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South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

March 23, 2010
U7-C-STP-NRC-100066
10 CFR 50.12
10 CFR 50.10

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 3 & 4
Docket Nos. 52-012 and 52-013
Request for Exemption to Authorize
Installation of Crane Foundation Retaining Walls

Reference: Letter, Mark A. McBurnett to Document Control Desk, "Request for Exemption to Authorize Installation of Crane Foundation Retaining Walls", U7-C-STP-NRC-100022, dated February 2, 2010 (ML100350219)

STP Nuclear Operating Company (STPNOC) has submitted an application for combined licenses (COLs) for South Texas Project (STP) Units 3 & 4, and the NRC has docketed that application. Plans for construction and installation activities rely on the use of construction cranes that are founded at the site grade elevation. Crane foundation retaining walls (CFRW) are needed to allow the crane foundations to be located at grade adjacent to the excavation areas for Units 3 & 4. In the referenced letter, STPNOC requested an exemption to authorize installation of the CFRW prior to issuance of COLs for Units 3 & 4. The purpose of this letter is to clarify the exemption request and to incorporate in a single document all of the required supporting information. STPNOC seeks prompt approval of the exemption request for CFRW installation to avoid unnecessary delay and expense.

The attachment to this letter provides STPNOC's formal request for an exemption from 10 CFR 50.10(a)(1), to the extent necessary to authorize installation of the CFRW for STP Units 3 & 4, and provides the information identified by § 50.12, including the relevant factors identified in § 50.12(a), and the four factors to be balanced in accordance with § 50.12(b).

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Preparation for installation of the CFRW is ongoing, with final installation activities planned to begin no later than November 1, 2010. Since CFRW installation is a critical path activity for the construction of STP Units 3 & 4, STPNOC requests that the NRC make a determination on this request as soon as practicable.

There are no commitments in this letter.

If there are any questions regarding this matter, please contact me at (361) 972-7206, or Scott Head at (361) 972-7136.

I declare under penalty of perjury that the foregoing information is true and correct.

Executed on 3/23/2010

MA McBurnett

Mark A. McBurnett
Vice President, Oversight and Regulatory Affairs
South Texas Project Units 3 & 4

Attachment: Request for Exemption for Crane Foundation Retaining Wall Installation

cc: w/o attachment except*
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Attachment

Request for Exemption for

Crane Foundation Retaining Wall Installation

A. Introduction

STP Nuclear Operating Company (STPNOC) has submitted an application for combined licenses (COLs) for South Texas Project (STP) Units 3 and 4, and the NRC has docketed that application. Plans for construction include installation of construction cranes that are founded at the site grade elevation. Crane foundation retaining walls (CFRW) are needed to allow the crane foundations to be located at grade adjacent to the excavation areas for Units 3 and 4. Installation of the CFRW must precede the excavation. Excavation as defined in 10 CFR 50.10(a)(2)(v) is not a construction activity.

Under 10 CFR 50.10 COL applicants may perform certain activities defined in § 50.10(a)(2) without prior approval by the U.S. Nuclear Regulatory Commission (NRC). However, COL applicants are prohibited from performing construction activities, as defined in § 50.10(a)(1), without prior NRC approval. Under § 50.12, an applicant may request an exemption permitting the conduct of activities that are otherwise prohibited by § 50.10 prior to the issuance of a COL.

B. Requested Exemption

Pursuant to 10 CFR 50.12(b), STPNOC requests an exemption from 10 CFR 50.10(a)(1), to the extent necessary to authorize the installation of the CFRW for Units 3 & 4, i.e., one CFRW per unit for a total of two CFRW. The requested exemption is limited to CFRW installation as described in more detail below.

C. CRFW Role, Location, and Description

NOTE: Distances, where provided below, are approximated.

1. Role of CFRW in Site Preparation and Excavation Activities.

Planning for the STP Units 3 and 4 preconstruction sequence includes the *in situ* installation of CFRW prior to excavations for plant construction, i.e., the CFRW will be installed prior to the commencement of any nearby excavation activities. As described in Final Safety Analysis Report (FSAR) Section 2.5S.4.5.2.4[1], CFRW is required to accommodate the reach of a heavy lift crane needed to place the reactor vessels. In addition, the crane will be used for other major lifts in support of the modular construction of the facility. The sole purpose of the CFRW is to facilitate excavation activities by retaining soil next to the excavations of the Reactor Building (R/B), Control Building (C/B), and Turbine Building (T/B) foundations, allowing the crane areas to be at grade and near the buildings. The CFRW are used only during plant construction activities. The CFRW are permanent structures, since they will be abandoned in-place, having no permanent facility function.

[1] FSAR references pertain to Revision 3 (Reference 1).

The CFRW are located to the east side of each unit and generally extend, in a North-South line, from south of the R/B to north of the T/B. Figure 1a, which is an annotated version of FSAR Figure 2.5S.4-48, illustrates the Units 3 and 4 overall excavation plan and notes the location of the walls, relative to each unit. The CFRW for each unit are labeled in Figure 1 as the crane wall. The location of the CFRW is established to support the installation of the crane pads. As discussed in more detail below, the CFRW have no adverse interactions with any of the structures, systems or components (SSC) identified in 10 CFR 50.10(a)(1).

2. Location of CFRW Relative to Construction Activities.

As noted above, an annotated version of FSAR Figure 2.5S.4-48 is provided in this attachment as Figure 1. Figure 1b shows a cutaway view showing the relative location of the CFRW to the R/B. The referenced figures are general illustrations of the arrangement of plant structures and do not precisely represent separation distances. However, the approximate separation distances between the CFRW and the structures described below will be met during plant construction. The CFRW location generally provides a separation distance of approximately 15 feet from structure walls of SSCs identified in 10 CFR 50.10(a)(1). Exceptions to this uniform distance are discussed in Appendix A.

3. Physical Description and Installation of the CFRW.

As discussed in FSAR Section 2.5S.4.5.2.4, the CFRW are non-safety related, reinforced concrete walls. One CFRW is installed on the east side of each unit. The installation method utilizes an *in situ* "slurry trench" method. As described in FSAR Section 2.5S.4.5.4.4, this method consists of excavating a "one bucket wide" trench that is continuously filled with "slurry". The slurry exerts positive hydrostatic pressure against the trench wall, thereby maintaining vertical excavation sidewalls, even below the groundwater table, which enables the placement of reinforcing and concrete.

The anticipated sequence for construction of the CFRW is as follows:

- A full depth and width slurry excavation is made with the excavation being maintained by the slurry
- Reinforcing is placed in the slurry filled trench
- Concrete is placed by tremie in the excavation from the bottom up
- As the site construction excavation proceeds on the west side of the wall, tiebacks and whalers are installed.

During subsequent excavation, the exposed height of the CFRW is expected to vary up to a maximum of 90 feet. Lateral support for the CFRW is provided by a tieback and whaler system, as described in FSAR Section 2.5S.4.5.2.4. The CFRW are construction aids provided for the purpose of supporting cranes used during construction. The area on the west side of the CFRW will be backfilled as construction progresses, and the wall will be abandoned in place following crane use.

Figure 1a. Overall Excavation Plan (From FSAR Figure 2.5S.4-48)

