SEISMIC EVALUATION REPORT

Tillamook Volunteer Fire District

Seismic Assessment for Fire Station 71
2310 4th St.
Tillamook, OR 97141

Prepared for:
Daron Bement
Fire Chief

December 16,2022
22057.00

Prepared By:
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Project Summary Information						
Building Part	*Building Part Name*	*Included in Retrofit*	*Year Built*	*Building Type**	*Nonstructural Retrofits included in Scope Y/N**	*Previous Seismic Retrofit Y/N* (year if Y)*
A	Main Station	Yes	1982	W2	Yes	No
*Entries required **ONLY** for building parts included in proposed seismic retrofit. If building part was previously or is currently being retrofitted, please list the building part's Risk Category and retrofit design Performance Objective, if known.						
Nonstructural deficiencies posing life safety risk **MUST** be included in the scope of work and budget.						
Seismic fragility inputs for existing buildings with **previous seismic retrofits MUST** be adjusted to reflect previous seismic retrofit measures completed for at building part.						
Total Retrofit Cost	$2,499,994					
Retrofit Square Feet	9,750 SF					
Retrofit Cost Per Square Feet	$256.40					**Yes or No?**
Is the campus within a tsunami**, FEMA flood zone, landslide/slope instability, liquefaction potential or other high hazard area? **If so, provide documentation (e.g., the Oregon Statewide Hazards Viewer by DOGAMI).** ** Projects within the code defined Tsunami Design Zone require consultation with DOGAMI prior to application submittal. Applicant shall include such documentation with the application.						**Yes** See Section 6

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East Elevation

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Board Room

Seismic Evaluation Snapshot	
Evaluation Standard	ASCE 41-17 (Tier 1 Analysis)
Performance Objective	Immediate Occupancy Risk Category IV
ASCE 41 Building Type	W2
Building Location	Tillamook, OR
Site Soil Classification	Class D
Seismic Hazard	BSE-2E / BSE-1E (5% in 50 years, 975-year return / 20% in 50 years, 225-year return)
FEMA 154 RVS Seismicity Zone	High
ASCE 41-17 Level of Seismicity	High
Current Post-Earthquake Minimum Recovery Time	9+ Months
Construction Cost Estimate	$2,499,994
Building Replacement Value Estimate	$8,775,000
Overall Structural Condition	Likely will not perform to **Immediate Occupancy** standards after a major seismic event.

1. Project Background

The goal of this evaluation of the Tillamook Volunteer Fire District Station 71 (Station 71) is to determine the expected performance during a design basis earthquake. The purpose of our seismic evaluation is to identify the structural and nonstructural deficiencies that exist at Station 71. The evaluation will then be used as the basis for developing a suitable strengthening scheme for the structural system. In addition, the evaluation will assist us in identifying the nonstructural components requiring seismic hardening (i.e., anchorage and/or bracing).

There is an adjacent building on the same block as Station 71. This building is not part of the fire district; therefore, it is not included in this report.

Our work is based on the following:

1. A review of available construction documents for the original building prepared by Harry Newton & Associates Architects and Planners AIA, dated 1979.

2. A site visit by Brian Knight, PE, SE, of WRK Engineers on June 15, 2022, to verify the as-built conditions of the building's structural and nonstructural systems.

2. Candidate Qualifications

Oregon Administrative Rule (OAR) 123-051-0300 provides the requirements for applicants to be eligible for a Seismic Rehabilitation Grant. Per these requirements, the building must be a fire station, police station, sheriff's office, or other facility used by state, county, district, or municipal law enforcement agencies. Station 71 is operated by the Tillamook Volunteer Fire District and meets the requirements of OAR 123-051-0300 and is therefore an eligible candidate for the Seismic Rehabilitation Grant Program.

We believe Station 71 is a good candidate for seismic strengthening based on the criteria highlighted in **Table 1**.

TABLE 1 – Candidate Summary	
Criteria	**Response**
Is the building in good condition?	Yes
Is the building a functional part of the community?	Yes
Is the building part of the community's emergency response (RC IV)?	Yes
Is the cost of a rehabilitation low relative to a new building cost?	Yes
Is the building located within a site that has low flood or landslide hazards?	Yes
Is the seismic rehabilitation cost less than the allowable grant maximum?	Yes
Is the building in an area of high seismicity?	Yes
Does the building have vertical or horizontal irregularities?	Yes

3. Evaluation Criteria and Methodology

For our evaluation of the Station 71, we used ASCE Standard 41-17, "Seismic Evaluation and Retrofit of Existing Buildings" published by the American Society of Civil Engineers (ASCE). ASCE 41 is the nationally recognized Standard for seismic assessment and evaluation of existing buildings. The goal of ASCE 41 is to identify the "weak links" in a building's lateral force resisting system that can lead to significant failure and/or collapse. In addition, ASCE 41 will identify typical nonstructural hazards that may pose a life-safety risk to occupants or a business interruption (i.e., operations) risk to the building.

The methodology utilizes a series of checklists that address possible seismic hazards. Checklists are included in the Standard for all the major structural systems, nonstructural elements, and geologic and site hazards. The evaluating engineer addresses each statement and determines whether it is compliant or noncompliant. Compliant statements identify conditions that are acceptable. Noncompliant statements identify conditions that need further investigation. In some cases, the Standard specifies additional calculations that may be performed to address a noncompliant statement. In other cases, a detailed analysis of the building must be performed.

ASCE 41-17 provides Performance Objectives based on a building's Risk Category which are to be used for the evaluation and retrofit of existing buildings. For our evaluation, we have used the Basic Performance Objective for Existing Buildings (BPOE) for Risk Category IV structures. For this performance objective, the building is evaluated to the Life Safety (LS) structural performance level and Hazards Reduced nonstructural performance level for the BSE-2E seismic hazard and to the Immediate Occupancy (IO) structural performance level and Position Retention (PR) nonstructural performance level for the BSE-1E seismic hazard.

The intent of the IO Structural Performance Level for BSE-1E is:

> *After a design earthquake, the basic vertical and lateral force resisting systems retain nearly all of their pre-earthquake strength, and very limited damage to both structural and nonstructural components is anticipated during the design earthquake which require some minor repairs, but the critical parts of the building are habitable.*

The intent of the LS Structural Performance Level for BSE-2E is:

> *After the earthquake, the structure has damaged components but there is some margin against either partial or total structural collapse that remains. The damaged structure is not an imminent collapse risk although some structural elements are severely damaged. The building will retain at least some of its strength against collapse and should prevent loss of human life. However, there may be injuries and the building could potentially be damaged beyond the point of economical repair.*

The intent of the PR Nonstructural Performance Level for BSE-1E is:

> *After a design earthquake, the nonstructural components might be damaged to the extent that they cannot immediately function but are secured in place so that damages caused by falling, toppling, or breaking of utility connection is avoided. Building access and Life Safety Systems, including doors, stairways, elevators, emergency lighting, fire alarms, and fire suppression systems, generally remain available and operable, provided that power and utility services are available.*

The intent of the HR Nonstructural Performance Level for BSE-2E is:

> *After a design earthquake, the nonstructural components are damaged and could potentially create falling hazards, but high hazard nonstructural components as defined in Chapter 13 of ASCE 7-16, are secured to prevent falling into areas of public assembly or those falling hazards from those components could pose a risk to life safety for many people. Preservation of Egress, protection of fire suppression systems, and similar life safety issues are not addressed.*

In other words, the IO Structural Performance Level and PR Nonstructural Performance Level are meant to ensure that a building will continue to remain in operation immediately following a major earthquake. The LS Structural Peformance Level and HR Nonstructural Peformance Level permit structural damage but ensure the structural integrity of a building after a major earthquake and that occupants are able to evacuate safely. **Figure 1** graphically shows the performance level differences.

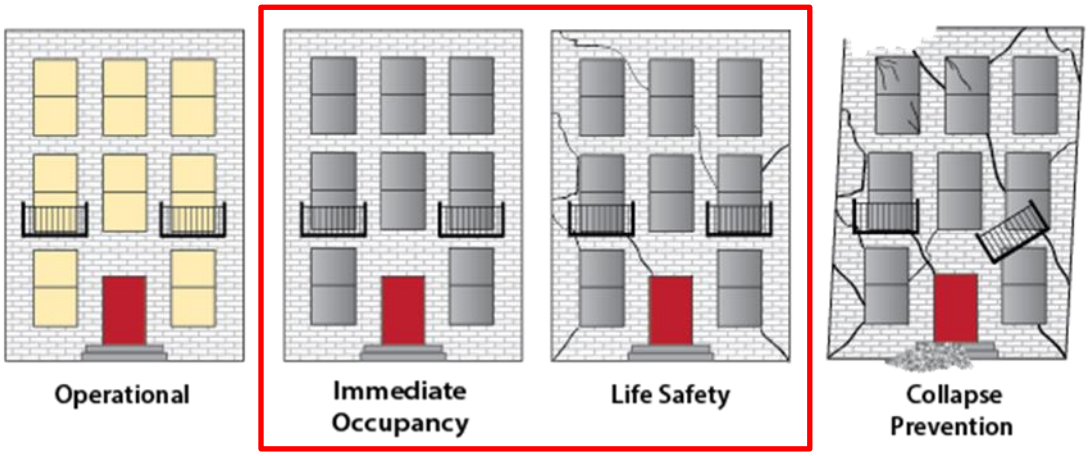

Figure 1: Structural Performance Level

4. Building Description

Station 71 is a two-story, wood-frame building originally constructed circa 1980. The building is irregular in plan, with a large single-story apparatus bay adjoining a two-story structure of offices, meeting rooms, and housing spaces. The two-story component is trapezoidal in plan, measuring approximately 40 feet by 68 feet, with a maximum roof height of approximately 22 feet. A 33-foot-tall hose tower adjoins this component to the north and measures approximately 8 feet by 12 feet in plan. The main apparatus bay shares its west wall with the two-story component and is 52.5 feet by 78 feet in plan, with 17.5 feet by 36 feet additional garage off the east side. The maximum roof height for the apparatus bay and garage is approximately 18 feet. See **Figure 2** for a Building Part Map and **Appendix A** for photos of the building.

The roof system has two main levels, with a smaller sloped section of roof over the entrance to the offices and meeting rooms at the southwest corner of the structure. Both the high and low roof systems consist of built-up roofing over plywood sheathing supported by engineered wood I-joists. The joists are supported by wood stud-bearing walls. The second floor consists of plywood sheathing over engineered wood I-joists bearing on wood stud walls. The roof and floor systems are supported at foundation level with conventional shallow concrete footings.

The lateral system consists of 2-sided gypsum shear walls, with fiber cement lap siding on the exterior walls. The roof and floor diaphragms are considered flexible relative to the walls that support them. The lateral loads from the roof and floor diaphragms are transferred to the gypsum shear walls and then to the soil through the concrete footings.

After reviewing the drawings and as-built condition, the lateral force resisting system and the ASCE 41 building type are classified as **W2: Wood Frames, Commercial and Industrial.** ASCE 41 defines this building type as:

W2: *These buildings are commercial or industrial buildings with a floor area of 5,000 ft² (465 m²) or more. There are few, if any, interior walls. The floor and roof framing consists of wood or steel trusses, glulam or steel beams, and wood posts or steel columns. The foundation system is permitted to consist of a variety of elements. Seismic forces are resisted by flexible diaphragms and exterior walls sheathed with plywood, oriented strand board, stucco, plaster, or straight or diagonal wood sheathing, or they are permitted to be braced with various forms of bracing. Wall openings for storefronts and garages, where present, are framed by post-and-beam framing.*

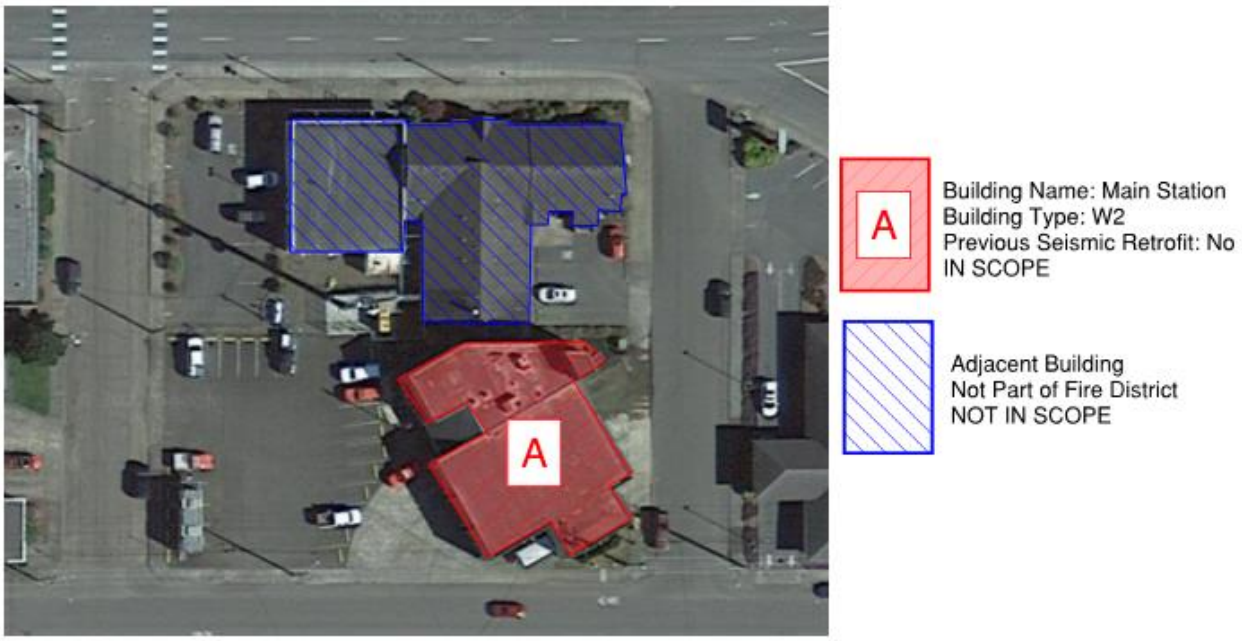

Figure 2: Building Part Map

5. Existing Material Test Results

An onsite investigation was performed solely to verify the as-built conditions. No materials testing was performed as part of our evaluation.

6. Site Description and Seismicity

The level of seismicity of the site is based on the BSE-2N event based in section 2.5 of ASCE 41-17. Using maps developed by the United States Geologic Survey (USGS), the short period spectral acceleration, S_S, is 1.219g and the long period spectral acceleration, S_1, is 0.634g. The building is founded on stiff soil of varying depths. As a result, the site soil classification is Class D. Amplification factors used to account for the soil conditions at the site are F_V = 1.7 and F_A = 1.2. Based on ASCE 41-17 Table 2-4, the building is located at a high seismicity area.

TABLE 2 - Site Specific Seismicity (BSE-2N)	
Soil Density	Stiff
ASCE 7-16 Soil Classification	D
Short Period Spectral Acceleration (S_S)	1.219
Long Period Spectral Acceleration (S_1)	0.634
Soil Condition Amplification Factors (F_V / F_A)	1.7 / 1.2
FEMA 154 RVS Seismicity Zone	High
ASCE 41-17 Level of Seismicity	High
Earthquake-Induced Liquefaction Settlement	High

The ground motions used for the ASCE 41 evaluation are based on the BSE-2E event. The long period spectral response acceleration parameter, S_{X1}, is .779g and the short period spectral acceleration parameter, S_{XS}, is .982g.

Using the ASCE 41-17 checklists, the geologic hazards that were assessed as part of this engineering evaluation include liquefaction, slope failure, and surface fault rupture potential. Using the DOGAMI Oregon HazVu website, these potential hazards were evaluated. The plot from Statewide Geohazards Viewer can be seen in **Appendix F**.

The site is identified as a high liquefaction potential location and deep foundations (i.e., piles) will be used to mitigate this hazard.

7. Building Deficiencies & Recommended Strengthening Measures

Using the procedures of ASCE 41, we have identified several deficiencies in the lateral force resisting system.

The ASCE 41 Tier 1 checklists used to identify structural and nonstructural deficiencies are attached as **Appendix E**.

Based on the identified deficiencies and building condition, we have developed a conceptual strengthening scheme (**Appendix B**) for Station 71.

7.1 Structural Deficiencies & Strengthening Measures

Numerous structural deficiencies have been identified at Station 71. All structural deficiencies and the strengthening measures are summarized in **Table 3**.

TABLE 3 – STRUCTURAL Deficiencies & Strengthening Measures Immediate Occupancy Performance Level			
Item Number	**Component Type**	**Deficiency**	**Strengthening Measure**
S1	Load Path	The structure does not contain a complete, well-defined load path with structural elements and connections that serve to transfer inertial forces associated with mass of elements to the building foundation.	Provide proper attachment of the shear walls to the roof diaphragm for transfer of in-plane and out-of-plane loading.
S2	Vertical Irregularities	Vertical elements in the seismic-force-resisting system are not all continuous to the foundation.	Provide plywood shear walls continuous between roof diaphragm and foundation.
S3	Liquefaction	DOGAMI Oregon HazVu has identified the site as susceptible to liquefaction.	Install micropiles at footings and grade beams to limit differential settlement.
S4	Shear Stress Check	The shear stress in the shear walls is more than the following values: Structural panel sheathing - 1,000 lb./ft.; Diagonal sheathing - 700 lb./ft.; Straight sheathing and all other conditions - 100 lb./ft.	Install plywood at existing shear walls. Add new hold-downs, blocking and connection to foundation.
S5	Gypsum Wallboard or Plaster Shear Walls	Shear walls are panelized with gypsum boards.	Install plywood at existing shear walls. Add new hold-downs, blocking and connection to foundation.
S6	Narrow Wood Shear Walls	Narrow wood shear walls with an aspect ratio greater than 2-to-1 are used to resist seismic forces.	Add new lateral force resisting system at narrow wood shear walls.
S7	Walls Connected Through Floors	Shear walls don't have an interconnection between stories to transfer overturning and shear forces through the floor.	Add interconnection between stories at shear walls to transfer shear wall forces through the floor.
S8	Openings	Walls with openings greater than 80% of the length are not braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are not supported by adjacent construction through positive ties capable of transferring the seismic forces.	Add new lateral force resisting system to brace walls with openings greater than 80% of their length.

TABLE 3 – STRUCTURAL Deficiencies & Strengthening Measures continued			
Item Number	**Component Type**	**Deficiency**	**Strengthening Measure**
S9	Hold-down Anchors	Shear walls do not have hold-down anchors attached to end studs.	Install hold-downs at shear walls where they are needed to resist uplift for overturning seismic loads.
S10	Wood Posts	There is not a positive connection of wood posts to the foundation.	Add positive connection between post and foundation.
S11	Narrow Wood Shear Walls	Narrow wood shear walls with an aspect ratio greater than 1.5-to-1 are used to resist seismic forces.	Add new lateral force resisting system at narrow wood shear walls.
S12	Roof Chord Continuity	All chord elements are not continuous, regardless of changes in roof elevation.	Add straps and blocking to reinforce roof chords.

7.2 Nonstructural Deficiencies & Strengthening Measures

A nonstructural seismic evaluation for Station 71 was conducted for the Position Retention Nonstructural Performance Level. **Table 4** summarizes the deficiencies and the strengthening measures required for the various nonstructural systems found in the building.

TABLE 4 – NONSTRUCTURAL Deficiencies & Strengthening Measures Position Retention Performance Level			
Item Number	**Component Type**	**Deficiency**	**Strengthening Measure**
N1	Hazardous Material Equipment	Equipment mounted on vibration isolators and containing hazardous material is not equipped with restraints or snubbers.	Add restraints or snubbers.
N2	Edge Clearance	Free edges of integrated suspended ceilings do not have enough clearance.	Reconfigure to provide adequate edge clearance.
N3	Edge Support	Free edges of integrated suspended ceilings are not supported.	Replace existing closure angle with required angle to provide edge support.

TABLE 4 – NONSTRUCTURAL Deficiencies & Strengthening Measures continued			
Item Number	**Component Type**	**Deficiency**	**Strengthening Measure**
N4	Seismic Joints	Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is more than 2,500ft^2 (232.3m^2) and has a ratio of long-to-short of more than 4-to-1	Add seperation joints to suspended ceilings in hallways to enforce ratio of long-to-short of less than 4-to-1.
N5	Stair Details	The connection between the stairs and the structure does rely on post-installed anchors in concrete or masonry, and the stair details are capable of accommodating the drift calculated using the Quick Check procedure for moment-frame structures or 0.5 in. for all other structures without including any lateral stiffness contribution from the stairs.	Reinforce connection between stairs and structure to accommodate drift.
N6	Tall Narrow Contents	Contents more than 6 ft. high with a height-to-depth ratio greater than 3-to-1 are not anchored to the structure or to each other.	Brace and/or anchor all contents more than 6 ft. high to the structure or to each other.
N7	Fall-Prone Contents	Content weighing more than 20 lb. whose center of mass is more than 4 ft. above the adjacent floor level are not braced or otherwise restrained.	Brace all equipment, stored items, or other contents weighing more than 20 lb. whose center of mass is more than 4 ft. above the adjacent floor level.
N8	Suspended Contents	Items suspended without lateral bracing are not free to swing or move with the structure without damaging themselves or adjoining components.	Provide lateral bracing at suspended content.
N9	Tall Narrow Equipment	Equipment more than 6 ft. high with a height-to-depth or height-to-weight ratio greater than 3-to-1 is not anchored to the floor slab or adjacent structural walls.	Cabinets and Lockers more than 6 ft high or with a height-to-depth ratio exceeding 3:1 are to be anchored to ground.
N10	Suspended Equipment	Equipment suspended without lateral bracing is not free to swing from or move with the structure from which it is suspended without damaging itself or adjoining components.	Provide lateral bracing for suspended equipment.

TABLE 4 – NONSTRUCTURAL Deficiencies & Strengthening Measures continued			
Item Number	**Component Type**	**Deficiency**	**Strengthening Measure**
N11	Vibration Isolators	Equipment mounted on vibration isolators is not equipped with horizontal restraints or snubbers nor with vertical restraints to resist overturning.	Provide horizontal and vertical restraints to resist lateral displacement and overturning.
N12	Heavy Equipment	Floor-supported equipment weighing more than 400 lb. is not anchored to the structure.	Provide adequate anchorage to equipment weighing more than 400 lb.
N13	Duct Bracing	Rectangular ductwork larger than 6 ft^2 in cross-sectional area are not adequately braced for seismic loading.	Provide lateral bracing at rectangular duct work.

The strengthening measures are recommendations intended to provide a general discussion of the potential strengthening/hardening measures likely needed for this building. However, they are conceptual and do not constitute a final engineered solution.

8. Construction Cost Estimate

An engineer's opinion of probable cost has been prepared based on the developed seismic strengthening scheme (**Appendix B**) and is attached as **Appendix C**. The cost estimate addresses all seismic strengthening required. The cost estimate includes construction costs, contingencies and necessary soft costs required to complete the scope of work. A summary of the cost estimate is provided in **Table 5**.

TABLE 5 – Cost Estimate Summary	
Construction Category	**Cost Estimate**
Structural	$1,100,162
Nonstructural	$36,000
Demolition	$197,903
Engineering and CM	$351,497
Margins and Adjustments	$814,432
Total	**$2,499,994**
Total Area	9,750 Square Feet
$/Square Feet	$256.40

The cost estimate included in this report has been reviewed by the design engineer responsible for the evaluation and seismic strengthening schemes of Station 71 and has determined the estimate is accurate.

9. Benefit Cost Analysis

The benefit cost analysis (BCA) is performed using the BCA spreadsheet provided by the Oregon Business Development Department-Infrastructure Finance Authority (OBDD-IFA) as required by the SRGP (Seismic Rehabilitation Grant Program). The BCA tool considers the net present value of costs associated with damage to the building and its contents, displacements costs, loss of functionality costs, and casualties. Default building data and fragility curve information is provided in the BCA tool.

The BCA score for this project is **0.521.**

Although the Station 71 received a BCA score less than 1.0, we believe it is still a strong candidate for seismic strengthening and should be considered for grant funding. The BCA analysis performed using the OBDD-IFA BCA spreadsheet tool does not accurately capture the cost to the building if it is out-of-service after a major seismic event and its importance to the community. The grant application outlines the additional benefits and the potential costs to the community if the building is excessively damaged and not ready for re-occupancy after a major seismic event.

10. Rapid Visual Screening

The Department of Geology and Mineral Industries (DOGAMI) completed many Rapid Visual Screening (RVS) assessments for public facilities throughout Oregon. However, for the purpose of this report, a new RVS report was created to align with this seismic evaluation. Attached in **Appendix F** is the RVS report created using the FEMA P-154 Data Collection Form for the Station 71.

11. Limitations

The opinions and recommendations presented in this report were developed with the care commonly used as the state of practice of the profession. No other warranties are included, either expressed or implied, as to the professional advice included in this report. This report has been prepared for Tillamook Volunteer Fire District and is used solely in its evaluation of the seismic safety of the building included herein. This report has not been prepared for use by other parties and may not contain sufficient information for the purposes of other parties or uses. If you have any comments or questions regarding this evaluation, please contact us.

12. Certification Statement

WRK Engineers has reviewed Station 71, noted the deficiencies in the Tier 1 checklists, developed seismic retrofit solutions to rectify the deficiencies and the cost estimate. The design engineer certifies the retrofit scope of work includes strengthening measures of all the structural and nonstructural deficiencies identified in the report and all items required to perform the work. The design engineer certifies the cost estimate includes all the retrofit's scope of work elements.

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Brian Knight, PE, SE

Appendix A

BUILDING PHOTOS

Image 1: West Elevation

Image 2: East Elevation

Image 3: South Elevation

Image 4: Main Entry

Image 5: Main Entry with Unbraced Lighting & Glazing

Image 6: Interior Corridor Ceiling

Image 7: Interior Board Room Ceiling

Image 8: Unbraced Duct in Apparatus Bay

Image 9: Unanchored Equipment

Image 10: Unbraced Cabinets & Shelving

Appendix B

CONCEPTUAL SEISMIC STRENGTHENING SCHEME

TILLAMOOK VOLUNTEER FIRE DISTRICT
SEISMIC REHABILITATION GRANT
STRENGTHENING CONCEPTS

SHEET INDEX	
SHEET ID	SHEET TITLE
G1	COVER SHEET
S1	FOUNDATION STRENGTHENING PLAN
S2	SECOND FLOOR AND LOW ROOF STRENGTHENING PLAN
S3	HIGH ROOF STRENGTHENING PLAN

PROJECT NARRATIVE

THE INTENT OF THESE DRAWINGS IS TO ILLUSTRATE THE SCHEMATIC SEISMIC REHABILITATION TASKS TO RECTIFY THE LISTED SEISMIC AND NONSTRUCTURAL DEFICIENCIES. THESE SCHEMATIC DRAWINGS HAVE BEEN PREPARED USING THE CURRENT OREGON STRUCTURAL SPECIALTY CODE (OSSC) AND ASCE 41 (SEISMIC REHABILITATION OF EXISTING BUILDINGS) STANDARD.

THE TARGET FOR REHABILITATION IS TO ACHIEVE A LIFE SAFETY (LS) STRUCTURAL PERFORMANCE LEVEL AND A HAZARDS REDUCED (HR) NONSTRUCTURAL PERFORMANCE LEVEL AT THE BSE-2E SEISMIC EVENT AND THE IMMEDIATE OCCUPANCY (IO) STRUCTURAL PERFORMANCE LEVEL AND POSITION RETENTION (PR) NONSTRUCTURAL PERFORMANCE LEVEL AT THE BSE-1E SEISMIC EVENT.

THE (IO) STRUCTURAL PERFORMANCE LEVEL MEANS THAT AFTER A DESIGN EARTHQUAKE, THE BASIC VERTICAL AND LATERAL FORCE RESISTING SYSTEMS RETAIN NEARLY ALL OF THEIR PRE-EARTHQUAKE STRENGTH AND STIFFNESS. VERY LIMITED DAMAGE TO BOTH THE STRUCTURAL AND NONSTRUCTURAL COMPONENTS IS ANTICIPATED DURING THE DESIGN EARTHQUAKE WHICH REQUIRE SOME MINOR REPAIRS, BUT MAY NOT BE REQUIRED PRIOR TO REOCCUPANCY. THE RISK OF LIFE THREATENING INJURY AS A RESULT OF STRUCTURAL DAMAGE IS VERY LOW.

PROJECT INCLUDES SEISMIC REHABILITATION FOR THE ENTIRE FIRE STATION BUILDING.

STRUCTURAL DEFICIENCIES

S1. THE STRUCTURE DOES NOT CONTAIN A COMPLETE, WELL-DEFINED LOAD PATH WITH STRUCTURAL ELEMENTS AND CONNECTIONS THAT SERVE TO TRANSFER INERTIAL FORCES ASSOCIATED WITH THE MASS OF ALL ELEMENTS OF THE BUILDING TO THE FOUNDATION.
S2. ALL VERTICAL ELEMENTS IN THE SEISMIC-FORCE RESISTING SYSTEM ARE NOT CONTINUOUS TO THE FOUNDATION.
S3. LIQUEFACTION-SUSCEPTIBLE, SATURATED, LOOSE GRANULAR SOILS THAT COULD JEOPARDIZE THE BUILDING'S SEISMIC PERFORMANCE DO EXIST IN THE FOUNDATION SOILS AT DEPTHS WITH 50 FT UNDER THE BUILDING.
S4. THE SHEAR STRESS IN THE SHEAR WALLS, CALCULATED USING THE QUICK CHECK PROCEDURE, IS GREATER THAN 100 LB/FT.
S5. INTERIOR GYPSUM WALLBOARD IS USED FOR SHEAR WALLS.
S6. NARROW WOOD SHEAR WALLS WITH AN ASPECT RATIO GREATER THAN 2-TO-1 ARE USED TO RESIST SEISMIC FORCES.
S7. SHEAR WALLS DO NOT HAVE AN INTERCONNECTION BETWEEN STORIES TO TRANSFER OVERTURNING AND SHEAR FORCES THROUGH THE FLOOR.
S8. WALLS WITH OPENINGS GREATER THAN 80% OF THE LENGTH ARE NOT BRACED WITH WOOD STRUCTURAL PANEL SHEAR WALLS WITH ASPECT RATIOS LESS THAN 1.5-TO-1 OR SUPPORTED BY ADJACENT CONSTRUCTION THROUGH POSITIVE TIES CAPABLE OF TRANSFERRING THE SEISMIC FORCES.
S9. ALL SHEAR WALLS DO NOT HAVE HOLD-DOWN ANCHORS ATTACHED TO THE END STUDS.
S10. THERE IS NOT A POSITIVE CONNECTION OF WOOD POSTS TO THE FOUNDATION.
S11. NARROW WOOD SHEAR WALLS WITH AN ASPECT RATIO GREATER THAN 1.5-TO-1 ARE USED TO RESIST SEISMIC FORCES.
S12. ALL CHORD ELEMENTS ARE NOT CONTINUOUS, REGARDLESS OF CHANGES IN ROOF ELEVATION.

NOTE:
HATCH INDICATES PROJECT SCOPE.

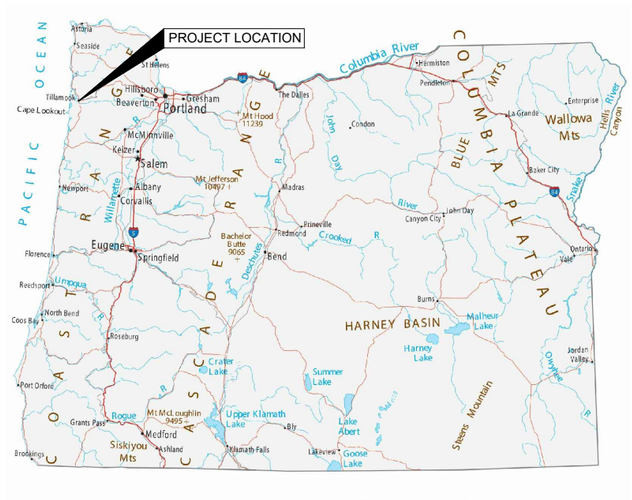
1 BUILDING PARTS IDENTIFICATION

NORTH

NONSTRUCTURAL DEFICIENCIES

N1. EQUIPMENT MOUNTED ON VIBRATION ISOLATORS AND CONTAINING HAZARDOUS MATERIAL IS NOT EQUIPPED WITH RESTRAINTS OR SNUBBERS.
N2. FREE EDGES OF INTEGRATED SUSPENDED CEILINGS DO NOT HAVE ENOUGH CLEARANCE.
N3. FREE EDGES OF INTEGRATED SUPPORTED CEILINGS ARE NOT ADEQUATELY SUPPORTED.
N4. ACOUSTICAL TILE OR LAY-IN PANEL CEILINGS HAVE SEISMIC SEPARATION JOINTS SUCH THAT EACH CONTINUOUS PORTION OF THE CEILING IS MORE THAN 2,500 FT2 AND HAS A RATIO OF LONG-TO-SHORT OF MORE THAN 4-TO-1.
N5. THE CONNECTION BETWEEN THE STAIRS AND THE STRUCTURE RELIES ON POST-INSTALLED ANCHORS IN CONCRETE OR MASONRY, AND THE STAIR DETAILS ARE NOT CAPABLE OF ACCOMMODATING STORY DRIFT WITHOUT INCLUDING ANY LATERAL STIFFNESS CONTRIBUTION FROM THE STAIRS.
N6. CONTENTS MORE THAN 6 FT HIGH WITH A HEIGHT-TO-DEPTH RATIO GREATER THAN 3-TO-1 ARE NOT ANCHORED TO THE STRUCTURE OR TO EACH OTHER.
N7. CONTENT WEIGHING MORE THAN 20 LB WHOSE CENTER OF MASS IS MORE THAN 4 FT ABOVE THE ADJACENT FLOOR LEVEL ARE NOT BRACED OR OTHERWISE RESTRAINED.
N8. ITEMS SUSPENDED WITHOUT LATERAL BRACING ARE NOT FREE TO SWING OR MOVE WITH THE STRUCTURE WITHOUT DAMAGING THEMSELVES OR ADJOINING COMPONENTS.
N9. EQUIPMENT MORE THAN 6 FT HIGH WITH A HEIGHT-TO-DEPTH RATIO GREATER THAN 3-TO-1 IS NOT ANCHORED TO THE FLOOR SLAB OR ADJACENT STRUCTURAL WALLS.

N10. EQUIPMENT SUSPENDED WITHOUT LATERAL BRACING IS NOT FREE TO SWING FROM OR MOVE WITH THE STRUCTURE FROM WHICH IS IS SUSPENDED WITHOUT DAMAGING ITSELF OR ADJOINING COMPONENTS.
N11. EQUIPMENT MOUNTED ON VIBRATION ISOLATORS IS NOT EQUIPPED WITH HORIZONTAL RESTRAINTS OR SNUBBERS, NOR WITH VERTICAL RESTRAINTS TO RESIST OVERTURNING.
N12. FLOOR SUPPORTED EQUIPMENT WEIGHING MORE THAN 400 LB IS NOT ANCHORED TO THE STRUCTURE.
N13. RECTANGULAR DUCTWORK LARGER THAN 6 FT2 IN CROSS-SECTIONAL AREA ARE NOT ADEQUATELY BRACED FOR SEISMIC LOADING.



2 STATE MAP

NORTH

TILLAMOOK VOLUNTEER FIRE DISTRICT
SEISMIC REHABILITATION GRANT STRENGTHENING CONCEPTS
2310 4TH ST
TILLAMOOK, OR 97141

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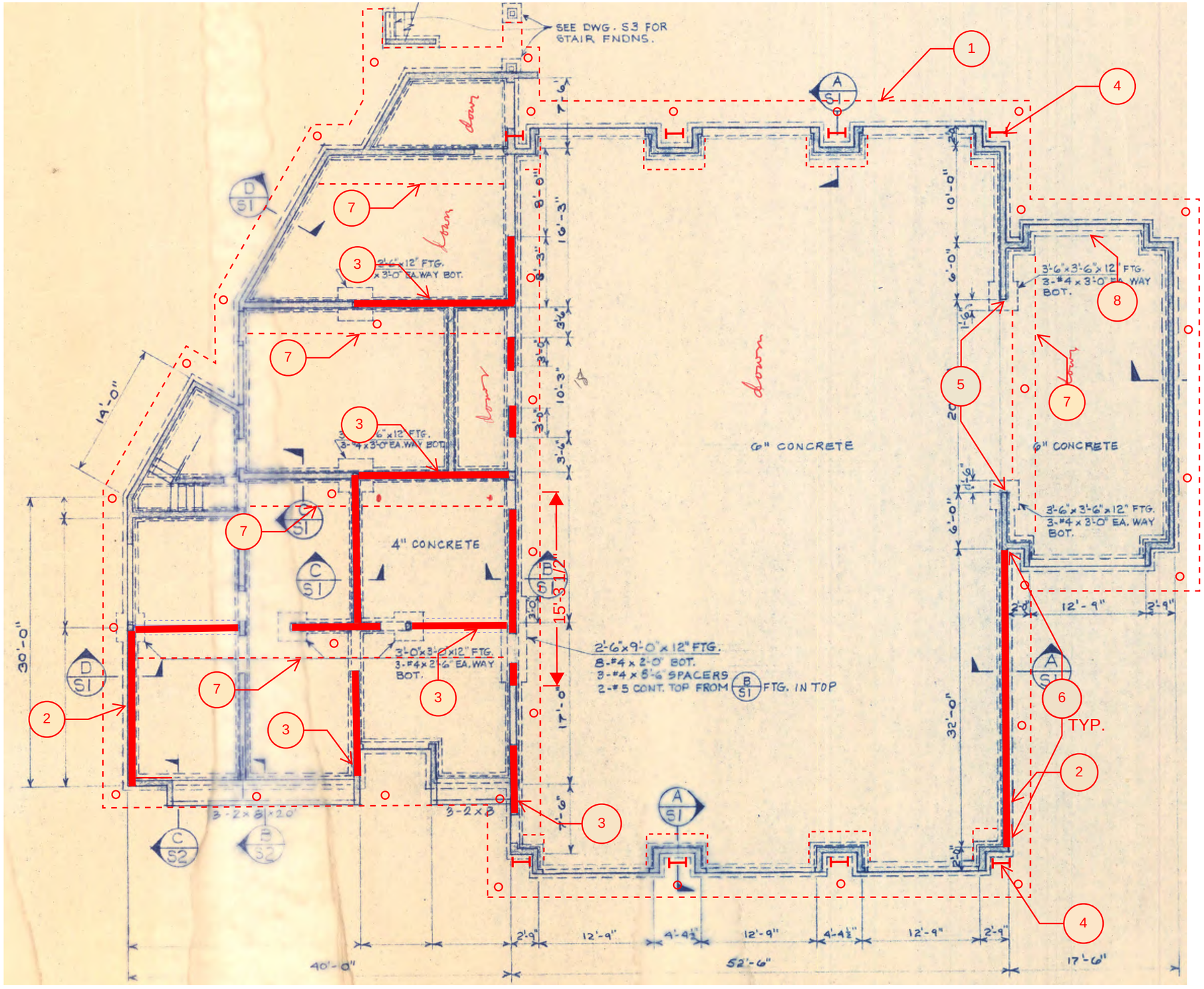
SHEET NO.
G1



1 FOUNDATION STRENGTHENING PLAN

NORTH

KEYED NOTES:

1. ADD 1'-10" x 2'-6" PERIMETER FOUNDATION. WITH 50' PIN PILES AT 15'-0" O.C. REPAIR FLOOR FINISHES AS REQUIRED. (S3)
2. REMOVE EXISTING GYP SHEATHING AND ADD 1/2" EXTERIOR PLYWOOD SHEATHING TO REINFORCE SHEAR WALLS. REPAIR EXTERIOR WALL FINISHES AS REQUIRED. (S4)
3. REMOVE EXISTING GYP WALLBOARD AND ADD 1/2" PLYWOOD TO REINFORCE SHEAR WALLS. REPLACE AND REPAIR FLOOR, WALL, AND CEILING FINISHES AS REQUIRED. REMOVE AND INSTALL IMPACTED CASEWORK AND PLUMBING FIXTURES AS REQUIRED. (S4, S5)
4. ADD STEEL MOMENT FRAME AND FOUNDATION TO REPAIR EXTERIOR WALL FINISHES AND ADD WEATHER PROTECTION AS REQUIRED. (S1, S4, S6, S8, S11)
5. ADD POSITIVE CONNECTION BETWEEN POST AND FOUNDATION. REPAIR FLOOR FINISHES AS REQUIRED. (S10)
6. ADD HOLD DOWN ANCHORS TO END STUDS OF SHEAR WALLS. REPAIR WALL AND FLOOR FINISHES AS REQUIRED. (S9)
7. ADD 1'10" x 3'-0" GRADE BEAMS TO SUPPORT INTERIOR BEARING WALLS. REPAIR WALL AND FLOOR FINISHES AS REQUIRED. (S3)

wrk Structural & Seismic Engineers

TILLAMOOK VOLUNTEER FIRE DISTRICT
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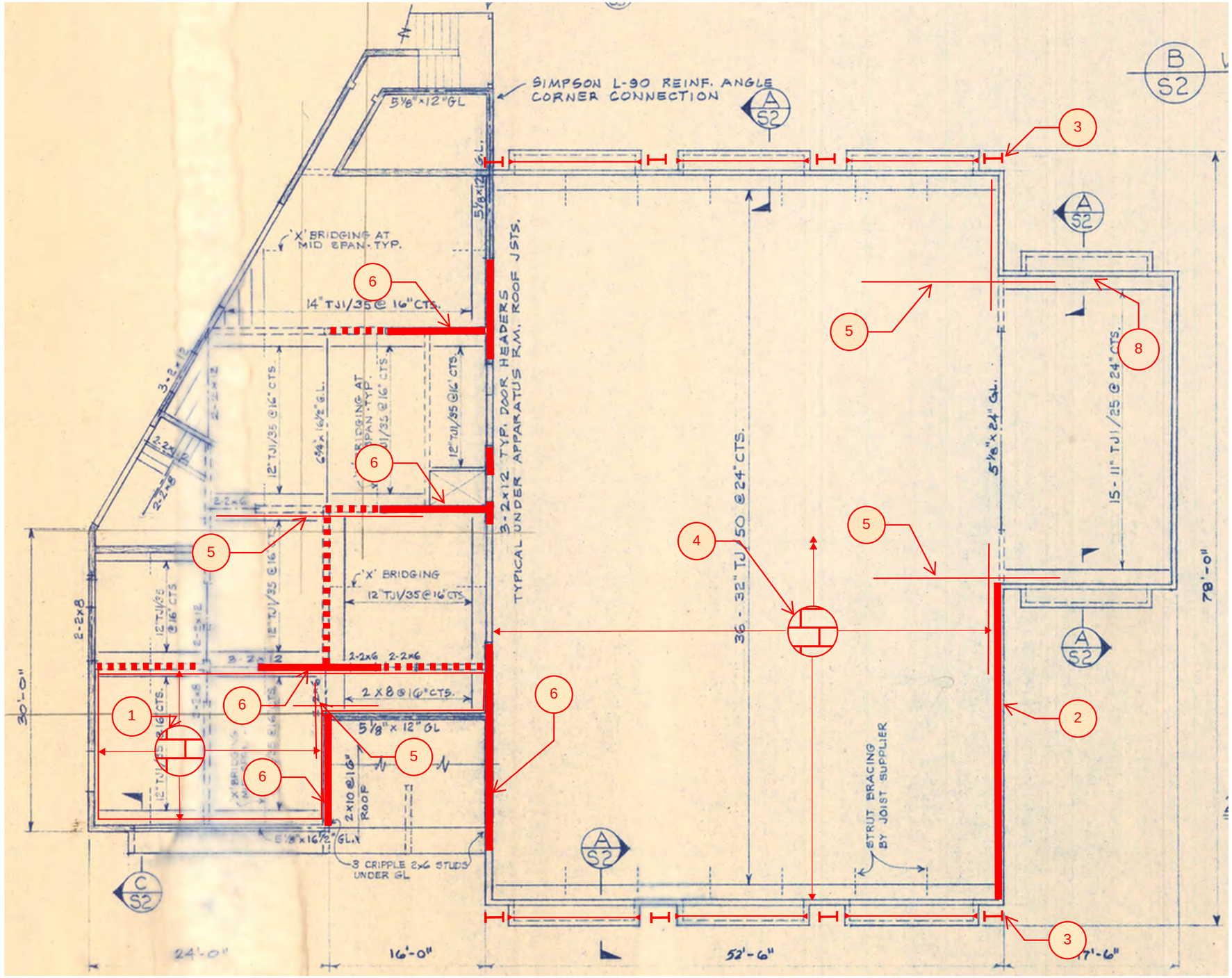
S1



1 SECOND FLOOR AND LOW ROOF STRENGTHENING PLAN

NORTH

KEYED NOTES:

1. ADD BLOCKING FOR DIAPHRAGM REINFORCEMENT. NAIL PANEL EDGES 10D @ 6IN O.C. REMOVE AND RESTORE (E) FLOOR AND CEILING FINISHES AS REQUIRED. (S1, S2)
2. REMOVE EXISTING GYP SHEATHING AND ADD 1/2" EXTERIOR PLYWOOD SHEATHING TO REINFORCE SHEAR WALLS. SEE SHEET 1. (S4)
3. ADD STEEL MOMENT FRAME TO APP BAY. SEE SHEET 1. (S1, S4, S6, S8, S11)
4. SUPPLEMENT (E) NAILING SUCH THAT NAILING MEETS 10D @ 6IN O.C. REMOVE AND REPLACE (E) ROOFING AS REQUIRED. (S1)
5. ADD (S) CMST14 STRAPS AND BLOCKING FOR DIAPHRAGM CHORD REINFORCEMENT AND TRANSFER OF SEISMIC FORCES. REPAIR (E) CEILING FINISHES AS REQUIRED. (S1, S2, S12)
6. REMOVE EXISTING GYP WALLBOARD AND ADD 1/2" PLYWOOD TO REINFORCE SHEAR WALLS. ADD IN PLANE CONNECTIONS AND HOLDDOWNS TO TRANSFER SEISMIC FORCES BETWEEN STORIES. REMOVE AND RESTORE (E) WALL, FLOOR, AND CEILING FINISHES AS REQUIRED. REMOVE AND REPLACE (E) CASEWORK AS REQUIRED. (S4, S5, S7, S9)
7. REMOVE EXISTING GYP SHEATHING AND ADD 1/2" EXTERIOR PLYWOOD SHEATHING TO REINFORCE SHEAR WALLS. ADD IN PLANE CONNECTIONS AND HOLDDOWNS TO TRANSFER SEISMIC FORCES BETWEEN STORIES. SEE SHEET 1. REMOVE AND RESTORE (E) WALL, FLOOR, AND CEILING FINISHES AS REQUIRED. (S4, S7, S9)

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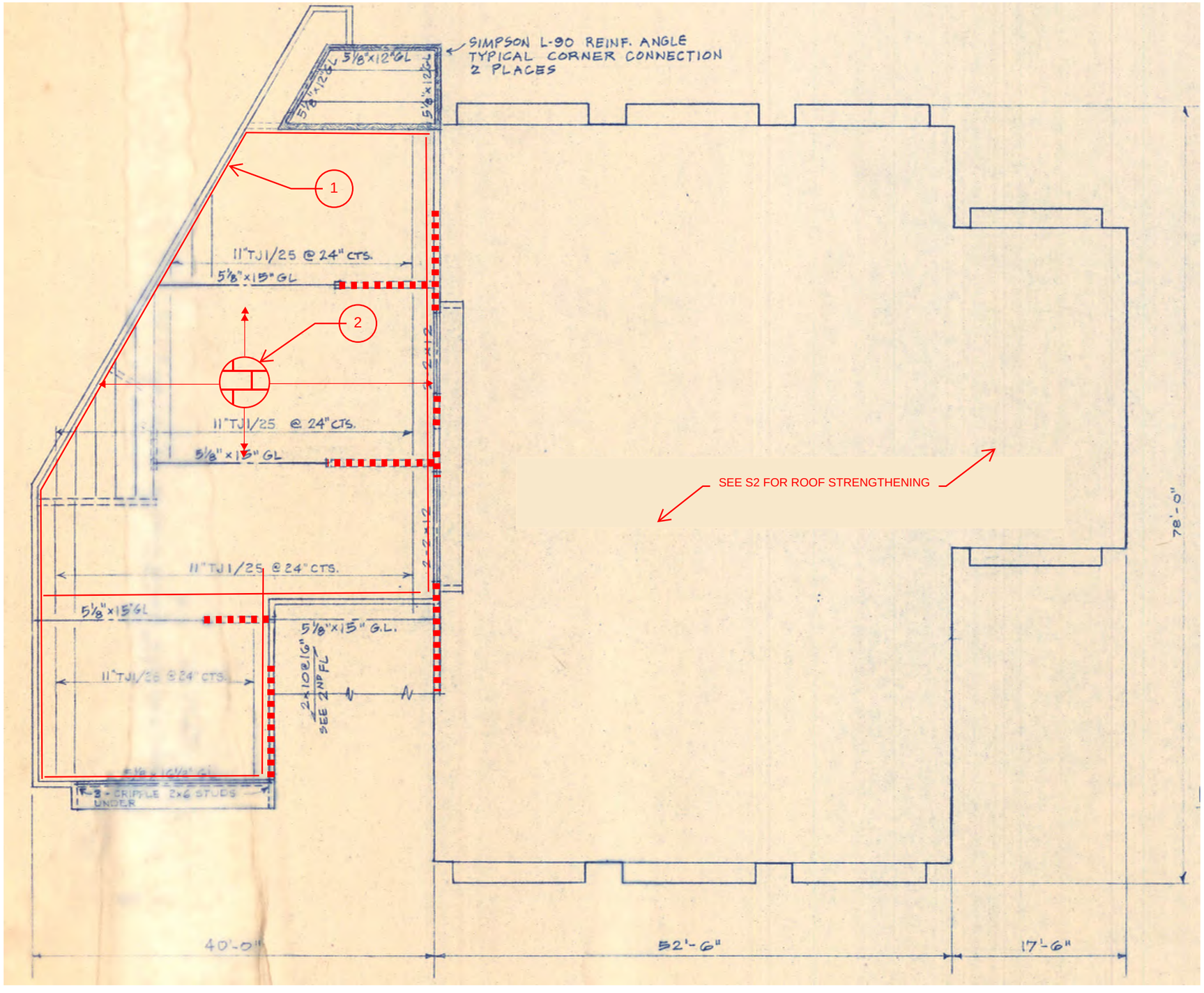
SHEET NO.
S2



1 HIGH ROOF STRENGTHENING PLAN

NORTH

KEYED NOTES:

1. ADD (S) CMST14 STRAPS FOR DIAPHRAGM CHORD REINFORCEMENT. SEE SHEET 2. (S12)
2. SUPPLEMENT (E) NAILING SUCH THAT NAILING IS 10D @ 6IN O.C. SEE SHEET 2. (S1)

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TILLAMOOK VOLUNTEER FIRE DISTRICT
SEISMIC REHABILITATION GRANT STRENGTHENING CONCEPTS
2310 4TH ST
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S3

Structural & Seismic Engineers

Appendix E

ASCE 41-17 TIER 1 CHECKLISTS

17-3 Immediate Occupancy Basic Configuration Checklist

Very Low Seismicity

Building System - General

	C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
S1		X			LOAD PATH: The structure contains 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. *(Tier 2: Sec. 5.4.1.1; Commentary: Sec. A.2.1.1)*	The structure does not have an adequate load path to transfer seismic forces to the foundation.
	X				ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 0.5% of the height of the shorter building in low seismicity, 1.0% in moderate seismici ty, and 3.0% in high seismicity. (Tier 2: Sec. 5.4.1.2; Commentary: Sec. A.2.1.2)	
			X		MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. *(Tier 2: Sec. 5.4.1.3; Commentary: Sec. A.2.1.3)*	

Building System – Building Configuration

	C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
	X				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. *(Tier 2: Sec. 5.4.2.1; Commentary: Sec. A.2.2.2)*	
	X				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. *(Tier 2: Sec. 5.4.2.2; Commentary: Sec. A.2.2.3)*	
S2		X			VERTICAL IRREGULARITIES: All vertical elements in the seismic-force- resisting system are continuous to the foundation. *(Tier 2: Sec. 5.4.2.3; Commentary: Sec. A.2.2.4)*	Vertical irregularities exist between 1st and 2nd floors.
	X				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. *(Tier 2: Sec. 5.4.2.4; Commentary: Sec. A.2.2.5)*	
	X				MASS: There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. *(Tier 2: Sec. 5.4.2.5; Commentary: Sec. A.2.2.6)*	
	X				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. *(Tier 2: Sec. 5.4.2.6; Commentary: Sec. A.2.2.7)*	

17-3 Immediate Occupancy Basic Configuration Checklist

Low Seismicity

(Complete the Following Items in Addition to the Items for Very Low Seismicity)

Geologic Site Hazards

C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
	X			LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building. *(Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.1)*	Liquefaction-susceptible soils exist beneath the building.
X				SLOPE FAILURE: The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure. *(Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.2)*	
X				SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. *(Tier 2: Sec. 5.4.3.1 ; Commentary: Sec.A.6.1.3)*	

S3

Moderate and High Seismicity

(Complete the Following Items in Addition to the Items for Low Seismicity)

Foundation Configuration

C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
X				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 $0.6S_a$. *(Tier 2: Sec. 5.4.3.3; Commentary: Sec. A.6.2.1)*	
X				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. *(Tier 2: Sec. 5.4.3.4; Commentary: Sec. A.6.2.2)*	

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

17-7. Immediate Occupancy Checklist for Building Type W2

Very Low Seismicity

Seismic-Force-Resisting System

	C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
	X				REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. *(Tier 2: Sec. 5.5.1.1; Commentary: Sec. A.3.2.1.1)*	
S4		X			SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural panel sheathing, 1,000 lb/ft (14.6 kN/m); Diagonal sheathing, 700 lb/ft (10.2 kN/m); Straight sheathing, 100 lb/ft (1.5 kN/m); All other conditions, 100 lb/ft (1.5 kN/m). *(Tier 2: Sec. 5.5.3.1.1 ; Commentary: Sec.A.3.2.7.1)*	No plywood sheathing on shear walls, (E) gypsum sheathing is not adequate.
			X		STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system. *(Tier 2: Sec. 5.5.3.6.1; Commentary: Sec. A.3.2.7.2)*	
S5		X			GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. *(Tier 2: Sec. 5.5.3.6.1; Commentary: Sec. A.3.2.7.3)*	Gypsum wallboard is the primary shear resisting system.
S6		X			NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces. *(Tier 2: Sec. 5.5.3.6.1; Commentary: Sec. A.3.2.7.4)*	Narrow wood shear walls between apparatus bay doors are used to resist seismic forces.
S7		X			WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor. *(Tier 2: Sec. 5.5.3.6.2; Commentary: Sec. A.3.2.7.5)*	Shear walls are misaligned between floors and not adequately connected through the floor.
			X		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-2. *(Tier 2: Sec. 5.5.3.6.3; Commentary: Sec. A.3.2.7.6)*	
			X		CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. *(Tier 2: Sec. 5.5.3.6.4; Commentary: Sec. A.3.2.7.7)*	
S8		X			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. *(Tier 2: Sec. 5.5.3.6.5; Commentary: Sec. A.3.2.7.8)*	Walls bracing apparatus bay doors do not meet aspect ratio requirements.
S9		X			HOLD-DOWN ANCHORS: All shear walls have hold-down anchors attached to the end studs constructed in accordance with acceptable construction practices. *(Tier 2: Sec. 5.5.3.6.6; Commentary: Sec. A.3.2.7.9)*	Shear walls do not have adequate hold-down anchors at end studs.

17-7. Immediate Occupancy Checklist for Building Type W2

Connections

S10

C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
	X			WOOD POSTS: There is a positive connection of wood posts to the foundation. *(Tier 2: Sec. 5.7.3.3; Commentary: Sec. A.5.3.3)*	Wood posts in apparatus bay are not adequately connected to the foundation
X				WOOD SILLS: All wood sills are bolted to the foundation. *(Tier 2: Sec. 5.7.3.3; Commentary: Sec. A.5.3.4)*	
X				GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support. *(Tier 2: Sec. 5.7.4.1; Commentary: Sec. A.5.4.1)*	

Foundation System

C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
		X		DEEP FOUNDATIONS: Piles and piers are capable of transferring the lateral forces between the structure and the soil. *(Commentary: Sec. A.6.2.3)*	
		X		SLOPING SITES: The difference in foundation embedment depth from one side of the building to another does not exceed one story. *(Commentary: A.6.2.4)*	

Low, Moderate, and High Seismicity

(Complete the Following Items in Addition to the Items for Very Low Seismicity)

Seismic-Force-Resisting System

S11

C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
	X			NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 1.5-to-1 are not used to resist seismic forces. *(Tier 2: Sec. 5.5.3.6.1; Commentary: Sec. A.3.2.7.4)*	Walls bracing apparatus bay do not meet aspect ratio requirements.

