U.S. Department of Energy
Office of River Protection
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

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04-WTP-268

The Honorable John T. Conway
Chairman
Defense Facilities Nuclear Safety Board
625 Indiana Avenue, N.W., Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

U.S. DEPARTMENT OF ENERGY (DOE), OFFICE OF RIVER PROTECTION (ORP) RESPONSES TO THE DEFENSE NUCLEAR FACILITIES SAFETY BOARD (DNFSB) CONCERNS

This letter is in response to your letters to Mr. Paul M. Golan, DOE, concerning observations of the Hanford Site's Waste Treatment and Immobilization Plant made by members of the staff of the DNFSB. One letter dated July 21, 2004, addressed concerns related to the ventilation systems and the other letter dated August 26, 2004, addressed concerns related to the electrical and instrumentation and control systems. The attachment to this letter contains ORP responses to most of the DNFSB concerns. ORP will respond to the remaining concerns at a later date.

If you have any questions, please contact me, or your staff may contact Mr. Lewis F. Miller, Jr., ORP, (509 376 6817).

Sincerely,

Roy J. Schepens
Manager

WTP:WJP

cc w/attch:
P. M. Golan, EM-1
P. M. Bubar, EM-3

04.1929

Attachment
04-WED-268

Responses to Issues Raised in July 21, 2004 Defense Nuclear Facilities Safety Board (DNFSB) Letter Regarding Waste Treatment and Immobilization Plant (WTP) Ventilation Systems Design

WTP-04-281-01 In reviewing the Pretreatment facility's Process Vessel Ventilation (PVV) system, the staff noted a hot air in-bleed system was classified as nonsafety, commercial grade. This system protects the process ventilation High-efficiency Particulate Air (HEPA) filters, which are classified as safety-class. The staff questioned the use of commercial-grade equipment in this application. The staff requested the technical basis for this classification.

Response: The technical basis for the use of commercial grade equipment is that the equipment is classified as Risk Reduction Class (RRC) or Additional Protection Class (APC) and SSCs with this classification may be procured as commercial grade under the provisions of the DOE approved Quality Assurance Program. The rational for RRC/APC safety classification is:

A Steam Ejector malfunction was evaluated as the bounding hot air inbleed event for the PVV/PVP system (CCN-078307). This event resulted in ~ 50 grams of material carrying over to the HEPA Filters from the HEME (safety significant). The process vessel ventilation system has 4 primary and 4 secondary HEPA filters, thus assuming the material is spread evenly across the primary HEPAs, each primary filter will see approximately 13 grams. Each filter is capable of withstanding up to 600 grams of aerosol; therefore, the HEPA filters will not fail. (Given operation of the hot air inbleed system, no adverse impacts would be expected with regards to the HEPA filter performance for this event.) Assuming a concurrent failure of the hot air inbleed system, the temperature indicator will notify Operations to investigate and take appropriate actions. However, the hot air inbleed system provides a defense-in-depth safety function.

The temperature indicator is located downstream from the hot-air in-bleed system (in front of the PVV/PVP HEPAs) and will be classified as SDS to provide Operations with an indication of the operability of the hot-air inbleed system. If this system is not functioning properly, the temperature indicator will result in an Operations action to restore the function of the hot-air inbleed system, evaluate the condition of the filters, or shut down the vessel vent system, as appropriate. Additional indicators of this event include HEPA differenterial pressure and humidity monitors. (These indicators and the hot air inbleed system will be reviewed for reclassification consistent with DOE-STD-3009 in the near future.)

Also, maintaining flow through the PVV/PVP system is not required under accident conditions. Thus, the PVV/PVP HEPA confinement boundary can be protected against significant wetting challenges by stopping the fans (flow) through the system, re-directing any aerosols into the C5 confinement boundary.

Based on this, the hot air injection system is not required to be classified as SDS or SDC.

WTP-04-281-02 The planned ventilation filter housing shaker table tests will use a bounding seismic spectra as input for the shaker table tests. The staff wants to review the bounding data for suitability.

Response: The WTP Project will not use bounding data for the PT and HLW facilities. The specific In-Structure Response Spectra (ISRS) curves for each facility will be used and separate testing for each facility will be conducted. The applicable curves, by elevation and column line, for the Remote Change HEPA Filter housings will be used which shows the expected frequencies and accelerations in the north/south, east/west, and vertical directions. The reason for applying the ISRS curves specific to each building and not using bounding data is as follows:

The Remote Change HEPA Filter Housings in the PT and HLW buildings will require separate testing for the following reasons:

a) The housings are supported by steel platforms. Since the platforms are not rigid, they need to be simulated for testing. The platform configurations are different. Therefore, their simulations would be different, requiring separate testing.
b) ISRS for PT and HLW buildings are different.
c) It is likely that the external loads on the housings, e.g., connected ducts, in PT could be different from those in HLW.

Enclosed are the ISRS curves applicable to the Remote Change HEPA Filter housings in the HLW and PTF facilities.+

WTP-04-281-03 The staff noted that the Analytical Laboratory's ventilation systems did not have a source of auxiliary power. The consequences of recovery after a loss of power, which could result in a spread-of-contamination event, need to be considered before the decision is made on whether a source of auxiliary power is necessary.

Response: A spread-of-contamination event after loss of power principally affects ability of the Radiological Laboratories (Rad Labs) to restore operations. The safety consequences of this event have been evaluated and found to be acceptable.

The following rationale is provided in support of the current design of the C3 ventilation with respect to its power supply and the mitigation of the spread-of-contamination event following a loss of power:

<u>Reliability of Power Supply at RPP-WTP-</u>

- The Load centers in Lab are fed by two independent 13.8 kV feeders. Each 13.8 kV feeder complements the other as an auxiliary power supply. Loss of either of the independent power lines has been determined to be an unlikely event: A Loss of Off-Site Power (LOSP) event of ≥ 1 h for RPP-WTP is expected to be 1 occurrence in 33 years; (Ref.: CCN # 016417C).

<u>Low Radiological Source Term Availability-</u>

- The Rad Labs will receive aqueous samples that are diluted in the Hot Cells. The radioactivity of the samples transferred from the Hot Cells into the Rad Labs will be less than or equal to the radioactivity in the sample drawn from the Low Activity Waste (LAW) Concentrate Receipt Vessel (LAW 1); (Ref.: 24590-LAB-3YD-ARL-00001). Only a small fraction (estimated to be < 10% of the total number of samples received by the Lab per year) of these aqueous samples/aliquots will undergo a sample preparation process (e.g. drying) that will make them potentially air-borne. Therefore, the potential for spread of radiological contamination from low level aqueous samples is low. Routine housekeeping will maintain the interior of the fume hoods at low radiological levels, making it an insignificant source.

- These aqueous samples are the principal contributors to the source-term that will be spread.

Passive Design Features that Minimize the Potential for Spread of Radiological Contamination-

- Given the fact that the samples are dilute and majority of the samples are aqueous and are not potentially airborne, the likelihood of the spread of contamination is low. In addition, the amount of radioactive material available for release is further minimized, since sample containers are closed when not in use.

- It has been conservatively estimated that the radiological concentration in the Rad Labs' exhaust air (before HEPA filtration) range between 0.005 - 3.0 μCi/yr (Ref. 24590-LAB-M0C-V37T-00002, Rev. B-Draft), when the Rad Labs are in full-scale operation. Based on this air-borne radioactivity in the fume hood, at any given time, should the C3 ventilation shut down and the air within the fume hood becomes stagnant, the potential for a significant spread of low level radiological contamination is very low.

- Backflow from the C3V exhaust ductwork to the occupied Rad Labs' space is unlikely. The C3 exhaust system has three fans in parallel, two in operation at any time, the third in standby. Each fan is provided with an automatic isolation damper in the discharge side. The damper is programmed to close when the fan is off. However, these dampers fail open on loss of power, to take advantage of exhausting by stack effect, the inlet louvers to the building being at an elevation of about 25 ft, while the stack discharge is at 120 ft elevation. In addition, back-draft dampers are provided in line with the fail open automatic isolation dampers above, to prevent backflow during system disturbance; (Ref: 24590-LAB-M8-C3V-00003003).

In summary, the existing power supply to the Rad Lab fume hoods exhaust is adequate based on the following:

1. The power supply is highly reliable with a probability of LOSP event of ≥ 1hour in once in 33 years.

2. In the unlikely event of loss of power to the C3 exhaust fans; the passive design features will mitigate the potential for spread of radiological contamination.

3. Given the low radiological source term the consequence of a significant spread-of-contamination event (that would adversely affect the resumption of Lab operations) is low.

WTP-04-281-04 The WTP project will use anhydrous ammonia in amounts up to 12,000 gallons. Rupture of the storage tanks could produce unacceptable concentrations of ammonia in about 2 minutes at the unprotected control areas. The safe haven for remote process shutdowns is located in the Pretreatment facility annex. This safe haven comprises approximately 100,000 cubic feet, with a cleanup recirculation unit that turns over only 1,000 cubic feet per minute. A turnover rate of once per 100 minutes does not appear adequate to protect the personnel who are expected to remain in the safe haven.

Response: Control implementation will be provided by running the standby filtration unit continuously. The air change rate will be based on 1/8" W.G. positive pressure with respect to the atmosphere. It will include an inleakage factor to account for gradual degradation in seals, floor drains, fans, ductwork, and other components; and other degrading factors including drift in control dampers, inadequate maintenance on control room envelope, changes in differential pressures caused by ventilation system changes and inadvertent misalignment of ventilation systems – consistent with U.S. Nuclear Regulatory Commission (NRC) Regulatory Guides 1.194, 1.196, 1.197, and NEI 99-03. The calculation with the revised air change rate is scheduled to be completed in December 2004.

WTP-04-281-05 The staff urged that more attention be given to the design of the safe haven. Consideration ought to be given to experience gained from control rooms at licensed nuclear power plants. This experience has been captured by the NRC in regulatory guides (R.G.) entitled: R.G. 1.194, Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants; R.G. 1.196, Control Room Habitability at Light-Water Nuclear Power Reactors; and R.G. 1.197, Demonstrating Control Room Envelope Integrity At Nuclear Power Reactors. The commercial nuclear industry, as represented by the Nuclear Energy Industry (NEI), has also distributed in draft form NEI 99-03, Control Room Habitability Assessment Guidance.

