State of Oklahoma
Office of Management and Enterprise Services
Division of Capital Assets Management
Construction and Properties

Addendum

This addendum forms a part of the contract document and modifies the original request for proposals as noted below. Please acknowledge receipt of this addendum in the space provided on the submittal form. Failure to do so may subject the Offeror to disqualification.

Date of Issue: January 22, 2015

Addendum Number: Three (3)

CAP Project Number: 15151DB Solicitation

Project Name: Oklahoma Capitol Restoration - Interior Rehabilitation

TO ALL OFFERORS OF CONCERN:

Item #1: "Attachment 1 - Owner's Project Team Investigations: The Existing Structure Evaluation Report" to RFP. Report from Wallace Engineering dated January 21, 2015; 23 pages.

Item #2: Add the following weighting breakdowns to the table in 2.1 (RFP Phase II Suggested Table of Contents) of Section 002211 under Tab 3 Cost Basis:
"Pre-design scope of work development cost 7.5
Design Builder's Fee .... 7.5"
Optional replacement page included.

Item #3: At the Pre-Proposal Conference, a question arose regarding a form location for the requirement of 002211 2.2-B-3 (Client Evaluations). This section does not require the submission of a form; however, the standard State Project Close-out Survey (DCAM/CAP Form 590) for is attached for use and/or reference in utilizing our form, creating your own form, or providing the information requested on the form; 1 page.

ALL OTHER DOCUMENTS ARE TO REMAIN THE SAME AND INTACT.

David Mihm
Project Manager

January 21st, 2015

Mr. Duane Mass
Mass Architects
18 West Park Place
Oklahoma City, OK 73103

RE: Oklahoma State Capitol
Existing Structure Seismic Evaluation Report
Oklahoma City, Oklahoma
Wallace Project No. 1460091

Mr. Duane Mass:

At the request of Trait Thompson, Chair of the Capitol Preservation Commission of the Office of Management and Enterprise Services Division of Capital Assets Management, Wallace Engineering has performed a voluntary seismic evaluation of the existing Oklahoma State Capitol structure.

The findings included in this report are from the observations and evaluations performed in accordance with the procedures defined in the 2013 American Society of Engineers Standard 41-13 Standard: Seismic Evaluation and Retrofit of Existing Buildings. Inclusive of this report are the Evaluation Report Items 1 through 4 noted as the minimum requirements as directed by section 1.4.5 of ASCE 41-13, and Item 5 - Recommendations for Scope Inclusion for the Design-Build Request for Proposal. This report includes the evaluation findings based on the performance-based procedures of the ASCE 41-13. However, a comprehensive structural analysis per the current structural Oklahoma State building code requirements of the 2009 International Building Code and all structural material references included in the 2009 IBC of the existing structure of Capitol structure is beyond the scope of the evaluations presented in this report.

1. <u>Scope and Intent</u>:

The scope of this report is to provide the observations and findings from a seismic evaluation for the existing structure of the Oklahoma State Capitol Building per the requirements and procedures presented in the ASCE 41-13 Standard. This voluntary seismic evaluation was requested by Trait Thompson, acting as project manager for the restoration project of the Oklahoma State Capitol Building. In attendance during the project scope discussions were Duane Mass, AIA, and Michael Tower, AIA, both of Mass Architects and Kevin Bahner, P.E., of Wallace Engineering. Hereafter, the summation of the attendees for the scope meetings will be referred to as the AE1 consultant team. It is our understanding that the intent of the evaluation is to evaluate the current structure of the Capitol Building under seismic loadings and report potential deficiencies of the existing structure that would require further evaluation and potential retrofitting to the potential bidders of the Design-Build firms involved in bidding the renovation work for the Capitol Restoration Project.

During the design team progress meeting conducted 11/17/14 at Mass Architects, the direction was given to the AE1consultant team that Wallace Engineering to proceed with the Seismic Evaluation procedures presented in the American Society of Civil Engineers (ASCE) Standard 41-13 – Seismic Evaluation and

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Retrofit of Existing Buildings. For the intent of this evaluation, it was directed that Wallace Engineering was to proceed with the Seismic Evaluation sections presented in the ASCE 41-13 Standard, and not proceed with the Retrofit sections of the Standard. Wallace Engineering was informed that it shall be the final responsibility of the selected Design-Build Renovation team awarded the bid for the State Capitol renovations to provide, at a minimum, a comprehensive structural review of the potential deficiencies identified in this report and additionally conduct their own self-performed seismic evalutation. Additionally the Design-Build Consultant Team, by identification of potential seismic hazard from their own self-performed site investigation and seismic evaluation, shall provide analysis of conformance and/or provide specific retrofit requirements to mitigate potential seismic anchorage deficiencies and falling hazards.

The selection of the structure's Performance Objective, as directed be the ASCE 41-13 Standard, occurred during the design progress meeting on 11/17/14. The Target Building Performance Levels as described in Tables C2.3 – Damage Control and Building Performance Levels, and C2.4 – Structural Performance Levels and Illustrative Damage - were discussed in depth with the AE1 consultant team. The list of potential structural damage scenarios discussed and noted in tables C2.3 and C2.4 from the ASCE 41-13 Standard are "estimates rather than precise predictions, variation among buildings of the same Target Performance Level must be expected" (C2.3, Pg. 36). Additionally, it is stated that "for illustrative purposes to convey conceptually what earthquake damage correlates with the different performance levels. The table is not intended for and should not be used… as an expectation of post-earthquake performance of a building evaluated… to this standard" (C2.3.1, Pg. 36). Further discussion of the potential structural performance outcomes are discussed further in this report in section 2.e. - Performance Level.

After discussion, the AE1 consultant team determined that the Target Building Performance Level for the Capitol Structure would be <u>Level 3-C – Life Safety</u>. This target Performance Level was agreed upon to offer the level of appropriate structural performance criteria in relation to the project scope and occupant safety level for the ASCE 41-13 Standard's defined seismic Hazard Level for the State Capitol Building. From the selection of the Target Building Performance Level, the level of Seismic Hazard and Level of Seismicity for the Capitol Structure is defined further in the report in section 2.f. – Level of Seismicity.

The seismic evaluation performed per the ASCE 41-13 Standard is based on performance-based methodologies. The prescriptive direction for criteria for seismic evaluations listed in the Standard are based on multiple evaluations of known structural performance of similar buildings and structures during past seismic events, along with the knowledge and experiences of a large team of specialists in earthquake engineering and seismic evaluation and retrofit. As stated in the ASCE 41-13 Standard, "The standard incorporates many advances made in the analysis and design evaluation of structures that are likely to have general or wide-spread application in the performance evaluation of existing structures and reflect known laboratory experience and field observation of earthquake damage. The acceptance criteria have been specified using the actual laboratory results, where available, supplemented by the engineering judgment of various development teams."

This methodology differs from the current code based seismic design procedures for the design of new building structures currently specified in the Oklahoma State Building Code, which is the 2009 International Building Code and its referenced standards. The ASCE 41-13 provides specific performance based criteria for structural outcomes during a seismic event. This criteria is intended to provide goals of the evaluation in lieu of providing an analytical design of components of the structure to meet the modern day building code and material-specific design manuals and standards.

2. Site and Building Data:

2.a. General Building Description:

The original state capitol building structure is a cast-in-place concrete frame building structure constructed approximately during the years 1914-1917. The structure was constructed from Construction Documents and Project Specifications from Layton & Smith Architects dated 1914. The existing documents will be available for review by the Design-Build firms bidding on the project.