Diaphragms

S12

C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
X				DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. *(Tier 2: Sec. 5.6.1.1; Commentary: Sec. A.4.1.1)*	
	X			ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation. *(Tier 2: Sec. 5.6.1.1; Commentary: Sec. A.4.1.3)*	Roof chord elements are not continuous.
		X		DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. *(Tier 2: Sec. 5.6.1.5; Commentary: Sec. A.4.1.8)*	
		X		STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 1-to-1 in the direction being considered. *(Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.1)*	

17-7. Immediate Occupancy Checklist for Building Type W2

C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
X				SPANS: All wood diaphragms with spans greater than 12 ft (3.6 m) consist of wood structural panels or diagonal sheathing. *(Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.2)*	
X				DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 30 ft (9.1 m) and aspect ratios less than or equal to 3-to-1. *(Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.3)*	
X				OTHER DIAPHRAGMS: The diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. *(Tier 2: Sec. 5.6.5; Commentary: Sec. A.4.7.1)*	

Connections

C	NC	N/A	U	EVALUATION STATEMENT	COMMENT
X				WOOD SILL BOLTS: Sill bolts are spaced at 4 ft or less with acceptable edge and end distance provided for wood and concrete. *(Tier 2: Sec. 5.7.3.3; Commentary: Sec. A.5.3.7)*	

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

17-38. Nonstructural Checklist

Life Safety Systems

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—not required; LS—LMH; PR—LMH. FIRE SUPPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13. *(Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.1)*	
		X		HR—not required; LS—LMH; PR—LMH. FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13. *(Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.2)*	
		X		HR—not required; LS—LMH; PR—LMH. EMERGENCY POWER: Equipment used to power or control Life Safety systems is anchored or braced. *(Tier 2: Sec. 13.7.7; Commentary: Sec.* A.7.12.1*)*	
		X		HR—not required; LS—LMH; PR—LMH. STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints. *(Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.1)*	
		X		HR—not required; LS—MH; PR—MH. SPRINKLER CEILING CLEARANCE: Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13. *(Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.3)*	
X				HR—not required; LS—not required; PR—LMH. EMERGENCY LIGHTING: Emergency and egress lighting equipment is anchored or braced. *(Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.1)*	

Hazardous Materials

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
	X			HR—LMH; LS—LMH; PR—LMH. HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers. *(Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.2)*	Generator and compressor are not restrained
X				HR—LMH; LS—LMH; PR—LMH. HAZARDOUS MATERIAL STORAGE: Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods. *(Tier 2: Sec. 13.8.3; Commentary: Sec. A.7.15.1)*	
X				HR—MH; LS—MH; PR—MH. HAZARDOUS MATERIAL DISTRIBUTION: Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release. *(Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.4)*	
X				HR—MH; LS—MH; PR—MH. SHUTOFF VALVES: Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks. *(Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.3)*	

N1

17-38. Nonstructural Checklist

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
X				HR—LMH; LS—LMH; PR—LMH. FLEXIBLE COUPLINGS: Hazardous material ductwork and piping, including natural gas piping, have flexible couplings. *(Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.15.4)*	
		X		HR—MH; LS—MH; PR—MH. PIPING OR DUCTS CROSSING SEISMIC JOINTS: Piping or ductwork carrying hazardous material that either crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. *(Tier 2: Sec. 13.7.3, 13.7.5, 13.7.6; Commentary: Sec.* A.7.13.6*)*	

Partitions

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—LMH; LS—LMH; PR—LMH. UNREINFORCED MASONRY: Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 ft (3.0 m) in Low or Moderate Seismicity, or at most 6 ft (1.8 m) in High Seismicity. *(Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.1)*	
		X		HR—LMH; LS—LMH; PR—LMH. HEAVY PARTITIONS SUPPORTED BY CEILINGS: The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system. *(Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.2.1)*	
		X		HR—not required; LS—MH; PR—MH. DRIFT: Rigid cementitious partitions are detailed to accommodate the following drift ratios: in steel moment frame, concrete moment frame, and wood frame buildings, 0.02; in other buildings, 0.005. *(Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.2)*	
X				HR—not required; LS—not required; PR—MH. LIGHT PARTITIONS SUPPORTED BY CEILINGS: The tops of gypsum board partitions are not laterally supported by an integrated ceiling system. *(Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.2.1)*	
		X		HR—not required; LS—not required; PR—MH. STRUCTURAL SEPARATIONS: Partitions that cross structural separations have seismic or control joints. *(Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.3)*	
		X		HR—not required; LS—not required; PR—MH. TOPS: The tops of ceiling-high framed or panelized partitions have lateral bracing to the structure at a spacing equal to or less than 6 ft (1.8 m). *(Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.4)*	

Ceilings

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—H; LS—MH; PR—LMH. SUSPENDED LATH AND PLASTER: Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area. *(Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.3)*	

17-38. Nonstructural Checklist

	C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
			X		HR—not required; LS—MH; PR—LMH. SUSPENDED GYPSUM BOARD: Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft² (1.1 m²) of area. *(Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.3)*	
			X		HR—not required; LS—not required; PR—MH. INTEGRATED CEILINGS: Integrated suspended ceilings with continuous areas greater than 144 ft² (13.4 m²) and ceilings of smaller areas that are not surrounded by restraining partitions are laterally restrained at a spacing no greater than 12 ft (3.6 m) with members attached to the structure above. Each restraint location has a minimum of four diagonal wires and compression struts, or diagonal members capable of resisting compression. *(Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.2)*	
N2		X			HR—not required; LS—not required; PR—MH. EDGE CLEARANCE: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft² (13.4 m²) have clearances from the enclosing wall or partition of at least the following: in Moderate Seismicity, 1/2 in. (13 mm); in High Seismicity, 3/4 in. (19 mm). *(Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.4)*	No gap around edges of suspended ceilings.
	X				HR—not required; LS—not required; PR—MH. CONTINUITY ACROSS STRUCTURE JOINTS: The ceiling system does not cross any seismic joint and is not attached to multiple independent structures. *(Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.5)*	
N3		X			HR—not required; LS—not required; PR—H. EDGE SUPPORT: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft² (13.4 m²) are supported by closure angles or channels not less than 2 in. (51 mm) wide. *(Tier 2: Sec. 13.6.4 ; Commentary: Sec. A.7.2.6)*	Channels less than 2" inches.
N4		X			HR—not required; LS—not required; PR—H. SEISMIC JOINTS: Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is no more than 2,500 ft² (232.3 m²) and has a ratio of long-to-short dimension no more than 4-to-1. *(Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.7)*	Main floor hallway has ratio greater than 4-to-1

Light Fixtures

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
X				HR—not required; LS—MH; PR—MH. INDEPENDENT SUPPORT: Light fixtures that weigh more per square foot than the ceiling they penetrate are supported independent of the grid ceiling suspension system by a minimum of two wires at diagonally opposite corners of each fixture. *(Tier 2: Sec. 13.6.4, 13.7.9; Commentary: Sec. A.7.3.2)*	
		X		HR—not required; LS—not required; PR—H. PENDANT SUPPORTS: Light fixtures on pendant supports are attached at a spacing equal to or less than 6 ft. Unbraced suspended fixtures are free to allow a 360-degree range of motion at an angle not less than 45 degrees from horizontal without contacting adjacent components. Alternatively, if rigidly supported and/or braced, they are free to move with the structure to which they are	

17-38. Nonstructural Checklist

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		attached without damaging adjoining components. Additionally, the connection to the structure is capable of accommodating the movement without failure. *(Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.3)*	
X				HR—not required; LS—not required; PR—H. LENS COVERS: Lens covers on light fixtures are attached with safety devices. *(Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.4)*	

Cladding and Glazing

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—MH; LS—MH; PR—MH. CLADDING ANCHORS: Cladding components weighing more than 10 lb/ft^2 (0.48 kN/m^2) are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 ft (1.8 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 ft (1.2 m) *(Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.1)*	
		X		HR—not required; LS—MH; PR—MH. CLADDING ISOLATION: For steel or concrete moment-frame buildings, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less. *(Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.3)*	
		X		HR—MH; LS—MH; PR—MH. MULTI-STORY PANELS: For multi-story panels attached at more than one floor level, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less. *(Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.4)*	
		X		HR—not required; LS—MH; PR—MH. THREADED RODS: Threaded rods for panel connections detailed to accommodate drift by bending of the rod have a length-to-diameter ratio greater than 0.06 times the story height in inches for Life Safety in Moderate Seismicity and 0.12 times the story height in inches for Life Safety in High Seismicity and Position Retention in any seismicity. *(Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.9)*	
		X		HR—MH; LS—MH; PR—MH. PANEL CONNECTIONS: Cladding panels are anchored out of plane with a minimum number of connections for each wall panel, as follows: for Life Safety in Moderate Seismicity, 2 connections; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 connections. *(Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.5)*	
		X		HR—MH; LS—MH; PR—MH. BEARING CONNECTIONS: Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel. *(Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.6)*	

17-38. Nonstructural Checklist

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—MH; LS—MH; PR—MH. INSERTS: Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel. *(Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.7)*	
		X		HR—not required; LS—MH; PR—MH. OVERHEAD GLAZING: Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft^2 (1.5 m^2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked. *(Tier 2: Sec. 13.6.1.5; Commentary: Sec. A.7.4.8)*	

Masonry Veneer

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—not required; LS—LMH; PR—LMH. TIES: Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft^2 (0.25 m^2), and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36 in. (914 mm); for Life Safety in High Seismicity and for Position Retention in any seismicity, 24 in. (610 mm). *(Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.1)*	
		X		HR—not required; LS—LMH; PR—LMH. SHELF ANGLES: Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor. *(Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.2)*	
		X		HR—not required; LS—LMH; PR—LMH. WEAKENED PLANES: Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing. *(Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.3)*	
		X		HR—LMH; LS—LMH; PR—LMH. UNREINFORCED MASONRY BACKUP: There is no unreinforced masonry backup. *(Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.7.2)*	
		X		HR—not required; LS—MH; PR—MH. STUD TRACKS: For veneer with coldformed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center. *(Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.6.)*	
		X		HR—not required; LS—MH; PR—MH. ANCHORAGE: For veneer with concrete block or masonry backup, the backup is positively anchored to the structure at a horizontal spacing equal to or less than 4 ft along the floors and roof. *(Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.7.1)*	
		X		HR—not required; LS—not required; PR—MH. WEEP HOLES: In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing. *(Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.6)*	

17-38. Nonstructural Checklist

		X		HR—not required; LS—not required; PR—MH. OPENINGS: For veneer with cold-formed-steel stud backup, steel studs frame window and door openings. *(Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.6.2)*	

Parapets, Cornices, Ornamentation, and Appendages

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—LMH; LS—LMH; PR—LMH. URM PARAPETS OR CORNICES: Laterally unsupported unreinforced masonry parapets or cornices have height-tothickness ratios no greater than the following: for Life Safety in Low or Moderate Seismicity, 2.5; for Life Safety in High Seismicity and for Position Retention in any seismicity, 1.5. *(Tier 2: Sec. 13.6.5; Commentary: Sec. A.7.8.1)*	
		X		HR—not required; LS—LMH; PR—LMH. CANOPIES: Canopies at building exits are anchored to the structure at a spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 10 ft (3.0 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 6 ft (1.8 m). *(Tier 2: Sec. 13.6.6; Commentary: Sec. A.7.8.2)*	
		X		HR—H; LS—MH; PR—LMH. CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement. *(Tier 2: Sec. 13.6.5; Commentary: Sec. A.7.8.3)*	
		X		HR—MH; LS—MH; PR—LMH. APPENDAGES: Cornices, parapets, signs, and other ornamentation or appendages that extend above the highest point of anchorage to the structure or cantilever from components are reinforced and anchored to the structural system at a spacing equal to or less than 6 ft (1.8 m). This evaluation statement item does not apply to parapets or cornices covered by other evaluation statements. *(Tier 2: Sec. 13.6.6; Commentary: Sec. A.7.8.4)*	

