TIER 1 SEISMIC EVALUATION
Campbell Library
Campbell, California

Draft Report

Prepared For:
City of Campbell
70 North First Street
Campbell, California

Prepared By:
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101 California Street, Suite 875
San Francisco, California

May 13, 2015

BCA Job No. 2015098

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APPENDICES

EXECUTIVE SUMMARY

Biggs Cardosa Associates has been retained by the City of Campbell to provide a Tier 1 seismic assessment and conceptual seismic retrofit recommendations for the Campbell Library. This report contains the structural and seismic findings based on our Tier 1 assessment as well as our experience with buildings of similar size, age and construction.

The Campbell Library is a 2-story, 24,000 sf structure that was constructed in the early 1970's and opened to the public in 1975. The library consists of wood-framed roof and second floor, with steel columns, and concrete masonry wall at 1st story and wood-framed walls at 2nd story. The rectangular shaped structure is symmetrical in plan. Foundations consist of isolated spread footing below columns and continuous footings below walls. The lateral system comprises of plywood roof and floor diaphragms, plywood shearwalls at 2nd story and masonry walls at 1st story. The first floor is slab-on-grade.

Overall, the building is currently in good structural condition. The Campbell Library contains a complete vertical load-carrying system with no observed evidence of any significant structural damage, distress or deterioration. There were no visible indications that the building has undergone any significant settlement or differential settlement.

The deficiencies identified were based on a review of the available drawings, including drawings of a similar adjacent building (City Hall), a limited walk-through of the building, completion of Tier 1 assessment checklists, and our experience with structures of similar size, age and construction type. No destructive investigation was undertaken to either verify the existing conditions shown in the available documents, to identify unknown conditions, or to ascertain the extent of damage where evidence of potential structural damage was present. No structural drawings were available for review for the building and many details were inferred from the adjacent City Hall building.

The findings of this assessment indicate that while the building apparently has a complete lateral load-resisting system, it may have deficiencies in the required continuity and/or strength for some of its structural elements that are necessary for satisfactory seismic behavior. The building may be vulnerable to seismic damage but is likely to maintain its gravity load-carrying system after the design level earthquake. The existing Campbell Library, however, does not fully meet the requirements for the Life Safety performance level.

The preliminary cost estimate for the required seismic retrofit work identified through this Tier 1 evaluation is $320,950, including a small allowance for waterproofing of the masonry walls. Assessment of drainage/waterproofing issues by a specialist firm is recommended.

Further evaluation of the structure using ASCE 41 Tier 2 Deficiency-Based procedure as well as field verification of various as-built conditions are required and recommended before finalizing the seismic retrofit program for the building.

PROJECT OVERVIEW

Biggs Cardosa Associates has been retained by the City of Campbell to provide a Tier 1 seismic assessment (using ASCE 41-13 methodology) and conceptual seismic retrofit recommendations for the Campbell Library. This report contains the structural/seismic findings based on our Tier 1 assessment, our limited observation of existing field conditions, and our experience with many buildings of similar size, age and construction type. Potential seismic deficiencies are identified and conceptual recommendations are outlined for remedial work. A conceptual cost estimate is provided for the proposed seismic retrofit.

The 24,000 sf, 2-story Campbell Library was constructed in the early 1970's and opened to the public in 1975. The facility houses library functions on both floors as well as the City of Campbell's Emergency Operations Center (EOC) at the first floor (in the northeast corner). Based on our discussion with the City, we understand that the City plans to renovate the existing Library building and convert it into a City Hall. The existing City Hall building will be demolished and replaced with a new building that will house several City functions, including the Police Department and the relocated EOC, among others.

This report outlines the findings and recommendations of our Tier 1 assessment of the existing Library building's primary lateral load-resisting system. This assessment does not cover seismic anchorage and/or bracing of non-structural items such as electrical/mechanical equipment, ceilings, partitions, or other architectural elements. Further, an assessment of other building systems/features such as mechanical, electrical, plumbing, fire protection, accessibility, egress, drainage, waterproofing, etc. is beyond the scope of this report.

The scope of services for the structural/seismic assessment described in this report is summarized below:

1. Review available as-built structural drawings, previous seismic assessment reports, geotechnical reports, etc. for the building.
2. Perform a site visit to observe the existing structura1 conditions of the building, including the nature and layout of the primary lateral load-resisting system, physical condition of structural members and connections, and damage or deterioration of existing structural framing/connections. [Building finishes will not be disturbed during the site visit and our observation will be limited to the readily visible framing elements].
3. Perform a Tier 1 seismic assessment of the building based on the methodology outlined in ASCE41-13.
4. Identify structural/seismic deficiencies in the building's framing system based on our field observations and the Tier 1 seismic assessment.
5. Prepare qualitative conceptual recommendations for the required retrofit work to remedy the identified structural/seismic deficiencies and for the repair/replacement of the

damaged or deteriorated structural framing observed during our site visit.

6. Prepare a conceptual-level construction cost estimate for the proposed structural/seismic retrofit work.
7. Prepare a brief letter report describing the findings of structural/seismic assessment, recommendations for seismic retrofit/repair, and conceptual construction cost estimate for seismic retrofit work.

We understand that Anderson Brule Architects is preparing the conceptual architectural renovation program to convert the existing Library building into a City Hall facility as well as developing the related conceptual cost estimates.

AVAILABLE DOCUMENTS

The City researched its records for available documents – structural drawings, geotechnical reports, previous seismic assessment reports, etc. – and provided us the following drawings to review for this seismic assessment:

- Drawings for "Campbell Library Remodel," prepared by Jensen, Johnson & Associates, dated August 28, 1987. This drawing set was prepared for non-structural remodeling work and included one cover sheet (C), four architectural sheets (A1-A4), four electrical sheets (E1-E4), and two mechanical/plumbing sheets (MP-1 & MP-2). No structural modifications to the building appeared to have been be made as part of this remodeling work.
- Original design drawings (architectural and structural) for "Campbell City Hall." This set included:
  - Six architectural drawings (sheets 7-12), prepared by William W. Hedley, Jr. Architects, dated March 23, 1970, and
  - Thirteen structural drawings (sheets S1-S13), prepared by Donald R. James, Civil Engineer, dated March 13, 1970.

The original as-built structural plans for the Campbell Library building were not available.

The existing City Hall is located on a nearby site, just west of the Library. We understand the two buildings were designed by the same design team, were built during the same period in the early 1970's, and utilize similar construction materials, framing and details.

The findings and conclusions in this report are based on the available drawings and our site visit on April 14, 2015. With no structural drawings available for the Library, we have assumed that the structural framing and detailing of the Library is similar to that shown on the plans for the City Hall. While most of the structural framing and detailing of the Library is covered up by architectural finish materials and cannot be observed directly, areas that

could be observed suggest that this is a reasonable assumption, although this needs to be verified as the project develops.

BUILDING DESCRIPTION

The Campbell Library is a 2-story, 24,000 sf structure of primarily wood-framed construction, with selected structural elements constructed of steel, concrete or masonry. The building is rectangular in plan (approximately 146-ft L x 86-ft W) and has a story height of 12-ft at both levels. It was built in the early 1970's and opened to the public in 1975.