The existing Construction Documents provide detail of a concrete column and beam frame system, along with traditionally reinforced concrete beam and one- way slab designs for the typical slab framing systems. Additionally, there are alternate sheets that indicated a proprietary beam and slab shoring and reinforcing system. Per field observations (limited by in place finishes) and discussion of the existing structure with the building maintenance staff, it is assumed that the alternate design sheets were not used for construction of the Capitol's concrete slab and frame structures. There is a mixture of brick and clay tile infill walls used throughout the Capitol building frame. The exterior of the building is clad in cut limestone and granite architectural features and ornamentation. The original capitol Construction Documents include a heavily reinforced concrete ring beam where the documents indicated the intended location of a large dome structure, which was not completed with the original project.

The Capitol Dome structure was built from Construction Documents from Frankfurt Short Bruza dated from 2001. The dome addition is a combination of structural steel frame and concrete wall structure that was added to the existing original Capitol concrete frame structure below. The construction of the dome was completed in 2002. The existing documents will be available for review by the Design-Build firms bidding on the project. The structure is clad in formed precast stone elements supported by the steel framing below. Additionally, there are several levels of concrete over steel deck slabs used for mechanical mezzanines and catwalk access.

2.b. Structural System Description:

Original State Capitol Structure:

The original concrete structure is founded on a combination of continuous wall footing foundations around the building perimeter and spread foundations at the interior column locations bearing directly on grade. The original concrete frame structure of the Capitol consists of a basement level with slab on grade and five elevated concrete slabs floors over traditional continuous concrete beam framing. The gabled roof elevation consists of an elevated concrete slab, gabled reinforced concrete beams, and gabled steel framed girders supporting C-channel framing and a two and one-half inch (2 ½") concrete roof slab. Portions of the existing steel framed trusses and concrete roof had existing skylight locations, which have since been infilled with a light-weight concrete roof paneling infill system. Additionally, the original documents detail the elevated concrete-framed rotunda platform and ring beam that was planned to receive the original dome configuration, but the original dome was not built at the time of original construction.

Concrete columns are reinforced with vertical bars, hoops, splices at floor levels, and dowels to the foundation. Concrete beams and girders are shown reinforced with stirrups, bottom bars and top bent bars at the beam/column joint. One-way reinforced flat slabs with continuous bottom bars and top bent bars are indicated over the top of beam/girder lines. Generally, the concrete reinforcement noted above is indicated on the existing Capitol Construction Documents. However, there are instances in which the clarity of size and locations of reinforcing bars are vague or unclear. The size, spacing and placement of the reinforcement is not visually observable. The flat

slabs form horizontal diaphragms that span between beam/column frame lines throughout the building, and also column/slab column strips as described in Common Building Type C1 in Table 3-1 of the
ASCE 41-13 standard for additional redundancy for seismic force distribution.

Capitol Dome Addition Structure:

The dome addition is a steel column and beam framed system that is founded on the original concrete frame structure. The dome structure has two primary grids of columns oriented radially around the dome center point. Each of the primary grids establish locations of steel frames that are part of the dome frame's gravity and lateral support system, delivering lateral component forces through a combination of braced frame and moment frame actions. The column base plates are anchored to the concrete frame by threaded rods embedded with epoxy adhesive to the original concrete structure's ring beam.

The upper portion of the dome consists of arched wide flange beams that terminate at a concrete compression ring at the top of the dome structure. The upper arched beam sections support mezzanine slabs hung vertically by W-shaped tension hangers supported from the steel beam framing above. There are additional concrete slabs over steel form deck at the exterior exposed buttress and peristyle elevation levels.

The dome structure supports a combination of exterior precast architectural elements and interior hung glass fiber gypsum-cast dome architectural elements and stained glass elements. Additionally, there is a steel framed podium structure supporting a steel frame grillage that supports a thirty-six inch diameter steel pipe that supports the bronze statue of The Guardian at the top of the Dome Addition. The statue is anchored with one and one-half inch plates and eight one and quarter inch diameter bolts. The dome addition is 140'-0" total (note including the sculpture) above the base elevation of the original building concrete structure.

2.c. Non-Structural Systems Description:

Per the ASCE 41-13 Standard, the VERY LOW SEISMICITY level for this site denotes that exterior stone and masonry wall and architectural feature anchorages are the only Non-Structural Systems that require evaluation for the purpose of this seismic evaluation. This topic is discussed further in the report in Section 4.a. – Tier 1 Evaluation. Per section C.2.3.2.3 of the ASCE 41-13 Standard, this is construed by the statement that "In a building performing to the Nonstructural Performance Level (N-C), non-structural components may have sustained significant and costly damage, but they would not become dislodged and fall in a manner that could cause death or serious injury…" Therefore a detailed description of the interior non-structural systems is not required at the VERY LOW SEISMICITY LEVEL.

2.d. Common Building Type:

Per the ASCE 41-13, a Common Building Type had to be established. The Common Building Type for the existing concrete base structure of the existing Capitol building is defined by Table 3-1 in the ASCE 41-13 Standard. From section 2.b. from this report, the structural system for the lower portion is C1 – Concrete Moment Frames. The building type description describes "these buildings consist of a frame assembly of cast-in-place concrete beams and columns. Floor and roof framing consists of cast-in-place concrete slabs. Seismic forces are developed by concrete moment frames that develop their stiffness through monolithic beam-column connections. In older construction, or in low levels of seismicity, the moment frames may consist of column strips of two way flat slab systems. Modern frames in levels of high seismicity have joint reinforcing, closely spaced ties, and special details to provide ductile performance. This detailing is not present in older construction. The foundation system may consist of a variety of elements". It should be noted that there are locations where the building frame may have total or partial masonry wall infills that may participate in stiffening the overall structure during a seismic event. However the concrete frames are the elements that will resist the seismic forces for the overall concrete structure for the purpose of this evaluation.

The Common Building Type for the existing dome addition structure of the existing Capitol building is defined by Table 3-1 in the ASCE 41-13 Standard. From section 2.b. of this report, the structural system for the dome addition portion is a combination of S1- Steel Moment Frames and S2 – Steel Braced Frames. The building type description for Moment Frames describes "Seismic Forces are resisted by steel frames that develop their stiffness through rigid or semi-rigid beam-column connections... Where only selected connections are moment-resisting, resistance is provided along discrete frame lines". The building type description for Braced Frames describes "these buildings have a frame of steel columns, beams, and braces. Braced frames develop resistance to seismic forces by the bracing action of the diagonal members. The braces induce forces in the associated beams and columns such that all elements work together in a manner similar to a truss; all element stresses are primarily axial." Diaphragms transfer the seismic loads to the braced frames and moment frames. The diaphragms consist of concrete or metal deck filled with concrete and are stiff relative to the frames.

2.e. Performance Level:

The Performance Level for the existing structure is defined and selected per section 2.3 of the ASCE 41-13 Standard. The Target Building Performance Level as noted above for the voluntary seismic evaluation is Level 3-C – Life Safety. From ASCE Table 2-1 - Basic Performance Objective for Existing Buildings (BPOE), for a Tier 1 seismic evaluation, the associated Seismic Hazard Level is BSE-1E. Per the AE1 consultant team group discussion on 11/17/14 noted above, the determination for this voluntary evaluation was to proceed with Life Safety Building Performance at the BSE-1E Hazard Level as described in sections 2.2.3.1 and C.2.2.3.1 in the ASCE 41-13 Standard. The Seismic Hazard Level BSE-1E is discussed further in this report in section 2.f. - Level of Seismicity.

From ASCE Table C2-4, Life Safety (S-3) is the selected Structural Performance Level associated with Level 3-C – Life Safety. From ASCE Table C2.5, Life Safety (N-C) is the selected Nonstructural Performance Level associated with the Architectural Components of the building not related to the structural frame. This is defined as Life Safety Building Performance Level (3-C) defined in section 2.3.3.3 of the ASCE 41-13 Standard. The Illustrative Damage Tables 2-4 and 2-5 discussed with the AE1 consultant team are included in Appendix A at the conclusion of this report.