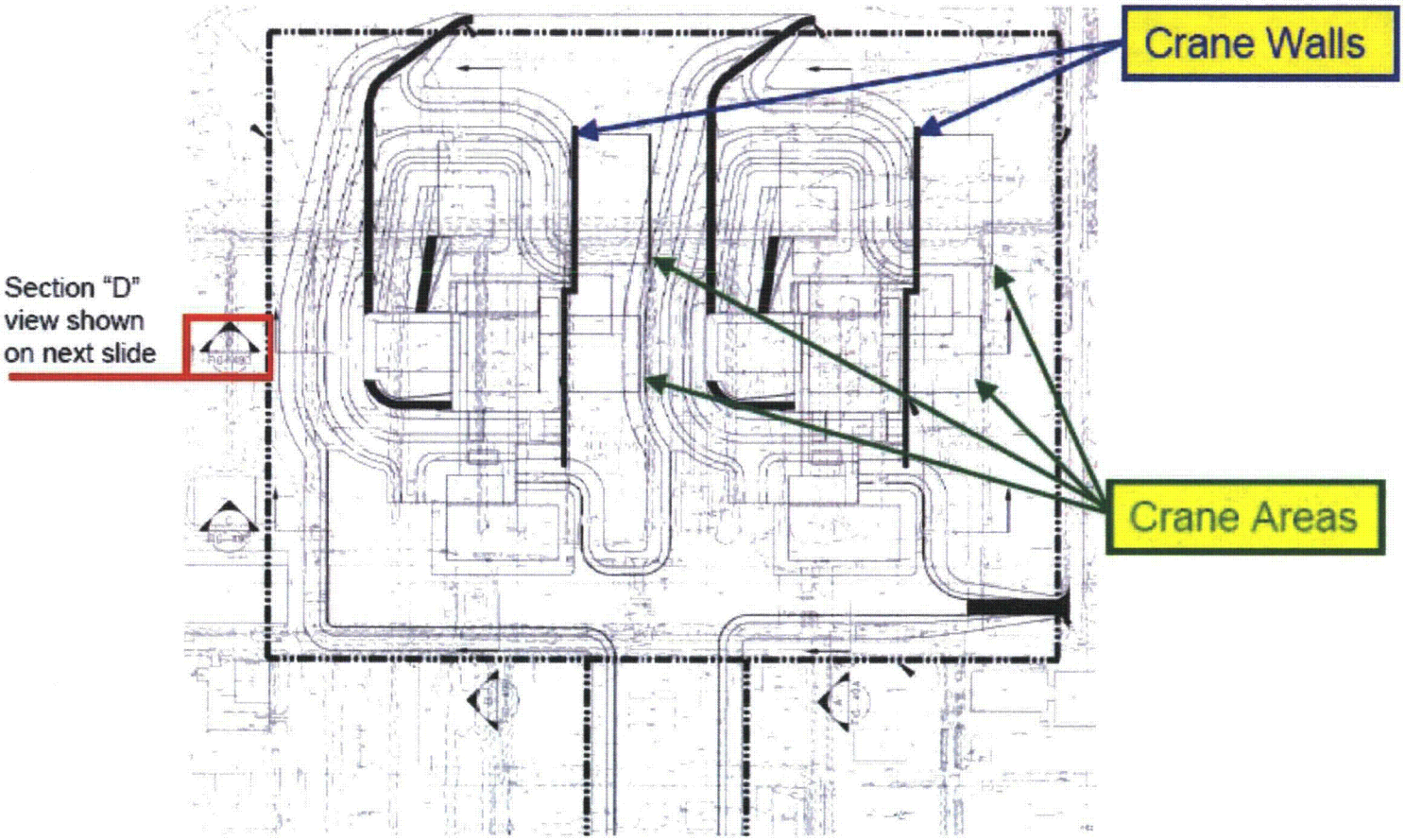
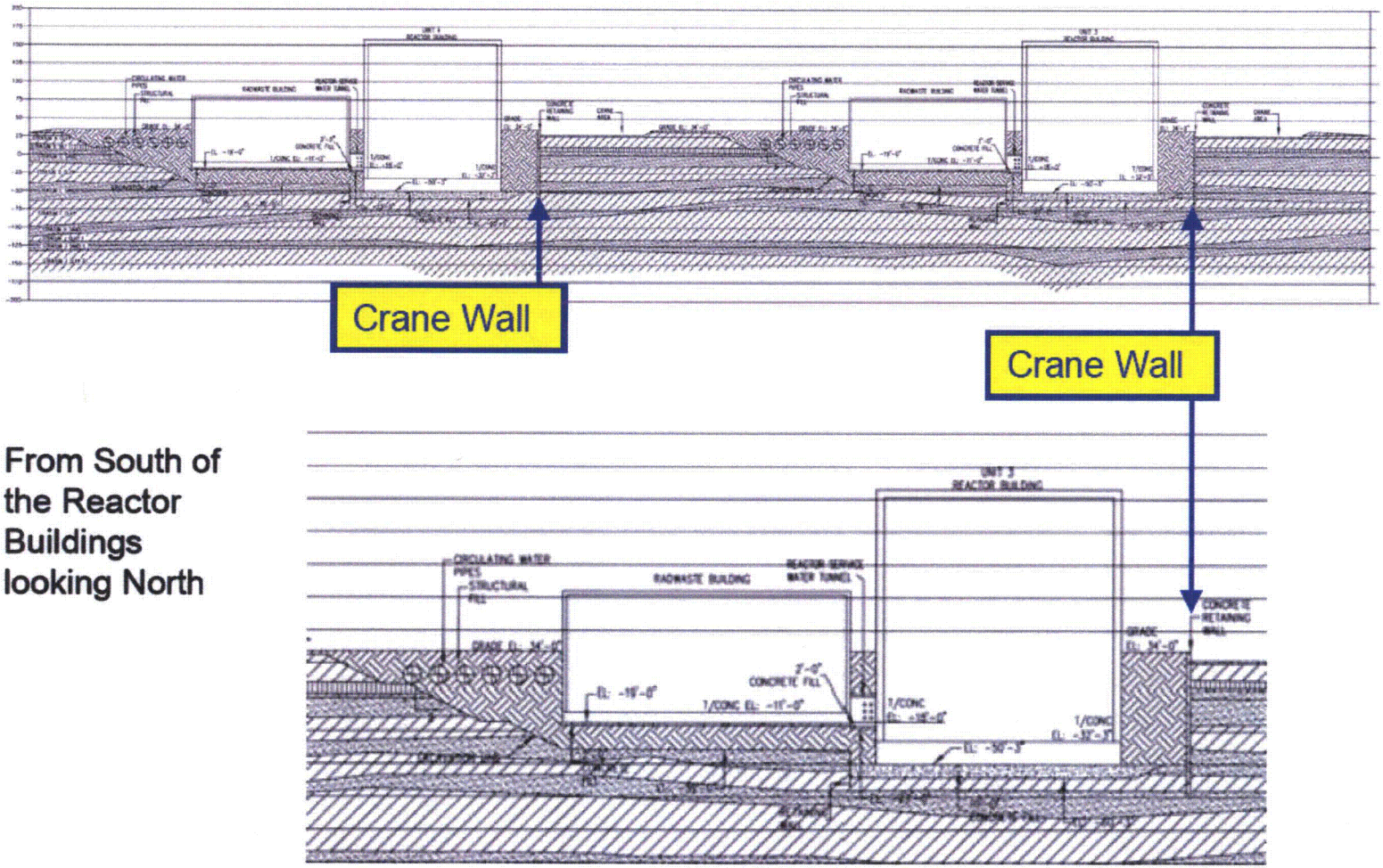


Figure 1b. Cutaway View (From FSAR Figure 2.5S.4-49D Section "D")



D. Application of 10 CFR 50.12(a)

Section 50.12(a) states that the NRC may grant exemptions which are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security. In addition, the NRC will not consider granting an exemption unless special circumstances are present.

1. The exemption is authorized by law.

   Issuance of the exemption is authorized by law since this is the type of exemption contemplated by § 50.12(b), and would not conflict with any provision of the Atomic Energy Act, the National Environmental Policy Act (NEPA), or any other law.

2. The exemption does not present an undue risk to the public health and safety.

   As described above, the exemption will authorize installation of CFRW for STP Units 3 & 4 before issuance of COLs. The exemption will affect only the timing of installation of the CFRW, and will not affect any NRC safety requirements that apply to the design, construction and operation of STP Units 3 & 4. Similarly, the exemption also will not affect any NRC requirements that apply to the operation of STP Units 1 & 2. Consequently, the exemption will not present an undue risk to the public health and safety.

3. The exemption is consistent with the common defense and security.

   Because the exemption will only affect the timing of installation of the CFRW, and will not authorize the possession of licensed material or affect any NRC security requirements that apply to STP Units 1, 2, 3 & 4, the exemption is consistent with the common defense and security.

4. Special circumstances are present.

   10 CFR 50.12(a)(2) states that special circumstances are present whenever any of six listed circumstances exist. The following listed circumstances apply here:

   a. Section 50.12(a)(2)(ii) applies because application of the regulation to CFRW installation will not serve the purposes of Section 50.10(c).

      The purpose of § 50.10(c) is to prohibit the initiation of onsite construction activities that have a reasonable nexus to safety before issuance of NRC approval. Application of § 50.10 to delay the installation of the CFRW will not serve that purpose because the CFRW do not have a reasonable nexus to safety.