The building is located on a flat site. The first story is partially depressed below grade with the exterior masonry walls retaining soil up to approximately their mid-height. There is a short (2 to 3-ft height) masonry retaining wall approximately 10-ft away from the building footprint enclosing the entire perimeter of the building. The finished grade slopes down several feet from this retaining wall to a level just below the windows in the masonry walls at the building perimeter, resulting in surface runoff draining toward the building. See Photos 1 through 5.

There are three entrances to the building at the first story. Stairways at the north and south ends provide access to finished grade, while a long sloping ramp provides access to both floors near the main entrance located on the east side of the building. The second story is symmetrical in plan with entrances on all four sides of the building. The roof overhangs the perimeter walls by approximately 3-ft (see Photo 6) and is supported by exterior steel columns spaced evenly around the building. The flat roof contains two large mechanical units protected from view by a continuous roof screen.

The first story consists of 8" fully-grouted, reinforced concrete masonry perimeter walls and interior steel columns supporting a wood-framed floor. The masonry wall is essentially continuous along the north end (with just one opening for door leading to the stairs) and has window openings along the other three sides. The wood-framed floor consists of 5/8" plywood sheathing and non-structural concrete topping supported by 2x wood joists at 16" on center that span between glu-laminated wood beams. The beams are supported by the interior 5-in square steel tube columns and perimeter concrete-masonry walls that are continuous to the foundation. The wood framing supported by the masonry walls sits on a continuous sill plate with anchor bolts spaced at 48" on center (or 32" oc where plywood shear walls occur above).

The second story consists of steel columns supporting a wood-framed roof. Exterior wood framed walls are non-load bearing shear walls, sheathed with ½" plywood. The ½" thick plywood roof is supported by 2x wood joists at 16" on center that span between glu-laminated wood beams supported by the interior steel columns and perimeter stud walls. The stud walls are supported by the masonry walls below. The interior steel columns align with the columns below and are continuous to the foundation.

The first floor is a 4” slab-on-grade with welded wire mesh reinforcement. The slab is placed on a prepared subgrade consisting of 2” sand layer, visqueen membrane (vapor barrier) and 4” crushed rock layer. The building foundation system consists of continuous footings below masonry walls and isolated spread footings below steel tube columns.

The building’s lateral load-resisting system consists of plywood roof and second floor diaphragms and the plywood/masonry shear walls at its perimeter – plywood shear walls at the second story and concrete masonry shear walls at the first story. Inferring from the City Hall drawings, the second-story plywood shear walls are anchored into the masonry walls below with Simpson hold-downs at each end (but this needs to be field verified).

Selected recent photos of the building are included in Appendix 1.

EXISTING CONDITIONS

In order to perform a Tier 1 seismic assessment of the Campbell Library, the nature of construction and layout of the current structure had to be determined. The available drawings (noted above) and our site visit on April 14, 2015 provided the basic information to accomplish this task. No specific information on the building’s structural framing system or details has been available.

No destructive investigation or physical testing of existing conditions or materials was performed during the site visit. As most of the structural framing is concealed by architectural finishes, not all structural elements of the building were visible during the site visit and not all of the building components relevant for this assessment were able to be verified. Since the adjacent City Hall building was constructed around the same time as the Library and has very similar visible finishes, materials and layout, the available structural drawings for the City Hall were used to infer the various details, materials and components. A field investigation requiring the removal of finishes in selected areas of the building may be required to verify the existing conditions and materials.

Overall the building appears to be in good physical condition. While signs of minor water intrusion were observed at several locations (see Photos 15 & 16), the wood framing observed at the second floor and roof showed no signs of moisture-related damage or any other type of deterioration. The steel columns and steel connection hardware showed no signs of corrosion. There were no visible indications (cracks in walls, slabs, sidewalks, etc.) that the building has undergone any significant settlement or differential settlement.

The masonry walls appeared to be in good structural condition. No visible cracks were present during the site visit although the masonry wall has been painted and this could obscure small cracks. Signs of previous water seepage through the masonry walls were observed at several locations, suggesting that a waterproofing/drainage system on the soil-side of masonry walls either was not originally installed or may have been compromised if

installed. [The City Hall drawings show that a waterproofing membrane and a gravel backfill with weep holes at wall base were installed on soil-side of masonry walls in that building.]

The presence of steel clips and other details appear to provide an indication that, like the City Hall structure, the Library building was originally designed by considering seismic loads. There was no indication that the building has been modified or seismically retrofitted since its original construction.

SEISMIC EVALUATION AND FINDINGS

Evaluation Basis

The purpose of this evaluation was to determine whether significant seismic deficiencies exist, to determine the potential seismic risk, and to provide general conceptual recommendations for reduction of seismic risk through mitigation. The Tier 1 methodology of ASCE/SEI 41-13 was used for this preliminary assessment; a full ASCE 41 compliance review using more advanced procedures (such as Tier 2 or Tier 3) was neither intended nor performed. The ASCE 41 Basic Configuration and Structural Checklists for Life Safety performance level were completed to help identify the potential seismic deficiencies in the Library building's lateral load-resisting system. See Appendix 4.

The analysis methodology of ASCE 41 includes three levels of analytical procedures for seismic assessment of existing structures: a quick check procedure (Tier 1) intended to serve as an aid in quickly identifying high seismic risk structures; a more intensive deficiency-based analysis procedure (Tier 2), and a systematic analysis procedure (Tier 3).

The Tier 1 quick check employs a set of checklists for each building type, which contain evaluation statements that help identify areas of concern with regard to the structure's ability to adequately transmit earthquake forces to the foundation and supporting grade. This evaluation utilized the Tier 1 checklists, along with the Quick Checks required under this procedure.

It should be noted that with each building code cycle (every three years), building codes for new design are modified to enhance structural performance during seismic events. However, engineering standards developed to evaluate existing buildings have lagged behind in development. Revisions to ASCE 41 Seismic Evaluation and Retrofit of Existing Buildings were recently completed and this document is intended to replace previous evaluation guidelines as the standard of practice for the seismic evaluation of existing buildings. One of the primary goals of this document is to include lessons learned from past earthquakes.

For the Campbell Library, only a structural seismic evaluation was done per ASCE 41. The building was not evaluated for fire protection, egress, accessibility, mechanical, electrical, plumbing, waterproofing or drainage requirements. The Campbell Library may require these

other improvements to meet the code requirements, but an assessment of these systems is beyond the scope of this report.

Lateral Load-Resting System

Lateral loads for buildings result primarily from earthquake inertia forces acting on structural and non-structural elements. Out-of-plane forces acting on interior and exterior walls are transferred to the roof and floor diaphragms, then to seismic system parallel to the direction of the earthquake or wind loads. These elements then transfer the forces to the foundations.

At second story of the Campbell Library, the plywood roof diaphragm transfers forces into the perimeter plywood shearwalls. At the first story, the plywood second floor diaphragm transfers forces into the masonry shearwalls at perimeter of the building. The forces from the second-story plywood shearwalls are transferred directly into the first-story masonry shearwalls, which then transfer the combined lateral forces to the foundations.

Seismic Evaluation Results

Our assessment of Campbell Library was based on ASCE 41 Tier 1 analysis, our field observations, our review of the structural drawings for the adjacent City Hall (which has similar construction), and our experience with buildings of similar size, age and construction type. Our findings indicate that while the building apparently has a complete lateral load-resisting system, it may have deficiencies in the required continuity and/or strength for some of its structural elements that are necessary for satisfactory seismic behavior. The building may be vulnerable to seismic damage but is likely to maintain its gravity load-carrying system after the design level earthquake. The existing Campbell Library building, however, does not fully meet the requirements for the Life Safety performance level.