From Table C2-3 – Damage Control and Building Performance Levels, the relative outcome of expected structure damage at the Performance Level of Life Safety (S-3) is described as moderate. Descriptions of the anticipated damage to structural components includes: "Some residual strength and stiffness left in all stories. Gravity-load-bearing elements function. No out-of-plane wall failures. Some permanent drift. Damage to partitions. Continued occupancy might not be likely before repair. Building might not be economical to repair. For non-structural components, the expectation is that falling hazards, such as parapet features, are mitigated. Damage can be expected to architectural, mechanical and electrical systems. In relation to the expected performance of a typical new building properly designed to the design earthquake of current codes and standards, there would be more damage and a slightly higher life safety risk."

Per section C.2.3.3.3 of the ASCE 41-13 Standard, "The risk to Life Safety in buildings meeting this target Building Performance Level (Life Safety Level (3-C)) is low".

2.f. Level of Seismicity:

Per section 2.3 of the ASCE 41-13 Standard, the Seismic Hazard Level is BSE-1E. The BSE-1E Hazard Level is a probabilistic Seismic Hazard Level that describes and assigns the ground motions produced by an earthquake that will be used for this seismic evaluation. Per Table C2-1 of the ASCE 41-13 Standard, the probability of exceedance of the BSE-1E Hazard Level is 20% in 50 years and the expected Mean Return Period is 225 years for the Seismic Hazard Level. As stated in commentary section C2.2.1 of the ASCE 41-13 Standard, "The California Building Code (CBSC 2010a) has, since the 1998 edition, permitted the use of a lower probabilistic hazard for retrofit of state-owned buildings of 20% in 50 years", which is the selected level of Seismic Hazard Level of this evaluation.

The ground shaking associated with the Seismic Hazard Level is determined on a probabilistic basis and is defined in the general procedure from section 2.4.1.4 – BSE-1E Spectral Response Acceleration Parameters. Ground accelerations S_s and S_1 for BSE-1E are taken from the approved 20%/50-year maximum direction spectral response acceleration contour maps. These values were taken directly from the United States Geological Society (USGS) seismic hazard design maps utility located on the USGS.gov website. The seismic design parameters output derived from the online utility is attached in Appendix B at the end of the report. The values of S_S and S_1 are modified per the site Soil Classification as defined in section 2.4.1.6 of the ASCE 41-13 Standard. The site soil class used for this evaluation is soil Site Class 'C' and is described further in section 2.g. below.

The Level of Seismicity is defined per section 2.5 and Table 2-5 of the ASCE 41-13 Standard.

From Eqn. (2-12): $S_{DS} = 2/3F_aS_S$

From Eqn. (2-13): $S_{D1} = 2/3F_vS_1$

Where for soil Site Class 'C', $F_a = 1.2$ per Table 2-3 and $F_v = 1.7$ per Table 2-4 in the ASCE 41-13 Standard, and $S_{S,20/50} = 0.043g$ and $S_{1,20/50} = 0.016g$ per the USGS provided output.

Therefore: $S_{DS} = 2/3F_aS_S = (2/3) \times 1.2 \times 0.043g = \underline{0.0344g}$

$S_{D1} = 2/3F_vS_1 = (2/3) \times 1.7 \times 0.016g = \underline{0.0181g}$

The values of S_{DS} and S_{D1} are then compared to ASCE 41-13 Table 2-5 - Level of Seismicity Definitions listed in Table 2.5 in the ASCE 41-13 Standard to determine the Level of Seismicity used for this evaluation.

Therefore: $S_{DS} = 0.0344g < 0.167g$ = VERY LOW SEISMICITY

$S_{D1} = 0.0181g < 0.067g$ = VERY LOW SEISMICITY

By use of the site specific seismic data provided by the USGS seismic design hazard maps, the seismicity calculations indicate the State Capitol Structure will use VERY LOW SEISMICITY in the evaluation process and criteria defined in the ASCE 41-13 Standard. By inspection, the relative seismicity is very low for this site and is considerably below the next threshold level of seismicity definition - LOW SEISMICITY.

2.g. Soil Type:

Per discussions from the AE1 consultant team during the 11/17/14 progress meeting, it was noted that a specific recent Geotechnical Evaluation for the Capitol Building was not available for use for this voluntary seismic evaluation. Per section 2.4.1.6 of the ASCE 41-13 Standard, a soil Site Class had to be established to provide the F_a and F_v site adjustment values required for Equations (2-12) and (2-13) noted above. From section 2.4.1.6.1, Site Class 'C' is described as "very dense soil… or with blow count N>50…" Several factors were considered to proceed with a soil Site Class 'C" for the existing Capitol Building Structure.

From the existing original Capitol Building construction documents, Sheet No. 1 indicates there was a revised Foundation Plan released that noted an allowable soil capacity of 6,500 pound/sq.ft. for spread and continuous foundations. This allowable pressure is indicative of a higher capacity soil structure supporting the Capitol building, and generally is higher than typical average allowable bearing pressures associated with a stiff soil structure correlating with soil Site Class 'D'.

Additionally, the existing Capitol Dome Addition Construction Documents were produced by Frankfurt Short Bruza and are dated January 15, 2001. On sheet S1.01 of the existing Construction Document Set, the Design Data for soils indicates that the foundation analysis was performed and a geotechnical report provided by Standard Testing and Engineering Company. As noted on the S1.01, the allowable bearing pressure for the existing foundation system was indicated at 10,000 pound/sq.ft., which is a considerable increase over the original allowable bearing pressure indicated on the existing Capitol Building Construction Documents. Since the capitol dome addition design was produced under the 1999 BOCA building code, it is unlikely that the soil site class is listed in the geotechnical report, as this was a requirement that started with the introduction of the International Building Code.

Finally, as a check of soil conditions with a structure in close location proximity, Wallace Engineering completed the structural design for the Oklahoma History Center located at 800 Nazih Zuhdi Drive, which is approximately 1,150 ft. from the Oklahoma State Capitol building. The foundation analysis was performed and a geotechnical report provided by Terracon, Inc. Per review of the geotechnical borings provided in the report by Terracon, the blow counts performed on the boring samples were indicative of a consistent blow count condition of N>50 as described as a requirement for soil Site Class 'C' criteria. The soil Site Class for the Oklahoma History Center is Site Class 'C', as confirmed via email correspondence dated 11/25/14 from Jeremy Basler, P.E., Principal and Manager of the Geotechnical Department at the Oklahoma City Terracon branch.

With consideration of the above available information, soil Site Class 'C' was chosen per section 2.4.1.6 of the ASCE 41-13 Standard for the seismic evaluation of the Capitol Building Structure.

3. List of Assumptions:

- Per available information regarding the soil and bearing conditions at and near the Capitol building, a soil Site Class 'C' has been assumed.
- Due to the lack of any material testing reports and construction observation reports and based on a limited visual condition assessment, the assumption is made that both the original concrete frame building structure and the dome addition structures are built per the issued Construction Documents and Project Specifications, and do not include any hidden construction-related deficiencies that create discontinuities in the structural load path that distributes seismic forces.
- It is assumed that the structural engineer of record for the Capitol Dome Addition Construction Documents designed the new dome structural addition to meet or exceed all applicable building

code requirements at the time of project issuance. Additionally, the assumption is that the engineer of record for the Capitol Dome Addition Construction Documents fully reviewed all existing conditions of the existing concrete frame and foundation structure to support the steel-framed dome structure, including all code required design load combinations including dead loads, live loads, wind loads, and seismic loads under the BOCA building code requirements at the time of construction indicated on the S1.01 sheet.

- Due to the large percentage of in-place plaster finishes that conceal the existing structural concrete frame, the assumption is made that no original construction-related or design change created discontinuities are present. Additionally, it is assumed that no interior renovations now hidden by interior finishes have led to alterations of the existing structural system that created discontinuities in the structural load path in existing elements that distribute seismic forces.
- Due to the large percentage of in-place roofing materials and plumbing chases that conceal the structural concrete frame, the assumption is made there are no prolonged moisture-exposure conditions that has led to existing material deterioration of the existing structural system that could create discontinuities in the structural load path that distributes seismic forces.

