|  |
| --- |
|  Building Component Evaluation Report (CER)of theList Building Typeat Street Address, City, State Owner’s Property No. XXX-XXXX  |
| Insert color picture of the front elevation of the facility to the cover sheet of the reportInstructions to Engineer of Record (04/03/2019):Use this template in conjunction with the instructions included with the [*Building Component Evaluations and Status Lists*](https://office365lds.sharepoint.com/sites/MFD-Structural/). This template provides the option of using Risk Category I, II, III or IV, as defined by the current edition of the ASCE 7 and the IBC, but use Risk Category III for meetinghouses, seminaries, institutes and most Welfare Services buildings and processing plants. Some Welfare Services Buildings, such as Bishops’ Central Warehouses, require Risk Category IV be used. Verify with Owner’s Representative (Chris Barker/ Chris.Barker@ldschurch.org).This template replaces the use of *ASCE/SEI 31-03*, *ASCE/SEI 41-06* and *ASCE/SEI 41-13* with *ASCE/SEI 41-17*. Use this template for reports for all buildings. Submit reports to the Owner’s Representative and *MFD* (Chris.Barker@ldschurch.org) for review and to be archived in the *As-Built Catalog*. The information from the report will be incorporated into the [*Building Component Evaluations and Status Lists*](https://office365lds.sharepoint.com/sites/MFD-Structural/) and *FLS/FMAT*.At the conclusion of any structural retrofit, the Engineer of Record will be required to:* Add a page at the front of the structural as-built drawings which includes, in table format, structural retrofit measures from previous CERs, RTERs and SERs noting their status. Refer to the [*Building Component Evaluations and Status Lists*](https://office365lds.sharepoint.com/sites/MFD-Structural/) for a concept example. Submit as-built drawings to the Owner’s Representative and MFD (Chris.Barker@ldschurch.org) to be archived in the [*As-Built Catalog*](https://asbuilt.ldschurch.org/asbuilts/).
* Update the CER’s tables in Section 5 and Section 6, as applicable, and submit them to the Owner’s Representative and MFD (chris.barker@ldschurch.org) to be archived to the [*As-Built Catalog*](https://asbuilt.ldschurch.org/asbuilts/). The information from the updated tables will be incorporated into the [*Building Component Evaluations and Status Lists*](https://office365lds.sharepoint.com/sites/MFD-Structural/Shared%20Documents/Forms/AllItems.aspx)and *FLS/FMAT.*
 |
| FIRM LOGO | Prepared by Firm NameMonth, Day, Year | Engineers Stamp |

# Executive Summary

|  |
| --- |
| BUILDING DATA |
| Owner’s Property Number: | XXX-XXXX  | ASCE/SEI 41-17Building Type: | XXXXXX |
| Building Plan Type:  | XXXXXXXXXX | Year Constructed: | XXXX |
| Site Visit Date: | XXXXXXXXXX | Year(s) of Additions: | XXXX |
| Report Date: | XXXXXXXXXX | Total Building Area: | XX,XXX sq. ft. |
| Structural Engineer: | XXXXXXXXXX | Number of Stories: | X |
| Firm Job Number: | XXXXXXXXXX | Basement: | X  |
| Risk Category (as defined by the current edition of ASCE 7 and IBC): | XXXXXXXXXX |  |  |
| RETROFIT OPINION OF COST |
|  | **ROOF RETROFIT**  | **BALANCE** | **COMPLETE RETROFIT** |
| Structural: |  $ 0 |  $ 0 |  $ 0 |
| Non-Structural: |  $ 0 |  $ 0 |  $ 0 |
| Mechanical/electrical/comm: |  $ 0 |  $ 0 |  $ 0 |
| furnishings/contents: |  $ 0 |  $ 0 |  $ 0 |
|  |  |  |  |
| Total ConStruction Cost: | $ 0 | $ 0 | $ 0 |
|  |  |  |  |
| StructURAL design Fee: |  $ 0 |  $ 0 |  $ 0 |
| Geotechnical testing Fee: |  $ 0 |  $ 0 |  $ 0 |
| materials Testing Fee: |  $ 0 |  $ 0 |  $ 0 |
| STRUCTural OBHERvation fee: |  $ 0 |  $ 0 |  $ 0 |
| special Inspection fee: |  $ 0 |  $ 0 |  $ 0 |
|  |  |  |  |
| Total FEEs: | $ 0 | $ 0 | $ 0 |
|  |  |
| Structural Seismic System(s) CostS: | $ 0 | $ 0 | $ 0 |
| Structural Gravity System(s) costS (exclude Trusses): | $ 0 | $ 0 | $ 0 |
| Structural Trusses costS: | $ 0 | $ 0 | $ 0 |
| Non-Structural SEismic Costs: | $ 0 | $ 0 | $ 0 |

The above estimates do not include the cost for removal and replacement of roofing or other replacements and improvements costs

Table of Contents

Executive Summary 1

Table of Contents 2

1. Facility Data ?
2. Structure Description ?
3. Site Conditions ?
4. Evaluation and Retrofit Procedures ?
5. Findings ?
6. Recommendations ?
7. References ?

**Appendices**

Appendix A Photographs

Appendix B ASCE/SEI 41-17 Tier 1 Screening Analysis and Checklists

Appendix C ASCE/SEI 41-17 Tier 2 Structural Calculations

Appendix D Cost Estimate Details

Appendix E Testing Results

Appendix F Geotechnical Evaluation Report

1. Facility Data

Original Construction

1. Architectural Drawings: firm, date
2. Structural Drawings: firm, date

Additions

1. Architectural Drawings: firm, date
2. Structural Drawings: firm, date

Remodeling/Renovations

1. Architectural Drawings: firm, date
2. Structural Drawings: firm, date

Reports

1. Geotechnical: firm, report title, date
2. Building Component Evaluation Report (CER): firm, report title, date
3. Roof Truss Evaluation Report (RTER): firm, report title, date
4. Structural Evaluation Report (SER): firm, report title, date
5. Miscellaneous Reports firm, report title, date

2. Structure Description

Table 2-1

construction history

|  |  |
| --- | --- |
| Design Date | Description |
| XXXX | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |
| XXXX | XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX |

Table 2-2

Vertical Load-Resisting Elements
for the high roof sections

|  |  |
| --- | --- |
| Horizontal Elements | Source\* |
|  | Sheathing: | 5/8 “ plywood |  |
| Roof | Joists: | 2 x 8 @ 16” on center |  |
| Purlins: | None |  |
| Beams: | Curved glued-laminated |  |
| Girders: | None |  |
|  | Truss Type 1: | Carpenter built with split ring connectors |  |
|  | Truss Type 2: | Carpenter built with split ring connectors |  |
|  | Attic insulation: | Yes or no. If yes, provide brief description |  |
| Floors | Type: | 4” concrete slab on grade |  |
| Vertical Elements |  |
| Columns: | None  |  |
| Walls: | Partially grouted reinforced concrete 8” slump block i.e. bearing walls with 4” veneer |  |
| Column foundations: | None  |  |
| Wall foundations: | Concrete strip footings  |  |

\* D – Structural Drawing FO – Field Observations T - Testing

Comments:

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 2-3

Vertical Load-Resisting Elements
for the low roof section

|  |  |
| --- | --- |
| Horizontal Elements | Source\* |
| Roof | Sheathing: | 5/8” plywood |  |
|  | Joists: | 2 x 8 @ 16” on center |  |
|  | Purlins: | None |  |
|  | Beams: | None |  |
|  | Girders: | None |  |
|  | Truss Type 1: | None |  |
|  | Truss Type 2: | None |  |
|  | Attic insulation: | Yes or no. If yes, provide brief description |  |
| Floors | Type: | 4” concrete slab on grade |  |
| Vertical Elements |  |
| Columns: | None |  |
| Walls: | Partially grouted reinforced concrete 6” slump block bearing  |  |
| Column foundations: | None |  |
| Wall foundations: | Concrete strip footings  |  |

\* D – Structural Drawing FO – Field Observations T - Testing

Comments:

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 2-4

TRUSS TYPE 1

|  |  |
| --- | --- |
| **Truss location:** | Chapel |
| **Truss span (ft):** | 50 | **Ridge connection:** | Split ring |
| **Top chord:** | 2x6 | **Top chord/Web connection:** | Nails |
| **Bottom chord:** | 2x6 | **Bottom chord/Web connection:** | Nails |
| **Web members:** | 1x4 | **Bottom chord splice connection:** | Split ring |
|  | **Bottom/Top chord connection:** | Split ring |

Table 2-5

TRUSS TYPE 2

|  |  |
| --- | --- |
| **Truss location:** | Cultural hall |
| **Truss span (ft):** | 50 | **Ridge connection:** | Split ring |
| **Top chord:** | 2x6 | **Top chord/Web connection:** | Bolts |
| **Bottom chord:** | 2x6 | **Bottom chord/Web connection:** | Bolts |
| **Web members:** | 1x4 | **Bottom chord splice connection:** | Split ring |
|  | **Bottom/Top chord connection:** | Split ring |

Table 2-6

Lateral Load-Resisting Elements

|  |  |
| --- | --- |
| Horizontal Elements  | Source\* |
| Diaphragms: | 5/8” plywood sheathing acts as a flexible diaphragm |  |
| Vertical Elements |  |
| Shear walls: | Partially grouted reinforced concrete block walls |  |

\* D – Structural Drawing FO – Field Observations T - Testing

Comments:

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 2-7

SPIRE/STEEPLE Vertical and Lateral ELements

|  |  |
| --- | --- |
| Horizontal Elements  | Source\* |
| Diaphragms: | Connected to low roof diaphragm  |  |
| Vertical Elements |  |
| Column/Walls: | Rectangular CMU box column (6’ x 6’) |  |
| Foundation |  |
| Spread footing: | 12’ x 12’ x 18” |  |

\* D – Structural Drawing FO – Field Observations T - Testing

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Insert 8 ½” x 11” reduced copy of the original architectural floor plan(s) for each level and structural foundation and floor plan(s) as needed to clarify the evaluation. Adjust the titles for the figures accordingly.

Figure 2-1 – Architectural Floor Framing Plan(s)

Insert 8 ½” x 11” reduced copy of the original structural roof framing plan(s) and architectural roof plan(s) as needed to clarify the evaluation. Adjust the titles for the figures accordingly.

Figure 2-2 – Structural Roof Framing Plan(s)

3. Site Conditions

Table 3- 1

Soils information

|  |  |
| --- | --- |
| Description: | Unknown |
| Shear wave velocity: | Vs value - note how determined |
| Site class: | Site class - note how determined |
| Soil stability: | Expansive or collapsible |
| Reference: | XXXXXXXXXXXXXXX |

Comments:

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 3- 2

Seismicity

|  |  |
| --- | --- |
| Seismicity | MCER |
| Ground Motion Parameters1, 4 | 0.2 sec period: | Ss = X.XXg, SXS = X.XXg, SDS = X.XXg |
| 1.0 sec period: | S1 = X.XX g, SX1 = X.XXg, SD1 = X.XXg |
| Level of Seismicity1: | Very Low, Low, Moderate, High |
| Spectral Acceleration | BSE-1E: | X.XXg |
| BSE-2E: | X.XXg |
| Vulnerability2 | Fault rupture: | Yes or No |
| Slope failure: | Yes or No |
| Liquefaction: | Yes or No |
| Distance to Nearest Fault3: | X miles |

Comments and References:

If the Level of Seismicity is less than “High”, as defined by ASCE/SEI 41-17, the Owner does not require a seismic evaluation and will not proceed with a seismic retrofit (SDS is less than 0.500g and SD1 is less than 0.200g).

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 3- 3

Windstorm characterization

|  |  |
| --- | --- |
| Parameter | Description |
| Wind speed (mph)1: | XXX |
| Site exposure category: | B , C |
| Site exposure description: | B, terrain with buildings, forest or surface irregularities 20 feet or more in height covering at least 20% of the area, extending one mile or more from the siteC, terrain is flat and generally open, extending ½ mile or more from the site  |

References:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

**Table 3- 4**

Snow characterization

|  |  |
| --- | --- |
| Parameter | Description |
| **Ground snow load (psf):** | XX |
| **Roof snow load (psf):** | XX |
| **Snow drift locations:** | Locations are noted on the roof seismic retrofit plan |

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

4. Evaluation and Retrofit Procedures

The objective of this study is to determine if the existing building meets the Owner’s acceptance criteria for the given demands of gravity (dead, live and snow), wind and seismic loads.

If the acceptance criteria are not met, conceptual retrofit measures have been developed along with the associated costs for implementation.

**Gravity Load (Dead, Live, Snow and Snow Drift) Systems Evaluation and Procedures:**

* **Gravity Load (Dead, Live, Snow and Snow Drift) Systems Evaluation Procedure:**
	+ The gravity load (dead, live, snow and snow drift) systems evaluation for demand and acceptance criteria is in accordance with the current edition of ASCE 7 and the International Building Code.
		- The allowable wood values at the time of construction are used.
		- The evaluation includes a thorough visual screening (visual observation and engineering judgment) of the roof trusses, associated secondary framing, bracing, and support connections for deficiencies including failing/failed split ring truss connections and other identifiable roof framing deficiencies.
		- The evaluation also includes reviewing available roof truss as-built drawings and performing calculations of the split ring truss connection~~s~~ capacities and the gravity load carrying capacities of the roof trusses.
* **Gravity Load (Dead, Live, Snow and Snow Drift) Systems Retrofit Procedure:**
	+ If retrofit, the Owner requires the deficient members to comply with the full demand and capacity criteria of the current edition of ASCE 7 and the International Building Code.

**Wind Load Resisting Systems Evaluation and Retrofit Procedures:**

* **Wind Load Resisting Systems Evaluation Procedure**
	+ The wind load systems evaluation for demand and acceptance criteria is in accordance with the current edition of ASCE 7 and the International Building Code.
* **Wind Load Resisting Systems Retrofit Procedure**
	+ If retrofit, the Owner requires the deficient members to comply with the full demand and capacity criteria of the current edition of ASCE 7 and the International Building Code.

**Seismic Load Resisting Systems Evaluation and Retrofit Procedures:**

The Performance Objective is one or more pairings of a Seismic Hazard Level, as defined by ASCE/SEI 41-17, combined with a Desired Structural Performance Level. The evaluation and concept retrofit measures are per ASCE/SEI 41-17 for the Basic Performance Objective for Existing Buildings (BPOE)

* **Seismic Load Resisting System Evaluation Procedure:**
	+ ASCE/SEI 41-17 Tier 1 analysis with screening checklists have been completed and attached.
	+ ASCE/SEI 41-17 Tier 2 structural calculations have been completed and attached using the BPOE noted below:
* **Seismic Load Resisting System Retrofit Procedure:**
	+ ASCE/SEI 41-17 Tier 2 structural concept retrofit measureshave been provided using the BPOE noted below:

|  |
| --- |
| **BASIC PERFORMANCE OBJECTIVE FOR EXISTING BUILDINGS (BPOE)** |
| **Seismic Hazard Level for Evaluation and Retrofit** | **Minimum Desired Structural Performance Level** | **Acceptance Criteria** |
| BSE-1E | Risk Categories I and IINot Evaluated per ASCE/SEI 41-17(Life Safety Assumed)Risk Category IIINot Evaluated per ASCE/SEI 41-17(Damage Control Assumed)Risk Category IVImmediate Occupancy  | ASCE/SEI 41-17 |
| BSE-2E | Risk Categories I and IICollapse PreventionRisk Category IIILimited SafetyRisk Category IVLife Safety | ASCE/SEI 41-17 |

5. Findings

Notes to Engineer of Record for Tables 5-1 and 5-2:

* Provide different opinions of Likely Structural Performance Level for different areas of the building that would have different performance levels.
* Provide different Likely Structural Performance Levels for additions that would have different performance levels than that of the original building.
* If the Likely Structural Performance Level meets the criteria provided in “4. Evaluation and Retrofit Procedures/Seismic Load Resisting System Evaluation Procedures”, the building will not be retrofit.
* If the Level of Seismicity is less than “High”, the building will not be retrofit (SDS is less than 0.500g and SD1 is less than 0.200g).

Table 5- 1

OPINION OF SEISMIC PERFORMANCE WITHOUT RETROFIT PER

Seismic Load Resisting System evaluation for BSE-1E

|  |  |
| --- | --- |
| Item | Description |
| Opinion of Seismic Performance Level:Seismic Hazard Level: BSE 1E | Not Evaluated orImmediate Occupancy orDamage Control or Life Safety or Limited Safety orCollapse Prevention or Collapse Risk |
| Structural damage: | xxxxxxxxxxxxxxxxxxxxxxxxxxxxx |
| Non-structural damage: | xxxxxxxxxxxxxxxxxxxxxxxxxxxxx |
| **Likely post-earthquake inspection placard1:** | xxxxxxxxxxxxxxxxxxxxxxxxxxxxx |

1. As defined by ATC 20:
* “INSPECTED” (green placard) – Safe, but may need repairs.
* “RESTRICTED USE” (yellow placard) - Some restrictions, until repairs are made.
* “UNSAFE” (red placard) – Unsafe must be repaired or removed.

Table 5- 2

OPINION OF SEISMIC PERFORMANCE WITHOUT RETROFIT PER

Seismic Load Resisting System evaluation for BSE-2E

|  |  |
| --- | --- |
| Item | Description |
| Opinion of Seismic Performance level:Seismic Hazard Level: BSE-2E | Immediate Occupancy orDamage Control or Life Safety or Limited Safety orCollapse Prevention or Collapse Risk |
| Structural damage: | xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx |
| on-structural damage: | xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx |
| Likely post-earthquake inspection placard1: | xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx |

1. As defined by ATC 20:
* “INSPECTED” (green placard)– Safe, but may need repairs.
* “RESTRICTED USE” (yellow placard) - Some restrictions, until repairs are made.
* “UNSAFE” (red placard)– Unsafe, must be repaired or removed.

Table 5- 3

Structural Deficiencies

| No. | Item | **Description** | **Photo No.** | **Type\*** |
| --- | --- | --- | --- | --- |
| Gravity Load System Deficiencies per Drawings: |
|  | Truss Type 1: | Overstressed due to snow loads |  |  |
|  | Steeple support connection: | Inadequate connection |  |  |
|  | Overbuild framing: | Inadequate connection |  |  |
| Gravity Load System Deficiencies per Observation(s): |
|  | Split ring connections: | Slipping or do not satisfy calculations |  |  |
|  | Truss top chords: | Un-braced |  |  |
|  | Bolted connections: | Slipping, or do not satisfy calculations |  |  |
|  | Plywood gusset plates: | Insufficient nailing |  |  |
|  | Truss web members | Cut or missing |  |  |
|  | Truss top and bottom chords: | Wood splitting at the connections |  |  |
|  | Suspended ceiling support framing: | Support members not installed |  |  |
|  |
| Lateral Load System ~~D~~eficiencies per Drawings: |
|  | High roof diaphragm: | Without blocking, the high roof demands exceed capacities |  |  |
|  | Shear wall 1: | The CMU wall between the classroom and the offices is inadequate to act as a shear wall. |  |  |
|  | Shear wall 2: | The wall at the front of the classroom exceeds overturning criteria. |  |  |
| Lateral Load System Deficiencies per Observation(s): |
|  | High roof-to-wall connection: | No out-of-plane wall anchors exist nor does a load path exist to transfer diaphragm shear to the classroom or offices walls. |  |  |
|  | Entrance canopies: | Anchorage of canopies is inadequate. |  |  |
|  | Stairs: | URM is unacceptable in the stairways. |  |  |

\* G – Gravity EQ – Earthquake/Seismic W – Wind S - Snow

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

**Table 5- 4**

Structural deterioration

|  No. | Item | **Description** | **Photo No.** |
| --- | --- | --- | --- |
|  | Dry rot: | Evidence of dry rot exists in the soffit at the northwest corner of the south wing. |  |
|  | Mildew: | Evidence of mildew exists in the ceiling of the boiler room. |  |
|  | Termite: | Evidence of termite damage exists in the foundation next to the south stairway. |  |
|  | Settlement: | Approximately 1” of settlement was observed at the front entry. |  |
|  | Corrosion: | Corrosion was observed in rebar in the concrete column at the south end of the chapel. |  |

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 5- 5

NON-STRUCTURAL deficiencies

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Component | Description | Photo No. |
|  | Non-load bearing partitions: | CMU partitions are unanchored at the top. |  |
|  | Metal stud tracks: | Track fastening is inadequate. |  |
|  | Ceiling systems: | Gypsum board ceiling is sagging and pulling away from the furring attached to the bottom of the roof trusses. |  |
|  | Glazing: | Panes over 16 square feet in area, located up to a height of 10 feet above an exterior walking surface, should have safety glazing. Glazing located over 10 feet above an exterior walking surface should be laminated annealed or laminated heat-strengthened safety glass. |  |
|  | Masonry veneer: | Veneer anchorage is not indicated on the drawing and internal veneer exists in the chapel. |  |
|  | Parapets/Cornices: | URM parapets h/t >1.5 |  |
|  | Masonry chimneys: | URM chimney h/b > 2 |  |
|  | Cladding: | No evidence exists of brick veneer attachment to the CMU. |  |
|  | Suspended items: | Describe attachments to the structure |  |

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 5- 6

Mechanical / Electrical / Communications deficiencies

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Component | Description | Photo No. |
|  | Emergency power: | Control panel to generator is not braced. |  |
|  | HVAC: | XXXXXXXXX |  |
|  | Vibration isolators: | Snubbers are not provided on HVAC units on roof. |  |
|  | Furnace: | XXXXXXXXX |  |
|  | Water heater: | XXXXXXXXX |  |
|  | Boiler: | XXXXXXXXX |  |
|  | Piping:  | Fire suppression piping is not braced. |  |
|  | Natural gas seismic shut-off valve: | Owner requirement for buildings in Seismic Design Category D, E, or F |  |
|  | Ducts: | XXXXXXXXX |  |
|  | Transformers: | XXXXXXXXX |  |
|  | Switchgear: | XXXXXXXXX |  |
|  | Lighting fixtures: | XXXXXXXXX |  |
|  | Satellite dish: | XXXXXXXXX |  |
|  | Sound system: | XXXXXXXXX |  |

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 5- 7

furnishingS/contents deficiencies

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Item | Description | Photo No. |
| FC-1 | Bookcases: | Bookcase in materials center is 6 ft high and not anchored. |  |
| FC-2 | Filing cabinets: | Filing cabinet (4 drawers) in materials center is not anchored. |  |
| FC-3 | Computers: | Desktop computers in offices are not anchored. |  |
| FC-4 | Family History equipment: | Desktop copier is not anchored. |  |
| FC-5 | Toxic substances: | Glass bottles of toxic chemicals are stored in open shelves. |  |

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

6. Recommendations

Notes to Engineer of Record for Table 6-1:

* The items listed are to correspond numerically to those in Table 5-3.
* For the Lateral Load Systems Structural Retrofit Measures:
	+ If the Likely Structural Performance Level in Section 5 meets the criteria provided in Section 4, the building will not be retrofit.
	+ If the Level of Seismicity is less than “High”, the building will not be retrofit (SDS is less than 0.500g and SD1 is less than 0.200g).
* Update the Tables in Section 5 and Section 6, as applicable, when structural retrofits are performed.

Table 6- 1

Structural Retrofit measures (ConCEPTUAL)

| No. | Items and Comments | Retrofit R or B1 | Plan No. | Sketch No. | Recommended Retrofit Year/Timing | Actual Retrofit Date  |
| --- | --- | --- | --- | --- | --- | --- |
| **Gravity Load Systems Concept Structural Retrofit Measures:** |
| S-1 | Split ring connection | R | 6-2 | SK-? | Next reroof |  |
| S-8 | Truss web members | R | 6-2 | SK-? | 2019 |  |
|  |
| **Lateral Load Systems Concept Structural Retrofit Measures**: |
| S-11 | Diaphragm blocking | R | 6-2 | SK-? | Next reroof |  |
| S-12S-13 | Wall strengthening | B | 6-1 | SK-? | Next R&I project that affects the walls |  |
| S-12S-13 | Wall and footing strengthening | R | 6-1 | SK-? | Next R&I project that affects the walls |  |
| S-14 | Out-of-plane wall anchors | R | 6-2 | SK-? | 2019 |  |
| S-? | Describe item | R | 6-2 | SK-? | Provide timing for work |  |
| D-1 | Describe item | B | 6-2 | SK-? | Provide timing for work |  |
| D-2 | Describe item | B | 6-2 | SK-? | Provide timing for work |  |
| D-3 | Describe item | B | 6-1 | SK-? | Provide timing for work |  |
| D-4 | Describe item | B | 6-1 | SK-? | Provide timing for work |  |
| D-5 | Describe item | B | 6-1 | SK-? | Provide timing for work |  |

R – Roof - indicates a retrofit item that should occur during a scheduled re-roof project
B – Balance - indicates a retrofit item that should occur during a scheduled exterior or interior R&I project

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 6- 2

NON-Structural Retrofit measures

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | Item | RetrofitR or B2 | Plan No. | Sketch No. | Recommended Retrofit Year/Timing | Actual Retrofit Date |
| NS-1 | Brace top of partitions | B | 6-1 | SK-21 | Next reroof |  |
| NS-2 | Fasten tracks | B | 6-1 | SK-22 | 2015 |  |
| NS-3 | Brace ceiling systems | B | 6-1 | SK-23 | 2015 |  |
| NS-4 | Replace glazing | B | 6-1 | SK-24 | 2015 |  |
| NS-5 | Describe retrofit | B | 6-1 | SK-25 | Provide timing for work |  |
| NS-6 | Describe retrofit | R | 6-2 | SK-26 | Provide timing for work |  |
| NS-7 | Describe retrofit | R | 6-2 | SK-27 | Provide timing for work |  |
| NS-8 | Describe retrofit | B | 6-1 | SK-28 | Provide timing for work |  |
| NS-9 | Describe retrofit | B | 6-1 | SK-29 | Provide timing for work |  |

R – Roof - indicates a retrofit item that should occur during a scheduled re-roof project
B – Balance - indicates a retrofit item that can be installed independent of a scheduled re-roof project

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 6- 3

mechanical/electrical/communications Retrofit measures

| No. | Item | RetrofitR or B3 | Plan No. | Sketch No. | Recommended Retrofit Year/Timing | Actual Retrofit Date |
| --- | --- | --- | --- | --- | --- | --- |
| M-1 | Brace control panel | B | 6-1 | SK-30 | 2015 |  |
| M-2 | Describe retrofit | B | 6-1 | SK-31 | Provide timing for work |  |
| M-3 | Provide snubbers | R | 6-2 | SK-32 | 2015 |  |
| M-4 | Describe retrofit | B | 6-1 | SK-33 | Provide timing for work |  |
| M-5 | Describe retrofit | B | 6-1 | SK-34 | Provide timing for work |  |
| M-6 | Describe retrofit | B | 6-1 | SK-35 | Provide timing for work |  |
| M-7 | Brace fire suppression piping | B | 6-1 | SK-36 | 2015 |  |
| M-8 | Provide natural gas seismic shut-off valve | B | 6-1 | SK-37 | 2015 |  |
| M-9 | Describe retrofit | B | 6-1 | SK-38 | Provide timing for work |  |
| E-1 | Describe retrofit | B | 6-1 | SK-39 | Provide timing for work |  |
| E-2 | Describe retrofit | B | 6-1 | SK-40 | Provide timing for work |  |
| E-3 | Describe retrofit | B | 6-1 | SK-41 | Provide timing for work |  |
| C-1 | Describe retrofit | B | 6-1 | SK-42 | Provide timing for work |  |
| C-2 | Describe retrofit | B | 6-1 | SK-43 | Provide timing for work |  |

R – Roof - indicates a retrofit item that should occur during a scheduled re-roof project
B – Balance - indicates a retrofit item that can be installed independent of a scheduled re-roof project

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 6- 4

furnishings/contents Retrofit measures

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | Item | RetrofitR or B4 | Plan No. | Sketch No. | Recommended Retrofit Year/Timing | Actual Retrofit Date |
| FC-1 | Anchor bookcase to wall | B | 6-1 | SK-44 | 2015 |  |
| FC-2 | Anchor file cabinet to wall | B | 6-1 | SK-45 | 2015 |  |
| FC-3 | Velcro computers to desk | B | 6-1 | SK-46 | 2015 |  |
| FC-4 | Velcro copier to desk | B | 6-1 | SK-47 | 2015 |  |
| FC-5 | Toxic chemicals should be stored in unbreakable containers and restrained in a lockable cabinet Provide any needed recommendations for toxic chemicals. | B | 6-1 | SK-48 | 2015 |  |