Inferring from the City Hall drawings, the masonry shearwalls at the first story are presumably fully grouted and reinforced and appear to be adequate for transferring the in-plane seismic loads to the foundations. The in-plane shear connection between the second floor diaphragm and the masonry walls below consists of a wood blocking and steel angle clips attached to a continuous wood sill plate with anchor bolts embedded into the masonry wall at each joist. This connection appears to be sufficient for transferring the seismic loads.

The plywood shearwalls at the second story appear to be adequate for transferring the in-plane seismic loads. Holdowns at the ends of plywood shearwalls, if present, were concealed by architectural finishes and could not be observed during our site visit. The drawings for the adjacent City Hall building indicate holdowns at several wood shearwalls, but unless holdowns are field verified and their strength is adequate, they will need to be added to the existing walls.

The shear capacities of the roof and second floor plywood diaphragms appear to be adequate for transferring the seismic forces to the shear walls; the details and capacities of the roof diaphragm chords/collectors, however, need verification.

Based on the evaluation performed, we believe the Campbell Library may have the following potential seismic deficiencies:

1. At roof level, wood wall-to-roof connections appear to be adequate for out-of-plane wall loads but their details and capacities need verification. If found deficient, new closely-spaced steel straps will need to be added.
2. At roof level, building cross-ties are inadequate for transferring out-of-plane wall loads into the roof diaphragm. Addition of new horizontal steel straps or steel rods with holdowns is required at beam splice locations (typically at columns).
3. At roof level, collectors along shearwall lines are inadequate for transferring the diaphragm load to the shearwalls. Addition of new steel straps with blocking between joists is required.
4. At roof level, diaphragm chords appear to be adequate but their details and capacities need verification.
5. Holdowns at the ends of second story plywood shearwalls, if present, were not visible during the site visit. Holdowns will need to be added to the existing plywood shearwalls unless holdowns are field verified and their strength is found to be adequate.
6. At second floor level, masonry wall-to-floor connections appear to be adequate for out-of-plane wall loads but their details and capacities need verification. If found deficient, new close-spaced steel straps will need to be added.
7. At second floor level, building cross-ties are inadequate for transferring out-of-plane masonry wall loads into the floor diaphragm. Addition of new horizontal steel straps or steel rods with holdowns is required at beam splice locations (typically at columns).

RECOMMENDATIONS

Based on the seismic deficiencies identified through this preliminary assessment, we believe that the Campbell Library requires, at a minimum, the following retrofit work:

1. At roof level, provide building cross-ties by adding new horizontal steel straps at beam splice locations (typically at columns). These straps will be installed over the roof plywood sheathing, directly above the beams below. [See Deficiency 2 above].
2. At roof level, provide new collectors along shearwall lines by adding new steel straps over plywood sheathing, with new blocking between the joists. [See Deficiency 3 above].

3. At second floor level, provide building cross-ties by adding new horizontal steel straps or steel rods with holdowns at beam splice locations (typically at columns). [See Deficiency 7 above].

Refer to Appendix 2 for conceptual seismic retrofit plans showing the extent of this seismic retrofit work.

COST ESTIMATE

As detailed in Appendix 3, the preliminary construction cost estimate for the retrofit work outlined above is $320,950. This amount also includes a small allowance for the installation of a new waterproofing membrane on the interior face of first-story masonry walls, although we believe this item needs to be evaluated by a firm that specializes in drainage and waterproofing.

FURTHER ACTIONS

As indicated by the potential seismic deficiencies in the Campbell Library building outlined above - most of which need further field work, analysis and verification – we recommend the following further steps to fully define the scope of required seismic retrofit:

1. Perform an investigative field verification of existing conditions to determine the necessary information on pertinent structural framing and connection details.
2. Perform a detailed ASCE 41 Tier 2 Deficiency-Based Seismic Evaluation of the building using the deficiencies outlined above to allow a more accurate verification and definition of the building's seismic retrofit needs. Develop retrofit concepts.
3. Review architectural and mechanical plans for other improvements proposed for conversion of the Library building into a City Hall facility. Develop conceptual structural details for proposed building modification required for conversion.

The implementation of these actions will help determine the full extent of structural upgrade required for the building and ensure that the "new" City Hall facility meets the seismic safety requirements.

<u>Masonry Walls – Drainage & Waterproofing</u>

We recommend that the City retain a drainage and waterproofing specialist firm to assess these issues as they pertain to the first-story masonry walls. Potential solutions to preventing water seepage through the walls may include removing all existing finish materials on interior face of wall, epoxy injection of cracks, and applying a coating/membrane to interior face of the wall, or alternatively repairing/installing the drainage and waterproofing system behind the wall.

LIMITATIONS AND DISCLAIMERS

The evaluation, findings, conclusions and recommendations outlined in this report were based on limited information. This report has been prepared using the same degree of care and skill ordinarily exercised for this type of professional service by structural engineers practicing in this area at this time. No other warranty, expressed or implied, is made as to the professional advice in this report.

This report has been prepared for exclusive use of the City of Campbell and may not be used by any other individual or entity without the express written approval of Biggs Cardosa Associates, Inc.

Appendix 1

Photos

Photo 1 – East elevation view

Photo 2 – North elevation view (from northeast corner)

Photo 3 – West elevation view

Photo 4 – South elevation view

Photo 5 – Exterior perimeter retaining wall and first story masonry walls.