4. **Findings**:

Per the Evaluation procedures listed in section 3.3 of the ASCE 41-13 Standard, a Tier 1 screening procedure was selected as the seismic evaluation procedure. The Tier 1 screening procedure is allowed at the Life Safety (S-3) Performance Level. As described in section 2.d. above, there are two distinct building types for the Capitol Building: C1 – Concrete Moment Frames and a combination of S1 – Steel Moment Frames and S2 – Steel Braced Frames for the Capitol Dome Addition. Per ASCE 41-13 sections 3.3.1.2.2 and 3.3.1.2.2.2, a Tier 1 evaluation is permitted under the Life Safety (S-3) Performance Level, each story consists of a seismic-force-resisting system conforming to a Common Building Type, and the total building height complies with the lowest height limit in Table 3-2 for any system in any direction.

From Table 3-2 of the ASCE 41-13 Standard, the allowable number of stories is listed in relation to the Common Building Type, Level of Seismicity, and the Performance Level. For the VERY LOW SEISMICITY Level, and Performance Level (S-3), Table 3-2 lists No Limit on the number of stories for S1 – Steel Moment Frames, S2 – Steel Braced Frames, and C1 – Concrete Moment Frames. Therefore the total building height complies with section 3.3.1.2.2.2. Therefore a Tier 1 screening procedure is valid and was performed as required in Chapter 4 of the 41-13 Standard.

4.a. **Tier 1 Evaluation**:

The Tier 1 screening evaluation is described in section 16.1.1 of the ASCE 41-13 Standard. Per the Tier 1 procedures, an on-site visual observation was conducted over several site visits per section 4.2.1 to confirm general conformance of the existing conditions to those shown in the existing documents. During the site investigation, the existing capitol concrete frame structure and the steel capitol dome structure were visually observed (as reasonably accessible by in place hard finishes) to confirm general conformance with the existing Construction Documents. However, a very large percentage of the concrete frame and slab structure is concealed by in-place hard plaster surfaces, architectural stud walls and ceilings, and mechanical systems. The only reasonably accessible areas for visual observation for the original structure at the time of the observations were in the unoccupied attic spaces underneath the concrete roof and dome support ring beam structure. The on-site observation for the concrete frame building was supplemented with review of minimal original historical construction progress photos taken from broad views provided to the AE1 consultant team.

Additionally, the surfaces of the steel framing of the dome addition are completely concealed with spray-on fireproofing. Per the on-site observations, discussions with Doug Kellogg (Capitol Building Manager), and to the best of our visual observations, the assumption was made that both the structures of the original concrete frame building and the dome addition were generally constructed per existing documentation in the general terms of reviewing only the framing LOAD PATH evaluation below. This statement is based on the current observeable structure and its visible condition, but it does not guarantee that the framing is built per existing construction documents as many elements, such as concrete reinforcing sizes and placement and steel bolted connections and welds, are concealed from visual observations. Additionally the visual observation referenced in this evaluation does not guarantee the structural performance of any specific structural element or connection during a seismic event.

The Tier 1 evaluation procedure states that the VERY LOW SEISMICITY checklist shall be completed for all building types in Very Low Seismicity being evaluated to the Life Safety Performance Level. Each evaluation statement shall be reviewed for and marked as Compliant (C), Non-Compliant (N/C), Unknown (U), or Not Applicable (N/A).

Per section C16.1.1 of the ASCE 41-13 Standard, the evaluation statements provided (in the checklist) represents all of the required statements for buildings in Very Low Seismicity being evaluated for Life Safety including structural and nonstructural. Therefore, the requirements of Life Safety (S-3) for the Structural Performance Level and Life Safety (N-C) for the Non-Structural Performance Level are both covered by the evaluation statements in the VERY LOW SEISMICITY checklist.

Per ASCE 41-13 table 4.7 - Checklists Required for a Tier 1 Screening in the ASCE 41-13 Standard, the evaluation of the Capitol Building in accordance with meeting Life Safety (S-3) Performance Level requires completion of the VERY LOW SEISMICITY Checklist from section 16.1.1. The checklist is as follows (and is included in Appendix C).

16.1 BASIC CHECKLIST

Very Low Seismicity
Structural Components

Load Path: The structure shall contain a complete, well-defined load path, including structural elements and connections that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation.

- **This checklist statement is noted as Compliant**
(reference further compliancy discussion below in section 4.b.)

Wall Anchorage: Exterior stone or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections shall have the adequate strength to resist the connection force calculated in the Quick Check procedure of section 4.5.3.7.

- **This checklist statement is noted as Non-Compliant**
(reference further compliancy discussion below in section 4.b.)

4.b. Discussion of Checklist Compliancy Statements:

LOAD PATH COMPLIANCY: Per Commentary A.2.1.1 of the 41-13 Standard, "There must be a complete seismic force resisting system that forms a continuous load path between the foundation, all diaphragm levels, and all portions of the building for proper seismic performance". Additionally it is stated that, "compliance with this statement indicates only the existence of a complete load path and that all elements and connections within the load path appear to be detailed for transferring seismic forces."

The Structural Systems descriptions for both the original capitol concrete frame structure and the dome addition are covered in section 2.b – Structural System Description above. From review of the original concrete frame structure documents, it was established that horizontal concrete diaphragms exist at all framing levels of the capitol building. The concrete slabs at the floor framing systems of the concrete framed structure tie directly into beam-column frame systems and additionally column-slab frame systems to provide lateral load path from horizontal diaphragms to vertical force resisting frame systems. The existing structural elements and connections consist of a structural load path that will transfer inertial forces associated with the effects of the specific seismic ground accelerations on the buildings mass at the LOW SEISMICITY LEVEL used for this evaluation.

The capitol dome addition is a steel column frame structure that is founded on the large rotunda ring beam structure of the original capitol concrete framed building. The dome's steel structure distributes seismic lateral loads through a combination of steel braced frames and moment connections along with concrete diaphragm transfer elements to deliver the seismic loads to the base connections of the steel columns to the existing concrete building frame below. The existing dome structural elements and connections consist of a structural load path that will transfer inertial forces associated with the effects of the specific seismic ground accelerations on the buildings mass at the LOW SEISMICITY LEVEL used for this evaluation.

For further evaluation beyond the stated checklist of the building structure's load path, an approximate 3-dimensional model of the Capitol's building frame system as noted in the existing Construction Documents of the original capitol concrete frame and capitol steel dome addition was modeled in the 2013 version of ETABs integrate analysis software. The purpose of the model was to provide additional verification of load path of the existing building structure when subjected to the seismic-lateral force as defined by Eqn. (4-1) under section 4.5.2.1 of the 41-13 Standard. This Tier 1 evaluation seismic force was used in the generated model to run a pseudo-seismic linear-static analysis of the building frame and review the expected deformations of the structure at the Tier 1 Evaluation seismicity level per section C4.5.2.1. Review of the output of drifts and deformations of the linear static analysis of the Capitol Building at the Tier 1 Evaluation pseudo-seismic prescribed loading did not raise issues with the Load Path criteria presented in the VERY LOW SEISMICITY checklist. The model was not intended nor used to check discrete structural members, elements, or connections for demand/capacity ratios under seismic loading.

WALL ANCHORAGE COMPLIANCY: Per Commentary A.5.1.1 of the 41-13 Standard, the evaluation criteria for wall anchorage exists for "bearing walls that are not positively anchored to the diaphragms that may separate from the structure, causing partial collapse of the floors and roof, and Nonbearing walls that separate for the structure that may represent a significant falling hazard. The hazard amplifies with the height above the building base."