      Although the CFRW are permanent retaining walls, they do not affect the safety of STP Units 3 & 4 or have a reasonable nexus to safety. As described above, the CFRW are non-safety related support facilities for construction. The location of the CFRW is designed to accommodate the crane function and to facilitate modular construction

techniques. The CFRW are considered "permanent" only because they will be abandoned in-place after construction. The CFRW have no function during operation of STP Units 3 & 4, and will not affect the safety of any plant structures. This conclusion is supported by an evaluation of the influence of the CFRW on interactions with the structures, systems or components identified in 10 CFR 50.10(a)(1), including influence on the stability (static and dynamic) analyses. This evaluation is included with this attachment as Appendix A which shows that the CFRW has no adverse influence on the stability (static and dynamic) of any SSCs identified in 10 CFR 50.10(a)(1).

The analyses of the CFRW described in Appendix A were based on an analytical model for the structures at the STP site that includes some design changes to the Reactor and Control Buildings that are being handled in accordance with Interim Staff Guidance, Finalizing Licensing-basis Information, DC/COL-ISG-011. The results reported in Appendix A, nevertheless, appropriately reflect the effect of the CFRW on the safety-related structures as described in the COL application. Fundamentally, the relatively small CFRW is inconsequential to the massive Reactor and Control Buildings and has no significant effect on those structures. The design changes under consideration for adoption after COL issuance pursuant to the process described in ISG-011, would not affect this fundamental relationship.

Consequently, the special circumstance described in 10 CFR 50.12(a)(2)(ii) applies to this exemption request.

b. Section 50.12(a)(2)(iii) applies because compliance with § 50.10(c) would result in undue hardship or other costs that are significantly in excess of those contemplated when NRC adopted the most recent modifications to § 50.10.

If installation of the CFRW is not initiated until after receipt of the COLs the construction schedule for STP Unit 3 would be extended and commercial operation of Unit 3 would be delayed by approximately eight months. STPNOC understands that the procedural requirements for issuance of an LWA to allow the installation of the CFRW prior to COL issuance would have an adverse impact on the schedule for completion of NRC's review of the COL application, and would delay COL issuance. Although the amount of such delay is uncertain, any such delay would also delay commercial operation of Unit 3. The cost of any delay of the commercial operation of Unit 3 would depend upon a number of uncertain factors, but is expected to be substantial.

STPNOC has identified two potentially viable alternative construction approaches to reduce or avoid such delay; however, either approach would involve significant increased cost and technical uncertainties. The first alternative is to redesign the CFRW to make it practical to remove them prior to fuel load. If such a redesign could be accomplished, the CFRW would be temporary structures, and installation would clearly be an activity that does not meet the definition of construction. There are, however, technical considerations that would need to be resolved before this approach could be considered viable, and it is estimated that use of temporary CFRW would

increase the combined cost of construction of Units 3 & 4 by approximately $22 million. The second alternative is to increase the size of the excavation and locate the construction cranes in the excavation. This alternative would result in the need to dismantle, relocate, and reassemble the cranes from time to time during construction to facilitate backfill operations. This would significantly complicate the construction sequence, is estimated to increase combined cost of construction of Units 3 & 4 by more than $260 million and would extend the construction schedule by in excess of 5 months.

The need for CFRW arises from the unique characteristics of the STP site, which is a deep soil site without any rock foundations. Without the CFRW, it will not be possible to locate the construction cranes sufficiently close to the permanent plant buildings and at plant grade. Since installation of the CFRW must be accomplished before the excavation for the permanent plant structures, compliance with § 50.10(c) will result in the costs described above. Such costs were not considered by the Commission, and would not occur at sites that have rock foundations.

E. Application of 10 CFR 50.12(b)

The balance of the factors in § 50.12(b) supports issuance of the requested exemption.

1. Installation of the CFRW will not give rise to a significant adverse impact on the environment.

   The impacts of CFRW installation are within the scope of the anticipated preconstruction activities described in Sections 3.9S and 3.10S and Chapter 4 of the Environmental Report for STP Units 3 & 4 (ER). The principal CFRW installation steps consist of:

   - Full depth and width slurry excavation for each CFRW, with the excavation being maintained by the slurry.
   - Reinforcing placed in the slurry filled trench.
   - Concrete placed by tremie in the excavations from bottom up.
   - Installation of tiebacks and whalers as the site construction excavation proceeds to provide lateral support for the CFRW.

   Installation of each CFRW will disturb an area approximately 890 feet long by 13 feet wide, which is 23,140 square feet or or approximately 0.54 acres for both CFRW. This acreage is 0.1 percent of the 540 acres that are estimated to be impacted by site preparation and construction of STP Units 3 & 4 (ER Table 4.1-1).

   As described in ER Section 4.1, the affected area was previously disturbed during the construction of STP Units 1 & 2, and is not environmentally sensitive.

   As described in ER Section 4.6, CFRW installation will employ best management practices (BMP) in accordance with regulatory and permit requirements, and will implement the environmental controls required in the Storm Water Pollution Prevention

Plan (SWPPP). These measures will mitigate the impacts of ground disturbance due to CFRW installation and assure that there will not be a significant environmental impact.

Approximately 75 workers are expected to be needed to complete CFRW installation. This is a small fraction of the estimated 1300 to 2400 workers projected to be employed during preconstruction activities, as described in ER Section 3.10S. In fact, 75 workers is within the normal variation in the number of workers and visitors at the STP site (ER Figure 3.10S-3). Given the small number of workers involved with installation of the CFRW, the CFRW installation will not result in significant adverse socio-economic impacts to local communities.

The completed CFRW will be below-grade reinforced concrete walls approximately three feet wide, 890 feet long and 80 feet deep. The CFRW will not be a significant barrier to movement of groundwater because of their limited depth (ER Section 4.2.1).

The completed CFRW will not have an adverse aesthetic impact, since they are below grade and not visible from off-site (ER Section 4.4.2.2.5).

Consequently, installation of the CFRW will not give rise to a significant adverse impact on the environment.

2. Redress of any adverse environmental impact from CFRW installation can reasonably be effected should such redress be necessary.

   As discussed above, installation of the CFRW will not result in a significant adverse environmental impact. The presence of the CFRW will not prevent any anticipated future uses of the STP site, or of the site-area in the vicinity of Units 3 & 4, and if it ever becomes desirable to remove the CFRW, this could be done using conventional construction methods. Therefore, redress of any adverse environmental impact due to CFRW installation can be reasonably effected, and no anticipated future use of the site will be prevented.

3. CFRW installation will not foreclose subsequent adoption of alternatives.

   None of the alternatives considered in the ER Chapter 9 would require any different use of the subsurface in the vicinity of the CFRW location, and the cost of CFRW installation would be a small fraction of the cost of preconstruction activities. Consequently, installation of the CFRW will not foreclose adoption of any alternatives.

4. Delay of CFRW installation would impose a significant cost that would be contrary to the public interest.

   As described above, delay of CFRW installation until COL issuance would delay commercial operation of Unit 3 by approximately eight months, and alternative construction approaches would significantly increase the cost of construction.

Thus, delay in CFRW installation would result in significant cost to the owners of STP Units 3 & 4 and the public. Issuance of an exemption authorizing CFRW installation would avoid these unnecessary costs, and is clearly in the public interest.

5. Issuance of such an exemption shall not be deemed to constitute a commitment to issue a construction permit. During the period of any exemption granted pursuant to paragraph (b), any activities conducted shall be carried out in such a manner as will minimize or reduce their environmental impact.

   STPNOC acknowledges that issuance of the requested exemption would not constitute a commitment to issue COLs for STP Units 3 & 4. As described above, the activities authorized by the exemption will be carried out in accordance with Best Management Practices and will not have a significant environmental impact.

F. Conclusion

CFRW installation is of critical importance to the STP Units 3 & 4 construction schedule. Issuance of an exemption to authorize CFRW installation prior to issuance of COLs is consistent with the provisions of 10 CFR 50.12, and the four factors identified in § 50.12(b) all favor the granting of this exemption request.

G. References

1. Letter, Mark A. McBurnett to Document Control Desk, "Submittal of Combined License Application Revision 3," dated September 16, 2009, U7-C-STP-NRC-090130 (ML092930393)

Appendix A

Crane Foundation Retaining Wall Evaluation Summary

Crane Foundation Retaining Wall Evaluation Summary

1. Purpose

The purpose of this evaluation is to demonstrate that the construction Crane Foundation Retaining Wall (CFRW) installation has no adverse interactions with SSCs as identified by 10 CFR 50.10(a)(1)(i) through (vii), including influence on the stability (static and dynamic) analyses.