Photo 6 – Exterior overhangs and steel columns

Photo 7 – Interior space at first floor with masonry shearwalls beyond

Photo 8 – Interior space at second floor

Photo 9 – Typical glulam beam to steel column connection

Photo 10 – Typical Joist to glulam beam connection

Photo 11 – Joist bridging and glulam beam to column connection beyond

Photo 12 – Bolted wood sill plate at masonry wall

Photo 13 – Bolt and Simpson steel clips at wood sill plate

Photo 14 – Typical floor framing at masonry wall

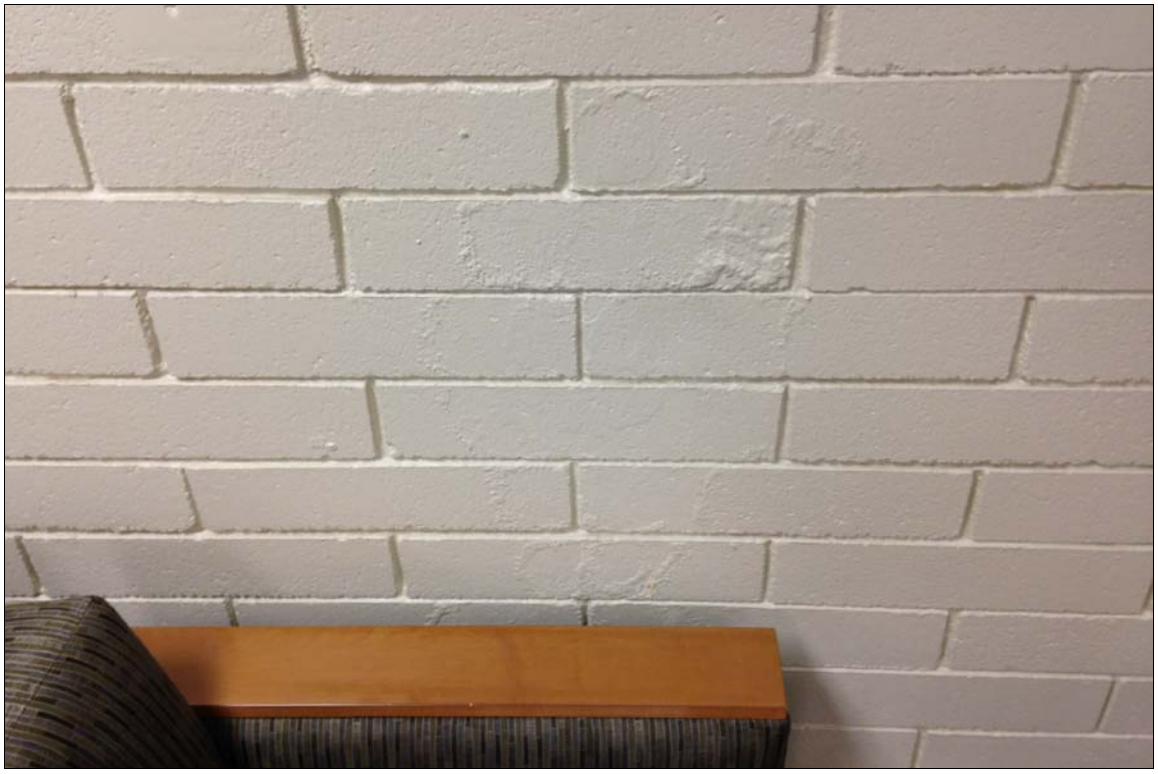


Photo 15 – Signs of water intrusion through masonry wall

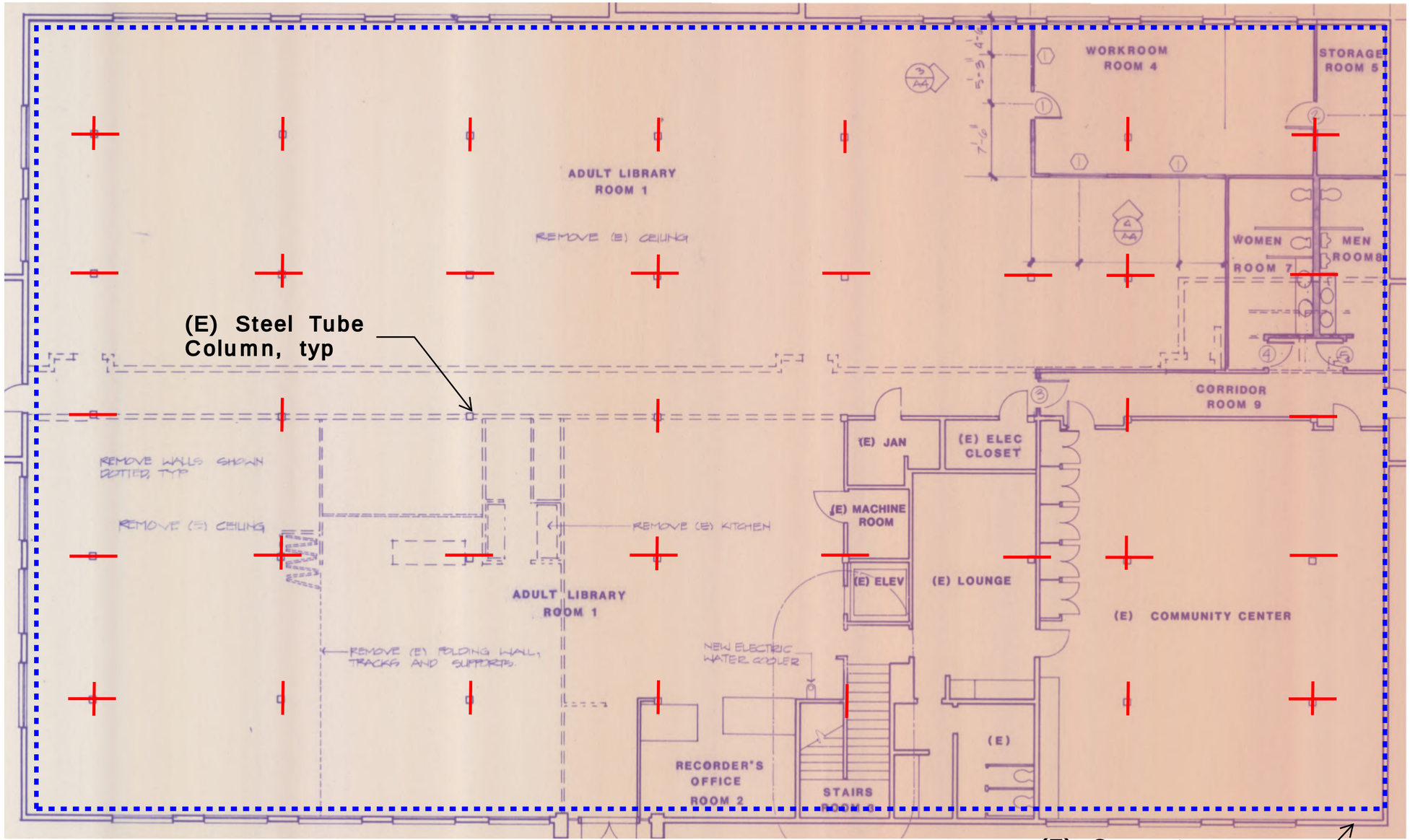
Photo 16 – Water damage at ceiling tile

Appendix 2

Conceptual Seismic Retrofit Plans

146 ft

86 ft



(E) Concrete Masonry Shearwall below, typ

Second Floor Plan

→ N

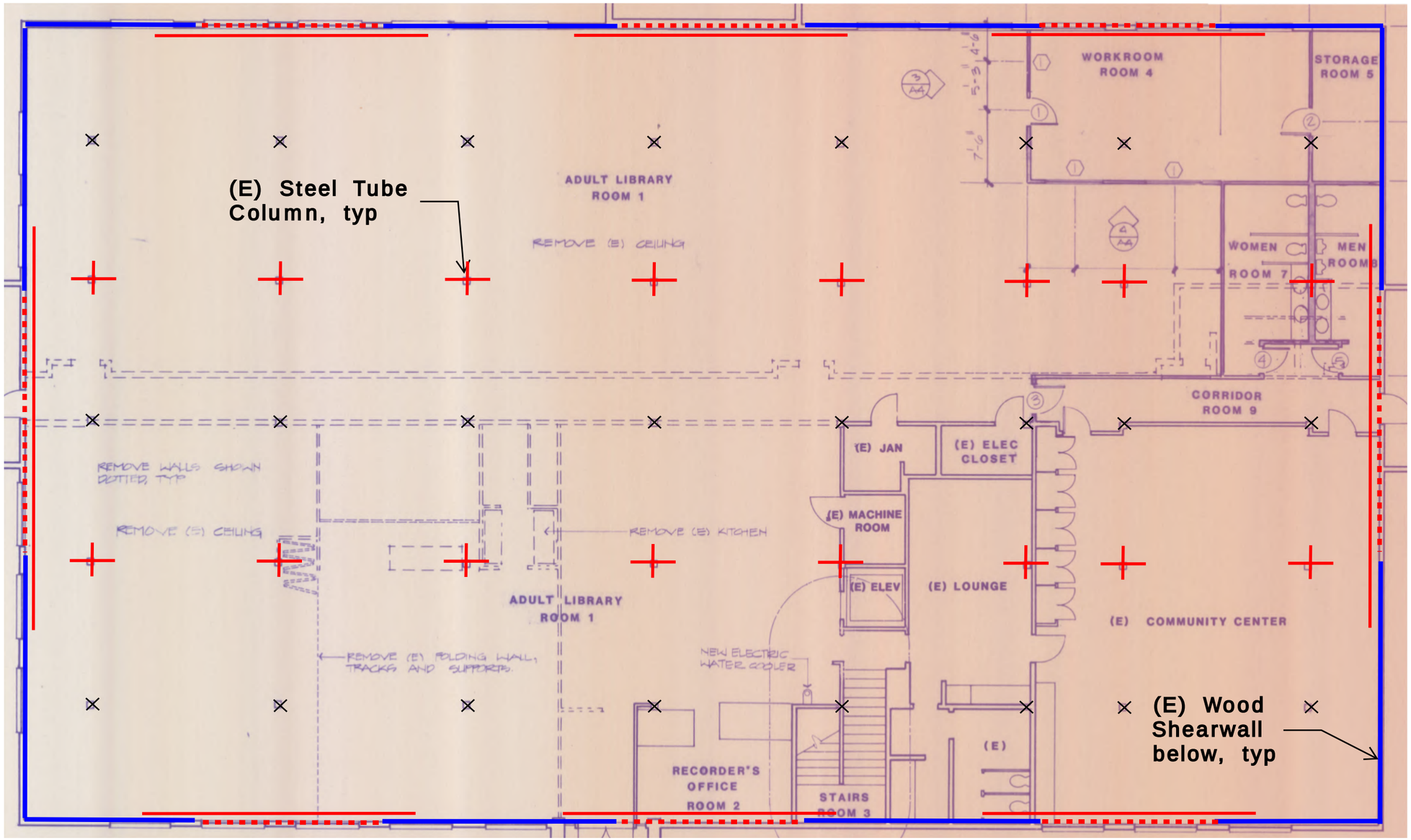
Indicates (N) seismic tie - steel rod or strap on each side of (E) glu-lam beam.

Indicates (N) waterproofing on inside face of first story walls

Campbell Library
77 Harrison Ave, Campbell, CA
May 8, 2015

146 ft

86 ft



Indicates (N) steel strap at (E) plywood diaphragm

Indicates (N) wood blocking

Indicates (E) Wood shearwall below

Roof Plan

→ N

Campbell Library
77 Harrison Ave, Campbell, CA
May 8, 2015

Appendix 3

Conceptual Cost Estimate

Leland Saylor Associates
A Certified DVBE

CONCEPTUAL ESTIMATE

CAMPBELL LIBRARY SEISMIC RETROFIT

CAMPBELL, CA

LSA JOB NUMBER:
15-047A R2

May 12, 2015

PREPARED FOR
BIGGS CARDOSA ASSOCIATES, INC.
BY LELAND SAYLOR ASSOCIATES

101 Montgomery Street, Suite 800 | San Francisco | California | 94104
415-291-3200 | 415-291-3201 (f) | www.lelandsaylor.com

Leland Saylor Associates
A Certified DVBE

PROJECT:	**CAMPBELL LIBRARY SEISMIC RETROFIT**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	BID DATE:	
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

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Leland Saylor Associates
A Certified DVBE

PROJECT:	**CAMPBELL LIBRARY SEISMIC RETROFIT**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK, AC**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	CHECKED BY:	**IS**
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

SECTION I

PREFACE AND NOTES TO THE ESTIMATE

Leland Saylor Associates
A Certified DVBE

PROJECT:	**CONCEPTUAL ESTIMATE**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	BID DATE:	
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

PREFACE AND NOTES TO THE ESTIMATE

1.0 PROJECT SYNOPSIS

1.1 TYPE OF STUDY:

CONCEPTUAL ESTIMATE

1.2 PROJECT DESCRIPTION:

Construction Type:	I, II, III, IV, V, N.R., F.R., 1 HR., ETC.
Foundation Type:	NO WORK INCLUDED
Exterior Wall Type:	EXISTING
Roof Type:	BUILT-UP ROOF, REPAIR WORK
Stories Below Grade:	NONE
Stories Above Grade:	TWO
Sitework:	NOT INCLUDED
Plumbing System:	NOT INCLUDED
Mechanical System:	NOT INCLUDED
Fire Protection System:	NOT INCLUDED
Electrical Service:	NOT INCLUDED

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PROJECT:	**CONCEPTUAL ESTIMATE**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	BID DATE:	