From observation from the existing structure on site, and the review of the existing Construction Documents, there are several locations of wall anchorage to roof connections and architectural ornamentation connections to the building frame where it is indeterminate of the specific anchorage system utilized to positively anchor these elements to the diaphragm and or frame to meet the intent of the evaluation criteria. Due to the large inertial mass of some of these elements and the height of the existing building, the risk is elevated that a seismic event could create a falling hazard. Per section A.5.1.1, "If the anchorage is nonexistent, mitigation with elements or connections needed to anchor the walls to the diaphragms is necessary to achieve the selected performance level." Additionally, any exterior feature that presents a significant falling hazard due to inadequate anchorage must be mitigated.

Due to this uncertainty of discrete observable anchorages, the evaluation of Wall Anchorage on the VERY LOW SEISMICITY checklist is noted as Non-Compliant for this evaluation. The areas of known suspected deficiencies and uncertainties are noted below in the Recommendations for Scope Inclusion for the Design-Build Request for Proposal section below. The Design-Build Renovation consultant team shall review the noted deficiencies and additionally conduct their own review of the existing structure and attached elements to develop a plan to mitigate any falling hazards that may occur due to the seismic anchorage forces defined by the Tier 1 analysis criteria and forces in section 4.5.3.7 of the ASCE 41-13 Standard.

Once analysis of these exterior walls and ornamentations is completed and deficiencies documented, and all deficient anchorages are verified to be mitigated, then the Wall Anchorage evaluation criteria will be considered Compliant. Once both Load Path and Wall Anchorage evaluation statements are considered Compliant, then the Capitol Building will attain the requested Life Safety Building Performance Level (3-C) as directed by the AE1 consultant team.

5. <u>Recommendations for Scope Inclusion for the Design-Build Request for Proposal</u>:

As stated in Section 1 of this report, it shall be the final responsibility of the selected Design-Build Renovation team awarded the bid for the State Capitol renovations to provide, at a minimum, their own self-performed site investigation and seismic evaluation. Additionally, a structural review of the potential deficiencies identified below in this report in conjunction with their own self-performed seismic evaluation.

The Design-Build Renovation consultant team shall develop a comprehensive review of the interior building structural frame and interior anchorages of the exterior stone and masonry façade and ornamentations to the interior building frame to identify issues of seismic hazard for wall anchorage and/or seismic bracing of non-structural architectural features that present a falling hazard per the Tier 1 analysis procedures presented in the ASCE 41-13 Standard. It should be noted that most retrofit anchorages will be made by the Renovation Design-Build team from the interior of the existing structure. However, there are likely some instances of retrofit scope identified and reported by the Renovation Design-Build consultant team from their evaluation that may require falling-hazard mitigation anchorage work be performed by the Exterior Renovation Design-Build team or additional contractors hired to perform the required work on the exterior envelope of the building.

The Design-Build Renovation team's seismic evaluation shall minimally address the following (but not limited to) wall anchorage issues:

- The Design-Build Renovation team shall evaluate and address as required the concrete roof beam support conditions at the upper concrete roof of the South Portico. The roof beams rest on brick corbels that show signs of shear cracking and potential degraded bearing capacity.

- The Design-Build Renovation team shall evaluate and address the wall anchorage connection as required at the perimeter of the sloped 2 ½" thick roof slab to the exterior wall framing at the upper gabled roof framing areas with steel girder trusses and channel framing along the East and West wings of the Capitol.

The Design-Build Renovation team's evaluation shall minimally address the following (but not limited to) potential falling hazard issues:

- Evaluate and address as required anchorages of exterior stone pediment features anchored to and suspended from brick masonry infill walls within the concrete building frame.

- Evaluate and address as required anchorages of vertically suspended soffit features to interior building structure (including, but not limited, to the south portico soffit).

- Evaluate and address as required existing condition of anchorage involving the anchor bolts that provide a portion of the anchorage resistance of cantilevered stone projections/overhang at the roofline of the existing concrete building frame.

- Evaluate and address as required the free standing architectural stone features at the perimeter of the roof (including, but not limited to, the stone griffon/statues, cantilevered architectural crenellations, etc.)

The Design-Build Renovation team's evaluation shall minimally address the following (but not limited to) interior falling hazard issues:

- Evaluation of interior suspended architectural features for seismic sway bracing and adequate anchorages to existing structures. (including, but not limited to, the existing suspended plaster barrel vault ceilings, etc.)

For the purpose of meeting the LOAD PATH requirements of the Tier 1 Analysis, the Design-Build Renovation consultant team shall have a contingency plan to review and mitigate any structural damage or deterioration identified or uncovered during construction that is determined to compromise the integrity of the existing concrete or steel structural frame work that impairs or diminishes the capacity for the frame to carry seismic loadings. This shall include evaluation and review of the observed locations of concrete cover issues over existing rebar reinforcing on the existing concrete building frame.

The Design-Build Renovation team shall also give consideration to performing a geotechnical analysis on the Capitol site to verify Soil Site Class 'C' is appropriate for the Capitol site.

Thank you for consulting with Wallace Engineering. Please do not hesitate to call if you have any questions or require any further explanation of the information presented in this report.

Sincerely,

Kevin P. Bahner, P.E.
Principal
WALLACE ENGINEERING • STRUCTURAL CONSULTANTS, INC.
cc: File

APPENDIX A:

- ASCE 41-13 Illustrative Damage Tables 2-4 and 2-5

Table C2-4. Structural Performance Levels and Illustrative Damage

Seismic-Force-Resisting System	Type	Structural Performance Levels		
		Collapse Prevention (S-5)	Life Safety (S-3)	Immediate Occupancy (S-1)
Concrete frames	Primary elements	Extensive cracking and hinge formation in ductile elements. Limited cracking or splice failure in some nonductile columns. Severe damage in short columns.	Extensive damage to beams. Spalling of cover and shear cracking in ductile columns. Minor spalling in nonductile columns. Joint cracks.	Minor cracking. Limited yielding possible at a few locations. Minor spalling of concrete cover.
	Secondary elements	Extensive spalling in columns and beams. Limited column shortening. Severe joint damage. Some reinforcing buckled.	Major cracking and hinge formation in ductile elements. Limited cracking or splice failure in some nonductile columns. Severe damage in short columns.	Minor spalling in a few places in ductile columns and beams. Flexural cracking in beams and columns. Shear cracking in joints.
	Drift	Transient drift sufficient to cause extensive nonstructural damage. Extensive permanent drift.	Transient drift sufficient to cause nonstructural damage. Noticeable permanent drift.	Transient drift that causes minor or no nonstructural damage. Negligible permanent drift.
Steel moment frames	Primary elements	Extensive distortion of beams and column panels. Many fractures at moment connections, but shear connections remain intact. A few elements might experience partial fracture.	Hinges form. Local buckling of some beam elements. Severe joint distortion; isolated moment connection fractures, but shear connections remain intact.	Minor local yielding at a few places. No fractures. Minor buckling or observable permanent distortion of members.
	Secondary elements	Same as for primary elements.	Extensive distortion of beams and column panels. Many fractures at moment connections, but shear connections remain intact.	Same as for primary elements.
	Drift	Transient drift sufficient to cause extensive nonstructural damage. Extensive permanent drift.	Transient drift sufficient to cause nonstructural damage. Noticeable permanent drift.	Transient drift that causes minor or no nonstructural damage. Negligible permanent drift.
Braced steel frames	Primary and secondary elements	Extensive yielding and buckling of braces. Many braces and their connections might fail.	Many braces yield or buckle but do not totally fail. Many connections might fail.	Minor yielding or buckling of braces.
	Drift	Transient drift sufficient to cause extensive nonstructural damage. Extensive permanent drift.	Transient drift sufficient to cause nonstructural damage. Noticeable permanent drift.	Transient drift that causes minor or no nonstructural damage. Negligible permanent drift.
Concrete walls	Primary elements	Major flexural or shear cracks and voids. Sliding at joints. Extensive crushing and buckling of reinforcement. Severe boundary element damage. Coupling beams shattered and virtually disintegrated.	Some boundary element cracking and spalling and limited buckling of reinforcement. Some sliding at joints. Damage around openings. Some crushing and flexural cracking. Coupling beams: extensive shear and flexural cracks; some crushing, but concrete generally remains in place.	Minor diagonal cracking of walls. Coupling beams experience diagonal cracking.
	Secondary elements	Panels shattered and virtually disintegrated.	Major flexural and shear cracks. Sliding at construction joints. Extensive crushing. Severe boundary element damage. Coupling beams shattered and virtually disintegrated.	Minor cracking of walls. Some evidence of sliding at construction joints. Coupling beams experience x-cracks. Minor spalling.
	Drift	Transient drift sufficient to cause extensive nonstructural damage. Extensive permanent drift.	Transient drift sufficient to cause nonstructural damage. Noticeable permanent drift.	Transient drift that causes minor or no nonstructural damage. Negligible permanent drift.
Unreinforced masonry infill walls[a]	Primary and secondary	Extensive cracking and crushing; portions of outer wythe shed, some infill walls on the verge of falling out.	Extensive cracking and some crushing but wall remains in place. No falling units. Extensive crushing and spalling of veneers at corners of openings and configuration changes.	Minor cracking of masonry infills and veneers. Minor spalling in veneers at a few corner openings.
	Drift	Transient drift sufficient to cause extensive nonstructural damage. Extensive permanent drift.	Transient drift sufficient to cause nonstructural damage. Noticeable permanent drift.	Transient drift that causes minor or no nonstructural damage. Negligible permanent drift.

