EXHIBIT A

wrk
Structural & Seismic Engineers

SEISMIC EVALUATION REPORT

Seismic Assessment for Drakes Crossing Main Fire Station

19364 Powers Creek Loop Rd. NE, Silverton, OR 97381

STRUCTURAL
REGISTERED PROFESSIONAL ENGINEER
64298 PE
OREGON
May 9, 2006
BRIAN T. KNIGHT

EXPIRES: 6/30/2025

January 10, 2025
24021.00

Prepared for:
Drakes Crossing Rural Fire Protection District
Brandon Hamilton
Fire Chief

Prepared By:
WRK Engineers
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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 Yes)*
A	Main Fire Station	Yes	1990	S3	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 a building part.

Total Retrofit Cost	$2,101,226	
Retrofit Square Feet	4,800 SF	
Retrofit Cost Per Square Feet	$437.75	**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 require consultation with DOGAMI prior to application submittal. Applicant shall include such documentation with the application.		**No**

Engineering Report Checklist		
☒	Engineering Report Cover Page	
☒	Project Summary Page	Page i
☒	Building Parts Identification	Page 4
☒	Statement of the Performance Objective	Page 2
Summary of Deficiencies		
☒	Structural Seismic Deficiencies	Page 6
☒	Nonstructural Seismic Deficiencies	Page 7
Summary of Mitigation/Retrofit		
☒	Structural Mitigation/Retrofit	Page 6
☒	Nonstructural Mitigation/Retrofit	Page 7
Summary Construction Cost Estimate		
☒	Direct Cost	Page 7
☒	Indirect Soft Cost	Page 7
☒	Certification Statement by Engineer	Page 9
ASCE 41-17 Tier 1 Checklist		
☒	Basic Configuration Checklist	Appendix E
☒	Building System Structural Checklist	Appendix E
☒	Nonstructural Checklist	Appendix E
☒	**Retrofit Drawings & Sketches**	Appendix B
☒	**DOGAMI or Geotechnical Report**	Appendix F
☒	**Itemized Construction Cost Estimate**	Appendix C

Table of Contents

APPENDICES

1. Project Background

The goal of this evaluation of Drakes Crossing RFPD Main Fire Station (Fire Station) 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 the Fire Station. 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).

Our work is based on the following:

1. A site visit by Will Nickelson of WRK Engineers on August 16, 2024, to verify the as-built conditions of the building's structural and nonstructural systems. Measurements of key structural components were taken as there are no existing construction drawings of the building.

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. Drakes Crossing Main Fire Station is owned and operated by the Drakes Crossing Rural Fire Protection District and meets the requirements of OAR 123-051-0300 and is therefore an eligible candidate for the Seismic Rehabilitation Grant Program.

We believe the Fire Station 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

3. Evaluation Criteria and Methodology

For our evaluation of the Fire Station, 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 (HR) 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 objectives for a BSE-1E seismic event in red, and a BSE-2E seismic event in blue.

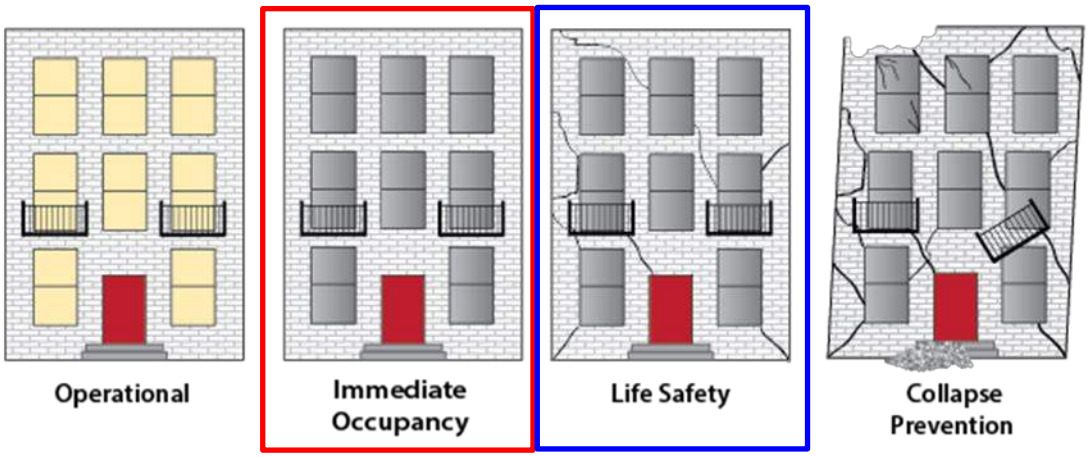


Figure 1: Structural Performance Level

4. Building Description

The Fire Station, built in the 1990's, is a single-story, metal-framed structure covering 4,800 square feet. Its rectangular design measures approximately 80 feet by 60 feet, with a maximum roof height of around 20 feet. The building houses offices, a kitchen, a training room, storage rooms, and an apparatus bay. For visual reference, please consult **Figure 2** for a Building Part Map and **Appendix A** for Building photos.

The lateral system of the station features horizontal rod bracing, spanning between vertical rod bracing in the East-West direction and steel moment frames in the North-South direction. This roof diaphragm is considered flexible relative to the supporting frames and braces.

In terms of gravity support, the station utilizes metal roofing, which is held up by steel purlins at 48" on center. These purlins span between the steel frames spaced at 20 feet on center. Both gravity and lateral loads are transmitted to the soil through concrete footings.

Additionally, the Fire Station incorporates a wood-framed mezzanine with a plywood diaphragm. The mezzanine's rectangular layout measures approximately 30 feet by 11 feet, with a maximum height of about 9 feet. The gravity system for the mezzanine employs 2x joists, spaced 16 inches on center, which span between the wood stud walls. Gravity loads from the mezzanine are transferred to the soil via a slab on grade foundation.

After reviewing the drawings and as-built condition, the lateral force resisting system, and ASCE 41, the building type is classified as **S3: Metal Building Frames.**

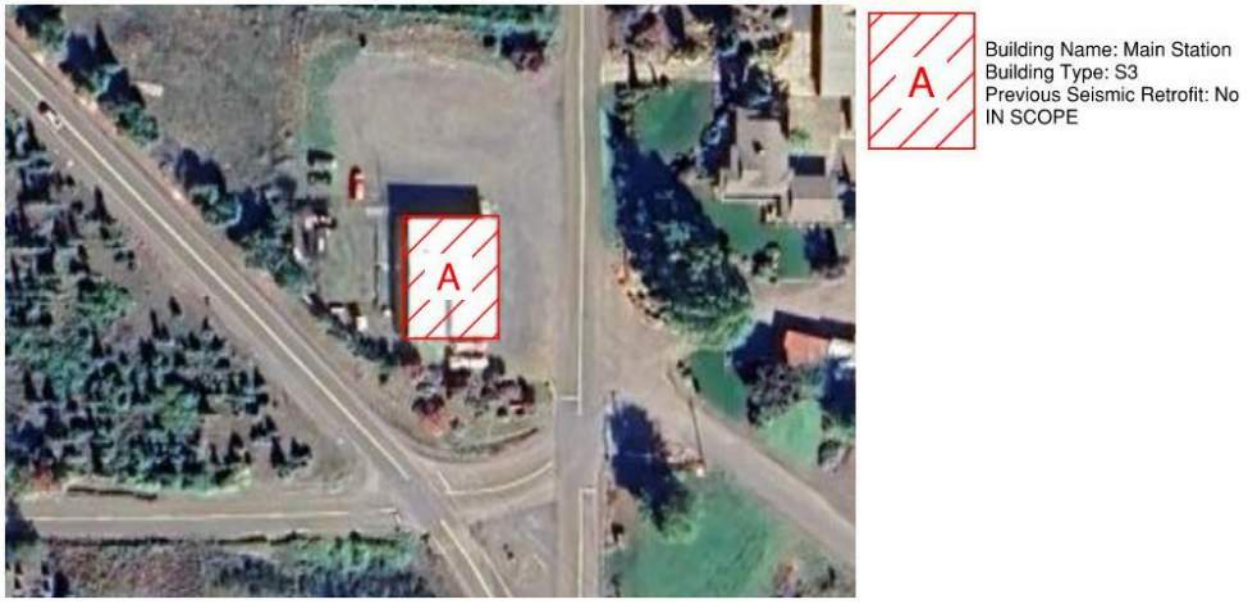


Figure 2: Building Part Map

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 Specific Seismicity and Geologic Hazards

Using the data collected by the United States Geologic Survey, **Table 2** summarizes the site specific seismicity for the location of the Fire Station. The site class for the building is Class "B", stiff soils of varying depths, according to the BCA Tool/DOGAMI.