2. Scope of Evaluation

To assess the potential for adverse interactions with SSCs as identified by 10 CFR 50.10 (a)(1)(i) through (vii), the scope of this evaluation includes:

a. Soil-structure interaction analysis
b. Static and dynamic bearing capacity and settlement

The appropriate elements of the STPNOC Quality Assurance Program Document (QAPD) for design and construction would be applied to the evaluation described below.

3. Structures Evaluated

SSCs as identified by 10 CFR 50.10(a)(1)(i) through (vii) with potential influence from the CFRW installation, i.e., the structures included in the evaluation, are:

a. Reactor Building
b. Control Building
c. Ultimate Heat Sink and Reactor Service Water Pump House
d. Turbine Building
e. Service Building
f. Diesel Generator Fuel Oil Storage Vault and Tunnel
g. Reactor Service Water Piping Tunnel
h. Fire Protection Pump House

B. Evaluation and Results

NOTE: Distances, where provided below, are approximated.

1. Soil-structure interaction (SSI) analysis

The CFRW occupies a very small volume relative to the overall soil mass and represents a small increase in overall weight as compared to the replaced soil (150 pcf concrete

density versus soil densities of 125 to 130 pcf). As expected, it has a negligible effect on other nearby structures.

In order to confirm this expectation, an SSI analysis of the Reactor and Control Buildings was performed for the site-specific conditions, including site-specific Safe Shutdown Earthquake (SSE) and soil properties. This analysis was performed using two-dimensional (2D) models. For these 2D analyses, 2D models of the Reactor and Control Buildings were developed, and SSI analyses were performed using computer program SASSI2000, described in Final Safety Analysis Report (FSAR) Appendix 3C.8. These analyses used the same methodology, soil properties, and input motions as described in detail in FSAR Appendix 3A, Sections 3A.12 through 3A.21, except that a 2D model was used instead of a 3D model. The use of a 2D model was necessary since both the buildings and the CFRW could not be modeled in a 3D model which would be of a manageable size. The CFRW was modeled with the Reactor Building and Control Building in separate analyses, and the SSI analyses were repeated to evaluate the influence of the CFRW on the seismic response of the Reactor and Control Buildings.

a. Reactor Building

The CFRW is located 15 feet from the exterior wall of the Reactor Building (R/B). The comparison of the SSI analysis results, with and without the CFRW, are presented in Figures 2.1 through 2.4 for the R/B in-structure response spectra at four locations: bottom of basemat, reactor pressure vessel/main steam (RPV/MS) nozzle, top of the reinforced concrete containment vessel (RCCV), and top of the R/B. Table 2.1 compares maximum forces and moments, at key locations, with and without the CFRW. It can be seen from these figures and table that the CFRW does not have a significant effect on the responses of the R/B.

Figure 2.5 shows a comparison of the lateral soil pressure obtained from the SSI analysis on the R/B walls, with and without the CFRW. As expected, the lateral soil pressures are increased due to the presence of the CFRW. However, the R/B exterior walls are designed for the larger of the: (1) pressures provided in the Advanced Boiling Water Reactor Design Control Document (DCD) Tier 2 Figure 3H.1-11 and (2) pressures obtained from the alternate method described in FSAR Reference 2.5S.4-62 (see FSAR Section 2.5S.4.10.5.2). Both of these methods yield lateral pressures substantially higher than those obtained from the SSI analysis, as shown in Figure 2.5. Therefore, the increase in pressure due to the CFRW in the SSI analysis is of no consequence to the design of the exterior walls.

b. Control Building

The CFRW is located 80 feet from the exterior wall of the Control Building (C/B). The SSI analysis described above for the R/B and CFRW was also performed for the C/B and the CFRW. The distance separating the C/B from the

CFRW used in the analysis was conservatively based on 67 feet. Comparison of the in-structure response spectra for the C/B at the top of the basemat and the top of the C/B is shown in Figures 2.6 and 2.7, and the comparison of maximum seismic forces and moments is shown in Table 2.2. It can be seen from these figures and table that the CFRW does not have a significant effect on the responses of the C/B.

The evaluation and conclusion for lateral soil pressure for the C/B is the same as described for the R/B in paragraph B.1.a above.

c. Ultimate Heat Sink and Reactor Service Water Pump House

The Ultimate Heat Sink (UHS) and Reactor Service Water Pump House (RSWPH) is a large structure. Its smallest separation distance from the CFRW is nearly 60 feet. The dynamic response of a relatively large structure (UHS and RSWPH) at a significant distance from a relatively small structure (CFRW) would not be influenced by the presence of the small structure. Based upon the results of the R/B and C/B SSI analyses, it can be concluded that the CFRW does not have a significant effect on the response of the UHS and RSWPH.

d. Turbine Building

The CFRW is located 15 feet from the exterior wall of the Turbine Building (T/B). The T/B is a large structure. The influence of the CFRW, a much smaller structure, on the T/B is expected to be insignificant. Based upon the results of the R/B SSI analyses, it can be concluded that the CFRW does not have a significant effect on the response of the T/B.

e. Service Building

The Service Building (S/B) is a non-Seismic Category I structure (refer to FSAR Section 3.2, Table 3.2-1) designed for the SSE, meeting Seismic Category II/I requirements. The SSE input for this II/I evaluation is determined based on the influence of a heavy structure (i.e., C/B) on the lighter nearby structure (S/B). The influence of the C/B on the SSE input and design of the S/B far exceeds any influence from the much lighter CFRW. Therefore, the presence of the CFRW has no influence on the S/B design.

f. Diesel Generator Fuel Oil Storage Vault and Tunnel

The Diesel Generator Fuel Oil Storage Vault and Tunnel are designed for the SSE input considering the influence of a heavy structure (i.e., R/B) on the lighter nearby structure (Diesel Generator Fuel Oil Storage Vault and Tunnel). The influence of the R/B on the SSE input and design of the Diesel Generator Fuel Oil Storage Vault and Tunnel far exceeds any influence from the much lighter

CFRW. Therefore, the presence of the CFRW has no influence on the design of the Diesel Generator Fuel Oil Storage Vault and Tunnel.

g. Reactor Service Water (RSW) Piping Tunnel

The RSW Piping Tunnel is located more than 250 feet away from the CFRW. At this location, the CFRW has no effect on the RSW Piping Tunnel.

h. Fire Protection Pump House

The Fire Protection Pump House is located more than 300 feet away from the CFRW. At this location, the CFRW has no effect on the Fire Protection Pump House.

2. Static and Dynamic Bearing Capacity and Settlement

A qualitative engineering assessment was performed to determine if the preconstruction activity of installing the CFRW results in adverse interactions with the static and dynamic stability (bearing capacity and settlement) of the structures listed in Section A.3 above. The 3-foot wide concrete CFRW is needed to provide support for cranes that will be used during construction of Units 3 & 4. The CFRW is generally located on the east side of each unit. The closest separation from the CFRW and the near edge of a structure wall foundation (specifically a Diesel Generator Fuel Oil Storage Vault) is 15 feet to the structure wall and 11 feet to the edge of the foundation. The Diesel Generator Fuel Oil Storage Vaults are supported on 44 feet of structural fill placed as backfill for the Units 3 & 4 excavation. The Diesel Generator Fuel Oil Storage Vault Tunnel is located between the R/B wall and the CFRW, approaching within approximately 2 feet of the CFRW. This tunnel structure is 7.5 feet wide and 11 feet high with the bottom bearing at elevation 23 feet, 11 feet below planned post-construction site grade of 34 feet. The tunnel structure will be supported on 73 feet of structural fill placed as backfill for Units 3 & 4 excavation. The structural loads resulting from the tunnel structure are similar to those of the backfill loads and the CFRW will have negligible impact to the Diesel Generator Fuel Oil Storage Vault Tunnel. The S/B will be located across the CFRW, supported on 45 feet of backfill west of the CFRW and on undisturbed soil on the east side. The S/B will be separated by 3 feet of soil from the top of the CFRW and 15 feet horizontally from the CFRW. Thus, the CFRW does not support the S/B foundation.