Response: The above mentioned documents have been reviewed and provide valuable guidance for the design of the Control Room Building. The Architectural aspect of the Control Room Building design is consistent with the NRC and NEI documents as discussed below:

- The penetrations specifications have been completed to meet design criteria for air pressure differentials, radiation, chemical exposure, fire, smoke, and axial/lateral movement. (NEI 99-03, Rev 1, Section 3.4.3)
- The door seals are specified to meet the air infiltration, fire and smoke. (NEI 99-03, Rev 1, Section 3.4.4)
- The design of the structure is concrete so there should be minimal leakage
- Expansion joints have been specified incorporating resistance to ultraviolet light, lateral temperature expansion, and seismic movement. (NEI 99-03, Rev 1, Section 3.4.7)

The HVAC aspect of the Control Room Building design will be consistent with the following Nuclear Regulatory Commission Documents:

- Ventilation System Outside Air Intakes (NRC RG 1.194 Article 3.3.1)
- Infiltration Pathways (NRC RG 1.194 Article 3.3.3)
- Determination of inleakage value (NRC RG 1.197)

- Standard Test Method for Determining Air Change in a Single Zone by Means of a Tracer Gas Dilution (NRC RG 1.197 Reference 4 ASTM E741)
- Control Habitability Assessment Guidance (NEI 99-03)

A maintenance, testing, and surveillance program for the Control Room Habitability system and room envelope integrity will be established to encompass experience and lessons learned from commercial nuclear power industry as reflected in NRC Regulatory Guide 1.78. Development of this program will consider the guidelines in the other relevant NRC and NEI documents.

WTP-04-281-06 The staff questioned plans for protecting the workers not in the safe haven given the rapid propagation of ammonia in a potential tank accident.

Response: The control room design incorporates engineered features that provide a safe haven for personnel that may be required to perform critical functions to place the facility in a safe state in the unlikely event of an ammonia release.

There is no intent, currently, to provide additional engineered features to protect facility personnel not located in the safe haven from ammonia releases. These personnel will respond in accordance with emergency procedures covering an ammonia release. These procedures are tentatively scheduled for development in 2007 and will define protective actions to be taken in response to an ammonia release.

(The controls strategy for ammonia releases is prevention. This strategy is implemented by the following:

- A design subjected to the WTP ISM process to identify system vulnerabilities and to select appropriate standards
- A system designed and built to standards relied upon by the chemical industry to protect both workers and the public from the potential consequences associated with receipt, transfer and storage of large amounts of ammonia
- System components designated safety significant in accordance with the approach in DOE-STD-3009 (these components are also designated SC-III/PC-2/QL-2.)
- Operations governed by Technical Safety Requirement (TSR) level controls

This control strategy is considered adequate to protect WTP workers from the hazards associated with ammonia operations in accordance with DOE and industry standards.)

Response: The response to this item will be provided at a later date.

WTP-04-281-07 Damper bypass leakage is a particularly important consideration for the habitability of the safe haven. With the potential for high concentrations of anhydrous ammonia outside the facility and the current low turnover rate of 100 minutes, small amounts of bypass leakage through isolation dampers could contaminate the safe haven with ammonia fumes. The capability to test for bypass leakage is challenging.

Response: The HVAC equipment (Air Handling Unit, Emergency Standby Filtration Unit, and Automatic Control Dampers) serving the Pretreatment Main Control Room safe haven will be designed, fabricated, and tested to meet the requirements of ASME AG-1-1997 with ASME AG-1a-2000 Addenda, ASME N509, and ASME N510.

A maintenance, testing, and surveillance program for the Control Room Habitability system and room envelope integrity will be established to encompass experience and lessons learned from commercial nuclear power industry as reflected in NRC Regulatory Guide 1.78. Development of this program will consider the guidelines in the other relevant NRC and NEI documents.

WTP-04-281-08 The structural adequacy of the safe haven is still uncertain. At present, a steel architectural clad siding is specified. This type of clad siding is currently not designed to withstand a seismic event. The contractor noted that it was considering extending the concrete so that the clad siding would not be used for this portion of the structure.

Response: In early 2004 the seismic analysis of the Pretreatment Facility Annex structure that contained the control room and associated areas resulted in a response spectra that was larger than anticipated, resulting in difficulty qualifying the Important to Safety (ITS) equipment. The proposed Control Building is reinforced concrete that provides a uniform shear wall concrete design. This is identified in Trend (TN-24590-03-01094, approved on June 20, 2004.)

The Control Building adjacent to the main Pretreatment Facility is being designed as a Seismic Category I concrete building. The Control Building, housing the control room and supporting electrical and HVAC equipment, is being designed in accordance with the WTP Civil Design Criteria for SC-I concrete structures. No architectural metal siding will be used.

WTP-04-281-09 In an earlier design, the in-bleed filter units going from the lower-contaminated C-3 zone to the high-contaminated C-5 zone had HEPA filters for backflow prevention of contamination. The HEPA filters (rated at 99.97 percent removal efficiency) have been replaced by a filter (rated at 85 percent removal efficiency) and a fire damper (about 97 percent efficient). This represents a factor of 15 reduction in removal efficiency. The safety basis analysis was not available during the review, but will be examined by the staff to ensure adequate protection is being provided for facility workers during an accident.

Response: A response was sent to the DNFSB under WTP-04-091 on June 8, 2004 (CCN: 089977).

The decrease in filtration efficiency in the change from HEPA filters to the damper system for the inbleeds to the C5V system was considered when the change was made. The C5V is an extremely reliable system. Considering the potential for system failures and upsets, the project determined that the cost-effective solution for the mitigation of the impacts, consistent with the ALARA principle, was to use the damper system.

The evaluation of replacing the C5V inbleed HEPA filters with pressure-activated dampers based on the following information:

- The C5V ventilation system is Safety Class, SC-I, and meets the single failure criteria.

- The PSAR did not credit the HEPA in the in-bleeds for any specific function (see Table 3-9, 4-1, & 4-2) since the doses associated with a potential backflow are minimal (CCN 043734, 043735, 043736, and 049915).
- The DBE calculations did not identify a significant backpressure event resulting in backflows from C5 to C3 areas associated with a significant accidental release (see 24590-HLW-U0C-30-00002, Rev. B and 24590-HLW-U0C-30-00007, Rev A).
- The beyond design basis event (BDBE) calculation identified a potential over pressurization event (7.5" to 8" WG), which would have caused a backflow for on the order of 35 seconds.
- The other DBE analyses did not identify the inbleed HEPA filters as one of the required controls for prevention or mitigation of accidents
- An ALARA evaluation was prepared and the dampers were determined to be an acceptable alternative with substantially lower cost.
- The expense associated with procurement, installation, and maintenance of the large number of HEPA filters was considered to not provide sufficient safety benefit based on the dose/risk mitigation they were providing when compared to the use of the damper system.

The WTP concluded that for HVAC upset conditions this system would provide an acceptable mechanism for mitigations of backflows. This damper system provides adequate cost-effective mitigation of the limited impacts.

WTP-04-281-10 At the Pretreatment facility, the PVV system cannot handle the full flow of all five non-Newtonian vessels being sparged simultaneously at full flow; in fact, the sparger air flow for just the two lag storage vessels exceeds the PVV system capacity. Changes are required to accommodate the sparge air flow. Consideration is being given to sequencing the sparging rather than using continuous sparging. The staff will continue to follow the resolution of the limited capacity of the PVV system and the need to sparge to safely reduce hydrogen levels.

Response: The Pretreatment Facility PVV system has about 1,800 scfm allocated to sparging air flow from the non-Newtonian slurry tanks (UFP, Lag Storage, and Blend Vessels.) Once the effectiveness of sequential sparging is demonstrated by testing, the WTP plans to change the suthorization basis and design correspondingly to operate the spargers in the non-Newtonian slurry tanks sequentially, i.e. first the Blend Vessel spargers for an hour, then Lag Storage 1 and Ultra-filtratration Process 1 vessel spargers for an hour, then the Lag Storage 2 and Ultra-filtratration Process 2 vessel spargers for an hour before repeating this cycle. The sparger air flow does not exceed the PVV capacity of 3,600 scfm when operated in this manner.

BNI project has conducted scale tests to demonstrate the intermittent sparging strategy outlined above maintains safe operating conditions in these non-Newtonian tanks. Specifically, the safety issue is release of flammable gases potentially retained in these tanks during the rolling sparger on/off cycles. These experiments demonstrated that the most of the retained gases were released within two minutes from sparging initiation and all of the gas within fifteen minutes. Due to the rapid release of retained gases, intermittent operation of the spargers in these tanks for a period of an hour conservatively maintains plant safety.

If the vessels listed above were sparged continuously, the sparge flow would be about 4,800 scfm, and the PVV system design would have to be changed to about 5,600 scfm. This is well beyond the capacity of the equipment in the system, and redesign would represent a significant impact to the project. Testing at about half scale, using the sequenced sparged mode of operation, is intended to provide a second demonstration of the viability of sequential sparging. Once adequate testing has been performed, the authorization basis will be modified.

WTP-04-281-11 During its previous review, the staff noted that bypass leakage around the HEPA units in the C5 ventilation system, which must be maintained remotely, could present a problem. The contractor has looked into the matter and has identified the potential for leakage past dampers, which would bypass one bank of HEPA filters. There is no clear method for measuring this bypass leakage. The contractor has considered three potential test methods for examining leakage during facility startups. The staff will review the test methods as they are finalized.

Response: In order to adequately answer this action, a completed production model of the remote housing design will be required. This will help determine which of three test methods best satisfies the bypass leakage requirements. The remote filter-housing schedule currently indicates that a suitable housing for this testing will be available by December 2004. Therefore, a target date of February 25, 2005, is being provided for a response.