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

PREFACE AND NOTES TO THE ESTIMATE

1.3 GENERAL NOTES REGARDING PROJECT:

PRE-CONCEPTUAL LEVEL OF ESTIMATING.
NO PLANS & SPECIFICATION.
NO FURNITURE WORK INCLUDED
NO LIBRARY SHELF INCLUDED
NO KITCHEN EQUIPMENT INCLUDED

2.0 DEFINITIONS

2.1 ESTIMATE OF COST:

An Estimate of Cost is prepared from a survey of the quantities of work - items prepared from written or drawn information provided at the design-development, working drawing or bid-documents stage of the design. Historical costs, information provided by contractors and suppliers, plus judgmental evaluation by the Estimator are used as appropriate as the basis for pricing. Allowances as appropriate will be included for items of work which are not indicated on the design documents provided that the Estimator is made aware of them, or which, in the judgment of the Estimator, are required for completion of the work. We cannot, however, be responsible for items or work of an unusual nature of which we have not been informed.

2.2 BID:

An offer to enter a contract to perform work for a fixed sum, to be completed within a limited period of time.

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PROJECT:	**CONCEPTUAL ESTIMATE**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	BID DATE:	
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

PREFACE AND NOTES TO THE ESTIMATE

3.0 BIDS & CONTRACTS

3.1 MARKET CONDITIONS:

In the current market conditions for construction, our experience shows the following results on competitive bids, as a differential from Leland Saylor Associates final estimates:

Number of Bids		Percentage Differential
1	.....	+25 to 100%
2 - 3	.....	+10 to 25%
4 - 5	.....	0 to +10%
6 - 7	.....	0 to -10%
8 or more	.....	-10 to -20%

Accordingly, it is extremely important to ensure that a minimum of 4 to 5 valid bids are received. Since LSA has no control over the bid process, there is no guarantee that proposals, bids or construction cost will not vary from our opinions or our estimate.

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PROJECT:	**CONCEPTUAL ESTIMATE**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	BID DATE:	
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

PREFACE AND NOTES TO THE ESTIMATE

4.0 ESTIMATE DOCUMENTS

4.1 This Estimate has been compiled from the following documents and information supplied:

DRAWINGS:

Architectural	**Mechanical**	**Landscaping**
None	*None*	*None*
Structural	**Plumbing**	**Accessibility Standards**
None	*None*	*None*
Civil	**Electrical**	**Other**
None	*None*	*PHOTOS*

SPECIFICATIONS / PROJECT MANUAL:

PRE-CONCEPTUAL LEVEL OF ESTIMATING, NO PLANS & SPECIFICATION

COSTS PROVIDED BY OTHERS:

None

4.2 The user is cautioned that significant changes in the scope of the project, or alterations to the project documents after completion of the conceptual estimate can cause major cost changes. In these circumstances, Leland Saylor Associates should be notified and an appropriate adjustment made to the conceptual estimate.