The qualitative analysis of the R/B was performed as the worst case scenario due to its proximity to the CFRW and because the bulk of the structural fill within the nuclear island would not be in place at the time of its construction. The bottom of the CFRW at elevation minus 80 feet is 30 feet below the foundation level elevation (minus 50 feet) of the R/B. The R/B foundation is underlain by 10 feet of concrete fill (extending at a roughly 45 degree angle outward to elevation approximately minus 60 feet) whose edge is then 5 feet from the CFRW.

a. Bearing Capacity

From qualitative considerations, the results of existing analyses (refer to FSAR Section 2.5S.4.10.3) indicate that the conclusion that the ultimate static bearing capacity will exceed the applied soil bearing pressure by an adequate factor of safety of three remains valid.

The dynamic bearing capacity is of interest after construction is complete and fuel is loaded. The CFRW does not impact the dynamic bearing capacity after construction since the space between the safety-related and non-safety related structures and the CFRW has been backfilled and the soil behind the CFRW will be in a natural state. Therefore, there is no adverse impact to safety-related and non-safety related structures.

b. Settlement

The qualitative assessment for the settlement considered: (1) the change in settlement caused by the change in area (configuration) of the structural fill zones surrounding the R/B; (2) the impact to settlement due to adhesion created between the structural fill and the CFRW; and (3) the impact of adhesion on soil rebound. From qualitative considerations, the CFRW will affect the settlement of the R/B foundation in the following ways:

- The bottom elevation of the CFRW, at 15 feet horizontally from and 30 feet deeper than the R/B foundation, encroaches on the 1:1 (horizontal: vertical) line usually used to assign relative depth between adjacent foundations to avoid stress overlap. This encroachment will interfere with (reduce) the dissipation of stress laterally away from the foundation, which will slightly increase settlement of the R/B foundation along the side nearest to the CFRW.

- Settlement of soil relative to the CFRW will be partially reduced by adhesion of the soil to the wall, and will slightly reduce the settlement of the R/B foundation.

- The weight of the retained soil mass will cause the stresses remaining in the soil beneath the R/B foundation at the completion of the excavation to be greater than if the entire area was excavated as was assumed in the existing settlement calculations (results presented in FSAR Section 2.5S.4.10.4). This will reduce the soil rebound of the reactor foundation subgrade in the vicinity. A reduction of soil rebound is generally considered a positive impact to the foundation.

The net effect of the qualitative assessment is that the total settlement of the R/B increases slightly at the east side of the structure due to the change in the configuration of the structural backfill zones as a result of the presence of the CFRW. However, this slight increase is offset due to the reduction in settlement caused by the

adhesion between the soil and the CFRW. The results of the qualitative considerations indicate that there is generally little difference to the overall previously calculated total settlement (see FSAR Section 2.5S.4.10.4).

The qualitative assessment also indicates that the slight increase in settlement at the east side due to the presence of the CFRW has a beneficial effect on the angular distortion across the R/B. The amount of maximum angular distortion decreases across the structure from the previously calculated value of 1/600 (refer to FSAR Section 2.5S.4.10.4) to approximately 1/625 in the current qualitative analysis.

The CFRW is located between the loaded crane pad and the nuclear safety-related structures. The CFRW will act as a barrier between the crane pad and the structures so that there is little increase in effective stress and influence on the structures from crane operations.

The majority of the structures will be constructed farther away from the CFRW than the distance of the CFRW from the R/B. In addition, installation of the CFRW and a majority of the backfill should be completed prior to the construction of these other structures; therefore, the above-described qualitative assessment shows that the presence of the CFRW does not adversely influence the static and dynamic stability of the structures.

C. Conclusion

The evaluations discussed above demonstrate that the CFRW has no adverse interaction with SSCs as identified in 10 CFR 50.10(a)(1), including influence on the stability (static and dynamic) analyses.

Table 2.1
Reactor Building Force Comparison

Effect Of Crane Wall on Maximum Forces, Mean Soil				
			Model in SASSI Analysis	
Beam Element	Location	Response Type	2-D Reactor Building (alone)	2-D Reactor Building + CFRW
28	Shroud Support	Shear	119	119
		Moment	2,494	2,492
69	RPV Skirt	Shear	371	372
		Moment	6,490	6,433
78	RSW Base	Shear	313	315
		Moment	4,750	4,752
86	Pedestal Base	Shear	1,815	1,825
		Moment	110,857	111,627
89	RCCV at Grade	Shear	5,704	5,729
		Moment	286,375	289,930
99	R/B at Grade	Shear	13,851	13,951
		Moment	1,057,415	1,064,920

Units: Shear in kip; Moment in kip-ft

Table 2.2
Control Building Force Comparison

Effect of Crane Wall on Maximum Forces, Mean Soil				
			Model in SASSI Analysis	
Beam Element	Location	Response Type	2-D Control Building (alone)	2-D Control Building + CFRW
6	C/B at Grade	Shear	3,829	3,892
		Moment	144,908	145,381

Units: Shear in kip; Moment in kip-ft

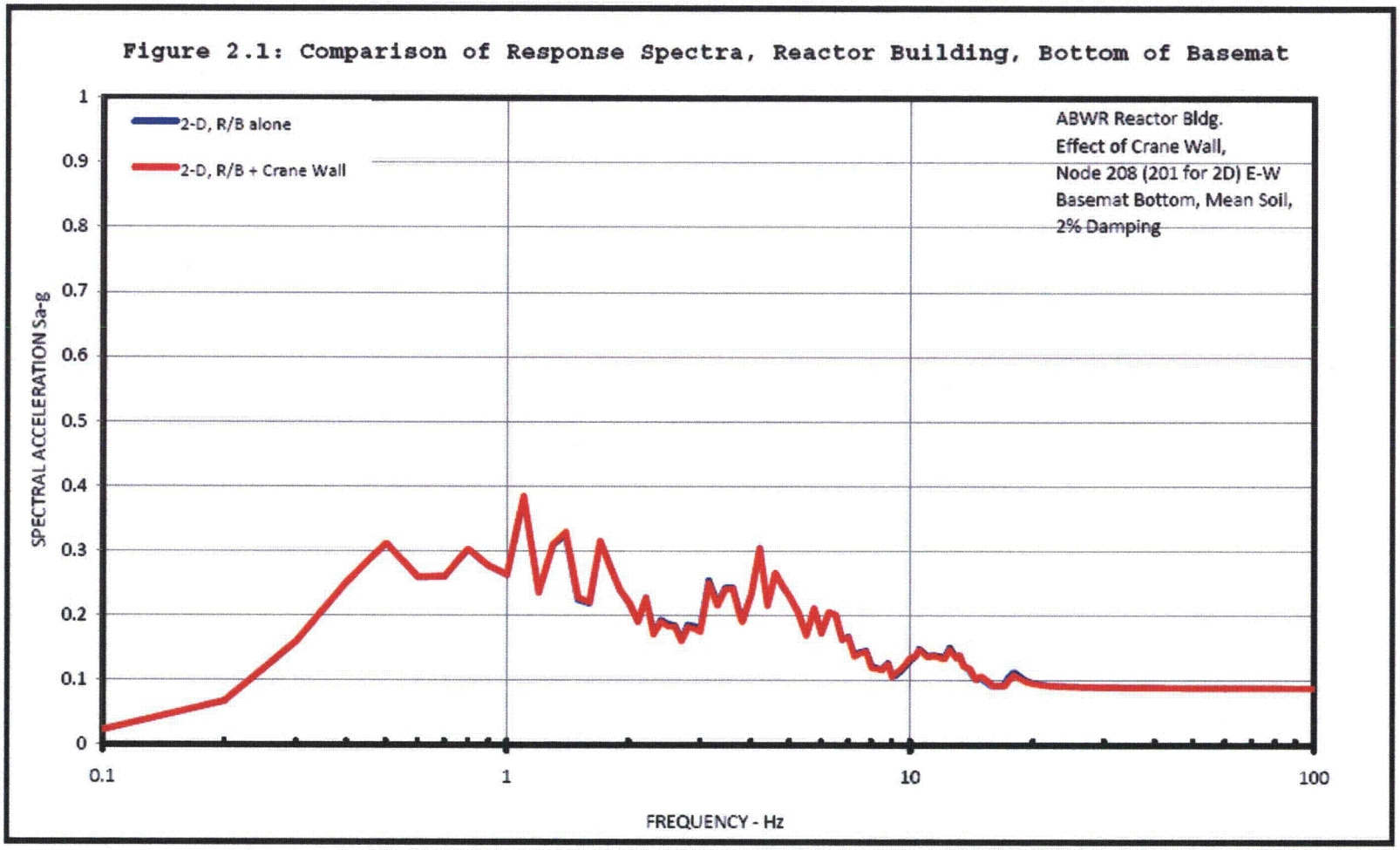


Figure 2.1: Comparison of Response Spectra, Reactor Building, Bottom of Basemat
2-D, R/B alone
2-D, R/B + Crane Wall
ABWR Reactor Bldg.
Effect of Crane Wall,
Node 208 (201 for 2D) E-W
Basemat Bottom, Mean Soil,
2% Damping
SPECTRAL ACCELERATION Sa-g
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.1
1
10
100
FREQUENCY - Hz

Figure 2.2: Comparison of Response Spectra, Reactor Building, RPV/MS Nozzle

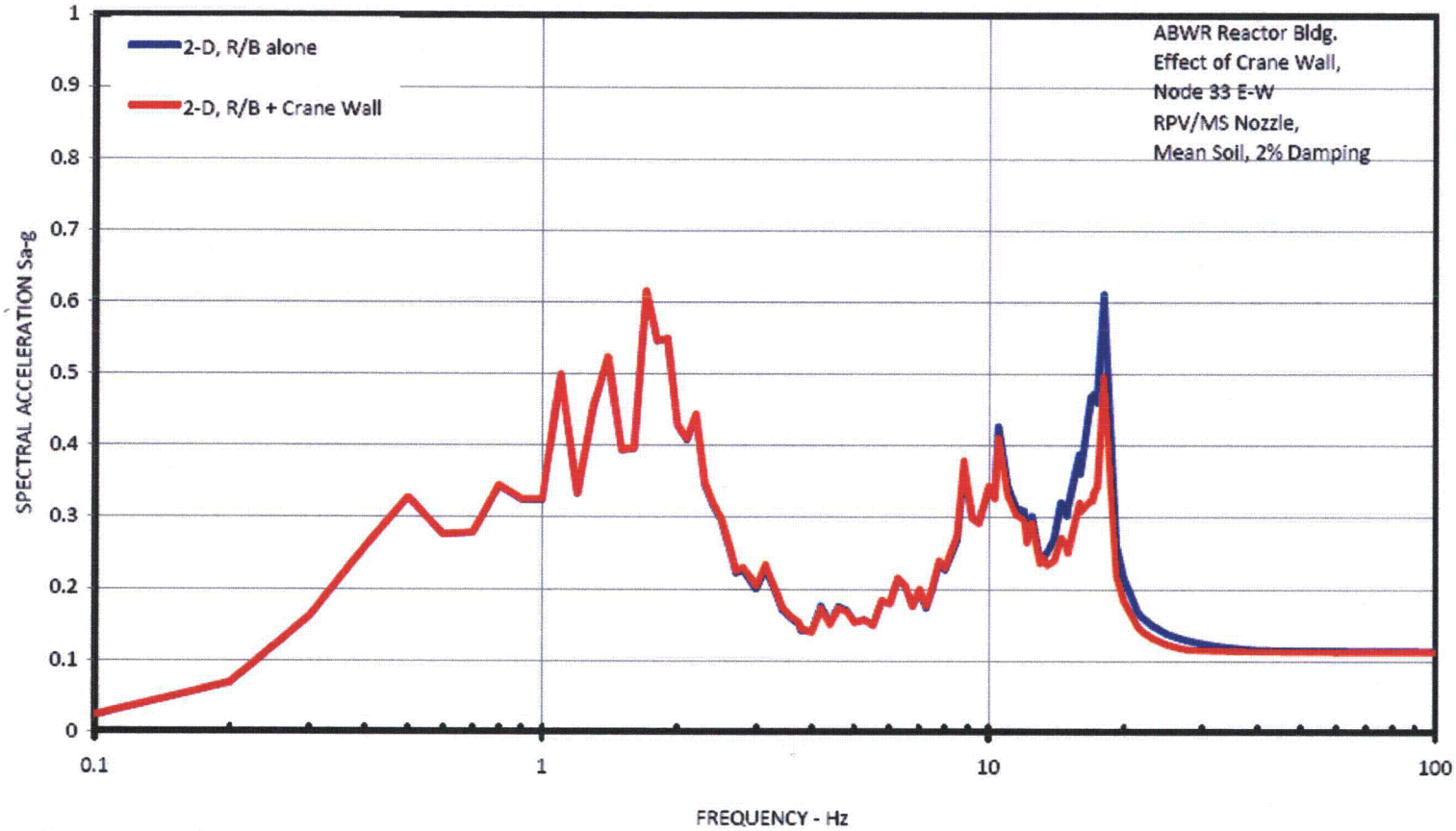


Figure 2.3: Comparison of Response Spectra, Reactor Building, Top of RCCV

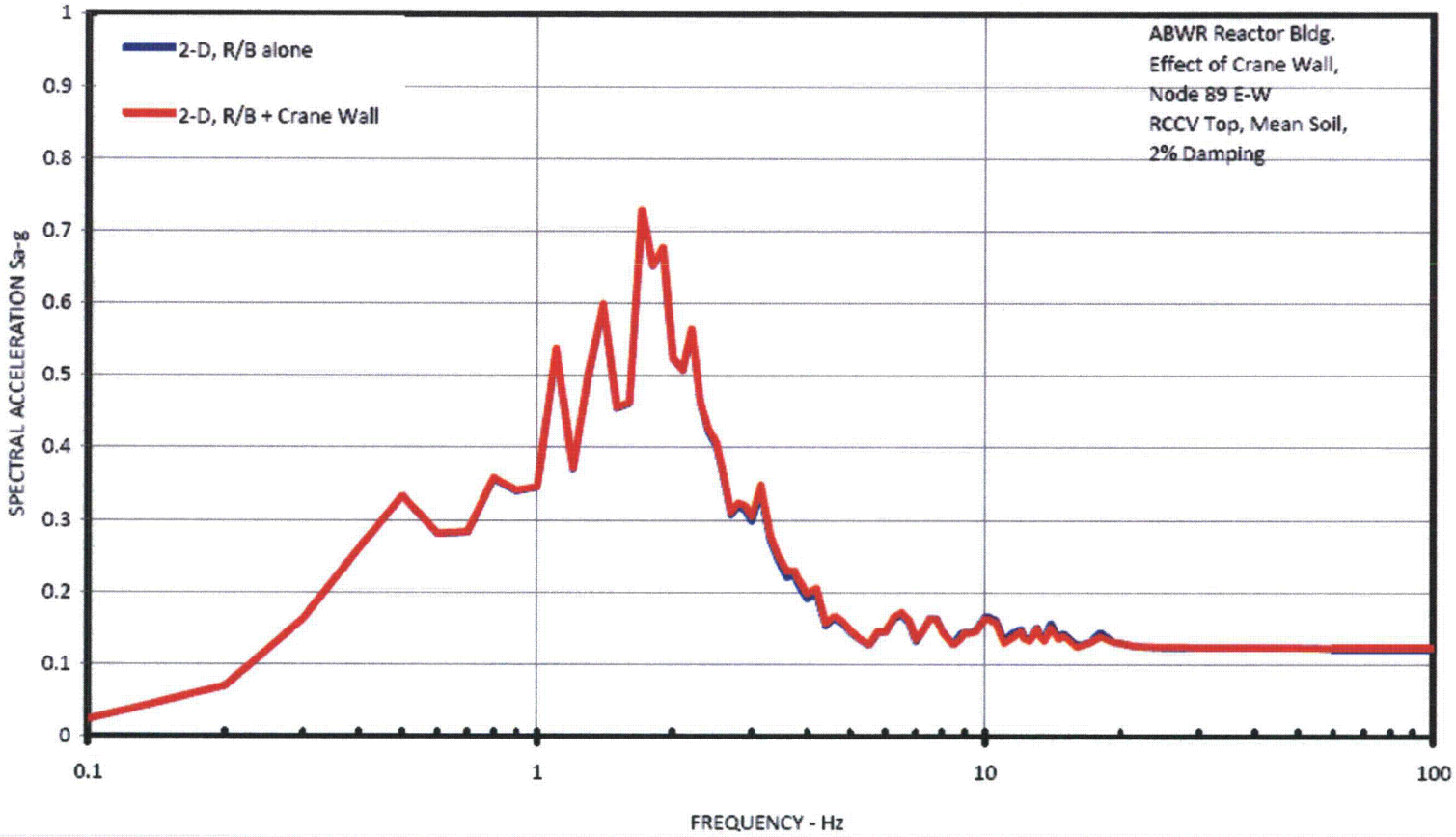


Figure 2.4: Comparison of Response Spectra, Top of Reactor Building

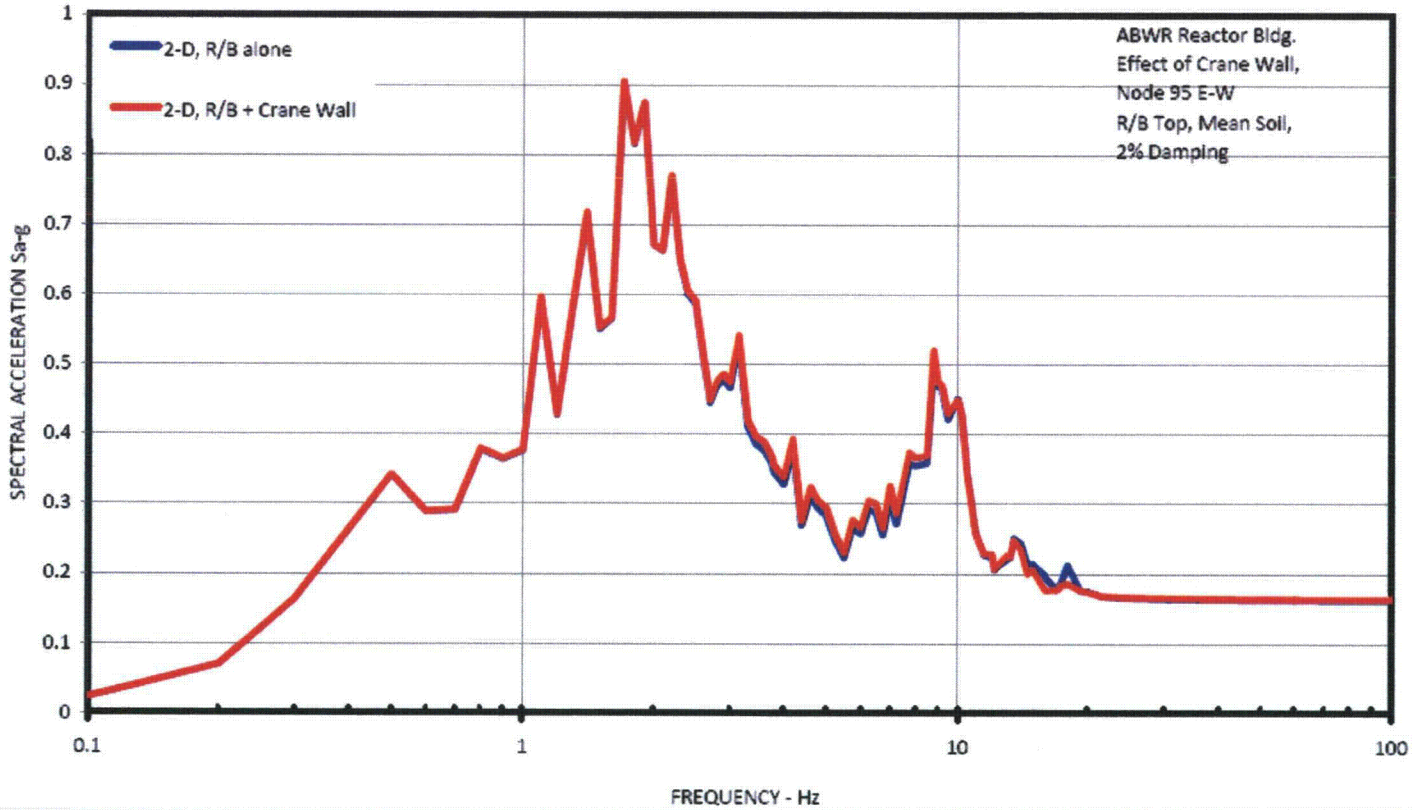
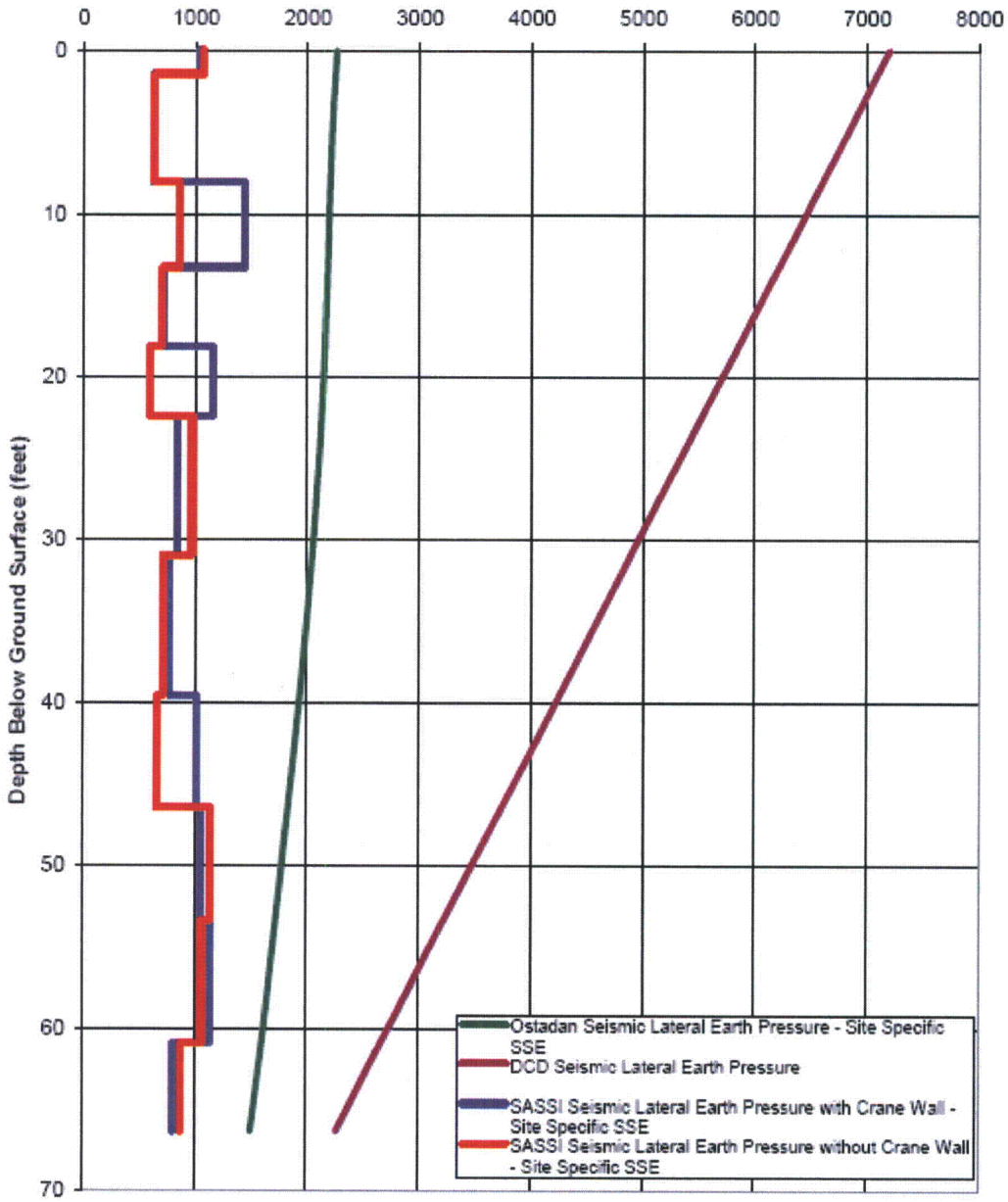


Figure 2.5:

Reactor Building Site Specific
At-Rest Seismic Lateral Earth Pressure (psf)
Multiple Methods Displayed