Continued

Table C2-5. Nonstructural Performance Levels and Illustrative Damage—Architectural Components

Component Group	Nonstructural Performance Levels: Life Safety (N-C)	Position Retention (N-B)	Operational (N-A)
Cladding	Extensive distortion in connections and damage to cladding components, including loss of weather-tightness and security. Overhead panels do not fall.	Connections yield; minor cracks or bending in cladding. Limited loss of weather-tightness.	Connections yield; negligible damage to panels. No loss of function or weather-tightness.
Glazing	Extensively cracked glass with potential loss of weather-tightness and security. Overhead panes do not shatter or fall.	Some cracked panes; none broken. Limited loss of weather-tightness.	No cracked or broken panes.
Partitions (masonry and hollow clay tile)	Distributed damage; some severe cracking, crushing, and dislodging in some areas.	Minor cracking at openings. Minor crushing and cracking at corners. Some minor dislodging, but no wall failure.	Minor cracking at openings. Minor crushing and cracking at corners.
Partitions (plaster and gypsum)	Distributed damage; some severe cracking and racking in some areas.	Cracking at openings. Minor cracking and racking throughout.	Minor cracking.
Ceilings	Extensive damage. Plaster ceilings cracked and spalled but did not drop as a unit. Tiles in grid ceilings dislodged and falling; grids distorted and pulled apart. Potential impact on immediate egress. Potential damage to adjacent partitions and suspended equipment.	Limited damage. Plaster ceilings cracked and spalled but did not drop as a unit. Suspended ceiling grids largely undamaged, though individual tiles falling.	Generally negligible damage with no impact on reoccupancy or functionality.
Parapets and ornamentation	Extensive damage; some falling in unoccupied areas.	Minor damage.	Minor damage.
Canopies and marquees	Extensively damaged but elements have not fallen.	Some damage to the elements, but essentially in place.	Minor damage to the elements, but essentially in place.
Chimneys and stacks	Extensive damage. No collapse.	Minor cracking.	Negligible damage.
Stairs and fire escapes	Some racking and cracking of slabs. Usable.	Minor damage.	Negligible damage.
Doors	Distributed damage. Some racked and jammed doors.	Minor damage. Doors operable.	Some minor damage. Doors operable.

NOTES: This table describes damage patterns commonly associated with nonstructural components for Nonstructural Performance Levels. The damage states described in the table might occur in some elements at the Nonstructural Performance Level, but it is unlikely that all of the damage states described will occur in all components at that Nonstructural Performance Level. The descriptions of damage states do not replace or supplement the quantitative definitions of performance provided elsewhere in this standard and are not intended for use in postearthquake evaluation of damage or for judging the safety of, or required level of repair to, a structure after an earthquake. They are presented to assist engineers using this standard to understand the relative degrees of damage at each defined performance level.
Damage patterns in nonstructural elements depend on the modes of behavior of those elements. More complete descriptions of damage patterns and levels of damage associated with damage levels can be found in other documents, such as FEMA E-74 (2011).

of the nonstructural components meeting a lower Performance Level. The Not Considered (N-D) Performance Level is intended to denote the Performance Level for which nonstructural components have not been evaluated, installed, or retrofitted, with specific attention paid to seismic design, or a situation in which only selected components have been retrofit but not enough to fully conform to the Life Safety Nonstructural Performance Level. For some nonstructural components at the Not Considered Performance Level, the typical installation or attachment details for the nonstructural component might provide some nominal capacity to resist seismic forces, including resistance by the use of friction.

For simplicity and ease of use, this standard treats Nonstructural Performance Levels N-A through N-C as cumulative. That is, any provision required to achieve N-B performance is also required to achieve N-A performance, and any provision required to achieve N-C performance is also required for N-A or N-B performance. Although this is rational in most cases, there are cases in which a safety-related N-C provision might have little actual relevance to a cost- or downtime-based objective. For example, an unessential piece of overhead equipment or an unreinforced masonry partition might legitimately threaten safety during the shaking, but if the damage is easily contained and the component is easily removed, repaired, or replaced, the effect on functional recovery is likely to be small. Nevertheless, for purposes of creating a usable and enforceable standard, these cases are not formally recognized as exceptions. Negotiation of scope exceptions among stakeholders on a given project or mitigation program is outside the scope of this standard.

By necessity, this standard is generic with respect to building uses. Though certain Nonstructural Performance Levels might be more or less appropriate for certain large classes of buildings (for example, buildings assigned to different Risk Categories as defined by the applicable regulations, building code, policy standards, or ASCE 7), the standard does not distinguish between actual uses within a class. For example, a rational safety-based objective for an assisted living facility or daycare center might consider certain vulnerabilities that would be reasonably ignored in an office building. Similarly, a downtime-based objective for an apartment building might reasonably require less attention to certain items than a downtime-based objective for a restaurant or department store that provides a public accommodation or for a manufacturing facility sensitive to dust and debris. Customized scopes that borrow from the N-A, N-B, and N-C provisions thus make sense for special occupancies. Nevertheless, this standard provides only generic provisions expected to apply to most buildings similarly situated. Again, negotiation of scope excep-

APPENDIX B:

- USGS Summary Report for Seismic Parameters

USGS Design Maps Summary Report

User–Specified Input

Report Title Oklahoma State Capitol Evaluation
Tue November 25, 2014 21:55:57 UTC

Building Code Reference Document ASCE 41-13 Retrofit Standard, BSE-1E
(which utilizes USGS hazard data available in 2008)