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PROJECT:	**CONCEPTUAL ESTIMATE**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	BID DATE:	
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

PREFACE AND NOTES TO THE ESTIMATE

5.0 GROSS SQUARE FEET

BUILDING	GSF
LIBRARY	25,112
TOTAL GROSS SQUARE FEET	25,112

6.0 WAGE RATES

6.1 This Estimate is based on prevailing wage-rates and conditions currently applicable in CAMPBELL, CA.

7.0 PRORATE ADDITIONS TO THE ESTIMATE

7.1 GENERAL CONDITIONS: **10.00%**

An allowance based on 10% of the construction costs subtotal has been included for Contractor's General Conditions.

7.2 CONTINGENCY: **20.00%**

An allowance based on 20% of the construction costs subtotal has been included for Design/Estimating Contingency.

NOTE: This allowance is intended to provide a Design Contingency sum only, for use during the design process. It is not intended to provide for a Construction Contingency sum.

Leland Saylor Associates
A Certified DVBE

PROJECT:	**CONCEPTUAL ESTIMATE**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	BID DATE:	
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

PREFACE AND NOTES TO THE ESTIMATE

7.3 ESCALATION: NOT INCLUDED

An allowance of 0% has been included in this estimate for construction material & labor cost escalation up to the anticipated mid-point of construction, based on the following assumptions:

Construction start date:	
Construction period:	
Mid-point of construction:	
Annual escalation rate:	
Allowance for escalation:	

No allowance has been made for Code Escalation or Technological Escalation.

7.4 PHASING ALLOWANCE NONE

The Phasing Allownace has been excluded in the prorates section of the estimate.

7.5 BONDS: 2.00%

An allowance of 2% of the construction cost subtotal is included to provide for the cost of Payment and Performance Bonds, if required.

7.6 CONTRACTOR'S FEE: 10.00%

An allowance based on 10% of the construction cost subtotal is included for Contractor's office Overhead and Profit. Office overhead of the contractor is always included with the fee.

All field overhead of the contractor is included in the General Conditions section of the estimate.

Leland Saylor Associates
A Certified DVBE

PROJECT:	**CONCEPTUAL ESTIMATE**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	BID DATE:	
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

PREFACE AND NOTES TO THE ESTIMATE

8.0 SPECIAL NOTES PERTAINING TO THIS ESTIMATE

8.1 SPECIFIC INCLUSIONS:

The following items are specifically included in this estimate:

NONE

8.2 SPECIFIC EXCLUSIONS:

The following items are specifically excluded from this estimate:

HAZMAT

SOIL REMEDIATION

Leland Saylor Associates
A Certified DVBE

PROJECT:	**CAMPBELL LIBRARY SEISMIC RETROFIT**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK, AC**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	CHECKED BY:	**IS**
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

SECTION I

SUMMARY OF ESTIMATE

LELAND SAYLOR ASSOCIATES

PROJECT:	**CAMPBELL LIBRARY SEISMIC RETROFIT**	JOB NO:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK, AC**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	CHECKED BY:	**IS**
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	DATE:	**5/12/2015**
		GSF:	**25,112**

CONCEPTUAL ESTIMATE

DIV #	DESCRIPTION	QTY	UNIT	UNIT COST	TOTALS
	SUMMARY OF THE ESTIMATE				
	CITY HALL LIBRARY	25,112	SF		**$ 320,950**
	TOTAL JOB DIRECT COSTS	**25,112**	**SF**	**12.78**	**$ 320,950**
	PRORATES INCLUDED				
	General Conditions	10.00%			**$ -**
	Design Contingency	20.00%			**$ -**
	Escalation	NOT INCLUDED			**$ -**
	Phasing Allowance	NONE			**$ -**
	SUB-TOTAL	**25,112**	**SF**	**12.78**	**$ 320,950**
	Bonds / Insurance	2.00%			**$ -**
	Contractors Fee	10.00%			**$ -**
	TOTAL PROJECT COSTS	**25,112**	**SF**	**12.78**	**$ 320,950**

Leland Saylor Associates
A Certified DVBE

PROJECT:	**CAMPBELL LIBRARY SEISMIC RETROFIT**	JOB NUMBER:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK, AC**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	CHECKED BY:	**IS**
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	ESTIMATE DATE:	**5/12/2015**

SECTION III

LIBRARY SEISMIC RETROFIT

LELAND SAYLOR ASSOCIATES

PROJECT:	**CAMPBELL LIBRARY SEISMIC RETROFIT**	JOB NO:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK, AC**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	CHECKED BY:	**IS**
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	DATE:	**5/12/2015**
		GSF:	**25,112**

CONCEPTUAL ESTIMATE

SUMMARY OF THE ESTIMATE

DIV #	DESCRIPTION	QTY	UNIT	UNIT COST	TOTALS
2.00	**EXISTING CONDITIONS**			0.39	**$ 9,780**
6.00	**WOOD & PLASTICS**			7.54	**$ 189,225**
7.00	**THERMAL AND MOISTURE PROTECTION**			0.38	**$ 9,576**
9.00	**FINISHES**			0.47	**$ 11,852**
	TOTAL JOB DIRECT COSTS	**25,112**	**SF**	**8.78**	**$ 220,433**
	PRORATES				
	General Conditions	10.00%			**$ 22,043**
	Design Contingency	20.00%			**$ 44,087**
	Escalation	NOT INCLUDED			**$ -**
	Phasing Allowance	NONE			**$ -**
	SUB-TOTAL	**25,112**	**SF**	**11.41**	**$ 286,562**
	Bonds / Insurance	2.00%			**$ 5,731**
	Contractors Fee	10.00%			**$ 28,656**
	TOTAL PROJECT COSTS	**25,112**	**SF**	**12.78**	**$ 320,950**

LELAND SAYLOR ASSOCIATES

PROJECT:	**CAMPBELL LIBRARY SEISMIC RETROFIT**	JOB NO:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK, AC**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	CHECKED BY:	**IS**
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	DATE:	**5/12/2015**
		GSF:	**25,112**