R – Roof - indicates a retrofit item that should occur during a scheduled re-roof project
B – Balance - indicates a retrofit item that can be installed independent of a scheduled re-roof project

Comments:

1. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Table 6- 5

Recommended DESIGN and construction phases activities1

|  |  |
| --- | --- |
| Phase | Activity |
|
| Design | Geotechnical review to quantify potential differential displacement or lateral spreading due to liquefaction in MCE seismic event |
| Design | Architectural treatment of new ceilings and walls  |
| Design | Mechanical engineer to reroute ducting due to interference of new shear wall |
| Construction | Confirm roof diaphragm nailing and truss to wall connections |

Activities recommended in addition to structural services to develop designs for retrofit items identified in Tables 6-1 thru 6-4.

Insert an 8 ½” x 11” annotated plan view - reduced photocopy of original plan(s) or photocopy of tracing of drawing(s).

Note the Retrofit No. and reference the Sketch No. on the plan(s).

Figure 6-1 – Floor Plan(s) – Recommended Retrofits

Insert an 8 ½” x 11” annotated plan view - reduced photocopy of original plan(s) or photocopy of tracing of drawing(s).

Note the Retrofit No. and reference the Sketch No. on the plan(s).

Figure 6-2 – Roof Plan(s) – Recommended Retrofits

Insert hand sketch here identifying conceptual Retrofit detail.

Sketch SK-1 – XXXXXXXXXX

Insert hand sketch here identifying conceptual Retrofit detail.

Sketch SK-2 – XXXXXXXXXX

1. References
2. Codes and Standards
3. American Society of Civil Engineers, Seismic Rehabilitation of Existing Buildings, ASCE/SEI 41-17.
4. Current *International Building Code (IBC)*.
5. Current *ASCE 7 Standard*.
6. Geotechnical Information
7. XXXXXXXXXXXXXXXXXXX
8. XXXXXXXXXXXXXXXXXXX
9. XXXXXXXXXXXXXXXXXXX
10. Test Reports
11. firm, report title, date
12. firm, report title, date

Appendices

**Appendix A - Photographs**

**Appendix B - ASCE/SEI 41-17 Tier 1 Screening Analysis and Checklists**

**Appendix C - ASCE/SEI 41-17 Tier 2 Structural Calculations**

**Appendix D - Cost Estimate Details**

**Appendix E - Testing and Inspection Results**

**Appendix F - Geotechnical Evaluation Report**

**Appendix A – Photographs**

* This appendix should include a photograph of each deficiencynoted in this report. Provide descriptive titles for the photographs with numbering matching the numbering in Tables 5.
* In addition, the following minimum photographs of the property should be included:
	+ Google Earth photograph of the property
	+ One (1) photograph of each of the four major elevations of the building

Insert photograph here. Add short description and identifying Deficiency No.

Photograph 1 - XXXXXXXXXX

Insert photograph here. Add short description and identifying Deficiency No.

Photograph 2 – XXXXXXXXXX

**Appendix B - ASCE/SEI 41-17 Tier 1 Screening Analysis and Checklists**

* This appendix is for Tier 1 screening analysis and checklists that are performed support the findings and recommendations in this report.

**Appendix C – ASEC/SEI 41-17 Tier 2 Structural Calculations**

* This appendix is for ASCE/SEI 41-17 Tier 2 structural calculations that are performed to support the findings and recommendations in this report.

**Appendix D – Opinion of Cost**

* This appendix is for the detailed opinion of cost that is prepared for this report.
* The opinion of cost line items should be referenced to the retrofit numbers in the report.
* The opinion of cost is intended to be a conceptual cost estimated based on the structural engineer’s judgment, experience with similar projects, and/or the assistance of an architect, general contractor, cost estimator, or other available technical resource.

**Appendix E – Testing Results**

* This appendix is for the testing and inspection results/report that are performed as a part of the evaluation of this facility.
* Testing and inspection should follow ASCE 41-17 requirements as appropriate.
* The engineer should use good judgment when the testing requirements appear to be unnecessary and then explain the reason for not performing them in this section.

**Appendix F – Geotechnical Evaluation Report**

* This appendix should include the geotechnical evaluation report, if applicable, that is prepared as a part of the evaluation of this facility.