TABLE 2 - Site Specific Seismicity	
Soil Density	Rock
ASCE 7-16 Soil Classification	Class B
BSE-2N Event: Short Period Spectral Acceleration (S_S)	0.716
BSE-2N Event: Long Period Spectral Acceleration (S_1)	0.35
BSE-2N Event: Soil Condition Amplification Factors (F_V / F_A)	0.8/0.9
BSE-1E Event: Short Period Spectral Acceleration (S_{xs})	0.43
BSE-1E Event: Long Period Spectral Acceleration (S_{x1})	0.187
BSE-2E Event: Short Period Spectral Acceleration (S_{xs})	0.457
BSE-2E Event: Long Period Spectral Acceleration (S_{x1})	0.195
FEMA 154 RVS Seismicity Zone	Moderately High
ASCE 41-17 Level of Seismicity	Moderate

Using the ASCE 41-17 checklists, the geologic hazards that were assessed as part of this engineering evaluation include liquefaction, landslide, flood potential, and tsunami inundation, if applicable. Using the DOGAMI Oregon HazVu website, these potential hazards were evaluated. The result from each hazard HazVu evaluation is included in **Appendix F**.

It was determined the site is in an area with no geologic hazards as identified from the DOGAMI Oregon HazVu plots.

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 the structural and nonstructural deficiencies are attached as **Appendix E**. Based on the identified deficiencies and building condition, we have developed a conceptual strengthening scheme (see **Appendix B**) for Drakes Crossing Fire Station.

The strengthening measures listed 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.

7.1 Structural Deficiencies & Strengthening Measures

Numerous structural deficiencies have been identified at the Fire Station. 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 the mass of all elements to the building foundation.	Provide a complete load path for transfer of inertial forces to building foundation.
S2	MEZZANINES	Interior mezzanine levels are not braced independently from the main structure or are not anchored to the seismic-force-resisting elements of the main structure.	Anchor mezzanine to main structure lateral force resisting system.
S3	BRACE AXIAL STRESS CHECK	Axial stress in the diagonals, is more than 0.5*Fy*, using the Quick Check procedure of Section 4.4.3.4.	Install new lateral force resisting elements to replace existing vertical rod bracing.
S4	FLEXURAL STRESS CHECK	The average flexural stress in the moment-frame columns and beams is greater than *Fy*.	Install steel moment frames and plywood shear walls to replace existing steel moment frames.
S5	TRANSFER TO STEEL FRAMES	Diaphragms are not connected for the transfer of seismic forces to the steel moment frames.	Strengthen diaphragms to adequately connect and transfer seismic forces to the lateral force resisting elements.
S6	MOMENT-RESISTING CONNECTIONS	All moment connections aren't able to develop the elastic moment (*FyS*) of the adjoining members.	Install new moment frames and plywood shear walls at strategic locations to resist lateral loads.

7.2 Nonstructural Deficiencies & Strengthening Measures

Numerous nonstructural deficiencies have been identified at the Fire Station. All nonstructural deficiencies and the strengthening measures are summarized in **Table 4**.

TABLE 4 – NONSTRUCTURAL
Deficiencies & Strengthening Measures
Position Retention Performance Level

Item Number	Component Type	Deficiency	Strengthening Measure
N1	TOPS	The tops of ceiling-high framed or panelized partitions do not have lateral bracing to the structure at a spacing equal to or less than 6 ft.	Tops of partitions are to be braced to the adjacent structure.
N2	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.
N3	MECHANICAL DOORS	Mechanically operated doors are not detailed to operate at a story drift ratio of 0.01.	Replace doors to operate at a story drift ratio of 0.01.

8. Construction Cost Estimate

An engineer's opinion of probable cost has been prepared based on the developed seismic strengthening scheme (see **Appendix B**) and is attached as **Appendix C**. The cost estimate addresses all seismic strengthening required and includes all 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
Engineering	$287,948
Construction Management	$45,000
Construction	$1,438,646
Relocation	$50,283
Contingency	$279,349
Total	**$2,101,226**
Total Area	4,800 Square Feet
$/Square Feet	$437.75

The cost estimate included in this report has been reviewed by the engineer responsible for the evaluation and seismic strengthening schemes of the Fire Station.

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 are provided in the BCA tool.

The BCA score for this project is **0.345**. Although the Main Fire Station 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 Drakes Crossing Main Fire Station.

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 Drakes Crossing Rural Fire Protection 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 Drakes Crossing Main Fire Station, noted the deficiencies in the Tier 1 checklists, developed seismic retrofit solutions to rectify the deficiencies, and a cost estimate for the project. 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.

Brian Knight, PE, SE

Appendix A

BUILDING PHOTOS

Image 1: East Elevation

Image 2: North Elevation

Image 3: South Elevation

Image 4: West Elevation

Image 5: Apparatus Bay Interior

Image 6: Existing Steel Moment Connection

Image 7: Tall and Narrow Unbraced Storage

Image 8: Kitchen Interior

Appendix B

CONCEPTUAL SEISMIC STRENGTHENING SCHEME

DRAKES CROSSING RFPD SEISMIC REHABILITATION GRANT STRENGTHENING CONCEPTS

SHEET INDEX	
SHEET ID	SHEET TITLE
G1	COVER SHEET
S1.1	FOUNDATION STRENGTHENING PLAN
S1.2	MEZZANINE STRENGTHENING PLAN
S1.3	ROOF STRENGTHENING PLAN

PROJECT NARATIVE

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 IMMEDIATE OCCUPANCY (IO) STRUCTURAL PERFORMANCE LEVEL AND A POSITION RETENTION NONSTRUCTURAL PERFORMANCE LEVEL AT THE BSE-1E SEISMIC EVENT AND THE LIFE SAFETY STRUCTURAL PERFORMANCE LEVEL AND HAZARDS REDUCTION NONSTRUCTURAL PERFORMANCE LEVEL AT THE BSE-2E 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

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 ELEMENTS TO THE BUILDING FOUNDATION.

S2. THE INTERIOR MEZZANINE LEVELS ARE NOT BRACED INDEPENDENTLY FROM THE MAIN STRUCTURE OR ARE ANCHORED TO THE SEISMIC-FORCE-RESISTING ELEMENTS OF THE MAIN STRUCTURE.

S3. AXIAL STRESS IN THE BRACED FRAME DIAGONALS IS MORE THAN 0.5Fy, USING THE QUICK CHECK PROCEDURE OF SECTION 4.4.3.4.

S4. THE AVERAGE FLEXURAL STRESS IN THE MOMENT-FRAME COLUMNS AND BEAMS IS GREATER THAN Fy.

S5. DIAPHRAGMS ARE NOT CONNECTED FOR THE TRANSFER OF SEISMIC FORCES TO THE STEEL MOMENT FRAMES.

S6. NONE OF THE MOMENT CONNECTIONS ARE ABLE TO DEVELOP THE ELASTIC MOMENT (FyS) OF THE ADJOINING MEMBERS.

NON-STRUCTURAL DEFICIENCIES

N1. THE TOPS OF CEILING-HIGH FRAMED OR PANELIZED PARTITIONS DO NOT HAVE LATERAL BRACING TO THE STRUCTURE AT A SPACING EQUAL TO OR LESS THAN 6 FT.

N2. 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.

N3. MECHANICALLY OPERATED DOORS ARE NOT DETAILED TO OPERATE AT A STORY DRIFT RATIO OF 0.01.

ALL NONSTRUCTURAL DEFICIENCIES WILL BE MITIGATED AS SHOWN IN TABLE 4 IN THIS REPORT UNLESS SPECIFICALLY NOTED OTHERWISE ON THE CONCEPTUAL STRENGTHENING SCHEME DRAWINGS.

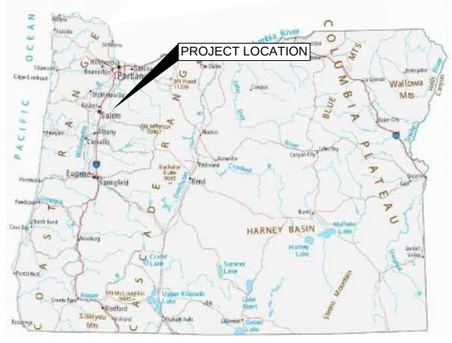
NOTE:
PROJECT SCOPE ONLY INCLUDES HATCHED AREA.

1 SITE MAP/BUILDING PARTS IDENTIFICATION

NORTH

2 VICINITY MAP

NORTH



3 STATE MAP

NORTH

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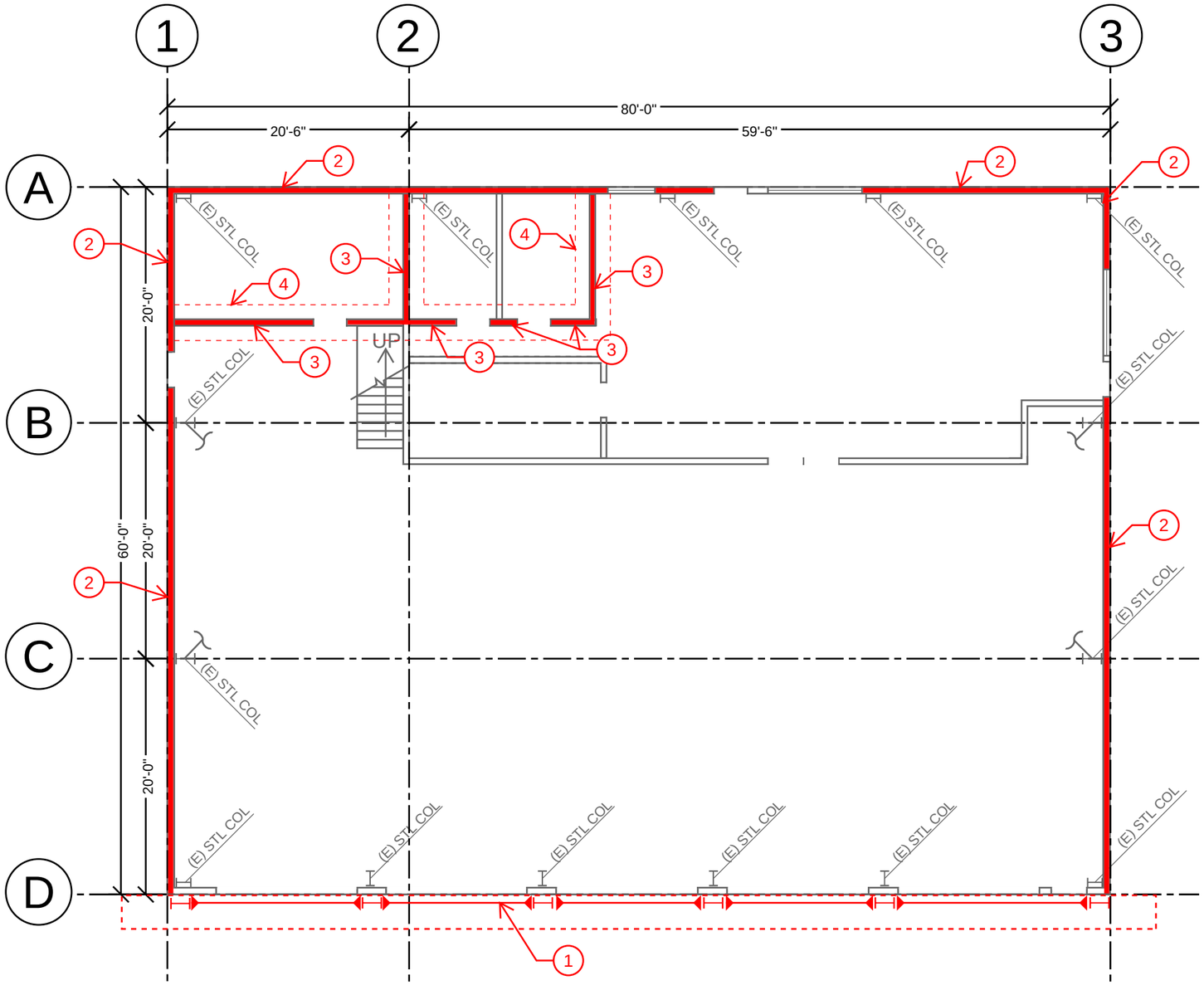
DRAKES CROSSING RURAL FIRE PROTECTION DISTRICT
SEISMIC REHABILITATION GRANT STRENGTHENING CONCEPTS
19364 POWERS CREEK LOOP ROAD NE,
SILVERTON, OR 97381

DATE: 12/15/2024
JOB NUMBER: 24021.00
PAGE REFERENCE:

SHEET NO.
G1



1 FOUNDATION STRENGTHENING PLAN
SCALE: NTS

NORTH

SEISMIC STRENGTHENING KEYED NOTES:

1. INSTALL STEEL MOMENT FRAMES AND EXCAVATE AS REQUIRED TO INSTALL CONCRETE FOUNDATIONS WITH CONCRETE ENCASED STEEL GRADE BEAMS. REPAIR OR REPLACE (E) EXTERIOR WALL FINISHES AND SLABS AS REQUIRED. INSTALL WEATHER PROTECTION AS REQUIRED. (S1, S4, S6)
2. DEMO (E) SIDING AND INSTALL 2x STUDS AT 16" OC AND 1/2" PLYWOOD SHEATHING W/ 10d NAILS AT 6" OC AT PANEL EDGES AND 12" OC IN FIELD. REPLACE (E) SIDING AFTER WORK IS COMPLETE. PROVIDE 5/8" DIA SCREW ANCHORS AT 48" OC FOR SILL ANCHORAGE. (S1, S3, S4, S5, S6)
3. REMOVE (E) GYPSUM WALL FINISHES AND RENAIL (E) PLYWOOD WITH 10d NAILS AT 6" OC AT PANEL EDGES AND 12" OC IN THE FIELD TO REINFORCE SHEAR WALLS. PROVIDE 5/8" DIA SCREW ANCHORS AT 48" OC AND PROVIDE A HOLDOWN AT WALL ENDS. REPAIR OR REPLACE (E) FLOOR, WALL, AND CEILING FINISHES AS REQUIRED. (S1, S2)
4. DEMO (E) CONC SLAB ON GRADE AND EXCAVATE AS REQUIRED TO INSTALL NEW 3'-0" WIDE x 1'-6" DEEP FOUNDATIONS. REPAIR OR REPLACE CONCRETE SLAB ON GRADE AS REQUIRED AFTER WORK IS COMPLETE. (S1, S2)

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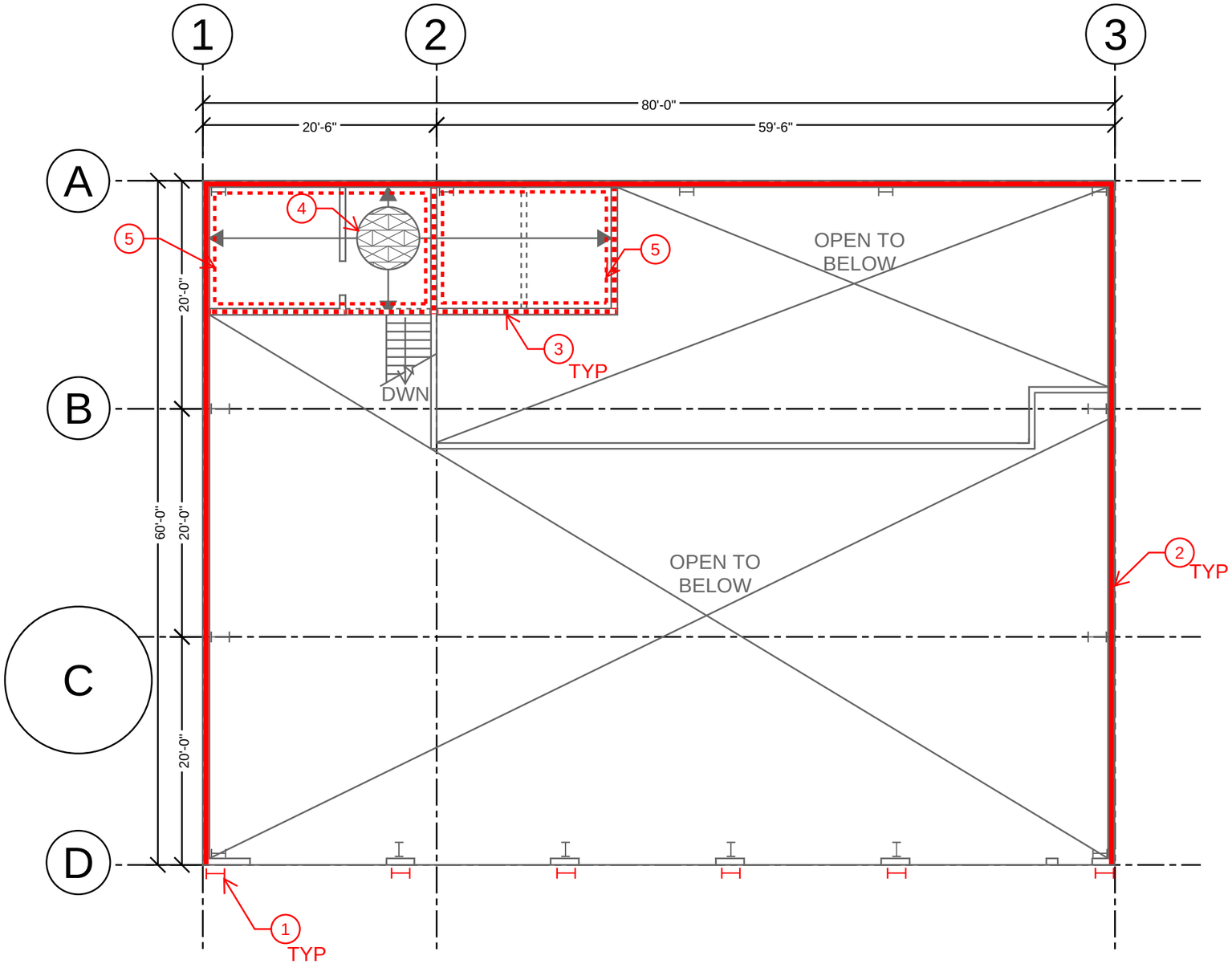
S1.1



1 MEZZANINE STRENGTHENING PLAN
SCALE: NTS

NORTH

SEISMIC STRENGTHENING KEYED NOTES:

1. STEEL MOMENT FRAME, SEE KEYED NOTE 1 ON S1.1 FOR MORE INFORMATION. (S1, S4, S6)
2. PLYWOOD SHEAR WALL, SEE KEYED NOTE 2 ON S1.1 FOR MORE INFORMATION. (S1, S3, S4, S5, S6)
3. PLYWOOD SHEAR WALL, SEE KEYED NOTE 3 ON S1.1 FOR MORE INFORMATION. (S1, S2)
4. DEMO (E) FLOORING DOWN TO (E) PLYWOOD SHEATHING AND RENAIL SHEATHING W/ 10d COMMON NAILS AT 6" OC AT PANEL EDGES AND 12" OC AT INTERIOR SUPPORTS. REPLACE FLOORING AFTER WORK IS COMPLETE. (S1, S2)
5. REMOVE (E) PLYWOOD SHEATHING AS REQUIRED TO INSTALL IN-PLANE CONNECTIONS BETWEEN PLYWOOD SHEAR WALL AND (E) PLYWOOD DIAPHRAGM. REPLACE PLYWOOD SHEATHING AFTER WORK IS COMPLETE. (S1, S2, S5)

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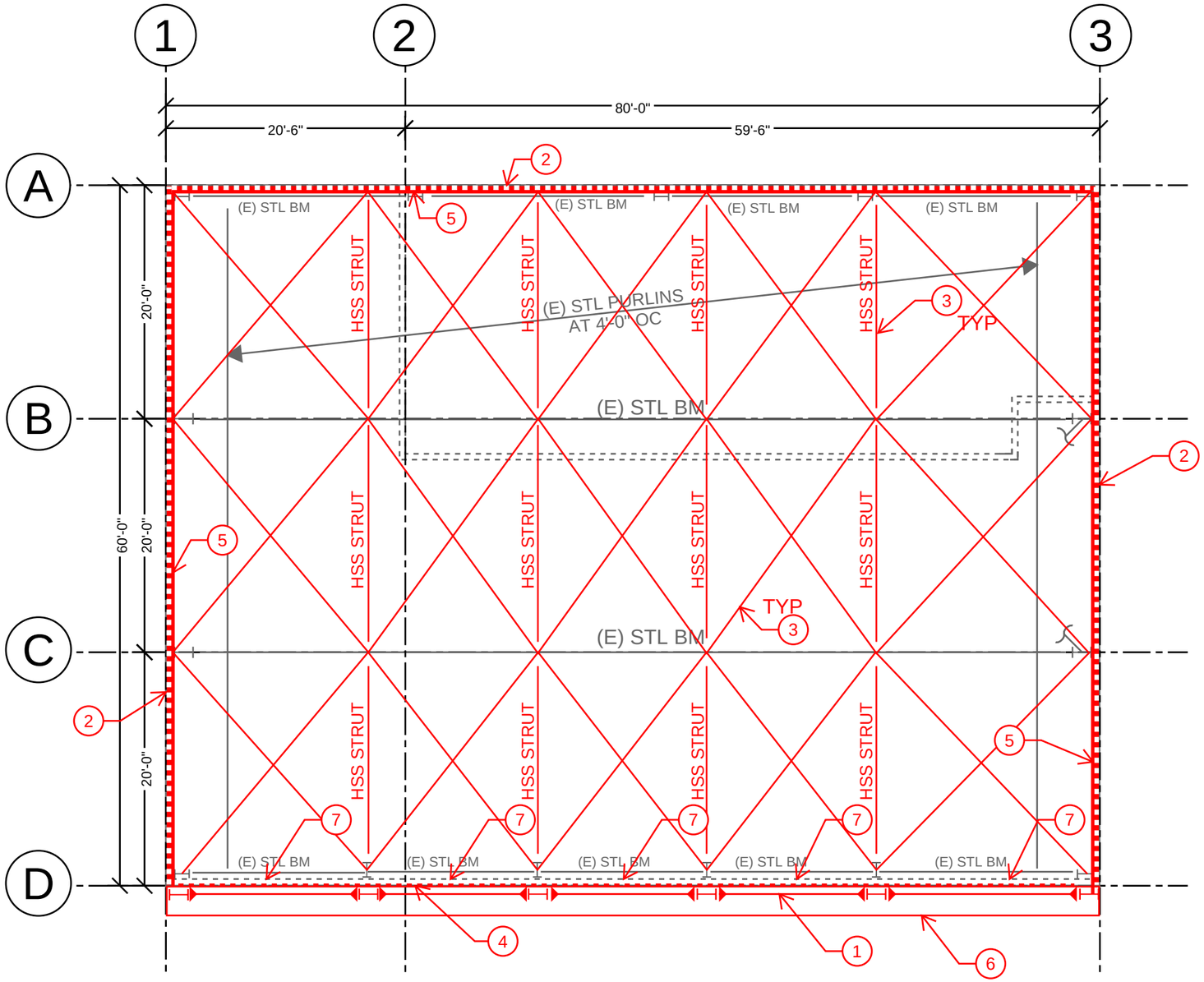
SHEET NO.
S1.2



1 ROOF STRENGTHENING PLAN
SCALE: NTS

NORTH

SEISMIC STRENGTHENING KEYED NOTES:

1. MOMENT FRAME BELOW, SEE KEYED NOTE 1 ON S1.1 FOR MORE INFORMATION. (S1, S4, S6)
2. PLYWOOD SHEAR WALL BELOW, SEE KEYED NOTE 3 ON S1.1 FOR MORE INFORMATION. (S1, S2)
3. DEMO (E) HORIZONTAL ROD BRACING AS REQUIRED TO INSTALL 5/8" DIAMETER THREADED ROD BRACING AND HSS STRUTS WHERE SHOWN TO PROVIDE A COMPLETE LOAD PATH AT THE ROOF DIAPHRAGM. PROVIDE ADEQUATE CONNECTIONS TO TRANSFER LATERAL FORCES TO LATERAL FORCE RESISTING ELEMENTS WHERE APPLICABLE. REPAIR AND REPLACE (E) WALL FINISHES AS REQUIRED. (S1, S5)
4. INSTALL CONTINUOUS IN-PLANE CONNECTION BETWEEN HORIZONTAL ROD DIAPHRAGM AND STEEL MOMENT FRAME. (S1, S5)
5. ADD STEEL COLLECTORS TO TRANSFER SEISMIC FORCE FROM THE DIAPHRAGM TO THE PLYWOOD SHEAR WALLS. REPAIR AND REPLACE (E) WALL AND CEILING FINISHES AS REQUIRED. (S1, S5)
6. EXTEND ROOFING TO COVER MOMENT FRAME AND HORIZONTAL ROD BRACING. (S1, S4, S6)
7. REPLACE OVERHEAD MECHANICAL DOORS TO ACCOMMODATE 1% DRIFT (N3)

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DRAKES CROSSING RURAL FIRE PROTECTION DISTRICT
SEISMIC REHABILITATION GRANT STRENGTHENING CONCEPTS
19364 POWERS CREEK LOOP ROAD NE,
SILVERTON, OR 97381

DATE: 12/15/2024
JOB NUMBER: 24021.00
PAGE REFERENCE:

SHEET NO.
S1.3

Appendix D

BENEFIT COST ANALYSIS WORKSHEET

Oregon Seismic Rehabilitation Grant Application: Benefit-Cost Analysis

Entity:	**Drakes Crossing Rural Fire Protection District**		
Point of Contact	**Brandon Hamilton, Fire Chief**		
Telephone:	**503-873-6868**		
E-Mail:	brandon.hamilton.501@gmail.com		
BCA File Name:	**Drakes Crossing-BCA-Tool_2024**	**BCA Date:**	**11/14/2024**

Building Name:	**Drakes Crossing Fire Station**
Site ID:	**Mari_fir38**
Facility Use:	**Fire Station**

Is the Building in the Oregon BCA Tool Database: Yes or No? **Yes**

How Many Structurally Different Building Parts Are There?

User-Defined	Database
	1

Unique Building ID Number	Building Part Square Footage	Percent of Total SF	Percent of Occupancy	Percent of Operating Budget	Building Part Being Retrofitted?
Mari_fir38A	4,800	100.00%			Yes
Totals:	**4,800**	**100.00%**			

Seismic Retrofit Cost Estimate per SRGP Application: **$2,101,226**

Benefit-Cost Analysis: Summary Results
Drakes Crossing Fire Station

Building Part	Benefits
Mari_fir38A	$724,062
Total Benefits	**$724,062**
Total Cost	**$2,101,226**
Benefit-Cost Ratio	**0.345**

Benefits by Category Avoided Damages and Losses	
Building Damage	$163,593
Contents Damage	$163,593
Displacement Costs	$10,372
Loss of Function Costs	$44,836
Casualties	$341,669
Total	**$724,062**

Occupancy Data

For benefit-cost analysis, the average occupancy on a 24/7/365 basis is used for casualty calculations.
Enter data below ONLY for the occupancy categories applicable to this building - all other green cell entries should be left blank.
There are entries below for: employees, visitors, students, meetings or special events and patients.

NOTE: for buildings with similar occupancies each month, complete the tables on the left side only.

NOTE: For buildings with different summer occupancies, complete the tables both on the left and right sides. If this does not apply, enter "0" for number of summer months

Employees: 12 Months per Year or Academic Year for Schools				
Day of Week	Time of Day	Hours per Day	Average Employees in Building	Calculated 24/7/365 Occupancy
Monday - Friday	Day	1	1	0.030
Monday - Friday	Evening	4	20	2.374
Monday - Friday	Night	1	1	0.030
Saturday	Day	2	15	0.178
Saturday	Evening	1	1	0.006
Saturday	Night	1	1	0.006
Sunday	Day	1	1	0.006
Sunday	Evening	1	1	0.006
Sunday	Night	1	1	0.006
			Subtotal:	**2.642**

Employees: Summer Months				Number of Months:
Day of Week	Time of Day	Hours per Day	Average Employees in Building	Calculated 24/7/365 Occupancy
Monday - Friday	Day			
Monday - Friday	Evening			
Monday - Friday	Night			
Saturday	Day			
Saturday	Evening			
Saturday	Night			
Sunday	Day			
Sunday	Evening			
Sunday	Night			
			Subtotal:	

Visitors: 12 Months per Year or Academic Year for Schools			
Day of Week	Average Number of Visitors Per Day	Average Time in Building (Minutes per Visitor)	Calculated 24/7/365 Occupancy
Monday - Friday	1	15	0.007
Saturday	1	30	0.003
Sunday	1	30	0.003
	Subtotal:		**0.013**

Visitors: Summer Months			Number of Months:
Day of Week	Average Number of Visitors Per Day	Average Time in Building (Minutes per Visitor)	Calculated 24/7/365 Occupancy
Monday - Friday			
Saturday			
Sunday			
	Subtotal:		

K-12 Students: Academic Year	
Average Daily Number of Students:	
Hours per Day:	
Days per Year:	
Calculated 24/7/365 Occupancy:	

K-12 Students: Summer School	
Average Daily Number of Students:	
Hours per Day:	
Days per Year:	
Calculated 24/7/365 Occupancy:	

College Students: Academic Year				
Number of Weeks per Year of Classes:				
Course	Class Duration (hours)	Number of Class Periods per Week	Average Number of Students per Class	Calculated 24/7/365 Occupancy
1 Hr. Courses	1			
1.5 Hr. Courses	1.5			
2 Hr. Courses	2			
3 Hr. Courses	3			
Other	N/A			
Other	N/A			
			Subtotal:	

College Students: Summer School				
Number of Weeks per Year of Classes:				
Course	Class Duration (hours)	Number of Class Periods per Week	Average Number of Students per Class	Calculated 24/7/365 Occupancy
1 Hr. Courses	1			
1.5 Hr. Courses	1.5			
2 Hr. Courses	2			
3 Hr. Courses	3			
Other	N/A			
Other	N/A			
			Subtotal:	

Occupancy Data

Meetings, Sports Events etc.

Event	Events per Year	People per Event	Average Time spent at Event (hours per person)	Calculated 24/7/365 Occupancy
Weekly Drill	50	15	3	0.257
Community Open Ho	1	100	4	0.046
Community Training	4	10	4	0.018
			Subtotal:	0.321

Patients

Total Number of In-Patient Beds:			
Average Daily Number of In-Patients			
Average Percentage Occupancy			
Day of Week	**Average Number of Out-Patients per Day**	**Average Time in Building (Hours per person)**	**Calculated 24/7/365 Occupancy**
Monday - Friday			
Saturday			
Sunday			
		Out-Patients:	
		In-Patients:	
		Total Patients:	

Occupancy Data

SUMMARY OCCUPANCY DATA:
Average 24/7/365 Occupancy

Occupancy Category	12 Months or Academic Year	Summer
Employees	2.642	
Visitors	0.013	
Students: K-12		
Students: College		
Meetings & Special Events	0.321	N/A
Patients		N/A
Subtotals:	2.976	
Avg 24/7/365 Occupancy:	2.976	

DATA DOCUMENTATION: OCCUPANCY	
Provide brief documentation below and/or references to other documents included with your application (with page number), for the sources of the occupancy data and estimates.	
Employees: Numbers	
Employees: Hours Per Day	
Visitors: Number Per Day	
Visitors: Average Time in Building	
K-12 Students: Number	
K-12 Students: Hours Per Day	
K-12 Students: Days Per Year	
Additional Comments Re: above Occupancy Data	
College Student Occupancy Data	

Meetings, Sports Events and Other Special Events	
NOTES:	**It is NOT necessary to provide separate documentation for every special event listed. Rather, provide an Overview Statement of the sources of special event occupancy estimates.**
	Provide specific documentation for high occupancy events or very frequent events with high Calculated 24/7/365 Occupancy, especially for occupancies that appear "unusual" or potentially "out of bounds."
Overview Statement Re: Sources of Special Events Occupancy Estimates	

Hospital Patient Data	
Number of Patient Beds	
Average Daily Number of In-Patients	
Average Daily Number of Out-Patients	
Average Time in Building for Out-Patients	

Annual Operating Budget for this Facility

Employees:

	Classification	Number of FTEs[1]	Average Annual Salary per Employee	Total Benefits as Percent of Salary	Annual Salary and Benefits
1	Fire Chief	1	$19,760	0.00%	**$19,760**
2	Office Administrator	1	$13,000	0.00%	**$13,000**
3					**$0**
4					**$0**
5					**$0**
6					**$0**
7					**$0**
8					**$0**
9					**$0**
10					**$0**
	Total Number of FTEs:	**2.00**		**Subtotal:**	**$32,760**

[1] FTEs: Full time equivalents

Other Building Expenses

Category	Annual Cost
Supplies	$89,700
Building Maintenance	$54,000
Utilities	$7,000
Insurance	$24,000
Rent	$0
Average Annual Capital Goods	$17,500
OTHER: specify below	
Percent of District Office/Headquarters Annual Operating Budget Attributed to This Building:	**$0**
If rent is zero (building owned), a proxy rent is calculated automatically, based on the value of the building:	**$201,600**
Subtotal:	**$393,800**

Total Building Annual Operating Budget:	**$426,560**

Annual Operating Budget for this Facility

For entities with multiple facilities, a fraction of the operating budget for a District Office of Headquarters building may be attributed to the building being retrofitted. That is, the annual operating budget for the building above may include part of the operating budget for the District Office or Headquarters Building.
If so, complete the following tables:

District Office/Headquarters Building Employees

	Classification	Number of FTEs[1]	Average Annual Salary per Employee	Total Benefits as Percent of Salary	Annual Salary and Benefits
1					$0
2					$0
3					$0
4					$0
5					$0
6					$0
7					$0
8					$0
9					$0
10					$0
	Total Number of FTEs:	0.00		Subtotal:	$0

District Office/Headquarters Building Expenses

Category		Annual Cost
Supplies		
Building maintenance		
Utilities		
Insurance		
Rent		
Average Annual Capital Goods		
OTHER: specify below		
Enter replacement value of building:		
If rent is zero (building owned), a proxy rent is calculated		$0
	Subtotal:	$0

Total Annual Operating Budget for District Office/Headquarters Building:	**$0**

DOCUMENTATION: ANNUAL OPERATING BUDGET	
NOTE:	**The Annual Operating Budget is used as a "proxy" for the value of services provided from a building and is used to count the benefits of avoiding loss of service in future earthquake events.**
Operating Budget by Categories	
Percent of District Office or Headquarters Annual Operating Budget Attributed to the Facility	

Building Part A: Data for Benefit-Cost Analysis

Building Name:	**Drakes Crossing Fire Station**
Building ID:	**Mari_fir38A**
Building Part Name / Description:	**Fire Station**

Evaluation for Building Part A

Seismic Hazard Data		
Region of Seismicity	Moderately High	
PGA Ground Motion (g)	2% in 50 year	0.321
	5% in 50 year	0.199
	10% in 50 year	0.124
	20% in 50 year	0.067
Spectral Accelerations (g)	S_{xs}, 2% in 50 year	0.685
	S_{x1}, 2% in 50 year	0.232
	S_{xs}, 10% in 50 year	0.262
	S_{x1}, 10% in 50 year	0.083

Data Entry Item	User Entered Values	Default Values	Used for BCA
Site Data			
County		Marion	Marion
Decimal Latitude		44.92639	44.92639
Decimal Longitude		122.65712	122.65712
Soil Type		B	AB
Construction Data			
Primary Structure Type (FEMA 154)		S3	S3
Number of Stories		1	1
Year Built	1990	0	1990
Rapid Visual Screening Data			
Pre-Code		No	No
Post-Benchmark		No	No
Existing Severe Vertical Irregularity		No	No
Existing Moderate Vertical Irregularity		No	No
Existing Plan Irregularity	Yes	No	Yes
Are Existing Structural Irregularities (RVS) resolved by the Structural Retrofit plan?			
Severe Vertical Irregularity is Resolved		N/A	N/A
Moderate Vertical Irregularity is Resolved		N/A	N/A
Plan Irregularity is Resolved	Yes	No	Yes
Building Data			
Historic Importance		None	None
Historic Adjustment Modifier	N/A	N/A	1.00
Building Square Footage - SF	4,800	4,800	4,800
Building Replacement - $/SF		$600.00	$600
Building Replacement Value - $	N/A	N/A	$2,880,000
Historic Building Replacement - $/SF	N/A	N/A	$600
Historic Building Replacement Value - $	N/A	N/A	$2,880,000
Contents Value - % of Building Value		100%	100%
Displacement Costs - $/SF/month		$2.75	$2.75
Displacement Costs - One Time		$3.25	$3.25
Average Annual Occupancy	0.00	2.98	2.98
Annual Operating Budget	$0	$426,560	$426,560
Seismic Fragility Curves			
Before Mitigation			
Slight Damage State		0.09	0.09
Moderate Damage State		0.12	0.12
Extensive Damage State		0.18	0.18
Complete Damage State		0.34	0.34
Beta		0.66	0.66
After Mitigation			
Retrofit Building Type		S3	S3
Risk Category		IV	IV
Slight Damage State		0.18	0.18
Moderate Damage State		0.29	0.29
Extensive Damage State		0.59	0.59
Complete Damage State		1.09	1.09
Beta		0.62	0.62

Data Documentation: Building Part A	
Brief documentation and/or refs to other docs included with your app (inc. pg #) MUST BE PROVIDED below whenever a User Entered Value (Column C) is given that intends to override a Database Default Value in Column D. If no justification is given, the User Input will not be used.	
Soil Type	
Primary Structure Type	
Number of Stories	
Year Built	Building built in 1990.
Severe Vertical Irregularity	
Moderate Vertical Irregularity	
Plan Irregularity	Moment frame addresses irregularity.
Pre-Code	
Post-Benchmark	
Historic Importance (if not none)	
Building Square Footage	
Building Replacement Value $/SF	
Contents Value % of Building Value	
Displacement Costs One Time	
Displacement Costs $/SF/month	
Fragility Curve Parameters Before Mitigation	
Fragility Curve Parameters After Mitigation	
Other Comments	

Appendix E

ASCE 41-17 TIER 1 CHECKLISTS

ASCE 41-17 Tier 1 Checklists

FIRM:	WRK Engineers
PROJECT NAME:	Drakes Crossing RFPD
SEISMICITY LEVEL:	Moderate
PROJECT NUMBER:	24021.00
COMPLETED BY:	WN
DATE COMPLETED:	8/23/2024
REVIEWED BY:	BK
REVIEW DATE:	8/25/2024

17.1.2IO Basic Configuration Checklist

Table 17-3. Immediate Occupancy Basic Configuration Checklist

	Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
	Very Low Seismicity							
	Seismic-Force-Resisting System							
S1	**C** ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.1	A.2.1.1	Provide complete load path for the transfer of inertial forces to building foundation.
	BK ☐	**NC** ☐	**N/A** ☒	**U** ☐	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 seismicity, and 3.0% in high seismicity.	5.4.1.2	A.2.1.2	
S2	**11** ☐	**NC** ☒	**N/A** ☐	**U** ☐	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	Anchor mezzanine to main structure lateral force resisting system and add shear walls as required.
	Building System-Building Configuration							
	C ☐	**NC** ☐	**N/A** ☒	**U** ☐	WEAK STORY: The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above.	5.4.2.1	A.2.2.2	
	C ☐	**NC** ☐	**N/A** ☒	**U** ☐	SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above.	5.4.2.2	A.2.2.3	
	C ☒	**NC** ☐	**N/A** ☐	**U** ☐	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	
	C ☒	**NC** ☐	**N/A** ☐	**U** ☐	GEOMETRY: There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines.	5.4.2.4	A.2.2.5	
	C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.5	A.2.2.6	
	C ☒	**NC** ☐	**N/A** ☐	**U** ☐	TORSION: The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension.	5.4.2.6	A.2.2.7	
	Low Seismicity (Complete the Following Items in Addition to the Items for Very Low Seismicity							
	Geologic Site Hazards							
	C ☒	**NC** ☐	**N/A** ☐	**U** ☐	LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building.	5.4.3.1	A.6.1.1	
	C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.3.1	A.6.1.2	
	C ☒	**NC** ☐	**N/A** ☐	**U** ☐	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	
	Moderate and High Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
	Foundation Configuration							
	C ☒	**NC** ☐	**N/A** ☐	**U** ☐	OVERTURNING: The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than 0.6*Sa.	5.4.3.3	A.6.2.1	
	C ☐	**NC** ☐	**N/A** ☒	**U** ☐	TIES BETWEEN FOUNDATION ELEMENTS: The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C.	5.4.3.4	A.6.2.2	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

17.6IO Structural Checklist for Building Types S3: Metal Building Frames

Table 17-13. Immediate Occupancy Checklist for Building Type S3

	Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
	Very Low Seismicity							
	Seismic-Force-Resisting System							
S3	C ☐	NC ☒	N/A ☐	U ☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than 0.50Fy.	5.5.4.1	A.3.3.1.2	Install new lateral force resisting elements to replace existing vertical rod bracing.
S4	C ☐	NC ☒	N/A ☐	U ☐	FLEXURAL STRESS CHECK: The average flexural stress in the moment-frame columns and beams, calculated using the Quick Check procedure of Section 4.4.3.9, is less than Fy.	5.5.2.1.2	A.3.3.1.3	Install steel moment frames and plywood shear walls to replace existing steel moment frames.
	Connections							
S5	C ☐	NC ☒	N/A ☐	U ☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel moment frames.	5.7.2	A.5.2.2	Strengthen diaphragms to adequately connect and transfer seismic forces to the lateral force resisting elements.
	C ☒	NC ☐	N/A ☐	U ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1	
	Moderate Seismicity (Complete the Following Items in Addition to the Items for Very Low and Low Seismicity)							
	Seismic-Force-Resisting System							
S6	C ☐	NC ☒	N/A ☐	U ☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the elastic moment (FyS) of the adjoining members.	5.5.2.2.1	A.3.1.3.4	Install new moment frames and plywood shear walls at strategic locations to resist lateral loads.
	Diaphragms							
	C ☐	NC ☐	N/A ☒	U ☐	PLAN IRREGULARITIES: There is tensile capacity to develop the strength of the diaphragm at reentrant corners or other locations of plan irregularities.	5.6.1.4	A.4.1.7	
	C ☐	NC ☐	N/A ☒	U ☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	
	C ☒	NC ☐	N/A ☐	U ☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	
	Connections							
	C ☐	NC ☐	N/A ☒	U ☐	ROOF PANELS: Where considered as diaphragm elements for lateral resistance, metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces.	5.7.5	A.5.5.1	
	C ☐	NC ☐	N/A ☒	U ☐	WALL PANELS: Where considered as shear elements for lateral resistance, metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces.	5.7.5	A.5.5.2	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Table 17-13. Immediate Occupancy Checklist for Building Type S3

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Seismic-Force-Resisting System							
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the strength of the adjoining members or panel zones.	5.5.2.2.1	A.3.1.3.4	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	COMPACT MEMBERS: All frame elements meet compact section requirements in accordance with AISC 360, Table B4.1.	5.5.2.2.4	A.3.1.3.8	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	BEAM PENETRATIONS: All openings in frame-beam webs are less than one quarter of the beam depth and are located in the center half of the beams.	5.5.2.2.5	A.3.1.3.9	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	OUT-OF-PLANE BRACING: Beam–column joints are braced out of plane.	5.5.2.2.7	A.3.1.3.11	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	BOTTOM FLANGE BRACING: The bottom flanges of beams are braced out of plane.	5.5.2.2.8	A.3.1.3.12	
Connections							
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel moment frames, and the connections are able to develop the lesser of the strength of the frames or the diaphragms.	5.7.2	A.5.2.2	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation, and the anchorage is able to develop the least of the following: the tensile capacity of the column, the tensile capacity of the lowest level column splice (if any), or the uplift capacity of the foundation.	5.7.3.1	A.5.3.1	
Foundation System							
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	DEEP FOUNDATIONS: Piles and piers are capable of transferring the seismic forces between the structure and the soil.		A.6.2.3	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	SLOPING SITES: The difference in foundation embedment depth from one side of the building to another does not exceed one story.		A.6.2.4	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