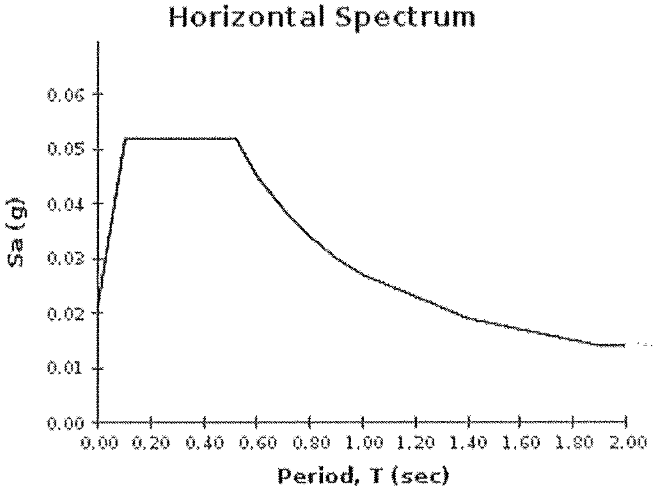
Site Coordinates 35.4922°N, 97.5034°W

Site Soil Classification Site Class C – "Very Dense Soil and Soft Rock"

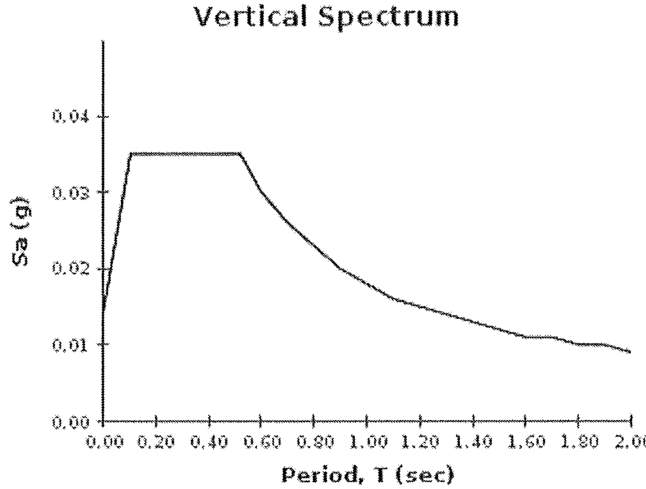
USGS–Provided Output

$S_{S,20/50}$	0.043 g	$S_{XS,BSE-1E}$	0.052 g	← = $S_{S,20/50}$ (Fa)
$S_{1,20/50}$	0.016 g	$S_{X1,BSE-1E}$	0.027 g	← = $S_{1,20/50}$ (Fv)

Horizontal Spectrum



Vertical Spectrum



USGS Design Maps Detailed Report

ASCE 41-13 Retrofit Standard, BSE-1E (35.4922°N, 97.5034°W)

Site Class C – "Very Dense Soil and Soft Rock"

Section 2.4.1 – General Procedure for Hazard Due to Ground Shaking

20%/50-year maximum direction spectral response acceleration for 0.2s and 1.0s periods, respectively:

From Section 2.4.1.4	$S_{S,20/50}$ = 0.043 g
From Section 2.4.1.4	$S_{1,20/50}$ = 0.016 g

Section 2.4.1.6 – Adjustment for Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Section 2.4.1.6.1.

SITE CLASS	SOIL PROFILE NAME	Soil shear wave velocity, $\overline{v}_s$, (ft/s)	Standard penetration resistance, $\overline{N}$	Soil undrained shear strength, $\overline{s}_u$, (psf)
A	Hard rock	$\overline{v}_s$ > 5,000	N/A	N/A
B	Rock	2,500 < $\overline{v}_s$ ≤ 5,000	N/A	N/A
C	Very dense soil and soft rock	1,200 < $\overline{v}_s$ ≤ 2,500	$\overline{N}$ > 50	>2,000 psf
D	Stiff soil profile	600 ≤ $\overline{v}_s$ < 1,200	15 ≤ $\overline{N}$ ≤ 50	1,000 to 2,000 psf
E	Stiff soil profile	$\overline{v}_s$ < 600	$\overline{N}$ < 15	<1,000 psf
E	—	Any profile with more than 10 ft of soil having the characteristics: 1. Plasticity index *PI* > 20, 2. Moisture content *w* ≥ 40%, and 3. Undrained shear strength $\overline{s}_u$ < 500 psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays (*H* > 10 feet of peat and/or highly organic clay where *H* = thickness of soil) 3. Very high plasticity clays (*H* > 25 feet with plasticity index *PI* > 75) 4. Very thick soft/medium stiff clays (*H* > 120 feet)		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Table 2–3. Values of F_a as a Function of Site Class and Mapped Short-Period Spectral Response Acceleration S_s

Site Class	Mapped Spectral Acceleration at Short-Period S_s				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	Site-specific geotechnical and dynamic site response analyses shall be performed				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 0.043 g, F_a = 1.200

Table 2–4. Values of F_v as a Function of Site Class and Mapped Spectral Response Acceleration at 1 s Period S_1

Site Class	Mapped Spectral Acceleration at 1 s Period S_1				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	Site-specific geotechnical and dynamic site response analyses shall be performed				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.016 g, F_v = 1.700

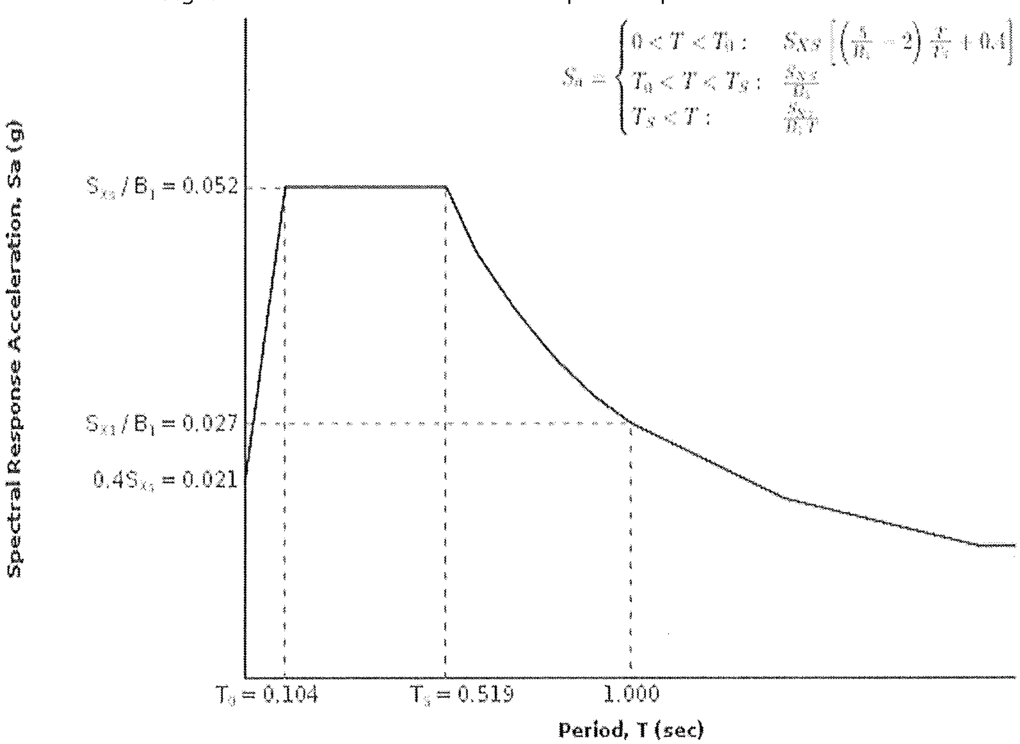
Provided as a reference for Equation (2-4):	$F_a S_{S,20/50}$ = 1.200 x 0.043 g = 0.052 g
Provided as a reference for Equation (2-5):	$F_v S_{1,20/50}$ = 1.700 x 0.016 g = 0.027 g
Provided as a reference for Equation (2-4):	$S_{XS,BSE-1N}$ = ⅔ x $S_{XS,BSE-2N}$ = ⅔ x $F_a S_{S,BSE-2N}$ = 0.210 g
Provided as a reference for Equation (2-5):	$S_{X1,BSE-1N}$ = ⅔ x $S_{X1,BSE-2N}$ = ⅔ x $F_v S_{1,BSE-2N}$ = 0.087 g