Masonry Chimneys

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—LMH; LS—LMH; PR—LMH. URM CHIMNEYS: Unreinforced masonry chimneys extend above the roof surface no more than the following: for Life Safety in Low or Moderate Seismicity, 3 times the least dimension of the chimney; for Life Safety in High Seismicity and for Position Retention in any seismicity, 2 times the least dimension of the chimney. *(Tier 2: Sec. 13.6.7; Commentary: Sec. A.7.9.1)*	
		X		HR—LMH; LS—LMH; PR—LMH. ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof. *(Tier 2: Sec. 13.6.7; Commentary: Sec. A.7.9.2)*	

17-38. Nonstructural Checklist

Stairs

	C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
			X		HR—not required; LS—LMH; PR—LMH. STAIR ENCLOSURES: Hollow-clay tile or unreinforced masonry walls around stair enclosures are restrained out of plane and have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 15-to-1; for Life Safety in High Seismicity and for Position Retention in any seismicity, 12-to-1. *(Tier 2: Sec. 13.6.2, 13.6.8; Commentary: Sec. A.7.10.1)*	
N5		X			HR—not required; LS—LMH; PR—LMH. STAIR DETAILS: The connection between the stairs and the structure does not rely on post-installed anchors in concrete or masonry, and the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.4.3.1 for moment-frame structures or 0.5 in. for all other structures without including any lateral stiffness contribution from the stairs. *(Tier 2: Sec. 13.6.8; Commentary: Sec. A.7.10.2)*	Stair attachment to structure is not adequate

Contents and Furnishings

	C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
			X		HR—LMH; LS—MH; PR—MH. INDUSTRIAL STORAGE RACKS: Industrial storage racks or pallet racks more than 12 ft high meet the requirements of ANSI/RMI MH 16.1 as modified by ASCE 7, Chapter 15. *(Tier 2: Sec. 13.8.1; Commentary: Sec. A.7.11.1)*	
N6		X			HR—not required; LS—H; PR—MH. TALL NARROW CONTENTS: Contents more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 are anchored to the structure or to each other. *(Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.2)*	Apparatus bay storage cabinets will require attachment to walls
N7		X			HR—not required; LS—H; PR—H. FALL-PRONE CONTENTS: Equipment, stored items, or other contents weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level are braced or otherwise restrained. *(Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.3)*	Items stacked on storage cabinets
			X		HR—not required; LS—not required; PR—MH. ACCESS FLOORS: Access floors more than 9 in. (229 mm) high are braced. *(Tier 2: Sec. 13.6.10; Commentary: Sec. A.7.11.4)*	
			X		HR—not required; LS—not required; PR—MH. EQUIPMENT ON ACCESS FLOORS: Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor. *(Tier 2: Sec. 13.7.7 13.6.10; Commentary: Sec. A.7.11.5)*	
N8		X			HR—not required; LS—not required; PR—H. SUSPENDED CONTENTS: Items suspended without lateral bracing are free to swing from or move with the structure from which they are suspended without damaging themselves or adjoining components. *(Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.6)*	Hanging 2x with eye hooks could damage duct work

17-38. Nonstructural Checklist

Mechanical and Electrical Equipment

	C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
			X		HR—not required; LS—H; PR—H. FALL-PRONE EQUIPMENT: Equipment weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level, and which is not in-line equipment, is braced. *(Tier 2: Sec. 13.7.1 13.7.7; Commentary: Sec. A.7.12.4)*	
	X				HR—not required; LS—H; PR—H. IN-LINE EQUIPMENT: Equipment installed in line with a duct or piping system, with an operating weight more than 75 lb (34.0 kg), is supported and laterally braced independent of the duct or piping system. *(Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.5)*	
N9		X			HR—not required; LS—H; PR—MH. TALL NARROW EQUIPMENT: Equipment more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 is anchored to the floor slab or adjacent structural walls. *(Tier 2: Sec. 13.7.1 13.7.7; Commentary: Sec. A.7.12.6)*	Water heater and compressor are not anchored adequately
	X				HR—not required; LS—not required; PR—MH. MECHANICAL DOORS: Mechanically operated doors are detailed to operate at a story drift ratio of 0.01. *(Tier 2: Sec. 13.6.9; Commentary: Sec. A.7.12.7)*	
N10		X			HR—not required; LS—not required; PR—H. SUSPENDED EQUIPMENT: Equipment suspended without lateral bracing is free to swing from or move with the structure from which it is suspended without damaging itself or adjoining components. *(Tier 2: Sec. 13.7.1, 13.7.7; Commentary: Sec. A.7.12.8)*	Hanging heaters in apparatus bay not restrained
N11		X			HR—not required; LS—not required; PR—H. VIBRATION ISOLATORS: Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning. *(Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.9)*	Air compressors are not restrained
N12		X			HR—not required; LS—not required; PR—H. HEAVY EQUIPMENT: Floorsupported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure. *(Tier 2: Sec. 13.7.1, 13.7.7; Commentary: Sec. A.7.12.10)*	Generator is not anchored
	X				HR—not required; LS—not required; PR—H. ELECTRICAL EQUIPMENT: Electrical equipment is laterally braced to the structure. *(Tier 2: Sec. 13.7.7; Commentary: Sec. A.7.12.11)*	
	X				HR—not required; LS—not required; PR—H. CONDUIT COUPLINGS: Conduit greater than 2.5 in. (64 mm) trade size that is attached to panels, cabinets, or other equipment and is subject to relative seismic displacement has flexible couplings or connections. *(Tier 2: Sec. 13.7.8; Commentary: Sec. A.7.12.12)*	

Piping

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—not required; LS—not required; PR—H. FLEXIBLE COUPLINGS: Fluid and gas piping has flexible couplings. *(Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.2)*	

17-38. Nonstructural Checklist

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
X				HR—not required; LS—not required; PR—H. FLUID AND GAS PIPING: Fluid and gas piping is anchored and braced to the structure to limit spills or leaks. *(Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.4)*	
		X		HR—not required; LS—not required; PR—H. C-CLAMPS: One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained. *(Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.5)*	
		X		HR—not required; LS—not required; PR—H. PIPING CROSSING SEISMIC JOINTS: Piping that crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. *(Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.6)*	

Ducts

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
	X			HR—not required; LS—not required; PR—H. DUCT BRACING: Rectangular ductwork larger than 6 ft^2 (0.56 m^2) in cross-sectional area and round ducts larger than 28 in. (711 mm) in diameter are braced. The maximum spacing of transverse bracing does not exceed 30 ft (9.2 m). The maximum spacing of longitudinal bracing does not exceed 60 ft (18.3 m). *(Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.2)*	Not all ducts are braced adequately
X				HR—not required; LS—not required; PR—H. DUCT SUPPORT: Ducts are not supported by piping or electrical conduit. *(Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.3)*	
		X		HR—not required; LS—not required; PR—H. DUCTS CROSSING SEISMIC JOINTS: Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements. *(Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.4)*	

N13

Elevators

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—not required; LS—H; PR—H. RETAINER GUARDS: Sheaves and drums have cable retainer guards. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.1)*	
		X		HR—not required; LS—H; PR—H. RETAINER PLATE: A retainer plate is present at the top and bottom of both car and counterweight. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.2)*	
		X		HR—not required; LS—not required; PR—H. ELEVATOR EQUIPMENT: Equipment, piping, and other components that are part of the elevator system are anchored. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.3)*	

17-38. Nonstructural Checklist

C	NC	N/A	U	EVALUATION STATEMENT[a,b]	COMMENT
		X		HR—not required; LS—not required; PR—H. SEISMIC SWITCH: Elevators capable of operating at speeds of 150 ft/min (0.30 m/min) or faster are equipped with seismic switches that meet the requirements of ASME A17.1 or have trigger levels set to 20% of the acceleration of gravity at the base of the structure and 50% of the acceleration of gravity in other locations. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.4)*	
		X		HR—not required; LS—not required; PR—H. SHAFT WALLS: Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.5)*	
		X		HR—not required; LS—not required; PR—H. COUNTERWEIGHT RAILS: All counterweight rails and divider beams are sized in accordance with ASME A17.1. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.6)*	
		X		HR—not required; LS—not required; PR—H. BRACKETS: The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.7)*	
		X		HR—not required; LS—not required; PR—H. SPREADER BRACKET: Spreader brackets are not used to resist seismic forces. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.8)*	
		X		HR—not required; LS—not required; PR—H. GO-SLOW ELEVATORS: The building has a go-slow elevator system. *(Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.9)*	

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.
[a] Performance Level: HR = Hazards Reduced, LS = Life Safety, and PR = Position Retention.
[b] Level of Seismicity: L = Low, M = Moderate, and H = High

Appendix F

DOGAMI, RVS, OR GEOTECHNICAL REPORT

Tillamook FD - Liquefaction & Fault Hazard

September 9, 2022

Active Faults
Moderate
High
Low

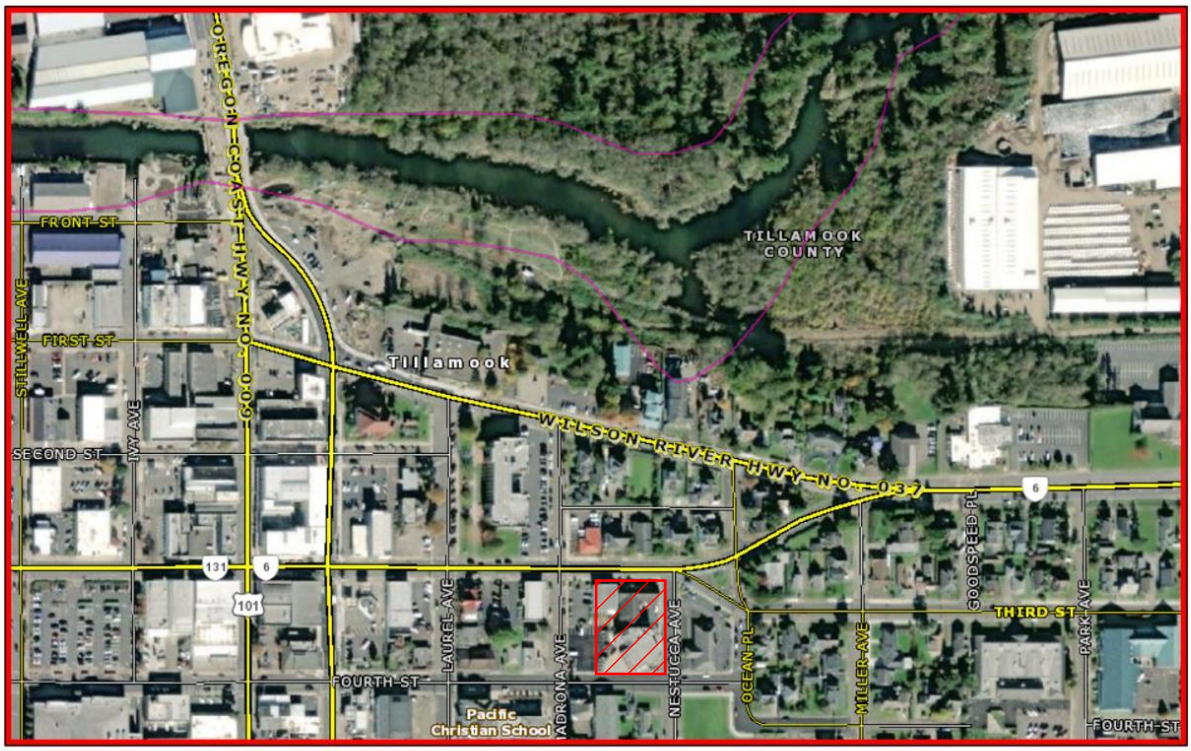
1:2,400

0 0.01 0.03 0.05 mi

0 0.02 0.04 0.09 km

Maxar, Microsoft, Oregon Department of Transportation, Geographic Information Services Unit