CONCEPTUAL ESTIMATE

ESTIMATE DETAIL

DIV #	DESCRIPTION	QTY	UNIT	UNIT COST	TOTALS
2.0	**EXISTING CONDITIONS**				
	DEMOLITION :				
	1st Floor / 2nd Fl Framing :				
	TEMPORARY REMOVAL OF EXISTING ACT TILES TO ALLOW ACCESS FOR STRAP INSTALL	45	LOC	10.00	**450**
	FINISH FLOOR PROTECTION	12,556	SF	0.25	**3,139**
	2nd Floor / Roof Framing :				
	REMOVE EXISTING ROOFING LOCALLY FOR NEW STRAPS INSTALLATION (ASSUMED 8 FEET LONG BY 6 INCH WIDE AND ADDITIONAL 20% FOR WORKING AREA)	154	SF	6.00	**922**
	REMOVE EXISTING ROOFING LOCALLY FOR NEW STRAPS INSTALLATION AT PERIMETER (300 FEET BY 6 INCHES WIDE WITH AN ADDITIONAL 20% FOR WORKING AREA)	180	SF	6.00	**1,080**
	TEMPORARY REMOVAL OF EXISTING ACT TILES TO ALLOW ACCESS FOR NEW WOOD BLOCKING	105	SF	10.00	**1,050**
	FINISH FLOOR PROTECTION	12,556	SF	0.25	**3,139**
	SUBTOTAL 2.0			**0.39**	**$ 9,780**
6.0	**WOOD & PLASTICS**				
	ROUGH CARPENTRY :				
	1st Floor / 2nd Fl Framing :				
	NEW SEISMIC TIE / STRAPS @ COLUMNS / BEAMS CONNECTIONS; 90 STRAPS TOTAL AS DEFINED BY CLIENT	90	LOC	1,500.00	**135,000**
	2nd Floor / Roof Framing :				
	PROVIDE ADDITIONAL BLOCKING @ EXTERIOR WALL ASSUME 4' OC; LINEAR LENGTH PROVIDED BY THE CLIENT	175	LF	15.00	**2,625**
	NEW SEISMIC STRAPS AT COLUMNS AND BEAMS	32	LOC	1,500.00	**48,000**
	NEW STEEL STRAPS AT PERIMETER	300	LF	12.00	**3,600**
	SUBTOTAL 6.0			**7.54**	**$ 189,225**

LELAND SAYLOR ASSOCIATES

PROJECT:	**CAMPBELL LIBRARY SEISMIC RETROFIT**	JOB NO:	**15-047A R2**
LOCATION:	**CAMPBELL, CA**	PREPARED BY:	**GK, AC**
CLIENT:	**BIGGS CARDOSA ASSOCIATES, INC.**	CHECKED BY:	**IS**
DESCRIPTION:	**LIBRARY SEISMIC RETROFIT**	DATE:	**5/12/2015**
		GSF:	**25,112**

CONCEPTUAL ESTIMATE

DIV #	DESCRIPTION	QTY	UNIT	UNIT COST	TOTALS
7.0	**THERMAL AND MOISTURE PROTECTION**				
	WATERPROOFING :				
	1st Floor :				
	PROVIDE NEW WATERPROOFING MEMBRANE AT INTERIOR ONLY AS DEFINED BY THE CLIENT	5,568	SF	1.00	**5,568**
	ROOFING :				
	NEW ROOFING TO STRAP AFFECTED AREAS	334	SF	12.00	**4,008**
	SUBTOTAL 7.0			**0.38**	**$ 9,576**
8.0	**DOORS & WINDOWS**				
	SUBTOTAL 8.0			**-**	**NONE**
9.0	**FINISHES**				
	WALL FRAMING :				
	1st Floor :	**NONE**			
	2nd Floor :	**NONE**			
	FLOOR FINISH :	**NONE**			
	ACOUSTICAL CEILING :				
	1st Floor :				
	REINSTALL SUSPENDED AC SYSTEM (2' x 4') ALLOW FOR 20% NEW MATERIALS	45	LOC	10.00	**450**
	ALLOWANCE FOR NEW ACT DUE TO DAMAGE DURING REMOVAL	1	SUM	1,000.00	**1,000**
	PAINT FINISH TO WATERPROOFING MEMBRANE AREA	5,568	SF	1.50	**8,352**
	2nd Floor :				
	REINSTALL SUSPENDED AC SYSTEM (2' x 4') ALLOW FOR 20% NEW MATERIALS	105	SF	10.00	**1,050**
	ALLOWANCE FOR NEW ACT DUE TO DAMAGE DURING REMOVAL	1	SUM	1,000.00	**1,000**
	SUBTOTAL 9.0			**0.47**	**$ 11,852**

Appendix 4

ASCE 41 Tier 1 Checklists

APPENDIX C
SUMMARY DATA SHEET

BUILDING DATA

Building Name: Campbell Library Date: 5/8/15

Building Address: 77 Harrison Ave, Campbell, CA

Latitude: 37.288 N Longitude: 121.943 W By:

Year Built: 1975 Year(s) Remodeled: 1987 Original Design Code: UBC 1973

Area (sf): 27,0000 Length (ft): 150 Width (ft): 90

No. of Stories: 2 Story Height: 12 Total Height: 24

USE ☐ Industrial ☒ Office ☐ Warehouse ☐ Hospital ☐ Residential ☐ Educational ☐ Other:

CONSTRUCTION DATA

Gravity Load Structural System: Plywood roof on glu-lam beams over steel columns

Exterior Transverse Walls: Wood framed / Masonry Openings?

Exterior Longitudinal Walls: Wood framed / Masonry Openings?

Roof Materials/Framing: Plywood / 2x wood joists / Glu-lam beams

Intermediate Floors/Framing: Plywood / 2x wood joists / Glu-lam beams

Ground Floor: Slab on grade

Columns: Steel tubes Foundation: Spread footings

General Condition of Structure: Good

Levels Below Grade? 0

Special Features and Comments:

LATERAL-FORCE-RESISTING SYSTEM

	First Story -Longitudinal-	Second Story -Transverse-
System:	Concrete-masonry shear walls	Wood shear walls
Vertical Elements:	CMU Walls / Steel Columns	Stud walls / Steel Columns
Diaphragms:	5/8" Plywood	1/2" Plywood
Connections:	Sill plate and anchor bolts	Wood Blkg and nails

EVALUATION DATA

BSE-1N Spectral Response Accelerations: S_{Ds} = 1.057 S_{D1} = 0.601

Soil Factors: Class = D F_a = 1.0 F_v = 1.5

BSE-1E Spectral Response Accelerations: S_{XS} = 1.585 S_{X1} = 0.902

Level of Seismicity: High Performance Level: Life Safety

Building Period: T = 0.91 sec

Spectral Acceleration: S_a = 1.057

Modification Factor: $C_mC_1C_2$ = 1.1 Building Weight: W = 935 kips

Pseudo Lateral Force: V= 1.1 W

$C_mC_1C_2S_aW$= 1085 kips

BUILDING CLASSIFICATION:

REQUIRED TIER 1 CHECKLISTS	**Yes**	**No**
Basic Configuration Checklist	☐	☒
Building Type _____ **Structural Checklist** W2 / RM1	☒	☐
Nonstructural Component Checklist	☐	☒

FURTHER EVALUATION REQUIREMENT:

Project: Campbell Library Location: Campbell, CA

Completed by: GJT Date: 5/8/15

16.1.2LS LIFE SAFETY BASIC CONFIGURATION CHECKLIST

Low Seismicity

Building System

General

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 ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 4% of the height of the shorter building. This statement shall not apply for the following building types: W1, W1a, and W2. (Commentary: Sec. A.2.1.2. Tier 2: Sec. 5.4.1.2)

C NC N/A U MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Commentary: Sec. A.2.1.3. Tier 2: Sec. 5.4.1.3)

Building Configuration

C NC N/A U WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above. (Commentary: Sec. A2.2.2. Tier 2: Sec. 5.4.2.1)

C NC N/A U SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Commentary: Sec. A.2.2.3. Tier 2: Sec. 5.4.2.2)

C NC N/A U VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Commentary: Sec. A.2.2.4. Tier 2: Sec. 5.4.2.3)

C NC N/A U GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Commentary: Sec. A.2.2.5. Tier 2: Sec. 5.4.2.4)

C NC N/A U MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Commentary: Sec. A.2.2.6. Tier 2: Sec. 5.4.2.5)

C NC N/A U TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Commentary: Sec. A.2.2.7. Tier 2: Sec. 5.4.2.6)

Moderate Seismicity: Complete the Following Items in Addition to the Items for Low Seismicity.