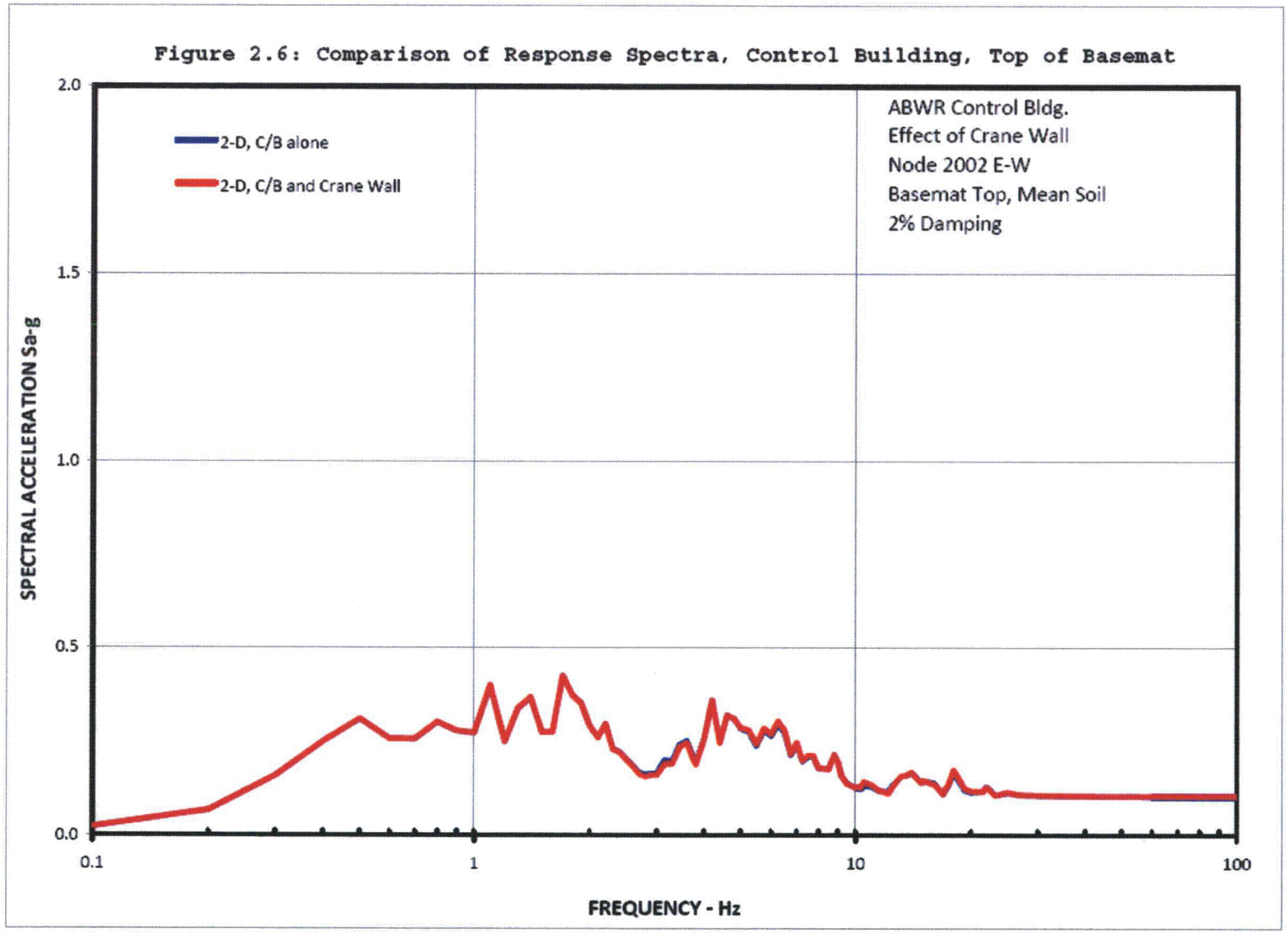


Figure 2.6: Comparison of Response Spectra, Control Building, Top of Basemat
2-D, C/B alone
2-D, C/B and Crane Wall
ABWR Control Bldg.
Effect of Crane Wall
Node 2002 E-W
Basemat Top, Mean Soil
2% Damping
SPECTRAL ACCELERATION Sa-g
2.0
1.5
1.0
0.5
0.0
0.1
1
10
100
FREQUENCY - Hz

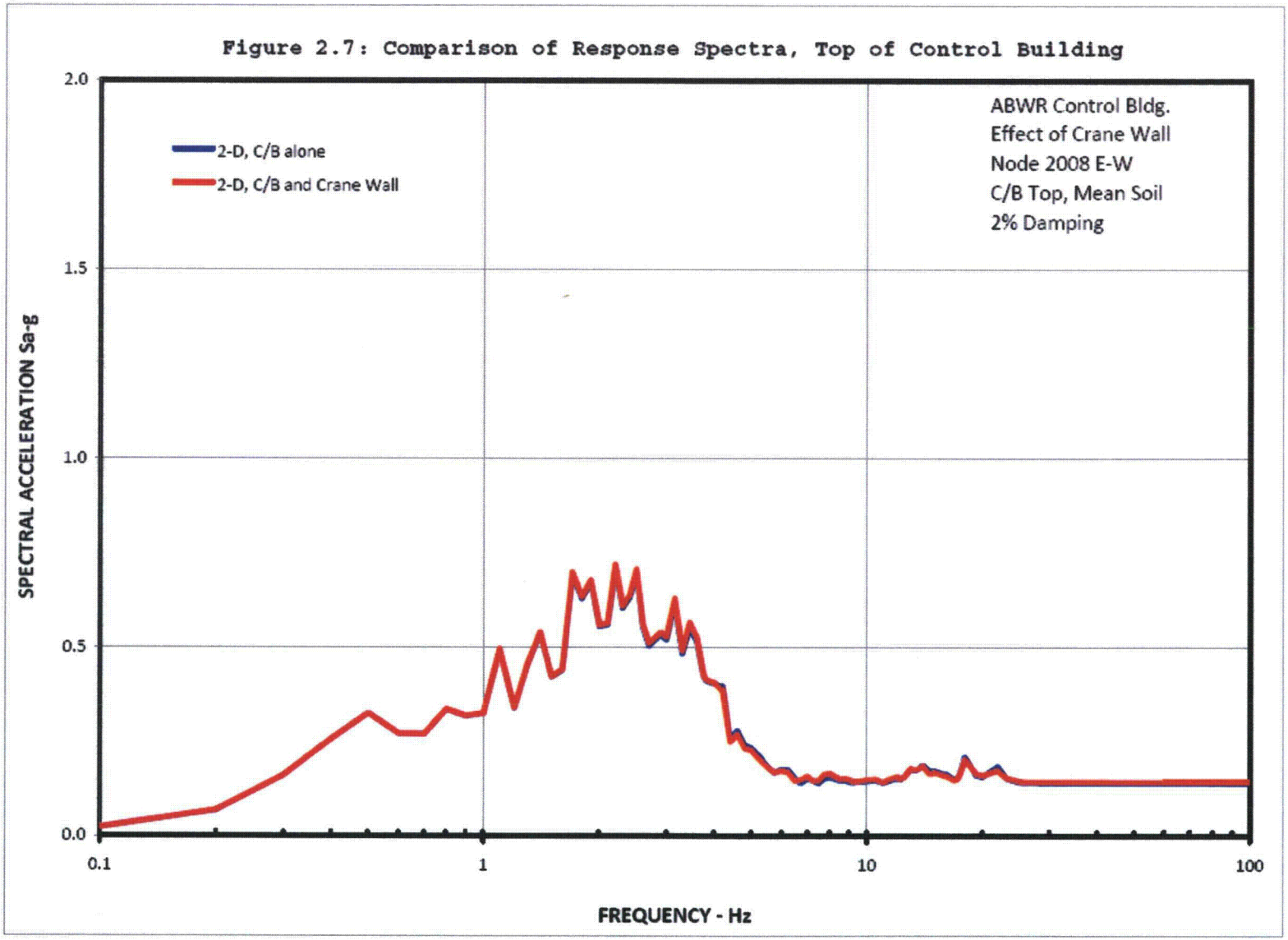


Figure 2.7: Comparison of Response Spectra, Top of Control Building
2-D, C/B alone
2-D, C/B and Crane Wall
ABWR Control Bldg.
Effect of Crane Wall
Node 2008 E-W
C/B Top, Mean Soil
2% Damping
SPECTRAL ACCELERATION Sa-g
2.0
1.5
1.0
0.5
0.0
0.1
1
10
100
FREQUENCY - Hz