Tillamook FD - Tsunami Hazard



November 29, 2022

Statutory Tsunami Inundation Line

1:4,800

0 0.03 0.06 0.11 mi

0 0.04 0.09 0.18 km

Oregon Department of Transportation, Geographic Information Services Unit, Maxar

Tillamook FD - Flood Hazard

August 24, 2022

- Floodway
- 100-Year Floodplain
- 500-Year Floodplain
- 2015 FEMA Q3 Flood
- 2015 State Digitized Flood

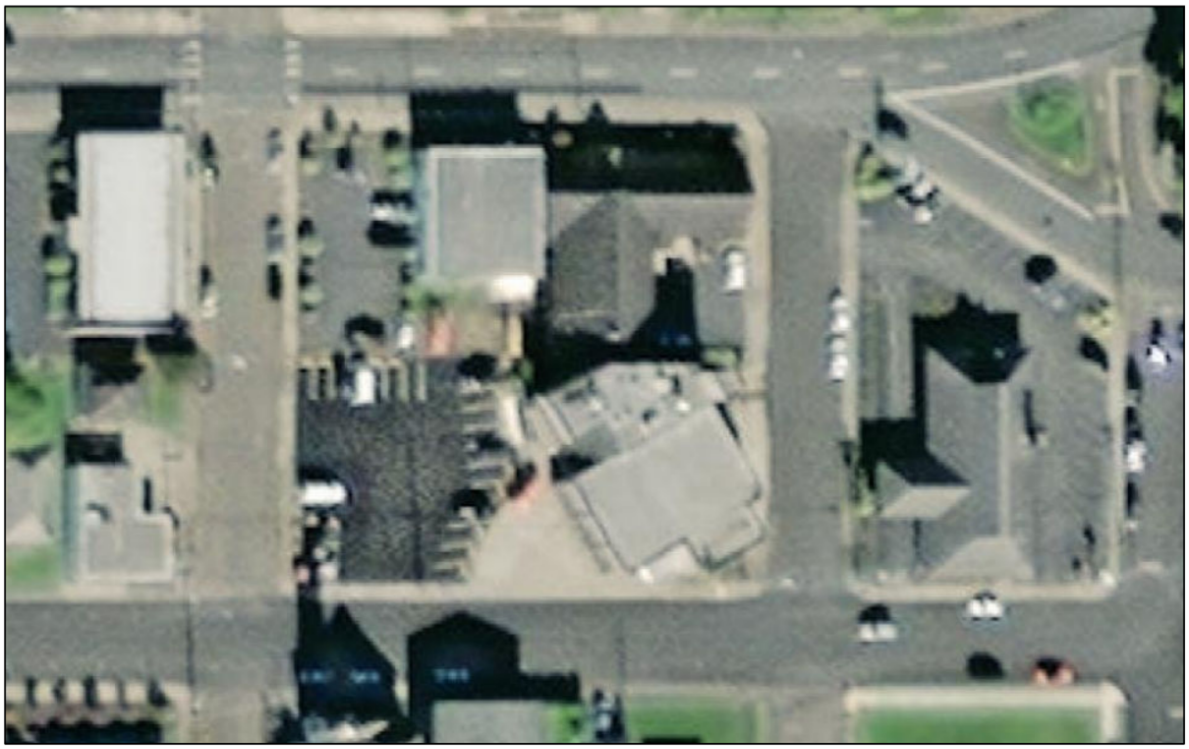
1:960

0 0.01 0.01 0.02 mi

0 0.01 0.01 0.03 km

Maxar, Microsoft, Oregon Department of Transportation, Geographic Information Services Unit

Tillamook FD - Landslide Hazard



August 24, 2022

Landslide Hazard

- Low - Landsliding Unlikely
- Moderate - Landsliding Possible
- High - Landsliding Likely
- Very High - Existing Landslide

1:960

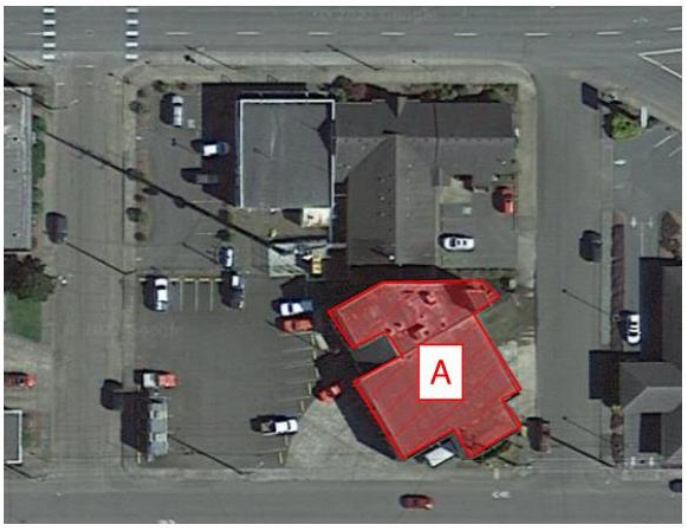
0 0.01 0.01 0.02 mi

0 0.01 0.01 0.03 km

Maxar, Microsoft, Oregon Department of Transportation, Geographic Information Services Unit

Rapid Visual Screening of Buildings for Potential Seismic Hazards
FEMA P-154 Data Collection Form

Till_fir01A **Level 1**
HIGH Seismicity



SKETCH

Address: 2310 4th St.
Tillamook, OR **Zip:** 97471
Other Identifiers:
Building Name: Tillamook Volunteer Fire District Station 71
Use: Fire Station
Latitude: 45.45575 **Longitude:** -123.84025
S_S: 1.219 **S_1:** 0.634
Screener(s): Brian Knight **Date/Time:** 11/1/2022

No. Stories: Above Grade: 2 Below Grade: **Year Built:** 1982 ☐ EST
Total Floor Area (sq. ft.): 9,750 **Code Year:**
Additions: ☒ None ☐ Yes, Year(s) Built:

Occupancy: Assembly, Commercial, (Emer. Services), ☐ Historic, ☐ Shelter, Industrial, Office, School, ☐ Government, Utility, Warehouse, Residential, # Units:

Soil Type: ☐A Hard Rock ☐B Avg Rock ☐C Dense Soil ☒D Stiff Soil ☐E Soft Soil ☐F Poor Soil **DNK** *If DNK, assume Type D.*

Geologic Hazards: Liquefaction: (Yes)/No/DNK Landslide: Yes/(No)/DNK Surf. Rupt.: Yes/(No)/DNK

Adjacency: ☒ Pounding ☐ Falling Hazards from Taller Adjacent Building

Irregularities: ☒ Vertical (type/severity) Steps in Elev. View (Mod. & Sev.)
☒ Plan (type) Re-entrant Corners, Torsion

Exterior Falling Hazards: ☐ Unbraced Chimneys ☐ Heavy Cladding or Heavy Veneer ☐ Parapets ☐ Appendages ☐ Other:

COMMENTS:

☐ Additional sketches or comments on separate page

BASIC SCORE, MODIFIERS, AND FINAL LEVEL 1 SCORE, S_{L1}

FEMA BUILDING TYPE (Do Not Know)	W1	W1A	(W2)	S1 (MRF)	S2 (BR)	S3 (LM)	S4 (RC SW)	S5 (URM INF)	C1 (MRF)	C2 (SW)	C3 (URM INF)	PC1 (TU)	PC2	RM1 (FD)	RM2 (RD)	URM	MH
Basic Score	**3.6**	**3.2**	**2.9**	**2.1**	**2.0**	**2.6**	**2.0**	**1.7**	**1.5**	**2.0**	**1.2**	**1.6**	**1.4**	**1.7**	**1.7**	**1.0**	**1.5**
Severe Vertical Irregularity, V_{L1}	-1.2	-1.2	(-1.2)	-1.0	-1.0	-1.1	-1.0	-0.8	-0.9	-1.0	-0.7	-1.0	-0.9	-0.9	-0.9	-0.7	NA
Moderate Vertical Irregularity, V_{L1}	-0.7	-0.7	-0.7	-0.6	-0.6	-0.7	-0.6	-0.5	-0.5	-0.6	-0.4	-0.6	-0.5	-0.5	-0.5	-0.4	NA
Plan Irregularity, P_{L1}	-1.1	-1.0	(-1.0)	-0.8	-0.7	-0.9	-0.7	-0.6	-0.6	-0.8	-0.5	-0.7	-0.6	-0.7	-0.7	-0.4	NA
Pre-Code	-1.1	-1.0	-0.9	-0.6	-0.6	-0.8	-0.6	-0.2	-0.4	-0.7	-0.1	-0.5	-0.3	-0.5	-0.5	0.0	-0.1
Post-Benchmark	1.6	1.9	(2.2)	1.4	1.4	1.1	1.9	NA	1.9	2.1	NA	2.0	2.4	2.1	2.1	NA	1.2
Soil Type A or B	0.1	0.3	0.5	0.4	0.6	0.1	0.6	0.5	0.4	0.5	0.3	0.6	0.4	0.5	0.5	0.3	0.3
Soil Type E (1-3 stories)	0.2	0.2	0.1	-0.2	-0.4	0.2	-0.1	-0.4	0.0	0.0	-0.2	-0.3	-0.1	-0.1	-0.1	-0.2	-0.4
Soil Type E (> 3 stories)	-0.3	-0.6	-0.9	-0.6	-0.6	NA	-0.6	-0.4	-0.5	-0.7	-0.3	NA	-0.4	-0.5	-0.6	-0.2	NA
Minimum Score, S_{MIN}	*1.1*	*0.9*	*0.7*	*0.5*	*0.5*	*0.6*	*0.5*	*0.5*	*0.3*	*0.3*	*0.3*	*0.2*	*0.2*	*0.3*	*0.3*	*0.2*	*1.0*

FINAL LEVEL 1 SCORE, $S_{L1} \geq S_{MIN}$: 2.9 FEMA 154 Collapse Potential = Low

EXTENT OF REVIEW

Exterior: ☐ Partial ☒ All Sides ☐ Aerial
Interior: ☐ None ☒ Visible ☒ Entered
Drawings Reviewed: ☒ Yes ☐ No
Soil Type Source: DNK
Geologic Hazards Source: USGC.org
Contact Person: Brian Knight

LEVEL 2 SCREENING PERFORMED?

☐ Yes, Final Level 2 Score, S_{L2} _____ ☐ No
Nonstructural hazards? ☐ Yes ☐ No

OTHER HAZARDS

Are There Hazards That Trigger A Detailed Structural Evaluation?

☒ Pounding potential (unless S_{L2} > cut-off, if known)
☐ Falling hazards from taller adjacent building
☒ Geologic hazards or Soil Type F
☐ Significant damage/deterioration to the structural system

ACTION REQUIRED

Detailed Structural Evaluation Required?

☐ Yes, unknown FEMA building type or other building
☐ Yes, score less than cut-off
☒ Yes, other hazards present
☐ No

Detailed Nonstructural Evaluation Recommended? *(check one)*

☒ Yes, nonstructural hazards identified that should be evaluated
☐ No, nonstructural hazards exist that may require mitigation, but a detailed evaluation is not necessary
☐ No, no nonstructural hazards identified ☐ DNK

Where information cannot be verified, screener shall note the following: EST = Estimated or unreliable data OR DNK = Do Not Know

Legend: MRF = Moment-resisting frame; BR = Braced frame; RC = Reinforced concrete; SW = Shear wall; URM INF = Unreinforced masonry infill; TU = Tilt up; MH = Manufactured Housing; LM = Light metal; FD = Flexible diaphragm; RD = Rigid diaphragm