Geologic Site Hazards

C NC N/A U LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 ft under the building. (Commentary: Sec. A.6.1.1. Tier 2: 5.4.3.1)

C NC N/A U SLOPE FAILURE: The building site is sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or is capable of accommodating any predicted movements without failure. (Commentary: Sec. A.6.1.2. Tier 2: 5.4.3.1)

C NC N/A U SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: 5.4.3.1)

High Seismicity: Complete the Following Items in Addition to the Items for Low and Moderate Seismicity.

Foundation Configuration

C NC N/A U OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than $0.6S_a$. (Commentary: Sec. A.6.2.1. Tier 2: Sec. 5.4.3.3)

C NC N/A U TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Commentary: Sec. A.6.2.2. Tier 2: Sec. 5.4.3.4)

Project: Campbell Library Location: Campbell, CA

Completed by: GJT Date: 5/8/15

16.3LS LIFE SAFETY STRUCTURAL CHECKLIST FOR BUILDING TYPE W2: WOOD FRAMES, COMMERCIAL AND INDUSTRIAL

Low and Moderate Seismicity

Lateral Seismic-Force-Resisting System

C NC N/A U REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1)

C NC N/A U SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than the following values (Commentary: Sec. A.3.2.7.1. Tier 2: Sec. 5.5.3.1.1):

Structural panel sheathing	1,000 lb/ft
Diagonal sheathing	700 lb/ft
Straight sheathing	100 lb/ft
All other conditions	100 lb/ft

C NC N/A U STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system. (Commentary: Sec. A.3.2.7.2. Tier 2: Sec. 5.5.3.6.1)

C NC N/A U GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used as shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. (Commentary: Sec. A.3.2.7.3. Tier 2: Sec. 5.5.3.6.1)

C NC N/A U NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces. (Commentary: Sec. A.3.2.7.4. Tier 2: Sec. 5.5.3.6.1)

C NC N/A U WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor. (Commentary: Sec. A.3.2.7.5. Tier 2: Sec.5.5.3.6.2)

C NC N/A U HILLSIDE SITE: For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1. (Commentary: Sec. A.3.2.7.6. Tier 2: Sec. 5.5.3.6.3)

C NC N/A U CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Commentary: Sec. A.3.2.7.7. Tier 2: Sec. 5.5.3.6.4)

C NC N/A U OPENINGS: Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces. (Commentary: Sec. A.3.2.7.8. Tier 2: Sec. 5.5.3.6.5)

Connections

C NC N/A U WOOD POSTS: There is a positive connection of wood posts to the foundation. (Commentary: Sec. A.5.3.3. Tier 2: Sec. 5.7.3.3)

C NC N/A U WOOD SILLS: All wood sills are bolted to the foundation. (Commentary: Sec. A.5.3.4. Tier 2: Sec. 5.7.3.3)

C NC N/A U GIRDER/COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1)

High Seismicity: Complete the Following Items in Addition to the Items for Low and Moderate Seismicity.

Diaphragms

(C) NC N/A U DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1. Tier 2: Sec. 5.6.1.1)

(C) NC N/A U ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. (Commentary: Sec. A.4.1.3. Tier 2: Sec. 5.6.1.1)

C NC (N/A) U DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Commentary: Sec. A.4.1.8. Tier 2: Sec. 5.6.1.5)

C NC (N/A) U STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)

(C) NC N/A U SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing. Wood commercial and industrial buildings may have rod-braced systems. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)

C NC (N/A) U DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)

(C) NC N/A U OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)

Connections

(C) NC N/A U WOOD SILL BOLTS: Sill bolts are spaced at 6 ft or less, with proper edge and end distance provided for wood and concrete. (Commentary: A.5.3.7. Tier 2: Sec. 5.7.3.3)

Project: Campbell Library Location: Campbell, CA

Completed by: GJT Date: 5/6/15

16.15LS LIFE SAFETY STRUCTURAL CHECKLIST FOR BUILDING TYPES RM1: REINFORCED MASONRY BEARING WALLS WITH FLEXIBLE DIAPHRAGMS AND RM2: REINFORCED MASONRY BEARING WALLS WITH STIFF DIAPHRAGMS

Low and Moderate Seismicity

Seismic-Force-Resisting System

(C) NC N/A U REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1. Tier 2: Sec. 5.5.1.1)

(C) NC N/A U SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than 70 lb/in.^{2}. (Commentary: Sec. A.3.2.4.1. Tier 2: Sec. 5.5.3.1.1)

(C) NC N/A U REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in., and all vertical bars extend to the top of the walls. (Commentary: Sec. A.3.2.4.2. Tier 2: Sec. 5.5.3.1.3)

Stiff Diaphragms

C NC (N/A) U TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab. (Commentary: Sec. A.4.5.1. Tier 2: Sec. 5.6.4)

Connections

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)

(C) NC N/A U WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers. (Commentary: Sec. A.5.1.2. Tier 2: Sec. 5.7.1.3)

(C) NC N/A U TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls. (Commentary: Sec. A.5.2.1. Tier 2: Sec. 5.7.2)

C NC (N/A) U TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements. (Commentary: Sec. A.5.2.3. Tier 2: Sec. 5.7.2)

(C) NC N/A U FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation. (Commentary: Sec. A.5.3.5. Tier 2: Sec. 5.7.3.4)

(C) NC N/A U GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Commentary: Sec. A.5.4.1. Tier 2: Sec. 5.7.4.1)

High Seismicity: Complete the Following Items in Addition to the Items for Low and Moderate Seismicity.

Stiff Diaphragms

C NC (N/A) U OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. (Commentary: Sec. A.4.1.4. Tier 2: Sec. 5.6.1.3)

C NC (N/A) U OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft long. (Commentary: Sec. A.4.1.6. Tier 2: Sec. 5.6.1.3)

Flexible Diaphragms

C (NC) N/A U CROSS TIES: There are continuous cross ties between diaphragm chords. (Commentary: Sec. A.4.1.2. Tier 2: Sec. 5.6.1.2)

C NC (N/A) U OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. (Commentary: Sec. A.4.1.4. Tier 2: Sec. 5.6.1.3)

C NC (N/A) U OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft long. (Commentary: Sec. A.4.1.6. Tier 2: Sec. 5.6.1.3)

C NC (N/A) U STRAIGHT SHEATHING: All straight sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Commentary: Sec. A.4.2.1. Tier 2: Sec. 5.6.2)

(C) NC N/A U SPANS: All wood diaphragms with spans greater than 24 ft consist of wood structural panels or diagonal sheathing. (Commentary: Sec. A.4.2.2. Tier 2: Sec. 5.6.2)

C NC (N/A) U DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft and aspect ratios less than or equal to 4-to-1. (Commentary: Sec. A.4.2.3. Tier 2: Sec. 5.6.2)

(C) NC N/A U OTHER DIAPHRAGMS: The diaphragm shall not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)

Connections

(C) NC N/A U STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. before engagement of the anchors. (Commentary: Sec. A.5.1.4. Tier 2: Sec. 5.7.1.2)