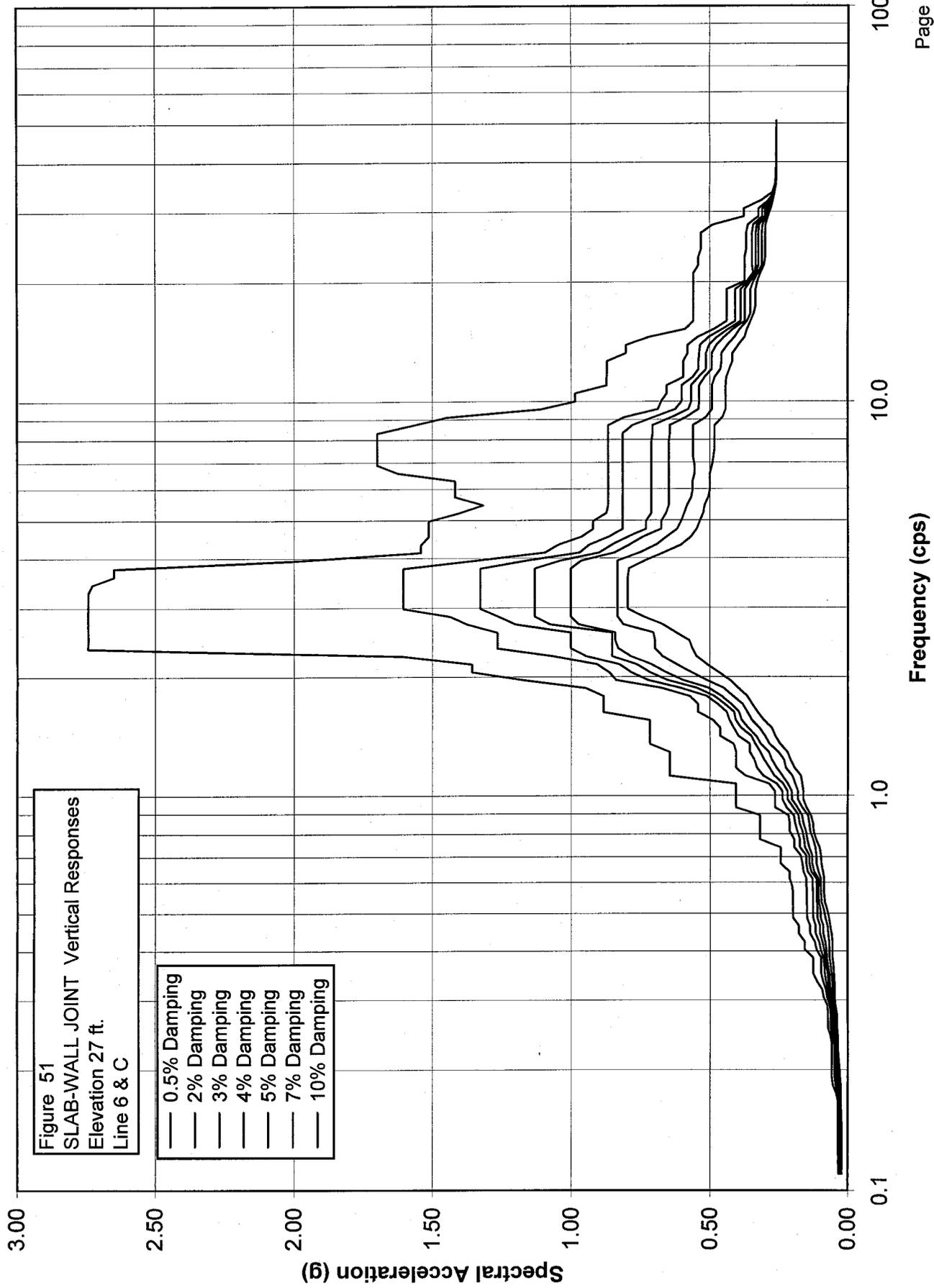
Forced Circulation Vacuum Evaporator System

2.3645	1.8736	2.3645	1.389	2.3645	1.2437	2.3645	1.1269	2.3645	1.0316	2.3645	0.9021	2.3645	0.7632
2.4771	1.8196	2.4771	1.389	2.4771	1.2437	2.4771	1.1269	2.4771	1.0316	2.4771	0.9021	2.4771	0.7632
2.595	1.881	2.595	1.389	2.595	1.2437	2.595	1.1269	2.595	1.0316	2.595	0.9021	2.595	0.7632
2.7186	2.0314	2.7186	1.389	2.7186	1.2437	2.7186	1.1269	2.7186	1.0316	2.7186	0.9021	2.7186	0.7632
2.848	2.0314	2.848	1.389	2.848	1.2437	2.848	1.1269	2.848	1.0316	2.848	0.8863	2.848	0.7389
2.9836	2.0314	2.9836	1.303	2.9836	1.08	2.9836	0.9836	2.9836	0.9059	2.9836	0.8032	2.9836	0.7031
3.1257	2.0314	3.1257	1.303	3.1257	1.0724	3.1257	0.9157	3.1257	0.9022	3.1257	0.8032	3.1257	0.6898
3.2745	2.0314	3.2745	1.2366	3.2745	0.9931	3.2745	0.9152	3.2745	0.8946	3.2745	0.7732	3.2745	0.6511
3.4305	1.378	3.4305	1.0337	3.4305	0.9587	3.4305	0.8718	3.4305	0.8069	3.4305	0.7189	3.4305	0.641
3.5938	1.378	3.5938	0.9882	3.5938	0.9587	3.5938	0.8718	3.5938	0.8069	3.5938	0.7189	3.5938	0.641
3.7649	1.378	3.7649	0.9882	3.7649	0.9587	3.7649	0.8718	3.7649	0.8069	3.7649	0.7113	3.7649	0.6277
3.9442	1.378	3.9442	0.9882	3.9442	0.9587	3.9442	0.8718	3.9442	0.8069	3.9442	0.7113	3.9442	0.6037
4.132	1.378	4.132	0.9882	4.132	0.9587	4.132	0.8718	4.132	0.8069	4.132	0.7113	4.132	0.6037
4.3288	1.378	4.3288	0.9882	4.3288	0.9587	4.3288	0.8718	4.3288	0.8069	4.3288	0.7113	4.3288	0.6037
4.5349	1.378	4.5349	0.9882	4.5349	0.9587	4.5349	0.8718	4.5349	0.8069	4.5349	0.7113	4.5349	0.6037
4.7508	1.5669	4.7508	0.9882	4.7508	0.9587	4.7508	0.8718	4.7508	0.8069	4.7508	0.7113	4.7508	0.6037
4.977	1.5669	4.977	0.9882	4.977	0.9587	4.977	0.8718	4.977	0.8069	4.977	0.7113	4.977	0.6037
5.214	1.5669	5.214	0.9882	5.214	0.9587	5.214	0.8718	5.214	0.8069	5.214	0.7113	5.214	0.6037
5.4623	1.5669	5.4623	0.9882	5.4623	0.9587	5.4623	0.8718	5.4623	0.8069	5.4623	0.7113	5.4623	0.6037
5.7224	1.5971	5.7224	0.9882	5.7224	0.9587	5.7224	0.8718	5.7224	0.7996	5.7224	0.6886	5.7224	0.5771
5.9948	1.5971	5.9948	0.9882	5.9948	0.9303	5.9948	0.8387	5.9948	0.7665	5.9948	0.6589	5.9948	0.5506
6.2803	1.5971	6.2803	0.9332	6.2803	0.8185	6.2803	0.7329	6.2803	0.6896	6.2803	0.6182	6.2803	0.5461
6.5793	1.5971	6.5793	0.9332	6.5793	0.8185	6.5793	0.7321	6.5793	0.6896	6.5793	0.6127	6.5793	0.5461
6.8926	1.5971	6.8926	0.9332	6.8926	0.782	6.8926	0.7038	6.8926	0.6547	6.8926	0.5928	6.8926	0.5303
7.2208	1.5971	7.2208	0.9332	7.2208	0.744	7.2208	0.6919	7.2208	0.6422	7.2208	0.5564	7.2208	0.5073
7.5646	1.5971	7.5646	0.9332	7.5646	0.7259	7.5646	0.6707	7.5646	0.6218	7.5646	0.5421	7.5646	0.4819
7.9248	1.5971	7.9248	0.9332	7.9248	0.7259	7.9248	0.6426	7.9248	0.5944	7.9248	0.5307	7.9248	0.475
8.3022	1.5971	8.3022	0.8247	8.3022	0.6776	8.3022	0.6066	8.3022	0.5633	8.3022	0.5094	8.3022	0.4593
8.6975	1.0152	8.6975	0.6458	8.6975	0.5676	8.6975	0.5258	8.6975	0.5026	8.6975	0.473	8.6975	0.4411
9.1116	1.0152	9.1116	0.5599	9.1116	0.5261	9.1116	0.5124	9.1116	0.4985	9.1116	0.473	9.1116	0.4411
9.5455	1.0152	9.5455	0.5599	9.5455	0.4992	9.5455	0.4815	9.5455	0.4734	9.5455	0.4558	9.5455	0.4296
10	0.7029	10	0.5024	10	0.4823	10	0.4718	10	0.462	10	0.4448	10	0.4232
10.4762	0.5723	10.4762	0.4841	10.4762	0.4737	10.4762	0.4648	10.4762	0.4567	10.4762	0.4417	10.4762	0.4214
10.975	0.5723	10.975	0.4609	10.975	0.4589	10.975	0.4533	10.975	0.4467	10.975	0.4331	10.975	0.4143
11.4976	0.5389	11.4976	0.4529	11.4976	0.4468	11.4976	0.4398	11.4976	0.4329	11.4976	0.4201	11.4976	0.4029
12.045	0.5389	12.045	0.4506	12.045	0.4294	12.045	0.4205	12.045	0.414	12.045	0.403	12.045	0.3884
12.6186	0.6021	12.6186	0.4408	12.6186	0.4169	12.6186	0.4013	12.6186	0.3955	12.6186	0.3854	12.6186	0.3735
13.2194	0.6021	13.2194	0.4277	13.2194	0.4024	13.2194	0.3942	13.2194	0.3892	13.2194	0.3804	13.2194	0.3697
13.8489	0.6021	13.8489	0.4277	13.8489	0.3935	13.8489	0.3881	13.8489	0.3833	13.8489	0.3749	13.8489	0.3643

24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery
 Forced Circulation Vacuum Evaporator System

14.5083	0.6021	14.5083	0.4277	14.5083	0.3907	14.5083	0.379	14.5083	0.3752	14.5083	0.3678	14.5083	0.3587
15.1991	0.6021	15.1991	0.4277	15.1991	0.3907	15.1991	0.3759	15.1991	0.3688	15.1991	0.3602	15.1991	0.3517
15.9228	0.5938	15.9228	0.4277	15.9228	0.3907	15.9228	0.373	15.9228	0.3618	15.9228	0.3489	15.9228	0.3435
16.681	0.5938	16.681	0.4277	16.681	0.3907	16.681	0.373	16.681	0.3618	16.681	0.343	16.681	0.3359
17.4753	0.5938	17.4753	0.4277	17.4753	0.3907	17.4753	0.373	17.4753	0.3618	17.4753	0.3425	17.4753	0.3285
18.3074	0.4889	18.3074	0.392	18.3074	0.3836	18.3074	0.373	18.3074	0.3618	18.3074	0.3425	18.3074	0.3223
19.1791	0.4889	19.1791	0.392	19.1791	0.3706	19.1791	0.3549	19.1791	0.3427	19.1791	0.3243	19.1791	0.3167
20.0923	0.4889	20.0923	0.3764	20.0923	0.354	20.0923	0.3401	20.0923	0.3303	20.0923	0.3164	20.0923	0.31
21.049	0.4889	21.049	0.3361	21.049	0.3183	21.049	0.3128	21.049	0.3106	21.049	0.308	21.049	0.3044
22.0513	0.4644	22.0513	0.3361	22.0513	0.3183	22.0513	0.3128	22.0513	0.3101	22.0513	0.3049	22.0513	0.2997
23.1013	0.4644	23.1013	0.3361	23.1013	0.3183	23.1013	0.31	23.1013	0.3047	23.1013	0.2982	23.1013	0.2928
24.2013	0.4644	24.2013	0.3289	24.2013	0.3159	24.2013	0.3045	24.2013	0.3008	24.2013	0.2967	24.2013	0.2917
25.3536	0.4147	25.3536	0.3214	25.3536	0.3115	25.3536	0.3009	25.3536	0.2939	25.3536	0.2915	25.3536	0.2883
26.5609	0.4147	26.5609	0.316	26.5609	0.3047	26.5609	0.2981	26.5609	0.2939	26.5609	0.2887	26.5609	0.2843
27.8256	0.4147	27.8256	0.288	27.8256	0.2828	27.8256	0.2812	27.8256	0.281	27.8256	0.28	27.8256	0.2785
29.1505	0.3507	29.1505	0.288	29.1505	0.2828	29.1505	0.2789	29.1505	0.2758	29.1505	0.2722	29.1505	0.2731
30.5386	0.2947	30.5386	0.2761	30.5386	0.2752	30.5386	0.2742	30.5386	0.2731	30.5386	0.271	30.5386	0.2699
31.9927	0.2947	31.9927	0.2708	31.9927	0.2697	31.9927	0.2694	31.9927	0.2691	31.9927	0.2683	31.9927	0.2682
33.516	0.2762	33.516	0.2708	33.516	0.2693	33.516	0.2686	33.516	0.2682	33.516	0.2677	33.516	0.2673
35.1119	0.2706	35.1119	0.2695	35.1119	0.2689	35.1119	0.2683	35.1119	0.2678	35.1119	0.2671	35.1119	0.2663
36.7838	0.2671	36.7838	0.2667	36.7838	0.2665	36.7838	0.2662	36.7838	0.266	36.7838	0.2655	36.7838	0.2649
38.5353	0.2646	38.5353	0.2644	38.5353	0.2643	38.5353	0.2641	38.5353	0.264	38.5353	0.2638	38.5353	0.2634
40.3702	0.2626	40.3702	0.2625	40.3702	0.2624	40.3702	0.2623	40.3702	0.2623	40.3702	0.2621	40.3702	0.2619
42.2924	0.2611	42.2924	0.261	42.2924	0.261	42.2924	0.2609	42.2924	0.2609	42.2924	0.2608	42.2924	0.2607
44.3062	0.2607	44.3062	0.2606	44.3062	0.2606	44.3062	0.2605	44.3062	0.2605	44.3062	0.2605	44.3062	0.2604
46.4159	0.2603	46.4159	0.2602	46.4159	0.2602	46.4159	0.2602	46.4159	0.2602	46.4159	0.2601	46.4159	0.2601
48.626	0.2599	48.626	0.2599	48.626	0.2599	48.626	0.2599	48.626	0.2598	48.626	0.2598	48.626	0.2598
50.9414	0.2596	50.9414	0.2596	50.9414	0.2596	50.9414	0.2596	50.9414	0.2596	50.9414	0.2595	50.9414	0.2595

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTWW051.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 51
 SLAB-WALL JOINT Vertical Responses
 Elevation 27 ft.
 Line 6 & C

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0328	0.1098	0.0294	0.1098	0.0275	0.1098	0.0264	0.1098	0.0254	0.1098	0.0237	0.1098	0.0217	0.1098	0.0217
0.115	0.0346	0.115	0.0311	0.115	0.029	0.115	0.0271	0.115	0.0257	0.115	0.024	0.115	0.022	0.115	0.022
0.1204	0.0347	0.1204	0.0311	0.1204	0.0291	0.1204	0.0272	0.1204	0.0257	0.1204	0.024	0.1204	0.022	0.1204	0.022
0.1262	0.0349	0.1262	0.0311	0.1262	0.0291	0.1262	0.0272	0.1262	0.0257	0.1262	0.024	0.1262	0.022	0.1262	0.022
0.1322	0.0349	0.1322	0.0311	0.1322	0.0291	0.1322	0.0272	0.1322	0.0257	0.1322	0.024	0.1322	0.022	0.1322	0.022
0.1385	0.0349	0.1385	0.0311	0.1385	0.0291	0.1385	0.0272	0.1385	0.0259	0.1385	0.0242	0.1385	0.0222	0.1385	0.0222
0.1451	0.0349	0.1451	0.0311	0.1451	0.0291	0.1451	0.0272	0.1451	0.0259	0.1451	0.0242	0.1451	0.0222	0.1451	0.0222
0.152	0.0349	0.152	0.0311	0.152	0.0291	0.152	0.0272	0.152	0.0262	0.152	0.0247	0.152	0.0233	0.152	0.0233
0.1592	0.0349	0.1592	0.0311	0.1592	0.0291	0.1592	0.0281	0.1592	0.0274	0.1592	0.0261	0.1592	0.0245	0.1592	0.0245
0.1668	0.0349	0.1668	0.0311	0.1668	0.0297	0.1668	0.0289	0.1668	0.0281	0.1668	0.0268	0.1668	0.0251	0.1668	0.0251
0.1748	0.0422	0.1748	0.0358	0.1748	0.0324	0.1748	0.0296	0.1748	0.0281	0.1748	0.0268	0.1748	0.0257	0.1748	0.0257
0.1831	0.0535	0.1831	0.0445	0.1831	0.0398	0.1831	0.0358	0.1831	0.0324	0.1831	0.0272	0.1831	0.026	0.1831	0.026
0.1918	0.0577	0.1918	0.0478	0.1918	0.0425	0.1918	0.038	0.1918	0.0347	0.1918	0.0318	0.1918	0.0286	0.1918	0.0286
0.2009	0.0577	0.2009	0.0478	0.2009	0.0425	0.2009	0.0392	0.2009	0.0373	0.2009	0.034	0.2009	0.0301	0.2009	0.0301
0.2105	0.0577	0.2105	0.0478	0.2105	0.0425	0.2105	0.0392	0.2105	0.0374	0.2105	0.0347	0.2105	0.0323	0.2105	0.0323
0.2205	0.0577	0.2205	0.0478	0.2205	0.0432	0.2205	0.0417	0.2205	0.0403	0.2205	0.0378	0.2205	0.0348	0.2205	0.0348
0.231	0.058	0.231	0.0493	0.231	0.0463	0.231	0.0439	0.231	0.0423	0.231	0.0393	0.231	0.0357	0.231	0.0357
0.242	0.0623	0.242	0.0553	0.242	0.0512	0.242	0.0476	0.242	0.0442	0.242	0.0393	0.242	0.0357	0.242	0.0357
0.2535	0.0713	0.2535	0.0624	0.2535	0.0575	0.2535	0.0532	0.2535	0.0496	0.2535	0.0441	0.2535	0.0384	0.2535	0.0384
0.2656	0.0713	0.2656	0.0624	0.2656	0.0575	0.2656	0.0532	0.2656	0.0496	0.2656	0.0441	0.2656	0.0384	0.2656	0.0384
0.2783	0.0713	0.2783	0.0624	0.2783	0.0575	0.2783	0.0532	0.2783	0.0496	0.2783	0.0441	0.2783	0.0395	0.2783	0.0395
0.2915	0.0744	0.2915	0.0666	0.2915	0.0623	0.2915	0.0586	0.2915	0.0554	0.2915	0.0502	0.2915	0.0443	0.2915	0.0443
0.3054	0.0875	0.3054	0.0757	0.3054	0.0693	0.3054	0.0642	0.3054	0.0604	0.3054	0.054	0.3054	0.0469	0.3054	0.0469
0.3199	0.092	0.3199	0.0796	0.3199	0.0728	0.3199	0.0669	0.3199	0.0618	0.3199	0.054	0.3199	0.0469	0.3199	0.0469
0.3352	0.1105	0.3352	0.0889	0.3352	0.0786	0.3352	0.0706	0.3352	0.0644	0.3352	0.0555	0.3352	0.0476	0.3352	0.0476
0.3511	0.1252	0.3511	0.0953	0.3511	0.0826	0.3511	0.0727	0.3511	0.0665	0.3511	0.0579	0.3511	0.0494	0.3511	0.0494
0.3678	0.1252	0.3678	0.0953	0.3678	0.0847	0.3678	0.0775	0.3678	0.0713	0.3678	0.0614	0.3678	0.0511	0.3678	0.0511

0.3853	0.1252	0.3853	0.0957	0.3853	0.088	0.3853	0.0809	0.3853	0.0754	0.3853	0.0657	0.3853	0.0548
0.4037	0.155	0.4037	0.1124	0.4037	0.0974	0.4037	0.0858	0.4037	0.0767	0.4037	0.0657	0.4037	0.0548
0.4229	0.155	0.4229	0.1187	0.4229	0.1033	0.4229	0.0912	0.4229	0.0815	0.4229	0.067	0.4229	0.0548
0.4431	0.1769	0.4431	0.1354	0.4431	0.1155	0.4431	0.0999	0.4431	0.0877	0.4431	0.0701	0.4431	0.0582
0.4642	0.1769	0.4642	0.1354	0.4642	0.1155	0.4642	0.0999	0.4642	0.0877	0.4642	0.0733	0.4642	0.0628
0.4863	0.1978	0.4863	0.1466	0.4863	0.1249	0.4863	0.109	0.4863	0.0971	0.4863	0.0808	0.4863	0.0674
0.5094	0.1978	0.5094	0.1466	0.5094	0.1249	0.5094	0.109	0.5094	0.0976	0.5094	0.0856	0.5094	0.074
0.5337	0.1978	0.5337	0.1466	0.5337	0.1249	0.5337	0.111	0.5337	0.1042	0.5337	0.0936	0.5337	0.0818
0.5591	0.1978	0.5591	0.1466	0.5591	0.1249	0.5591	0.111	0.5591	0.1044	0.5591	0.0958	0.5591	0.0848
0.5857	0.1999	0.5857	0.1483	0.5857	0.1264	0.5857	0.111	0.5857	0.105	0.5857	0.096	0.5857	0.0848
0.6136	0.2094	0.6136	0.1483	0.6136	0.1264	0.6136	0.1126	0.6136	0.105	0.6136	0.096	0.6136	0.0848
0.6428	0.2094	0.6428	0.1593	0.6428	0.144	0.6428	0.1314	0.6428	0.121	0.6428	0.105	0.6428	0.0886
0.6734	0.2426	0.6734	0.1636	0.6734	0.1492	0.6734	0.1381	0.6734	0.1283	0.6734	0.1122	0.6734	0.0946
0.7055	0.2426	0.7055	0.1691	0.7055	0.1492	0.7055	0.1381	0.7055	0.1283	0.7055	0.1134	0.7055	0.096
0.7391	0.2426	0.7391	0.1937	0.7391	0.1722	0.7391	0.1542	0.7391	0.1392	0.7391	0.1165	0.7391	0.1015
0.7743	0.3181	0.7743	0.1939	0.7743	0.1727	0.7743	0.1579	0.7743	0.1454	0.7743	0.1251	0.7743	0.1137
0.8111	0.3181	0.8111	0.2101	0.8111	0.1828	0.8111	0.163	0.8111	0.1508	0.8111	0.1355	0.8111	0.1229
0.8497	0.3181	0.8497	0.2101	0.8497	0.1907	0.8497	0.1742	0.8497	0.1603	0.8497	0.139	0.8497	0.1258
0.8902	0.3181	0.8902	0.2143	0.8902	0.1948	0.8902	0.1786	0.8902	0.1649	0.8902	0.1435	0.8902	0.1332
0.9326	0.4052	0.9326	0.2628	0.9326	0.2213	0.9326	0.1974	0.9326	0.1824	0.9326	0.1644	0.9326	0.1493
0.977	0.4052	0.977	0.2628	0.977	0.2362	0.977	0.2172	0.977	0.2019	0.977	0.1799	0.977	0.1598
1.0235	0.4052	1.0235	0.2628	1.0235	0.2362	1.0235	0.2172	1.0235	0.2019	1.0235	0.18	1.0235	0.16
1.0723	0.4052	1.0723	0.2849	1.0723	0.2568	1.0723	0.234	1.0723	0.2161	1.0723	0.1898	1.0723	0.1645
1.1233	0.6467	1.1233	0.3714	1.1233	0.3066	1.1233	0.2657	1.1233	0.2373	1.1233	0.2005	1.1233	0.1696
1.1768	0.6467	1.1768	0.4055	1.1768	0.3296	1.1768	0.2835	1.1768	0.2569	1.1768	0.2234	1.1768	0.1927
1.2328	0.6467	1.2328	0.4055	1.2328	0.3382	1.2328	0.303	1.2328	0.2744	1.2328	0.2302	1.2328	0.2071
1.2916	0.6467	1.2916	0.4055	1.2916	0.3557	1.2916	0.3173	1.2916	0.2858	1.2916	0.2514	1.2916	0.2182
1.353	0.7184	1.353	0.4147	1.353	0.3559	1.353	0.3348	1.353	0.3157	1.353	0.2832	1.353	0.2458
1.4175	0.7184	1.4175	0.463	1.4175	0.3962	1.4175	0.3501	1.4175	0.3316	1.4175	0.2996	1.4175	0.2626
1.485	0.7184	1.485	0.463	1.485	0.4137	1.485	0.3858	1.485	0.3607	1.485	0.3198	1.485	0.2745
1.5557	0.7184	1.5557	0.4893	1.5557	0.4292	1.5557	0.406	1.5557	0.3847	1.5557	0.3473	1.5557	0.305
1.6298	0.8858	1.6298	0.5437	1.6298	0.4392	1.6298	0.4118	1.6298	0.3941	1.6298	0.3642	1.6298	0.3268
1.7074	0.8858	1.7074	0.5437	1.7074	0.4729	1.7074	0.4469	1.7074	0.423	1.7074	0.3815	1.7074	0.3465
1.7887	0.8858	1.7887	0.5746	1.7887	0.5116	1.7887	0.4842	1.7887	0.4586	1.7887	0.4165	1.7887	0.3653
1.8738	0.9496	1.8738	0.6768	1.8738	0.6085	1.8738	0.5489	1.8738	0.505	1.8738	0.4504	1.8738	0.3969
1.963	1.1699	1.963	0.8403	1.963	0.7275	1.963	0.6563	1.963	0.5998	1.963	0.5135	1.963	0.4285
2.0565	1.3571	2.0565	0.8674	2.0565	0.7884	2.0565	0.7211	2.0565	0.6628	2.0565	0.5702	2.0565	0.4699
2.1544	1.3571	2.1544	0.909	2.1544	0.8297	2.1544	0.7674	2.1544	0.7149	2.1544	0.623	2.1544	0.5127
2.257	1.6105	2.257	1.0659	2.257	0.9486	2.257	0.8552	2.257	0.7893	2.257	0.6746	2.257	0.5507

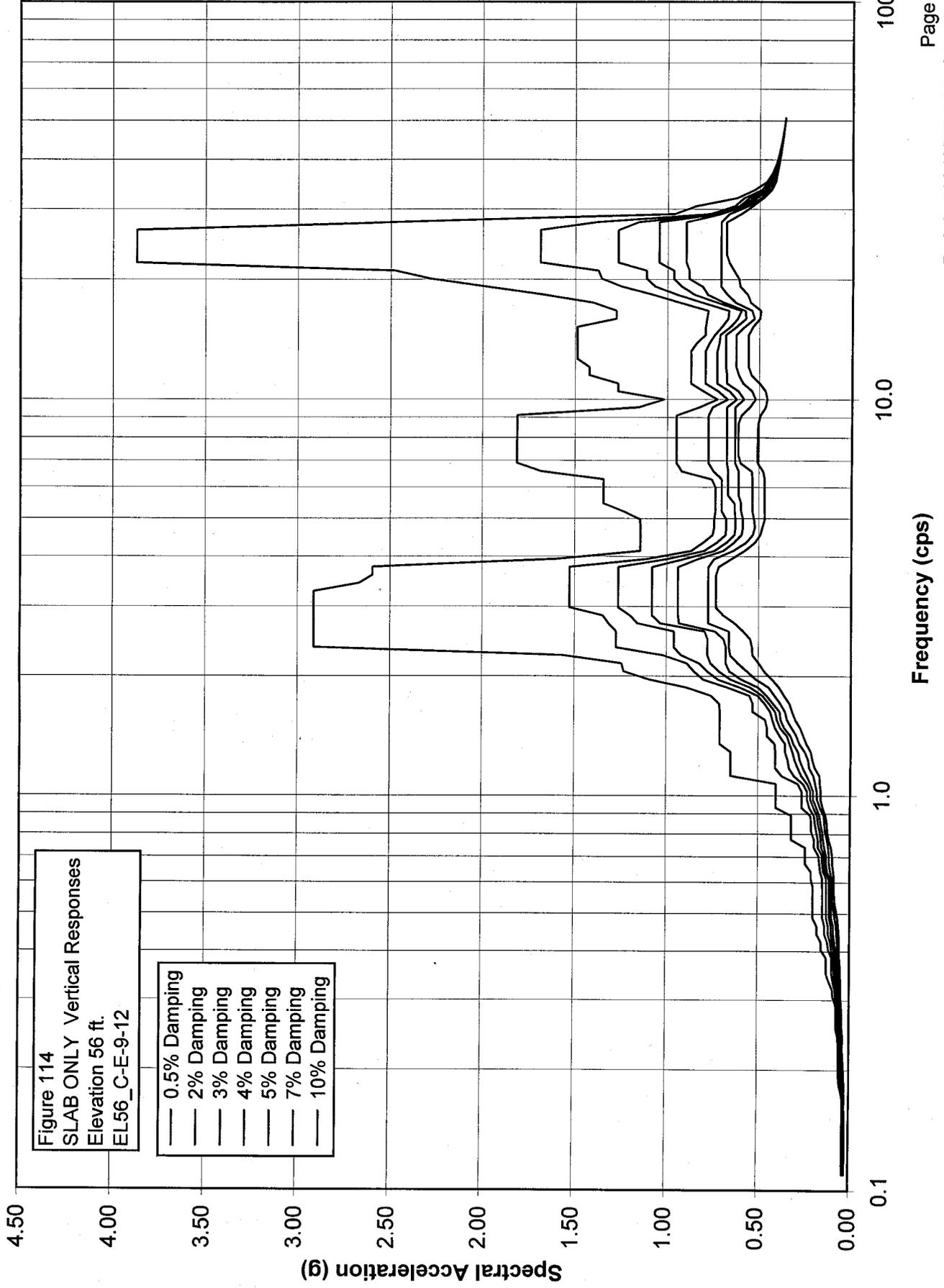
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2.3645	2.7436	2.3645	1.2661	2.3645	1.0029	2.3645	0.8552	2.3645	0.8328	2.3645	0.7008	2.3645	0.5658
2.4771	2.7436	2.4771	1.2661	2.4771	1.0029	2.4771	0.8552	2.4771	0.8436	2.4771	0.7008	2.4771	0.5767
2.595	2.7436	2.595	1.2661	2.595	1.0029	2.595	0.8552	2.595	0.8436	2.595	0.707	2.595	0.6251
2.7186	2.7436	2.7186	1.374	2.7186	1.2008	2.7186	1.0764	2.7186	0.9746	2.7186	0.8148	2.7186	0.6725
2.848	2.7436	2.848	1.437	2.848	1.2625	2.848	1.1314	2.848	1.0026	2.848	0.8356	2.848	0.7442
2.9836	2.7436	2.9836	1.6061	2.9836	1.3268	2.9836	1.1314	2.9836	1.0026	2.9836	0.8356	2.9836	0.7993
3.1257	2.7436	3.1257	1.6061	3.1257	1.3268	3.1257	1.1314	3.1257	1.0026	3.1257	0.8356	3.1257	0.7993
3.2745	2.7436	3.2745	1.6061	3.2745	1.3268	3.2745	1.1314	3.2745	1.0026	3.2745	0.8356	3.2745	0.7993
3.4305	2.7282	3.4305	1.6061	3.4305	1.3268	3.4305	1.1314	3.4305	1.0026	3.4305	0.8356	3.4305	0.7993
3.5938	2.651	3.5938	1.6061	3.5938	1.3268	3.5938	1.1314	3.5938	1.0026	3.5938	0.8356	3.5938	0.7993
3.7649	2.651	3.7649	1.6061	3.7649	1.3268	3.7649	1.1314	3.7649	1.0026	3.7649	0.8356	3.7649	0.7953
3.9442	2.0001	3.9442	1.3467	3.9442	1.1631	3.9442	1.0408	3.9442	0.9658	3.9442	0.8356	3.9442	0.7382
4.132	1.5412	4.132	1.0957	4.132	0.9718	4.132	0.9014	4.132	0.8463	4.132	0.7561	4.132	0.6687
4.3288	1.5412	4.3288	1.0482	4.3288	0.9372	4.3288	0.8564	4.3288	0.7931	4.3288	0.6969	4.3288	0.6045
4.5349	1.5142	4.5349	0.9655	4.5349	0.8667	4.5349	0.7984	4.5349	0.744	4.5349	0.6575	4.5349	0.5696
4.7508	1.5142	4.7508	0.9231	4.7508	0.8167	4.7508	0.7335	4.7508	0.679	4.7508	0.6203	4.7508	0.5484
4.977	1.5142	4.977	0.9231	4.977	0.8167	4.977	0.7335	4.977	0.6777	4.977	0.6058	4.977	0.5379
5.214	1.4035	5.214	0.8756	5.214	0.8167	5.214	0.714	5.214	0.6605	5.214	0.5939	5.214	0.5255
5.4623	1.3162	5.4623	0.8698	5.4623	0.8167	5.4623	0.714	5.4623	0.6502	5.4623	0.5838	5.4623	0.5205
5.7224	1.4183	5.7224	0.8698	5.7224	0.8167	5.7224	0.714	5.7224	0.6502	5.7224	0.5687	5.7224	0.5058
5.9948	1.4183	5.9948	0.8698	5.9948	0.8167	5.9948	0.714	5.9948	0.6502	5.9948	0.564	5.9948	0.4998
6.2803	1.4183	6.2803	0.8698	6.2803	0.8167	6.2803	0.714	6.2803	0.6502	6.2803	0.564	6.2803	0.4998
6.5793	1.6258	6.5793	0.8698	6.5793	0.8167	6.5793	0.714	6.5793	0.6502	6.5793	0.5565	6.5793	0.4998
6.8926	1.7003	6.8926	0.8698	6.8926	0.8167	6.8926	0.714	6.8926	0.6502	6.8926	0.5569	6.8926	0.4929
7.2208	1.7003	7.2208	0.8698	7.2208	0.8167	7.2208	0.714	7.2208	0.6502	7.2208	0.5625	7.2208	0.4872
7.5646	1.7003	7.5646	0.8698	7.5646	0.8167	7.5646	0.714	7.5646	0.6502	7.5646	0.5625	7.5646	0.4832
7.9248	1.7003	7.9248	0.8698	7.9248	0.8167	7.9248	0.714	7.9248	0.6502	7.9248	0.5625	7.9248	0.4832
8.3022	1.7003	8.3022	0.8698	8.3022	0.8167	8.3022	0.7092	8.3022	0.647	8.3022	0.5625	8.3022	0.4832
8.6975	1.5728	8.6975	0.8698	8.6975	0.7825	8.6975	0.7092	8.6975	0.647	8.6975	0.5625	8.6975	0.4832
9.1116	1.449	9.1116	0.8125	9.1116	0.7071	9.1116	0.6412	9.1116	0.5881	9.1116	0.5151	9.1116	0.4543
9.5455	1.1103	9.5455	0.6914	9.5455	0.6271	9.5455	0.5797	9.5455	0.5429	9.5455	0.4927	9.5455	0.4426
10	0.987	10	0.6788	10	0.6039	10	0.5686	10	0.5394	10	0.4927	10	0.4426
10.4762	0.987	10.4762	0.6575	10.4762	0.6033	10.4762	0.5686	10.4762	0.5394	10.4762	0.4927	10.4762	0.4426
10.975	0.875	10.975	0.6575	10.975	0.6033	10.975	0.5686	10.975	0.5394	10.975	0.4927	10.975	0.4426
11.4976	0.875	11.4976	0.597	11.4976	0.5629	11.4976	0.5424	11.4976	0.5204	11.4976	0.4823	11.4976	0.4399
12.045	0.873	12.045	0.597	12.045	0.5418	12.045	0.5142	12.045	0.4928	12.045	0.4618	12.045	0.4291
12.6186	0.873	12.6186	0.597	12.6186	0.5418	12.6186	0.5142	12.6186	0.4928	12.6186	0.4573	12.6186	0.417
13.2194	0.8059	13.2194	0.5817	13.2194	0.5393	13.2194	0.5142	13.2194	0.4928	13.2194	0.4573	13.2194	0.417
13.8489	0.8059	13.8489	0.5817	13.8489	0.5365	13.8489	0.5027	13.8489	0.4758	13.8489	0.4357	13.8489	0.3956

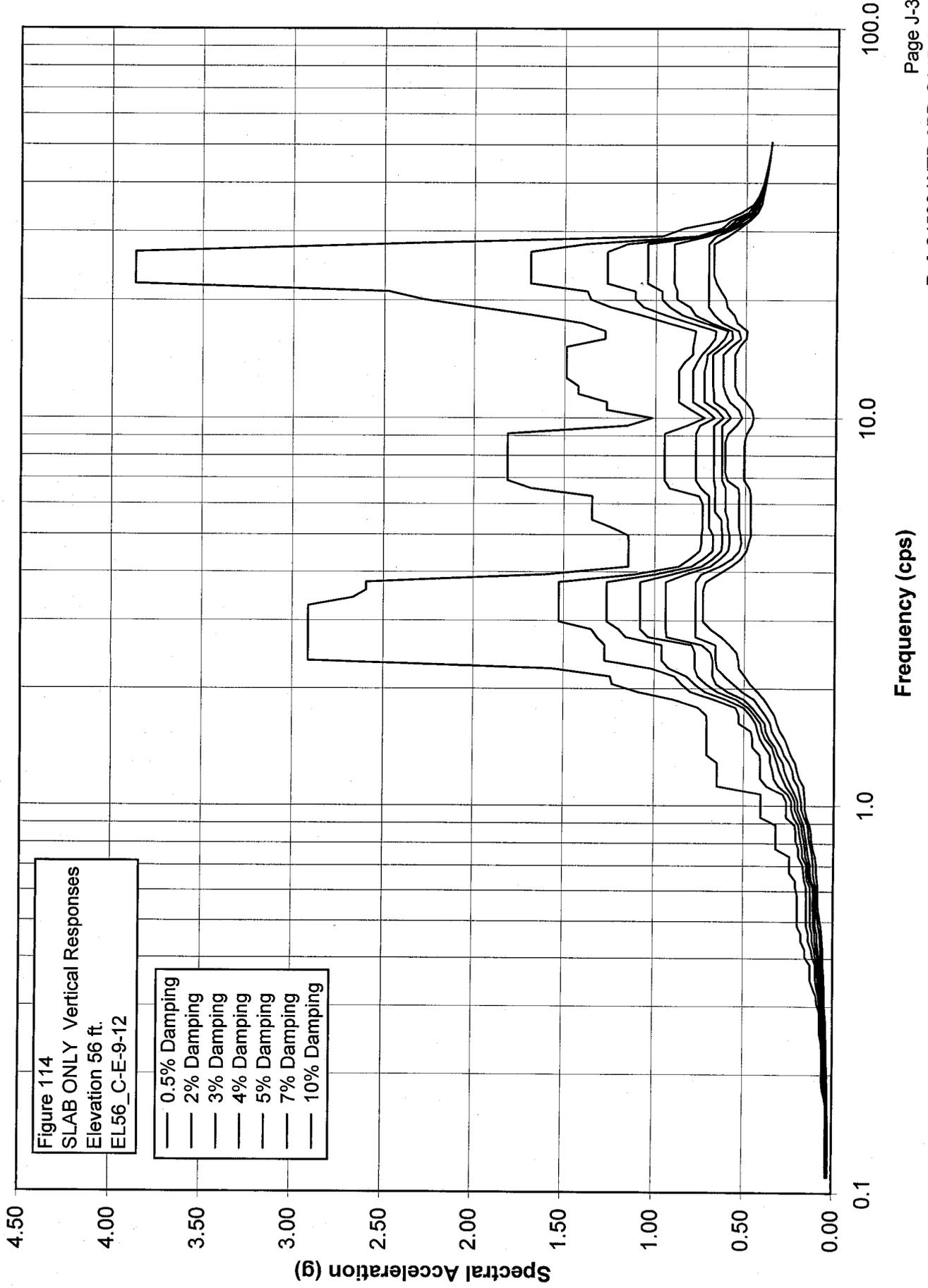
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 Forced Circulation Vacuum Evaporator System

14.5083	0.7241	14.5083	0.5447	14.5083	0.5045	14.5083	0.473	14.5083	0.4475	14.5083	0.4095	14.5083	0.373
15.1991	0.5902	15.1991	0.485	15.1991	0.4541	15.1991	0.4321	15.1991	0.4153	15.1991	0.3905	15.1991	0.3645
15.9228	0.5601	15.9228	0.4379	15.9228	0.4075	15.9228	0.3869	15.9228	0.372	15.9228	0.3647	15.9228	0.352
16.681	0.5601	16.681	0.4379	16.681	0.4075	16.681	0.3869	16.681	0.372	16.681	0.3518	16.681	0.339
17.4753	0.5601	17.4753	0.4379	17.4753	0.4075	17.4753	0.3869	17.4753	0.372	17.4753	0.3518	17.4753	0.3329
18.3074	0.5601	18.3074	0.4379	18.3074	0.4075	18.3074	0.3869	18.3074	0.372	18.3074	0.3518	18.3074	0.3329
19.1791	0.5601	19.1791	0.4379	19.1791	0.4075	19.1791	0.3869	19.1791	0.372	19.1791	0.3518	19.1791	0.3329
20.0923	0.5601	20.0923	0.3732	20.0923	0.3648	20.0923	0.3579	20.0923	0.352	20.0923	0.341	20.0923	0.3269
21.049	0.5601	21.049	0.3732	21.049	0.3417	21.049	0.3359	21.049	0.3315	21.049	0.3244	21.049	0.3155
22.0513	0.5425	22.0513	0.3732	22.0513	0.3457	22.0513	0.332	22.0513	0.3223	22.0513	0.3098	22.0513	0.3035
23.1013	0.5425	23.1013	0.3732	23.1013	0.3457	23.1013	0.332	23.1013	0.3223	23.1013	0.3098	23.1013	0.2985
24.2013	0.5325	24.2013	0.3666	24.2013	0.3457	24.2013	0.332	24.2013	0.3223	24.2013	0.3098	24.2013	0.2985
25.3536	0.5325	25.3536	0.3666	25.3536	0.3457	25.3536	0.332	25.3536	0.3223	25.3536	0.3098	25.3536	0.2985
26.5609	0.5325	26.5609	0.3666	26.5609	0.3457	26.5609	0.332	26.5609	0.3223	26.5609	0.3098	26.5609	0.2985
27.8256	0.4895	27.8256	0.3609	27.8256	0.3413	27.8256	0.3287	27.8256	0.3197	27.8256	0.3074	27.8256	0.2962
29.1505	0.3751	29.1505	0.322	29.1505	0.308	29.1505	0.2991	29.1505	0.2973	29.1505	0.2934	29.1505	0.2872
30.5386	0.3751	30.5386	0.322	30.5386	0.308	30.5386	0.2991	30.5386	0.2928	30.5386	0.2841	30.5386	0.2774
31.9927	0.3133	31.9927	0.2869	31.9927	0.2784	31.9927	0.2747	31.9927	0.2748	31.9927	0.2733	31.9927	0.2698
33.516	0.2719	33.516	0.2655	33.516	0.2651	33.516	0.2653	33.516	0.2652	33.516	0.2648	33.516	0.2637
35.1119	0.2622	35.1119	0.2613	35.1119	0.2609	35.1119	0.2603	35.1119	0.2597	35.1119	0.259	35.1119	0.2589
36.7838	0.2601	36.7838	0.2598	36.7838	0.2595	36.7838	0.2592	36.7838	0.2589	36.7838	0.2583	36.7838	0.2574
38.5353	0.2591	38.5353	0.2589	38.5353	0.2587	38.5353	0.2585	38.5353	0.2583	38.5353	0.2579	38.5353	0.2573
40.3702	0.2584	40.3702	0.2583	40.3702	0.2581	40.3702	0.258	40.3702	0.2579	40.3702	0.2576	40.3702	0.2573
42.2924	0.258	42.2924	0.2578	42.2924	0.2577	42.2924	0.2576	42.2924	0.2576	42.2924	0.2574	42.2924	0.2571
44.3062	0.2575	44.3062	0.2574	44.3062	0.2574	44.3062	0.2573	44.3062	0.2573	44.3062	0.2572	44.3062	0.257
46.4159	0.2571	46.4159	0.2571	46.4159	0.2571	46.4159	0.257	46.4159	0.257	46.4159	0.2569	46.4159	0.2568
48.626	0.2568	48.626	0.2568	48.626	0.2567	48.626	0.2567	48.626	0.2567	48.626	0.2567	48.626	0.2567
50.9414	0.2564	50.9414	0.2565	50.9414	0.2565	50.9414	0.2565	50.9414	0.2565	50.9414	0.2565	50.9414	0.2566

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTWW114.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-SOC-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 114
 SLAB ONLY Vertical Responses
 Elevation 56 ft.
 EL56_C-E-9-12

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.
0.1098	0.0329	0.1098	0.0295	0.1098	0.0275	0.1098	0.0264	0.1098	0.0254	0.1098	0.0237	0.1098	0.0237	0.1098	0.0216
0.115	0.0347	0.115	0.0311	0.115	0.029	0.115	0.0271	0.115	0.0257	0.115	0.0239	0.115	0.0239	0.115	0.0219
0.1204	0.0348	0.1204	0.0312	0.1204	0.0291	0.1204	0.0272	0.1204	0.0257	0.1204	0.0239	0.1204	0.0239	0.1204	0.0219
0.1262	0.0349	0.1262	0.0312	0.1262	0.0291	0.1262	0.0272	0.1262	0.0257	0.1262	0.0239	0.1262	0.0239	0.1262	0.0219
0.1322	0.0349	0.1322	0.0312	0.1322	0.0291	0.1322	0.0272	0.1322	0.0257	0.1322	0.0239	0.1322	0.0239	0.1322	0.0219
0.1385	0.0349	0.1385	0.0312	0.1385	0.0291	0.1385	0.0272	0.1385	0.0257	0.1385	0.0239	0.1385	0.0239	0.1385	0.0221
0.1451	0.0349	0.1451	0.0312	0.1451	0.0291	0.1451	0.0272	0.1451	0.0257	0.1451	0.0239	0.1451	0.0239	0.1451	0.0221
0.152	0.0349	0.152	0.0312	0.152	0.0291	0.152	0.0272	0.152	0.0262	0.152	0.0249	0.152	0.0249	0.152	0.0235
0.1592	0.0348	0.1592	0.0312	0.1592	0.0291	0.1592	0.0283	0.1592	0.0276	0.1592	0.0263	0.1592	0.0263	0.1592	0.0247
0.1668	0.0348	0.1668	0.0312	0.1668	0.0297	0.1668	0.029	0.1668	0.0282	0.1668	0.0269	0.1668	0.0269	0.1668	0.0252
0.1748	0.0422	0.1748	0.0358	0.1748	0.0324	0.1748	0.0296	0.1748	0.0282	0.1748	0.0269	0.1748	0.0269	0.1748	0.0258
0.1831	0.0535	0.1831	0.0445	0.1831	0.0398	0.1831	0.0358	0.1831	0.0324	0.1831	0.0324	0.1831	0.0324	0.1831	0.0261
0.1918	0.0577	0.1918	0.0477	0.1918	0.0424	0.1918	0.038	0.1918	0.0347	0.1918	0.0318	0.1918	0.0318	0.1918	0.0285
0.2009	0.0577	0.2009	0.0477	0.2009	0.0424	0.2009	0.0391	0.2009	0.0372	0.2009	0.034	0.2009	0.034	0.2009	0.0301
0.2105	0.0577	0.2105	0.0477	0.2105	0.0424	0.2105	0.0392	0.2105	0.0375	0.2105	0.0347	0.2105	0.0347	0.2105	0.0324
0.2205	0.0577	0.2205	0.0477	0.2205	0.0432	0.2205	0.0416	0.2205	0.0402	0.2205	0.0378	0.2205	0.0378	0.2205	0.0349
0.231	0.0586	0.231	0.0493	0.231	0.0464	0.231	0.044	0.231	0.0423	0.231	0.0394	0.231	0.0394	0.231	0.0358
0.242	0.0624	0.242	0.0554	0.242	0.0513	0.242	0.0476	0.242	0.0442	0.242	0.0423	0.242	0.0423	0.242	0.0358
0.2535	0.0714	0.2535	0.0624	0.2535	0.0575	0.2535	0.0532	0.2535	0.0496	0.2535	0.044	0.2535	0.044	0.2535	0.0384
0.2656	0.0714	0.2656	0.0624	0.2656	0.0575	0.2656	0.0532	0.2656	0.0496	0.2656	0.044	0.2656	0.044	0.2656	0.0384
0.2783	0.0714	0.2783	0.0624	0.2783	0.0575	0.2783	0.0532	0.2783	0.0496	0.2783	0.044	0.2783	0.044	0.2783	0.0396
0.2915	0.0743	0.2915	0.0667	0.2915	0.0623	0.2915	0.0587	0.2915	0.0554	0.2915	0.0503	0.2915	0.0503	0.2915	0.0444
0.3054	0.0876	0.3054	0.0758	0.3054	0.0693	0.3054	0.0643	0.3054	0.0605	0.3054	0.0541	0.3054	0.0541	0.3054	0.0469
0.3199	0.0921	0.3199	0.0796	0.3199	0.0728	0.3199	0.0669	0.3199	0.0618	0.3199	0.0541	0.3199	0.0541	0.3199	0.0469
0.3352	0.1106	0.3352	0.089	0.3352	0.0786	0.3352	0.0706	0.3352	0.0644	0.3352	0.0555	0.3352	0.0555	0.3352	0.0478
0.3511	0.1252	0.3511	0.0954	0.3511	0.0826	0.3511	0.0726	0.3511	0.0667	0.3511	0.0582	0.3511	0.0582	0.3511	0.0497
0.3678	0.1252	0.3678	0.0954	0.3678	0.0849	0.3678	0.0776	0.3678	0.0712	0.3678	0.0614	0.3678	0.0614	0.3678	0.0509

0.3853	0.1252	0.3853	0.0957	0.3853	0.088	0.3853	0.0809	0.3853	0.0753	0.3853	0.0656	0.3853	0.0547
0.4037	0.155	0.4037	0.1125	0.4037	0.0976	0.4037	0.086	0.4037	0.0768	0.4037	0.0656	0.4037	0.0547
0.4229	0.155	0.4229	0.119	0.4229	0.1036	0.4229	0.0912	0.4229	0.0814	0.4229	0.0671	0.4229	0.0547
0.4431	0.1769	0.4431	0.1354	0.4431	0.1155	0.4431	0.1001	0.4431	0.0878	0.4431	0.0702	0.4431	0.0587
0.4642	0.1769	0.4642	0.1354	0.4642	0.1155	0.4642	0.1001	0.4642	0.0878	0.4642	0.0734	0.4642	0.0628
0.4863	0.1981	0.4863	0.1469	0.4863	0.1252	0.4863	0.1094	0.4863	0.0975	0.4863	0.081	0.4863	0.0671
0.5094	0.1981	0.5094	0.1469	0.5094	0.1252	0.5094	0.1094	0.5094	0.0975	0.5094	0.0854	0.5094	0.0742
0.5337	0.1981	0.5337	0.1469	0.5337	0.1252	0.5337	0.111	0.5337	0.1043	0.5337	0.0939	0.5337	0.0821
0.5591	0.1981	0.5591	0.1469	0.5591	0.1252	0.5591	0.111	0.5591	0.1043	0.5591	0.0956	0.5591	0.0843
0.5857	0.1986	0.5857	0.1481	0.5857	0.1265	0.5857	0.111	0.5857	0.1045	0.5857	0.0956	0.5857	0.0843
0.6136	0.2097	0.6136	0.1481	0.6136	0.1265	0.6136	0.1132	0.6136	0.1048	0.6136	0.0956	0.6136	0.0843
0.6428	0.2097	0.6428	0.1595	0.6428	0.1441	0.6428	0.1318	0.6428	0.1214	0.6428	0.1054	0.6428	0.0887
0.6734	0.2429	0.6734	0.1643	0.6734	0.1495	0.6734	0.1384	0.6734	0.1286	0.6734	0.1123	0.6734	0.0941
0.7055	0.2429	0.7055	0.1698	0.7055	0.1495	0.7055	0.1384	0.7055	0.1286	0.7055	0.1129	0.7055	0.0954
0.7391	0.2429	0.7391	0.1938	0.7391	0.1723	0.7391	0.1543	0.7391	0.1393	0.7391	0.1166	0.7391	0.102
0.7743	0.3187	0.7743	0.1938	0.7743	0.1728	0.7743	0.158	0.7743	0.1453	0.7743	0.125	0.7743	0.1141
0.8111	0.3187	0.8111	0.2097	0.8111	0.1822	0.8111	0.1632	0.8111	0.1511	0.8111	0.1359	0.8111	0.1231
0.8497	0.3187	0.8497	0.2097	0.8497	0.1902	0.8497	0.1739	0.8497	0.16	0.8497	0.1392	0.8497	0.1257
0.8902	0.3187	0.8902	0.2147	0.8902	0.1952	0.8902	0.1789	0.8902	0.1653	0.8902	0.1438	0.8902	0.1331
0.9326	0.4043	0.9326	0.2626	0.9326	0.2209	0.9326	0.1971	0.9326	0.1821	0.9326	0.1638	0.9326	0.1491
0.977	0.4043	0.977	0.2626	0.977	0.2339	0.977	0.2155	0.977	0.2004	0.977	0.1789	0.977	0.1592
1.0235	0.4043	1.0235	0.2626	1.0235	0.2339	1.0235	0.2155	1.0235	0.2004	1.0235	0.1807	1.0235	0.1592
1.0723	0.4043	1.0723	0.2849	1.0723	0.2568	1.0723	0.234	1.0723	0.2159	1.0723	0.1896	1.0723	0.1643
1.1233	0.6502	1.1233	0.373	1.1233	0.3071	1.1233	0.2653	1.1233	0.2365	1.1233	0.1989	1.1233	0.1675
1.1768	0.6502	1.1768	0.4086	1.1768	0.3325	1.1768	0.285	1.1768	0.2582	1.1768	0.2243	1.1768	0.1928
1.2328	0.6502	1.2328	0.4086	1.2328	0.34	1.2328	0.3047	1.2328	0.2751	1.2328	0.23	1.2328	0.2061
1.2916	0.6502	1.2916	0.4086	1.2916	0.3543	1.2916	0.3156	1.2916	0.2838	1.2916	0.2478	1.2916	0.2145
1.353	0.7086	1.353	0.4121	1.353	0.3543	1.353	0.3302	1.353	0.311	1.353	0.2783	1.353	0.2406
1.4175	0.7086	1.4175	0.454	1.4175	0.385	1.4175	0.3437	1.4175	0.3254	1.4175	0.2936	1.4175	0.2567
1.485	0.7086	1.485	0.454	1.485	0.4103	1.485	0.3839	1.485	0.3602	1.485	0.3199	1.485	0.2743
1.5557	0.7086	1.5557	0.4636	1.5557	0.4243	1.5557	0.4012	1.5557	0.381	1.5557	0.3453	1.5557	0.3011
1.6298	0.7086	1.6298	0.5297	1.6298	0.4359	1.6298	0.4097	1.6298	0.3854	1.6298	0.3555	1.6298	0.318
1.7074	0.7121	1.7074	0.5297	1.7074	0.4668	1.7074	0.4428	1.7074	0.4206	1.7074	0.3816	1.7074	0.3319
1.7887	0.7575	1.7887	0.5496	1.7887	0.5036	1.7887	0.4793	1.7887	0.4566	1.7887	0.414	1.7887	0.3611
1.8738	0.892	1.8738	0.6685	1.8738	0.6011	1.8738	0.544	1.8738	0.5018	1.8738	0.4443	1.8738	0.3894
1.963	1.0943	1.963	0.801	1.963	0.7199	1.963	0.6514	1.963	0.5935	1.963	0.5124	1.963	0.4262
2.0565	1.2337	2.0565	0.8511	2.0565	0.7793	2.0565	0.7154	2.0565	0.6581	2.0565	0.5628	2.0565	0.4701
2.1544	1.2448	2.1544	0.8899	2.1544	0.823	2.1544	0.762	2.1544	0.6789	2.1544	0.6122	2.1544	0.4991
2.257	1.5688	2.257	1.0198	2.257	0.9214	2.257	0.7794	2.257	0.6789	2.257	0.6552	2.257	0.5322

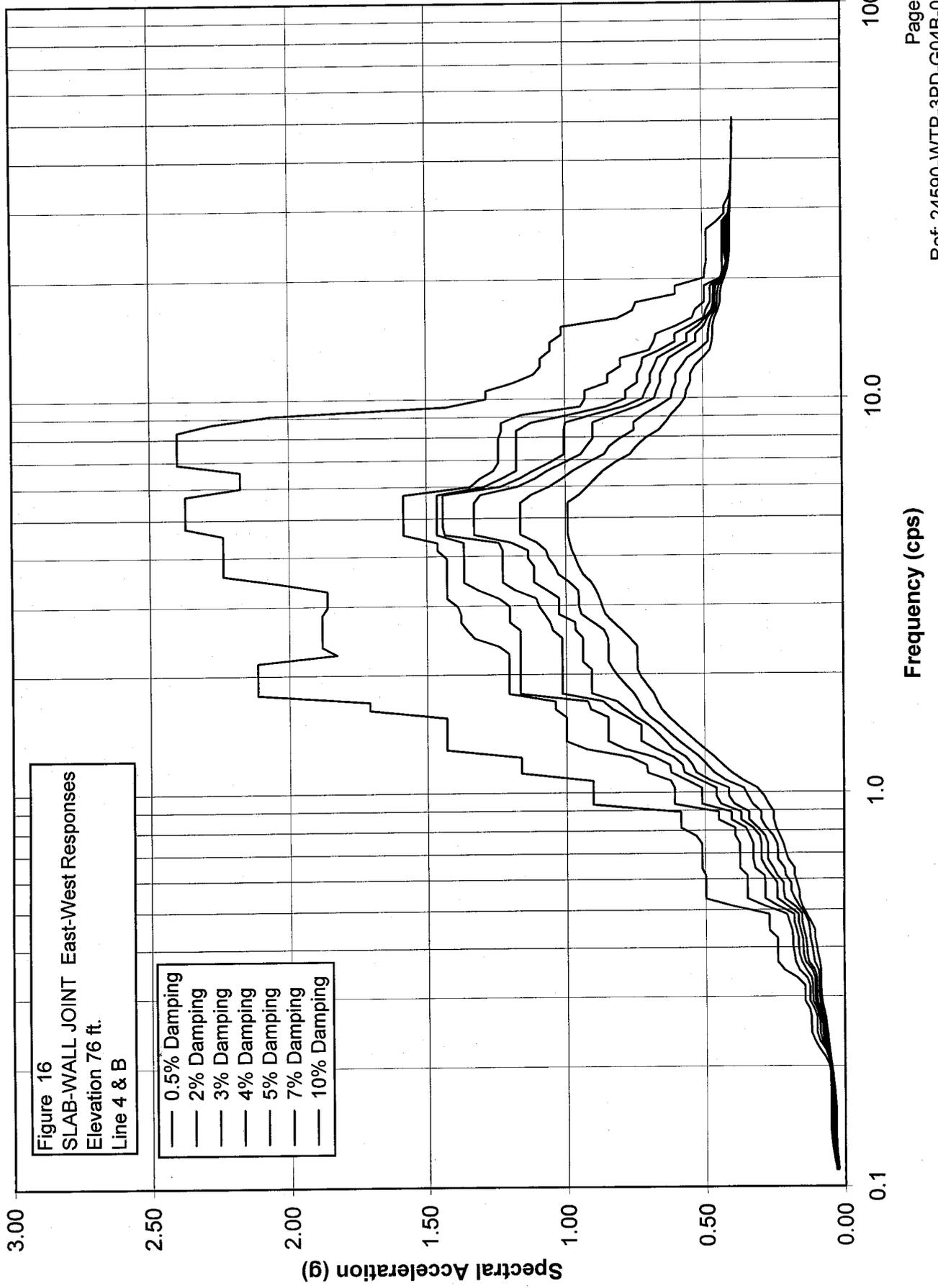
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2.3645	2.9117	2.3645	1.2761	2.3645	0.9616	2.3645	0.7794	2.3645	0.6789	2.3645	0.6628	2.3645	0.5365
2.4771	2.9117	2.4771	1.2761	2.4771	0.9616	2.4771	0.7794	2.4771	0.6908	2.4771	0.6628	2.4771	0.5471
2.595	2.9117	2.595	1.2761	2.595	0.9616	2.595	0.7954	2.595	0.7391	2.595	0.6628	2.595	0.5846
2.7186	2.9117	2.7186	1.3188	2.7186	1.1593	2.7186	1.0362	2.7186	0.9353	2.7186	0.7752	2.7186	0.6316
2.848	2.9117	2.848	1.3484	2.848	1.2006	2.848	1.0805	2.848	0.9403	2.848	0.7752	2.848	0.692
2.9836	2.9117	2.9836	1.5277	2.9836	1.264	2.9836	1.0805	2.9836	0.9403	2.9836	0.7752	2.9836	0.7343
3.1257	2.9117	3.1257	1.5277	3.1257	1.264	3.1257	1.0805	3.1257	0.9403	3.1257	0.7752	3.1257	0.7343
3.2745	2.9117	3.2745	1.5277	3.2745	1.264	3.2745	1.0805	3.2745	0.9403	3.2745	0.7752	3.2745	0.7343
3.4305	2.6673	3.4305	1.5277	3.4305	1.264	3.4305	1.0805	3.4305	0.9403	3.4305	0.7752	3.4305	0.7343
3.5938	2.5949	3.5938	1.5277	3.5938	1.264	3.5938	1.0805	3.5938	0.9403	3.5938	0.7752	3.5938	0.7343
3.7649	2.5949	3.7649	1.5277	3.7649	1.264	3.7649	1.0805	3.7649	0.9403	3.7649	0.7752	3.7649	0.7201
3.9442	1.6012	3.9442	1.1133	3.9442	1.0007	3.9442	0.9087	3.9442	0.8333	3.9442	0.7453	3.9442	0.6514
4.132	1.1465	4.132	0.8693	4.132	0.8001	4.132	0.7444	4.132	0.6953	4.132	0.6424	4.132	0.5789
4.3288	1.1465	4.3288	0.8084	4.3288	0.7336	4.3288	0.6811	4.3288	0.6391	4.3288	0.5725	4.3288	0.5234
4.5349	1.1465	4.5349	0.7546	4.5349	0.6828	4.5349	0.6342	4.5349	0.5952	4.5349	0.534	4.5349	0.4939
4.7508	1.1465	4.7508	0.7453	4.7508	0.6799	4.7508	0.6294	4.7508	0.5877	4.7508	0.5225	4.7508	0.4822
4.977	1.1489	4.977	0.7453	4.977	0.6799	4.977	0.6294	4.977	0.5877	4.977	0.5283	4.977	0.4703
5.214	1.2396	5.214	0.7395	5.214	0.7043	5.214	0.6335	5.214	0.5978	5.214	0.5371	5.214	0.4707
5.4623	1.3455	5.4623	0.7395	5.4623	0.7043	5.4623	0.6346	5.4623	0.5978	5.4623	0.5371	5.4623	0.4707
5.7224	1.3455	5.7224	0.7395	5.7224	0.7043	5.7224	0.6698	5.7224	0.6123	5.7224	0.5371	5.7224	0.4707
5.9948	1.3455	5.9948	0.7395	5.9948	0.7043	5.9948	0.6698	5.9948	0.6123	5.9948	0.5371	5.9948	0.4707
6.2803	1.3455	6.2803	0.7595	6.2803	0.7043	6.2803	0.6698	6.2803	0.6123	6.2803	0.5371	6.2803	0.4707
6.5793	1.684	6.5793	0.9222	6.5793	0.7494	6.5793	0.6698	6.5793	0.6123	6.5793	0.5413	6.5793	0.4805
6.8926	1.8149	6.8926	0.9509	6.8926	0.778	6.8926	0.6768	6.8926	0.6324	6.8926	0.6013	6.8926	0.5087
7.2208	1.8149	7.2208	0.9509	7.2208	0.778	7.2208	0.6768	7.2208	0.6324	7.2208	0.6144	7.2208	0.5087
7.5646	1.8149	7.5646	0.9509	7.5646	0.778	7.5646	0.6768	7.5646	0.6324	7.5646	0.6144	7.5646	0.5087
7.9248	1.8149	7.9248	0.9509	7.9248	0.778	7.9248	0.6768	7.9248	0.6324	7.9248	0.6144	7.9248	0.5087
8.3022	1.8149	8.3022	0.9509	8.3022	0.778	8.3022	0.6768	8.3022	0.6324	8.3022	0.6144	8.3022	0.5087
8.6975	1.8149	8.6975	0.9509	8.6975	0.778	8.6975	0.6768	8.6975	0.6324	8.6975	0.6144	8.6975	0.5059
9.1116	1.8149	9.1116	0.9509	9.1116	0.778	9.1116	0.6768	9.1116	0.6324	9.1116	0.5976	9.1116	0.4947
9.5455	1.1574	9.5455	0.8285	9.5455	0.7562	9.5455	0.6768	9.5455	0.6324	9.5455	0.5527	9.5455	0.4669
10	1.0191	10	0.7303	10	0.6741	10	0.6247	10	0.584	10	0.5211	10	0.4588
10.4762	1.2689	10.4762	0.8051	10.4762	0.7252	10.4762	0.6633	10.4762	0.6143	10.4762	0.5403	10.4762	0.4679
10.975	1.2689	10.975	0.8733	10.975	0.7952	10.975	0.7316	10.975	0.6774	10.975	0.5899	10.975	0.499
11.4976	1.4247	11.4976	0.8733	11.4976	0.7952	11.4976	0.7316	11.4976	0.6783	11.4976	0.6128	11.4976	0.5446
12.045	1.4247	12.045	0.8733	12.045	0.7952	12.045	0.7316	12.045	0.684	12.045	0.6273	12.045	0.5606
12.6186	1.4909	12.6186	0.8733	12.6186	0.7952	12.6186	0.7316	12.6186	0.684	12.6186	0.6273	12.6186	0.5606
13.2194	1.4909	13.2194	0.8733	13.2194	0.7952	13.2194	0.7316	13.2194	0.684	13.2194	0.6273	13.2194	0.5606
13.8489	1.4909	13.8489	0.8422	13.8489	0.7725	13.8489	0.7204	13.8489	0.684	13.8489	0.6273	13.8489	0.5606

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14.5083	1.4909	14.5083	0.7952	14.5083	0.7458	14.5083	0.7151	14.5083	0.684	14.5083	0.6273	14.5083	0.5606
15.1991	1.4909	15.1991	0.7952	15.1991	0.7064	15.1991	0.6596	15.1991	0.6265	15.1991	0.5817	15.1991	0.5361
15.9228	1.2797	15.9228	0.7883	15.9228	0.6725	15.9228	0.6193	15.9228	0.5748	15.9228	0.5277	15.9228	0.4985
16.681	1.2797	16.681	0.78	16.681	0.6679	16.681	0.5999	16.681	0.578	16.681	0.5418	16.681	0.494
17.4753	1.4073	17.4753	0.9347	17.4753	0.8112	17.4753	0.7304	17.4753	0.6932	17.4753	0.6314	17.4753	0.549
18.3074	1.6723	18.3074	1.0801	18.3074	0.949	18.3074	0.8549	18.3074	0.7825	18.3074	0.6755	18.3074	0.5649
19.1791	1.9879	19.1791	1.2503	19.1791	1.0688	19.1791	0.9246	19.1791	0.8121	19.1791	0.7102	19.1791	0.6054
20.0923	2.2843	20.0923	1.3591	20.0923	1.1154	20.0923	0.9682	20.0923	0.8852	20.0923	0.7102	20.0923	0.6137
21.049	2.4787	21.049	1.3786	21.049	1.1154	21.049	0.9682	21.049	0.8852	21.049	0.7102	21.049	0.6403
22.0513	3.8727	22.0513	1.6902	22.0513	1.2689	22.0513	1.0476	22.0513	0.9009	22.0513	0.7102	22.0513	0.6658
23.1013	3.8727	23.1013	1.6902	23.1013	1.2689	23.1013	1.0476	23.1013	0.9009	23.1013	0.7102	23.1013	0.6815
24.2013	3.8727	24.2013	1.6902	24.2013	1.2689	24.2013	1.0476	24.2013	0.9009	24.2013	0.7102	24.2013	0.6815
25.3536	3.8727	25.3536	1.6902	25.3536	1.2689	25.3536	1.0476	25.3536	0.9009	25.3536	0.7102	25.3536	0.6815
26.5609	3.8727	26.5609	1.6902	26.5609	1.2689	26.5609	1.0476	26.5609	0.9009	26.5609	0.7102	26.5609	0.6815
27.8256	2.4743	27.8256	1.3858	27.8256	1.1604	27.8256	1.0476	27.8256	0.9009	27.8256	0.7102	27.8256	0.6815
29.1505	0.9665	29.1505	0.7731	29.1505	0.7537	29.1505	0.7357	29.1505	0.7154	29.1505	0.6886	29.1505	0.6036
30.5386	0.8492	30.5386	0.6389	30.5386	0.6134	30.5386	0.5966	30.5386	0.5827	30.5386	0.566	30.5386	0.5402
31.9927	0.624	31.9927	0.5865	31.9927	0.5601	31.9927	0.5376	31.9927	0.5188	31.9927	0.4921	31.9927	0.4842
33.516	0.5318	33.516	0.4922	33.516	0.4753	33.516	0.4638	33.516	0.4549	33.516	0.4414	33.516	0.44
35.1119	0.4647	35.1119	0.4581	35.1119	0.4528	35.1119	0.4473	35.1119	0.4419	35.1119	0.4315	35.1119	0.4174
36.7838	0.4365	36.7838	0.4331	36.7838	0.4305	36.7838	0.4277	36.7838	0.4248	36.7838	0.4187	36.7838	0.4096
38.5353	0.4178	38.5353	0.4157	38.5353	0.4141	38.5353	0.4124	38.5353	0.4106	38.5353	0.4069	38.5353	0.401
40.3702	0.4039	40.3702	0.4024	40.3702	0.4014	40.3702	0.4003	40.3702	0.3992	40.3702	0.3967	40.3702	0.3928
42.2924	0.3928	42.2924	0.3918	42.2924	0.3911	42.2924	0.3904	42.2924	0.3897	42.2924	0.3881	42.2924	0.3855
44.3062	0.3835	44.3062	0.3829	44.3062	0.3825	44.3062	0.3821	44.3062	0.3816	44.3062	0.3806	44.3062	0.379
46.4159	0.3756	46.4159	0.3753	46.4159	0.3751	46.4159	0.3748	46.4159	0.3746	46.4159	0.374	46.4159	0.3732
48.626	0.3686	48.626	0.3685	48.626	0.3684	48.626	0.3683	48.626	0.3683	48.626	0.3682	48.626	0.368
50.9414	0.362	50.9414	0.3622	50.9414	0.3623	50.9414	0.3624	50.9414	0.3625	50.9414	0.3628	50.9414	0.3633

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTW016.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-SOC-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 16
 SLAB-WALL JOINT East-West Responses
 Elevation 76 ft.
 Line 4 & B

0.50%		2%		3%		4%		5%		7%		10%	
Damping Freq.	Accel.												
0.1098	0.0314	0.1098	0.0289	0.1098	0.0276	0.1098	0.0268	0.1098	0.0261	0.1098	0.0248	0.1098	0.0233
0.115	0.0359	0.115	0.0331	0.115	0.0315	0.115	0.0301	0.115	0.0291	0.115	0.0276	0.115	0.0255
0.1204	0.0411	0.1204	0.0383	0.1204	0.0367	0.1204	0.0354	0.1204	0.0341	0.1204	0.0317	0.1204	0.0288
0.1262	0.046	0.1262	0.0427	0.1262	0.0408	0.1262	0.039	0.1262	0.0373	0.1262	0.0344	0.1262	0.0312
0.1322	0.0489	0.1322	0.0443	0.1322	0.0422	0.1322	0.0403	0.1322	0.0386	0.1322	0.0356	0.1322	0.0322
0.1385	0.0518	0.1385	0.0463	0.1385	0.0431	0.1385	0.0403	0.1385	0.0386	0.1385	0.0356	0.1385	0.0322
0.1451	0.0518	0.1451	0.0463	0.1451	0.0431	0.1451	0.0403	0.1451	0.0386	0.1451	0.0356	0.1451	0.0322
0.152	0.0518	0.152	0.0463	0.152	0.0431	0.152	0.0403	0.152	0.0386	0.152	0.0356	0.152	0.0322
0.1592	0.0518	0.1592	0.0463	0.1592	0.0431	0.1592	0.0403	0.1592	0.0386	0.1592	0.0356	0.1592	0.0325
0.1668	0.0518	0.1668	0.0463	0.1668	0.0431	0.1668	0.0403	0.1668	0.0383	0.1668	0.0363	0.1668	0.0353
0.1748	0.0518	0.1748	0.0463	0.1748	0.0431	0.1748	0.041	0.1748	0.0405	0.1748	0.0395	0.1748	0.038
0.1831	0.0518	0.1831	0.0463	0.1831	0.0455	0.1831	0.0448	0.1831	0.0441	0.1831	0.0427	0.1831	0.0407
0.1918	0.0522	0.1918	0.0506	0.1918	0.0496	0.1918	0.0487	0.1918	0.0477	0.1918	0.0459	0.1918	0.0438
0.2009	0.057	0.2009	0.055	0.2009	0.0537	0.2009	0.0525	0.2009	0.0515	0.2009	0.0498	0.2009	0.0476
0.2105	0.0708	0.2105	0.0601	0.2105	0.0587	0.2105	0.0575	0.2105	0.0563	0.2105	0.0541	0.2105	0.0519
0.2205	0.091	0.2205	0.0715	0.2205	0.0644	0.2205	0.0625	0.2205	0.0611	0.2205	0.0588	0.2205	0.0561
0.231	0.108	0.231	0.0908	0.231	0.0814	0.231	0.0735	0.231	0.0674	0.231	0.0633	0.231	0.0597
0.242	0.1196	0.242	0.0994	0.242	0.0885	0.242	0.0794	0.242	0.0717	0.242	0.0668	0.242	0.0623
0.2535	0.1206	0.2535	0.0994	0.2535	0.0885	0.2535	0.0797	0.2535	0.0756	0.2535	0.0697	0.2535	0.066
0.2656	0.1206	0.2656	0.0994	0.2656	0.0924	0.2656	0.0882	0.2656	0.0842	0.2656	0.0771	0.2656	0.0689
0.2783	0.1256	0.2783	0.1098	0.2783	0.1009	0.2783	0.095	0.2783	0.0906	0.2783	0.0838	0.2783	0.0758
0.2915	0.1426	0.2915	0.1249	0.2915	0.1149	0.2915	0.106	0.2915	0.0982	0.2915	0.089	0.2915	0.0817
0.3054	0.1426	0.3054	0.1249	0.3054	0.1154	0.3054	0.1071	0.3054	0.0997	0.3054	0.0913	0.3054	0.0847
0.3199	0.1426	0.3199	0.1249	0.3199	0.1154	0.3199	0.1071	0.3199	0.0997	0.3199	0.0913	0.3199	0.0852
0.3352	0.1713	0.3352	0.1349	0.3352	0.1189	0.3352	0.1071	0.3352	0.0997	0.3352	0.0913	0.3352	0.0852
0.3511	0.2175	0.3511	0.1632	0.3511	0.1371	0.3511	0.1172	0.3511	0.1081	0.3511	0.0936	0.3511	0.0852
0.3678	0.2403	0.3678	0.1759	0.3678	0.1535	0.3678	0.1399	0.3678	0.128	0.3678	0.1082	0.3678	0.0889

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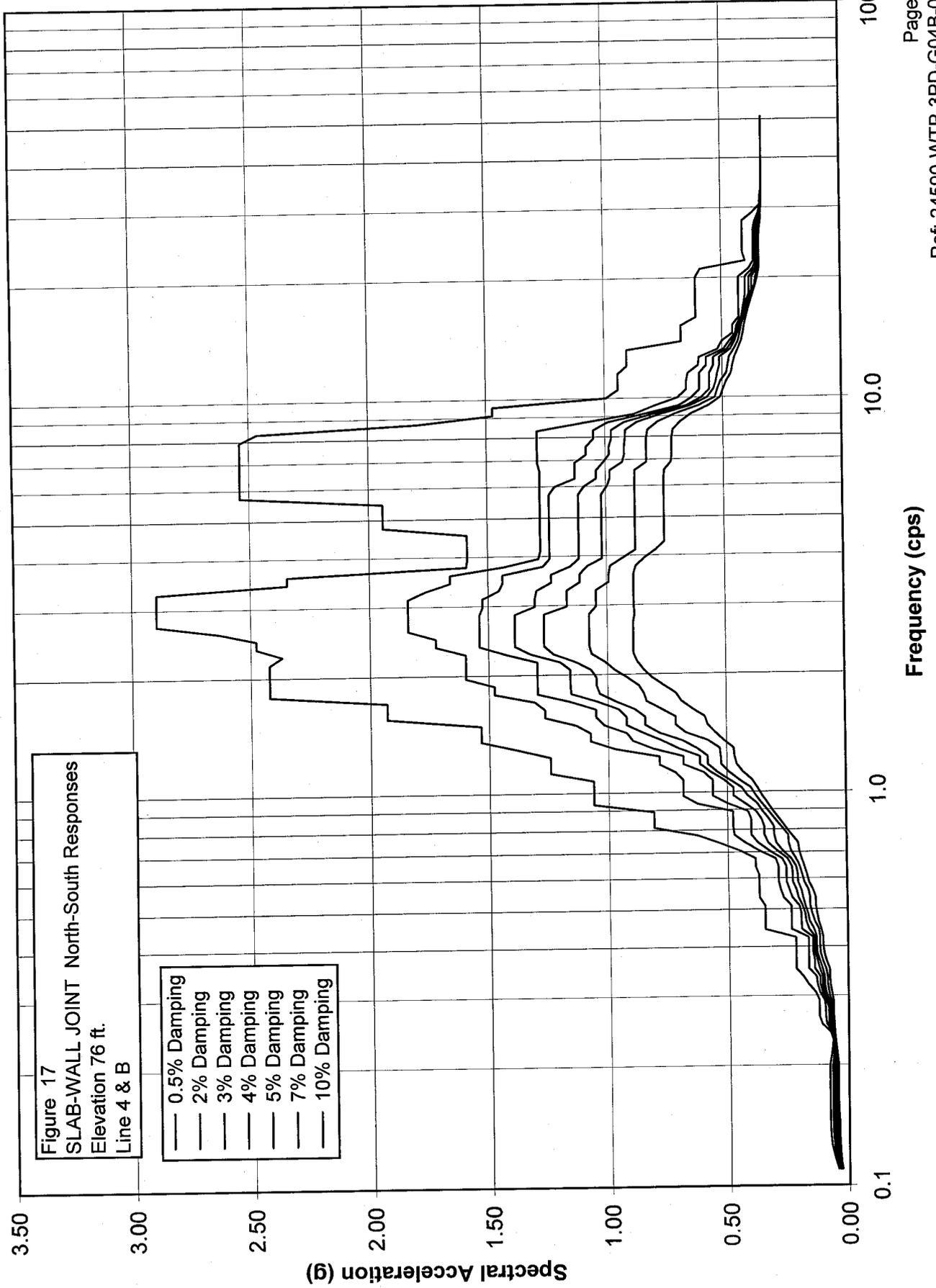
0.3853	0.2403	0.3853	0.1805	0.3853	0.1624	0.3853	0.1469	0.3853	0.1337	0.3853	0.1126	0.3853	0.0954
0.4037	0.2403	0.4037	0.1857	0.4037	0.1654	0.4037	0.1487	0.4037	0.1347	0.4037	0.1168	0.4037	0.0998
0.4229	0.2403	0.4229	0.1857	0.4229	0.1654	0.4229	0.1499	0.4229	0.1383	0.4229	0.1223	0.4229	0.1056
0.4431	0.27	0.4431	0.1874	0.4431	0.1715	0.4431	0.1574	0.4431	0.1449	0.4431	0.1245	0.4431	0.1056
0.4642	0.27	0.4642	0.1967	0.4642	0.1794	0.4642	0.1641	0.4642	0.1506	0.4642	0.1282	0.4642	0.1187
0.4863	0.27	0.4863	0.2054	0.4863	0.1802	0.4863	0.1641	0.4863	0.1506	0.4863	0.1407	0.4863	0.1348
0.5094	0.3943	0.5094	0.281	0.5094	0.2344	0.5094	0.2011	0.5094	0.1764	0.5094	0.1609	0.5094	0.1499
0.5337	0.4992	0.5337	0.3477	0.5337	0.284	0.5337	0.2403	0.5337	0.2137	0.5337	0.1777	0.5337	0.1604
0.5591	0.4992	0.5591	0.3477	0.5591	0.284	0.5591	0.2403	0.5591	0.2181	0.5591	0.1904	0.5591	0.162
0.5857	0.4992	0.5857	0.3477	0.5857	0.284	0.5857	0.2403	0.5857	0.2181	0.5857	0.1904	0.5857	0.1691
0.6136	0.4992	0.6136	0.3477	0.6136	0.2869	0.6136	0.2609	0.6136	0.2403	0.6136	0.2092	0.6136	0.1778
0.6428	0.5116	0.6428	0.3742	0.6428	0.3192	0.6428	0.2813	0.6428	0.2532	0.6428	0.2136	0.6428	0.1778
0.6734	0.5116	0.6734	0.3742	0.6734	0.3261	0.6734	0.2971	0.6734	0.2735	0.6734	0.237	0.6734	0.1992
0.7055	0.5116	0.7055	0.3742	0.7055	0.3261	0.7055	0.2971	0.7055	0.2735	0.7055	0.237	0.7055	0.2095
0.7391	0.5116	0.7391	0.3742	0.7391	0.3261	0.7391	0.2971	0.7391	0.2735	0.7391	0.24	0.7391	0.2184
0.7743	0.5323	0.7743	0.3909	0.7743	0.3386	0.7743	0.3025	0.7743	0.2834	0.7743	0.254	0.7743	0.2303
0.8111	0.5871	0.8111	0.3915	0.8111	0.3531	0.8111	0.3269	0.8111	0.3094	0.8111	0.2798	0.8111	0.2444
0.8497	0.5871	0.8497	0.4501	0.8497	0.4042	0.8497	0.3687	0.8497	0.3404	0.8497	0.297	0.8497	0.2515
0.8902	0.5871	0.8902	0.4501	0.8902	0.4042	0.8902	0.3687	0.8902	0.3404	0.8902	0.297	0.8902	0.2515
0.9326	0.9044	0.9326	0.6108	0.9326	0.5104	0.9326	0.4427	0.9326	0.3941	0.9326	0.3288	0.9326	0.2714
0.977	0.9044	0.977	0.6108	0.977	0.5118	0.977	0.4588	0.977	0.413	0.977	0.3445	0.977	0.2871
1.0235	0.9044	1.0235	0.6108	1.0235	0.5118	1.0235	0.4588	1.0235	0.413	1.0235	0.3599	1.0235	0.3111
1.0723	0.9044	1.0723	0.6244	1.0723	0.5649	1.0723	0.5166	1.0723	0.4812	1.0723	0.4236	1.0723	0.3613
1.1233	1.1629	1.1233	0.7071	1.1233	0.622	1.1233	0.574	1.1233	0.5312	1.1233	0.4673	1.1233	0.4044
1.1768	1.1629	1.1768	0.7114	1.1768	0.6268	1.1768	0.5814	1.1768	0.5455	1.1768	0.4933	1.1768	0.4362
1.2328	1.1629	1.2328	0.7698	1.2328	0.6847	1.2328	0.6148	1.2328	0.5695	1.2328	0.5195	1.2328	0.4666
1.2916	1.4292	1.2916	0.9259	1.2916	0.7874	1.2916	0.6766	1.2916	0.6164	1.2916	0.5565	1.2916	0.5009
1.353	1.4292	1.353	1.0006	1.353	0.8493	1.353	0.7307	1.353	0.6419	1.353	0.5947	1.353	0.5351
1.4175	1.4292	1.4175	1.0006	1.4175	0.8493	1.4175	0.7307	1.4175	0.6705	1.4175	0.6261	1.4175	0.567
1.485	1.4292	1.485	1.0006	1.485	0.8493	1.485	0.7307	1.485	0.7027	1.485	0.658	1.485	0.599
1.5557	1.4292	1.5557	1.0006	1.5557	0.8493	1.5557	0.7794	1.5557	0.749	1.5557	0.6968	1.5557	0.6298
1.6298	1.7077	1.6298	1.0388	1.6298	0.9126	1.6298	0.8346	1.6298	0.783	1.6298	0.7256	1.6298	0.6557
1.7074	1.7077	1.7074	1.0388	1.7074	0.9223	1.7074	0.8679	1.7074	0.8184	1.7074	0.7383	1.7074	0.672
1.7887	2.1137	1.7887	1.2054	1.7887	1.1656	1.7887	1.0145	1.7887	0.9077	1.7887	0.7562	1.7887	0.6839
1.8738	2.1137	1.8738	1.2054	1.8738	1.1656	1.8738	1.0145	1.8738	0.9077	1.8738	0.7847	1.8738	0.7074
1.963	2.1137	1.963	1.2054	1.963	1.1656	1.963	1.0145	1.963	0.9077	1.963	0.8101	1.963	0.7294
2.0565	2.1137	2.0565	1.2054	2.0565	1.1656	2.0565	1.0145	2.0565	0.9077	2.0565	0.8314	2.0565	0.7428
2.1544	2.1137	2.1544	1.2054	2.1544	1.1656	2.1544	1.0145	2.1544	0.9395	2.1544	0.8475	2.1544	0.7428
2.257	1.827	2.257	1.2057	2.257	1.1656	2.257	1.0145	2.257	0.9395	2.257	0.8475	2.257	0.7428

2.3645	1.8804	2.3645	1.2434	2.3645	1.1656	2.3645	1.0145	2.3645	0.9395	2.3645	0.8475	2.3645	0.7447
2.4771	1.8804	2.4771	1.3292	2.4771	1.1656	2.4771	1.0145	2.4771	0.9395	2.4771	0.8498	2.4771	0.7715
2.595	1.8804	2.595	1.3552	2.595	1.1656	2.595	1.0484	2.595	0.9655	2.595	0.8633	2.595	0.7995
2.7186	1.8804	2.7186	1.3777	2.7186	1.2022	2.7186	1.0582	2.7186	0.968	2.7186	0.9044	2.7186	0.8316
2.848	1.8804	2.848	1.3777	2.848	1.2022	2.848	1.0766	2.848	1.0257	2.848	0.9446	2.848	0.8584
2.9836	1.8607	2.9836	1.3893	2.9836	1.2036	2.9836	1.0969	2.9836	1.0257	2.9836	0.9532	2.9836	0.8695
3.1257	1.8607	3.1257	1.4271	3.1257	1.2419	3.1257	1.108	3.1257	1.0257	3.1257	0.9532	3.1257	0.8799
3.2745	1.8607	3.2745	1.4271	3.2745	1.3122	3.2745	1.1806	3.2745	1.0677	3.2745	0.957	3.2745	0.8919
3.4305	2.0366	3.4305	1.4271	3.4305	1.3656	3.4305	1.2277	3.4305	1.1143	3.4305	0.9881	3.4305	0.9092
3.5938	2.2364	3.5938	1.4271	3.5938	1.3656	3.5938	1.2277	3.5938	1.1143	3.5938	1.0274	3.5938	0.9381
3.7649	2.2364	3.7649	1.4271	3.7649	1.3656	3.7649	1.2277	3.7649	1.1143	3.7649	1.0407	3.7649	0.9544
3.9442	2.2364	3.9442	1.4271	3.9442	1.3656	3.9442	1.2277	3.9442	1.1355	3.9442	1.0614	3.9442	0.965
4.132	2.2364	4.132	1.4602	4.132	1.3656	4.132	1.2277	4.132	1.1355	4.132	1.0703	4.132	0.9778
4.3288	2.2364	4.3288	1.4602	4.3288	1.3656	4.3288	1.2408	4.3288	1.1959	4.3288	1.1036	4.3288	0.9854
4.5349	2.2364	4.5349	1.5826	4.5349	1.4622	4.5349	1.4348	4.5349	1.3288	4.5349	1.1628	4.5349	0.992
4.7508	2.3716	4.7508	1.5826	4.7508	1.4622	4.7508	1.4409	4.7508	1.3288	4.7508	1.1628	4.7508	0.992
4.977	2.3716	4.977	1.5826	4.977	1.4622	4.977	1.4409	4.977	1.3288	4.977	1.1628	4.977	0.992
5.214	2.3716	5.214	1.5826	5.214	1.4622	5.214	1.4409	5.214	1.3288	5.214	1.1628	5.214	0.992
5.4623	2.3716	5.4623	1.5826	5.4623	1.4622	5.4623	1.4409	5.4623	1.3288	5.4623	1.1628	5.4623	0.992
5.7224	2.3716	5.7224	1.5826	5.7224	1.4622	5.7224	1.4409	5.7224	1.3065	5.7224	1.1218	5.7224	0.9494
5.9948	2.174	5.9948	1.3435	5.9948	1.2949	5.9948	1.2349	5.9948	1.173	5.9948	1.0574	5.9948	0.9187
6.2803	2.174	6.2803	1.3083	6.2803	1.2302	6.2803	1.1657	6.2803	1.086	6.2803	1.0114	6.2803	0.8913
6.5793	2.174	6.5793	1.2587	6.5793	1.1757	6.5793	1.1146	6.5793	1.0633	6.5793	0.9712	6.5793	0.8607
6.8926	2.4006	6.8926	1.2413	6.8926	1.1757	6.8926	1.0556	6.8926	1.0029	6.8926	0.9176	6.8926	0.8191
7.2208	2.4006	7.2208	1.2413	7.2208	1.1757	7.2208	1.0053	7.2208	0.9447	7.2208	0.8592	7.2208	0.7652
7.5646	2.4006	7.5646	1.2413	7.5646	1.1757	7.5646	1.0053	7.5646	0.923	7.5646	0.841	7.5646	0.7421
7.9248	2.4006	7.9248	1.2413	7.9248	1.1757	7.9248	1.0053	7.9248	0.9008	7.9248	0.8025	7.9248	0.7109
8.3022	2.4006	8.3022	1.2296	8.3022	1.1757	8.3022	1.0053	8.3022	0.9008	8.3022	0.7518	8.3022	0.6612
8.6975	2.2773	8.6975	1.2296	8.6975	1.1232	8.6975	1.0001	8.6975	0.9008	8.6975	0.7518	8.6975	0.6359
9.1116	2.0653	9.1116	1.1587	9.1116	0.9831	9.1116	0.8993	9.1116	0.8231	9.1116	0.7124	9.1116	0.6152
9.5455	1.4291	9.5455	0.9457	9.5455	0.85	9.5455	0.7861	9.5455	0.7386	9.5455	0.6612	9.5455	0.5865
10	1.2844	10	0.927	10	0.7809	10	0.7196	10	0.6766	10	0.6164	10	0.565
10.4762	1.2844	10.4762	0.927	10.4762	0.7809	10.4762	0.7073	10.4762	0.6673	10.4762	0.611	10.4762	0.5598
10.975	1.1868	10.975	0.8449	10.975	0.7376	10.975	0.6909	10.975	0.654	10.975	0.5981	10.975	0.5451
11.4976	1.114	11.4976	0.8449	11.4976	0.7376	11.4976	0.6909	11.4976	0.654	11.4976	0.5981	11.4976	0.5451
12.045	1.0882	12.045	0.7988	12.045	0.7234	12.045	0.6756	12.045	0.6369	12.045	0.5755	12.045	0.5279
12.6186	1.0882	12.6186	0.7988	12.6186	0.7182	12.6186	0.6644	12.6186	0.6212	12.6186	0.5547	12.6186	0.4982
13.2194	1.0533	13.2194	0.6937	13.2194	0.6541	13.2194	0.6121	13.2194	0.5741	13.2194	0.512	13.2194	0.4728
13.8489	1.0533	13.8489	0.6765	13.8489	0.6007	13.8489	0.5574	13.8489	0.5245	13.8489	0.4799	13.8489	0.4666

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14.5083	1.012	14.5083	0.6692	14.5083	0.6007	14.5083	0.5574	14.5083	0.5245	14.5083	0.4799	14.5083	0.4628
15.1991	1.012	15.1991	0.5971	15.1991	0.5461	15.1991	0.5158	15.1991	0.4944	15.1991	0.4764	15.1991	0.4628
15.9228	0.8097	15.9228	0.5374	15.9228	0.495	15.9228	0.4885	15.9228	0.4812	15.9228	0.4679	15.9228	0.4559
16.681	0.7535	16.681	0.5267	16.681	0.487	16.681	0.4672	16.681	0.459	16.681	0.4511	16.681	0.4435
17.4753	0.741	17.4753	0.4931	17.4753	0.471	17.4753	0.4599	17.4753	0.4548	17.4753	0.4458	17.4753	0.4353
18.3074	0.5983	18.3074	0.4931	18.3074	0.471	18.3074	0.4599	18.3074	0.4548	18.3074	0.4458	18.3074	0.4353
19.1791	0.5983	19.1791	0.4931	19.1791	0.471	19.1791	0.4588	19.1791	0.4508	19.1791	0.4402	19.1791	0.4301
20.0923	0.4937	20.0923	0.4338	20.0923	0.4303	20.0923	0.4283	20.0923	0.4265	20.0923	0.4234	20.0923	0.4193
21.049	0.491	21.049	0.4263	21.049	0.4206	21.049	0.4172	21.049	0.4148	21.049	0.4121	21.049	0.41
22.0513	0.4851	22.0513	0.4272	22.0513	0.4133	22.0513	0.4078	22.0513	0.4067	22.0513	0.4055	22.0513	0.405
23.1013	0.4851	23.1013	0.4273	23.1013	0.4197	23.1013	0.414	23.1013	0.4097	23.1013	0.4043	23.1013	0.4017
24.2013	0.4851	24.2013	0.4273	24.2013	0.4197	24.2013	0.414	24.2013	0.4097	24.2013	0.4043	24.2013	0.4003
25.3536	0.4851	25.3536	0.4273	25.3536	0.4197	25.3536	0.414	25.3536	0.4097	25.3536	0.4043	25.3536	0.4003
26.5609	0.4851	26.5609	0.4273	26.5609	0.4197	26.5609	0.414	26.5609	0.4097	26.5609	0.4043	26.5609	0.4003
27.8256	0.4481	27.8256	0.4273	27.8256	0.4197	27.8256	0.414	27.8256	0.4097	27.8256	0.4043	27.8256	0.4003
29.1505	0.419	29.1505	0.4045	29.1505	0.4037	29.1505	0.4029	29.1505	0.402	29.1505	0.4006	29.1505	0.3988
30.5386	0.419	30.5386	0.4009	30.5386	0.3989	30.5386	0.3982	30.5386	0.3978	30.5386	0.3977	30.5386	0.3973
31.9927	0.4031	31.9927	0.3968	31.9927	0.3966	31.9927	0.3966	31.9927	0.3966	31.9927	0.3965	31.9927	0.3962
33.516	0.3964	33.516	0.3966	33.516	0.3966	33.516	0.3964	33.516	0.3961	33.516	0.3957	33.516	0.3953
35.1119	0.3946	35.1119	0.3947	35.1119	0.3946	35.1119	0.3946	35.1119	0.3946	35.1119	0.3945	35.1119	0.3943
36.7838	0.3934	36.7838	0.3935	36.7838	0.3934	36.7838	0.3934	36.7838	0.3934	36.7838	0.3934	36.7838	0.3933
38.5353	0.3925	38.5353	0.3925	38.5353	0.3925	38.5353	0.3925	38.5353	0.3925	38.5353	0.3925	38.5353	0.3925
40.3702	0.3917	40.3702	0.3917	40.3702	0.3917	40.3702	0.3917	40.3702	0.3917	40.3702	0.3917	40.3702	0.3917
42.2924	0.391	42.2924	0.391	42.2924	0.391	42.2924	0.3911	42.2924	0.3911	42.2924	0.3911	42.2924	0.3911
44.3062	0.3904	44.3062	0.3904	44.3062	0.3904	44.3062	0.3904	44.3062	0.3905	44.3062	0.3905	44.3062	0.3905
46.4159	0.3899	46.4159	0.3899	46.4159	0.3899	46.4159	0.3899	46.4159	0.3899	46.4159	0.3899	46.4159	0.3899
48.626	0.3894	48.626	0.3894	48.626	0.3894	48.626	0.3894	48.626	0.3894	48.626	0.3894	48.626	0.3895
50.9414	0.3889	50.9414	0.3889	50.9414	0.3889	50.9414	0.3889	50.9414	0.3889	50.9414	0.389	50.9414	0.389

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTW017.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 17
 SLAB-WALL JOINT North-South Responses
 Elevation 76 ft.
 Line 4 & B

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0457	0.1098	0.0394	0.1098	0.0365	0.1098	0.0344	0.1098	0.033	0.1098	0.033	0.1098	0.0312	0.1098	0.0287
0.115	0.0556	0.115	0.0493	0.115	0.0466	0.115	0.0443	0.115	0.0422	0.115	0.0422	0.115	0.0385	0.115	0.0339
0.1204	0.0648	0.1204	0.0584	0.1204	0.0546	0.1204	0.0513	0.1204	0.0482	0.1204	0.0482	0.1204	0.0429	0.1204	0.0366
0.1262	0.072	0.1262	0.0618	0.1262	0.0573	0.1262	0.0534	0.1262	0.0499	0.1262	0.0499	0.1262	0.0438	0.1262	0.0383
0.1322	0.0763	0.1322	0.0654	0.1322	0.0604	0.1322	0.0565	0.1322	0.053	0.1322	0.053	0.1322	0.047	0.1322	0.0403
0.1385	0.0787	0.1385	0.0673	0.1385	0.0609	0.1385	0.0565	0.1385	0.053	0.1385	0.053	0.1385	0.047	0.1385	0.0403
0.1451	0.0789	0.1451	0.0676	0.1451	0.0613	0.1451	0.0565	0.1451	0.053	0.1451	0.053	0.1451	0.047	0.1451	0.041
0.152	0.0789	0.152	0.0676	0.152	0.0613	0.152	0.0567	0.152	0.0537	0.152	0.0537	0.152	0.0485	0.152	0.0433
0.1592	0.0789	0.1592	0.0676	0.1592	0.0613	0.1592	0.0567	0.1592	0.0537	0.1592	0.0537	0.1592	0.0492	0.1592	0.0442
0.1668	0.0789	0.1668	0.0676	0.1668	0.0613	0.1668	0.0567	0.1668	0.0537	0.1668	0.0537	0.1668	0.0492	0.1668	0.0442
0.1748	0.0789	0.1748	0.0676	0.1748	0.0613	0.1748	0.0567	0.1748	0.0537	0.1748	0.0537	0.1748	0.0492	0.1748	0.0442
0.1831	0.0789	0.1831	0.0676	0.1831	0.0612	0.1831	0.0567	0.1831	0.0537	0.1831	0.0537	0.1831	0.0492	0.1831	0.0442
0.1918	0.0789	0.1918	0.0676	0.1918	0.0612	0.1918	0.0564	0.1918	0.0536	0.1918	0.0536	0.1918	0.0492	0.1918	0.0442
0.2009	0.0789	0.2009	0.0676	0.2009	0.0612	0.2009	0.0564	0.2009	0.0534	0.2009	0.0534	0.2009	0.0485	0.2009	0.0442
0.2105	0.0738	0.2105	0.0634	0.2105	0.0597	0.2105	0.0564	0.2105	0.0534	0.2105	0.0534	0.2105	0.0493	0.2105	0.048
0.2205	0.0688	0.2205	0.0627	0.2205	0.0591	0.2205	0.0562	0.2205	0.055	0.2205	0.055	0.2205	0.0534	0.2205	0.0519
0.231	0.0652	0.231	0.0628	0.231	0.0614	0.231	0.06	0.231	0.0589	0.231	0.0589	0.231	0.0572	0.231	0.0554
0.242	0.0763	0.242	0.0692	0.242	0.0653	0.242	0.0637	0.242	0.0626	0.242	0.0626	0.242	0.0606	0.242	0.0584
0.2535	0.1104	0.2535	0.0919	0.2535	0.0827	0.2535	0.0755	0.2535	0.0696	0.2535	0.0696	0.2535	0.0635	0.2535	0.0608
0.2656	0.1222	0.2656	0.0954	0.2656	0.083	0.2656	0.0755	0.2656	0.0696	0.2656	0.0696	0.2656	0.0656	0.2656	0.0625
0.2783	0.1222	0.2783	0.0954	0.2783	0.0834	0.2783	0.0787	0.2783	0.0746	0.2783	0.0746	0.2783	0.0678	0.2783	0.0633
0.2915	0.1222	0.2915	0.1011	0.2915	0.0942	0.2915	0.088	0.2915	0.0825	0.2915	0.0825	0.2915	0.0733	0.2915	0.0633
0.3054	0.137	0.3054	0.1189	0.3054	0.1089	0.3054	0.1003	0.3054	0.093	0.3054	0.093	0.3054	0.0814	0.3054	0.0699
0.3199	0.1652	0.3199	0.1288	0.3199	0.1173	0.3199	0.1075	0.3199	0.0991	0.3199	0.0991	0.3199	0.0858	0.3199	0.0753
0.3352	0.1878	0.3352	0.133	0.3352	0.1173	0.3352	0.1075	0.3352	0.0991	0.3352	0.0991	0.3352	0.0868	0.3352	0.0772
0.3511	0.2182	0.3511	0.1648	0.3511	0.1394	0.3511	0.1198	0.3511	0.1077	0.3511	0.1077	0.3511	0.0934	0.3511	0.0781
0.3678	0.2182	0.3678	0.1648	0.3678	0.1394	0.3678	0.128	0.3678	0.1179	0.3678	0.1179	0.3678	0.1053	0.3678	0.0913

0.3853	0.2182	0.3853	0.1648	0.3853	0.1469	0.3853	0.1377	0.3853	0.1296	0.3853	0.1157	0.3853	0.1001
0.4037	0.2182	0.4037	0.1648	0.4037	0.1472	0.4037	0.1383	0.4037	0.1306	0.4037	0.1178	0.4037	0.1038
0.4229	0.2196	0.4229	0.1651	0.4229	0.1472	0.4229	0.1383	0.4229	0.1306	0.4229	0.1178	0.4229	0.1038
0.4431	0.3471	0.4431	0.2358	0.4431	0.1927	0.4431	0.1619	0.4431	0.1417	0.4431	0.1216	0.4431	0.1117
0.4642	0.3471	0.4642	0.2358	0.4642	0.1944	0.4642	0.1745	0.4642	0.1591	0.4642	0.1376	0.4642	0.1213
0.4863	0.3471	0.4863	0.2358	0.4863	0.1944	0.4863	0.1782	0.4863	0.1664	0.4863	0.1494	0.4863	0.128
0.5094	0.3471	0.5094	0.2358	0.5094	0.2023	0.5094	0.1889	0.5094	0.1775	0.5094	0.157	0.5094	0.1327
0.5337	0.3694	0.5337	0.269	0.5337	0.2322	0.5337	0.2067	0.5337	0.1859	0.5337	0.157	0.5337	0.1327
0.5591	0.3694	0.5591	0.2795	0.5591	0.2425	0.5591	0.2131	0.5591	0.1923	0.5591	0.1626	0.5591	0.1441
0.5857	0.3694	0.5857	0.2874	0.5857	0.2546	0.5857	0.228	0.5857	0.2062	0.5857	0.1802	0.5857	0.1605
0.6136	0.3694	0.6136	0.2874	0.6136	0.2546	0.6136	0.228	0.6136	0.2069	0.6136	0.1881	0.6136	0.1674
0.6428	0.3838	0.6428	0.2874	0.6428	0.2546	0.6428	0.2304	0.6428	0.2129	0.6428	0.198	0.6428	0.1784
0.6734	0.3838	0.6734	0.2993	0.6734	0.2732	0.6734	0.2494	0.6734	0.2341	0.6734	0.2147	0.6734	0.1893
0.7055	0.4476	0.7055	0.3685	0.7055	0.3268	0.7055	0.2921	0.7055	0.2698	0.7055	0.2339	0.7055	0.1997
0.7391	0.5354	0.7391	0.4255	0.7391	0.3731	0.7391	0.3307	0.7391	0.2961	0.7391	0.2439	0.7391	0.204
0.7743	0.6277	0.7743	0.4727	0.7743	0.4011	0.7743	0.3464	0.7743	0.3042	0.7743	0.2459	0.7743	0.2311
0.8111	0.8112	0.8111	0.4771	0.8111	0.4011	0.8111	0.3464	0.8111	0.3042	0.8111	0.274	0.8111	0.2569
0.8497	0.8112	0.8497	0.4771	0.8497	0.4011	0.8497	0.3574	0.8497	0.3261	0.8497	0.3007	0.8497	0.2821
0.8902	0.8112	0.8902	0.4771	0.8902	0.4144	0.8902	0.3805	0.8902	0.3532	0.8902	0.328	0.8902	0.307
0.9326	1.0637	0.9326	0.6267	0.9326	0.4986	0.9326	0.4267	0.9326	0.3743	0.9326	0.3553	0.9326	0.3309
0.977	1.0637	0.977	0.6855	0.977	0.5616	0.977	0.4746	0.977	0.4148	0.977	0.38	0.977	0.3532
1.0235	1.0637	1.0235	0.6855	1.0235	0.5616	1.0235	0.4746	1.0235	0.4394	1.0235	0.4014	1.0235	0.3729
1.0723	1.0637	1.0723	0.6855	1.0723	0.5616	1.0723	0.5139	1.0723	0.4905	1.0723	0.4486	1.0723	0.3956
1.1233	1.2428	1.1233	0.7188	1.1233	0.6006	1.1233	0.5695	1.1233	0.5416	1.1233	0.4926	1.1233	0.4331
1.1768	1.2428	1.1768	0.7851	1.1768	0.684	1.1768	0.6142	1.1768	0.5807	1.1768	0.5239	1.1768	0.4597
1.2328	1.2428	1.2328	0.7851	1.2328	0.684	1.2328	0.6142	1.2328	0.5807	1.2328	0.5263	1.2328	0.4688
1.2916	1.3814	1.2916	0.9712	1.2916	0.8123	1.2916	0.7043	1.2916	0.6263	1.2916	0.5301	1.2916	0.4714
1.353	1.533	1.353	1.0745	1.353	0.8967	1.353	0.7736	1.353	0.6873	1.353	0.5798	1.353	0.513
1.4175	1.533	1.4175	1.0745	1.4175	0.9239	1.4175	0.8519	1.4175	0.7856	1.4175	0.6729	1.4175	0.5491
1.485	1.533	1.485	1.1333	1.485	1.0159	1.485	0.9236	1.485	0.8444	1.485	0.7155	1.485	0.5803
1.5557	1.9303	1.5557	1.2635	1.5557	1.0508	1.5557	0.9236	1.5557	0.8444	1.5557	0.7155	1.5557	0.5918
1.6298	1.9303	1.6298	1.2635	1.6298	1.0508	1.6298	0.9544	1.6298	0.8875	1.6298	0.7745	1.6298	0.644
1.7074	1.9303	1.7074	1.3071	1.7074	1.1559	1.7074	1.0443	1.7074	0.9675	1.7074	0.8379	1.7074	0.6902
1.7887	2.4221	1.7887	1.4752	1.7887	1.2941	1.7887	1.1537	1.7887	1.034	1.7887	0.8493	1.7887	0.713
1.8738	2.4221	1.8738	1.4752	1.8738	1.2941	1.8738	1.1559	1.8738	1.0476	1.8738	0.8706	1.8738	0.7652
1.963	2.4221	1.963	1.5955	1.963	1.2941	1.963	1.1559	1.963	1.0476	1.963	0.9171	1.963	0.8134
2.0565	2.4221	2.0565	1.5955	2.0565	1.2941	2.0565	1.1559	2.0565	1.07	2.0565	0.9722	2.0565	0.8496
2.1544	2.4221	2.1544	1.5955	2.1544	1.2941	2.1544	1.1997	2.1544	1.1339	2.1544	1.0119	2.1544	0.8753
2.257	2.3679	2.257	1.5955	2.257	1.4258	2.257	1.3212	2.257	1.227	2.257	1.0672	2.257	0.8914

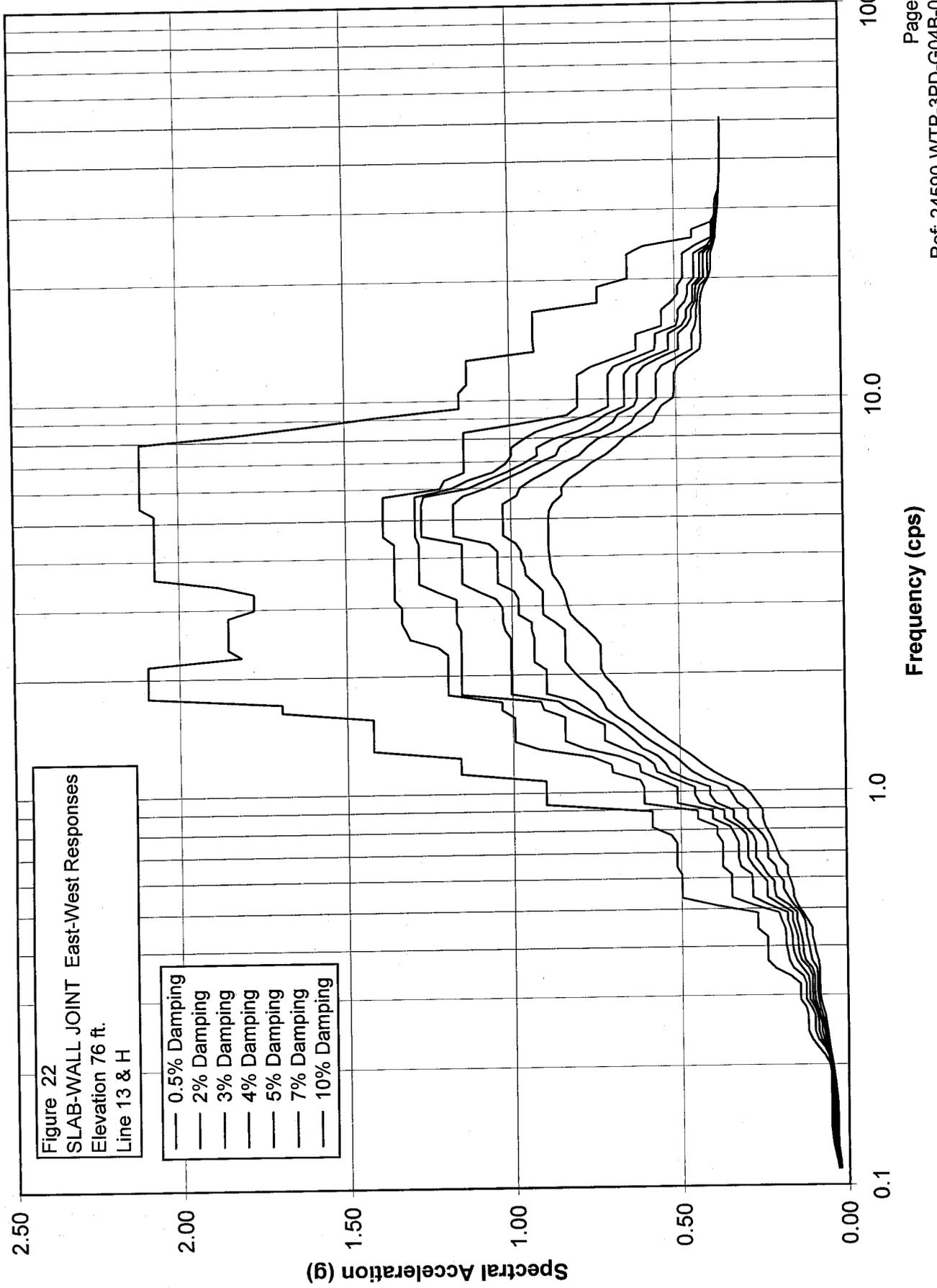
Forced Circulation Vacuum Evaporator System

2.3645	2.477	2.3645	1.7215	2.3645	1.537	2.3645	1.3876	2.3645	1.2649	2.3645	1.0763	2.3645	0.8914
2.4771	2.477	2.4771	1.7215	2.4771	1.537	2.4771	1.3876	2.4771	1.2649	2.4771	1.0763	2.4771	0.8914
2.595	2.6307	2.595	1.8387	2.595	1.537	2.595	1.3876	2.595	1.2649	2.595	1.0763	2.595	0.8914
2.7186	2.8968	2.7186	1.8387	2.7186	1.537	2.7186	1.3876	2.7186	1.2649	2.7186	1.0763	2.7186	0.8914
2.848	2.8968	2.848	1.8387	2.848	1.537	2.848	1.3876	2.848	1.2649	2.848	1.0763	2.848	0.8853
2.9836	2.8968	2.9836	1.8387	2.9836	1.5231	2.9836	1.3025	2.9836	1.168	2.9836	1.0465	2.9836	0.8885
3.1257	2.8968	3.1257	1.8387	3.1257	1.5231	3.1257	1.3025	3.1257	1.168	3.1257	1.0465	3.1257	0.8885
3.2745	2.8968	3.2745	1.7642	3.2745	1.4552	3.2745	1.2955	3.2745	1.168	3.2745	1.0465	3.2745	0.8885
3.4305	2.3461	3.4305	1.6586	3.4305	1.4384	3.4305	1.2328	3.4305	1.1139	3.4305	0.9924	3.4305	0.8885
3.5938	2.3461	3.5938	1.6586	3.5938	1.4384	3.5938	1.2328	3.5938	1.1139	3.5938	0.9924	3.5938	0.8885
3.7649	1.591	3.7649	1.433	3.7649	1.2678	3.7649	1.1522	3.7649	1.0829	3.7649	0.9868	3.7649	0.8786
3.9442	1.5852	3.9442	1.2849	3.9442	1.2385	3.9442	1.1157	3.9442	1.0195	3.9442	0.9338	3.9442	0.8426
4.132	1.5852	4.132	1.2768	4.132	1.2385	4.132	1.1157	4.132	1.0195	4.132	0.8782	4.132	0.7929
4.3288	1.5852	4.3288	1.2768	4.3288	1.2385	4.3288	1.1157	4.3288	1.0195	4.3288	0.8782	4.3288	0.7551
4.5349	1.5852	4.5349	1.2768	4.5349	1.2385	4.5349	1.1157	4.5349	1.0195	4.5349	0.8782	4.5349	0.7551
4.7508	1.9405	4.7508	1.2768	4.7508	1.2385	4.7508	1.1157	4.7508	1.0195	4.7508	0.8782	4.7508	0.7551
4.977	1.9405	4.977	1.2768	4.977	1.2385	4.977	1.1157	4.977	1.0195	4.977	0.8782	4.977	0.7551
5.214	1.9405	5.214	1.2768	5.214	1.2385	5.214	1.1157	5.214	1.0195	5.214	0.8782	5.214	0.7551
5.4623	1.9405	5.4623	1.2768	5.4623	1.2385	5.4623	1.1157	5.4623	1.0195	5.4623	0.8782	5.4623	0.7551
5.7224	2.5389	5.7224	1.2768	5.7224	1.2385	5.7224	1.1157	5.7224	1.0195	5.7224	0.8782	5.7224	0.7551
5.9948	2.5389	5.9948	1.2768	5.9948	1.2138	5.9948	1.0915	5.9948	0.996	5.9948	0.8782	5.9948	0.7551
6.2803	2.5389	6.2803	1.2768	6.2803	1.1292	6.2803	1.0403	6.2803	0.9828	6.2803	0.8782	6.2803	0.7551
6.5793	2.5389	6.5793	1.2768	6.5793	1.1292	6.5793	1.0403	6.5793	0.9828	6.5793	0.8776	6.5793	0.7522
6.8926	2.5389	6.8926	1.2849	6.8926	1.1292	6.8926	1.0107	6.8926	0.9301	6.8926	0.8273	6.8926	0.7234
7.2208	2.5389	7.2208	1.2849	7.2208	1.0813	7.2208	0.9849	7.2208	0.921	7.2208	0.8273	7.2208	0.7197
7.5646	2.5389	7.5646	1.2849	7.5646	1.0813	7.5646	0.9849	7.5646	0.921	7.5646	0.8273	7.5646	0.7197
7.9248	2.5389	7.9248	1.2849	7.9248	1.0493	7.9248	0.9738	7.9248	0.9177	7.9248	0.8273	7.9248	0.7197
8.3022	2.4675	8.3022	1.2849	8.3022	1.0493	8.3022	0.9738	8.3022	0.9155	8.3022	0.8218	8.3022	0.7139
8.6975	1.7908	8.6975	1.0886	8.6975	0.9904	8.6975	0.9211	8.6975	0.8663	8.6975	0.7793	8.6975	0.6822
9.1116	1.4709	9.1116	0.8803	9.1116	0.8371	9.1116	0.7977	9.1116	0.7631	9.1116	0.7042	9.1116	0.6346
9.5455	1.4709	9.5455	0.7911	9.5455	0.6864	9.5455	0.6531	9.5455	0.6365	9.5455	0.6025	9.5455	0.5596
10	0.9957	10	0.6919	10	0.6306	10	0.5911	10	0.5651	10	0.5327	10	0.5111
10.4762	0.9436	10.4762	0.6547	10.4762	0.5987	10.4762	0.5554	10.4762	0.5397	10.4762	0.5224	10.4762	0.4978
10.975	0.9436	10.975	0.6547	10.975	0.5987	10.975	0.5554	10.975	0.5278	10.975	0.5083	10.975	0.4838
11.4976	0.9436	11.4976	0.648	11.4976	0.5987	11.4976	0.5554	11.4976	0.521	11.4976	0.4831	11.4976	0.4638
12.045	0.9057	12.045	0.604	12.045	0.5683	12.045	0.5381	12.045	0.512	12.045	0.4776	12.045	0.4572
12.6186	0.9057	12.6186	0.6001	12.6186	0.5683	12.6186	0.5381	12.6186	0.512	12.6186	0.4712	12.6186	0.4476
13.2194	0.9057	13.2194	0.5198	13.2194	0.4936	13.2194	0.4797	13.2194	0.4652	13.2194	0.4501	13.2194	0.4338
13.8489	0.6748	13.8489	0.5007	13.8489	0.4691	13.8489	0.4573	13.8489	0.4459	13.8489	0.4326	13.8489	0.4193

Forced Circulation Vacuum Evaporator System

14.5083	0.6748	14.5083	0.4549	14.5083	0.4436	14.5083	0.4396	14.5083	0.4347	14.5083	0.4249	14.5083	0.4123
15.1991	0.6748	15.1991	0.4549	15.1991	0.437	15.1991	0.4313	15.1991	0.4262	15.1991	0.4173	15.1991	0.406
15.9228	0.6104	15.9228	0.4264	15.9228	0.4171	15.9228	0.4149	15.9228	0.4122	15.9228	0.4062	15.9228	0.3971
16.681	0.6104	16.681	0.4264	16.681	0.4097	16.681	0.4057	16.681	0.4023	16.681	0.396	16.681	0.3876
17.4753	0.6104	17.4753	0.4264	17.4753	0.4026	17.4753	0.3953	17.4753	0.3906	17.4753	0.3842	17.4753	0.377
18.3074	0.6104	18.3074	0.4264	18.3074	0.3978	18.3074	0.3813	18.3074	0.3724	18.3074	0.3699	18.3074	0.3654
19.1791	0.6104	19.1791	0.4264	19.1791	0.3978	19.1791	0.3813	19.1791	0.3698	19.1791	0.3582	19.1791	0.3553
20.0923	0.6104	20.0923	0.4264	20.0923	0.3978	20.0923	0.3813	20.0923	0.3698	20.0923	0.3543	20.0923	0.3474
21.049	0.5894	21.049	0.3822	21.049	0.3659	21.049	0.3554	21.049	0.3479	21.049	0.344	21.049	0.3401
22.0513	0.3986	22.0513	0.3623	22.0513	0.3529	22.0513	0.3502	22.0513	0.3477	22.0513	0.3435	22.0513	0.3394
23.1013	0.4085	23.1013	0.3623	23.1013	0.3529	23.1013	0.3502	23.1013	0.3477	23.1013	0.3435	23.1013	0.3394
24.2013	0.4085	24.2013	0.3623	24.2013	0.3529	24.2013	0.3502	24.2013	0.3477	24.2013	0.3435	24.2013	0.3394
25.3536	0.4085	25.3536	0.3623	25.3536	0.3529	25.3536	0.3502	25.3536	0.3477	25.3536	0.3435	25.3536	0.3394
26.5609	0.4085	26.5609	0.3623	26.5609	0.3529	26.5609	0.3473	26.5609	0.3437	26.5609	0.3395	26.5609	0.3363
27.8256	0.4085	27.8256	0.3543	27.8256	0.3475	27.8256	0.3434	27.8256	0.3402	27.8256	0.3355	27.8256	0.3318
29.1505	0.3651	29.1505	0.3403	29.1505	0.3378	29.1505	0.3359	29.1505	0.3344	29.1505	0.3324	29.1505	0.3305
30.5386	0.3346	30.5386	0.3341	30.5386	0.3313	30.5386	0.3293	30.5386	0.3278	30.5386	0.3273	30.5386	0.3278
31.9927	0.3323	31.9927	0.3288	31.9927	0.3276	31.9927	0.327	31.9927	0.3267	31.9927	0.3264	31.9927	0.3266
33.516	0.3276	33.516	0.327	33.516	0.3267	33.516	0.3264	33.516	0.3262	33.516	0.3262	33.516	0.3264
35.1119	0.3276	35.1119	0.327	35.1119	0.3267	35.1119	0.3264	35.1119	0.3262	35.1119	0.326	35.1119	0.3262
36.7838	0.3269	36.7838	0.3266	36.7838	0.3264	36.7838	0.3262	36.7838	0.3261	36.7838	0.326	36.7838	0.3261
38.5353	0.3261	38.5353	0.3259	38.5353	0.3259	38.5353	0.3259	38.5353	0.3259	38.5353	0.326	38.5353	0.3261
40.3702	0.3259	40.3702	0.3259	40.3702	0.3259	40.3702	0.3259	40.3702	0.3259	40.3702	0.3259	40.3702	0.326
42.2924	0.3258	42.2924	0.3258	42.2924	0.3258	42.2924	0.3258	42.2924	0.3258	42.2924	0.3258	42.2924	0.3258
44.3062	0.3257	44.3062	0.3257	44.3062	0.3257	44.3062	0.3257	44.3062	0.3257	44.3062	0.3257	44.3062	0.3257
46.4159	0.3255	46.4159	0.3255	46.4159	0.3255	46.4159	0.3255	46.4159	0.3255	46.4159	0.3256	46.4159	0.3256
48.626	0.3254	48.626	0.3254	48.626	0.3254	48.626	0.3254	48.626	0.3254	48.626	0.3254	48.626	0.3254
50.9414	0.3253	50.9414	0.3253	50.9414	0.3253	50.9414	0.3253	50.9414	0.3253	50.9414	0.3253	50.9414	0.3253

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTW022.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 22
 SLAB-WALL JOINT East-West Responses
 Elevation 76 ft.
 Line 13 & H

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0314	0.1098	0.0288	0.1098	0.0276	0.1098	0.0268	0.1098	0.0261	0.1098	0.0249	0.1098	0.0249	0.1098	0.0233
0.115	0.0359	0.115	0.0331	0.115	0.0315	0.115	0.0301	0.115	0.029	0.115	0.0275	0.115	0.0275	0.115	0.0255
0.1204	0.041	0.1204	0.0383	0.1204	0.0367	0.1204	0.0353	0.1204	0.034	0.1204	0.0317	0.1204	0.0317	0.1204	0.0288
0.1262	0.046	0.1262	0.0427	0.1262	0.0408	0.1262	0.0389	0.1262	0.0373	0.1262	0.0344	0.1262	0.0344	0.1262	0.0312
0.1322	0.0489	0.1322	0.0443	0.1322	0.0422	0.1322	0.0403	0.1322	0.0386	0.1322	0.0356	0.1322	0.0356	0.1322	0.0322
0.1385	0.0518	0.1385	0.0463	0.1385	0.0431	0.1385	0.0403	0.1385	0.0386	0.1385	0.0356	0.1385	0.0356	0.1385	0.0322
0.1451	0.0518	0.1451	0.0463	0.1451	0.0431	0.1451	0.0403	0.1451	0.0386	0.1451	0.0356	0.1451	0.0356	0.1451	0.0322
0.152	0.0518	0.152	0.0463	0.152	0.0431	0.152	0.0403	0.152	0.0386	0.152	0.0356	0.152	0.0356	0.152	0.0322
0.1592	0.0518	0.1592	0.0463	0.1592	0.0431	0.1592	0.0403	0.1592	0.0386	0.1592	0.0356	0.1592	0.0356	0.1592	0.0325
0.1668	0.0519	0.1668	0.0463	0.1668	0.0431	0.1668	0.0403	0.1668	0.0386	0.1668	0.0363	0.1668	0.0363	0.1668	0.0352
0.1748	0.0519	0.1748	0.0463	0.1748	0.0431	0.1748	0.041	0.1748	0.0404	0.1748	0.0395	0.1748	0.0395	0.1748	0.038
0.1831	0.0519	0.1831	0.0463	0.1831	0.0455	0.1831	0.0448	0.1831	0.0441	0.1831	0.0427	0.1831	0.0427	0.1831	0.0407
0.1918	0.0522	0.1918	0.0506	0.1918	0.0496	0.1918	0.0486	0.1918	0.0477	0.1918	0.0459	0.1918	0.0459	0.1918	0.0438
0.2009	0.057	0.2009	0.055	0.2009	0.0537	0.2009	0.0526	0.2009	0.0515	0.2009	0.0498	0.2009	0.0498	0.2009	0.0475
0.2105	0.0708	0.2105	0.0602	0.2105	0.0587	0.2105	0.0575	0.2105	0.0563	0.2105	0.0541	0.2105	0.0541	0.2105	0.0518
0.2205	0.091	0.2205	0.0715	0.2205	0.0644	0.2205	0.0626	0.2205	0.0612	0.2205	0.0587	0.2205	0.0587	0.2205	0.0559
0.231	0.108	0.231	0.0908	0.231	0.0815	0.231	0.0735	0.231	0.0673	0.231	0.0632	0.231	0.0632	0.231	0.0595
0.242	0.1196	0.242	0.0993	0.242	0.0885	0.242	0.0794	0.242	0.0716	0.242	0.0667	0.242	0.0667	0.242	0.0621
0.2535	0.1205	0.2535	0.0993	0.2535	0.0885	0.2535	0.0797	0.2535	0.0756	0.2535	0.0697	0.2535	0.0697	0.2535	0.066
0.2656	0.1205	0.2656	0.0993	0.2656	0.0924	0.2656	0.0881	0.2656	0.0842	0.2656	0.077	0.2656	0.077	0.2656	0.0688
0.2783	0.1256	0.2783	0.1098	0.2783	0.1009	0.2783	0.095	0.2783	0.0907	0.2783	0.0838	0.2783	0.0838	0.2783	0.0757
0.2915	0.1425	0.2915	0.1249	0.2915	0.1149	0.2915	0.1061	0.2915	0.0983	0.2915	0.089	0.2915	0.089	0.2915	0.0816
0.3054	0.1425	0.3054	0.1249	0.3054	0.1153	0.3054	0.107	0.3054	0.0996	0.3054	0.0912	0.3054	0.0912	0.3054	0.0845
0.3199	0.1425	0.3199	0.1249	0.3199	0.1153	0.3199	0.107	0.3199	0.0996	0.3199	0.0912	0.3199	0.0912	0.3199	0.0851
0.3352	0.1712	0.3352	0.1348	0.3352	0.1188	0.3352	0.107	0.3352	0.0996	0.3352	0.0912	0.3352	0.0912	0.3352	0.0851
0.3511	0.2175	0.3511	0.1632	0.3511	0.1371	0.3511	0.1171	0.3511	0.1079	0.3511	0.0934	0.3511	0.0934	0.3511	0.0851
0.3678	0.2402	0.3678	0.1758	0.3678	0.1534	0.3678	0.1398	0.3678	0.1279	0.3678	0.1082	0.3678	0.1082	0.3678	0.089

Forced Circulation Vacuum Evaporator System

0.3853	0.2402	0.3853	0.1803	0.3853	0.1621	0.3853	0.1467	0.3853	0.1334	0.3853	0.1124	0.3853	0.0955
0.4037	0.2402	0.4037	0.1855	0.4037	0.1653	0.4037	0.1485	0.4037	0.1346	0.4037	0.1168	0.4037	0.0997
0.4229	0.2402	0.4229	0.1855	0.4229	0.1653	0.4229	0.1499	0.4229	0.1384	0.4229	0.1221	0.4229	0.1054
0.4431	0.2699	0.4431	0.1872	0.4431	0.1713	0.4431	0.1572	0.4431	0.1447	0.4431	0.1246	0.4431	0.1054
0.4642	0.2699	0.4642	0.1967	0.4642	0.1794	0.4642	0.1641	0.4642	0.1506	0.4642	0.1282	0.4642	0.1183
0.4863	0.2699	0.4863	0.2052	0.4863	0.1799	0.4863	0.1641	0.4863	0.1506	0.4863	0.1404	0.4863	0.1344
0.5094	0.3941	0.5094	0.2808	0.5094	0.2341	0.5094	0.2008	0.5094	0.1761	0.5094	0.1605	0.5094	0.1494
0.5337	0.4989	0.5337	0.3475	0.5337	0.2838	0.5337	0.24	0.5337	0.2133	0.5337	0.1773	0.5337	0.1598
0.5591	0.4989	0.5591	0.3475	0.5591	0.2838	0.5591	0.24	0.5591	0.2179	0.5591	0.1902	0.5591	0.1613
0.5857	0.4989	0.5857	0.3475	0.5857	0.2838	0.5857	0.24	0.5857	0.2179	0.5857	0.1902	0.5857	0.1686
0.6136	0.4989	0.6136	0.3475	0.6136	0.2863	0.6136	0.2604	0.6136	0.2398	0.6136	0.2087	0.6136	0.1773
0.6428	0.5129	0.6428	0.374	0.6428	0.319	0.6428	0.2809	0.6428	0.2528	0.6428	0.2134	0.6428	0.1773
0.6734	0.5129	0.6734	0.374	0.6734	0.3258	0.6734	0.2968	0.6734	0.2731	0.6734	0.2367	0.6734	0.1989
0.7055	0.5129	0.7055	0.374	0.7055	0.3258	0.7055	0.2968	0.7055	0.2731	0.7055	0.2367	0.7055	0.2092
0.7391	0.5129	0.7391	0.374	0.7391	0.3258	0.7391	0.2968	0.7391	0.2731	0.7391	0.2399	0.7391	0.2183
0.7743	0.5295	0.7743	0.3898	0.7743	0.3375	0.7743	0.302	0.7743	0.283	0.7743	0.2537	0.7743	0.23
0.8111	0.5863	0.8111	0.3898	0.8111	0.3512	0.8111	0.3264	0.8111	0.3088	0.8111	0.2792	0.8111	0.2438
0.8497	0.5863	0.8497	0.4492	0.8497	0.4033	0.8497	0.368	0.8497	0.3397	0.8497	0.2962	0.8497	0.2508
0.8902	0.5863	0.8902	0.4492	0.8902	0.4033	0.8902	0.368	0.8902	0.3397	0.8902	0.2962	0.8902	0.2508
0.9326	0.9027	0.9326	0.6101	0.9326	0.5099	0.9326	0.4422	0.9326	0.3935	0.9326	0.3261	0.9326	0.27
0.977	0.9027	0.977	0.6101	0.977	0.5099	0.977	0.4569	0.977	0.4111	0.977	0.3426	0.977	0.2856
1.0235	0.9027	1.0235	0.6101	1.0235	0.5099	1.0235	0.4569	1.0235	0.4111	1.0235	0.3584	1.0235	0.3097
1.0723	0.9027	1.0723	0.6219	1.0723	0.5626	1.0723	0.5148	1.0723	0.4794	1.0723	0.4222	1.0723	0.3598
1.1233	1.1587	1.1233	0.7044	1.1233	0.6193	1.1233	0.5713	1.1233	0.5286	1.1233	0.4651	1.1233	0.4024
1.1768	1.1587	1.1768	0.7081	1.1768	0.6241	1.1768	0.5793	1.1768	0.5435	1.1768	0.4919	1.1768	0.4352
1.2328	1.1587	1.2328	0.7665	1.2328	0.6816	1.2328	0.6128	1.2328	0.5676	1.2328	0.5182	1.2328	0.4654
1.2916	1.4218	1.2916	0.9202	1.2916	0.7825	1.2916	0.6722	1.2916	0.6141	1.2916	0.5551	1.2916	0.4999
1.353	1.4218	1.353	0.9944	1.353	0.8443	1.353	0.7264	1.353	0.64	1.353	0.593	1.353	0.5336
1.4175	1.4218	1.4175	0.9944	1.4175	0.8443	1.4175	0.7264	1.4175	0.6676	1.4175	0.6233	1.4175	0.5643
1.485	1.4218	1.485	0.9944	1.485	0.8443	1.485	0.7264	1.485	0.6984	1.485	0.6542	1.485	0.5952
1.5557	1.4218	1.5557	0.9944	1.5557	0.8443	1.5557	0.774	1.5557	0.7438	1.5557	0.6919	1.5557	0.6252
1.6298	1.6945	1.6298	1.033	1.6298	0.9073	1.6298	0.8297	1.6298	0.7772	1.6298	0.7201	1.6298	0.651
1.7074	1.6945	1.7074	1.033	1.7074	0.9166	1.7074	0.8629	1.7074	0.8139	1.7074	0.7333	1.7074	0.6674
1.7887	2.0952	1.7887	1.1949	1.7887	1.1542	1.7887	1.0044	1.7887	0.8986	1.7887	0.7485	1.7887	0.6789
1.8738	2.0952	1.8738	1.1949	1.8738	1.1542	1.8738	1.0044	1.8738	0.8986	1.8738	0.7771	1.8738	0.7004
1.963	2.0952	1.963	1.1949	1.963	1.1542	1.963	1.0044	1.963	0.8986	1.963	0.8017	1.963	0.7222
2.0565	2.0952	2.0565	1.1949	2.0565	1.1542	2.0565	1.0044	2.0565	0.8986	2.0565	0.8235	2.0565	0.7363
2.1544	2.0952	2.1544	1.1949	2.1544	1.1542	2.1544	1.0044	2.1544	0.934	2.1544	0.8422	2.1544	0.7363
2.257	1.8139	2.257	1.1949	2.257	1.1542	2.257	1.0044	2.257	0.934	2.257	0.8422	2.257	0.7363

Forced Circulation Vacuum Evaporator System

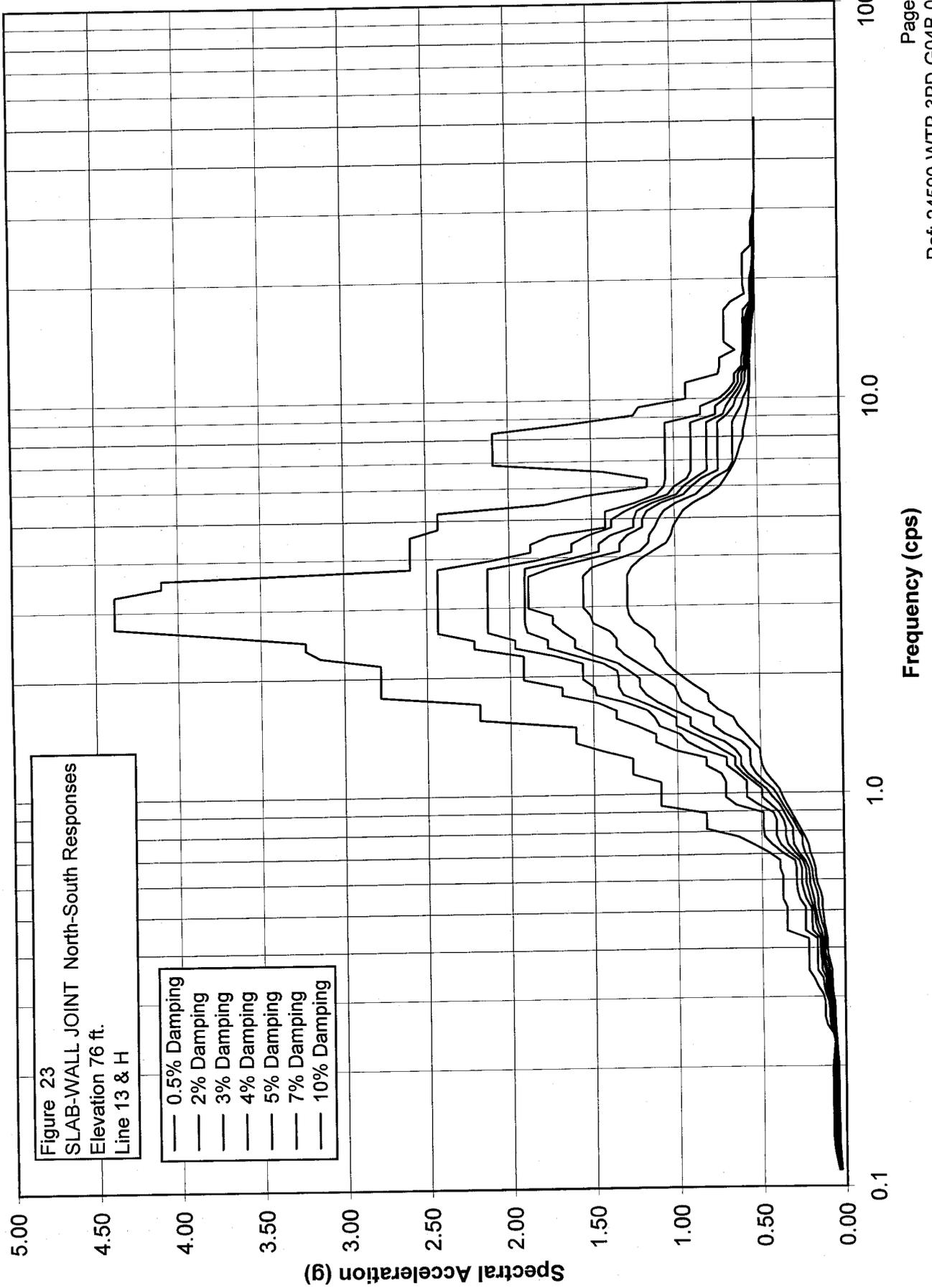
2.3645	1.8527	2.3645	1.2245	2.3645	1.1542	2.3645	1.0044	2.3645	0.934	2.3645	0.8422	2.3645	0.7363
2.4771	1.8527	2.4771	1.3088	2.4771	1.1542	2.4771	1.0044	2.4771	0.934	2.4771	0.8422	2.4771	0.7541
2.595	1.8527	2.595	1.3196	2.595	1.1542	2.595	1.0208	2.595	0.9412	2.595	0.8422	2.595	0.777
2.7186	1.8527	2.7186	1.3328	2.7186	1.1667	2.7186	1.0275	2.7186	0.9412	2.7186	0.8724	2.7186	0.804
2.848	1.8527	2.848	1.3328	2.848	1.1667	2.848	1.0275	2.848	0.9801	2.848	0.9067	2.848	0.8258
2.9836	1.7756	2.9836	1.3328	2.9836	1.1667	2.9836	1.0302	2.9836	0.9801	2.9836	0.9078	2.9836	0.8333
3.1257	1.7756	3.1257	1.3538	3.1257	1.1669	3.1257	1.0484	3.1257	0.9801	3.1257	0.9078	3.1257	0.8392
3.2745	1.7756	3.2745	1.3538	3.2745	1.2252	3.2745	1.1008	3.2745	0.9938	3.2745	0.9078	3.2745	0.8459
3.4305	1.8813	3.4305	1.3538	3.4305	1.2793	3.4305	1.1491	3.4305	1.042	3.4305	0.9326	3.4305	0.8603
3.5938	2.0738	3.5938	1.3538	3.5938	1.2793	3.5938	1.1491	3.5938	1.042	3.5938	0.9577	3.5938	0.8775
3.7649	2.0738	3.7649	1.3538	3.7649	1.2793	3.7649	1.1491	3.7649	1.042	3.7649	0.961	3.7649	0.8926
3.9442	2.0738	3.9442	1.3538	3.9442	1.2793	3.9442	1.1491	3.9442	1.042	3.9442	0.9712	3.9442	0.8951
4.132	2.0738	4.132	1.3538	4.132	1.2793	4.132	1.1491	4.132	1.042	4.132	0.9712	4.132	0.888
4.3288	2.0738	4.3288	1.3538	4.3288	1.2793	4.3288	1.1491	4.3288	1.0677	4.3288	0.9865	4.3288	0.888
4.5349	2.0738	4.5349	1.3866	4.5349	1.2904	4.5349	1.271	4.5349	1.1737	4.5349	1.0245	4.5349	0.888
4.7508	2.0738	4.7508	1.3866	4.7508	1.2904	4.7508	1.271	4.7508	1.1737	4.7508	1.0245	4.7508	0.888
4.977	2.0738	4.977	1.3866	4.977	1.2904	4.977	1.271	4.977	1.1737	4.977	1.0245	4.977	0.888
5.214	2.0738	5.214	1.3866	5.214	1.2904	5.214	1.271	5.214	1.1737	5.214	1.0245	5.214	0.886
5.4623	2.1167	5.4623	1.3866	5.4623	1.2904	5.4623	1.271	5.4623	1.1737	5.4623	1.0245	5.4623	0.8742
5.7224	2.1167	5.7224	1.3866	5.7224	1.2904	5.7224	1.2638	5.7224	1.1455	5.7224	0.9827	5.7224	0.8467
5.9948	2.1167	5.9948	1.2138	5.9948	1.1803	5.9948	1.1301	5.9948	1.0755	5.9948	0.9721	5.9948	0.8467
6.2803	2.1167	6.2803	1.2006	6.2803	1.129	6.2803	1.0716	6.2803	1.0216	6.2803	0.934	6.2803	0.8255
6.5793	2.1167	6.5793	1.406	6.5793	1.0631	6.5793	1.0107	6.5793	0.9678	6.5793	0.8882	6.5793	0.789
6.8926	2.1167	6.8926	1.406	6.8926	1.0156	6.8926	0.9617	6.8926	0.9178	6.8926	0.8452	6.8926	0.7575
7.2208	2.1167	7.2208	1.1406	7.2208	0.9969	7.2208	0.9201	7.2208	0.8636	7.2208	0.7922	7.2208	0.7147
7.5646	2.1167	7.5646	1.1406	7.5646	0.9969	7.5646	0.9201	7.5646	0.8512	7.5646	0.7678	7.5646	0.684
7.9248	2.1167	7.9248	1.1406	7.9248	0.9628	7.9248	0.8735	7.9248	0.8122	7.9248	0.7374	7.9248	0.658
8.3022	1.8243	8.3022	1.1406	8.3022	0.9203	8.3022	0.792	8.3022	0.7323	8.3022	0.673	8.3022	0.614
8.6975	1.6077	8.6975	0.9739	8.6975	0.8399	8.6975	0.7481	8.6975	0.6927	8.6975	0.6357	8.6975	0.5718
9.1116	1.4078	9.1116	0.8293	9.1116	0.7567	9.1116	0.7128	9.1116	0.6771	9.1116	0.6205	9.1116	0.5605
9.5455	1.1538	9.5455	0.7968	9.5455	0.7052	9.5455	0.6564	9.5455	0.6273	9.5455	0.5894	9.5455	0.5448
10	1.1538	10	0.7968	10	0.7052	10	0.6564	10	0.6172	10	0.5597	10	0.5092
10.4762	1.1538	10.4762	0.7968	10.4762	0.7052	10.4762	0.6564	10.4762	0.6172	10.4762	0.5597	10.4762	0.5057
10.975	1.1294	10.975	0.7968	10.975	0.7052	10.975	0.6564	10.975	0.6172	10.975	0.5597	10.975	0.5057
11.4976	1.1294	11.4976	0.7968	11.4976	0.7052	11.4976	0.6564	11.4976	0.6172	11.4976	0.5597	11.4976	0.5057
12.045	1.1294	12.045	0.7562	12.045	0.6873	12.045	0.6356	12.045	0.5968	12.045	0.5433	12.045	0.4939
12.6186	1.1294	12.6186	0.6859	12.6186	0.6241	12.6186	0.581	12.6186	0.5472	12.6186	0.4956	12.6186	0.4602
13.2194	0.9248	13.2194	0.6189	13.2194	0.5638	13.2194	0.5215	13.2194	0.4914	13.2194	0.4499	13.2194	0.4261
13.8489	0.9276	13.8489	0.6189	13.8489	0.5601	13.8489	0.5215	13.8489	0.4914	13.8489	0.4499	13.8489	0.4222

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 Cesium Nitric Acid Recovery
 Forced Circulation Vacuum Evaporator System

14.5083	0.9276	14.5083	0.6189	14.5083	0.5601	14.5083	0.5215	14.5083	0.4914	14.5083	0.4499	14.5083	0.4225
15.1991	0.9276	15.1991	0.541	15.1991	0.4978	15.1991	0.4797	15.1991	0.4639	15.1991	0.439	15.1991	0.4225
15.9228	0.9276	15.9228	0.541	15.9228	0.4904	15.9228	0.4655	15.9228	0.451	15.9228	0.4348	15.9228	0.4225
16.681	0.9276	16.681	0.541	16.681	0.4904	16.681	0.4655	16.681	0.451	16.681	0.4348	16.681	0.4225
17.4753	0.7343	17.4753	0.5111	17.4753	0.4688	17.4753	0.4453	17.4753	0.4373	17.4753	0.4308	17.4753	0.4225
18.3074	0.7343	18.3074	0.4909	18.3074	0.4614	18.3074	0.4453	18.3074	0.4373	18.3074	0.429	18.3074	0.4191
19.1791	0.7343	19.1791	0.4909	19.1791	0.4614	19.1791	0.4453	19.1791	0.435	19.1791	0.4221	19.1791	0.4109
20.0923	0.6437	20.0923	0.4752	20.0923	0.4408	20.0923	0.4225	20.0923	0.4112	20.0923	0.3984	20.0923	0.3959
21.049	0.6437	21.049	0.4752	21.049	0.4408	21.049	0.4225	21.049	0.4112	21.049	0.3984	21.049	0.3893
22.0513	0.6437	22.0513	0.4752	22.0513	0.4408	22.0513	0.4225	22.0513	0.4112	22.0513	0.3984	22.0513	0.3893
23.1013	0.6437	23.1013	0.4752	23.1013	0.4408	23.1013	0.4225	23.1013	0.4112	23.1013	0.3984	23.1013	0.3888
24.2013	0.5958	24.2013	0.4369	24.2013	0.3982	24.2013	0.3879	24.2013	0.3865	24.2013	0.3843	24.2013	0.3808
25.3536	0.4468	25.3536	0.3862	25.3536	0.3825	25.3536	0.3791	25.3536	0.3767	25.3536	0.3759	25.3536	0.3746
26.5609	0.4468	26.5609	0.3862	26.5609	0.3825	26.5609	0.3791	26.5609	0.3767	26.5609	0.3744	26.5609	0.3731
27.8256	0.3825	27.8256	0.3862	27.8256	0.3825	27.8256	0.3791	27.8256	0.3767	27.8256	0.3736	27.8256	0.3713
29.1505	0.3749	29.1505	0.3704	29.1505	0.3687	29.1505	0.3677	29.1505	0.3683	29.1505	0.3686	29.1505	0.368
30.5386	0.3749	30.5386	0.3684	30.5386	0.3677	30.5386	0.367	30.5386	0.3665	30.5386	0.3656	30.5386	0.3654
31.9927	0.3721	31.9927	0.3677	31.9927	0.3665	31.9927	0.3659	31.9927	0.3654	31.9927	0.3647	31.9927	0.364
33.516	0.3635	33.516	0.3637	33.516	0.3636	33.516	0.3635	33.516	0.3634	33.516	0.3631	33.516	0.3628
35.1119	0.3609	35.1119	0.3612	35.1119	0.3613	35.1119	0.3614	35.1119	0.3615	35.1119	0.3616	35.1119	0.3616
36.7838	0.3599	36.7838	0.3601	36.7838	0.3602	36.7838	0.3602	36.7838	0.3603	36.7838	0.3604	36.7838	0.3605
38.5353	0.3593	38.5353	0.3593	38.5353	0.3594	38.5353	0.3595	38.5353	0.3595	38.5353	0.3596	38.5353	0.3597
40.3702	0.3587	40.3702	0.3587	40.3702	0.3588	40.3702	0.3588	40.3702	0.3589	40.3702	0.3589	40.3702	0.359
42.2924	0.3582	42.2924	0.3582	42.2924	0.3583	42.2924	0.3583	42.2924	0.3583	42.2924	0.3584	42.2924	0.3584
44.3062	0.3578	44.3062	0.3578	44.3062	0.3578	44.3062	0.3578	44.3062	0.3578	44.3062	0.3579	44.3062	0.3579
46.4159	0.3574	46.4159	0.3574	46.4159	0.3574	46.4159	0.3574	46.4159	0.3574	46.4159	0.3575	46.4159	0.3575
48.626	0.357	48.626	0.357	48.626	0.357	48.626	0.357	48.626	0.357	48.626	0.3571	48.626	0.3571
50.9414	0.3567	50.9414	0.3567	50.9414	0.3567	50.9414	0.3567	50.9414	0.3567	50.9414	0.3567	50.9414	0.3567

RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTWW023.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 23
 SLAB-WALL JOINT North-South Responses
 Elevation 76 ft.
 Line 13 & H

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0457	0.1098	0.0394	0.1098	0.0366	0.1098	0.0346	0.1098	0.0333	0.1098	0.0314	0.1098	0.0314	0.1098	0.029
0.115	0.0556	0.115	0.0495	0.115	0.0468	0.115	0.0445	0.115	0.0424	0.115	0.0387	0.115	0.0387	0.115	0.0341
0.1204	0.065	0.1204	0.0585	0.1204	0.0548	0.1204	0.0514	0.1204	0.0484	0.1204	0.0431	0.1204	0.0431	0.1204	0.0368
0.1262	0.072	0.1262	0.0619	0.1262	0.0573	0.1262	0.0534	0.1262	0.0499	0.1262	0.044	0.1262	0.044	0.1262	0.0387
0.1322	0.0763	0.1322	0.0654	0.1322	0.0606	0.1322	0.0566	0.1322	0.0532	0.1322	0.0474	0.1322	0.0474	0.1322	0.0408
0.1385	0.0787	0.1385	0.0673	0.1385	0.0609	0.1385	0.0566	0.1385	0.0532	0.1385	0.0474	0.1385	0.0474	0.1385	0.0408
0.1451	0.0789	0.1451	0.0675	0.1451	0.0611	0.1451	0.0566	0.1451	0.0532	0.1451	0.0474	0.1451	0.0474	0.1451	0.0414
0.152	0.0789	0.152	0.0675	0.152	0.0611	0.152	0.0569	0.152	0.054	0.152	0.049	0.152	0.049	0.152	0.0438
0.1592	0.0789	0.1592	0.0675	0.1592	0.0611	0.1592	0.0569	0.1592	0.054	0.1592	0.0495	0.1592	0.0495	0.1592	0.0446
0.1668	0.0792	0.1668	0.0677	0.1668	0.0613	0.1668	0.0569	0.1668	0.054	0.1668	0.0495	0.1668	0.0495	0.1668	0.0446
0.1748	0.0794	0.1748	0.068	0.1748	0.0616	0.1748	0.0569	0.1748	0.054	0.1748	0.0495	0.1748	0.0495	0.1748	0.0446
0.1831	0.0794	0.1831	0.068	0.1831	0.0616	0.1831	0.0569	0.1831	0.054	0.1831	0.0495	0.1831	0.0495	0.1831	0.0446
0.1918	0.0794	0.1918	0.068	0.1918	0.0616	0.1918	0.0568	0.1918	0.0539	0.1918	0.0495	0.1918	0.0495	0.1918	0.0446
0.2009	0.0794	0.2009	0.068	0.2009	0.0616	0.2009	0.0568	0.2009	0.0537	0.2009	0.0487	0.2009	0.0487	0.2009	0.0448
0.2105	0.0744	0.2105	0.0638	0.2105	0.0601	0.2105	0.0568	0.2105	0.0537	0.2105	0.0501	0.2105	0.0501	0.2105	0.0489
0.2205	0.0694	0.2205	0.0633	0.2205	0.0597	0.2205	0.0567	0.2205	0.0557	0.2205	0.0543	0.2205	0.0543	0.2205	0.0527
0.231	0.0656	0.231	0.0633	0.231	0.062	0.231	0.0608	0.231	0.0598	0.231	0.0581	0.231	0.0581	0.231	0.0561
0.242	0.0768	0.242	0.0695	0.242	0.0657	0.242	0.0645	0.242	0.0633	0.242	0.0614	0.242	0.0614	0.242	0.059
0.2535	0.1108	0.2535	0.0924	0.2535	0.0831	0.2535	0.0756	0.2535	0.0696	0.2535	0.064	0.2535	0.064	0.2535	0.0613
0.2656	0.1224	0.2656	0.0958	0.2656	0.0833	0.2656	0.0756	0.2656	0.0696	0.2656	0.066	0.2656	0.066	0.2656	0.0628
0.2783	0.1224	0.2783	0.0958	0.2783	0.0843	0.2783	0.0796	0.2783	0.0755	0.2783	0.0686	0.2783	0.0686	0.2783	0.0634
0.2915	0.1224	0.2915	0.1016	0.2915	0.0946	0.2915	0.0884	0.2915	0.0829	0.2915	0.0737	0.2915	0.0737	0.2915	0.0659
0.3054	0.1376	0.3054	0.1198	0.3054	0.1099	0.3054	0.1013	0.3054	0.0938	0.3054	0.0818	0.3054	0.0818	0.3054	0.0736
0.3199	0.1656	0.3199	0.1295	0.3199	0.118	0.3199	0.1082	0.3199	0.0997	0.3199	0.0864	0.3199	0.0864	0.3199	0.0786
0.3352	0.1885	0.3352	0.1345	0.3352	0.118	0.3352	0.1082	0.3352	0.0997	0.3352	0.0888	0.3352	0.0888	0.3352	0.0799
0.3511	0.2195	0.3511	0.1658	0.3511	0.1404	0.3511	0.121	0.3511	0.1094	0.3511	0.0947	0.3511	0.0947	0.3511	0.0799
0.3678	0.2195	0.3678	0.1658	0.3678	0.1411	0.3678	0.1297	0.3678	0.1197	0.3678	0.1054	0.3678	0.1054	0.3678	0.0927

Forced Circulation Vacuum Evaporator System

0.3853	0.2195	0.3853	0.1658	0.3853	0.1482	0.3853	0.1392	0.3853	0.1313	0.3853	0.1182	0.3853	0.1037
0.4037	0.2195	0.4037	0.1658	0.4037	0.1497	0.4037	0.141	0.4037	0.1333	0.4037	0.1207	0.4037	0.1067
0.4229	0.2197	0.4229	0.1658	0.4229	0.1497	0.4229	0.141	0.4229	0.1333	0.4229	0.1207	0.4229	0.1067
0.4431	0.3492	0.4431	0.237	0.4431	0.1936	0.4431	0.1625	0.4431	0.1433	0.4431	0.123	0.4431	0.1141
0.4642	0.3492	0.4642	0.237	0.4642	0.1965	0.4642	0.1766	0.4642	0.1607	0.4642	0.14	0.4642	0.1239
0.4863	0.3492	0.4863	0.237	0.4863	0.1965	0.4863	0.1797	0.4863	0.1687	0.4863	0.1514	0.4863	0.1297
0.5094	0.3492	0.5094	0.237	0.5094	0.2038	0.5094	0.1919	0.5094	0.1804	0.5094	0.1599	0.5094	0.1356
0.5337	0.3728	0.5337	0.2709	0.5337	0.2336	0.5337	0.2071	0.5337	0.1861	0.5337	0.1599	0.5337	0.1356
0.5591	0.3728	0.5591	0.2844	0.5591	0.2472	0.5591	0.2178	0.5591	0.1969	0.5591	0.1672	0.5591	0.1469
0.5857	0.3728	0.5857	0.291	0.5857	0.2581	0.5857	0.2314	0.5857	0.2095	0.5857	0.1839	0.5857	0.1647
0.6136	0.3728	0.6136	0.291	0.6136	0.2581	0.6136	0.2314	0.6136	0.211	0.6136	0.1935	0.6136	0.1734
0.6428	0.3892	0.6428	0.291	0.6428	0.2581	0.6428	0.2341	0.6428	0.2164	0.6428	0.1968	0.6428	0.176
0.6734	0.3892	0.6734	0.3002	0.6734	0.2736	0.6734	0.253	0.6734	0.2391	0.6734	0.2144	0.6734	0.189
0.7055	0.4568	0.7055	0.3773	0.7055	0.3354	0.7055	0.3005	0.7055	0.2769	0.7055	0.2399	0.7055	0.2062
0.7391	0.5468	0.7391	0.437	0.7391	0.3838	0.7391	0.3407	0.7391	0.3056	0.7391	0.2529	0.7391	0.2172
0.7743	0.6403	0.7743	0.4827	0.7743	0.4094	0.7743	0.3537	0.7743	0.3106	0.7743	0.254	0.7743	0.239
0.8111	0.831	0.8111	0.4886	0.8111	0.4094	0.8111	0.3537	0.8111	0.3106	0.8111	0.2831	0.8111	0.2657
0.8497	0.831	0.8497	0.4886	0.8497	0.4094	0.8497	0.3657	0.8497	0.3378	0.8497	0.3109	0.8497	0.2933
0.8902	0.831	0.8902	0.4886	0.8902	0.4288	0.8902	0.3942	0.8902	0.3631	0.8902	0.3404	0.8902	0.3207
0.9326	1.1005	0.9326	0.6506	0.9326	0.519	0.9326	0.4449	0.9326	0.3898	0.9326	0.3703	0.9326	0.3469
0.977	1.1005	0.977	0.7147	0.977	0.5864	0.977	0.4962	0.977	0.4337	0.977	0.3972	0.977	0.3706
1.0235	1.1005	1.0235	0.7147	1.0235	0.5864	1.0235	0.4962	1.0235	0.4691	1.0235	0.4309	1.0235	0.3909
1.0723	1.1005	1.0723	0.7147	1.0723	0.5864	1.0723	0.5524	1.0723	0.5282	1.0723	0.4852	1.0723	0.4308
1.1233	1.2677	1.1233	0.7412	1.1233	0.6432	1.1233	0.6123	1.1233	0.5832	1.1233	0.5321	1.1233	0.4696
1.1768	1.2677	1.1768	0.8293	1.1768	0.7065	1.1768	0.6555	1.1768	0.62	1.1768	0.5613	1.1768	0.4934
1.2328	1.2677	1.2328	0.8293	1.2328	0.7065	1.2328	0.6555	1.2328	0.62	1.2328	0.5639	1.2328	0.5024
1.2916	1.4479	1.2916	1.0168	1.2916	0.8501	1.2916	0.7366	1.2916	0.6556	1.2916	0.5639	1.2916	0.5055
1.353	1.6058	1.353	1.1275	1.353	0.9398	1.353	0.8103	1.353	0.7197	1.353	0.6176	1.353	0.5488
1.4175	1.6058	1.4175	1.1275	1.4175	0.9845	1.4175	0.9078	1.4175	0.8382	1.4175	0.7198	1.4175	0.5908
1.485	1.6058	1.485	1.2335	1.485	1.1052	1.485	1.0054	1.485	0.9202	1.485	0.7812	1.485	0.6369
1.5557	2.1846	1.5557	1.3621	1.5557	1.1315	1.5557	1.0054	1.5557	0.9202	1.5557	0.7812	1.5557	0.6625
1.6298	2.1846	1.6298	1.3621	1.6298	1.1769	1.6298	1.0959	1.6298	1.0225	1.6298	0.8962	1.6298	0.7518
1.7074	2.1846	1.7074	1.4719	1.7074	1.3054	1.7074	1.2055	1.7074	1.1171	1.7074	0.9707	1.7074	0.8071
1.7887	2.7802	1.7887	1.6856	1.7887	1.4812	1.7887	1.3211	1.7887	1.1842	1.7887	0.9918	1.7887	0.8152
1.8738	2.7802	1.8738	1.6856	1.8738	1.4926	1.8738	1.3481	1.8738	1.2212	1.8738	1.0136	1.8738	0.8884
1.963	2.7802	1.963	1.9172	1.963	1.5603	1.963	1.3481	1.963	1.2212	1.963	1.0811	1.963	0.9548
2.0565	2.7802	2.0565	1.9172	2.0565	1.5603	2.0565	1.3571	2.0565	1.2869	2.0565	1.1624	2.0565	1.0171
2.1544	2.7802	2.1544	1.9172	2.1544	1.5603	2.1544	1.4424	2.1544	1.3536	2.1544	1.2355	2.1544	1.0641
2.257	3.1449	2.257	1.9172	2.257	1.7334	2.257	1.6089	2.257	1.4947	2.257	1.309	2.257	1.0916

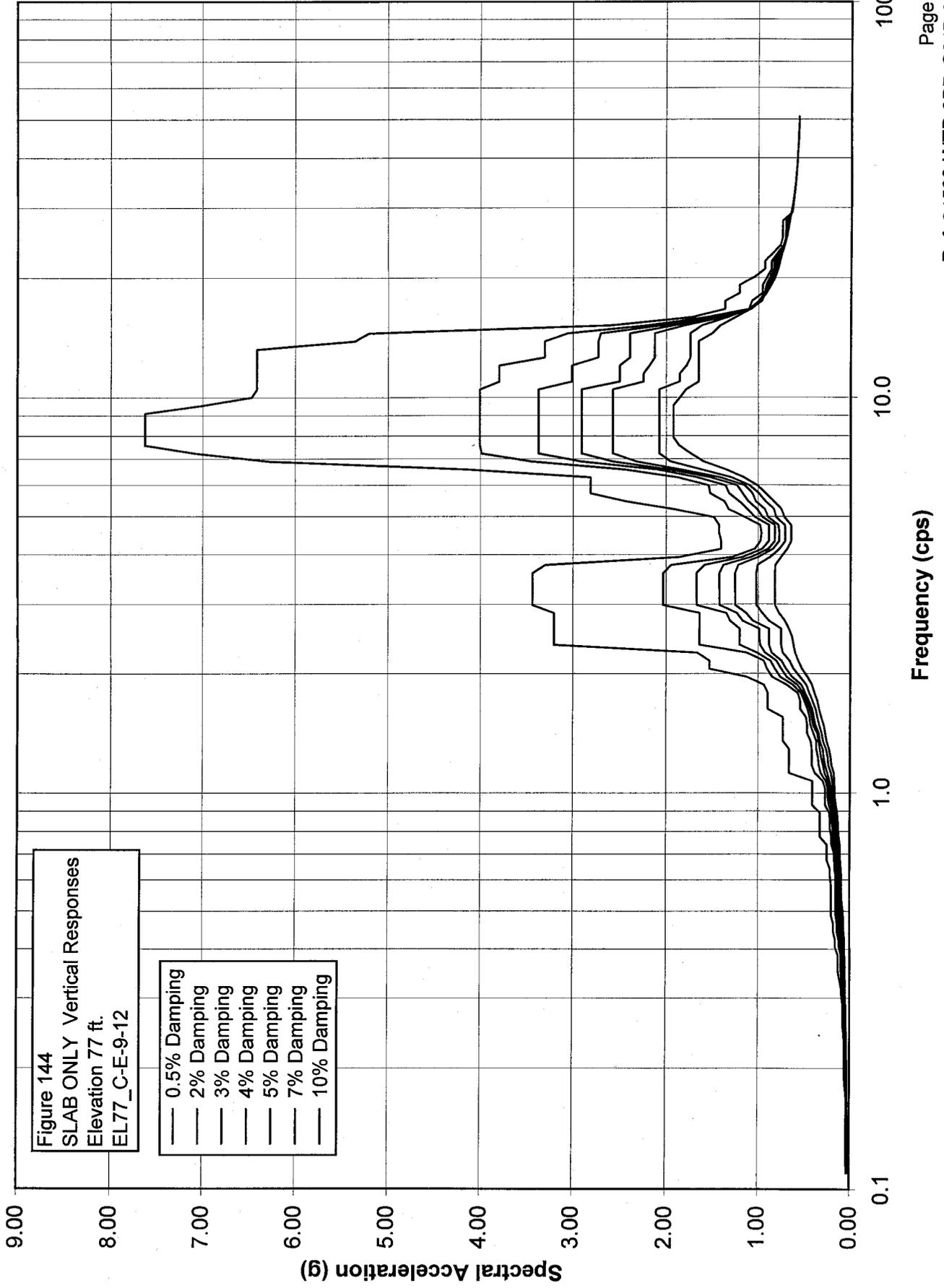
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2.3645	3.2327	2.3645	2.2136	2.3645	1.968	2.3645	1.7697	2.3645	1.6071	2.3645	1.3579	2.3645	1.1296
2.4771	3.2327	2.4771	2.2136	2.4771	1.968	2.4771	1.7697	2.4771	1.6071	2.4771	1.3579	2.4771	1.1301
2.595	3.7738	2.595	2.4327	2.595	2.131	2.595	1.8936	2.595	1.6778	2.595	1.3976	2.595	1.1754
2.7186	4.3838	2.7186	2.4327	2.7186	2.131	2.7186	1.9075	2.7186	1.7384	2.7186	1.4956	2.7186	1.2512
2.848	4.3838	2.848	2.4327	2.848	2.131	2.848	1.9075	2.848	1.7384	2.848	1.5139	2.848	1.2815
2.9836	4.3838	2.9836	2.4327	2.9836	2.131	2.9836	1.9075	2.9836	1.8855	2.9836	1.5536	2.9836	1.2917
3.1257	4.3838	3.1257	2.4327	3.1257	2.131	3.1257	1.9075	3.1257	1.8855	3.1257	1.5536	3.1257	1.2917
3.2745	4.3838	3.2745	2.4327	3.2745	2.131	3.2745	1.9075	3.2745	1.8855	3.2745	1.5536	3.2745	1.2917
3.4305	4.1005	3.4305	2.4327	3.4305	2.131	3.4305	1.9075	3.4305	1.8855	3.4305	1.5536	3.4305	1.2917
3.5938	4.1005	3.5938	2.4327	3.5938	2.131	3.5938	1.9075	3.5938	1.8855	3.5938	1.5536	3.5938	1.2917
3.7649	2.5959	3.7649	2.4327	3.7649	2.131	3.7649	1.9042	3.7649	1.7489	3.7649	1.5021	3.7649	1.265
3.9442	2.5959	3.9442	2.121	3.9442	1.8355	3.9442	1.6598	3.9442	1.5405	3.9442	1.3563	3.9442	1.2103
4.132	2.5959	4.132	1.8694	4.132	1.6226	4.132	1.4573	4.132	1.3351	4.132	1.2096	4.132	1.1326
4.3288	2.5959	4.3288	1.8694	4.3288	1.6226	4.3288	1.4573	4.3288	1.3351	4.3288	1.162	4.3288	1.0536
4.5349	2.5959	4.5349	1.7534	4.5349	1.5274	4.5349	1.3901	4.5349	1.2878	4.5349	1.1559	4.5349	1.0242
4.7508	2.4293	4.7508	1.4177	4.7508	1.3814	4.7508	1.25	4.7508	1.1959	4.7508	1.1203	4.7508	1.0119
4.977	2.4293	4.977	1.4177	4.977	1.3814	4.977	1.25	4.977	1.1959	4.977	1.1002	4.977	0.9832
5.214	2.4293	5.214	1.4177	5.214	1.3011	5.214	1.2293	5.214	1.1678	5.214	1.0665	5.214	0.9502
5.4623	1.7778	5.4623	1.2464	5.4623	1.1957	5.4623	1.1382	5.4623	1.084	5.4623	0.9911	5.4623	0.8858
5.7224	1.5321	5.7224	1.1155	5.7224	1.0411	5.7224	0.9896	5.7224	0.9448	5.7224	0.8715	5.7224	0.7893
5.9948	1.1665	5.9948	1.0654	5.9948	1.0023	5.9948	0.947	5.9948	0.8992	5.9948	0.8196	5.9948	0.7273
6.2803	1.1638	6.2803	1.053	6.2803	0.9234	6.2803	0.8781	6.2803	0.8351	6.2803	0.7608	6.2803	0.6935
6.5793	1.4341	6.5793	1.053	6.5793	0.8984	6.5793	0.803	6.5793	0.7364	6.5793	0.6753	6.5793	0.6608
6.8926	2.0926	6.8926	1.053	6.8926	0.8984	6.8926	0.803	6.8926	0.7364	6.8926	0.6474	6.8926	0.6342
7.2208	2.0926	7.2208	1.053	7.2208	0.8984	7.2208	0.803	7.2208	0.7364	7.2208	0.6474	7.2208	0.6171
7.5646	2.0926	7.5646	1.053	7.5646	0.8984	7.5646	0.803	7.5646	0.7364	7.5646	0.6474	7.5646	0.603
7.9248	2.0926	7.9248	1.053	7.9248	0.8984	7.9248	0.803	7.9248	0.7364	7.9248	0.6474	7.9248	0.583
8.3022	2.0926	8.3022	1.053	8.3022	0.8984	8.3022	0.803	8.3022	0.7364	8.3022	0.6474	8.3022	0.5819
8.6975	1.6311	8.6975	1.053	8.6975	0.8984	8.6975	0.803	8.6975	0.7364	8.6975	0.6474	8.6975	0.5706
9.1116	1.246	9.1116	0.8385	9.1116	0.7483	9.1116	0.7033	9.1116	0.6765	9.1116	0.6224	9.1116	0.5604
9.5455	1.2115	9.5455	0.8385	9.5455	0.7483	9.5455	0.684	9.5455	0.6367	9.5455	0.5931	9.5455	0.5492
10	0.9271	10	0.7233	10	0.685	10	0.6511	10	0.6232	10	0.5792	10	0.5466
10.4762	0.9271	10.4762	0.6652	10.4762	0.6378	10.4762	0.6134	10.4762	0.5916	10.4762	0.5543	10.4762	0.5416
10.975	0.9271	10.975	0.6299	10.975	0.6085	10.975	0.5856	10.975	0.5694	10.975	0.5453	10.975	0.5376
11.4976	0.7303	11.4976	0.6299	11.4976	0.6085	11.4976	0.5856	11.4976	0.5658	11.4976	0.5453	11.4976	0.5376
12.045	0.7196	12.045	0.5849	12.045	0.5706	12.045	0.561	12.045	0.5542	12.045	0.5453	12.045	0.5376
12.6186	0.7196	12.6186	0.5849	12.6186	0.5706	12.6186	0.561	12.6186	0.5542	12.6186	0.5453	12.6186	0.5376
13.2194	0.6254	13.2194	0.574	13.2194	0.5614	13.2194	0.5505	13.2194	0.5472	13.2194	0.5416	13.2194	0.5356
13.8489	0.6913	13.8489	0.574	13.8489	0.5614	13.8489	0.5504	13.8489	0.5417	13.8489	0.535	13.8489	0.5308

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14.5083	0.6913	14.5083	0.574	14.5083	0.5614	14.5083	0.5504	14.5083	0.5417	14.5083	0.5301	14.5083	0.5264
15.1991	0.6913	15.1991	0.574	15.1991	0.5614	15.1991	0.5504	15.1991	0.5417	15.1991	0.5301	15.1991	0.5234
15.9228	0.6913	15.9228	0.574	15.9228	0.5614	15.9228	0.5504	15.9228	0.5417	15.9228	0.5292	15.9228	0.5181
16.681	0.6913	16.681	0.5725	16.681	0.5477	16.681	0.5365	16.681	0.5284	16.681	0.518	16.681	0.5095
17.4753	0.6486	17.4753	0.5314	17.4753	0.5237	17.4753	0.518	17.4753	0.5141	17.4753	0.5087	17.4753	0.5051
18.3074	0.5639	18.3074	0.5314	18.3074	0.5237	18.3074	0.518	18.3074	0.5141	18.3074	0.5087	18.3074	0.5057
19.1791	0.5736	19.1791	0.5314	19.1791	0.5237	19.1791	0.518	19.1791	0.5141	19.1791	0.5087	19.1791	0.5057
20.0923	0.5736	20.0923	0.5314	20.0923	0.5237	20.0923	0.518	20.0923	0.5141	20.0923	0.5087	20.0923	0.5057
21.049	0.5736	21.049	0.5192	21.049	0.515	21.049	0.5122	21.049	0.5106	21.049	0.5081	21.049	0.5057
22.0513	0.5736	22.0513	0.5155	22.0513	0.5137	22.0513	0.5122	22.0513	0.5106	22.0513	0.5081	22.0513	0.5057
23.1013	0.5736	23.1013	0.5131	23.1013	0.5105	23.1013	0.5085	23.1013	0.507	23.1013	0.5056	23.1013	0.5045
24.2013	0.5233	24.2013	0.5131	24.2013	0.5105	24.2013	0.5085	24.2013	0.507	24.2013	0.505	24.2013	0.5034
25.3536	0.5233	25.3536	0.5131	25.3536	0.5105	25.3536	0.5085	25.3536	0.507	25.3536	0.505	25.3536	0.5034
26.5609	0.5233	26.5609	0.5131	26.5609	0.5105	26.5609	0.5085	26.5609	0.507	26.5609	0.505	26.5609	0.5034
27.8256	0.5233	27.8256	0.5131	27.8256	0.5105	27.8256	0.5085	27.8256	0.507	27.8256	0.505	27.8256	0.5031
29.1505	0.5079	29.1505	0.5031	29.1505	0.5033	29.1505	0.5033	29.1505	0.5031	29.1505	0.5026	29.1505	0.5017
30.5386	0.5079	30.5386	0.5022	30.5386	0.5014	30.5386	0.501	30.5386	0.5008	30.5386	0.5005	30.5386	0.5001
31.9927	0.5079	31.9927	0.5022	31.9927	0.5005	31.9927	0.4997	31.9927	0.4994	31.9927	0.4991	31.9927	0.4988
33.516	0.4972	33.516	0.4972	33.516	0.4974	33.516	0.4975	33.516	0.4976	33.516	0.4976	33.516	0.4975
35.1119	0.4965	35.1119	0.4965	35.1119	0.4965	35.1119	0.4965	35.1119	0.4965	35.1119	0.4965	35.1119	0.4965
36.7838	0.4957	36.7838	0.4957	36.7838	0.4957	36.7838	0.4957	36.7838	0.4957	36.7838	0.4958	36.7838	0.4958
38.5353	0.495	38.5353	0.495	38.5353	0.495	38.5353	0.4951	38.5353	0.4951	38.5353	0.4951	38.5353	0.4951
40.3702	0.4944	40.3702	0.4944	40.3702	0.4945	40.3702	0.4945	40.3702	0.4945	40.3702	0.4945	40.3702	0.4945
42.2924	0.4939	42.2924	0.4939	42.2924	0.4939	42.2924	0.4939	42.2924	0.4939	42.2924	0.494	42.2924	0.494
44.3062	0.4934	44.3062	0.4935	44.3062	0.4935	44.3062	0.4935	44.3062	0.4935	44.3062	0.4935	44.3062	0.4935
46.4159	0.493	46.4159	0.4931	46.4159	0.4931	46.4159	0.4931	46.4159	0.4931	46.4159	0.4931	46.4159	0.4931
48.626	0.4927	48.626	0.4927	48.626	0.4927	48.626	0.4927	48.626	0.4927	48.626	0.4927	48.626	0.4927
50.9414	0.4923	50.9414	0.4923	50.9414	0.4923	50.9414	0.4923	50.9414	0.4923	50.9414	0.4923	50.9414	0.4923

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTW144.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 144
 SLAB ONLY Vertical Responses
 Elevation 77 ft.
 EL77_C-E-9-12

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.033	0.1098	0.0296	0.1098	0.0277	0.1098	0.0267	0.1098	0.0257	0.1098	0.0241	0.1098	0.0222	0.1098	0.0222
0.115	0.0348	0.115	0.0312	0.115	0.0291	0.115	0.0272	0.115	0.026	0.115	0.0243	0.115	0.0225	0.115	0.0225
0.1204	0.0349	0.1204	0.0313	0.1204	0.0292	0.1204	0.0274	0.1204	0.026	0.1204	0.0243	0.1204	0.0225	0.1204	0.0225
0.1262	0.0349	0.1262	0.0313	0.1262	0.0292	0.1262	0.0274	0.1262	0.026	0.1262	0.0243	0.1262	0.0225	0.1262	0.0225
0.1322	0.0349	0.1322	0.0313	0.1322	0.0292	0.1322	0.0274	0.1322	0.026	0.1322	0.0243	0.1322	0.0225	0.1322	0.0225
0.1385	0.0349	0.1385	0.0313	0.1385	0.0292	0.1385	0.0274	0.1385	0.026	0.1385	0.0244	0.1385	0.0225	0.1385	0.0225
0.1451	0.0349	0.1451	0.0313	0.1451	0.0292	0.1451	0.0274	0.1451	0.026	0.1451	0.0244	0.1451	0.0228	0.1451	0.0228
0.152	0.0349	0.152	0.0313	0.152	0.0292	0.152	0.0274	0.152	0.0265	0.152	0.0256	0.152	0.0247	0.152	0.0247
0.1592	0.0349	0.1592	0.0313	0.1592	0.0292	0.1592	0.0286	0.1592	0.0281	0.1592	0.0271	0.1592	0.026	0.1592	0.026
0.1668	0.0349	0.1668	0.0313	0.1668	0.03	0.1668	0.0294	0.1668	0.0288	0.1668	0.0278	0.1668	0.0267	0.1668	0.0267
0.1748	0.0424	0.1748	0.0359	0.1748	0.0325	0.1748	0.0297	0.1748	0.0288	0.1748	0.0278	0.1748	0.0268	0.1748	0.0268
0.1831	0.0535	0.1831	0.0445	0.1831	0.0398	0.1831	0.0358	0.1831	0.0324	0.1831	0.0278	0.1831	0.0271	0.1831	0.0271
0.1918	0.0577	0.1918	0.0478	0.1918	0.0425	0.1918	0.038	0.1918	0.0351	0.1918	0.0324	0.1918	0.0294	0.1918	0.0294
0.2009	0.0577	0.2009	0.0478	0.2009	0.0425	0.2009	0.0395	0.2009	0.0377	0.2009	0.0346	0.2009	0.0309	0.2009	0.0309
0.2105	0.0577	0.2105	0.0478	0.2105	0.0425	0.2105	0.0398	0.2105	0.0382	0.2105	0.0353	0.2105	0.0329	0.2105	0.0329
0.2205	0.0577	0.2205	0.0478	0.2205	0.0433	0.2205	0.0419	0.2205	0.0407	0.2205	0.0384	0.2205	0.0354	0.2205	0.0354
0.231	0.0582	0.231	0.0495	0.231	0.0466	0.231	0.0444	0.231	0.0428	0.231	0.0399	0.231	0.0364	0.231	0.0364
0.242	0.0629	0.242	0.0558	0.242	0.0516	0.242	0.0478	0.242	0.0445	0.242	0.0399	0.242	0.0364	0.242	0.0364
0.2535	0.0719	0.2535	0.0628	0.2535	0.0577	0.2535	0.0534	0.2535	0.05	0.2535	0.0448	0.2535	0.0395	0.2535	0.0395
0.2656	0.0719	0.2656	0.0628	0.2656	0.0577	0.2656	0.0534	0.2656	0.05	0.2656	0.0448	0.2656	0.0395	0.2656	0.0395
0.2783	0.0719	0.2783	0.0628	0.2783	0.0577	0.2783	0.0534	0.2783	0.05	0.2783	0.0448	0.2783	0.0401	0.2783	0.0401
0.2915	0.0746	0.2915	0.0669	0.2915	0.0625	0.2915	0.0592	0.2915	0.0563	0.2915	0.0513	0.2915	0.0456	0.2915	0.0456
0.3054	0.0878	0.3054	0.0762	0.3054	0.0698	0.3054	0.0649	0.3054	0.0612	0.3054	0.0549	0.3054	0.0479	0.3054	0.0479
0.3199	0.0922	0.3199	0.0798	0.3199	0.073	0.3199	0.0671	0.3199	0.0621	0.3199	0.0549	0.3199	0.0479	0.3199	0.0479
0.3352	0.1107	0.3352	0.0891	0.3352	0.0789	0.3352	0.071	0.3352	0.0651	0.3352	0.0567	0.3352	0.0493	0.3352	0.0493
0.3511	0.1255	0.3511	0.0958	0.3511	0.083	0.3511	0.073	0.3511	0.0676	0.3511	0.0592	0.3511	0.051	0.3511	0.051
0.3678	0.1255	0.3678	0.0958	0.3678	0.0851	0.3678	0.0779	0.3678	0.0717	0.3678	0.062	0.3678	0.0518	0.3678	0.0518

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0.3853	0.1255	0.3853	0.096	0.3853	0.0882	0.3853	0.0815	0.3853	0.076	0.3853	0.0665	0.3853	0.0558
0.4037	0.1553	0.4037	0.113	0.4037	0.0981	0.4037	0.0866	0.4037	0.0775	0.4037	0.0665	0.4037	0.0558
0.4229	0.1553	0.4229	0.1191	0.4229	0.1037	0.4229	0.0916	0.4229	0.0818	0.4229	0.0673	0.4229	0.0558
0.4431	0.1773	0.4431	0.1361	0.4431	0.1162	0.4431	0.1008	0.4431	0.0886	0.4431	0.0711	0.4431	0.0618
0.4642	0.1773	0.4642	0.1361	0.4642	0.1162	0.4642	0.1008	0.4642	0.0886	0.4642	0.0752	0.4642	0.0654
0.4863	0.199	0.4863	0.1474	0.4863	0.1256	0.4863	0.1098	0.4863	0.098	0.4863	0.0815	0.4863	0.0683
0.5094	0.199	0.5094	0.1474	0.5094	0.1256	0.5094	0.1098	0.5094	0.0985	0.5094	0.0869	0.5094	0.0758
0.5337	0.199	0.5337	0.1474	0.5337	0.1256	0.5337	0.112	0.5337	0.1055	0.5337	0.0953	0.5337	0.0843
0.5591	0.199	0.5591	0.1474	0.5591	0.1256	0.5591	0.112	0.5591	0.1058	0.5591	0.0976	0.5591	0.0869
0.5857	0.2002	0.5857	0.1487	0.5857	0.1269	0.5857	0.112	0.5857	0.1058	0.5857	0.0976	0.5857	0.0869
0.6136	0.2123	0.6136	0.1487	0.6136	0.1269	0.6136	0.1141	0.6136	0.1058	0.6136	0.0976	0.6136	0.0869
0.6428	0.2123	0.6428	0.1627	0.6428	0.1477	0.6428	0.1354	0.6428	0.1254	0.6428	0.1094	0.6428	0.0937
0.6734	0.245	0.6734	0.1654	0.6734	0.151	0.6734	0.14	0.6734	0.1305	0.6734	0.1152	0.6734	0.0997
0.7055	0.245	0.7055	0.1706	0.7055	0.151	0.7055	0.14	0.7055	0.1305	0.7055	0.1156	0.7055	0.0997
0.7391	0.245	0.7391	0.1968	0.7391	0.1753	0.7391	0.157	0.7391	0.1419	0.7391	0.1189	0.7391	0.105
0.7743	0.3218	0.7743	0.1968	0.7743	0.1777	0.7743	0.163	0.7743	0.1509	0.7743	0.1309	0.7743	0.1174
0.8111	0.3218	0.8111	0.2126	0.8111	0.186	0.8111	0.1664	0.8111	0.1543	0.8111	0.1391	0.8111	0.1264
0.8497	0.3218	0.8497	0.2126	0.8497	0.1936	0.8497	0.1787	0.8497	0.166	0.8497	0.1467	0.8497	0.1286
0.8902	0.3218	0.8902	0.2184	0.8902	0.1993	0.8902	0.1834	0.8902	0.1702	0.8902	0.1495	0.8902	0.1359
0.9326	0.4071	0.9326	0.267	0.9326	0.2262	0.9326	0.2022	0.9326	0.1868	0.9326	0.1679	0.9326	0.1515
0.977	0.4071	0.977	0.267	0.977	0.2404	0.977	0.2211	0.977	0.2055	0.977	0.183	0.977	0.1631
1.0235	0.4071	1.0235	0.267	1.0235	0.2404	1.0235	0.2211	1.0235	0.2055	1.0235	0.1842	1.0235	0.1648
1.0723	0.4071	1.0723	0.2914	1.0723	0.2627	1.0723	0.2398	1.0723	0.2217	1.0723	0.1948	1.0723	0.1702
1.1233	0.6635	1.1233	0.3827	1.1233	0.3162	1.1233	0.274	1.1233	0.245	1.1233	0.2072	1.1233	0.1762
1.1768	0.6635	1.1768	0.4157	1.1768	0.3403	1.1768	0.2928	1.1768	0.269	1.1768	0.2339	1.1768	0.2019
1.2328	0.6635	1.2328	0.4157	1.2328	0.3494	1.2328	0.3147	1.2328	0.2855	1.2328	0.2417	1.2328	0.2109
1.2916	0.6635	1.2916	0.4157	1.2916	0.3668	1.2916	0.3275	1.2916	0.2955	1.2916	0.2601	1.2916	0.2253
1.353	0.7315	1.353	0.4278	1.353	0.3675	1.353	0.3456	1.353	0.3259	1.353	0.2913	1.353	0.2528
1.4175	0.7315	1.4175	0.4664	1.4175	0.3974	1.4175	0.3581	1.4175	0.3391	1.4175	0.3067	1.4175	0.2682
1.485	0.7315	1.485	0.4664	1.485	0.4301	1.485	0.4016	1.485	0.3763	1.485	0.3348	1.485	0.2853
1.5557	0.7315	1.5557	0.4789	1.5557	0.44	1.5557	0.416	1.5557	0.3949	1.5557	0.3577	1.5557	0.3126
1.6298	0.8957	1.6298	0.5439	1.6298	0.4608	1.6298	0.434	1.6298	0.4088	1.6298	0.3748	1.6298	0.3366
1.7074	0.8957	1.7074	0.5439	1.7074	0.4975	1.7074	0.4718	1.7074	0.4478	1.7074	0.4066	1.7074	0.3569
1.7887	0.8957	1.7887	0.5697	1.7887	0.5367	1.7887	0.5112	1.7887	0.4873	1.7887	0.4425	1.7887	0.3876
1.8738	0.9394	1.8738	0.6897	1.8738	0.6221	1.8738	0.5745	1.8738	0.5318	1.8738	0.4747	1.8738	0.415
1.963	1.1252	1.963	0.8496	1.963	0.763	1.963	0.6912	1.963	0.6306	1.963	0.5461	1.963	0.4619
2.0565	1.5309	2.0565	0.9056	2.0565	0.819	2.0565	0.7513	2.0565	0.6985	2.0565	0.6162	2.0565	0.5268
2.1544	1.5309	2.1544	0.94	2.1544	0.8705	2.1544	0.8061	2.1544	0.7493	2.1544	0.661	2.1544	0.5651
2.257	1.6654	2.257	1.1282	2.257	1.0188	2.257	0.9293	2.257	0.8567	2.257	0.7363	2.257	0.6011

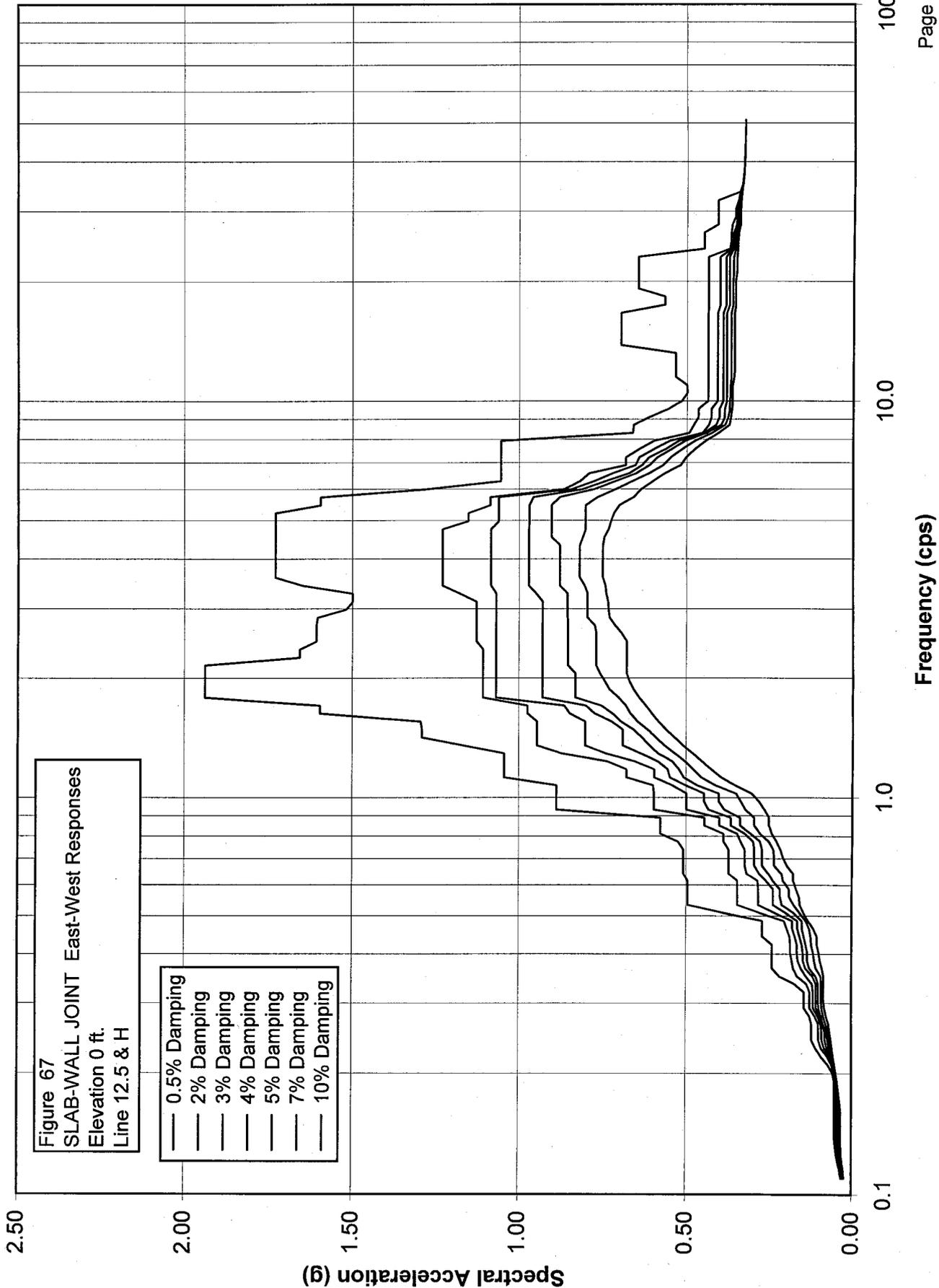
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2.3645	3.2019	2.3645	1.6409	2.3645	1.2057	2.3645	0.9845	2.3645	0.8844	2.3645	0.7543	2.3645	0.6199
2.4771	3.2019	2.4771	1.6409	2.4771	1.2057	2.4771	0.9923	2.4771	0.8844	2.4771	0.7543	2.4771	0.634
2.595	3.2019	2.595	1.6409	2.595	1.2057	2.595	0.9923	2.595	0.8844	2.595	0.7543	2.595	0.6712
2.7186	3.2019	2.7186	1.6409	2.7186	1.3102	2.7186	1.1743	2.7186	1.0634	2.7186	0.889	2.7186	0.7149
2.848	3.2019	2.848	1.6409	2.848	1.3533	2.848	1.2382	2.848	1.1373	2.848	0.9621	2.848	0.7803
2.9836	3.435	2.9836	2.035	2.9836	1.6724	2.9836	1.4273	2.9836	1.2549	2.9836	1.0273	2.9836	0.8233
3.1257	3.435	3.1257	2.035	3.1257	1.6724	3.1257	1.4273	3.1257	1.2549	3.1257	1.0273	3.1257	0.8233
3.2745	3.435	3.2745	2.035	3.2745	1.6724	3.2745	1.4273	3.2745	1.2549	3.2745	1.0273	3.2745	0.8233
3.4305	3.435	3.4305	2.035	3.4305	1.6724	3.4305	1.4273	3.4305	1.2549	3.4305	1.0273	3.4305	0.8233
3.5938	3.435	3.5938	2.035	3.5938	1.6724	3.5938	1.4273	3.5938	1.2549	3.5938	1.0273	3.5938	0.8233
3.7649	3.3006	3.7649	1.9448	3.7649	1.5871	3.7649	1.381	3.7649	1.2206	3.7649	1.0121	3.7649	0.8176
3.9442	1.8583	3.9442	1.286	3.9442	1.1718	3.9442	1.0802	3.9442	1.001	3.9442	0.8724	3.9442	0.7551
4.132	1.407	4.132	1.0422	4.132	0.9587	4.132	0.8932	4.132	0.8437	4.132	0.7724	4.132	0.689
4.3288	1.407	4.3288	0.9789	4.3288	0.8846	4.3288	0.8233	4.3288	0.7745	4.3288	0.7098	4.3288	0.6438
4.5349	1.4296	4.5349	0.9692	4.5349	0.8846	4.5349	0.8233	4.5349	0.7745	4.5349	0.7098	4.5349	0.6438
4.7508	1.4296	4.7508	0.9827	4.7508	0.8846	4.7508	0.826	4.7508	0.7843	4.7508	0.7148	4.7508	0.6473
4.977	1.4844	4.977	1.147	4.977	1.0394	4.977	0.9561	4.977	0.8966	4.977	0.8092	4.977	0.7185
5.214	1.9172	5.214	1.3256	5.214	1.1195	5.214	1.0161	5.214	0.9317	5.214	0.832	5.214	0.7531
5.4623	2.4312	5.4623	1.3711	5.4623	1.2108	5.4623	1.109	5.4623	1.0308	5.4623	0.9219	5.4623	0.8362
5.7224	2.8095	5.7224	1.5237	5.7224	1.3181	5.7224	1.173	5.7224	1.0639	5.7224	0.9962	5.7224	0.9209
5.9948	2.8095	5.9948	1.5398	5.9948	1.3592	5.9948	1.2311	5.9948	1.1477	5.9948	1.0971	5.9948	1.014
6.2803	2.8095	6.2803	1.8781	6.2803	1.6652	6.2803	1.521	6.2803	1.4188	6.2803	1.296	6.2803	1.1608
6.5793	4.1325	6.5793	2.4464	6.5793	2.0943	6.5793	1.9701	6.5793	1.8481	6.5793	1.6202	6.5793	1.3533
6.8926	6.2782	6.8926	3.4476	6.8926	2.9157	6.8926	2.5771	6.8926	2.3242	6.8926	1.9553	6.8926	1.5985
7.2208	7.071	7.2208	3.9889	7.2208	3.3741	7.2208	2.9088	7.2208	2.574	7.2208	2.0749	7.2208	1.7348
7.5646	7.6291	7.5646	4.009	7.5646	3.3741	7.5646	2.9088	7.5646	2.574	7.5646	2.0749	7.5646	1.8631
7.9248	7.6291	7.9248	4.009	7.9248	3.3741	7.9248	2.9088	7.9248	2.574	7.9248	2.0749	7.9248	1.9214
8.3022	7.6291	8.3022	4.009	8.3022	3.3741	8.3022	2.9088	8.3022	2.574	8.3022	2.0749	8.3022	1.9214
8.6975	7.6291	8.6975	4.009	8.6975	3.3741	8.6975	2.9088	8.6975	2.574	8.6975	2.0749	8.6975	1.9214
9.1116	7.6291	9.1116	4.009	9.1116	3.3741	9.1116	2.9088	9.1116	2.574	9.1116	2.0749	9.1116	1.9214
9.5455	6.9952	9.5455	4.009	9.5455	3.3741	9.5455	2.9088	9.5455	2.574	9.5455	2.0749	9.5455	1.9214
10	6.4689	10	4.009	10	3.3741	10	2.9088	10	2.574	10	2.0749	10	1.8526
10.4762	6.4105	10.4762	4.009	10.4762	3.3741	10.4762	2.9088	10.4762	2.574	10.4762	2.0749	10.4762	1.7842
10.975	6.4105	10.975	3.797	10.975	3.014	10.975	2.4993	10.975	2.2427	10.975	1.8543	10.975	1.6473
11.4976	6.4105	11.4976	3.797	11.4976	3.014	11.4976	2.4993	11.4976	2.2427	11.4976	1.8543	11.4976	1.6473
12.045	6.4105	12.045	3.797	12.045	3.014	12.045	2.4993	12.045	2.1807	12.045	1.7772	12.045	1.6473
12.6186	6.4105	12.6186	3.3047	12.6186	2.7283	12.6186	2.3905	12.6186	2.1241	12.6186	1.7375	12.6186	1.6473
13.2194	6.4105	13.2194	3.3047	13.2194	2.7283	13.2194	2.3905	13.2194	2.1241	13.2194	1.7375	13.2194	1.6473
13.8489	5.3624	13.8489	3.3047	13.8489	2.7283	13.8489	2.3905	13.8489	2.1241	13.8489	1.7375	13.8489	1.6473

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14.5083	5.2089	14.5083	3.0577	14.5083	2.7038	14.5083	2.3905	14.5083	2.1241	14.5083	1.7375	14.5083	1.499
15.1991	2.6001	15.1991	2.2044	15.1991	2.0461	15.1991	1.9128	15.1991	1.7975	15.1991	1.6125	15.1991	1.4111
15.9228	1.7158	15.9228	1.5528	15.9228	1.4679	15.9228	1.3925	15.9228	1.3721	15.9228	1.3273	15.9228	1.2463
16.681	1.3631	16.681	1.1044	16.681	1.0991	16.681	1.0919	16.681	1.0806	16.681	1.0968	16.681	1.0873
17.4753	1.3631	17.4753	1.0709	17.4753	0.9973	17.4753	0.9668	17.4753	0.9748	17.4753	0.9835	17.4753	0.9822
18.3074	1.2052	18.3074	0.9593	18.3074	0.9349	18.3074	0.9287	18.3074	0.9263	18.3074	0.9227	18.3074	0.9152
19.1791	1.2052	19.1791	0.9546	19.1791	0.9171	19.1791	0.9012	19.1791	0.892	19.1791	0.8794	19.1791	0.8652
20.0923	1.0468	20.0923	0.9082	20.0923	0.877	20.0923	0.8587	20.0923	0.8483	20.0923	0.8361	20.0923	0.8209
21.049	0.9305	21.049	0.8595	21.049	0.8346	21.049	0.8182	21.049	0.8118	21.049	0.8052	21.049	0.7904
22.0513	0.9305	22.0513	0.8595	22.0513	0.8346	22.0513	0.8182	22.0513	0.8064	22.0513	0.7893	22.0513	0.7707
23.1013	0.8414	23.1013	0.7957	23.1013	0.7868	23.1013	0.7792	23.1013	0.7723	23.1013	0.7604	23.1013	0.7461
24.2013	0.7635	24.2013	0.732	24.2013	0.7297	24.2013	0.7289	24.2013	0.728	24.2013	0.7252	24.2013	0.7189
25.3536	0.7411	25.3536	0.7066	25.3536	0.6973	25.3536	0.6989	25.3536	0.6998	25.3536	0.6998	25.3536	0.697
26.5609	0.7411	26.5609	0.7066	26.5609	0.6937	26.5609	0.6923	26.5609	0.6904	26.5609	0.6865	26.5609	0.6811
27.8256	0.7411	27.8256	0.7066	27.8256	0.6937	27.8256	0.6855	27.8256	0.6799	27.8256	0.6725	27.8256	0.6657
29.1505	0.6389	29.1505	0.6472	29.1505	0.6502	29.1505	0.6516	29.1505	0.6519	29.1505	0.651	29.1505	0.6485
30.5386	0.6276	30.5386	0.6295	30.5386	0.6307	30.5386	0.6316	30.5386	0.6323	30.5386	0.6331	30.5386	0.6329
31.9927	0.6179	31.9927	0.6186	31.9927	0.6191	31.9927	0.6195	31.9927	0.6199	31.9927	0.6204	31.9927	0.6205
33.516	0.6093	33.516	0.6097	33.516	0.6099	33.516	0.6101	33.516	0.6102	33.516	0.6105	33.516	0.6106
35.1119	0.6017	35.1119	0.6019	35.1119	0.602	35.1119	0.6021	35.1119	0.6022	35.1119	0.6023	35.1119	0.6023
36.7838	0.5949	36.7838	0.595	36.7838	0.5951	36.7838	0.5951	36.7838	0.5952	36.7838	0.5952	36.7838	0.5952
38.5353	0.5889	38.5353	0.5889	38.5353	0.589	38.5353	0.589	38.5353	0.589	38.5353	0.589	38.5353	0.589
40.3702	0.5835	40.3702	0.5835	40.3702	0.5835	40.3702	0.5836	40.3702	0.5836	40.3702	0.5836	40.3702	0.5835
42.2924	0.5787	42.2924	0.5787	42.2924	0.5787	42.2924	0.5787	42.2924	0.5787	42.2924	0.5787	42.2924	0.5787
44.3062	0.5743	44.3062	0.5743	44.3062	0.5743	44.3062	0.5743	44.3062	0.5743	44.3062	0.5743	44.3062	0.5743
46.4159	0.5703	46.4159	0.5703	46.4159	0.5703	46.4159	0.5703	46.4159	0.5703	46.4159	0.5703	46.4159	0.5703
48.626	0.5667	48.626	0.5667	48.626	0.5667	48.626	0.5667	48.626	0.5667	48.626	0.5667	48.626	0.5667
50.9414	0.5634	50.9414	0.5634	50.9414	0.5634	50.9414	0.5634	50.9414	0.5634	50.9414	0.5634	50.9414	0.5635

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-SOC-S15T-00005, Rev. 0B



S_PTWW067.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 67
 SLAB-WALL JOINT East-West Responses
 Elevation 0 ft.
 Line 12.5 & H

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0314	0.1098	0.0288	0.1098	0.0275	0.1098	0.0267	0.1098	0.026	0.1098	0.026	0.1098	0.0247	0.1098	0.0231
0.115	0.0358	0.115	0.033	0.115	0.0314	0.115	0.03	0.115	0.0289	0.115	0.0289	0.115	0.0273	0.115	0.0253
0.1204	0.041	0.1204	0.0382	0.1204	0.0366	0.1204	0.0352	0.1204	0.0339	0.1204	0.0339	0.1204	0.0316	0.1204	0.0287
0.1262	0.0459	0.1262	0.0426	0.1262	0.0406	0.1262	0.0389	0.1262	0.0372	0.1262	0.0372	0.1262	0.0344	0.1262	0.0311
0.1322	0.0488	0.1322	0.0442	0.1322	0.0421	0.1322	0.0402	0.1322	0.0385	0.1322	0.0385	0.1322	0.0355	0.1322	0.032
0.1385	0.0518	0.1385	0.0463	0.1385	0.0431	0.1385	0.0402	0.1385	0.0385	0.1385	0.0385	0.1385	0.0355	0.1385	0.032
0.1451	0.0518	0.1451	0.0463	0.1451	0.0431	0.1451	0.0402	0.1451	0.0385	0.1451	0.0385	0.1451	0.0355	0.1451	0.032
0.152	0.0518	0.152	0.0463	0.152	0.0431	0.152	0.0402	0.152	0.0385	0.152	0.0385	0.152	0.0355	0.152	0.032
0.1592	0.0518	0.1592	0.0463	0.1592	0.0431	0.1592	0.0402	0.1592	0.0385	0.1592	0.0385	0.1592	0.0355	0.1592	0.0322
0.1668	0.0518	0.1668	0.0463	0.1668	0.0431	0.1668	0.0402	0.1668	0.0385	0.1668	0.0385	0.1668	0.0361	0.1668	0.0348
0.1748	0.0518	0.1748	0.0463	0.1748	0.0431	0.1748	0.041	0.1748	0.0403	0.1748	0.0403	0.1748	0.0392	0.1748	0.0375
0.1831	0.0518	0.1831	0.0463	0.1831	0.0454	0.1831	0.0446	0.1831	0.0438	0.1831	0.0438	0.1831	0.0424	0.1831	0.0402
0.1918	0.0521	0.1918	0.0504	0.1918	0.0494	0.1918	0.0484	0.1918	0.0474	0.1918	0.0474	0.1918	0.0455	0.1918	0.0433
0.2009	0.0569	0.2009	0.0549	0.2009	0.0536	0.2009	0.0524	0.2009	0.0513	0.2009	0.0513	0.2009	0.0494	0.2009	0.0471
0.2105	0.0707	0.2105	0.06	0.2105	0.0585	0.2105	0.0572	0.2105	0.056	0.2105	0.056	0.2105	0.0538	0.2105	0.0513
0.2205	0.0909	0.2205	0.0714	0.2205	0.0642	0.2205	0.0623	0.2205	0.0608	0.2205	0.0608	0.2205	0.0584	0.2205	0.0554
0.231	0.1078	0.231	0.0906	0.231	0.0813	0.231	0.0735	0.231	0.0671	0.231	0.0671	0.231	0.0628	0.231	0.0589
0.242	0.1194	0.242	0.0991	0.242	0.0883	0.242	0.0791	0.242	0.0714	0.242	0.0714	0.242	0.0663	0.242	0.0617
0.2535	0.12	0.2535	0.0991	0.2535	0.0883	0.2535	0.0796	0.2535	0.0755	0.2535	0.0755	0.2535	0.069	0.2535	0.0654
0.2656	0.12	0.2656	0.0991	0.2656	0.0922	0.2656	0.0879	0.2656	0.0839	0.2656	0.0839	0.2656	0.0769	0.2656	0.0684
0.2783	0.1252	0.2783	0.1094	0.2783	0.1006	0.2783	0.0949	0.2783	0.0907	0.2783	0.0907	0.2783	0.0832	0.2783	0.0751
0.2915	0.1421	0.2915	0.1244	0.2915	0.1145	0.2915	0.1057	0.2915	0.0979	0.2915	0.0979	0.2915	0.0883	0.2915	0.0805
0.3054	0.1421	0.3054	0.1244	0.3054	0.115	0.3054	0.1067	0.3054	0.0994	0.3054	0.0994	0.3054	0.0903	0.3054	0.0832
0.3199	0.1421	0.3199	0.1244	0.3199	0.115	0.3199	0.1067	0.3199	0.0994	0.3199	0.0994	0.3199	0.0903	0.3199	0.0837
0.3352	0.1707	0.3352	0.1342	0.3352	0.1178	0.3352	0.1067	0.3352	0.0994	0.3352	0.0994	0.3352	0.0903	0.3352	0.0837
0.3511	0.2169	0.3511	0.1627	0.3511	0.1366	0.3511	0.1164	0.3511	0.107	0.3511	0.107	0.3511	0.0922	0.3511	0.0837
0.3678	0.2396	0.3678	0.1754	0.3678	0.1523	0.3678	0.1387	0.3678	0.1269	0.3678	0.1269	0.3678	0.1073	0.3678	0.0882

24590-PTF-3PS-MEVV-T0002, Rev. 4
Cesium Nitric Acid Recovery
Forced Circulation Vacuum Evaporator System

0.3853	0.2396	0.3853	0.1799	0.3853	0.1618	0.3853	0.1463	0.3853	0.1331	0.3853	0.112	0.3853	0.0944
0.4037	0.2396	0.4037	0.1842	0.4037	0.164	0.4037	0.1472	0.4037	0.1332	0.4037	0.1155	0.4037	0.0992
0.4229	0.2396	0.4229	0.1842	0.4229	0.164	0.4229	0.1495	0.4229	0.1381	0.4229	0.1214	0.4229	0.1046
0.4431	0.2688	0.4431	0.1868	0.4431	0.1709	0.4431	0.1568	0.4431	0.1442	0.4431	0.1234	0.4431	0.1046
0.4642	0.2688	0.4642	0.1954	0.4642	0.1781	0.4642	0.1629	0.4642	0.1495	0.4642	0.1272	0.4642	0.1151
0.4863	0.2688	0.4863	0.2037	0.4863	0.1784	0.4863	0.1629	0.4863	0.1495	0.4863	0.1378	0.4863	0.1308
0.5094	0.3911	0.5094	0.2791	0.5094	0.2331	0.5094	0.2001	0.5094	0.1754	0.5094	0.1572	0.5094	0.1456
0.5337	0.4951	0.5337	0.3445	0.5337	0.2811	0.5337	0.237	0.5337	0.2102	0.5337	0.174	0.5337	0.1562
0.5591	0.4951	0.5591	0.3445	0.5591	0.2811	0.5591	0.237	0.5591	0.2161	0.5591	0.1886	0.5591	0.1586
0.5857	0.4951	0.5857	0.3445	0.5857	0.2811	0.5857	0.237	0.5857	0.2161	0.5857	0.1886	0.5857	0.1672
0.6136	0.4951	0.6136	0.3445	0.6136	0.2835	0.6136	0.2579	0.6136	0.2376	0.6136	0.2068	0.6136	0.1755
0.6428	0.5081	0.6428	0.3704	0.6428	0.3158	0.6428	0.2788	0.6428	0.2506	0.6428	0.2109	0.6428	0.1755
0.6734	0.5081	0.6734	0.3704	0.6734	0.3214	0.6734	0.2929	0.6734	0.2694	0.6734	0.2332	0.6734	0.1957
0.7055	0.5081	0.7055	0.3704	0.7055	0.3214	0.7055	0.2929	0.7055	0.2694	0.7055	0.2332	0.7055	0.2068
0.7391	0.5081	0.7391	0.3704	0.7391	0.3214	0.7391	0.2929	0.7391	0.2694	0.7391	0.2359	0.7391	0.2145
0.7743	0.5246	0.7743	0.3867	0.7743	0.3352	0.7743	0.2967	0.7743	0.2757	0.7743	0.2494	0.7743	0.2264
0.8111	0.5776	0.8111	0.3867	0.8111	0.3456	0.8111	0.3215	0.8111	0.3045	0.8111	0.2755	0.8111	0.2408
0.8497	0.5776	0.8497	0.444	0.8497	0.3988	0.8497	0.3642	0.8497	0.3363	0.8497	0.2936	0.8497	0.2491
0.8902	0.5776	0.8902	0.444	0.8902	0.3988	0.8902	0.3642	0.8902	0.3363	0.8902	0.2936	0.8902	0.2491
0.9326	0.8877	0.9326	0.5975	0.9326	0.4991	0.9326	0.4325	0.9326	0.3845	0.9326	0.3203	0.9326	0.2634
0.977	0.8877	0.977	0.5975	0.977	0.4991	0.977	0.4459	0.977	0.4011	0.977	0.3342	0.977	0.2792
1.0235	0.8877	1.0235	0.5975	1.0235	0.4991	1.0235	0.4459	1.0235	0.4011	1.0235	0.3491	1.0235	0.3012
1.0723	0.8877	1.0723	0.6	1.0723	0.5421	1.0723	0.5019	1.0723	0.4672	1.0723	0.4115	1.0723	0.3515
1.1233	1.0436	1.1233	0.6796	1.1233	0.5961	1.1233	0.5493	1.1233	0.5076	1.1233	0.454	1.1233	0.393
1.1768	1.0436	1.1768	0.6796	1.1768	0.5966	1.1768	0.5564	1.1768	0.5218	1.1768	0.4787	1.1768	0.424
1.2328	1.0436	1.2328	0.7363	1.2328	0.6543	1.2328	0.5857	1.2328	0.5418	1.2328	0.503	1.2328	0.452
1.2916	1.0436	1.2916	0.8733	1.2916	0.7423	1.2916	0.6374	1.2916	0.5853	1.2916	0.5346	1.2916	0.4807
1.353	1.1657	1.353	0.9454	1.353	0.8025	1.353	0.6903	1.353	0.6111	1.353	0.5663	1.353	0.5097
1.4175	1.2899	1.4175	0.9454	1.4175	0.8025	1.4175	0.6903	1.4175	0.6337	1.4175	0.5919	1.4175	0.5357
1.485	1.2899	1.485	0.9454	1.485	0.8025	1.485	0.6903	1.485	0.6584	1.485	0.617	1.485	0.5609
1.5557	1.2945	1.5557	0.9454	1.5557	0.8025	1.5557	0.7243	1.5557	0.696	1.5557	0.6469	1.5557	0.584
1.6298	1.5963	1.6298	0.9746	1.6298	0.8489	1.6298	0.7751	1.6298	0.7218	1.6298	0.6683	1.6298	0.604
1.7074	1.5963	1.7074	0.9746	1.7074	0.8647	1.7074	0.8015	1.7074	0.7551	1.7074	0.6813	1.7074	0.6226
1.7887	1.939	1.7887	1.1073	1.7887	1.0689	1.7887	0.93	1.7887	0.8319	1.7887	0.7035	1.7887	0.6419
1.8738	1.939	1.8738	1.1073	1.8738	1.0689	1.8738	0.93	1.8738	0.8319	1.8738	0.7304	1.8738	0.6589
1.963	1.939	1.963	1.1073	1.963	1.0689	1.963	0.93	1.963	0.8319	1.963	0.7451	1.963	0.671
2.0565	1.939	2.0565	1.1073	2.0565	1.0689	2.0565	0.93	2.0565	0.8319	2.0565	0.7593	2.0565	0.6798
2.1544	1.939	2.1544	1.1073	2.1544	1.0689	2.1544	0.93	2.1544	0.8543	2.1544	0.771	2.1544	0.6798
2.257	1.6562	2.257	1.1073	2.257	1.0689	2.257	0.93	2.257	0.8543	2.257	0.771	2.257	0.6798

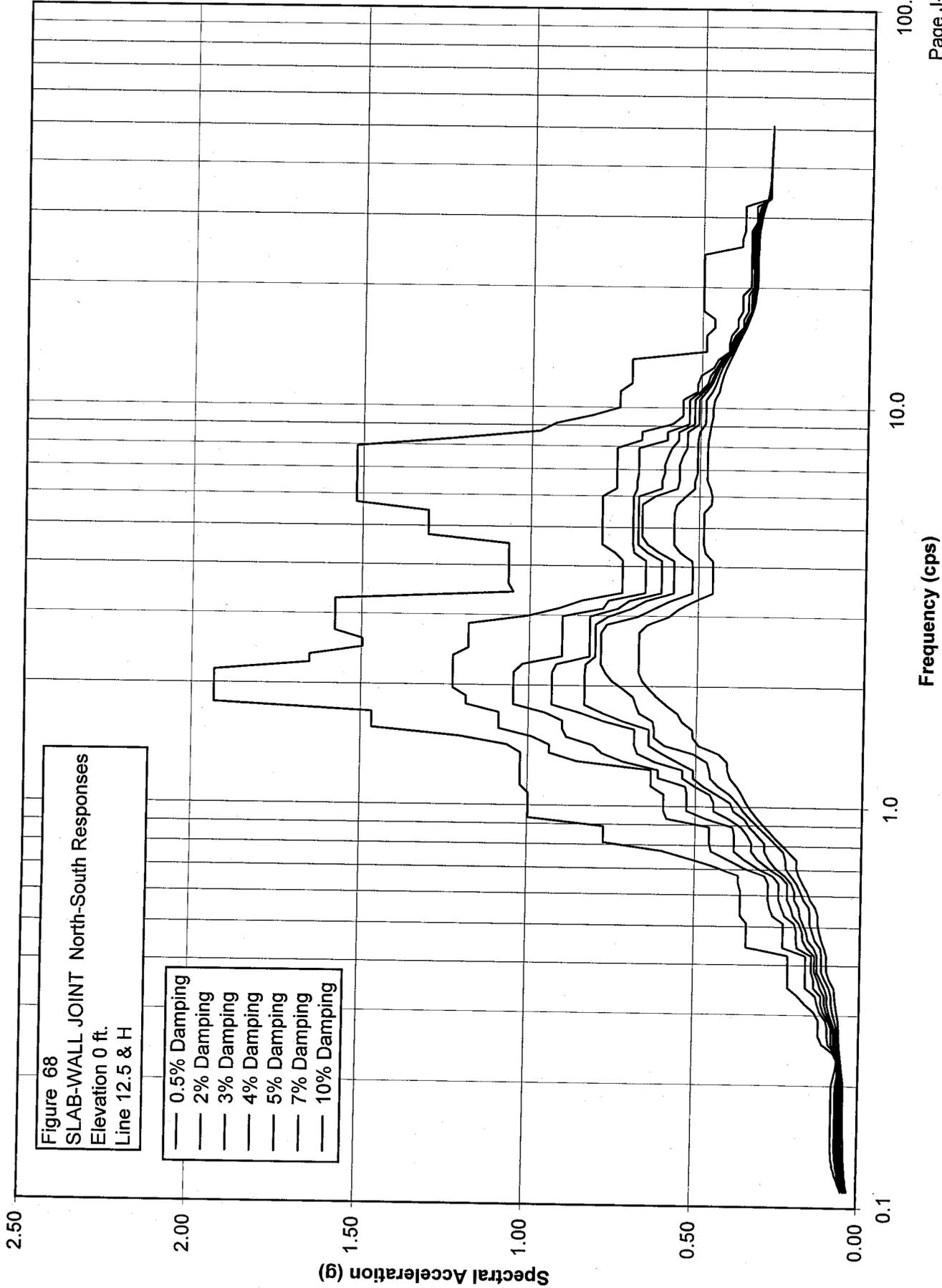
2.3645	1.6562	2.3645	1.1073	2.3645	1.0689	2.3645	0.93	2.3645	0.8543	2.3645	0.771	2.3645	0.6798
2.4771	1.6073	2.4771	1.127	2.4771	1.0689	2.4771	0.93	2.4771	0.8543	2.4771	0.771	2.4771	0.6798
2.595	1.6073	2.595	1.127	2.595	1.0689	2.595	0.93	2.595	0.8543	2.595	0.771	2.595	0.6948
2.7186	1.6073	2.7186	1.127	2.7186	1.0689	2.7186	0.93	2.7186	0.8543	2.7186	0.775	2.7186	0.7152
2.848	1.6038	2.848	1.127	2.848	1.0689	2.848	0.93	2.848	0.8559	2.848	0.7972	2.848	0.7309
2.9836	1.5188	2.9836	1.127	2.9836	1.0689	2.9836	0.93	2.9836	0.8559	2.9836	0.7972	2.9836	0.7343
3.1257	1.4997	3.1257	1.127	3.1257	1.0689	3.1257	0.93	3.1257	0.8559	3.1257	0.7972	3.1257	0.7358
3.2745	1.4997	3.2745	1.1771	3.2745	1.0689	3.2745	0.9489	3.2745	0.8559	3.2745	0.7972	3.2745	0.7415
3.4305	1.6477	3.4305	1.2287	3.4305	1.0843	3.4305	0.9715	3.4305	0.8786	3.4305	0.8056	3.4305	0.7439
3.5938	1.729	3.5938	1.2287	3.5938	1.0843	3.5938	0.9715	3.5938	0.8786	3.5938	0.8201	3.5938	0.7521
3.7649	1.729	3.7649	1.2287	3.7649	1.0843	3.7649	0.9715	3.7649	0.8786	3.7649	0.8201	3.7649	0.7521
3.9442	1.729	3.9442	1.2287	3.9442	1.0843	3.9442	0.9715	3.9442	0.8786	3.9442	0.8201	3.9442	0.7521
4.132	1.729	4.132	1.2287	4.132	1.0843	4.132	0.9715	4.132	0.8786	4.132	0.8201	4.132	0.7521
4.3288	1.729	4.3288	1.2287	4.3288	1.0843	4.3288	0.9715	4.3288	0.8786	4.3288	0.8201	4.3288	0.7521
4.5349	1.729	4.5349	1.2287	4.5349	1.0843	4.5349	0.9715	4.5349	0.9034	4.5349	0.8114	4.5349	0.7477
4.7508	1.729	4.7508	1.2287	4.7508	1.0843	4.7508	0.9715	4.7508	0.9034	4.7508	0.8028	4.7508	0.7348
4.977	1.729	4.977	1.1517	4.977	1.0607	4.977	0.9698	4.977	0.9034	4.977	0.8028	4.977	0.7272
5.214	1.729	5.214	1.1517	5.214	1.0607	5.214	0.9698	5.214	0.9034	5.214	0.8028	5.214	0.7183
5.4623	1.5947	5.4623	1.0863	5.4623	1.0607	5.4623	0.9698	5.4623	0.9034	5.4623	0.8028	5.4623	0.7033
5.7224	1.5947	5.7224	1.0863	5.7224	1.0607	5.7224	0.9582	5.7224	0.8798	5.7224	0.767	5.7224	0.6597
5.9948	1.2803	5.9948	0.866	5.9948	0.8444	5.9948	0.8127	5.9948	0.7784	5.9948	0.714	5.9948	0.6374
6.2803	1.0548	6.2803	0.8195	6.2803	0.7776	6.2803	0.744	6.2803	0.7149	6.2803	0.6643	6.2803	0.6028
6.5793	1.0548	6.5793	0.7923	6.5793	0.7225	6.5793	0.6735	6.5793	0.6523	6.5793	0.6139	6.5793	0.5669
6.8926	1.0548	6.8926	0.6827	6.8926	0.6543	6.8926	0.635	6.8926	0.6133	6.8926	0.5713	6.8926	0.5194
7.2208	1.0548	7.2208	0.6827	7.2208	0.6434	7.2208	0.6137	7.2208	0.5993	7.2208	0.5492	7.2208	0.5024
7.5646	1.0548	7.5646	0.643	7.5646	0.5993	7.5646	0.5643	7.5646	0.5464	7.5646	0.5145	7.5646	0.476
7.9248	1.0548	7.9248	0.6	7.9248	0.5525	7.9248	0.5251	7.9248	0.5059	7.9248	0.4766	7.9248	0.444
8.3022	0.6638	8.3022	0.4935	8.3022	0.453	8.3022	0.4489	8.3022	0.4419	8.3022	0.4251	8.3022	0.4054
8.6975	0.6605	8.6975	0.4805	8.6975	0.4345	8.6975	0.413	8.6975	0.3975	8.6975	0.3855	8.6975	0.3723
9.1116	0.6123	9.1116	0.4662	9.1116	0.4277	9.1116	0.403	9.1116	0.3873	9.1116	0.3764	9.1116	0.3684
9.5455	0.5564	9.5455	0.4662	9.5455	0.4277	9.5455	0.403	9.5455	0.3873	9.5455	0.3716	9.5455	0.3649
10	0.5166	10	0.4371	10	0.4088	10	0.3922	10	0.3815	10	0.3716	10	0.3633
10.4762	0.4998	10.4762	0.4371	10.4762	0.4088	10.4762	0.3922	10.4762	0.3812	10.4762	0.37	10.4762	0.3633
10.975	0.5011	10.975	0.4371	10.975	0.4088	10.975	0.3922	10.975	0.3812	10.975	0.37	10.975	0.3633
11.4976	0.5346	11.4976	0.4371	11.4976	0.4088	11.4976	0.3922	11.4976	0.3812	11.4976	0.3678	11.4976	0.3593
12.045	0.5346	12.045	0.4371	12.045	0.4088	12.045	0.3922	12.045	0.3812	12.045	0.3678	12.045	0.3575
12.6186	0.5346	12.6186	0.4371	12.6186	0.4088	12.6186	0.3922	12.6186	0.3812	12.6186	0.3678	12.6186	0.3575
13.2194	0.5346	13.2194	0.4371	13.2194	0.4088	13.2194	0.3922	13.2194	0.3812	13.2194	0.3678	13.2194	0.3575
13.8489	0.6983	13.8489	0.4371	13.8489	0.4088	13.8489	0.3922	13.8489	0.3812	13.8489	0.3678	13.8489	0.3575

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Forced Circulation Vacuum Evaporator System

14.5083	0.6983	14.5083	0.4371	14.5083	0.4088	14.5083	0.3922	14.5083	0.3812	14.5083	0.3678	14.5083	0.3575
15.1991	0.6983	15.1991	0.4371	15.1991	0.4088	15.1991	0.3922	15.1991	0.3812	15.1991	0.3678	15.1991	0.3575
15.9228	0.6983	15.9228	0.4371	15.9228	0.4088	15.9228	0.3922	15.9228	0.3812	15.9228	0.3678	15.9228	0.3575
16.681	0.6983	16.681	0.4371	16.681	0.4088	16.681	0.3922	16.681	0.3812	16.681	0.3678	16.681	0.3575
17.4753	0.5675	17.4753	0.4359	17.4753	0.4009	17.4753	0.3832	17.4753	0.3725	17.4753	0.3623	17.4753	0.3546
18.3074	0.5675	18.3074	0.4359	18.3074	0.4009	18.3074	0.3832	18.3074	0.3725	18.3074	0.3623	18.3074	0.3546
19.1791	0.6461	19.1791	0.4359	19.1791	0.4009	19.1791	0.3832	19.1791	0.3725	19.1791	0.3623	19.1791	0.3546
20.0923	0.6461	20.0923	0.4359	20.0923	0.4009	20.0923	0.3832	20.0923	0.3725	20.0923	0.3623	20.0923	0.3546
21.049	0.6461	21.049	0.4359	21.049	0.4009	21.049	0.3832	21.049	0.3725	21.049	0.3601	21.049	0.3508
22.0513	0.6461	22.0513	0.4359	22.0513	0.4009	22.0513	0.3832	22.0513	0.3725	22.0513	0.3601	22.0513	0.3504
23.1013	0.6461	23.1013	0.4359	23.1013	0.4009	23.1013	0.3832	23.1013	0.3725	23.1013	0.3601	23.1013	0.3504
24.2013	0.4489	24.2013	0.3721	24.2013	0.3669	24.2013	0.3636	24.2013	0.3605	24.2013	0.3546	24.2013	0.3479
25.3536	0.4489	25.3536	0.3675	25.3536	0.3609	25.3536	0.3581	25.3536	0.3561	25.3536	0.3522	25.3536	0.3477
26.5609	0.4489	26.5609	0.3675	26.5609	0.3609	26.5609	0.3565	26.5609	0.3534	26.5609	0.3491	26.5609	0.3452
27.8256	0.4073	27.8256	0.3647	27.8256	0.3523	27.8256	0.3488	27.8256	0.3467	27.8256	0.3435	27.8256	0.3406
29.1505	0.4073	29.1505	0.3548	29.1505	0.3516	29.1505	0.3488	29.1505	0.3467	29.1505	0.3435	29.1505	0.3402
30.5386	0.4073	30.5386	0.3548	30.5386	0.3516	30.5386	0.3488	30.5386	0.3467	30.5386	0.3435	30.5386	0.3402
31.9927	0.4073	31.9927	0.3465	31.9927	0.345	31.9927	0.3447	31.9927	0.3438	31.9927	0.3417	31.9927	0.3392
33.516	0.3423	33.516	0.3426	33.516	0.3419	33.516	0.341	33.516	0.3401	33.516	0.3386	33.516	0.3369
35.1119	0.3337	35.1119	0.3344	35.1119	0.3347	35.1119	0.3349	35.1119	0.3349	35.1119	0.3348	35.1119	0.3343
36.7838	0.3313	36.7838	0.3316	36.7838	0.3318	36.7838	0.3319	36.7838	0.332	36.7838	0.3321	36.7838	0.332
38.5353	0.3298	38.5353	0.3299	38.5353	0.33	38.5353	0.3301	38.5353	0.3302	38.5353	0.3303	38.5353	0.3303
40.3702	0.3286	40.3702	0.3287	40.3702	0.3288	40.3702	0.3289	40.3702	0.3289	40.3702	0.329	40.3702	0.3291
42.2924	0.3277	42.2924	0.3278	42.2924	0.3278	42.2924	0.3279	42.2924	0.3279	42.2924	0.328	42.2924	0.328
44.3062	0.327	44.3062	0.327	44.3062	0.3271	44.3062	0.3271	44.3062	0.3271	44.3062	0.3271	44.3062	0.3272
46.4159	0.3263	46.4159	0.3264	46.4159	0.3264	46.4159	0.3264	46.4159	0.3264	46.4159	0.3264	46.4159	0.3265
48.626	0.3257	48.626	0.3257	48.626	0.3257	48.626	0.3257	48.626	0.3258	48.626	0.3258	48.626	0.3258
50.9414	0.3252	50.9414	0.3252	50.9414	0.3252	50.9414	0.3252	50.9414	0.3252	50.9414	0.3252	50.9414	0.3252

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTWW068.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 68
 SLAB-WALL JOINT North-South Responses
 Elevation 0 ft.
 Line 12.5 & H

Damping		0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.	Damping Freq.	Accel.
0.1098	0.0456	0.1098	0.0394	0.1098	0.0365	0.1098	0.0343	0.1098	0.0327	0.1098	0.0305	0.1098	0.0305	0.1098	0.028
0.115	0.0555	0.115	0.0492	0.115	0.0464	0.115	0.0438	0.115	0.0416	0.115	0.0378	0.115	0.0378	0.115	0.0332
0.1204	0.0647	0.1204	0.058	0.1204	0.0542	0.1204	0.0508	0.1204	0.0478	0.1204	0.0424	0.1204	0.0424	0.1204	0.036
0.1262	0.0719	0.1262	0.0617	0.1262	0.0571	0.1262	0.0532	0.1262	0.0497	0.1262	0.0437	0.1262	0.0437	0.1262	0.0378
0.1322	0.0761	0.1322	0.0652	0.1322	0.06	0.1322	0.0561	0.1322	0.0525	0.1322	0.0466	0.1322	0.0466	0.1322	0.0398
0.1385	0.0785	0.1385	0.0671	0.1385	0.0608	0.1385	0.0561	0.1385	0.0525	0.1385	0.0466	0.1385	0.0466	0.1385	0.0398
0.1451	0.0789	0.1451	0.0676	0.1451	0.0612	0.1451	0.0561	0.1451	0.0525	0.1451	0.0466	0.1451	0.0466	0.1451	0.0407
0.152	0.0789	0.152	0.0676	0.152	0.0612	0.152	0.0564	0.152	0.0534	0.152	0.0482	0.152	0.0482	0.152	0.0426
0.1592	0.0789	0.1592	0.0676	0.1592	0.0612	0.1592	0.0564	0.1592	0.0534	0.1592	0.0482	0.1592	0.0482	0.1592	0.0435
0.1668	0.0789	0.1668	0.0676	0.1668	0.0612	0.1668	0.0564	0.1668	0.0534	0.1668	0.0482	0.1668	0.0482	0.1668	0.0435
0.1748	0.0789	0.1748	0.0676	0.1748	0.0612	0.1748	0.0564	0.1748	0.0534	0.1748	0.0482	0.1748	0.0482	0.1748	0.0435
0.1831	0.0789	0.1831	0.0676	0.1831	0.0612	0.1831	0.0564	0.1831	0.0534	0.1831	0.0482	0.1831	0.0482	0.1831	0.0435
0.1918	0.0789	0.1918	0.0676	0.1918	0.0612	0.1918	0.0562	0.1918	0.0532	0.1918	0.048	0.1918	0.048	0.1918	0.0435
0.2009	0.0789	0.2009	0.0676	0.2009	0.0612	0.2009	0.0562	0.2009	0.0532	0.2009	0.0478	0.2009	0.0478	0.2009	0.0435
0.2105	0.0734	0.2105	0.0632	0.2105	0.0596	0.2105	0.0562	0.2105	0.0532	0.2105	0.049	0.2105	0.049	0.2105	0.0468
0.2205	0.0683	0.2205	0.0622	0.2205	0.0587	0.2205	0.0559	0.2205	0.0547	0.2205	0.0527	0.2205	0.0527	0.2205	0.0501
0.231	0.0647	0.231	0.0623	0.231	0.0609	0.231	0.0595	0.231	0.0583	0.231	0.056	0.231	0.056	0.231	0.0532
0.242	0.0759	0.242	0.0684	0.242	0.0646	0.242	0.0627	0.242	0.0614	0.242	0.0589	0.242	0.0589	0.242	0.0561
0.2535	0.1097	0.2535	0.0914	0.2535	0.0822	0.2535	0.0748	0.2535	0.069	0.2535	0.0615	0.2535	0.0615	0.2535	0.0585
0.2656	0.1215	0.2656	0.0949	0.2656	0.0825	0.2656	0.0748	0.2656	0.069	0.2656	0.0636	0.2656	0.0636	0.2656	0.0602
0.2783	0.1215	0.2783	0.0949	0.2783	0.0825	0.2783	0.0776	0.2783	0.0734	0.2783	0.0664	0.2783	0.0664	0.2783	0.0612
0.2915	0.1215	0.2915	0.1001	0.2915	0.0932	0.2915	0.0871	0.2915	0.0817	0.2915	0.0726	0.2915	0.0726	0.2915	0.0624
0.3054	0.1358	0.3054	0.1179	0.3054	0.1078	0.3054	0.099	0.3054	0.0914	0.3054	0.0795	0.3054	0.0795	0.3054	0.0671
0.3199	0.164	0.3199	0.1266	0.3199	0.1152	0.3199	0.1054	0.3199	0.097	0.3199	0.0837	0.3199	0.0837	0.3199	0.0716
0.3352	0.1864	0.3352	0.1319	0.3352	0.1152	0.3352	0.1054	0.3352	0.097	0.3352	0.0843	0.3352	0.0843	0.3352	0.0745
0.3511	0.2149	0.3511	0.1624	0.3511	0.1375	0.3511	0.1182	0.3511	0.1047	0.3511	0.0907	0.3511	0.0907	0.3511	0.0762
0.3678	0.2149	0.3678	0.1624	0.3678	0.1375	0.3678	0.1252	0.3678	0.1164	0.3678	0.104	0.3678	0.104	0.3678	0.09

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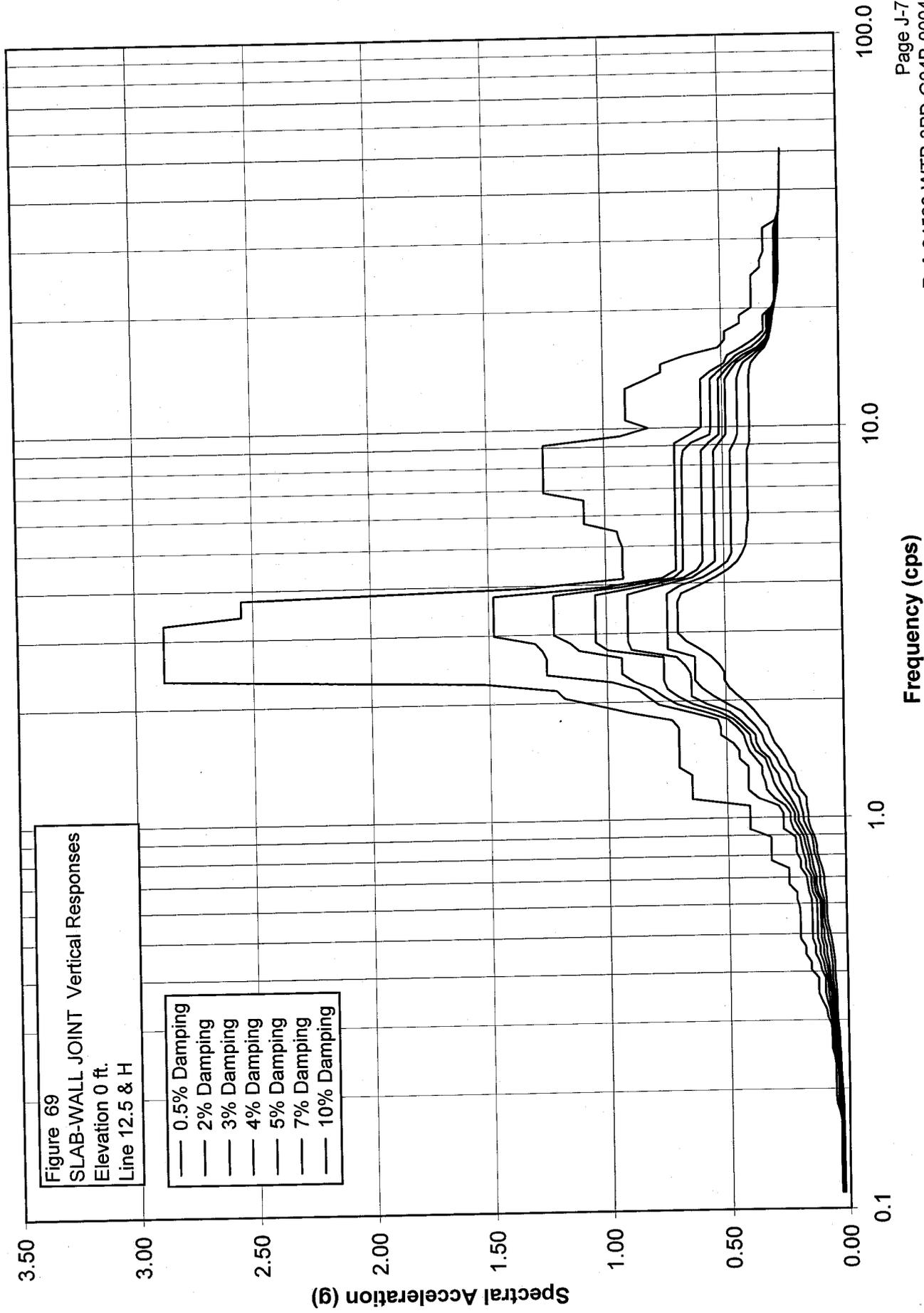
0.3853	0.2149	0.3853	0.1624	0.3853	0.1446	0.3853	0.1356	0.3853	0.1276	0.3853	0.1141	0.3853	0.0986
0.4037	0.2149	0.4037	0.1624	0.4037	0.1446	0.4037	0.1356	0.4037	0.1276	0.4037	0.1144	0.4037	0.1004
0.4229	0.2162	0.4229	0.1627	0.4229	0.1446	0.4229	0.1356	0.4229	0.1276	0.4229	0.1144	0.4229	0.1004
0.4431	0.3426	0.4431	0.2319	0.4431	0.1895	0.4431	0.1592	0.4431	0.1381	0.4431	0.1184	0.4431	0.1069
0.4642	0.3426	0.4642	0.2319	0.4642	0.1921	0.4642	0.1724	0.4642	0.1573	0.4642	0.1361	0.4642	0.1116
0.4863	0.3426	0.4863	0.2319	0.4863	0.1921	0.4863	0.1742	0.4863	0.1618	0.4863	0.1445	0.4863	0.1231
0.5094	0.3426	0.5094	0.2319	0.5094	0.1986	0.5094	0.1844	0.5094	0.1729	0.5094	0.1523	0.5094	0.1276
0.5337	0.3621	0.5337	0.2644	0.5337	0.2284	0.5337	0.2033	0.5337	0.1829	0.5337	0.1523	0.5337	0.1276
0.5591	0.3621	0.5591	0.2742	0.5591	0.238	0.5591	0.2093	0.5591	0.1863	0.5591	0.1548	0.5591	0.1353
0.5857	0.3621	0.5857	0.2791	0.5857	0.2469	0.5857	0.2206	0.5857	0.1991	0.5857	0.1715	0.5857	0.1521
0.6136	0.3621	0.6136	0.2791	0.6136	0.2469	0.6136	0.2206	0.6136	0.1993	0.6136	0.1818	0.6136	0.1615
0.6428	0.3694	0.6428	0.2791	0.6428	0.2469	0.6428	0.2213	0.6428	0.2086	0.6428	0.1933	0.6428	0.1748
0.6734	0.3694	0.6734	0.2906	0.6734	0.2657	0.6734	0.2429	0.6734	0.2288	0.6734	0.2108	0.6734	0.1877
0.7055	0.4317	0.7055	0.3543	0.7055	0.3133	0.7055	0.279	0.7055	0.2569	0.7055	0.2257	0.7055	0.1944
0.7391	0.5134	0.7391	0.4029	0.7391	0.3524	0.7391	0.3115	0.7391	0.278	0.7391	0.2281	0.7391	0.1944
0.7743	0.5998	0.7743	0.4518	0.7743	0.3831	0.7743	0.331	0.7743	0.2909	0.7743	0.2351	0.7743	0.2186
0.8111	0.7728	0.8111	0.458	0.8111	0.3831	0.8111	0.331	0.8111	0.2909	0.8111	0.2586	0.8111	0.2434
0.8497	0.7728	0.8497	0.458	0.8497	0.3831	0.8497	0.3436	0.8497	0.3138	0.8497	0.2842	0.8497	0.2671
0.8902	0.7728	0.8902	0.458	0.8902	0.388	0.8902	0.3627	0.8902	0.3375	0.8902	0.3097	0.8902	0.2901
0.9326	0.9974	0.9326	0.5856	0.9326	0.4664	0.9326	0.3986	0.9326	0.3523	0.9326	0.3345	0.9326	0.3123
0.977	0.9974	0.977	0.5962	0.977	0.5269	0.977	0.4456	0.977	0.3864	0.977	0.3568	0.977	0.3322
1.0235	0.9974	1.0235	0.5962	1.0235	0.5269	1.0235	0.4456	1.0235	0.3963	1.0235	0.375	1.0235	0.3489
1.0723	0.9974	1.0723	0.5962	1.0723	0.5269	1.0723	0.4578	1.0723	0.4362	1.0723	0.3969	1.0723	0.362
1.1233	1.022	1.1233	0.6338	1.1233	0.5306	1.1233	0.5028	1.1233	0.4775	1.1233	0.432	1.1233	0.3768
1.1768	1.022	1.1768	0.6338	1.1768	0.6129	1.1768	0.5399	1.1768	0.5088	1.1768	0.4574	1.1768	0.3977
1.2328	1.022	1.2328	0.6338	1.2328	0.6129	1.2328	0.5399	1.2328	0.5088	1.2328	0.4606	1.2328	0.4062
1.2916	1.022	1.2916	0.8562	1.2916	0.7174	1.2916	0.624	1.2916	0.5564	1.2916	0.4677	1.2916	0.4071
1.353	1.022	1.353	0.9365	1.353	0.781	1.353	0.6757	1.353	0.6023	1.353	0.5084	1.353	0.4311
1.4175	1.0636	1.4175	0.9365	1.4175	0.8087	1.4175	0.6853	1.4175	0.6424	1.4175	0.5953	1.4175	0.4919
1.485	1.2052	1.485	0.988	1.485	0.8866	1.485	0.6853	1.485	0.6424	1.485	0.6264	1.485	0.511
1.5557	1.4673	1.5557	1.0882	1.5557	0.8988	1.5557	0.6853	1.5557	0.6427	1.5557	0.6264	1.5557	0.5133
1.6298	1.4673	1.6298	1.0882	1.6298	0.8988	1.6298	0.7781	1.6298	0.7205	1.6298	0.6315	1.6298	0.5443
1.7074	1.4673	1.7074	1.0882	1.7074	0.9509	1.7074	0.8465	1.7074	0.7818	1.7074	0.6721	1.7074	0.5582
1.7887	1.9337	1.7887	1.1866	1.7887	1.0454	1.7887	0.9314	1.7887	0.8343	1.7887	0.6827	1.7887	0.5914
1.8738	1.9337	1.8738	1.1866	1.8738	1.0454	1.8738	0.9314	1.8738	0.8343	1.8738	0.6909	1.8738	0.6195
1.963	1.9337	1.963	1.2264	1.963	1.0454	1.963	0.9314	1.963	0.8343	1.963	0.7213	1.963	0.6444
2.0565	1.9337	2.0565	1.2264	2.0565	1.0454	2.0565	0.9314	2.0565	0.8343	2.0565	0.7554	2.0565	0.6649
2.1544	1.9337	2.1544	1.2264	2.1544	1.0454	2.1544	0.9314	2.1544	0.8343	2.1544	0.7745	2.1544	0.6753
2.257	1.6526	2.257	1.2264	2.257	1.0189	2.257	0.9197	2.257	0.8328	2.257	0.7876	2.257	0.6753

2.3645	1.6526	2.3645	1.2264	2.3645	0.9027	2.3645	0.8216	2.3645	0.8042	2.3645	0.7876	2.3645	0.6753
2.4771	1.4968	2.4771	1.1813	2.4771	0.9027	2.4771	0.8216	2.4771	0.8042	2.4771	0.7876	2.4771	0.6753
2.595	1.4968	2.595	1.1813	2.595	0.9027	2.595	0.8216	2.595	0.8042	2.595	0.7876	2.595	0.6753
2.7186	1.5785	2.7186	1.1813	2.7186	0.9027	2.7186	0.8216	2.7186	0.8042	2.7186	0.7876	2.7186	0.6751
2.848	1.5785	2.848	1.1813	2.848	0.9027	2.848	0.8216	2.848	0.8042	2.848	0.771	2.848	0.6514
2.9836	1.5785	2.9836	1.0072	2.9836	0.9027	2.9836	0.8216	2.9836	0.7681	2.9836	0.6806	2.9836	0.5889
3.1257	1.5785	3.1257	0.9135	3.1257	0.7834	3.1257	0.7396	3.1257	0.7002	3.1257	0.6334	3.1257	0.5581
3.2745	1.5785	3.2745	0.8453	3.2745	0.7676	3.2745	0.706	3.2745	0.6569	3.2745	0.5846	3.2745	0.5121
3.4305	1.0503	3.4305	0.7273	3.4305	0.6584	3.4305	0.6105	3.4305	0.5739	3.4305	0.5184	3.4305	0.4584
3.5938	1.0648	3.5938	0.7273	3.5938	0.6584	3.5938	0.6105	3.5938	0.5739	3.5938	0.5184	3.5938	0.4584
3.7649	1.0648	3.7649	0.7273	3.7649	0.6584	3.7649	0.6105	3.7649	0.5739	3.7649	0.5184	3.7649	0.4584
3.9442	1.0648	3.9442	0.7273	3.9442	0.6584	3.9442	0.6105	3.9442	0.5739	3.9442	0.5184	3.9442	0.4584
4.132	1.0648	4.132	0.7273	4.132	0.6584	4.132	0.6105	4.132	0.5739	4.132	0.5204	4.132	0.4587
4.3288	1.0648	4.3288	0.7521	4.3288	0.6945	4.3288	0.6539	4.3288	0.6178	4.3288	0.5556	4.3288	0.4808
4.5349	1.0648	4.5349	0.7892	4.5349	0.6979	4.5349	0.6817	4.5349	0.6557	4.5349	0.5747	4.5349	0.4858
4.7508	1.3052	4.7508	0.7892	4.7508	0.6979	4.7508	0.6817	4.7508	0.6702	4.7508	0.5747	4.7508	0.4858
4.977	1.3052	4.977	0.7892	4.977	0.6979	4.977	0.6817	4.977	0.6702	4.977	0.5747	4.977	0.4858
5.214	1.3052	5.214	0.7892	5.214	0.6979	5.214	0.6817	5.214	0.6702	5.214	0.5747	5.214	0.4858
5.4623	1.3052	5.4623	0.7892	5.4623	0.6979	5.4623	0.6817	5.4623	0.6702	5.4623	0.5747	5.4623	0.4858
5.7224	1.5193	5.7224	0.7892	5.7224	0.6979	5.7224	0.6817	5.7224	0.6702	5.7224	0.568	5.7224	0.4651
5.9948	1.5193	5.9948	0.7892	5.9948	0.6979	5.9948	0.6817	5.9948	0.6343	5.9948	0.5423	5.9948	0.4627
6.2803	1.5193	6.2803	0.7477	6.2803	0.6873	6.2803	0.6133	6.2803	0.5671	6.2803	0.5154	6.2803	0.4687
6.5793	1.5193	6.5793	0.7477	6.5793	0.6873	6.5793	0.6133	6.5793	0.5619	6.5793	0.5154	6.5793	0.4777
6.8926	1.5193	6.8926	0.7477	6.8926	0.6832	6.8926	0.6059	6.8926	0.5619	6.8926	0.5081	6.8926	0.4777
7.2208	1.5193	7.2208	0.7477	7.2208	0.6832	7.2208	0.6059	7.2208	0.5619	7.2208	0.5081	7.2208	0.4777
7.5646	1.5193	7.5646	0.7477	7.5646	0.6832	7.5646	0.5969	7.5646	0.5534	7.5646	0.5081	7.5646	0.4777
7.9248	1.5193	7.9248	0.7477	7.9248	0.6832	7.9248	0.5857	7.9248	0.5403	7.9248	0.5081	7.9248	0.4777
8.3022	1.2327	8.3022	0.6751	8.3022	0.5995	8.3022	0.5656	8.3022	0.5394	8.3022	0.508	8.3022	0.4774
8.6975	0.9775	8.6975	0.6751	8.6975	0.5995	8.6975	0.5656	8.6975	0.5394	8.6975	0.5041	8.6975	0.4735
9.1116	0.9295	9.1116	0.5846	9.1116	0.5348	9.1116	0.5193	9.1116	0.5065	9.1116	0.4867	9.1116	0.4695
9.5455	0.823	9.5455	0.5551	9.5455	0.5348	9.5455	0.5193	9.5455	0.5065	9.5455	0.4859	9.5455	0.4651
10	0.742	10	0.5551	10	0.5348	10	0.5193	10	0.5065	10	0.4859	10	0.4651
10.4762	0.742	10.4762	0.5551	10.4762	0.5348	10.4762	0.5193	10.4762	0.5065	10.4762	0.4855	10.4762	0.4609
10.975	0.742	10.975	0.5121	10.975	0.5044	10.975	0.4954	10.975	0.4859	10.975	0.4687	10.975	0.4468
11.4976	0.7067	11.4976	0.5121	11.4976	0.4824	11.4976	0.4755	11.4976	0.4693	11.4976	0.4577	11.4976	0.4423
12.045	0.7067	12.045	0.5026	12.045	0.4753	12.045	0.4651	12.045	0.4586	12.045	0.4489	12.045	0.436
12.6186	0.7067	12.6186	0.4664	12.6186	0.4572	12.6186	0.4527	12.6186	0.4481	12.6186	0.4393	12.6186	0.4274
13.2194	0.7067	13.2194	0.4531	13.2194	0.4433	13.2194	0.4378	13.2194	0.4336	13.2194	0.4263	13.2194	0.4166
13.8489	0.4879	13.8489	0.4205	13.8489	0.4173	13.8489	0.4169	13.8489	0.4158	13.8489	0.412	13.8489	0.4049

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 Cesium Nitric Acid Recovery
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14.5083	0.4879	14.5083	0.4205	14.5083	0.4147	14.5083	0.4103	14.5083	0.4068	14.5083	0.4011	14.5083	0.394
15.1991	0.4879	15.1991	0.4145	15.1991	0.4024	15.1991	0.3966	15.1991	0.393	15.1991	0.3882	15.1991	0.3825
15.9228	0.464	15.9228	0.3946	15.9228	0.3783	15.9228	0.3773	15.9228	0.3774	15.9228	0.3753	15.9228	0.3712
16.681	0.464	16.681	0.3946	16.681	0.3783	16.681	0.3694	16.681	0.366	16.681	0.3635	16.681	0.3605
17.4753	0.497	17.4753	0.3813	17.4753	0.3644	17.4753	0.3552	17.4753	0.3513	17.4753	0.352	17.4753	0.3511
18.3074	0.497	18.3074	0.3813	18.3074	0.3644	18.3074	0.3552	18.3074	0.35	18.3074	0.3471	18.3074	0.3445
19.1791	0.497	19.1791	0.3813	19.1791	0.3644	19.1791	0.3552	19.1791	0.35	19.1791	0.3449	19.1791	0.3419
20.0923	0.497	20.0923	0.3574	20.0923	0.3499	20.0923	0.347	20.0923	0.3445	20.0923	0.3407	20.0923	0.3381
21.049	0.497	21.049	0.3574	21.049	0.3499	21.049	0.347	21.049	0.3445	21.049	0.3407	21.049	0.3371
22.0513	0.497	22.0513	0.3574	22.0513	0.3499	22.0513	0.347	22.0513	0.3445	22.0513	0.3407	22.0513	0.3371
23.1013	0.497	23.1013	0.3574	23.1013	0.3521	23.1013	0.3479	23.1013	0.3445	23.1013	0.3407	23.1013	0.3371
24.2013	0.497	24.2013	0.3574	24.2013	0.3521	24.2013	0.3479	24.2013	0.3445	24.2013	0.3407	24.2013	0.3371
25.3536	0.3847	25.3536	0.3574	25.3536	0.3521	25.3536	0.3479	25.3536	0.3445	25.3536	0.3396	25.3536	0.3356
26.5609	0.3847	26.5609	0.3574	26.5609	0.3521	26.5609	0.3479	26.5609	0.3445	26.5609	0.3396	26.5609	0.3356
27.8256	0.3766	27.8256	0.3574	27.8256	0.3521	27.8256	0.3479	27.8256	0.3445	27.8256	0.3393	27.8256	0.334
29.1505	0.3766	29.1505	0.3422	29.1505	0.3374	29.1505	0.335	29.1505	0.3348	29.1505	0.3331	29.1505	0.3297
30.5386	0.3766	30.5386	0.3422	30.5386	0.3374	30.5386	0.3349	30.5386	0.3325	30.5386	0.3287	30.5386	0.3247
31.9927	0.3766	31.9927	0.3422	31.9927	0.3313	31.9927	0.326	31.9927	0.323	31.9927	0.3199	31.9927	0.3178
33.516	0.3014	33.516	0.3015	33.516	0.3016	33.516	0.3036	33.516	0.306	33.516	0.3088	33.516	0.3105
35.1119	0.3014	35.1119	0.3015	35.1119	0.3016	35.1119	0.3019	35.1119	0.3025	35.1119	0.3043	35.1119	0.3061
36.7838	0.3014	36.7838	0.3015	36.7838	0.3016	36.7838	0.3019	36.7838	0.3022	36.7838	0.3029	36.7838	0.3039
38.5353	0.3014	38.5353	0.3015	38.5353	0.3016	38.5353	0.3017	38.5353	0.3018	38.5353	0.3021	38.5353	0.3027
40.3702	0.301	40.3702	0.301	40.3702	0.3011	40.3702	0.3011	40.3702	0.3012	40.3702	0.3014	40.3702	0.3016
42.2924	0.3004	42.2924	0.3004	42.2924	0.3004	42.2924	0.3004	42.2924	0.3005	42.2924	0.3006	42.2924	0.3007
44.3062	0.2996	44.3062	0.2997	44.3062	0.2997	44.3062	0.2997	44.3062	0.2997	44.3062	0.2998	44.3062	0.2999
46.4159	0.2989	46.4159	0.2989	46.4159	0.2989	46.4159	0.2989	46.4159	0.2989	46.4159	0.299	46.4159	0.2991
48.626	0.2982	48.626	0.2982	48.626	0.2982	48.626	0.2982	48.626	0.2982	48.626	0.2982	48.626	0.2983
50.9414	0.2975	50.9414	0.2975	50.9414	0.2975	50.9414	0.2975	50.9414	0.2975	50.9414	0.2975	50.9414	0.2975

RPP-WTP Pretreatment Facility ISRS
Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTWW069.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B

Frequency (cps)
 Spectral Acceleration (g)

Figure 69
 SLAB-WALL JOINT Vertical Responses

Elevation 0 ft.
 Line 12.5 & H

0.50%		2%		3%		4%		5%		7%		10%	
Damping Freq.	Accel.												
0.1098	0.0329	0.1098	0.0294	0.1098	0.0275	0.1098	0.0263	0.1098	0.0253	0.1098	0.0236	0.1098	0.0217
0.115	0.0346	0.115	0.031	0.115	0.029	0.115	0.0271	0.115	0.0257	0.115	0.024	0.115	0.0222
0.1204	0.0347	0.1204	0.0312	0.1204	0.0291	0.1204	0.0272	0.1204	0.0257	0.1204	0.024	0.1204	0.022
0.1262	0.0349	0.1262	0.0312	0.1262	0.0291	0.1262	0.0272	0.1262	0.0257	0.1262	0.024	0.1262	0.022
0.1322	0.0349	0.1322	0.0312	0.1322	0.0291	0.1322	0.0272	0.1322	0.0257	0.1322	0.024	0.1322	0.022
0.1385	0.0349	0.1385	0.0312	0.1385	0.0291	0.1385	0.0272	0.1385	0.0259	0.1385	0.0242	0.1385	0.0222
0.1451	0.0349	0.1451	0.0312	0.1451	0.0291	0.1451	0.0272	0.1451	0.0259	0.1451	0.0242	0.1451	0.0222
0.152	0.035	0.152	0.0312	0.152	0.0291	0.152	0.0272	0.152	0.0262	0.152	0.0249	0.152	0.0235
0.1592	0.035	0.1592	0.0312	0.1592	0.0291	0.1592	0.0282	0.1592	0.0275	0.1592	0.0262	0.1592	0.0246
0.1668	0.035	0.1668	0.0312	0.1668	0.0297	0.1668	0.0289	0.1668	0.0282	0.1668	0.0269	0.1668	0.0252
0.1748	0.0422	0.1748	0.0358	0.1748	0.0323	0.1748	0.0296	0.1748	0.0282	0.1748	0.0269	0.1748	0.0257
0.1831	0.0535	0.1831	0.0445	0.1831	0.0398	0.1831	0.0358	0.1831	0.0324	0.1831	0.0272	0.1831	0.026
0.1918	0.0577	0.1918	0.0477	0.1918	0.0424	0.1918	0.038	0.1918	0.0347	0.1918	0.0318	0.1918	0.0286
0.2009	0.0577	0.2009	0.0477	0.2009	0.0424	0.2009	0.0391	0.2009	0.0373	0.2009	0.034	0.2009	0.0301
0.2105	0.0577	0.2105	0.0477	0.2105	0.0424	0.2105	0.0391	0.2105	0.0373	0.2105	0.0347	0.2105	0.032
0.2205	0.0577	0.2205	0.0477	0.2205	0.0432	0.2205	0.0416	0.2205	0.0402	0.2205	0.0376	0.2205	0.0345
0.231	0.0579	0.231	0.0493	0.231	0.0463	0.231	0.0438	0.231	0.0421	0.231	0.0391	0.231	0.0354
0.242	0.0624	0.242	0.0554	0.242	0.0513	0.242	0.0476	0.242	0.0442	0.242	0.0391	0.242	0.0354
0.2535	0.0713	0.2535	0.0623	0.2535	0.0574	0.2535	0.0532	0.2535	0.0496	0.2535	0.0439	0.2535	0.038
0.2656	0.0713	0.2656	0.0623	0.2656	0.0574	0.2656	0.0532	0.2656	0.0496	0.2656	0.0439	0.2656	0.038
0.2783	0.0713	0.2783	0.0623	0.2783	0.0574	0.2783	0.0532	0.2783	0.0496	0.2783	0.0439	0.2783	0.0395
0.2915	0.0742	0.2915	0.0666	0.2915	0.0624	0.2915	0.0587	0.2915	0.0554	0.2915	0.0501	0.2915	0.0441
0.3054	0.0875	0.3054	0.0758	0.3054	0.0693	0.3054	0.0641	0.3054	0.0603	0.3054	0.0539	0.3054	0.0468
0.3199	0.0921	0.3199	0.0797	0.3199	0.0728	0.3199	0.067	0.3199	0.0619	0.3199	0.0539	0.3199	0.0468
0.3352	0.1105	0.3352	0.0889	0.3352	0.0786	0.3352	0.0705	0.3352	0.0641	0.3352	0.0551	0.3352	0.0471
0.3511	0.1251	0.3511	0.0953	0.3511	0.0825	0.3511	0.0725	0.3511	0.0662	0.3511	0.0575	0.3511	0.0488
0.3678	0.1251	0.3678	0.0953	0.3678	0.0848	0.3678	0.0775	0.3678	0.0712	0.3678	0.0613	0.3678	0.0508

Forced Circulation Vacuum Evaporator System

0.3853	0.1251	0.3853	0.0956	0.3853	0.0879	0.3853	0.0806	0.3853	0.0751	0.3853	0.0653	0.3853	0.0543
0.4037	0.1549	0.4037	0.1124	0.4037	0.0974	0.4037	0.0858	0.4037	0.0767	0.4037	0.0653	0.4037	0.0543
0.4229	0.1549	0.4229	0.1189	0.4229	0.1035	0.4229	0.0912	0.4229	0.0812	0.4229	0.0667	0.4229	0.0543
0.4431	0.1769	0.4431	0.1354	0.4431	0.1155	0.4431	0.0999	0.4431	0.0876	0.4431	0.0699	0.4431	0.0582
0.4642	0.1769	0.4642	0.1354	0.4642	0.1155	0.4642	0.0999	0.4642	0.0876	0.4642	0.0733	0.4642	0.0627
0.4863	0.1981	0.4863	0.1469	0.4863	0.1252	0.4863	0.1094	0.4863	0.0976	0.4863	0.0813	0.4863	0.0673
0.5094	0.1981	0.5094	0.1469	0.5094	0.1252	0.5094	0.1094	0.5094	0.0976	0.5094	0.0852	0.5094	0.0741
0.5337	0.1981	0.5337	0.1469	0.5337	0.1252	0.5337	0.1111	0.5337	0.1042	0.5337	0.0936	0.5337	0.0818
0.5591	0.1981	0.5591	0.1469	0.5591	0.1252	0.5591	0.1111	0.5591	0.1042	0.5591	0.0955	0.5591	0.0843
0.5857	0.1998	0.5857	0.1484	0.5857	0.1265	0.5857	0.1111	0.5857	0.1044	0.5857	0.0955	0.5857	0.0843
0.6136	0.2095	0.6136	0.1484	0.6136	0.1265	0.6136	0.1134	0.6136	0.105	0.6136	0.0955	0.6136	0.0843
0.6428	0.2095	0.6428	0.1592	0.6428	0.1438	0.6428	0.1313	0.6428	0.1209	0.6428	0.105	0.6428	0.0888
0.6734	0.2431	0.6734	0.1645	0.6734	0.1488	0.6734	0.1376	0.6734	0.1279	0.6734	0.1116	0.6734	0.0934
0.7055	0.2431	0.7055	0.1697	0.7055	0.1488	0.7055	0.1376	0.7055	0.1279	0.7055	0.1119	0.7055	0.0943
0.7391	0.2431	0.7391	0.1929	0.7391	0.1714	0.7391	0.1533	0.7391	0.1383	0.7391	0.1155	0.7391	0.102
0.7743	0.3175	0.7743	0.1929	0.7743	0.1719	0.7743	0.1571	0.7743	0.1443	0.7743	0.1242	0.7743	0.1138
0.8111	0.3175	0.8111	0.209	0.8111	0.1824	0.8111	0.1628	0.8111	0.1507	0.8111	0.1354	0.8111	0.1227
0.8497	0.3175	0.8497	0.209	0.8497	0.1891	0.8497	0.1726	0.8497	0.1587	0.8497	0.1381	0.8497	0.1251
0.8902	0.3175	0.8902	0.2137	0.8902	0.1942	0.8902	0.1779	0.8902	0.1643	0.8902	0.143	0.8902	0.1324
0.9326	0.4048	0.9326	0.2629	0.9326	0.221	0.9326	0.1969	0.9326	0.1816	0.9326	0.1631	0.9326	0.1478
0.977	0.4048	0.977	0.2629	0.977	0.2331	0.977	0.2144	0.977	0.1991	0.977	0.1772	0.977	0.1571
1.0235	0.4048	1.0235	0.2629	1.0235	0.2331	1.0235	0.2144	1.0235	0.1995	1.0235	0.1799	1.0235	0.1575
1.0723	0.4048	1.0723	0.2835	1.0723	0.2555	1.0723	0.2329	1.0723	0.2147	1.0723	0.1885	1.0723	0.1632
1.1233	0.6478	1.1233	0.3684	1.1233	0.3014	1.1233	0.2603	1.1233	0.2316	1.1233	0.1946	1.1233	0.1635
1.1768	0.6478	1.1768	0.4092	1.1768	0.3316	1.1768	0.2847	1.1768	0.2551	1.1768	0.2216	1.1768	0.1911
1.2328	0.6478	1.2328	0.4092	1.2328	0.338	1.2328	0.3029	1.2328	0.2737	1.2328	0.2287	1.2328	0.2043
1.2916	0.6478	1.2916	0.4092	1.2916	0.3509	1.2916	0.3127	1.2916	0.2812	1.2916	0.2453	1.2916	0.2123
1.353	0.7014	1.353	0.4092	1.353	0.3509	1.353	0.3253	1.353	0.3066	1.353	0.2739	1.353	0.2367
1.4175	0.7014	1.4175	0.4461	1.4175	0.3788	1.4175	0.3371	1.4175	0.3191	1.4175	0.2878	1.4175	0.2509
1.485	0.7014	1.485	0.4461	1.485	0.4051	1.485	0.3792	1.485	0.3557	1.485	0.3154	1.485	0.27
1.5557	0.7014	1.5557	0.4721	1.5557	0.4179	1.5557	0.3954	1.5557	0.3754	1.5557	0.3399	1.5557	0.2966
1.6298	0.7014	1.6298	0.5225	1.6298	0.4273	1.6298	0.4017	1.6298	0.3782	1.6298	0.3494	1.6298	0.3129
1.7074	0.7014	1.7074	0.5225	1.7074	0.4561	1.7074	0.4333	1.7074	0.4115	1.7074	0.373	1.7074	0.3246
1.7887	0.729	1.7887	0.5356	1.7887	0.4929	1.7887	0.4698	1.7887	0.4473	1.7887	0.405	1.7887	0.3536
1.8738	0.8996	1.8738	0.6537	1.8738	0.5881	1.8738	0.5321	1.8738	0.4865	1.8738	0.4344	1.8738	0.3787
1.963	1.0379	1.963	0.7829	1.963	0.7049	1.963	0.6387	1.963	0.5812	1.963	0.4957	1.963	0.4097
2.0565	1.1799	2.0565	0.8292	2.0565	0.7618	2.0565	0.7008	2.0565	0.6444	2.0565	0.5516	2.0565	0.4489
2.1544	1.2145	2.1544	0.8698	2.1544	0.8071	2.1544	0.7471	2.1544	0.6444	2.1544	0.5977	2.1544	0.4842
2.257	1.5239	2.257	0.9814	2.257	0.887	2.257	0.7601	2.257	0.6444	2.257	0.6292	2.257	0.5055

2.3645	2.8799	2.3645	1.2551	2.3645	0.9373	2.3645	0.7601	2.3645	0.6498	2.3645	0.6292	2.3645	0.5055
2.4771	2.8799	2.4771	1.2551	2.4771	0.9373	2.4771	0.7601	2.4771	0.6732	2.4771	0.6292	2.4771	0.5278
2.595	2.8799	2.595	1.2551	2.595	0.9373	2.595	0.7601	2.595	0.706	2.595	0.6292	2.595	0.5594
2.7186	2.8799	2.7186	1.2732	2.7186	1.1168	2.7186	0.9952	2.7186	0.8955	2.7186	0.7427	2.7186	0.6096
2.848	2.8799	2.848	1.3029	2.848	1.1559	2.848	1.0459	2.848	0.9094	2.848	0.7428	2.848	0.6654
2.9836	2.8799	2.9836	1.4788	2.9836	1.2234	2.9836	1.0459	2.9836	0.9094	2.9836	0.7428	2.9836	0.6994
3.1257	2.8799	3.1257	1.4788	3.1257	1.2234	3.1257	1.0459	3.1257	0.9094	3.1257	0.7428	3.1257	0.6994
3.2745	2.8799	3.2745	1.4788	3.2745	1.2234	3.2745	1.0459	3.2745	0.9094	3.2745	0.7428	3.2745	0.6994
3.4305	2.549	3.4305	1.4788	3.4305	1.2234	3.4305	1.0459	3.4305	0.9094	3.4305	0.7428	3.4305	0.6994
3.5938	2.549	3.5938	1.4788	3.5938	1.2234	3.5938	1.0459	3.5938	0.9094	3.5938	0.7428	3.5938	0.6994
3.7649	2.549	3.7649	1.4788	3.7649	1.2234	3.7649	1.0459	3.7649	0.9094	3.7649	0.7428	3.7649	0.6835
3.9442	1.336	3.9442	1.0077	3.9442	0.9273	3.9442	0.8498	3.9442	0.779	3.9442	0.6898	3.9442	0.6087
4.132	0.9261	4.132	0.7625	4.132	0.7136	4.132	0.6724	4.132	0.6358	4.132	0.5904	4.132	0.5372
4.3288	0.9277	4.3288	0.7029	4.3288	0.6731	4.3288	0.6136	4.3288	0.5832	4.3288	0.5315	4.3288	0.4822
4.5349	0.9277	4.5349	0.7029	4.5349	0.6731	4.5349	0.5902	4.5349	0.5371	4.5349	0.4844	4.5349	0.4432
4.7508	0.9277	4.7508	0.7029	4.7508	0.6731	4.7508	0.5902	4.7508	0.5371	4.7508	0.4673	4.7508	0.4215
4.977	0.9277	4.977	0.7029	4.977	0.6731	4.977	0.5902	4.977	0.5371	4.977	0.4673	4.977	0.4074
5.214	0.9431	5.214	0.7029	5.214	0.6731	5.214	0.5902	5.214	0.5371	5.214	0.4673	5.214	0.4019
5.4623	0.9511	5.4623	0.7029	5.4623	0.6731	5.4623	0.5902	5.4623	0.5371	5.4623	0.4673	5.4623	0.4019
5.7224	1.089	5.7224	0.7029	5.7224	0.6731	5.7224	0.5902	5.7224	0.5371	5.7224	0.4673	5.7224	0.3968
5.9948	1.089	5.9948	0.7029	5.9948	0.6731	5.9948	0.5902	5.9948	0.5371	5.9948	0.4673	5.9948	0.3958
6.2803	1.089	6.2803	0.7029	6.2803	0.6731	6.2803	0.5902	6.2803	0.5371	6.2803	0.4673	6.2803	0.3958
6.5793	1.089	6.5793	0.7029	6.5793	0.6731	6.5793	0.5902	6.5793	0.5371	6.5793	0.4673	6.5793	0.3958
6.8926	1.2586	6.8926	0.7029	6.8926	0.6731	6.8926	0.5902	6.8926	0.5371	6.8926	0.4673	6.8926	0.3958
7.2208	1.2586	7.2208	0.7029	7.2208	0.6731	7.2208	0.5902	7.2208	0.5371	7.2208	0.4673	7.2208	0.3958
7.5646	1.2586	7.5646	0.7029	7.5646	0.6731	7.5646	0.5902	7.5646	0.5371	7.5646	0.4673	7.5646	0.3958
7.9248	1.2586	7.9248	0.7029	7.9248	0.6731	7.9248	0.5902	7.9248	0.5371	7.9248	0.4673	7.9248	0.3958
8.3022	1.2586	8.3022	0.7029	8.3022	0.6731	8.3022	0.5902	8.3022	0.5371	8.3022	0.4673	8.3022	0.3958
8.6975	1.2586	8.6975	0.7029	8.6975	0.6666	8.6975	0.5902	8.6975	0.5371	8.6975	0.4673	8.6975	0.3958
9.1116	1.2586	9.1116	0.7029	9.1116	0.6351	9.1116	0.5581	9.1116	0.5128	9.1116	0.4488	9.1116	0.3861
9.5455	0.9314	9.5455	0.6406	9.5455	0.5535	9.5455	0.5142	9.5455	0.4846	9.5455	0.4367	9.5455	0.3855
10	0.813	10	0.589	10	0.5484	10	0.5142	10	0.4846	10	0.4367	10	0.3855
10.4762	0.9068	10.4762	0.589	10.4762	0.5484	10.4762	0.5142	10.4762	0.4846	10.4762	0.4367	10.4762	0.3855
10.975	0.9068	10.975	0.589	10.975	0.5484	10.975	0.5142	10.975	0.4846	10.975	0.4367	10.975	0.3855
11.4976	0.9068	11.4976	0.589	11.4976	0.5484	11.4976	0.5142	11.4976	0.4846	11.4976	0.4367	11.4976	0.3855
12.045	0.9068	12.045	0.589	12.045	0.5484	12.045	0.5142	12.045	0.4846	12.045	0.4367	12.045	0.3855
12.6186	0.9068	12.6186	0.589	12.6186	0.5484	12.6186	0.5142	12.6186	0.4846	12.6186	0.4367	12.6186	0.3855
13.2194	0.8261	13.2194	0.589	13.2194	0.5484	13.2194	0.5142	13.2194	0.4846	13.2194	0.4367	13.2194	0.3855
13.8489	0.7566	13.8489	0.5475	13.8489	0.5135	13.8489	0.4864	13.8489	0.4635	13.8489	0.4259	13.8489	0.384

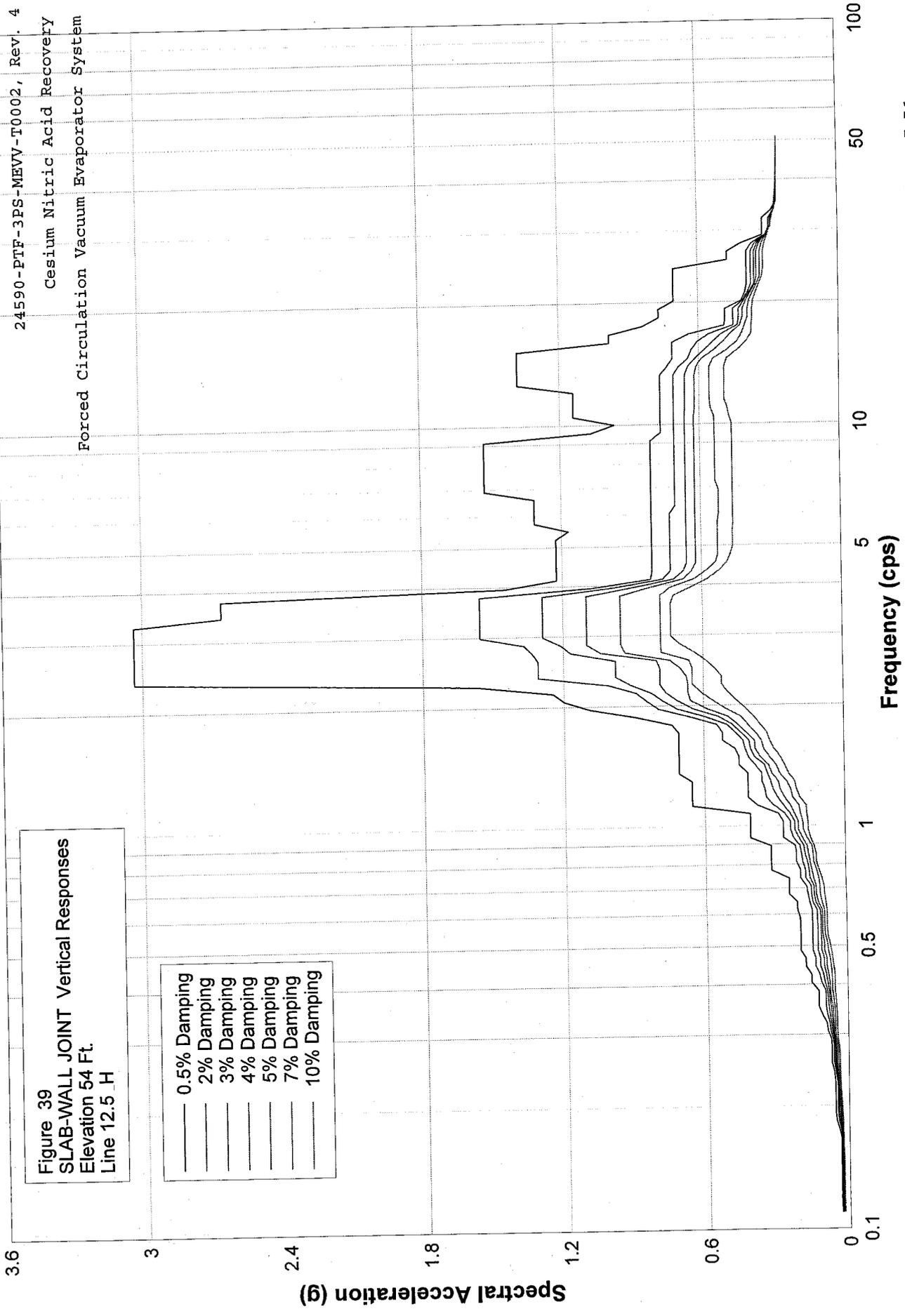
24590-PTF-3PS-MEW-T0002, Rev. 4
Cesium Nitric Acid Recovery

Forced Circulation Vacuum Evaporator System

14.5083	0.7566	14.5083	0.4885	14.5083	0.4717	14.5083	0.4548	14.5083	0.4385	14.5083	0.4093	14.5083	0.3747
15.1991	0.6596	15.1991	0.4732	15.1991	0.4364	15.1991	0.4094	15.1991	0.3887	15.1991	0.3655	15.1991	0.3466
15.9228	0.513	15.9228	0.4119	15.9228	0.3714	15.9228	0.3441	15.9228	0.3341	15.9228	0.3257	15.9228	0.3144
16.681	0.4842	16.681	0.3603	16.681	0.331	16.681	0.3117	16.681	0.3017	16.681	0.3008	16.681	0.2976
17.4753	0.4842	17.4753	0.3202	17.4753	0.3054	17.4753	0.2977	17.4753	0.2955	17.4753	0.2928	17.4753	0.2898
18.3074	0.4207	18.3074	0.3202	18.3074	0.3054	18.3074	0.2977	18.3074	0.2924	18.3074	0.2879	18.3074	0.2848
19.1791	0.4207	19.1791	0.3202	19.1791	0.3054	19.1791	0.2977	19.1791	0.2924	19.1791	0.286	19.1791	0.2804
20.0923	0.3705	20.0923	0.2829	20.0923	0.2805	20.0923	0.2802	20.0923	0.2794	20.0923	0.2772	20.0923	0.274
21.049	0.3705	21.049	0.2706	21.049	0.2695	21.049	0.2693	21.049	0.269	21.049	0.2686	21.049	0.2674
22.0513	0.3705	22.0513	0.2705	22.0513	0.2681	22.0513	0.2665	22.0513	0.2652	22.0513	0.2634	22.0513	0.2619
23.1013	0.3705	23.1013	0.2713	23.1013	0.264	23.1013	0.2589	23.1013	0.2573	23.1013	0.2578	23.1013	0.2579
24.2013	0.3705	24.2013	0.2713	24.2013	0.264	24.2013	0.2589	24.2013	0.2571	24.2013	0.2555	24.2013	0.2548
25.3536	0.3322	25.3536	0.2713	25.3536	0.264	25.3536	0.2588	25.3536	0.2565	25.3536	0.2552	25.3536	0.2539
26.5609	0.3322	26.5609	0.2713	26.5609	0.264	26.5609	0.2614	26.5609	0.2597	26.5609	0.257	26.5609	0.2544
27.8256	0.3173	27.8256	0.2713	27.8256	0.264	27.8256	0.2614	27.8256	0.2597	27.8256	0.257	27.8256	0.2544
29.1505	0.3173	29.1505	0.2708	29.1505	0.263	29.1505	0.2614	29.1505	0.2597	29.1505	0.257	29.1505	0.2544
30.5386	0.3173	30.5386	0.2708	30.5386	0.263	30.5386	0.2614	30.5386	0.2597	30.5386	0.257	30.5386	0.2544
31.9927	0.3173	31.9927	0.2708	31.9927	0.263	31.9927	0.2614	31.9927	0.2597	31.9927	0.257	31.9927	0.2544
33.516	0.2599	33.516	0.2631	33.516	0.2624	33.516	0.2607	33.516	0.2589	33.516	0.256	33.516	0.2535
35.1119	0.2503	35.1119	0.2513	35.1119	0.2518	35.1119	0.2521	35.1119	0.2521	35.1119	0.2519	35.1119	0.2511
36.7838	0.2484	36.7838	0.2486	36.7838	0.2488	36.7838	0.2489	36.7838	0.249	36.7838	0.249	36.7838	0.2488
38.5353	0.2468	38.5353	0.2469	38.5353	0.247	38.5353	0.247	38.5353	0.2471	38.5353	0.2471	38.5353	0.247
40.3702	0.2455	40.3702	0.2455	40.3702	0.2456	40.3702	0.2456	40.3702	0.2456	40.3702	0.2456	40.3702	0.2456
42.2924	0.2443	42.2924	0.2444	42.2924	0.2444	42.2924	0.2444	42.2924	0.2444	42.2924	0.2444	42.2924	0.2444
44.3062	0.2433	44.3062	0.2434	44.3062	0.2434	44.3062	0.2434	44.3062	0.2434	44.3062	0.2434	44.3062	0.2434
46.4159	0.2424	46.4159	0.2424	46.4159	0.2425	46.4159	0.2425	46.4159	0.2425	46.4159	0.2425	46.4159	0.2425
48.626	0.2416	48.626	0.2416	48.626	0.2416	48.626	0.2416	48.626	0.2417	48.626	0.2417	48.626	0.2417
50.9414	0.2409	50.9414	0.2409	50.9414	0.2409	50.9414	0.2409	50.9414	0.2409	50.9414	0.2409	50.9414	0.2409

RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B



S_PTWW039.grf
 RPP-WTP Pretreatment Facility ISRS
 Calc No.: 24590-PTF-S0C-S15T-00005, Rev. 0B
 Frequency (cps)
 Spectral Acceleration (g)
 Figure 39
 SLAB-WALL JOINT Vertical Responses
 Elevation 54 Ft.
 Line 12.5 & H

Damping 0.50%		Damping 2%		Damping 3%		Damping 4%		Damping 5%		Damping 7%		Damping 10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0329	0.1098	0.0295	0.1098	0.0275	0.1098	0.0264	0.1098	0.0254	0.1098	0.0236	0.1098	0.0217
0.115	0.0347	0.115	0.0311	0.115	0.029	0.115	0.0271	0.115	0.0257	0.115	0.024	0.115	0.022
0.1204	0.0348	0.1204	0.0312	0.1204	0.0291	0.1204	0.0272	0.1204	0.0257	0.1204	0.024	0.1204	0.022
0.1262	0.0349	0.1262	0.0312	0.1262	0.0291	0.1262	0.0272	0.1262	0.0257	0.1262	0.024	0.1262	0.022
0.1322	0.0349	0.1322	0.0312	0.1322	0.0291	0.1322	0.0272	0.1322	0.0257	0.1322	0.024	0.1322	0.022
0.1385	0.0349	0.1385	0.0312	0.1385	0.0291	0.1385	0.0272	0.1385	0.0258	0.1385	0.0241	0.1385	0.0222
0.1451	0.0349	0.1451	0.0312	0.1451	0.0291	0.1451	0.0272	0.1451	0.0258	0.1451	0.0241	0.1451	0.0222
0.152	0.0349	0.152	0.0312	0.152	0.0291	0.152	0.0272	0.152	0.0262	0.152	0.0249	0.152	0.0235
0.1592	0.0349	0.1592	0.0312	0.1592	0.0291	0.1592	0.0282	0.1592	0.0276	0.1592	0.0263	0.1592	0.0247
0.1668	0.0349	0.1668	0.0312	0.1668	0.0297	0.1668	0.0289	0.1668	0.0282	0.1668	0.0269	0.1668	0.0252
0.1748	0.0423	0.1748	0.0358	0.1748	0.0324	0.1748	0.0296	0.1748	0.0282	0.1748	0.0269	0.1748	0.0258
0.1831	0.0535	0.1831	0.0445	0.1831	0.0398	0.1831	0.0358	0.1831	0.0324	0.1831	0.0272	0.1831	0.0261
0.1918	0.0577	0.1918	0.0477	0.1918	0.0424	0.1918	0.038	0.1918	0.0347	0.1918	0.0319	0.1918	0.0286
0.2009	0.0577	0.2009	0.0477	0.2009	0.0424	0.2009	0.0392	0.2009	0.0373	0.2009	0.034	0.2009	0.0302
0.2105	0.0577	0.2105	0.0477	0.2105	0.0424	0.2105	0.0392	0.2105	0.0374	0.2105	0.0347	0.2105	0.0322
0.2205	0.0577	0.2205	0.0477	0.2205	0.0433	0.2205	0.0417	0.2205	0.0402	0.2205	0.0378	0.2205	0.0347
0.231	0.0582	0.231	0.0494	0.231	0.0464	0.231	0.0439	0.231	0.0422	0.231	0.0393	0.231	0.0356
0.242	0.0624	0.242	0.0554	0.242	0.0513	0.242	0.0476	0.242	0.0442	0.242	0.0393	0.242	0.0356
0.2535	0.0714	0.2535	0.0624	0.2535	0.0575	0.2535	0.0533	0.2535	0.0497	0.2535	0.044	0.2535	0.0382
0.2656	0.0714	0.2656	0.0624	0.2656	0.0575	0.2656	0.0533	0.2656	0.0497	0.2656	0.044	0.2656	0.0382
0.2783	0.0714	0.2783	0.0624	0.2783	0.0575	0.2783	0.0533	0.2783	0.0497	0.2783	0.044	0.2783	0.0396
0.2915	0.0742	0.2915	0.0667	0.2915	0.0624	0.2915	0.0587	0.2915	0.0555	0.2915	0.0503	0.2915	0.0443
0.3054	0.0876	0.3054	0.0758	0.3054	0.0693	0.3054	0.0642	0.3054	0.0604	0.3054	0.054	0.3054	0.0468
0.3199	0.0922	0.3199	0.0797	0.3199	0.0729	0.3199	0.067	0.3199	0.0619	0.3199	0.054	0.3199	0.0468
0.3352	0.1106	0.3352	0.0891	0.3352	0.0787	0.3352	0.0707	0.3352	0.0643	0.3352	0.0554	0.3352	0.0474
0.3511	0.1252	0.3511	0.0954	0.3511	0.0826	0.3511	0.0726	0.3511	0.0664	0.3511	0.0577	0.3511	0.0491
0.3678	0.1252	0.3678	0.0954	0.3678	0.0849	0.3678	0.0776	0.3678	0.0714	0.3678	0.0615	0.3678	0.0511

Forced Circulation Vacuum Evaporator System

0.3853	0.1252	0.3853	0.0957	0.3853	0.088	0.3853	0.0808	0.3853	0.0753	0.3853	0.0655	0.3853	0.0545
0.4037	0.1549	0.4037	0.1125	0.4037	0.0975	0.4037	0.0859	0.4037	0.0768	0.4037	0.0655	0.4037	0.0545
0.4229	0.1549	0.4229	0.1191	0.4229	0.1036	0.4229	0.0913	0.4229	0.0813	0.4229	0.067	0.4229	0.0545
0.4431	0.1771	0.4431	0.1356	0.4431	0.1157	0.4431	0.1002	0.4431	0.0879	0.4431	0.0702	0.4431	0.0586
0.4642	0.1771	0.4642	0.1356	0.4642	0.1157	0.4642	0.1002	0.4642	0.0879	0.4642	0.0736	0.4642	0.063
0.4863	0.1984	0.4863	0.1471	0.4863	0.1253	0.4863	0.1095	0.4863	0.0977	0.4863	0.0814	0.4863	0.0676
0.5094	0.1984	0.5094	0.1471	0.5094	0.1253	0.5094	0.1095	0.5094	0.0977	0.5094	0.0857	0.5094	0.0743
0.5337	0.1984	0.5337	0.1471	0.5337	0.1253	0.5337	0.1112	0.5337	0.1045	0.5337	0.0939	0.5337	0.0821
0.5591	0.1984	0.5591	0.1471	0.5591	0.1253	0.5591	0.1112	0.5591	0.1045	0.5591	0.0958	0.5591	0.0845
0.5857	0.1995	0.5857	0.1484	0.5857	0.1266	0.5857	0.1112	0.5857	0.1045	0.5857	0.0958	0.5857	0.0845
0.6136	0.2101	0.6136	0.1484	0.6136	0.1266	0.6136	0.1137	0.6136	0.1053	0.6136	0.0958	0.6136	0.0845
0.6428	0.2101	0.6428	0.1595	0.6428	0.1442	0.6428	0.1317	0.6428	0.1213	0.6428	0.1054	0.6428	0.0891
0.6734	0.2435	0.6734	0.1649	0.6734	0.1492	0.6734	0.1381	0.6734	0.1282	0.6734	0.1119	0.6734	0.0936
0.7055	0.2435	0.7055	0.1702	0.7055	0.1492	0.7055	0.1381	0.7055	0.1282	0.7055	0.1123	0.7055	0.0948
0.7391	0.2435	0.7391	0.1938	0.7391	0.1722	0.7391	0.1541	0.7391	0.1391	0.7391	0.1163	0.7391	0.1027
0.7743	0.3186	0.7743	0.1938	0.7743	0.1727	0.7743	0.158	0.7743	0.1452	0.7743	0.1249	0.7743	0.1147
0.8111	0.3186	0.8111	0.2103	0.8111	0.1832	0.8111	0.164	0.8111	0.1519	0.8111	0.1366	0.8111	0.1239
0.8497	0.3186	0.8497	0.2103	0.8497	0.1896	0.8497	0.1732	0.8497	0.1595	0.8497	0.139	0.8497	0.1264
0.8902	0.3186	0.8902	0.2147	0.8902	0.1952	0.8902	0.1789	0.8902	0.1652	0.8902	0.1439	0.8902	0.1339
0.9326	0.4069	0.9326	0.2647	0.9326	0.2228	0.9326	0.1987	0.9326	0.1834	0.9326	0.1649	0.9326	0.1495
0.977	0.4069	0.977	0.2647	0.977	0.235	0.977	0.2164	0.977	0.2011	0.977	0.179	0.977	0.159
1.0235	0.4069	1.0235	0.2647	1.0235	0.235	1.0235	0.2164	1.0235	0.2012	1.0235	0.1817	1.0235	0.1592
1.0723	0.4069	1.0723	0.2863	1.0723	0.2582	1.0723	0.2353	1.0723	0.2171	1.0723	0.1909	1.0723	0.1654
1.1233	0.6549	1.1233	0.3732	1.1233	0.3044	1.1233	0.263	1.1233	0.2342	1.1233	0.1968	1.1233	0.1659
1.1768	0.6549	1.1768	0.414	1.1768	0.3355	1.1768	0.2883	1.1768	0.2581	1.1768	0.2245	1.1768	0.1934
1.2328	0.6549	1.2328	0.414	1.2328	0.3417	1.2328	0.3064	1.2328	0.2768	1.2328	0.2315	1.2328	0.2063
1.2916	0.6549	1.2916	0.414	1.2916	0.3553	1.2916	0.3167	1.2916	0.285	1.2916	0.2485	1.2916	0.2145
1.353	0.7094	1.353	0.414	1.353	0.3553	1.353	0.3301	1.353	0.3111	1.353	0.2781	1.353	0.2405
1.4175	0.7094	1.4175	0.4509	1.4175	0.3825	1.4175	0.3426	1.4175	0.3244	1.4175	0.2929	1.4175	0.2556
1.485	0.7094	1.485	0.4509	1.485	0.4112	1.485	0.3849	1.485	0.3611	1.485	0.3203	1.485	0.2744
1.5557	0.7094	1.5557	0.4679	1.5557	0.425	1.5557	0.4019	1.5557	0.3815	1.5557	0.3455	1.5557	0.3015
1.6298	0.7094	1.6298	0.5202	1.6298	0.4336	1.6298	0.4078	1.6298	0.3845	1.6298	0.3552	1.6298	0.318
1.7074	0.7094	1.7074	0.5202	1.7074	0.4644	1.7074	0.4411	1.7074	0.4188	1.7074	0.3795	1.7074	0.3306
1.7887	0.7372	1.7887	0.5441	1.7887	0.5022	1.7887	0.4784	1.7887	0.4554	1.7887	0.4122	1.7887	0.3597
1.8738	0.8906	1.8738	0.662	1.8738	0.5953	1.8738	0.5386	1.8738	0.4968	1.8738	0.4422	1.8738	0.3861
1.963	1.0888	1.963	0.795	1.963	0.7156	1.963	0.6479	1.963	0.5892	1.963	0.507	1.963	0.4197
2.0565	1.1994	2.0565	0.8457	2.0565	0.7762	2.0565	0.7135	2.0565	0.6568	2.0565	0.5613	2.0565	0.46
2.1544	1.2457	2.1544	0.8903	2.1544	0.8251	2.1544	0.7629	2.1544	0.6675	2.1544	0.6111	2.1544	0.4955
2.257	1.5724	2.257	1.0092	2.257	0.9139	2.257	0.787	2.257	0.6675	2.257	0.6478	2.257	0.5221

Forced Circulation Vacuum Evaporator System

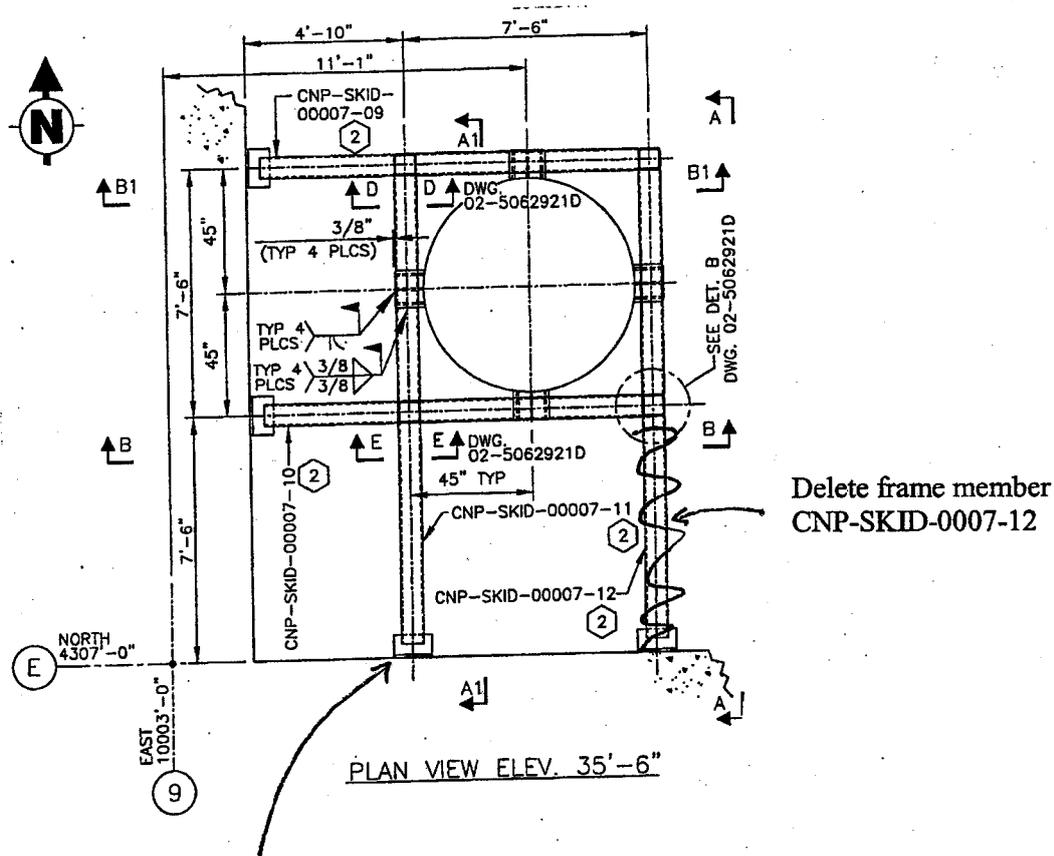
2.3645	3.0358	2.3645	1.3091	2.3645	0.9767	2.3645	0.787	2.3645	0.6738	2.3645	0.6478	2.3645	0.5221
2.4771	3.0358	2.4771	1.3091	2.4771	0.9767	2.4771	0.787	2.4771	0.6996	2.4771	0.6478	2.4771	0.5535
2.595	3.0358	2.595	1.3091	2.595	0.9767	2.595	0.8024	2.595	0.7441	2.595	0.6625	2.595	0.5909
2.7186	3.0358	2.7186	1.3326	2.7186	1.1682	2.7186	1.0405	2.7186	0.9372	2.7186	0.7795	2.7186	0.6406
2.848	3.0358	2.848	1.3674	2.848	1.2124	2.848	1.0985	2.848	0.9538	2.848	0.7823	2.848	0.699
2.9836	3.0358	2.9836	1.5563	2.9836	1.2869	2.9836	1.0985	2.9836	0.9538	2.9836	0.7823	2.9836	0.7384
3.1257	3.0358	3.1257	1.5563	3.1257	1.2869	3.1257	1.0985	3.1257	0.9538	3.1257	0.7823	3.1257	0.7384
3.2745	3.0358	3.2745	1.5563	3.2745	1.2869	3.2745	1.0985	3.2745	0.9538	3.2745	0.7823	3.2745	0.7384
3.4305	2.661	3.4305	1.5563	3.4305	1.2869	3.4305	1.0985	3.4305	0.9538	3.4305	0.7823	3.4305	0.7384
3.5938	2.661	3.5938	1.5563	3.5938	1.2869	3.5938	1.0985	3.5938	0.9538	3.5938	0.7823	3.5938	0.7384
3.7649	2.661	3.7649	1.5563	3.7649	1.2869	3.7649	1.0985	3.7649	0.9538	3.7649	0.7823	3.7649	0.7242
3.9442	1.4442	3.9442	1.0743	3.9442	0.9842	3.9442	0.9015	3.9442	0.8266	3.9442	0.7368	3.9442	0.6479
4.132	1.2245	4.132	0.821	4.132	0.767	4.132	0.7197	4.132	0.6788	4.132	0.6329	4.132	0.5756
4.3288	1.2245	4.3288	0.8143	4.3288	0.7354	4.3288	0.6803	4.3288	0.6428	4.3288	0.5811	4.3288	0.5258
4.5349	1.2245	4.5349	0.8143	4.5349	0.7354	4.5349	0.6643	4.5349	0.6244	4.5349	0.5408	4.5349	0.4918
4.7508	1.2245	4.7508	0.8143	4.7508	0.7354	4.7508	0.6643	4.7508	0.6244	4.7508	0.5295	4.7508	0.4762
4.977	1.2245	4.977	0.8143	4.977	0.7354	4.977	0.6643	4.977	0.6244	4.977	0.5295	4.977	0.4651
5.214	1.2245	5.214	0.8143	5.214	0.7354	5.214	0.6643	5.214	0.6244	5.214	0.5295	5.214	0.4651
5.4623	1.1693	5.4623	0.8143	5.4623	0.7354	5.4623	0.6643	5.4623	0.6244	5.4623	0.5295	5.4623	0.4651
5.7224	1.3152	5.7224	0.8143	5.7224	0.7354	5.7224	0.6643	5.7224	0.6244	5.7224	0.5291	5.7224	0.4615
5.9948	1.3152	5.9948	0.8143	5.9948	0.7354	5.9948	0.6643	5.9948	0.6244	5.9948	0.5224	5.9948	0.4615
6.2803	1.3152	6.2803	0.8143	6.2803	0.7108	6.2803	0.6643	6.2803	0.6244	6.2803	0.5224	6.2803	0.4615
6.5793	1.3152	6.5793	0.8143	6.5793	0.7108	6.5793	0.6643	6.5793	0.6244	6.5793	0.5224	6.5793	0.4615
6.8926	1.5276	6.8926	0.8143	6.8926	0.7108	6.8926	0.6643	6.8926	0.6244	6.8926	0.5224	6.8926	0.4615
7.2208	1.5276	7.2208	0.8143	7.2208	0.7108	7.2208	0.6643	7.2208	0.6244	7.2208	0.5367	7.2208	0.4615
7.5646	1.5276	7.5646	0.8143	7.5646	0.7108	7.5646	0.6643	7.5646	0.6244	7.5646	0.5367	7.5646	0.4615
7.9248	1.5276	7.9248	0.8143	7.9248	0.7108	7.9248	0.6643	7.9248	0.6244	7.9248	0.5367	7.9248	0.4615
8.3022	1.5276	8.3022	0.8143	8.3022	0.7108	8.3022	0.6643	8.3022	0.6244	8.3022	0.5367	8.3022	0.4615
8.6975	1.5276	8.6975	0.8143	8.6975	0.7108	8.6975	0.6643	8.6975	0.6244	8.6975	0.5367	8.6975	0.4615
9.1116	1.5276	9.1116	0.8143	9.1116	0.7108	9.1116	0.6643	9.1116	0.6244	9.1116	0.5367	9.1116	0.4615
9.5455	1.0683	9.5455	0.7685	9.5455	0.7108	9.5455	0.6643	9.5455	0.6244	9.5455	0.5367	9.5455	0.4615
10	0.966	10	0.7685	10	0.7108	10	0.6643	10	0.6244	10	0.5367	10	0.4615
10.4762	1.1413	10.4762	0.7685	10.4762	0.7108	10.4762	0.6643	10.4762	0.6244	10.4762	0.5383	10.4762	0.4729
10.975	1.1413	10.975	0.7685	10.975	0.7108	10.975	0.6623	10.975	0.6206	10.975	0.5532	10.975	0.4802
11.4976	1.1413	11.4976	0.7685	11.4976	0.7108	11.4976	0.6623	11.4976	0.6206	11.4976	0.5569	11.4976	0.4932
12.045	1.1413	12.045	0.7685	12.045	0.7108	12.045	0.6623	12.045	0.6206	12.045	0.5569	12.045	0.4932
12.6186	1.3801	12.6186	0.7685	12.6186	0.7108	12.6186	0.6623	12.6186	0.6206	12.6186	0.5569	12.6186	0.4932
13.2194	1.3801	13.2194	0.7685	13.2194	0.7108	13.2194	0.6623	13.2194	0.6206	13.2194	0.5569	13.2194	0.4932
13.8489	1.3801	13.8489	0.7393	13.8489	0.6881	13.8489	0.6477	13.8489	0.6134	13.8489	0.5569	13.8489	0.4932

24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery
 Forced Circulation Vacuum Evaporator System

14.5083	1.3801	14.5083	0.7138	14.5083	0.6481	14.5083	0.6173	14.5083	0.5885	14.5083	0.5384	14.5083	0.4812
15.1991	1.3801	15.1991	0.7138	15.1991	0.6322	15.1991	0.5765	15.1991	0.5354	15.1991	0.4794	15.1991	0.4344
15.9228	0.9839	15.9228	0.7138	15.9228	0.6059	15.9228	0.5404	15.9228	0.4951	15.9228	0.4367	15.9228	0.397
16.681	0.9839	16.681	0.6414	16.681	0.5532	16.681	0.499	16.681	0.4622	16.681	0.4151	16.681	0.3744
17.4753	0.8392	17.4753	0.4892	17.4753	0.4497	17.4753	0.4327	17.4753	0.4227	17.4753	0.4016	17.4753	0.3733
18.3074	0.7701	18.3074	0.4851	18.3074	0.4497	18.3074	0.4264	18.3074	0.4102	18.3074	0.3887	18.3074	0.3692
19.1791	0.7701	19.1791	0.4851	19.1791	0.4497	19.1791	0.4264	19.1791	0.4102	19.1791	0.3887	19.1791	0.3692
20.0923	0.7053	20.0923	0.4141	20.0923	0.4086	20.0923	0.4022	20.0923	0.3951	20.0923	0.3821	20.0923	0.3658
21.049	0.7053	21.049	0.3974	21.049	0.3868	21.049	0.3798	21.049	0.3751	21.049	0.3664	21.049	0.3544
22.0513	0.7053	22.0513	0.3912	22.0513	0.3729	22.0513	0.3598	22.0513	0.3557	22.0513	0.3489	22.0513	0.34
23.1013	0.7053	23.1013	0.3912	23.1013	0.3729	23.1013	0.3598	23.1013	0.3493	23.1013	0.334	23.1013	0.3247
24.2013	0.7053	24.2013	0.3912	24.2013	0.3729	24.2013	0.3598	24.2013	0.3493	24.2013	0.334	24.2013	0.3197
25.3536	0.4743	25.3536	0.3912	25.3536	0.3729	25.3536	0.3598	25.3536	0.3493	25.3536	0.334	25.3536	0.3197
26.5609	0.4743	26.5609	0.3912	26.5609	0.3729	26.5609	0.3598	26.5609	0.3493	26.5609	0.334	26.5609	0.3197
27.8256	0.4162	27.8256	0.3683	27.8256	0.3546	27.8256	0.3444	27.8256	0.3364	27.8256	0.3247	27.8256	0.3138
29.1505	0.3218	29.1505	0.3084	29.1505	0.3088	29.1505	0.3086	29.1505	0.3079	29.1505	0.3058	29.1505	0.3018
30.5386	0.3218	30.5386	0.2953	30.5386	0.2889	30.5386	0.2879	30.5386	0.2894	30.5386	0.2909	30.5386	0.2906
31.9927	0.3218	31.9927	0.2953	31.9927	0.2889	31.9927	0.2856	31.9927	0.2842	31.9927	0.283	31.9927	0.2824
33.516	0.2832	33.516	0.2739	33.516	0.2714	33.516	0.2734	33.516	0.2743	33.516	0.2751	33.516	0.2756
35.1119	0.2621	35.1119	0.2633	35.1119	0.2646	35.1119	0.2659	35.1119	0.2669	35.1119	0.2686	35.1119	0.2701
36.7838	0.2621	36.7838	0.2629	36.7838	0.2634	36.7838	0.2639	36.7838	0.2645	36.7838	0.2654	36.7838	0.2666
38.5353	0.2617	38.5353	0.2621	38.5353	0.2624	38.5353	0.2627	38.5353	0.2629	38.5353	0.2635	38.5353	0.2642
40.3702	0.2609	40.3702	0.2612	40.3702	0.2614	40.3702	0.2615	40.3702	0.2617	40.3702	0.262	40.3702	0.2625
42.2924	0.2601	42.2924	0.2603	42.2924	0.2604	42.2924	0.2605	42.2924	0.2606	42.2924	0.2608	42.2924	0.2611
44.3062	0.2592	44.3062	0.2594	44.3062	0.2594	44.3062	0.2595	44.3062	0.2596	44.3062	0.2597	44.3062	0.2599
46.4159	0.2585	46.4159	0.2585	46.4159	0.2586	46.4159	0.2586	46.4159	0.2587	46.4159	0.2587	46.4159	0.2589
48.626	0.2577	48.626	0.2577	48.626	0.2577	48.626	0.2578	48.626	0.2578	48.626	0.2578	48.626	0.2579
50.9414	0.257	50.9414	0.257	50.9414	0.2569	50.9414	0.2569	50.9414	0.2569	50.9414	0.257	50.9414	0.257

ATTACHMENT # 2

CNP Frame Modification

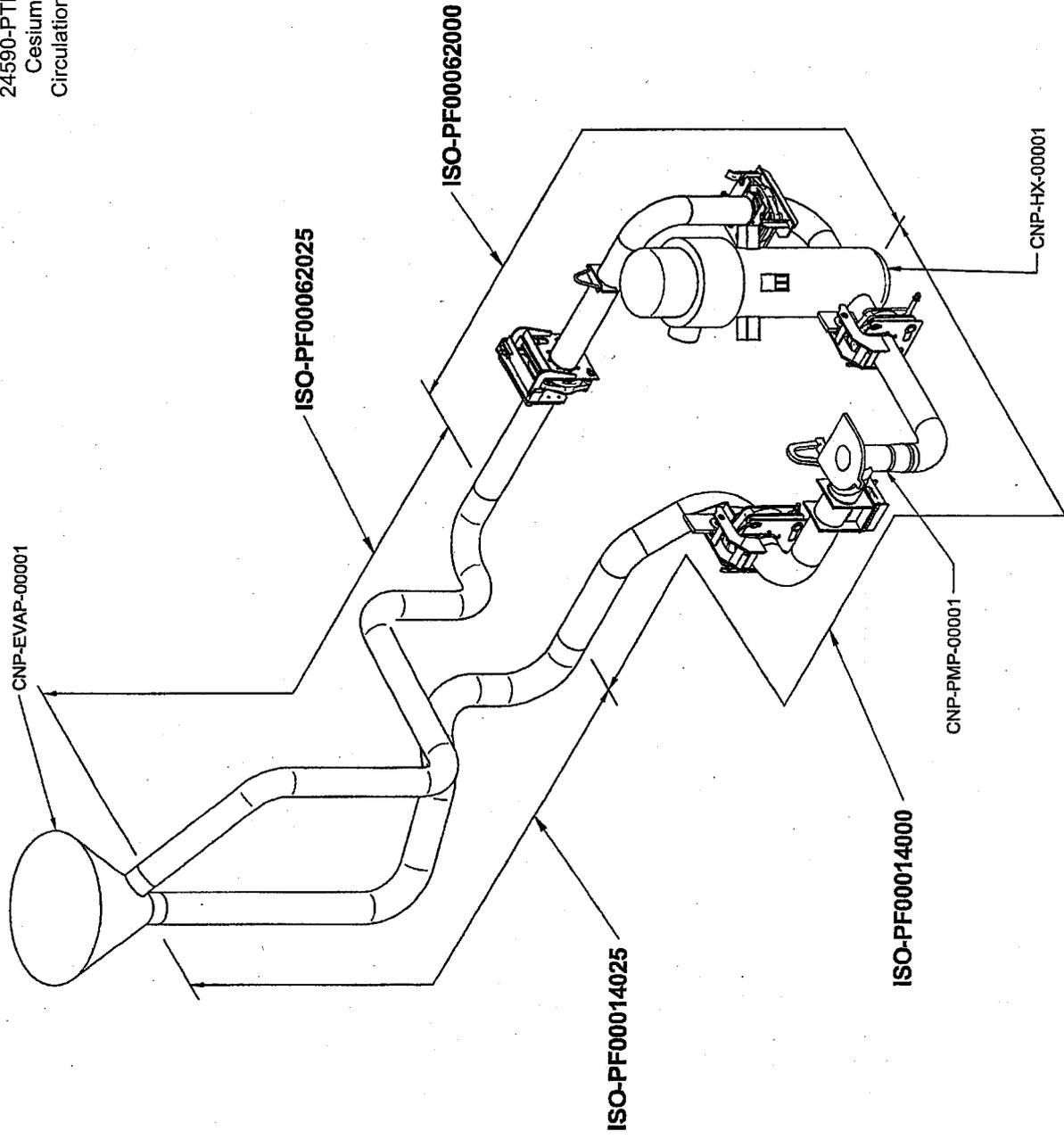


See RGM ISRS figures 37, 38, and 39
in Appendix J, Attachment 1

ATTACHMENT # 3

Isometrics for CNP Evaporator Recirculation Piping and Off-gas piping

24590-PTF-3PS-MEVV-T0002, Rev. 4
Cesium Nitric Acid Recovery Forced
Circulation Vacuum Evaporator System

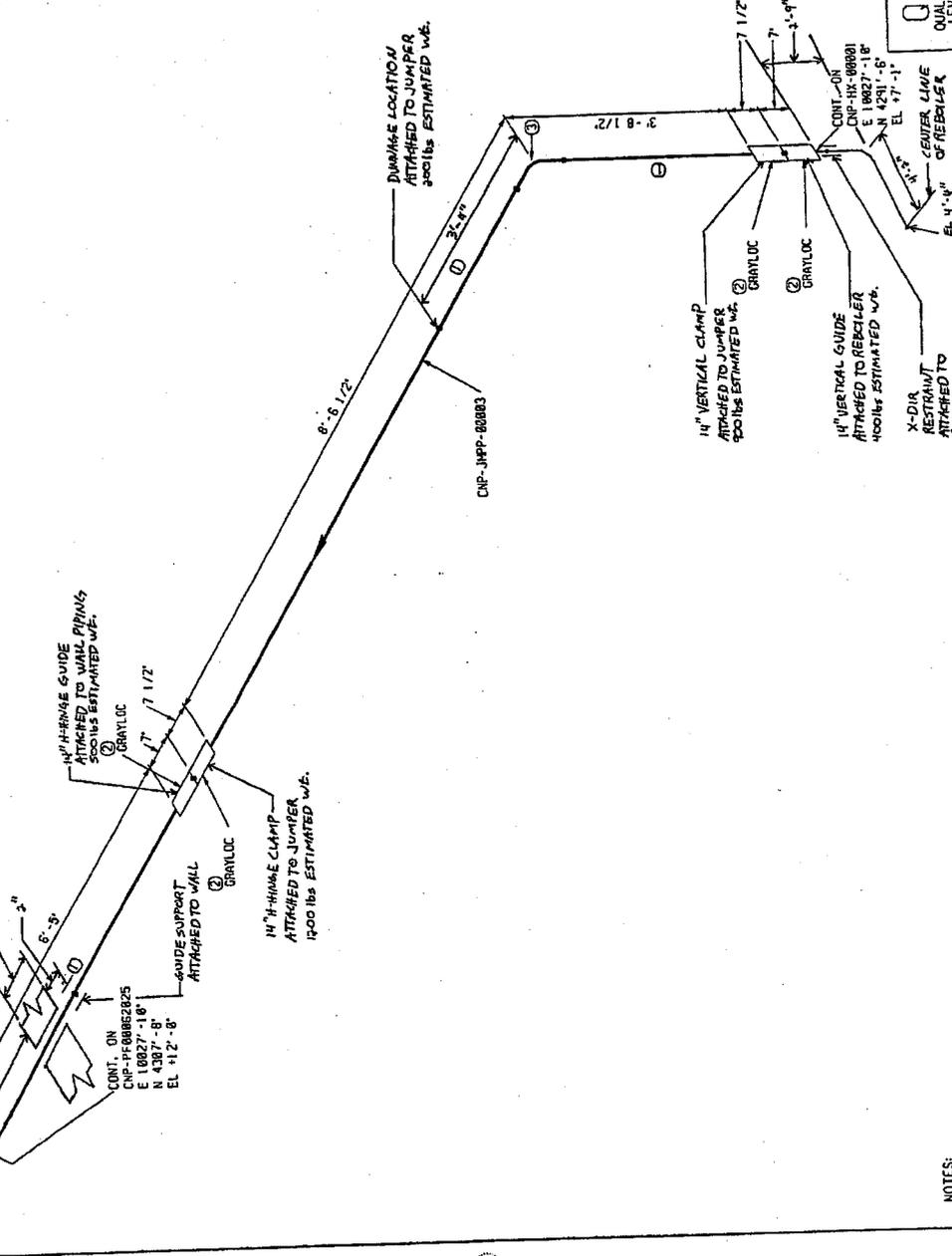


CNP
PROCESS LOOP
INFORMATION ISO

J-84



PART NO.	SHOP MATERIALS	COMPONENT DESCRIPTION	N.S. FINISHED	QTY.	RECEIVED S/C CODE
1	PIPE	PIPE, 861 98822CL1, WELDED, 6.25" WALL, 80E	14	15'-2"	PPPCW082208
2	FITTINGS	GRAYLOC, GRAYLOC, 8365 GRADE WPC22-VK, 6.250"	14	1	N/A
3		EL - 96, LR, BW, 8365 GRADE WPC22-VK, 6.250"	14	1	PF08V0420P



NOTES:
 1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-50-00001001.

PAIN CODE	NA	CONTENT APPLICABLE TO ALARA?	<input type="checkbox"/> YES <input type="checkbox"/> NO	QUALITY LEVEL	NO
INSULATION TYPE	NI	ADR NO.		SEISMIC CAT.	SC-1
INSULATION THK.	0			PCF FILE: TYP. CONN. CHECK	

ISO Created: JUL-07-2006 09:06

ISO Created: JUL-07-2006 09:06

STRESS ANALYST:  DATE:

STRESS REVIEW - PRINT REV

ACCEPTED

NOT ACCEPTED

ACCEPTED W/ COMMENTS

SUPPORTS ADDED TO MODEL

BY:

CONTRACT NO: DE-AC27-01RV14136

CONST. WORK AREA: 21

PAID: 24590-PTF-ME-CNP-00008

CONTRACT NO: DE-AC27-01RV14136

CONST. WORK AREA: 21

PRETREATMENT FACILITY
ISOMETRIC

LINE No.	CNP-PF-00062-N31D-1.4	PIPE SPEC:	N31D
DWG No.	24590-PTF-P3-CNP-PF00062000	REV	A
PLotted BY:	plavis2	Plot DATE:	07/07/2006 09:06:07 AM

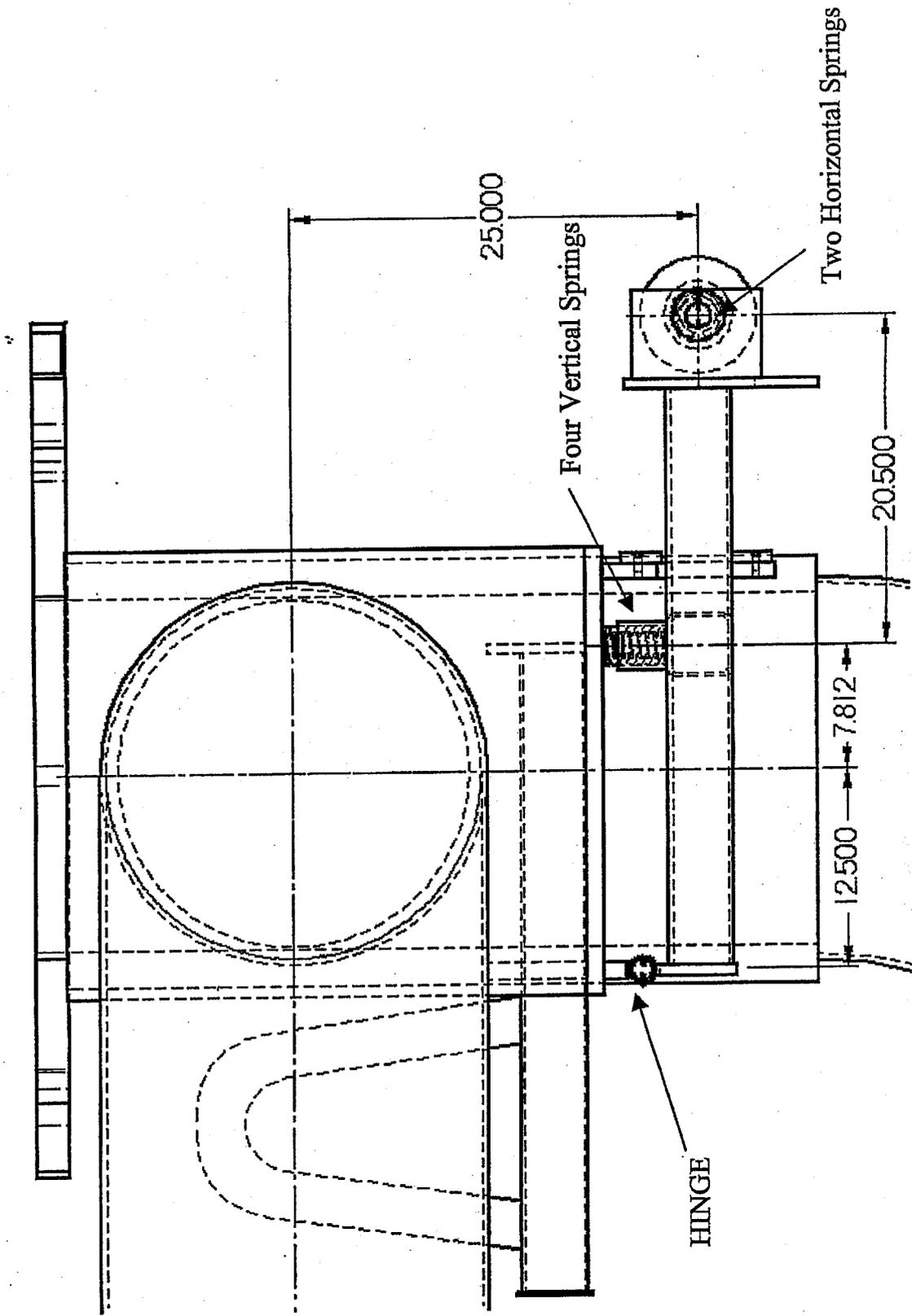
24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery Forced
 Circulation Vacuum Evaporator System

J-87

Ref: 24590-WTP-3DP-G04B-00049

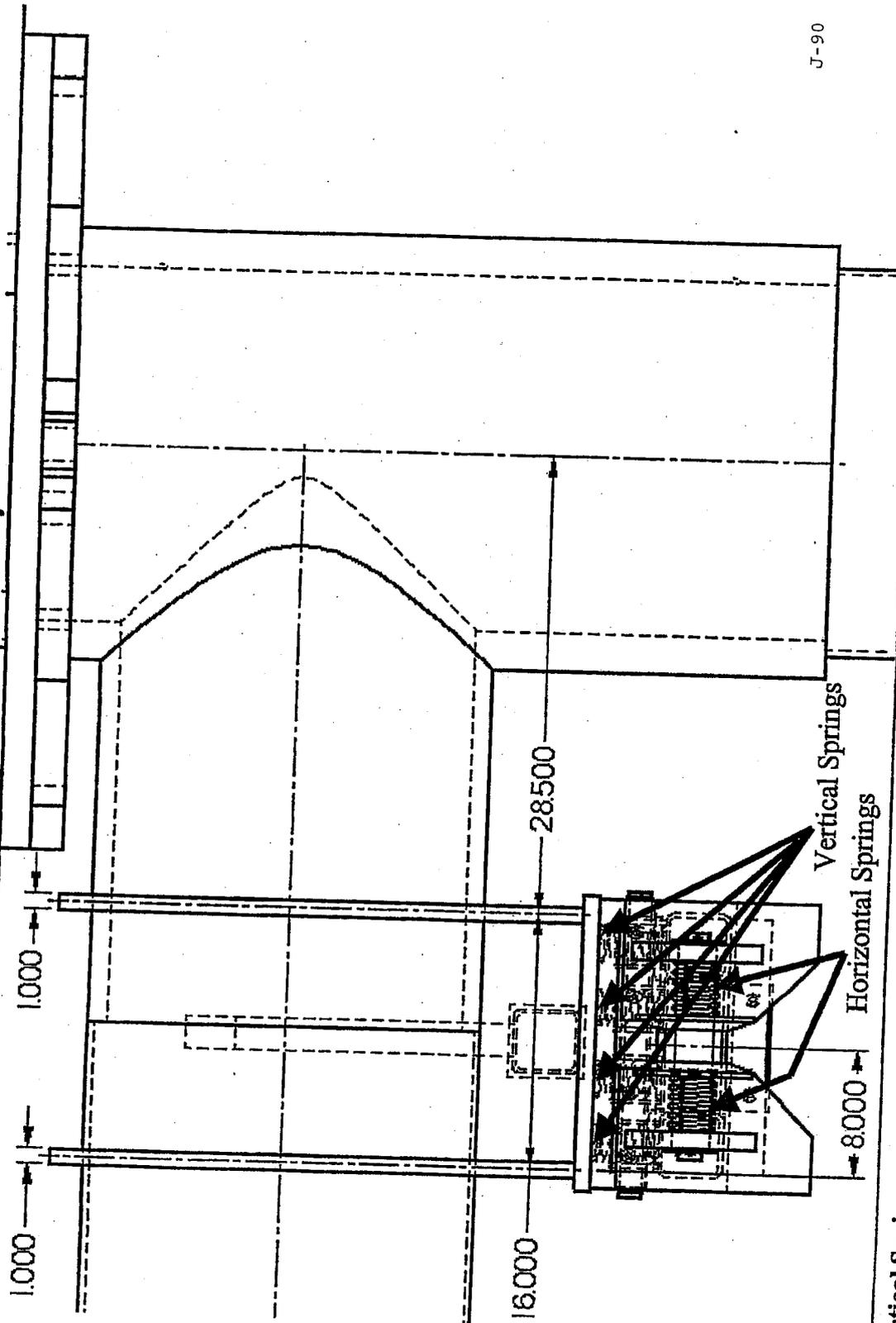
24590-G04B-F00019 Rev 4 (1/17/2006)

24" Mid Roller Assembly.



Note: Use Mid Roller Assembly spring configuration for all Mid Roller Assemblies
until finalized information is available.

24" Mid Roller Assembly.



Vertical Spring:

•Spring Rate: 1310 lbs/in

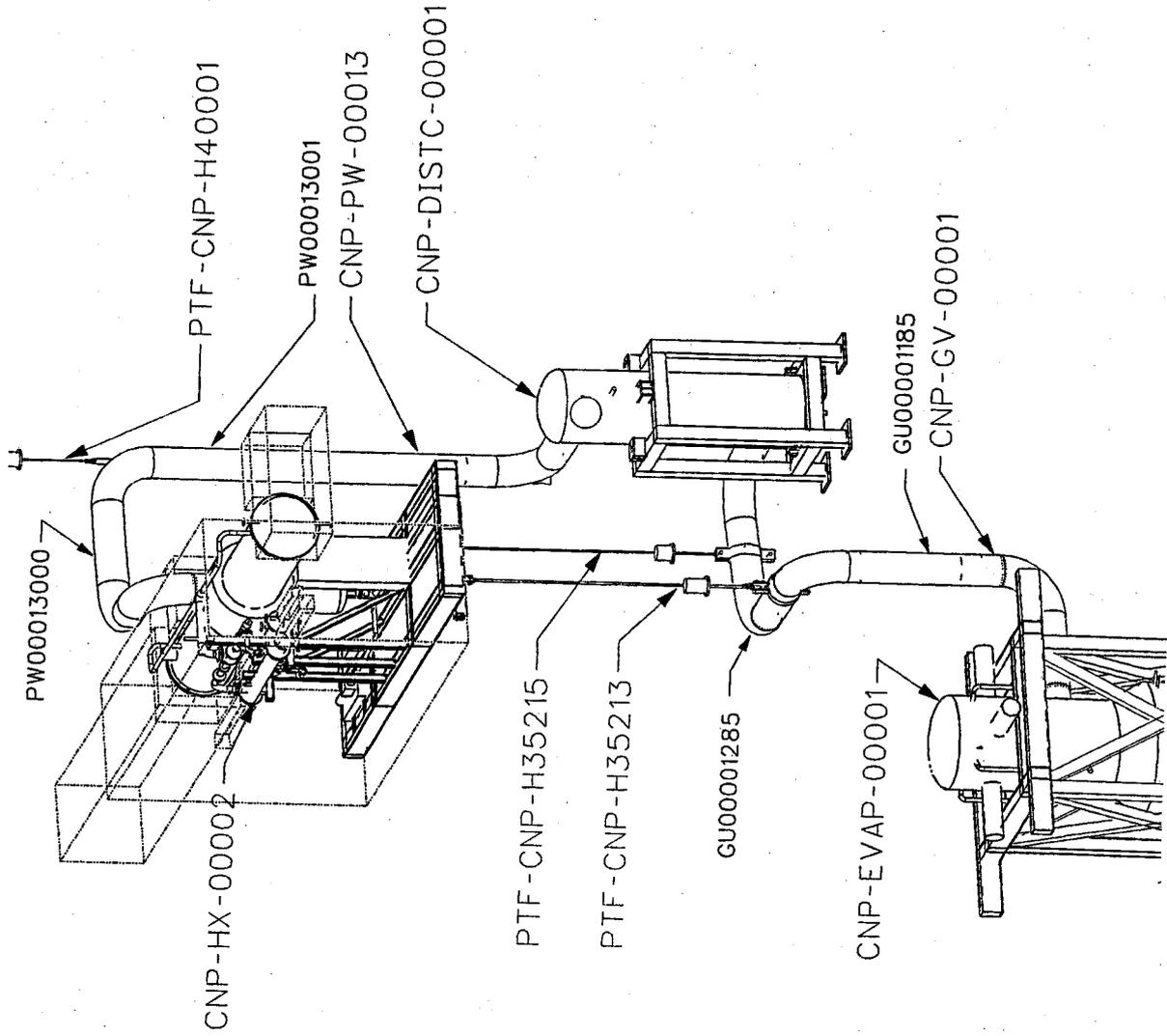
•Preload: Four springs are compressed approximately 0.150" during installed cold condition. (Springs are in parallel)

Horizontal Spring (North-South):

•Spring Rate: 76 lbs/in

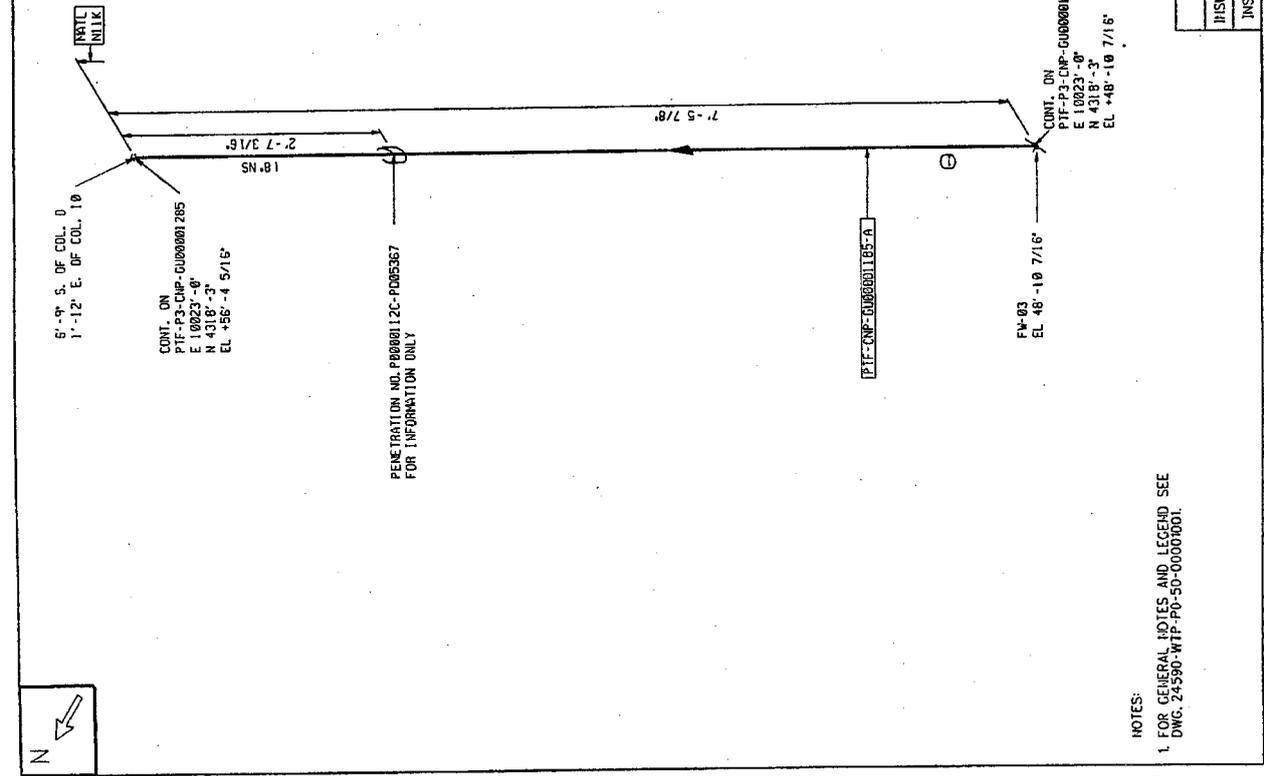
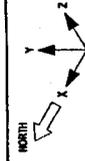
•Preload: 0.000" preload during the installed cold condition. (One spring acting in north direction, one acting spring in south direction)

24590-PTF-3PS-MEVV-T0002, Rev. 4
Cesium Nitric Acid Recovery Forced
Circulation Vacuum Evaporator System



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24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery Forced
 Circulation Vacuum Evaporator System



SHOP MATERIALS	RECHD. SIX CODE
PART NO. COMPONENT DESCRIPTION	
1 NICKEL ALLOY PIPE	
N.S. QUANTITY	QTY
18	7'6"
	PPFC900030A

COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

NOTES:
 1. FOR GENERAL NOTES AND LEGEND SEE
 DWG. 24590-WTP-P0-S0-0000001.

STRESS REVIEW PRINT	REV
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<input type="checkbox"/> ACCEPTED W/ COMMENTS	<input type="checkbox"/> SUPPORTS ADDED TO MODEL
BY: _____ DATE: _____	

STRESS ANALYST:
 RIVER PROTECTION PROJECT
 WASTE TREATMENT PLANT
 24590-PTF-3PS-MEVV FOR PLACE
 RICHLAND, WA 99352

CONTRACT No: DE-AC27-01RV14136
 CONST. WORK AREA: 01
 P&ID: 24590-PTF-M6-CNP-00008

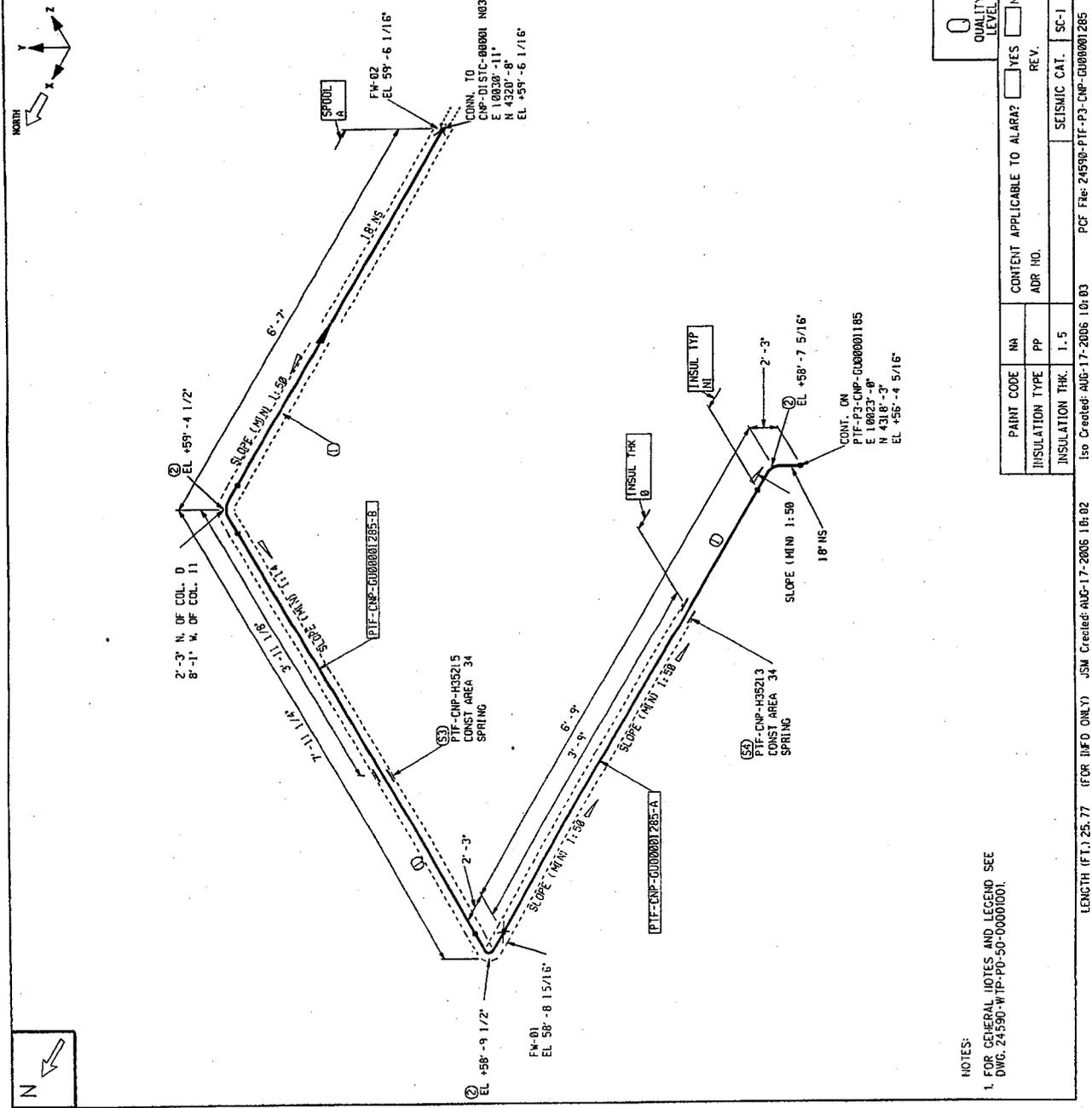
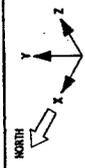
**PRETREATMENT FACILITY
 ISOMETRIC**

LINE No.	CNP-GU-00001-NIK-18	PIPE SPEC:	NIK
DWG No.	24590-PTF-P3-CNP-GU00001185	REV	A
PLOT DATE: 08/17/2006		10:05:44 AM	
PLOT BY: sjmihrow		SHT. 1 OF 1	

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INSULATION TYPE	NI	ADR NO.	
INSULATION THK.	0	SEISMIC CAT.	SC-1
REV. _____			

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 JSM Created: AUG-17-2006 10:02
 PCF File: 24590-PTF-P3-CNP-GU00001185

24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery Forced
 Circulation Vacuum Evaporator System



SHOP MATERIALS		BECHTEL SK CODE	
PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY
1	PIPE, B67508367CL1, WELDED, Ø. 250", BBE	18	12'-4"
FITTINGS			
2	EL - 90, LR, 84, 8366 GRADE W/ØXN-K, Ø. 250"	18	3
FIELD MATERIALS			
SUPPORTS			
3	PIPE SUPP, PTF-CNP-H35215	N.S. (INCHES)	QTY
4	PIPE SUPP, PTF-CNP-H35215	N.S. (INCHES)	QTY

FIELD MATERIALS		BECHTEL SK CODE	
PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY
3	PIPE SUPP, PTF-CNP-H35215	N.S. (INCHES)	QTY
4	PIPE SUPP, PTF-CNP-H35215	N.S. (INCHES)	QTY

COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

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<input type="checkbox"/> ACCEPTED W/ COMMENTS	<input type="checkbox"/> SUPPORTS ADDED TO MODEL	
BY:		
DATE:		



RIVER PROTECTION PROJECT
 WASTE TREATMENT CENTER PLACE
 RICHLAND, WA 99352

CONTRACT No:	DE-AC27-01RV14136
PAID: 24590-PTF-16-CNP-08810	CONST. WORK AREA: 34
PRETREATMENT FACILITY ISOMETRIC	
LINE No.	CNP-GU-00001-N11G-18
DWG No.	24590-PTF-P3-CNP-GU00001285
REV	A

NOTES:
 1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P3-0000001.

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INSULATION THK.	1.5
SEISMIC CAT.	SC-1

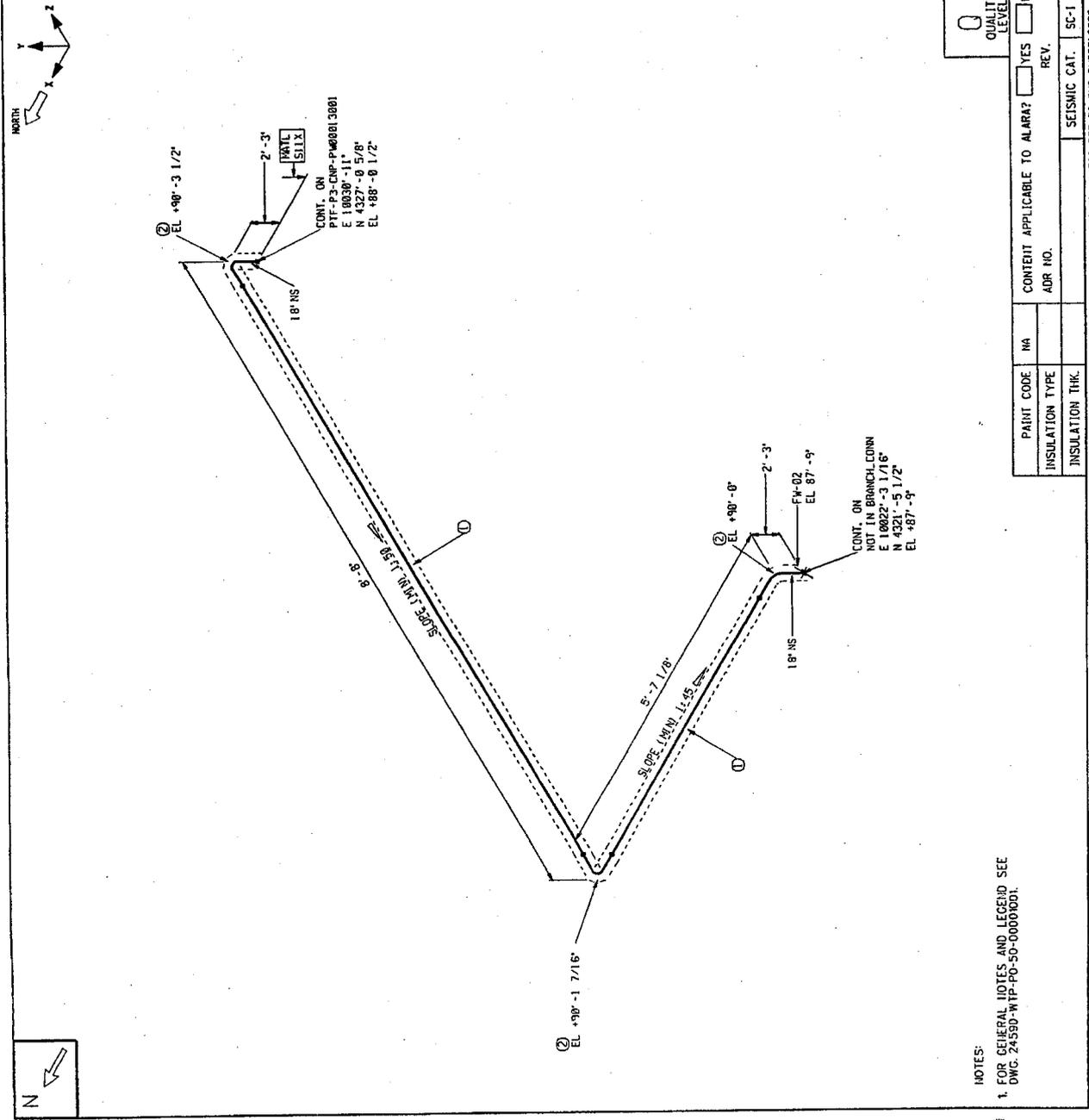
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24590-G04B-F00019 Rev 4 (1/17/2006)

Ref: 24590-WTP-3DP-G04B-00049

J-93

24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery Forced
 Circulation Vacuum Evaporator System



SHOP MATERIALS	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL SIK CODE
PIPE	1 PIPE, A312P316/316L, EFW, Ø. 250", 8BE	18	5' 4"	PPFC088AJ19A
FITTINGS	2 EL - 90, LRA, BW, A403MP316/316L-WX, Ø. 250"	18	3	PF0MVL248R

PART NO.	DESCRIPTION	REV.	DATE
1	ACCEPTED		
2	ACCEPTED W/ COMMENTS		
3	NOT ACCEPTED		
4	SUPPORTS ADDED TO MODEL		

STRESS ANALYST: _____
 DATE: _____

RIVER PROTECTION PROJECT
 WASTE TREATMENT PLANT
 10000 CENTER PLACE
 RICHLAND, WA 99352

CONTRACT No: DE-AC27-01RV14156
 PAID: 24590-PTF-146-CNP-80018
 CONST. WORK AREA:

**PRETREATMENT FACILITY
 ISOMETRIC**

LINE No. _____
 DWG No. 24590-PTF-P3-CNP-PW00013000
 PLOTTED BY: sjm/klm PLOT DATE: 08/17/2006 10:05:25 AM SHT. 1 OF 1

PAINT CODE	INSULATION TYPE	INSULATION THK.	SEISMIC CAT.	SC-1

ISO Created: AUG-17-2006 10:03
 JSM Created: AUG-17-2006 10:02
 LENGTH (FT.) NO DATA (FOR IJFD ONLY)

NOTES:
 1. FOR GENERAL NOTES AND LEGEND SEE
 DWG. 24590-WTP-PO-50-00001001.

COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

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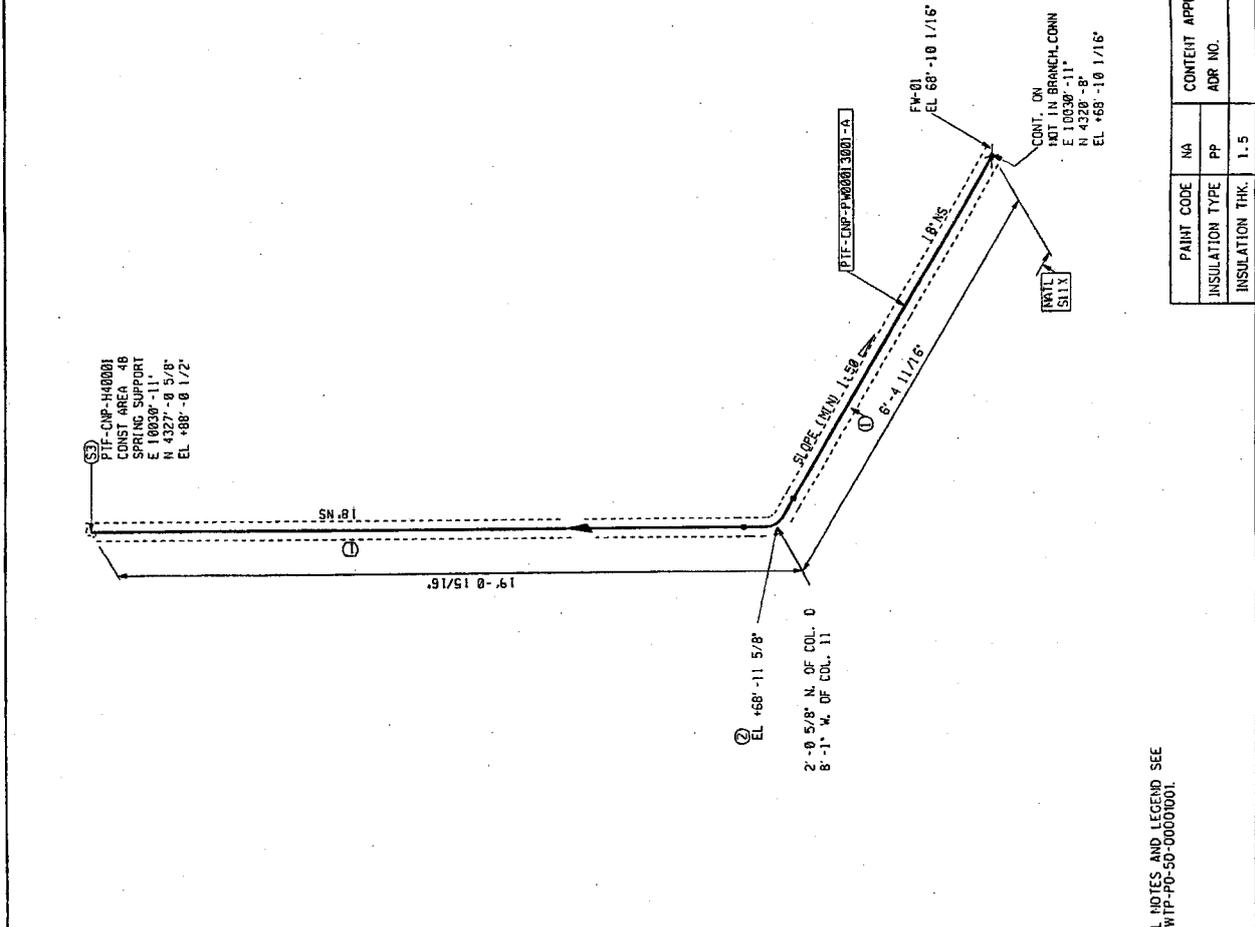
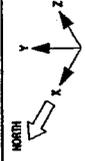
QUALITY LEVEL: 0
 CONTENT APPLICABLE TO ALARA? YES NO
 ADR NO. REV.

REF: 24590-WTP-3DP-G04B-00049

24590-G04B-F00019 Rev 4 (1/17/2006)

J-94

24590-PTF-3PS-MEVW-T0002, Rev. 4
 Cesium Nitric Acid Recovery Forced
 Circulation Vacuum Evaporator System



SHOP MATERIALS	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL SIC CODE
PIPE	1 PIPE, A312TP316/316L, EPW, 0.250", BBE	18	21' 0"	PPPC0801100A
FITTINGS	2 EL - 90, LR, BR, 4403MP316/316L-WX, 0.250"	18	1	PF0N4V0240R
FIELD MATERIALS				
SUPPORTS	3 PIPE SUPT, PTF-CNP-H40001		1	

STRESS REVIEW PRINT	REV	DATE
<input type="checkbox"/> ACCEPTED	<input type="checkbox"/> NOT ACCEPTED	
<input type="checkbox"/> ACCEPTED W/ COMMENTS	<input type="checkbox"/> SUPPORTS ADDED TO MODEL	
BY:		

ISO TYPE: PT_XSTRESS C:\iso\24590-PTF-P3-CNP-PW00013001.DGN

RIVER PROTECTION PROJECT
 WASTEWATER TREATMENT CENTER PLACE
 RICHLAND, WA 99352

CONTRACT No: DE-AC27-01RV14136
 PAID: 24590-PTF-HS-CNP-00010 CONST. WORK AREA: 34

PRETREATMENT FACILITY
 ISOMETRIC

LINE No. CNP-PW-0001.3-S11X-18 PIPE SPEC: S11X
 DWG No. 24590-PTF-P3-CNP-PW0001.3001
 PLOTTED BY: sjwikow PLOT DATE: 08/17/2006 10:06:46 AM SHT. 1 OF 1

PAINT CODE	NA	CONTENT APPLICABLE TO ALARA?	YES	NO
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INSULATION THK.	1.5		<input type="checkbox"/>	<input type="checkbox"/>

ISO Created: AUG-17-2006 10:02
 PCF File: 24590-PTF-P3-CNP-PW0001.3001
 ISO Created: AUG-17-2006 10:03

NOTES:
 1. FOR GENERAL NOTES AND LEGEND SEE
 DWG. 24590-WTP-PD-50-00000001.

COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

Ref: 24590-WTP-3DP-G04B-00049

J-95

24590-G04B-F00019 Rev 4 (1/17/2006)

ATTACHMENT # 4

Attached tables show the design load requirements for forces and moments applied to piping nozzles on separator vessel, reboiler, distillation column, and condensers.

The direction of the listed forces and moments for vertical nozzles into the equipment head are provided in global coordinates (X = North/South, y = vertical, and z = East/West - Vessel 0° defined as North).

The directions of the listed forces and moments for horizontal nozzles into the equipment shell are provided in local coordinates per 24590-WTP-3PS-MV00-T0001.

CNP-EVAP-00001 SC-I

TABLE 1

CCN 126201

Note:

*V = vertical head nozzle - values are x = North/South, y = vertical, z = East/West (global coordinates), Vessel 0° defined as North

**H = horizontal shell nozzle - values are per axes shown in 24590-WTP-3PS-MV00-T0001 Rev 2, Appendix A (local coordinates)

Nozzle Number	Nozzle Size (in)	Orientation (V* / H**)	Load Case	Design Loads (Force in lbs, Moment in ft-lb)					
				Fx	Fy	Fz	Mx	My	Mz
N01	14	Note 1	Weight	2990	3770	436	2490	1560	10680
			Seismic	1950	1690	1430	9450	14175	14175
			Thermal	1950	1820	1840	9650	19350	19350
N02	16	Note 1	Weight	547	4550	547	3128	1958	1958
			Seismic	1710	1885	1710	12075	18150	18150
			Thermal	2080	1810	2400	18850	25400	25400
N03	18	H	Weight	684	1095	684	3803	2376	2376
			Seismic	2115	2871	3035	20735	22425	22425
			Thermal	2290	2880	3050	16200	32340	32340
N05	2	H	Weight	50	60	50	75	75	75
			Seismic	106	70	106	158	237	237
			Thermal	80	70	100	110	220	220
N06	3	H	Weight	52	84	52	119	75	75
			Seismic	162	108	162	468	701	701
			Thermal	203	219	200	430	860	860
N07	1	H	Weight	15	20	15	20	20	20
			Seismic	30	20	30	37	55	55
			Thermal	20	20	30	30	50	50
N08	2	H	Weight	50	60	50	75	75	75
			Seismic	106	70	106	158	237	237
			Thermal	80	70	100	110	220	220
N09A*	1	H	Weight	15	20	15	20	20	20
			Seismic	41	20	30	37	84	55
			Thermal	21	20	30	42	50	50
N09B*	1	H	Weight	15	20	15	20	20	20
			Seismic	30	20	30	37	55	55
			Thermal	20	32	30	30	50	58
N10	0.75	H	Weight	15	20	15	20	20	20
			Seismic	51	20	30	37	55	55
			Thermal	20	20	30	30	50	50
N11A	1	H	Weight	15	20	15	20	20	20
			Seismic	30	20	30	37	55	55
			Thermal	20	23	30	30	50	50
N11B	1	H	Weight	15	20	15	20	20	20
			Seismic	30	20	51	37	99	55
			Thermal	20	20	30	30	50	50
N12	2	H	Weight	50	60	50	75	75	75
			Seismic	106	70	106	158	237	237
			Thermal	80	70	100	110	220	220
N13	2	H	Weight	50	60	50	75	75	75
			Seismic	106	70	106	158	237	237
			Thermal	80	70	100	110	220	220

EVL
8/10/02

* Nozzle loads for these bubblers due to hydrogen accumulation are not available and will be provided later.

Note 1: Nozzle loads for N01, N02, and N03 shall be per Seller's design & qualification using the results of the coupled FEA.

CNP-EVAP-00001 SC-I

TABLE 1 (CONT.)

CONTINUED

Note:

*V = vertical head nozzle - values are x = North/South, y = vertical, z = East/West (global coordinates), Vessel 0° defined as North

**H = horizontal shell nozzle - values are per axes shown in 24590-WTP-3PS-MV00-T0001 Rev 2, Appendix A (local coordinates)

Nozzle Number	Nozzle Size (in)	Orientation (V* / H**)	Load Case	Design Loads (Force in lbs, Moment in ft-lb)					
				Fx	Fy	Fz	Mx	My	Mz
N16*	1	H	Weight	15	20	15	20	20	20
			Seismic	30	47	30	37	60	85
			Thermal	23	20	30	30	50	50
N17 Spare	2	H	Weight	50	60	50	75	75	75
			Seismic	106	70	106	158	237	237
			Thermal	80	70	100	110	220	220
N18 Spare	2	H	Weight	50	60	50	75	75	75
			Seismic	106	70	106	158	237	237
			Thermal	80	70	100	110	220	220
N21A*	1	H	Weight	15	20	15	20	20	20
			Seismic	30	54	30	37	55	55
			Thermal	20	25	30	30	50	58
N21B*	1	H	Weight	15	20	15	20	20	20
			Seismic	30	20	30	37	80	55
			Thermal	20	25	30	64	50	50
N22*	1	H	Weight	15	20	15	20	20	20
			Seismic	30	20	30	37	59	55
			Thermal	21	36	30	33	50	95
N24A	1	H	Weight	15	20	15	20	20	28
			Seismic	30	28	37	37	106	88
			Thermal	20	20	30	30	60	50
N24B	1	H	Weight	15	20	15	20	20	20
			Seismic	30	20	30	37	91	55
			Thermal	20	20	30	30	50	50
N25	24	Manway	Weight	Manway	Manway	Manway	Manway	Manway	Manway
			Seismic	Manway	Manway	Manway	Manway	Manway	Manway
			Thermal	Manway	Manway	Manway	Manway	Manway	Manway

* Nozzle loads for these bubblers due to hydrogen accumulation are not available and will be provided later.

Note 1: Nozzle loads for N01, N02, and N03 shall be per Seller's design & qualification using the results of the coupled FEA.

TABLE 2

PRELIMINARY Nozzle Loads on Non-Black Cell Vessels Designated as SC-1							
Pipe Size	Load Type	Forces			Moments		
		Fx (lb)	Fy (lb)	Fz (lb)	Mx (ft-lb)	My (ft-lb)	Mz (ft-lb)
1 in	Weight	15	20	15	20	20	20
1 in	Seismic	45	30	45	56	83	83
1 in	Thermal	30	26	40	38	77	77
1-1/2 in	Weight	35	45	35	40	40	40
1-1/2 in	Seismic	90	60	90	137	206	206
1-1/2 in	Thermal	64	56	86	96	192	192
2 in	Weight	50	60	50	75	75	75
2 in	Seismic	159	105	159	237	356	356
2 in	Thermal	114	100	152	169	337	337
3 in	Weight	69	111	69	158	99	99
3 in	Seismic	323	215	323	935	1401	1401
3 in	Thermal	228	203	305	664	1330	1330
4 in	Weight	116	186	116	288	180	180
4 in	Seismic	548	365	548	1755	2640	2640
4 in	Thermal	393	350	524	1260	2520	2520
6 in	Weight	279	446	279	797	498	498
6 in	Seismic	1326	885	1326	4845	7275	7275
6 in	Thermal	980	872	1310	3580	7160	7160
8 in	Weight	311	497	311	988	618	618
8 in	Seismic	1467	980	1467	5895	8835	8835
8 in	Thermal	1190	1060	1590	4800	9590	9590
10 in	Weight	351	561	351	1880	1180	1180
10 in	Seismic	1635	1092	1635	11010	16500	16500
10 in	Thermal	1270	1130	1690	8500	17000	17000
12 in	Weight	485	776	485	2710	1700	1700
12 in	Seismic	2265	1515	2265	15750	23700	23700
12 in	Thermal	1780	1580	2370	12400	24800	24800
14 in	Weight	581	930	581	3320	2080	2080
14 in	Seismic	2700	1800	2700	18900	28350	28350
14 in	Thermal	2140	1900	2860	15000	30100	30100
16 in	Weight	729	1170	729	4170	2610	2610
16 in	Seismic	3420	2280	3420	24150	36300	36300
16 in	Thermal	2800	2490	3730	19800	39500	39500
18 in	Weight	911	1460	911	5070	3170	3170
18 in	Seismic	4230	2820	4230	30000	44850	44850
18 in	Thermal	3550	3160	4730	25200	50300	50300
20 in	Weight	1120	1790	1120	6310	3950	3950
20 in	Seismic	5100	3405	5100	35850	53700	53700
20 in	Thermal	4440	3950	5920	31200	62400	62400
22 in	Weight	1340	2150	1340	7300	4560	4560
22 in	Seismic	6045	4035	6045	42150	63300	63300
22 in	Thermal	5430	4830	7240	37900	75800	75800
24 in	Weight	1570	2510	1570	8510	5320	5320
24 in	Seismic	7065	4710	7065	48600	73050	73050
24 in	Thermal	6560	5840	8750	45200	90400	90400

TABLE 3: CNP Reboiler Steam Design Nozzle Loads

Reboiler Vessel ID Number	Nozzle Number	Calculation Number	Load Case	Reboiler Steam Nozzle Design Loads					
				Fx (lb)	Fy (lb)	Fz (lb)	Mx (ft-lb)	My (ft-lb)	Mz (ft-lb)
CNP-RBLR-00001	N03	24590-PTF-P61C-CNP-00011	WT01	-339	-1510	-45	-64	58	-5958
			OCC	2768	4430	1608	3594	2415	7509
			THRM01	-405	-940	-16	641	181	-1870

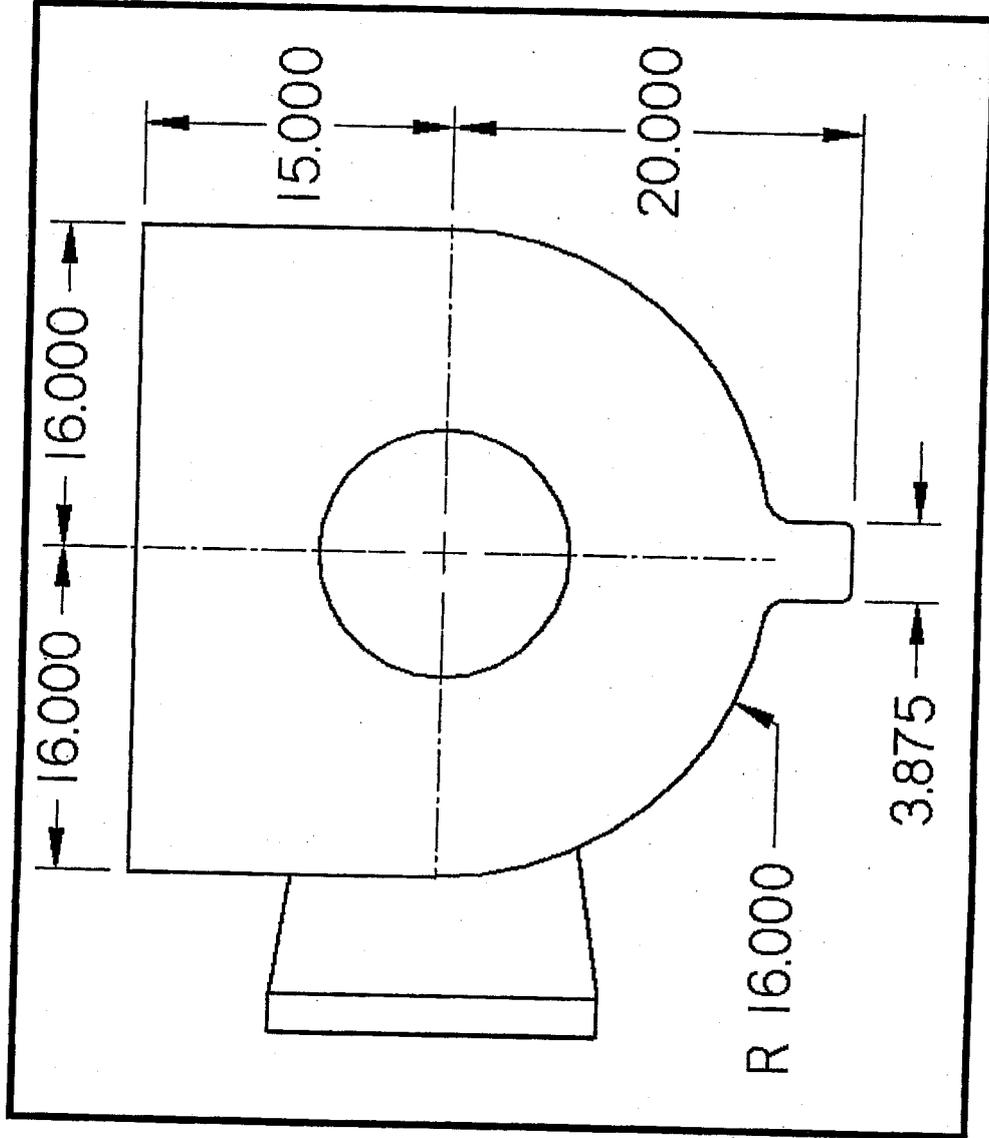
NOTES:

- ❖ Load direction per 24590-WTP-3PS-MV000-T0001, APPENDIX A.
- ❖ Tabulated loads are from ME101 analyses results with 25% increase factor for design purposes.
- ❖ Seismic loads considered the new ISRS, 5% damping and Modal Sum by CQC. Applied F_u is unity.
- ❖ Ref. CCN 110509

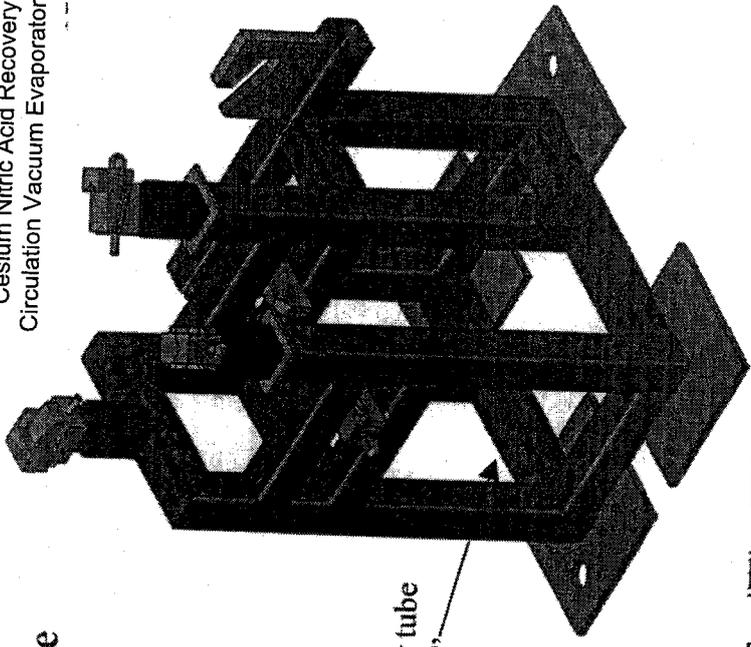
ATTACHMENT # 5

CNP Design Concepts

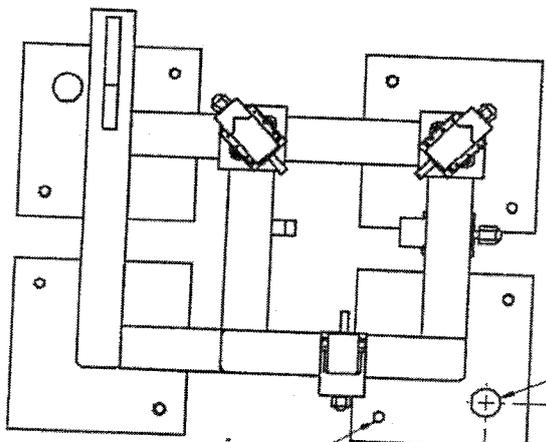
Pump Flange Detail



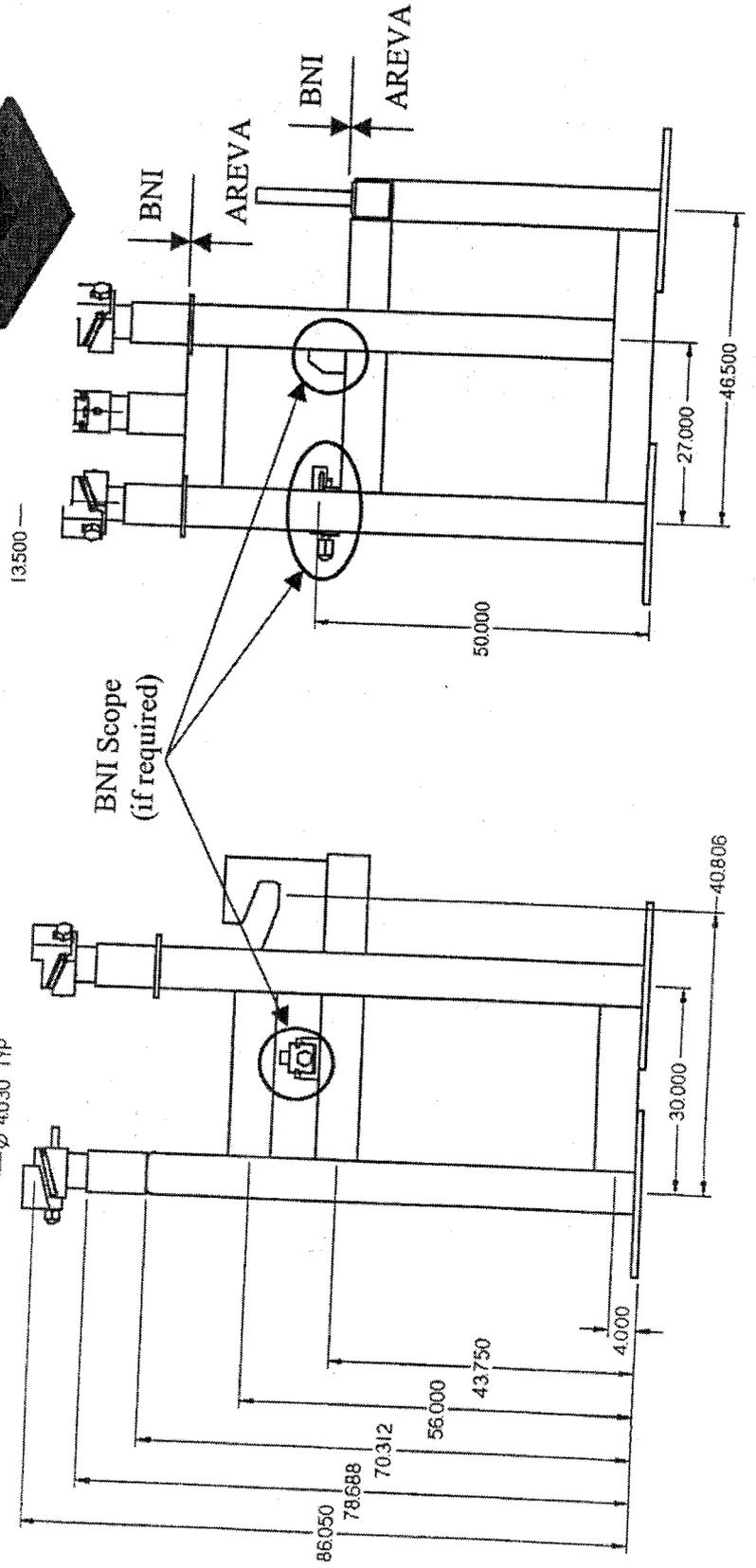
Pump Support Frame (CNP)



Proposed main member tube
 steel size: 8" x 8" x 1/2"



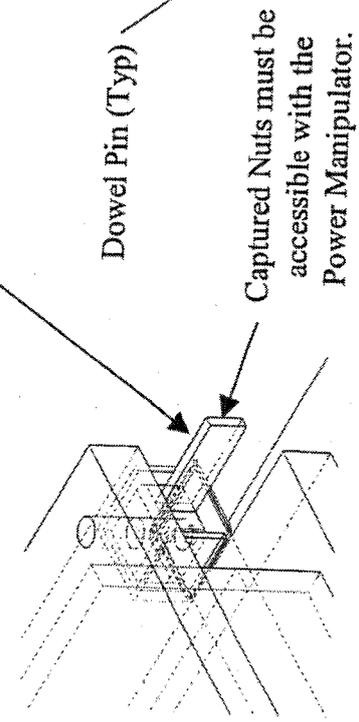
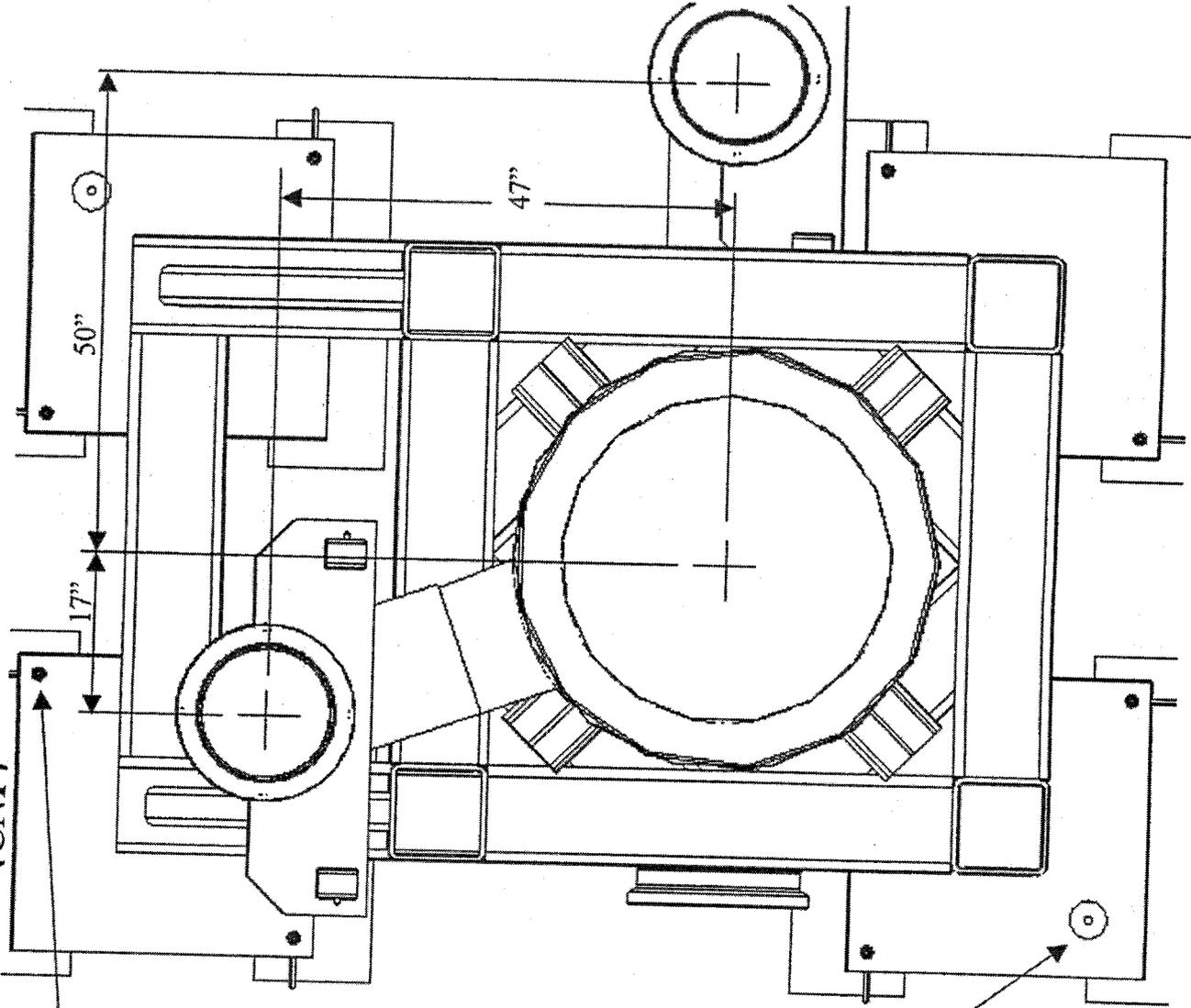
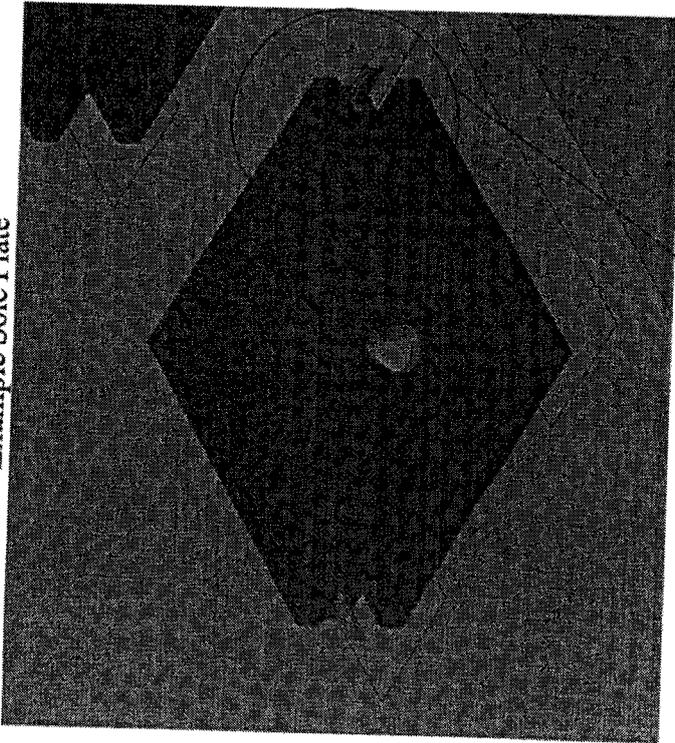
Stud location as required.
 Must be accessible with
 impact wrench.



**Sole Plates
 (CNP)**

Stud location as required.
 Must be accessible with
 impact wrench.

Example Sole Plate



Dowel Pin (Typ)

Captured Nuts must be
 accessible with the
 Power Manipulator.

ATTACHMENT # 6

SC-I/II Seismic Analysis Qualification and FEA Report Check List

SC-I/II Seismic Analysis Qualification and FEA Report Check List

Required Data		Source Reference	Applicable Section of Seismic Qualification Report
1 Identification and Description of Equipment			
1.1	Equipment Tag Number or other identification that uniquely defines the equipment	24590-WTP-3PS-SS90-T0001 §7.1.2(a)	
1.2	Identification of safety functions of the equipment that must be provided during and after a design basis earthquake (DBE)	24590-WTP-3PS-SS90-T0001 §7.1.2(d) 24590-WTP-3PS-MV00-T0002 §7.3.1 Equipment specification and/or data sheet	
1.3	Identification and description of the parts or features of the equipment that perform the safety functions and are therefore required to resist the DBE (this includes identification of Seismic Categories of relevant components or parts of the equipment)	24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §1.4 (page 1-7) and §C.8 (page C-65)	
1.4	Identification of basic material properties, key dimensions, and physical configuration of the equipment, including reference to design drawings/documents (including revision designation) that are used to control the design/configuration of the equipment	24590-WTP-3PS-SS90-T0001 §7.1.2(c)	
2 Description of Analyses and Methodology			
2.1	Reference to governing code(s) that specify ultimate or yield values (code allowable strength or stress levels)	Equipment specification and/or data sheet 24590-WTP-3PS-SS90-T0001 §7.1.2(e) 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.3.2 (page 2-12)	
2.2	Identification of the code-defined strength or stress levels used in the analyses (the capacity of the equipment based on code ultimate or yield values)	24590-WTP-3PS-SS90-T0001 §7.1.2(e) 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.3.2 (page 2-12)	
2.3	Definition of the seismic loads (earthquake loadings) used in the analysis (e.g., in-structure response spectra)	24590-WTP-3PS-SS90-T0001 §7.1.2(e) DOE-STD-1020-94 §1.4 (page 1-7), §2.2 (page 2-4), §C.8 (page C-65) 24590-WTP-3PS-MV00-T0002 §2.2.4	
2.4	Identification of equipment aging processes (e.g., corrosion, erosion, radiation, vibration/thermal fatigue, etc.), documentation or reference to documentation of these affects on material properties over the design life of the equipment, and evidence that the equipment will continue to provide its safety functions during and after a DBE at the end of design life	Equipment specification and/or data sheet 24590-WTP-3PS-SS90-T0001 §2.3 IEEE Std 344	

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SC-I/II Seismic Analysis Qualification and FEA Report Check List

Required Data	Source Reference	Applicable Section of Seismic Qualification Report
2.5 If an equivalent static analysis model is used in lieu of dynamic analyses, include justification of the adequacy of this approach (e.g., evidence that the structural features of the equipment are relatively simple, symmetric, and have essentially uniform distribution of mass and stiffness)	24590-WTP-3PS-SS90-T0001 §6.1.2 and §7.1.2(g) 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.2, page 2-4	
2.6 Description of how the analysis considers 3 orthogonal components of earthquake ground motion (two horizontal and one vertical), and how the responses from the various direction components are combined in accordance with American Society of Civil Engineers (ASCE) Standard 4.	24590-WTP-3PS-SS90-T0001 §6.1.3 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.3.2 (page 2-12)	
2.7 Identification of the damping values used in the analyses (e.g., damping values of 2 for massive low-stressed equipment with 0.5 for sloshing modes in liquid-containing metal tanks, or 3 for electrical cabinets and other equipment)	24590-WTP-3PS-SS90-T0001 §6.1.1(b) 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.3.3 (page 2-15)	
2.8 Evidence that connecting structural supports and piping (and the associated dynamic coupling effects) are properly represented in the analytical model	Equipment specification and/or data sheet 24590-WTP-3PS-SS90-T0001 §6.2.3 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §C.6.1, Items 2 & 3 (page C-58)	
2.9 Identification of the best estimate of all non-seismic demands expected to occur concurrently with a DBE (in a comparable format to the code allowable values)	Equipment specification and/or data sheet 24590-WTP-3PS-SS90-T0001 §4 and §5 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.3.2 (page 2-12)	
3 Results/Conclusions		
3.1 Identification of the important natural frequencies of the equipment (or the peak of the design response spectrum must be used)	24590-WTP-3PS-SS90-T0001 §6.1.1(a) and §6.1.2(a) 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.2 (page 2-4)	done
3.2 Identification of the computed elastic seismic response of the equipment (in a comparable format to the code allowable values)	24590-WTP-3PS-SS90-T0001 §7.1.2(g) 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.3.2 (page 2-12)	

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SC-I/II Seismic Analysis Qualification and FEA Report Check List

Required Data	Source Reference	Applicable Section of Seismic Qualification Report
3.3 Description of how the analyses address the distribution of resulting seismic-induced inertial forces and evaluation of the load path(s)	24590-WTP-3PS-SS90-T0001 §7.1.2(g) 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.2 (page 2-4)	
3.4 Description of method used to combine seismic and non-seismic loads (using code-defined load factors) and to compare the result with code-defined strength or stress levels to confirm the design is adequate	Equipment specification and/or data sheet 24590-WTP-3PS-SS90-T0001 §5 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.3.2 (page 2-12)	
3.5 Identification of relative seismic anchor motion (SAM) between equipment and interconnected piping	24590-WTP-3PS-SS90-T0001 §7.4 24590-WTP-3PS-MV00-T0002 §2.2.4 DOE-STD-1020-94 §2.2 (page 2-6) and §2.4.1 (page 2-19)	
3.6 Identification of reaction loads on connecting structural supports and piping (individual loads as well as load combinations)	24590-WTP-3PS-SS90-T0001 §7.2	
4 Quality Assurance		
4.1 Signature of responsible engineer who performed the calculation	24590-WTP-3PS-MV00-T0002 §2.2.4 NQA-1-1989	
4.2 Signature of engineer(s) who checked the calculation for numerical accuracy, and theory and assumptions	DOE-STD-1020-94 §1.4 (page 1-7) and §C.8 (page C-65) 24590-WTP-3PS-MV00-T0002 §2.2.4 NQA-1-1989 Supplement 3S-1	
4.3 Description of theory (analytical method) and assumptions used in the seismic analyses	DOE-STD-1020-94 §1.4 (page 1-7) and §C.8 (page C-65) NQA-1-1989 Supplement 3S-1	
4.4 Description of computer program(s) used in the analyses, including model(s) used, input values, and output results calculated by the computer program	24590-WTP-3PS-SS90-T0001 §7.1.2(g) 24590-WTP-3PS-MV00-T0002 §2.2.4 NQA-1-1989 Supplement 3S-1	
4.5 Printout of output of computer analyses, including signature of responsible engineer who performed the computer analyses on first page of output	DOE-STD-1020-94 §C.8 (page C-65) 24590-WTP-3PS-MV00-T0002 §2.2.4 NQA-1-1989 Supplement 3S-1 DOE-STD-1020-94 §C.8 (page C-65)	

SC-I/II Seismic Analysis Qualification and FEA Report Check List

Required Data	Source Reference	Applicable Section of Seismic Qualification Report
4.6 Documentation or reference to documentation of verification of computer program accuracy	24590-WTP-3PS-SS90-T0001 §7.1.2(g) 24590-WTP-3PS-MV00-T0002 §2.2.4 NQA-1-1989 Supplement 3S-1 DOE-STD-1020-94 §C.8 (page C-65)	

24590-PTF-3PS-MEV-T0002, Rev. 4
Cesium Nitric Acid Recovery Forced
Circulation Vacuum Evaporator System

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APPENDIX K

**Location of the 2-inch inlet drain nozzle
on reboiler steam condensate vessel**

24590-PTF-3PS-MEVV-T0002, Rev. 4
 Cesium Nitric Acid Recovery Forced
 Circulation Vacuum Evaporator System