17.19 Nonstructural Checklist

Table 17-38. Nonstructural Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Life Safety Systems							
C	NC	N/A	U	HR—not required; LS—LMH; PR—LMH. FIRE SUPPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13.	13.7.4	A.7.13.1	
C	NC	N/A	U	HR—not required; LS—LMH; PR—LMH. FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13.	13.7.4	A.7.13.2	
C	NC	N/A	U	HR—not required; LS—LMH; PR—LMH. EMERGENCY POWER: Equipment used to power or control Life Safety systems is anchored or braced.	13.7.7	A.7.12.1	
C	NC	N/A	U	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.	13.7.6	A.7.14.1	
C	NC	N/A	U	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.	13.7.4	A.7.13.3	
C	NC	N/A	U	HR—not required; LS—not required; PR—LMH. EMERGENCY LIGHTING: Emergency and egress lighting equipment is anchored or braced.	13.7.9	A.7.3.1	
Hazardous Materials							
C	NC	N/A	U	HR—LMH; LS—LMH; PR—LMH. HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers.	13.7.1	A.7.12.2	
C	NC	N/A	U	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.	13.8.3	A.7.15.1	
C	NC	N/A	U	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.	13.7.3 13.7.5	A.7.13.4	
C	NC	N/A	U	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.	13.7.3 13.7.5	A.7.13.3	
C	NC	N/A	U	HR—LMH; LS—LMH; PR—LMH. FLEXIBLE COUPLINGS: Hazardous material ductwork and piping, including natural gas piping, have flexible couplings.	13.7.3 13.7.5	A.7.15.4	
C	NC	N/A	U	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.	13.7.3 13.7.5 13.7.6	A.7.13.6	
Partitions							
C	NC	N/A	U	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.	13.6.2	A.7.1.1	
C	NC	N/A	U	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.	13.6.2	A.7.2.1	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Table 17-38. Nonstructural Checklist

	Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.6.2	A.7.1.2	
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.6.2	A.7.2.1	
	C	NC	N/A	U				
	☐	☐	☒	☐	HR—not required; LS—not required; PR—MH. STRUCTURAL SEPARATIONS: Partitions that cross structural separations have seismic or control joints.	13.6.2	A.7.1.3	
N1	C	NC	N/A	U				
	☐	☒	☐	☐	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).	13.6.2	A.7.1.4	Tops of partitions are to be braced to the adjacent structure.
	Ceilings							
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.6.4	A.7.2.3	
	C	NC	N/A	U				
	☐	☐	☒	☐	HR—not required; LS—MH; PR—LMH. SUSPENDED GYPSUM BOARD: Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 $ft.^2$ (1.1 m^2) of area.	13.6.4	A.7.2.3	
	C	NC	N/A	U				
	☐	☐	☒	☐	HR—not required; LS—not required; PR—MH. INTEGRATED CEILINGS: Integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) 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.	13.6.4	A.7.2.2	
	C	NC	N/A	U				
	☐	☐	☒	☐	HR—not required; LS—not required; PR—MH. EDGE CLEARANCE: The free edges of integrated suspended ceilings with continuous areas greater than 144 $ft.^2$ (13.4 m^2) 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).	13.6.4	A.7.2.4	
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.6.4	A.7.2.5	
	C	NC	N/A	U				
	☐	☐	☒	☐	HR—not required; LS—not required; PR—H. EDGE SUPPORT: The free edges of integrated suspended ceilings with continuous areas greater than 144 $ft.^2$ (13.4 m^2) are supported by closure angles or channels not less than 2 in. (51 mm) wide.	13.6.4	A.7.2.6	
	C	NC	N/A	U				
	☐	☐	☒	☐	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 ft^2 (232.3 m^2) and has a ratio of long-to-short dimension no more than 4-to-1.	13.6.4	A.7.2.7	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Table 17-38. Nonstructural Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Light Fixtures							
C ☐	NC ☐	N/A ☒	U ☐	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.	13.6.4 13.7.9	A.7.3.2	
C ☐	NC ☐	N/A ☒	U ☐	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 attached without damaging adjoining components. Additionally, the connection to the structure is capable of accommodating the movement without failure.	13.7.9	A.7.3.3	
C ☐	NC ☐	N/A ☒	U ☐	HR—not required; LS—not required; PR—H. LENS COVERS: Lens covers on light fixtures are attached with safety devices.	13.7.9	A.7.3.4	
Cladding and Glazing							
C ☐	NC ☐	N/A ☒	U ☐	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)	13.6.1	A.7.4.1	
C ☐	NC ☐	N/A ☒	U ☐	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-diameterratio of 4.0 or less.	13.6.1	A.7.4.3	
C ☐	NC ☐	N/A ☒	U ☐	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.	13.6.1	A.7.4.4	
C ☐	NC ☐	N/A ☒	U ☐	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.	13.6.1	A.7.4.9	
C ☐	NC ☐	N/A ☒	U ☐	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.	13.6.1.4	A.7.4.5	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Table 17-38. Nonstructural Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
C	NC	N/A	U				
☐	☐	☒	☐	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.	13.6.1.4	A.7.4.6	
☐	☐	☒	☐	HR—MH; LS—MH; PR—MH. INSERTS: Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel.	13.6.1.4	A.7.4.7	
☐	☐	☒	☐	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.	13.6.1.5	A.7.4.8	
Masonry Veneer							
☐	☐	☒	☐	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 ModerateSeismicity, 36 in. (914 mm); for Life Safety in High Seismicity and for Position Retention in any seismicity, 24 in. (610 mm).	13.6.1.2	A.7.5.1	
☐	☐	☒	☐	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.	13.6.1.2	A.7.5.2	
☐	☐	☒	☐	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.	13.6.1.2	A.7.5.3	
☐	☐	☒	☐	HR—LMH; LS—LMH; PR—LMH. UNREINFORCED MASONRY BACKUP: There is no unreinforced masonry backup.	13.6.1.1 13.6.1.2	A.7.7.2	
☐	☐	☒	☐	HR—not required; LS—MH; PR—MH. STUD TRACKS: For veneer with cold-formed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center.	13.6.1.1 13.6.1.2	A.7.6.1	
☐	☐	☒	☐	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.	13.6.1.1 13.6.1.2	A.7.7.1	
☐	☐	☒	☐	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.	13.6.1.2	A.7.5.6	
☐	☐	☒	☐	HR—not required; LS—not required; PR—MH. OPENINGS: For veneer with cold-formed-steel stud backup, steel studs frame window and door openings.	13.6.1.1 13.6.1.2	A.7.6.2	
Parapets, Cornices, Ornamentation, and Appendages							
☐	☐	☒	☐	HR—LMH; LS—LMH; PR—LMH. URM PARAPETS OR CORNICES: Laterally unsupported unreinforced masonry parapets or cornices have height-to-thicknessratios 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.	13.6.5	A.7.8.1	
☐	☐	☒	☐	HR—not required; LS—LMH; PR—LMH. CANOPIES: Canopies at building exits are anchored to the structure at a spacing less 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).	13.6.6	A.7.8.2	
☐	☐	☒	☐	HR—H; LS—MH; PR—LMH. CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement.	13.6.5	A.7.8.3	

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Table 17-38. Nonstructural Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
C	NC	N/A	U				
☐	☐	☒	☐	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.	13.6.6	A.7.8.4	
Masonry Chimneys							
☐	☐	☒	☐	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.	13.6.7	A.7.9.1	
☐	☐	☒	☐	HR—LMH; LS—LMH; PR—LMH. ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof.	13.6.7	A.7.9.2	
Stairs							
☐	☐	☒	☐	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.	13.6.2 13.6.8	A.7.10.1	
☐	☐	☒	☐	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.	13.6.8	A.7.10.2	
Contents and Furnishings							
☐	☐	☒	☐	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.	13.8.1	A.7.11.1	
N2 ☐	☒	☐	☐	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.	13.8.2	A.7.11.2	Brace and/or anchor all contents more than 6 ft. high to the structure or to each other.
☐	☐	☒	☐	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.	13.8.2	A.7.11.3	
☐	☐	☒	☐	HR—not required; LS—not required; PR—MH. ACCESS FLOORS: Access floors more than 9 in. (229 mm) high are braced.	13.6.10	A.7.11.4	
☐	☐	☒	☐	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.	13.7.7 13.6.10	A.7.11.5	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Table 17-38. Nonstructural Checklist

	Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
	C	NC	N/A	U				
	☐	☐	☒	☐	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	13.8.2	A.7.11.6	
	Mechanical and Electrical Equipment							
	C	NC	N/A	U				
	☐	☐	☒	☐	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-lineequipment, is braced.	13.7.1 13.7.7	A.7.12.4	
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.7.1	A.7.12.5	
	C	NC	N/A	U				
	☒	☐	☐	☐	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.	13.7.1 13.7.7	A.7.12.6	
N3	C	NC	N/A	U				
	☐	☒	☐	☐	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.	13.6.9	A.7.12.7	Replace doors to operate at a story drift ratio of 0.01.
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.7.1 13.7.7	A.7.12.8	
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.7.1	A.7.12.9	
	C	NC	N/A	U				
	☐	☐	☒	☐	HR—not required; LS—not required; PR—H. HEAVY EQUIPMENT: Floor-supported or platform-supportedequipment weighing more than 400 lb (181.4 kg) is anchored to the structure.	13.7.1 13.7.7	A.7.12.10	
	C	NC	N/A	U				
	☐	☐	☒	☐	HR—not required; LS—not required; PR—H. ELECTRICAL EQUIPMENT: Electrical equipment is laterally braced to the structure.	13.7.7	A.7.12.11	
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.7.8	A.7.12.12	
	Piping							
	C	NC	N/A	U				
	☐	☐	☒	☐	HR—not required; LS—not required; PR—H. FLEXIBLE COUPLINGS: Fluid and gas piping has flexible couplings.	13.7.3 13.7.5	A.7.13.2	
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.7.3 13.7.5	A.7.13.4	
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.7.3 13.7.5	A.7.13.5	
	C	NC	N/A	U				
	☐	☐	☒	☐	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.	13.7.3 13.7.5	A.7.13.6	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Table 17-38. Nonstructural Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Ducts							
C ☐	NC ☐	N/A ☒	U ☐	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).	13.7.6	A.7.14.2	
C ☐	NC ☐	N/A ☒	U ☐	HR—not required; LS—not required; PR—H. DUCT SUPPORT: Ducts are not supported by piping or electrical conduit.	13.7.6	A.7.14.3	
C ☐	NC ☐	N/A ☒	U ☐	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.	13.7.6	A.7.14.4	
Elevators							
C ☐	NC ☐	N/A ☒	U ☐	HR—not required; LS—H; PR—H. RETAINER GUARDS: Sheaves and drums have cable retainer guards.	13.7.11	A.7.16.1	
C ☐	NC ☐	N/A ☒	U ☐	HR—not required; LS—H; PR—H. RETAINER PLATE: A retainer plate is present at the top and bottom of both car and counterweight.	13.7.11	A.7.16.2	
C ☐	NC ☐	N/A ☒	U ☐	HR—not required; LS—not required; PR—H. ELEVATOR EQUIPMENT: Equipment, piping, and other components that are part of the elevator system are anchored.	13.7.11	A.7.16.3	
C ☐	NC ☐	N/A ☒	U ☐	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.	13.7.11	A.7.16.4	
C ☐	NC ☐	N/A ☒	U ☐	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.	13.7.11	A.7.16.5	
C ☐	NC ☐	N/A ☒	U ☐	HR—not required; LS—not required; PR—H. COUNTERWEIGHT RAILS: All counterweight rails and divider beams are sized in accordance with ASME A17.1.	13.7.11	A.7.16.6	
C ☐	NC ☐	N/A ☒	U ☐	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.	13.7.11	A.7.16.7	
C ☐	NC ☐	N/A ☒	U ☐	HR—not required; LS—not required; PR—H. SPREADER BRACKET: Spreader brackets are not used to resist seismic forces.	13.7.11	A.7.16.8	
C ☐	NC ☐	N/A ☒	U ☐	HR—not required; LS—not required; PR—H. GO-SLOW ELEVATORS: The building has a go-slow elevator system.	13.7.11	A.7.16.9	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Appendix F

DOGAMI HAZARDS & RVS

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PL

NP

0D[DU 0LFURVRIW 2UHJRQ 'HSDUWPHQW RI 7UDQ
,QIRUPDWLRQ 6HUYLFHV 8QLW

'UDNHV &URVVLQJ 5)3' /DQGVOLGH +D]DU

-XO\

'HWDLOHG 6XVFHSWLELOLW\ 5HTXHVWHG 9DSV

'HHS 6XVFHSWLELOLW\

/RZ VXVFHSWLELOLW\ WR ODQGVOLGHV

0RGHUDWH VXVFHSWLELOLW\ WR ODQGVOLGHV

+LJK VXVFHSWLELOLW\ WR ODQGVOLGHV

6KROORZ 6XVFHSWLELOLW\

/RZ VXVFHSWLELOLW\ WR ODQGVOLGHV

0RGHUDWH VXVFHSWLELOLW\ WR ODQGVOLGHV

+LJK VXVFHSWLELOLW\ WR ODQGVOLGHV

6WDWHZLGH /DQGVOLGH 6XVFHSWLELOLW\ 2YHUYLHZ 0DS

9HU\ +LJK

PL

NP

0D[DU 0LFURVRIW 2UHJRQ 'HSDUWPHQW RI 7UDQ
,QIRUPDWLRQ 6HUYLFHV 8QLW

'UDNHV &URVVLQJ 5)3' /LTXHIDFWLRQ +D]

-XO\ /LTXHIDFWLRQB6XVF WLELOL B0DS /RZ +LJK

1RQH

0RGHUDWH 9HU\ +LJK

9HU\ /RZ

PL

NP

0D[DU 0LFURVRIW 2UHJRQ 'HSDUWPHQW RI 7UDQ' ,QIRUPDWLRQ 6HUYLFHV 8QLW

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

Mari_fir38A
Level 1
MODERATELY HIGH Seismicity

Address: 19364 POWERS CREEK LOOP ROAD
SILVERTON, OR Zip: 97381
Other Identifiers: Building Part A
Building Name: DRAKES CROSSING RFPD FIRE STATION
Use: FIRE STATION
Latitude: 44.92639 Longitude: 122.65712
S_S: 0.716 S_1: 0.350
Screener(s): WN Date/Time: 08/16/2024

No. Stories: Above Grade: 1 Below Grade: 0 Year Built: 1990 ☒ EST
Total Floor Area (sq. ft.): 4,800 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) ☒ Plan (type) Torsion

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

COMMENTS:
HATCH INDICATES BUILDING SCOPE

☐ 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	**4.1**	**3.7**	**3.2**	**2.3**	**2.2**	**2.9**	**2.2**	**2.0**	**1.7**	**2.1**	**1.4**	**1.8**	**1.5**	**1.8**	**1.8**	**1.2**	**2.2**
Severe Vertical Irregularity, V_{L1}	-1.3	-1.3	-1.3	-1.1	-1.0	-1.2	-1.0	-0.9	-1.0	-1.1	-0.8	-1.0	-0.9	-1.0	-1.0	-0.8	NA
Moderate Vertical Irregularity, V_{L1}	-0.8	-0.8	-0.8	-0.7	-0.6	-0.8	-0.6	-0.6	-0.6	-0.6	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5	NA
Plan Irregularity, P_{L1}	-1.3	-1.2	-1.1	-0.9	-0.8	-1.0	-0.8	-0.7	-0.7	-0.9	-0.6	-0.8	-0.7	-0.7	-0.7	-0.5	NA
Pre-Code	-0.8	-0.9	-0.9	-0.5	-0.5	-0.7	-0.6	-0.2	-0.4	-0.7	-0.1	-0.4	-0.3	-0.5	-0.5	-0.1	-0.3
Post-Benchmark	1.5	1.9	2.3	1.4	1.4	1.0	1.9	NA	1.9	2.1	NA	2.1	2.4	2.1	2.1	NA	1.2
Soil Type A or B	0.3	0.6	0.9	0.6	0.9	0.3	0.9	0.9	0.6	0.8	0.7	0.9	0.7	0.8	0.8	0.6	0.9
Soil Type E (1-3 stories)	0.0	-0.1	-0.3	-0.4	-0.5	0.0	-0.4	-0.5	-0.2	-0.2	-0.4	-0.5	-0.3	-0.4	-0.4	-0.3	-0.5
Soil Type E (> 3 stories)	-0.5	-0.8	-1.2	-0.7	-0.7	NA	-0.7	-0.6	-0.6	-0.8	-0.4	NA	-0.5	-0.6	-0.7	-0.3	NA
Minimum Score, S_{MIN}	*1.6*	*1.2*	*0.8*	*0.5*	*0.5*	*0.9*	*0.5*	*0.5*	*0.3*	*0.3*	*0.3*	*0.3*	*0.2*	*0.3*	*0.3*	*0.2*	*1.4*

FINAL LEVEL 1 SCORE, $S_{L1} \geq S_{MIN}$: 2.2 **FEMA 154 Collapse Potential = Low**

EXTENT OF REVIEW

Exterior: ☐ Partial ☒ All Sides ☐ Aerial
Interior: ☐ None ☒ Visible ☒ Entered
Drawings Reviewed: ☐ Yes ☒ No
Soil Type Source: DOGAMI
Geologic Hazards Source: USGS.gov
Contact Person: WILL NICKELSON

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