WTP-04-281-12 During discussions regarding the WTP's Analytical Laboratory, the staff learned that the contractor currently envisions using a pneumatic, overhead sample transfer system to move samples from the three facilities to the laboratory. The staff noted that this could prove problematical if the samples were to become stuck and suggested that the contractor may wish to consider other methods of transferring samples.

Response: The automatic sampling system (ASX) does utilize a pneumatic transfer system to transfer sample containers from the facilities to the laboratory. Such a means of quick, efficient sample transfer has been used successfully at several other nuclear facilities. This system is being designed and procured under a subcontract arrangement, with a 30% and 60% design package being required milestones for submittal of the design, before the start of fabrication is permitted. The system procurement documents specify that the design must include a means of returning a stuck sample carrier to its origin. The entire design, including the pneumatic transfer system, will be subjected to rigorous ISM reviews, where the proposed details of design to accommodate a stuck carrier will be reviewed. With the specified requirements and the ISM reviews, concerns regarding stuck carriers will be appropriately addressed and resolved.

Responses to Issues Raised in August 26, 2004 DNFSB Letter Regarding WTP Electrical/C&I Design

WTP-04-278-01 In substation A-6, the equipment room containing 13.8 kV switchgear does not have an operational fire protection system. Although the building has sprinkler heads installed, the system was intentionally disabled because of concern that the sprinkler system water might enter the equipment that is vented at the top. This issue could be resolved by providing a raised noncombustible cover at the top, with concurrence from the switchgear vendor, or through some other method that would prevent entry of water into the switchgear instead of disabling the fire protection.

Response: The fire protection system in substation A-6, consisting of sprinkler heads for fire suppression, was intentionally shut down due to concerns about possible electrocution of personnel should water enter the electrical equipment panels upon activation of the sprinkler heads. This issue has been resolved by modifying the control logic associated with sprinkler actuation. This will allow sufficient time for personnel to move away from electrical equipment panels before the sprinkler heads are activated. This design is consistent with fire suppression systems in other WTP electrical equipment buildings. Pre-action modifications to the system have been made, Acceptance Test Procedures were performed and the system was placed in full operation on October 11, 2004. ORP has requested confirmation from the DOE Richland Operation Office that the switchgear design will be consistent with IEEE 979-1994, *IEEE Guide for Substation Fire Protection,* specifically the requirements of Section 7.2 regarding use of water in proximity to the switchgear. Once an adequately detailed confirmation is received, ORP will provide this information to the DNFSB. ORP is planning to receive this confirmation no later than December 30, 2004.

WTP-04-278-02 The 4160 V systems for four of the medium-voltage switchgears have no dedicated ground fault protection for the feeder circuit to the motor starter, making it unsafe to work near this system once it has been energized. The current design uses fuses (an old design concept) that will need to be replaced each time a fault occurs. The use of fuses also makes it difficult to coordinate the protective devices, which could result in the loss of the entire bus during a fault. A design using breakers could provide ground fault protection and permit coordination of protective devices.

Response: In the initial phases of the electrical design, 4160V power was to be provided to a vendor furnished 4160V bus. The vendor bus was to feed integrated packages that contain a range of motors and controls. For this application, BNI opted for fused switches in lieu of power circuit breakers. Fuses offer current-limiting fault protection for a fraction of the size and cost of metal-clad switchgear. The only drawback of this approach is selectivity in the event of a feeder ground fault. This shortcoming has been greatly reduced by taking additional steps to ensure a feeder ground fault does not occur as well as limiting the impacts on the overall system in the event a ground fault does occur. These steps include:

1. The installation of power cables in concrete-encased underground electrical duct banks.
2. The application of a 400A, 10-second grounding resistor

3. Distributing loads evenly over four busses to prevent collapse of the system in the event of a single bus failure.
4. Providing protective relays for ground fault protection of equipment fed by the vendor 4160V bus.

WTP-04-278-03 During the facility walkdown, the Board's staff requested that manhole-47 (containing 13.8 kV cables) be opened to assess its condition. The staff observed that concrete had poured through one of the openings in the duct bank and deposited at the bottom of the manhole, partially covering the sump area. BNI staff present during the walkdown stated they would correct this condition by carefully removing the concrete, and would verify that this is not a problem in the other facility manholes.

Response: During a scheduled outage, the concrete in manhole-47 was removed and the sump area freed of any residual debris. Subsequent inspection of all other manholes verified that this condition was unique to manhole-47.

WTP-04-278-04 The staff noted that several safety-significant loads are connected to the safety-class busses. IEEE Standard 384, Standard Criteria for Independence of Class IE Equipment and Circuits, requires that non-safety-class loads be appropriately isolated from safety-class busses to ensure that failure of a safety-significant component would not cause failure of the safety-class power system. Because of the large number of connected safety-significant loads (18), it would be prudent to feed these loads from dedicated safety-significant busses instead of using individual isolation devices for each safety-significant load.

Response:

1. The following criterion will be added to the electrical design criteria and guide, 24590-WTP-DC-E-01-001, revision 2 which will be issued by 10/29/04.

   "SDS loads may be powered from a SDC bus if there are no more than two SDS loads requiring power. If there are more than two SDS loads connected a SDC bus, then a separate SDS power bus should be used. The incoming power for the SDS bus will be provided from a SDC bus. If a SDS load is powered from a SDC bus then it will be treated as an associated circuit per IEEE 384."

2. A review of the RPP-WTP overall load list produced the following results:

BOF:	There are two SDC MCCs with two (2) SDS loads on each MCC. No further action required.
LAB:	There are no SDC MCCs and no SDC or SDS electrical loads. No further action required.
LAW:	There are no SDS loads powered from a SDC bus. No further action required.
HLW:	There are four SDC MCCs with eight (8) SDS loads on two of the MCCs. The changes outlined below are being implemented.
PTF:	There are two SDC MCCs and no SDS loads powered from these MCCs.

No further action required.

3. HLW currently has two SDC (SC) MCCs for train A loads, and two SDC (SC) MCCs for train B loads. Since there are more than two SDS (SS) loads powered from each MCC, a separate SDS bus has been created in each train by converting a MCC in each train to a SDS (SS) bus. The following design changes have been instigated for each train:

   - All SDS (SS) loads are being moved to the SDS (SS) MCC.
   - All SDC (SC) loads are being moved to the SDC (SC) MCC.
   - Each train will have one SDS (SS) MCC and one SDC (SC) MCC bus.

4. The buses feeding the SDS (SS) loads will be procured under the same purchase order as the SDC (SC) power buses and will be qualified as SDC (SC) equipment. These busses will be tagged accordingly to indicate that the bus is intended for SDS (SS) loads only.

5. UPS power loads

   At this time it is not known how many SDS instruments will require power from a SDC UPS nor are the locations of the instruments finalized at this time. SDS loads will be powered off of separate, SDS designated power panels that will be powered from a SDC UPS. All of the equipment will be qualified and purchased as SDC.

WTP-04-278-05 The SRD for the electrical systems (Section 4.4-4) does not contain a complete list of required standards as delineated in DOE Order 420.1, Facility Safety, and DOE Guide 420.1-1, Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for Use with DOE Order 420.1, Facility Safety. BNI engineers stated that they would revise the standards list for Section 4.4-4 of the SRD.

Background: IEEE 603-1991 was originally a SRD implementing standard but was removed under 24590-WTP-ABCN-ESH-01-027 and replaced with ISA S84.10-1996. Other implementing standards that referred to IEEE-603 were tailored to replace the reference with ISA S84.010-1996. The DNFSB position is that ISA S84.10-1996 is an acceptable implementing standard for the C&I systems, but IEEE 603-1991 should be retained for the safety class electrical systems.

Response: ORP agrees that safety class electrical systems must be designed to the basic approach in section 5.2.3 (Electrical) of DOE G 420.1-1 with appropriate consideration and application of the national codes and standards referenced therein, including IEEE 603, where applicable. BNI has been requested to reevaluate the previous change to the Safety Requirements Document which replaced IEEE 603-1991 with ISA S84.10, using the standards setting portion of its integrated safety management process, and has begun that reevaluation. ORP anticipates that this reevaluation will be completed no later than March 1, 2004. In the event that BNI concludes that some standard or combination of standards other than IEEE 603-1991 is appropriate, and ORP endorses that conclusion, ORP will advise the DNFSB of that decision. Otherwise, the SRD will be revised by the authorization basis amendment process to reincorporate IEEE 601-1991 as an implementing standard for safety class electrical systems by March 1, 2004.

WTP-04-278-06 One-line drawings used for the existing electrical calculations do not match the current one-line drawings. However, BNI has performed an informal estimate of short-circuit and load-flow calculations and expects no major issues in this area. The Board's staff will review the calculations once they have been completed.

Response: BNI maintains a working copy of the electrical system topography that complies with the working copy of the one-line diagrams, load schedules and other reference documents required to perform electrical system calculations. BNI performs periodic electrical analyses to validate the acceptability of the current design. Since the electrical model represents the up-to-date working status for all facilities, calculations cannot be formally issued due to the constraints imposed by project and DOE guidelines. Most notably, calculations that rely on drawings and schedules for input must have these reference documents formally issued, thus the lag between the formal issue of a calculation and reference documents. Final (or confirmed) short circuit, load flow, voltage drop and motor starting calculations will be issued upon the final receipt of all calculation specific vendor documentation – this is estimated to be mid to end 2007. However, informal calculations and the issuance of revised calculations are prepared when engineering deems that loads have changed significantly enough to warrant a new revision.

WTP-04-278-07 The SDC C5 ventilation system is the key active system used to prevent exceedence of site boundary radioactivity and hazardous chemical limits. One of the two independent C5 ventilation trains will be in service during normal plant operations. The current design calls for starting the standby train when total system exhaust flow falls below a nominal design value. A conservative value of total system flow can be used as a precursor for an imminent loss of system functionality. However, flow imbalances or larger-than-anticipated inleakage into one C5 area could result in meeting the total flow requirement concurrently with inadequate vacuum in other C5 areas. The Board's staff suggested that monitoring the vacuum in each C5 room would be a more appropriate control scheme for this SDC system. Additionally, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers Handbook Heating, Ventilating, and Air Conditioning Systems and Applications suggests using static pressure controls for ventilation systems in certain manufacturing processes, clean rooms, and laboratories. These examples are analogous to the C5 ventilation system.

Response: BNI is evaluating this concern, but has been unable to complete a satisfactory response. A response to this item will be provided at a later date (currently scheduled for December 29, 2004).

WTP-04-278-08 The principal industry standard adopted for all safety instrumented systems in WTP is Instrumentation, Systems, and Automation Society (ISA) 84.01, Application of Safety Instrumented Systems for the Process Industries. For WTP, the probability-based SIL required by ISA 84.01 is developed using BNI's Integrated Safety Management (ISM) process. BNI reported that the most stringent requirement noted to date has been an SIL-2, which means the safety system, including both hardware and software from sensors through final actuation devices, can fail to operate as often as 1 in 100 attempted operations.

BNI will generate calculations to demonstrate that the delivered systems are reliable enough to support the required SIL. In these calculations, BNI will assume that software developed by its staff will not result in a safety system's failure to operate. The Board's staff will review the reliability analyses for the safety instrumented systems to better understand the technical basis for these positions.

Response: The Item indicates that "The Board's staff will review the reliability analyses for safety instrumented systems..." The subject reliability analyses are part of the SSRS for each SIS. SSRSs for PT are scheduled to be issued Rev. 0 between December 2004 and November 2005; SSRSs for HLW are scheduled to be issued Rev. 0 between May 2005 and March 2006; SSRSs for LAW are scheduled to be issued Rev. 0 between April and August 2005.

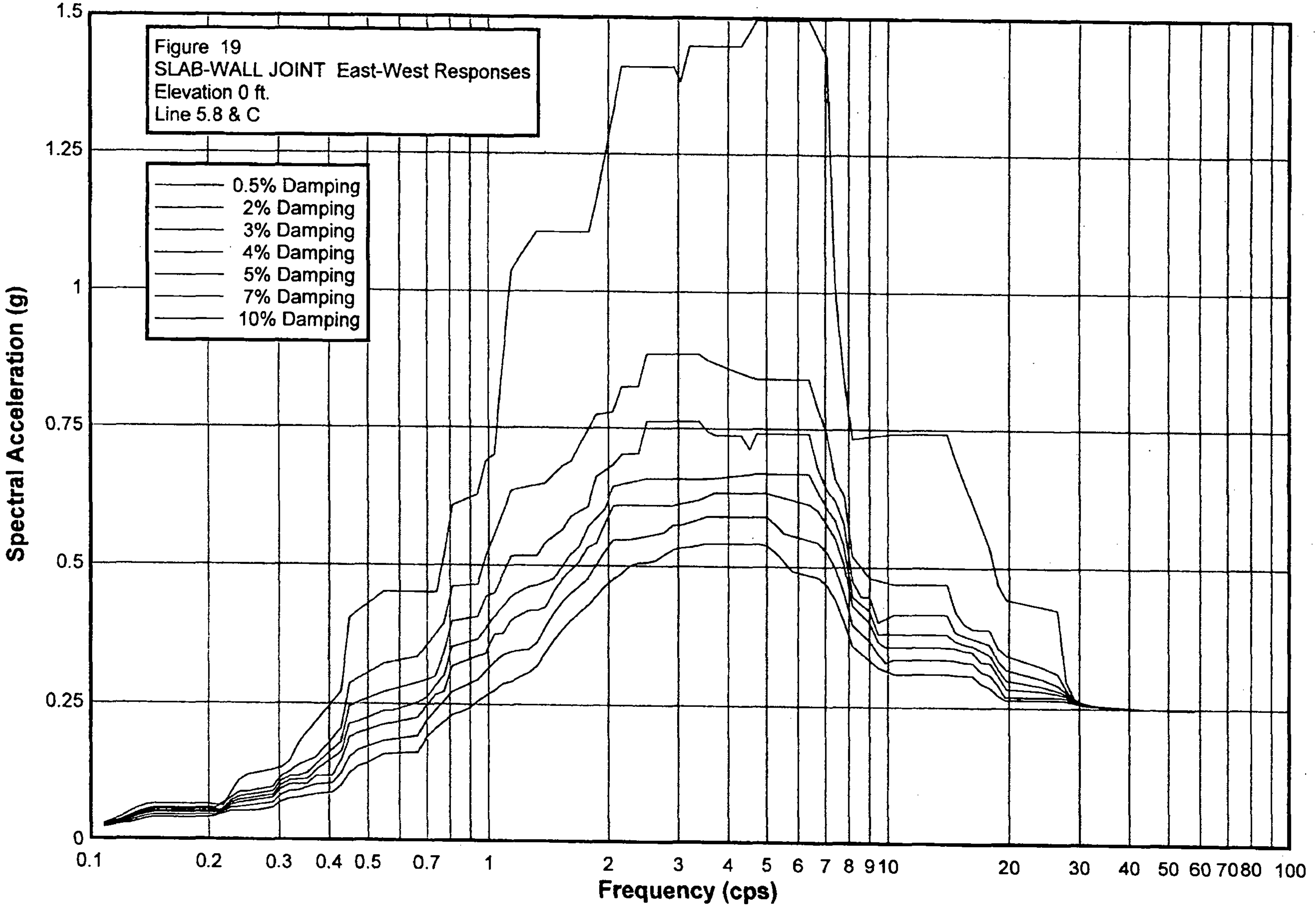
WTP-04-278-09 The SRD, Section 4.3, addresses the seven criteria for engineered safety systems. Section 2.7.1 of Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; General Information, Instrumentation and Control invokes the appropriate SRD requirements for engineered safety systems except for criterion 4.3-2. Criterion 4.3-2 invokes consensus standards for important-to-safety systems for which single-failure protection is required. BNI engineers stated that not including the single-failure criterion was an oversight; they also said that the SDC/SC I&C systems will be protected from single failures. Although senior DOE staff stated that revising the PSAR was not required because the SRD is an upper-tier document, BNI engineers reported that they would initiate a change to the PSAR to specifically invoke criterion 4.3-2 for SDC/SC I&C systems.

Response: 24590-WTP-SE-ENS-04-0118 was issued June 28, 2004, to revise the PSAR General information volume as follows:

Change 24590-WTP-PSAR-ESH-01-002-01 Section 2.7.1 to clarify that WTP instrumentation and control is subject to Safety Criterion 4.3-2. In particular, change the line on p. 2-56 which currently reads "SRD Section 4.3, Engineered Safety Systems, Safety Criteria 4.3-1, and 4.3-3 through 4.3-6" to read "SRD Section 4.3, Engineered Safety Systems, Safety Criteria 4.3-1 through 4.3-6".

RPP-WTP HLW Vitrification Facility ISRS

Calc No.: 24590-HLW-S0C-S15T-00009, Rev. 0C



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Enclosure

RPP-WTP HLW Vitrification Facility ISRS

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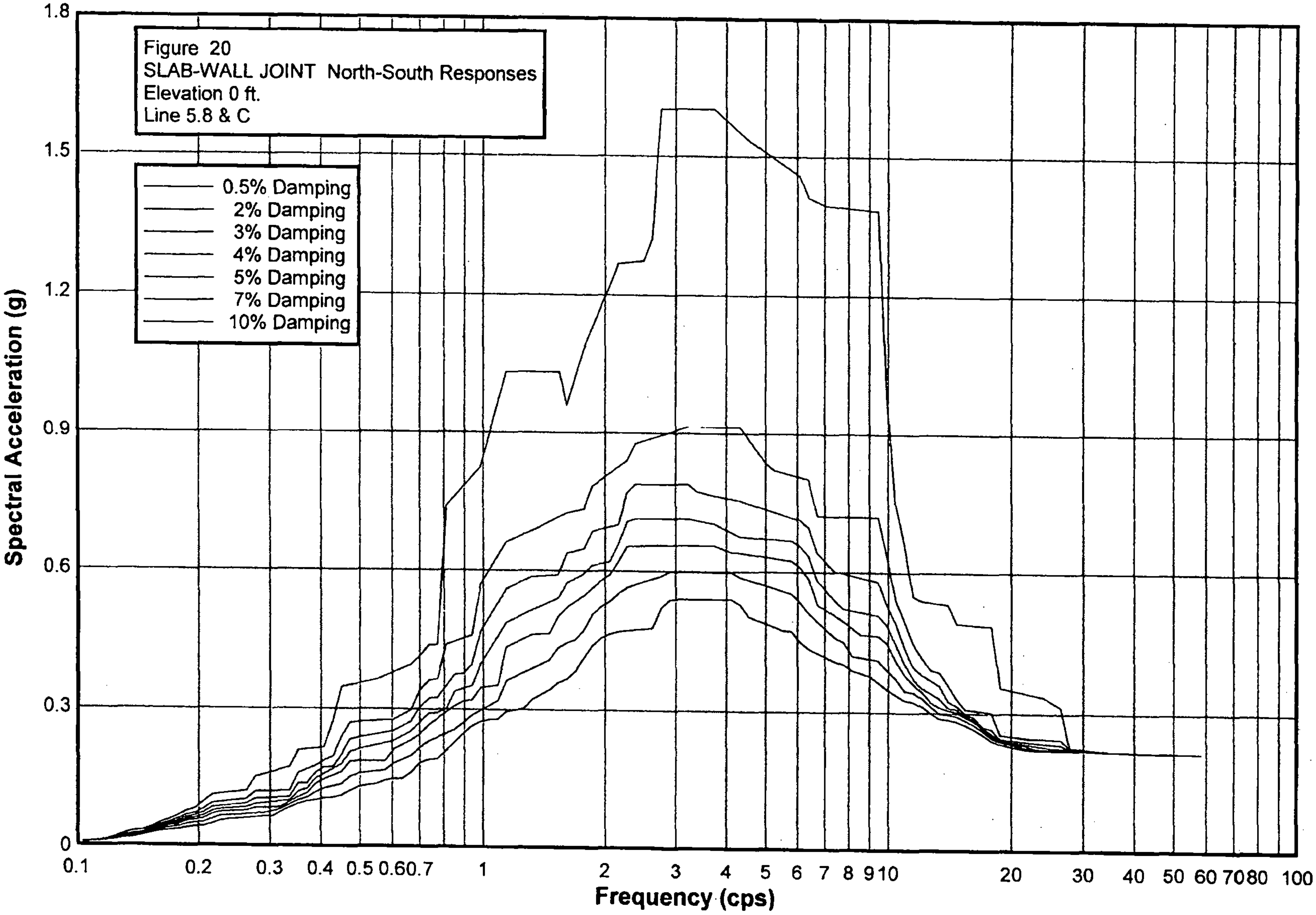
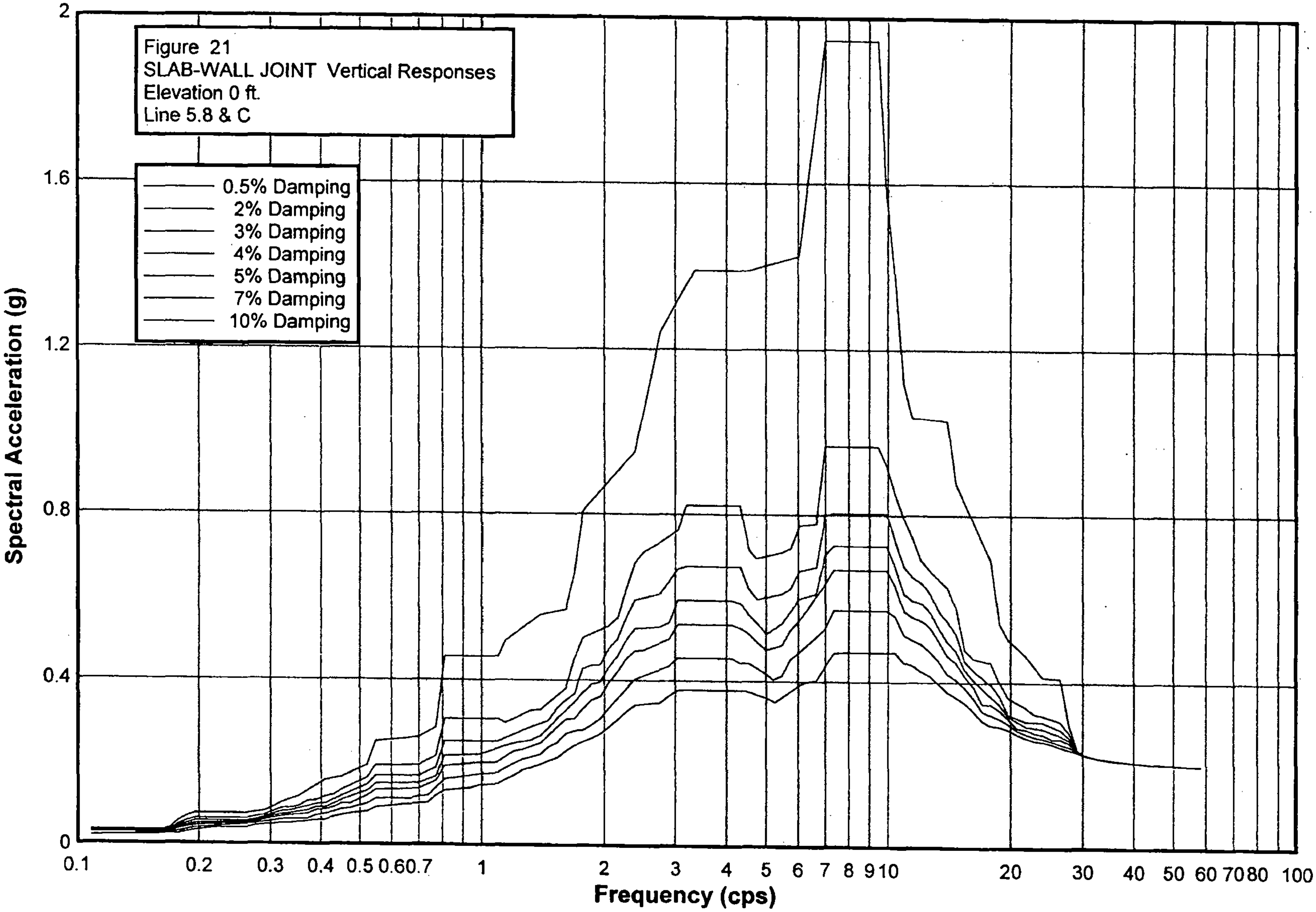


Figure 20
SLAB-WALL JOINT North-South Responses
Elevation 0 ft.
Line 5.8 & C

RPP-WTP HLW Vitrification Facility ISRS

Calc No.: 24590-HLW-S0C-S15T-00009, Rev. 0C



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RPP-WTP HLW Vitrification Facility ISRS

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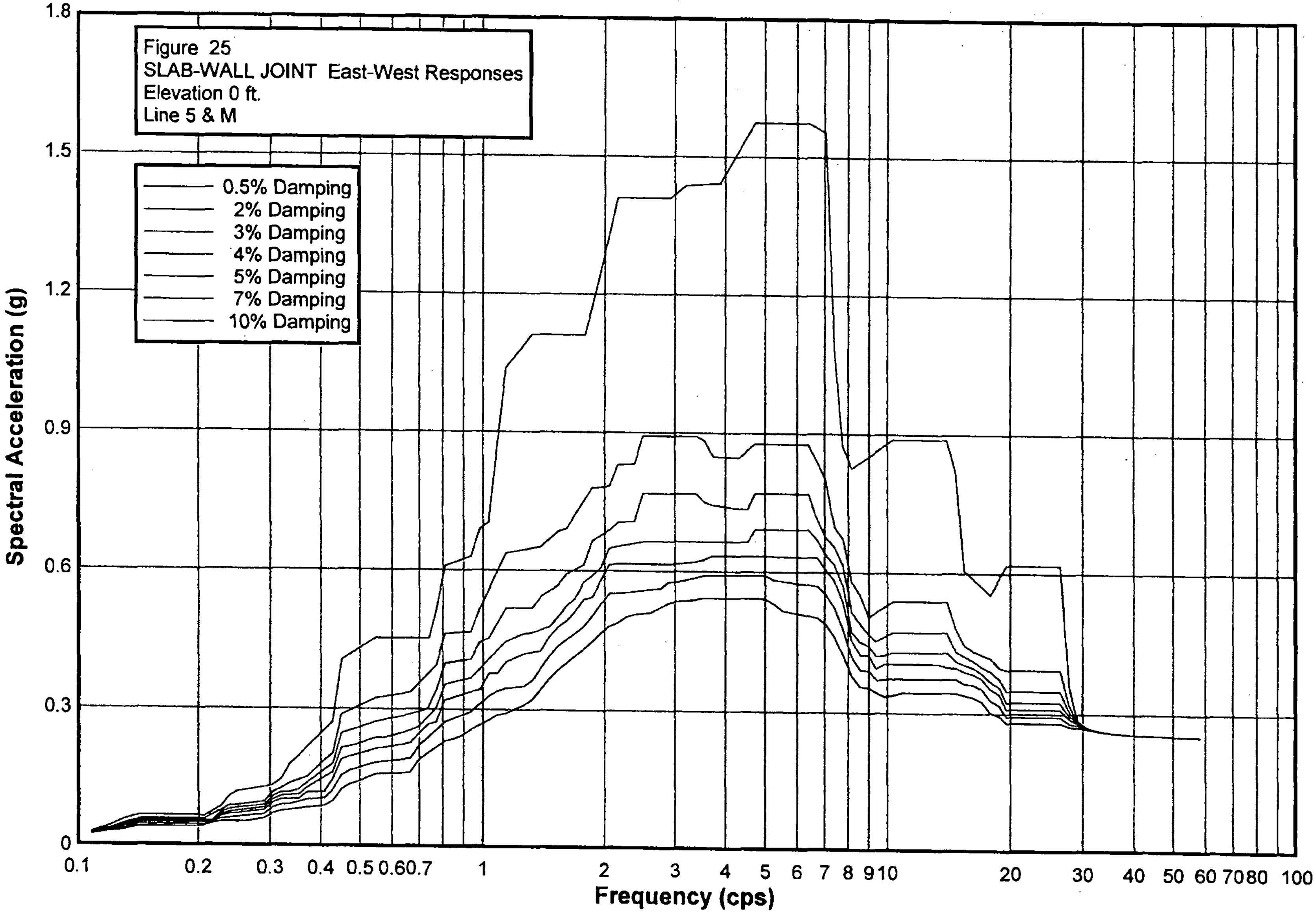

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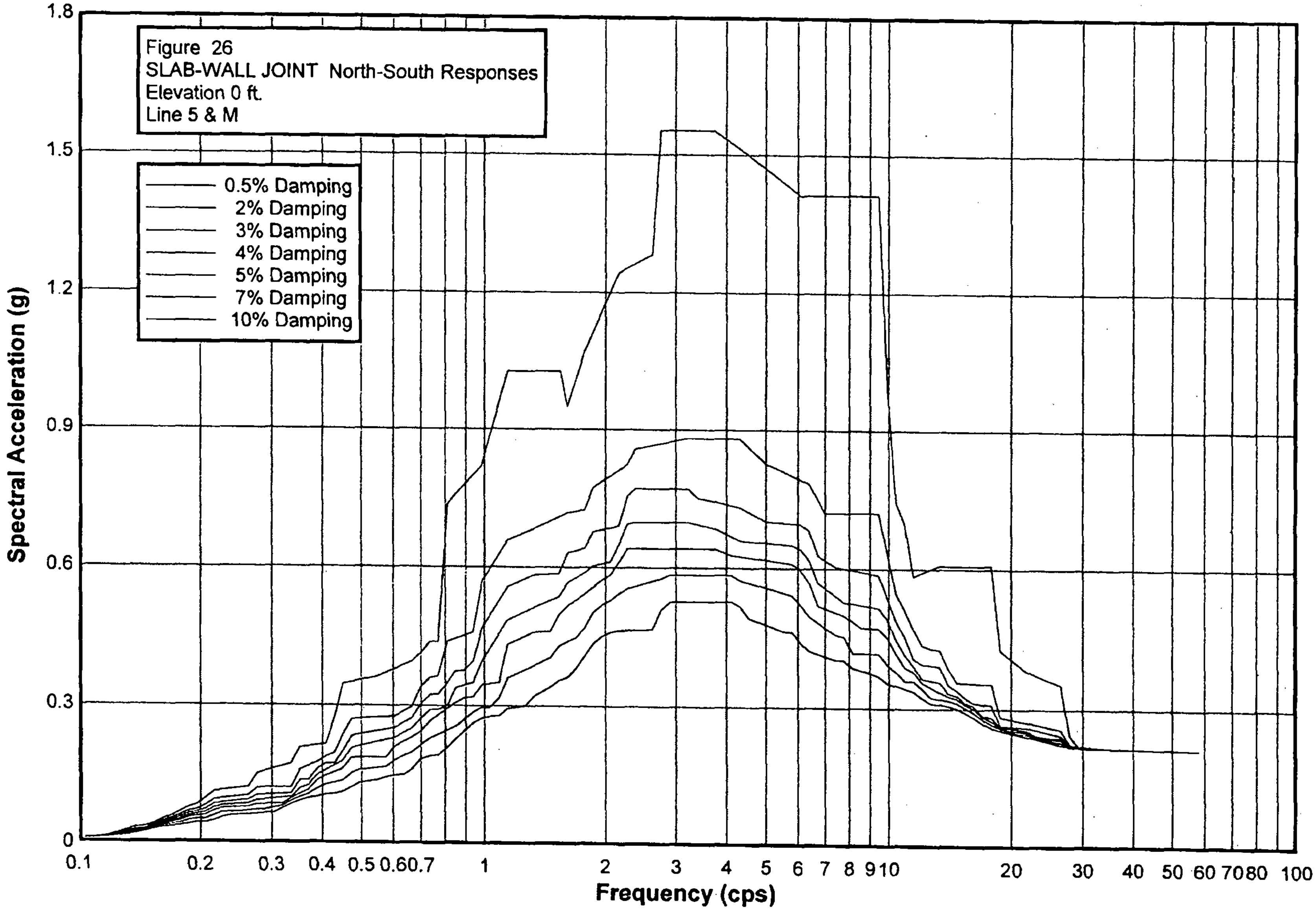

Enclosure

RPP-WTP HLW Vitrification Facility ISRS

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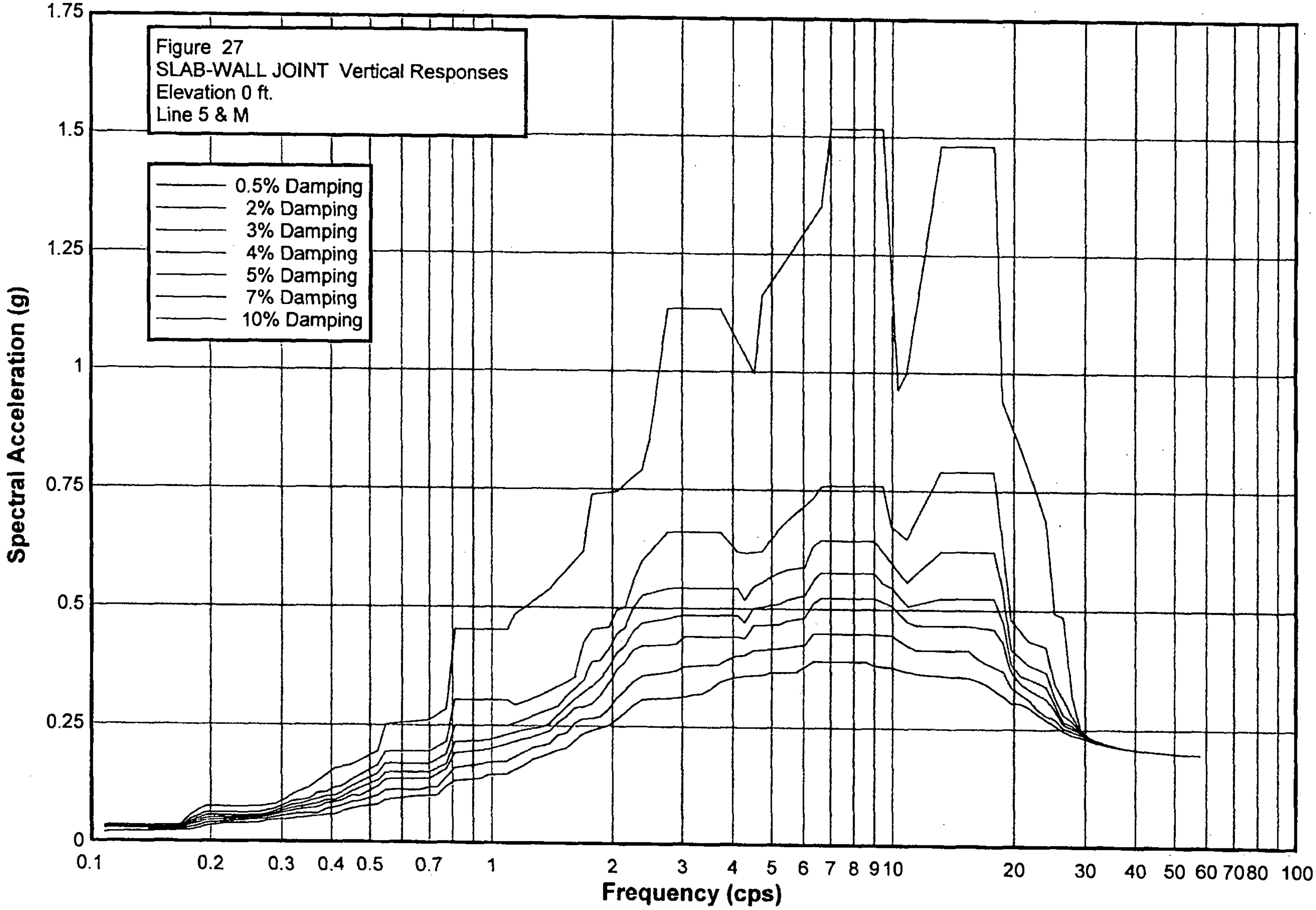
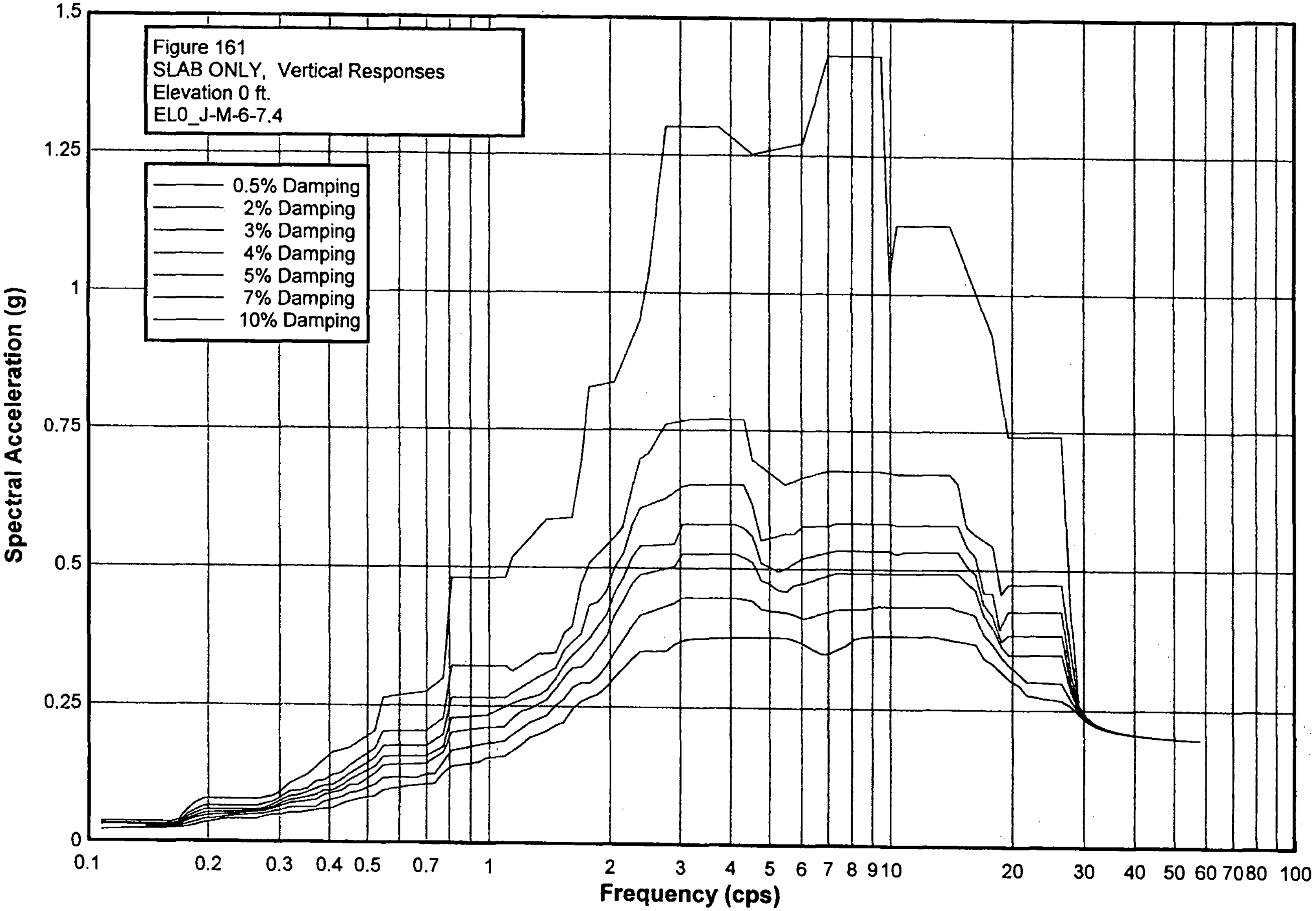


Figure 27
SLAB-WALL JOINT Vertical Responses
Elevation 0 ft.
Line 5 & M

Enclosure

RPP-WTP HLW Vitrification Facility ISRS

Calc No.: 24590-HLW-S0C-S15T-00009, Rev. 0C



Enclosure

RPP-WTP Pretreatment Facility ISRS

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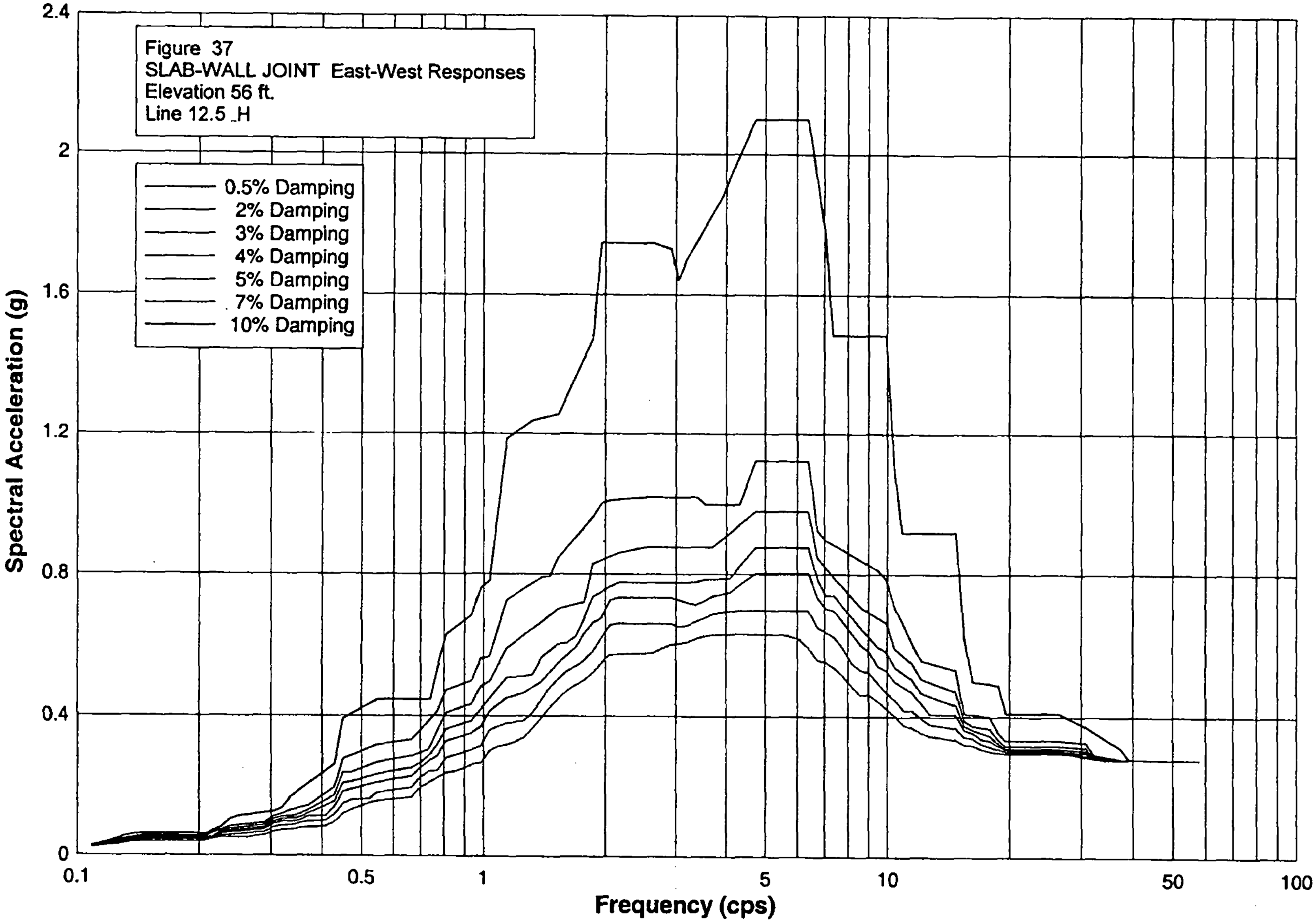

RPP-WTP Pretreatment Facility ISRS

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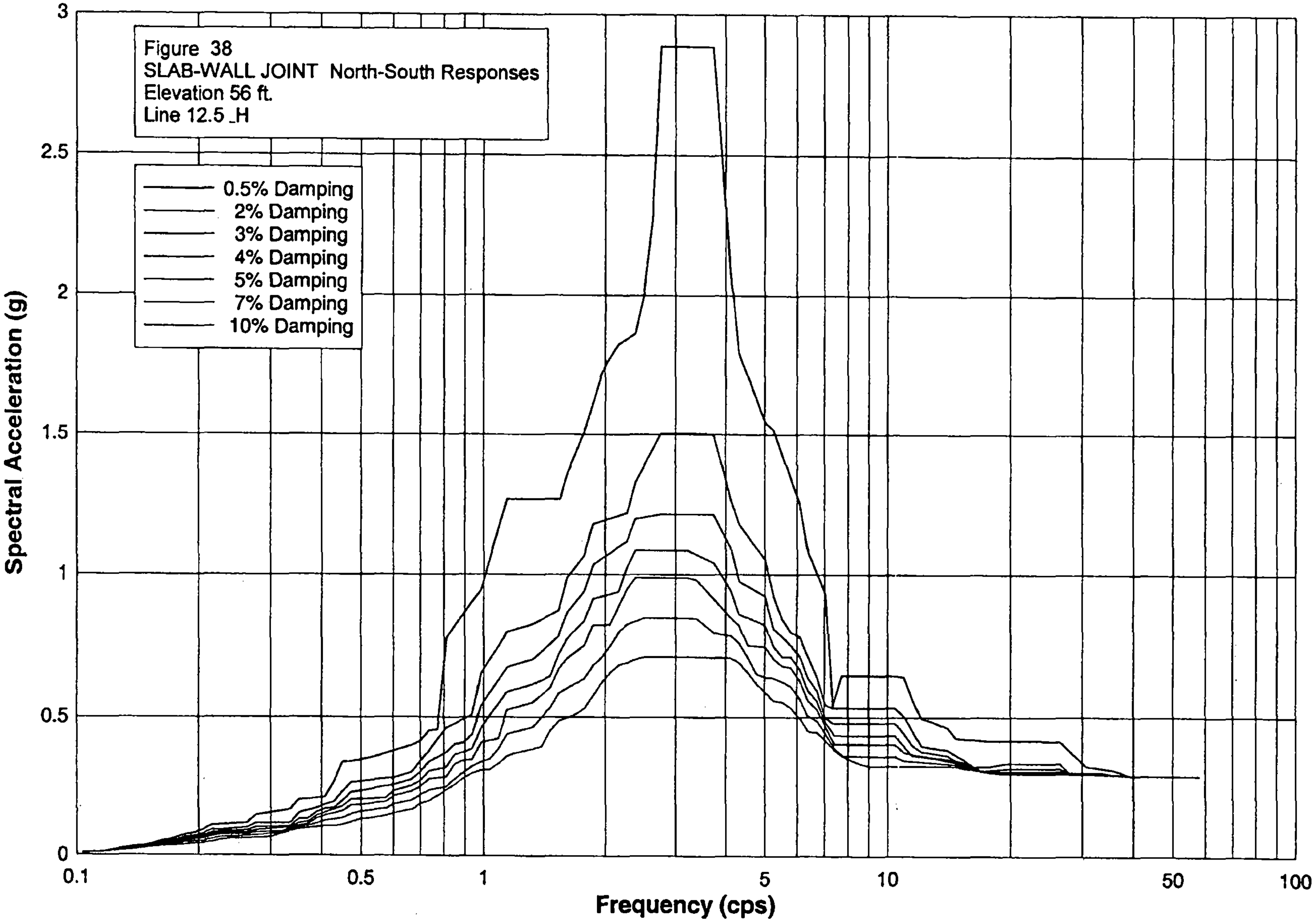

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RPP-WTP Pretreatment Facility ISRS

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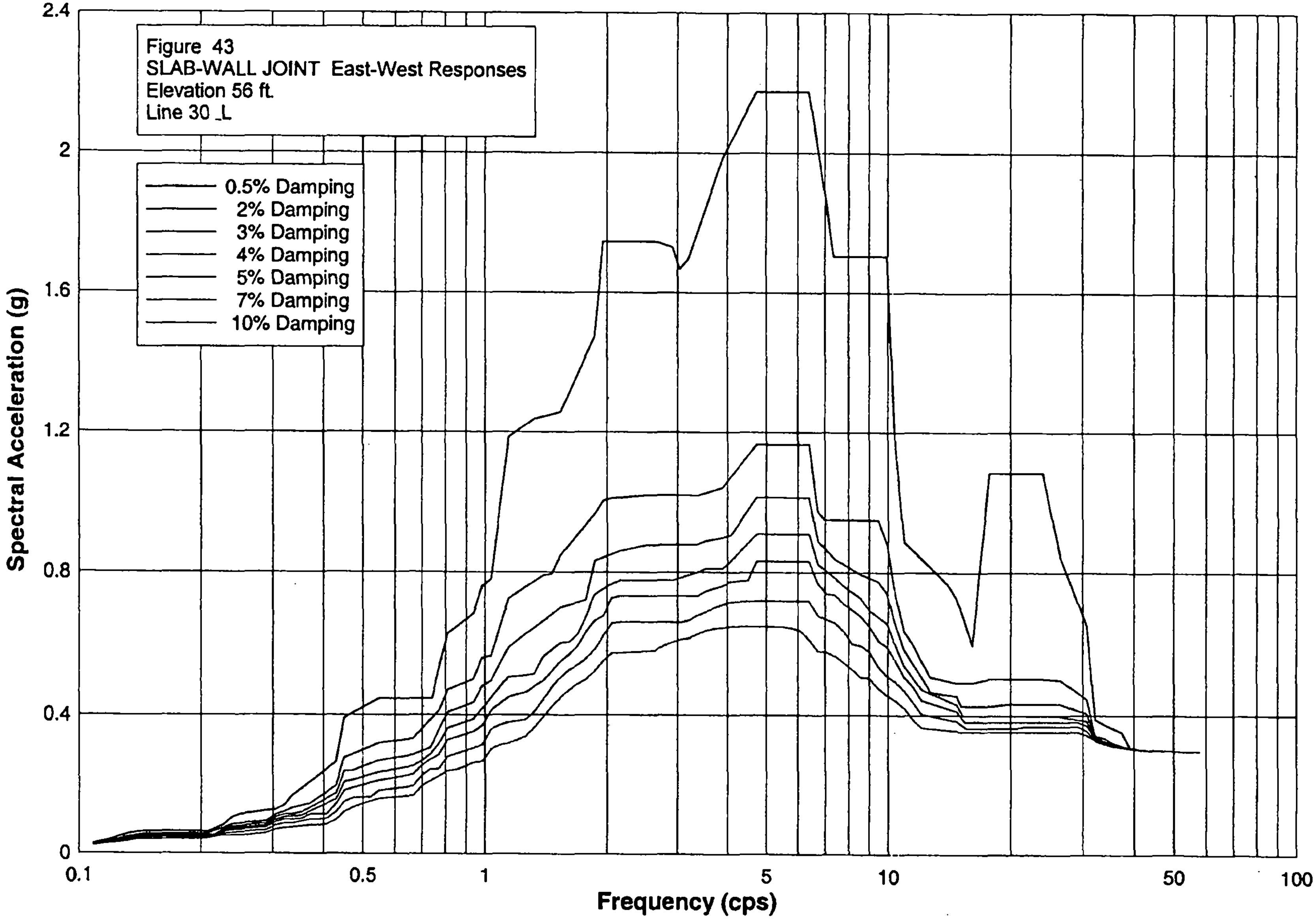

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RPP-WTP Pretreatment Facility ISRS

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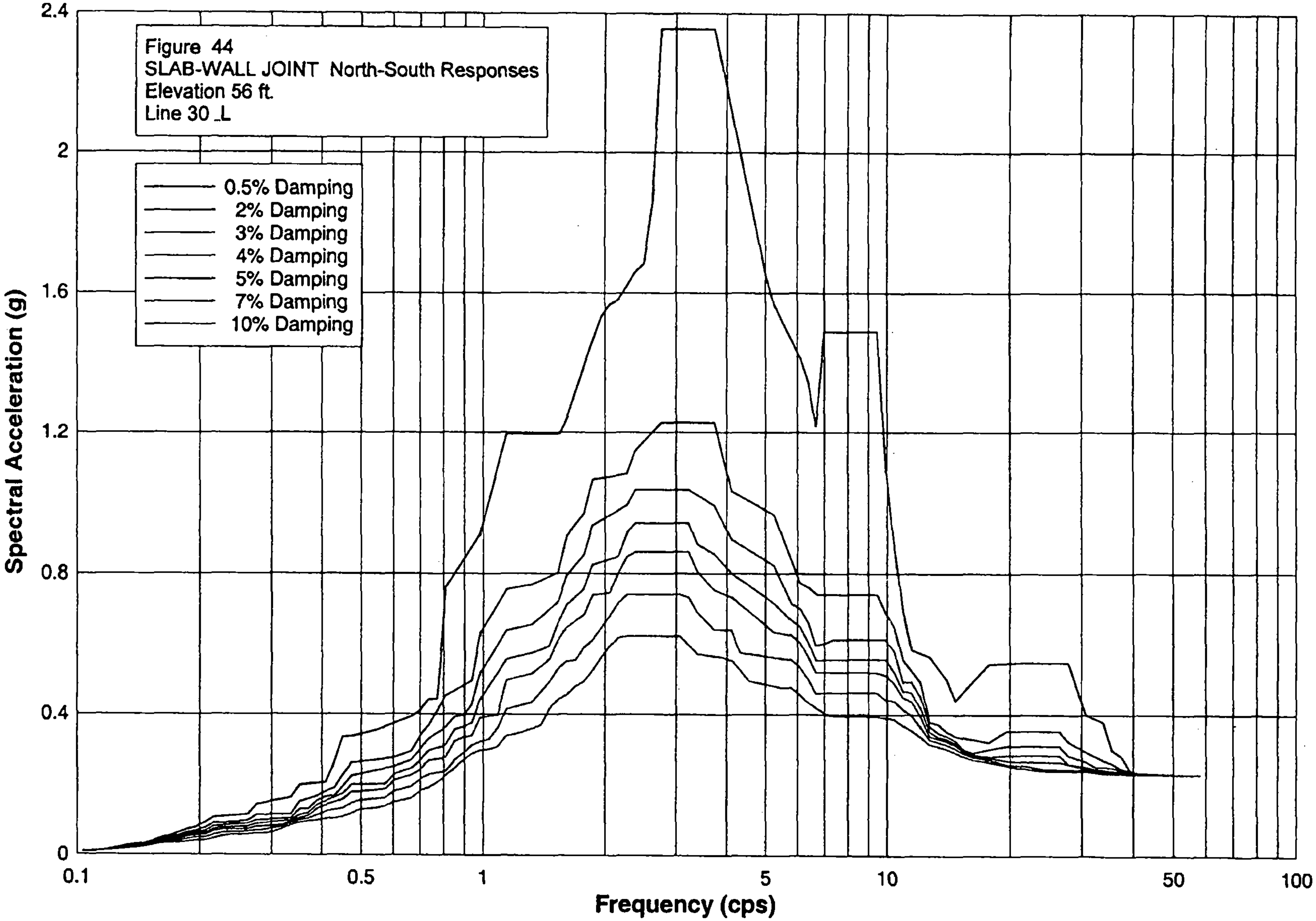

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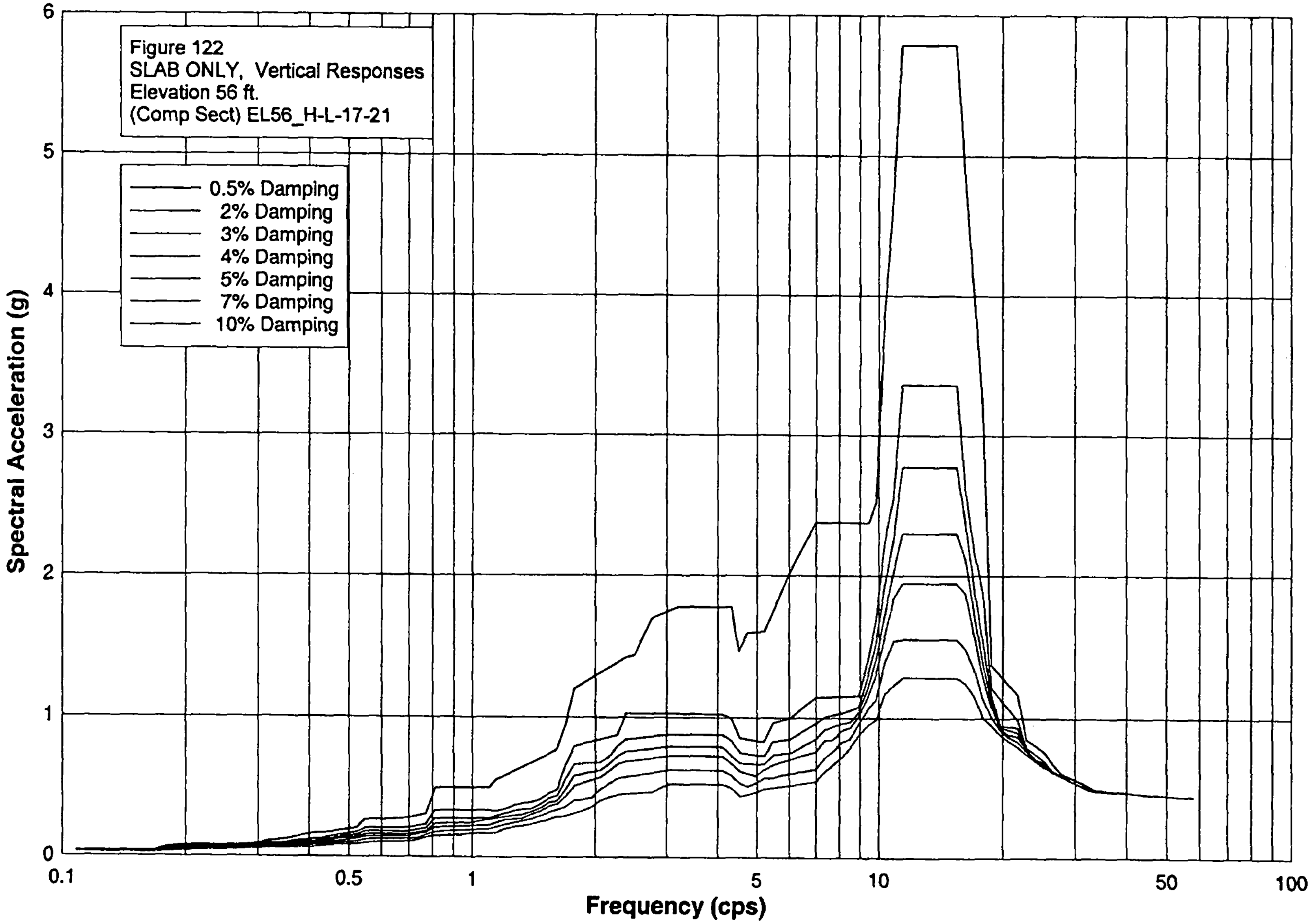

RPP-WTP Pretreatment Facility ISRS

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