Equation (2–4): $S_{XS,BSE-1E}$ = MIN[$F_a S_{S,20/50}$, $S_{XS,BSE-1N}$] = MIN[0.052g, 0.210g] = 0.052g

Equation (2–5): $S_{X1,BSE-1E}$ = MIN[$F_v S_{S,20/50}$, $S_{X1,BSE-1N}$] = MIN[0.027g, 0.087g] = 0.027g

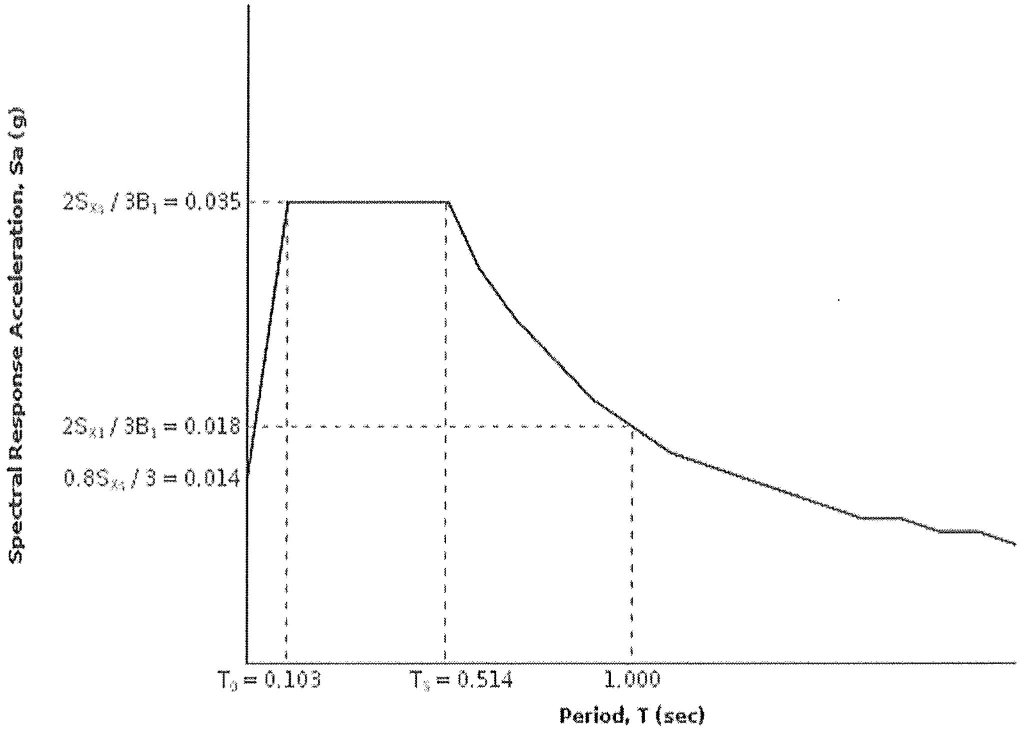
Section 2.4.1.7.1 — General Horizontal Response Spectrum

Figure 2-1. General Horizontal Response Spectrum



Section 2.4.1.7.2 — General Vertical Response Spectrum

The General Vertical Response Spectrum is determined by multiplying the General Horizontal Response Spectrum by ⅔.



APPENDIX C:

- Tier 1 Checklist: Very Low Seismicity – Structural Components

Project: STATE CAPITOL BUILDING Location: OKLAHOMA CITY, OK

Completed by: KEVIN BAHNER, P.E. Date: 12/18/14

TIER 1 CHECKLISTS

16.1 BASIC CHECKLIST

Very Low Seismicity

Structural Components

(C) NC N/A U LOAD PATH: The structure shall contain a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Commentary: Sec. A.2.1.1. Tier 2: Sec. 5.4.1.1)

C (NC) N/A U WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections shall have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.5.3.7. (Commentary: Sec. A.5.1.1. Tier 2: Sec. 5.7.1.1)

3	**Cost Basis**	**15%**
	Pre-design scope of work development cost	7.5
	Design Builder's Fee	7.5

2.2 TAB 1 - Past Performance and Relevant Experience (35% of Award Scoring)

A. This section is meant to provide additional specific information on the individuals comprising the project team that is relevant to this project. The intent for this section is to not be the same as was provided with the Request for Qualification responses. The team members, their roles and their specific duties on this project is to be supported by their experience on similar and other projects.

B. This section should address the following:

1. Project Experience

   a. List all pertinent interior restoration and rehabilitation projects containing historic materials and design features, i.e., plaster partitions, historic doors and hardware, marble flooring, historic ornamentation and similar work. Specifically detail up to three (3) specific projects and explain, in a maximum of one page for each, why these projects illustrate your unique qualifications and the lessons learned from these projects which are applicable to this project.

   b. List a project or explain in detail your experience with and understanding of the National Park Service Preservations standards and how they do or do not apply to this specific project in a maximum of one page.

   c. Provide a list of interior restoration projects completed by team members (designer or contractor) best illustrating techniques and abilities which are applicable to this project. This response should be in the form of a list, stating for each project the type of contract used (i.e. Owner provided, AIA, DBIA, vendor provided) and an Owner contact. Projects performed as design-build projects involving historic restoration or renovation are considered ideal.

   d. Provide a listing of successful design-build projects at or near this budget level, in one page or less. This listing shall demonstrate your team's specific knowledge of design-build. This listing may apply to designer of record and constructor of record separately.

   e. Provide in one page or less, an example project or projects in which the team, designer or contractor utilized detailed investigations processes to establish a final scope of work for the Owner to use to establish a final project scope and budget.

   f. Provide an example of uniquely staged or phased projects, that allowed a facility to remain operating and in use during renovation or construction processes. Explain, in a maximum of one page, how this project or project's processes or approach best demonstrates your capabilities for this project.

2. Personnel Experience

   a. Please specifically list the following personnel illustrating their experience addressing the six items illustrated under Project experience:

      1. The Lead Design Project Manager for Architecture and Engineering
      2. The Pre-Construction Services Manager (specifically focusing on pricing, planning and specific forensic abilities on buildings)

State of Oklahoma
Office of Management and Enterprise Services
Division of Capital Assets Management
Construction and Properties Department

Project Close-out Survey

CAP Project Name:______________________________ CAP Project Number:______________

____
(Contractor)

(Project Manager) *(Superintendent)*

____
(Consultant)

(Project Manager) *(Construction Administration Observer (if applicable))*

(Agency) *(Agency Contact)*

This evaluation is of the: ☐ Contractor ☐ Consultant ☐ Other: ______________

Please rate each of the criteria on a scale of 1 to 10, with 10 representing that you were very satisfied/in complete agreement with the statement and 1 representing that you were very unsatisfied/in disagreement with the statement. Please rate each of the criteria to the best of your knowledge. If you do not have sufficient knowledge in a particular area or it is not applicable, leave it blank.

NO	EVALUATION CRITERIA	UNIT	RATING
1	Ability to manage the project cost (minimize change orders)	(1-10)	
2	Ability to maintain project schedule (complete on-time or early)	(1-10)	
3	Quality of workmanship	(1-10)	
4	Professionalism and ability to manage (includes responses and prompt payment to suppliers and subcontractors)	(1-10)	
5	Close-out process (no punch list upon turnover, warranties, operating and maintenance manuals, etc. submitted promptly)	(1-10)	
6	Communication, explanation of risk, and documentation	(1-10)	
7	Ability to follow the State's and/or Agency's rules, regulations, and requirements (housekeeping, safety, etc…)	(1-10)	
8	Overall customer satisfaction and comfort level in hiring the vendor again based on performance	(1-10)	

(Printed Evaluator Name) *(Evaluator Signature)* *(Date)*

(Telephone Number) *(Email Address)*

(Position/ Title) *(Agency/Firm Name)*

Comments: