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Vulnerability of Some Sitka School District Schools to Earthquake Damage Based on Rapid Visual Screening

June 15, 2018

Prepared for: Sitka School District and
Alaska Seismic Hazards Safety Commission
Administered by: The Earthquake Engineering Research Institute
Funded by: Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA)

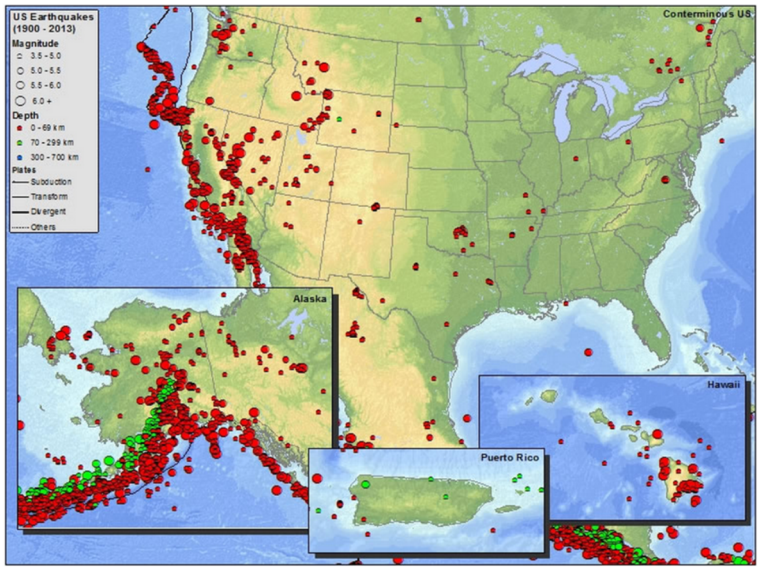
The Department of Homeland Security (DHS)

The Earthquake Engineering Research Institute (EERI)

The Alaska Seismic Hazards Safety Commission (ASHSC)

Executive Summary:

BBFM Engineers was contracted by EERI and ASHSC to perform a rapid visual screening of several schools in the Sitka School District. A rapid visual screening is defined by FEMA P-154, which describes it as a "sidewalk survey." The screening process ranks the buildings by approximate level of safety, based on generalizations such as construction type, age of building, detailing practices common at the time, local seismicity, building structural irregularities, and the like.



Sites of major earthquakes in the US (USGS)

Dennis L. Berry, PE Troy J. Feller, PE Colin Maynard, PE Scott M. Gruhn, PE Greg Latreille, PE

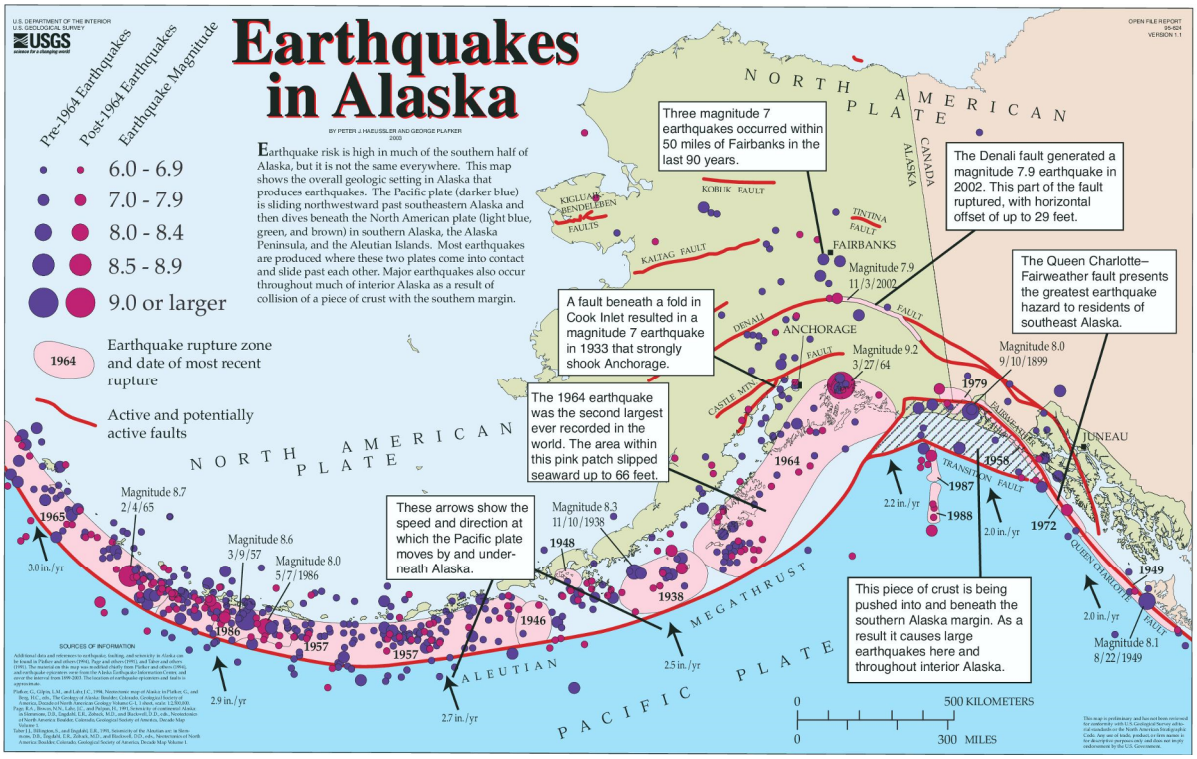
This project reviewed original construction and one addition at Baranof Elementary School, Blatchley Middle School, and Keet Gooshi Heen Middle School. The rapid visual screening process established by FEMA recommends further investigation for all structures investigated. This report ranks the structures by the FEMA estimate of risk.

Seismicity in Alaska:

Alaska is among the most seismically active areas on Earth. Over the past 50 years, the United States Geological Survey (USGS) recorded in the United States more than 3,000 earthquakes more powerful than magnitude 5, with approximately 80% of these occurring in Alaska. Further, of the twelve most powerful earthquakes America has ever experienced, ten were located in Alaska. These include the 1964 Great Alaska Earthquake, which remains the second-most powerful ever measured on Earth.

Alaska's intense seismicity is a result of plate tectonics. The Pacific Plate, moving north 2" to 3" per year, slides below the North American Plate at a fault called the Aleutian Megathrust. This tectonic collision and subduction is able to produce an earthquake up to magnitude 9.2, according to the Federal Emergency Management Agency (FEMA). Many other faults occur around the state, and though earthquakes associated with them are not as powerful, they may govern the nearby ground accelerations because of their close proximity.

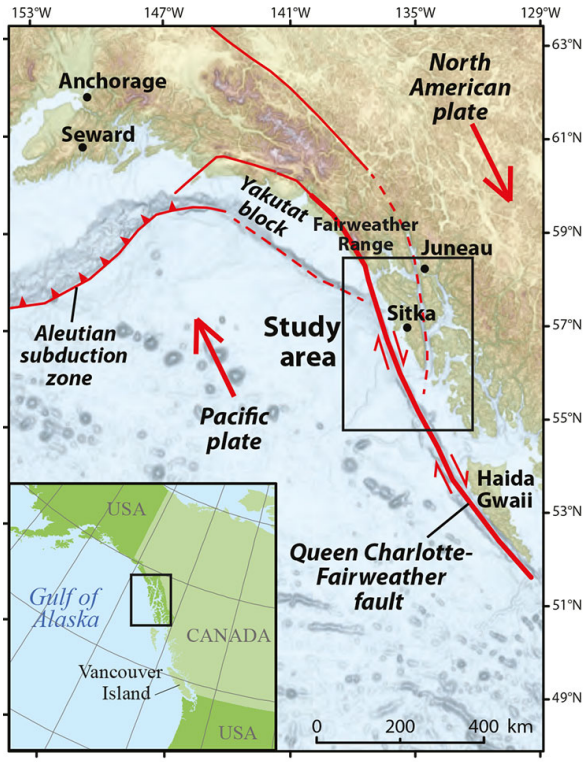
The strength and duration of Alaska's 1964 earthquake shocked the scientific world, spurring an increase in research in plate tectonics and seismology. The Alaska Dispatch News chronicled many of these changes in a March 23, 2014 article on the subject: "'The 1964 event changed the way we



Alaskan seismicity: faults, earthquakes, and rupture zones (USGS)

thought about earthquakes,' said Mike West, state seismologist with the [Alaska Earthquake Center] at the University of Alaska Fairbanks. 'It literally helped prove plate tectonics.'"

The dominant seismic fault in Southeast Alaska is the Queen Charlotte-Fairweather fault, which has generated six earthquakes of magnitude 7 or greater, including a magnitude 8.1 event off the coast of British Columbia in 1949. Near Sitka, this fault is a strike-slip fault moving some 50 millimeters per year.



Faults in Southeast Alaska (USGS)

Building Codes:

As noted above, the 1964 Great Alaska Earthquake changed the geological understanding of earthquakes. It also substantially changed the way building structures are designed. In 1973, the Uniform Building Code was modified to add many new, specific requirements. For example, descriptions of seismic force collectors within floors and roofs were added, as were new detailing requirements for seismic safety in regions of high seismicity. Design seismic forces for braced frames effectively doubled; unreinforced masonry and concrete were now prohibited for all structural elements in regions of high seismicity; gravity-only columns now needed to be designed to have sufficient strength when swaying dramatically during a seismic event.

Since then, building codes have continued to be modernized. In response to observations after other earthquakes and informed by extensive testing, building code committees have continued to increase design seismic forces, establish more robust detailing requirements, and intensify inspection mandates. Schools in particular are now designed for an increased factor of safety because of their importance to their communities. Further, in some cases schools are designed to an even higher level of safety so they can be used as shelters following a major earthquake. Because of these changes and many others, buildings constructed today are much more earthquake-resistant than older buildings.

The fact that older buildings are less earthquake-resistant is significant to Alaska's schools because many of them were constructed before building code modernization began to improve the safety of building construction. As a result, older school buildings are typically less earthquake-safe than newer ones. How much less safe depends on many factors, including age and type of structural system, structural irregularities, building location, and quality of construction. School districts and managers of facilities would benefit greatly from having good information readily available regarding the safety of their facilities. This would enable them to make informed decisions regarding timing and urgency of any further structural reviews and upgrades.

Rapid Evaluation of Facilities:

To that end, FEMA developed a rapid evaluation procedure outlined in their publication P-154, "Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook." This contains a method for evaluating structures' seismic performance very quickly and without great expense, referring to it as a "sidewalk survey." It takes into account the age and type of structure, building height, irregularities in the structure that decrease reliability, and whether it was constructed before the enforcement of design codes and the implementation of construction inspection. FEMA developed this method to provide a tool to give building owners and managers good, actionable information with minimal up-front cost.

The method used by FEMA P-154 to evaluate a building is quite straightforward. It establishes an initial score for each type of structural system (wood shear walls, steel braced frame, and so forth), with a higher score indicating greater reliability. A given building's initial score is then modified (up or down) based on other factors, including the number of stories, vertical structural irregularities, plan structural irregularities, probable soil type, whether it was designed and constructed before codes were generally enforced, and whether it was designed and constructed under substantially modern codes. The evaluator enters the building information, adding and subtracting from the initial score to obtain the final score. FEMA carefully selected the scores and modifications so the final score could carry some readily understandable information. The Third Edition of FEMA 154 notes, in section 5.2:

> Fundamentally, the final S score is an estimate of the probability (as described in Chapter 1) if an earthquake occurs with ground motions called the risk-targeted maximum considered earthquake, MCE_R, as described in Chapter 2…
> A final score, S, of 3 implies there is a chance of 1 in 10^3, or 1 in 1,000, that the building will collapse if such ground motions occur. A final score, S, of 2 implies there is a chance of 1 in 10^2, or 1 in 100, that the building will collapse if such ground motions occur.

BBFM Engineers makes no statement about these probabilities except to note FEMA's intent in developing the scoring process. Typically a final score below 2.0 is taken as indication that a more detailed investigation is warranted, although that value can be adjusted at the outset of an evaluation project as desired by the owner of the facilities.

Importantly, these scores and risks do not take into account actual member strengths or actual connection reliability, only what is common for similar structural types of similar age. Therefore, the actual building safety may be substantially different from what the scores may indicate. Accordingly, buildings with low scores are noted as requiring further structural investigation to determine whether structural upgrade is warranted. These scores can be used appropriately to identify and rank buildings for their vulnerability to earthquake damage.

Alaska School Safety:

As stated in 2010 by the Western States Seismic Policy Council (WSSPC), "Every community is required to educate children, and it is the responsibility of governmental agencies to design and construct safe buildings to house them. While current building codes and construction practices have recognized the effects of earthquakes and provide state-of-the-art design considerations, many older school buildings were built before these principles were understood… These older

buildings have not been properly graded or passed the test of seismic safety. Consequently, many students face significant seismic risk." The WSSPC is a non-profit consortium of eighteen member states and territories including Alaska.

After all, since children are required to attend school and parents lack specific information about the seismic safety of different structures, it is the responsibility of the government to ensure the schools provide a safe learning environment for Alaska's children. Again, schools may be used as emergency shelters after major earthquakes, further raising the importance of the building's successful performance during an earthquake.

According to the Alaska Department of Education, the total enrollment in public school districts in Alaska as of October 1, 2017, was 133,381, which represents a 0.1% increase over the previous year. Of these, 1,306 students are in the Sitka School District, or about 1.0% of the state's total. School districts statewide accept as part of their mission to protect the safety of children as well as facilities whose replacement cost is many billions of dollars.

This Study:

In the interest of student safety and community resilience to earthquakes, BBFM Engineers was asked to perform a rapid visual screening of a number of aging schools in the Sitka School District to determine which schools warrant an in-depth seismic review, and which structures are expected to perform acceptably during a major earthquake. The screening program follows the criteria established by FEMA Publication 154, Third Edition. FEMA refers to this screening program as a "sidewalk survey" because it is intended to be a very quick review of structure type, structure age, structural discontinuities, local seismicity, and the like. These quick reviews are often based on assumptions about the building code in use at the time, the soil type, and more. They do not consider the particular member sizes and connection details used, as would a more in-depth analysis. Rather, FEMA describes the purpose of P-154 this way: "to provide a methodology to evaluate the seismic safety of a large inventory of buildings quickly and inexpensively, with minimum access to the buildings, and determine those buildings that require a more detailed examination." Therefore, rapid visual screening is general by nature. Where the risk of collapse or partial collapse during the Maximum Considered Earthquake appears to exceed 1%, the screening program recommends a detailed structural evaluation specific to the structure.

In this study, BBFM Engineers completed the screening of three schools, one of which has an addition. In total, then, we reviewed four structures, including original construction and additions. All four warrant a more detailed evaluation.

In addition to further review of the four structures, we also recommend that similar studies be undertaken in all regions of high seismicity throughout the state, especially in light of the cost-effectiveness of the FEMA 154 process, which can be performed for just $700 to $1,200 per structure. Studies examining many structures in readily-accessible areas may find economies allowing them to be performed for fees near the lower end of this range, while remote or smaller-scale studies may require a higher fee.

Objectives of this Study:

This study was funded by FEMA and managed by the Earthquake Engineering Research Institute

(EERI) and the Alaska Seismic Hazards Safety Commission (ASHSC). It is the goal of FEMA and of EERI to improve earthquake safety throughout the country, and to that end they are sponsoring projects in various states to showcase the ease and value of rapid visual observation of schools.

Two goals reside at the core of this study: to show planners how quickly and cost effectively an initial assessment can be performed for schools using FEMA's rapid visual screening program, and to rate a sampling of existing schools to provide the Sitka School District information crucial to their planning purposes. Any buildings of concern can then be prioritized for further study and/or upgrade, as appropriate.

ASHSC looked for a school district with older schools constructed with a variety of structural system types and found a willing participant in the Sitka School District, home of some 1.0% of Alaska's pre-kindergarden through 12th grade students. BBFM reviewed the following three schools:

1) Baranof Elementary School (1954 addition and 1982 addition)
2) Blatchley Middle School (1969 original)
3) Keet Gooshi Heen Middle School (1988 original)

BBFM Engineers visited the school district's plans room and copied all available structural drawings. Before we visited the schools themselves, we began a FEMA P-154 data collection form for each structure, inputting all available information: location in relation to known seismic faults, structural system type, year of construction, and more.

BBFM Engineers then visited the schools, photographing their current condition and noting any conditions not shown on the drawings and materials that, during an earthquake, could become pounding or falling hazards. In this manner, the information necessary for the Rapid Visual Screening was obtained.

Upon approval by the Sitka School District, ASHSC can provide a link to the plans, photos, and other supporting information in electronic format, which may prove invaluable for further building assessment or post-earthquake response. Requests for supporting information should be made to the Alaska Seismic Hazards Safety Commission or BBFM Engineers.

Cost of this Study:

After administrative overhead, BBFM's combined fee for this study and a parallel study in Juneau (of ten structures) was $24,999 plus up to $2,000 for travel-related reimbursables. Rapid Visual Screening can be performed at a very minimal cost, even as low as $700 per structure, depending on availability of drawings, ease of access to schools, and number of schools included in the study.

We uploaded the available structural drawings for all the schools, along with photographs and FEMA P-154 Data Forms onto the cloud, as these could be very useful after a major earthquake. The drawings are in multi-page .pdf format, the standard format for the industry, while the drawings are in .jpg format. ASHSC is able to distribute the URL link when necessary.

Results of the Study:

Of the four structures reviewed, the final scores range from 0.3 to 0.9. According to FEMA's guidelines, these represent estimated probabilities of partial or complete collapse of 50% and 13%, respectively. These probabilities are dramatically impacted by building design and construction practices common at the time, which may differ significantly from the practices used on these particular structures.

Again, all four structures exhibited scores below 2.0, which indicates a need for a more detailed investigation of the structure. Further, one school has a potential hazard from pounding with an adjacent structure, which should be investigated in greater detail. Following are the results for each school, sorted in alphabetical order. Coincidentally, these structures are also sorted by the FEMA estimate of the risk of collapse or partial collapse.

1) Baranof Elementary School: 1954 Original Construction
   - Reinforced concrete shear wall construction
   - Final score = 0.3; FEMA estimate of collapse risk: 50%
   - Detailed investigation is indicated for structural design and detailing.
2) Baranof Elementary School: 1982 Original Construction
   - Reinforced concrete shear wall construction
   - Final score = 0.8; FEMA estimate of collapse risk: 16%
   - Detailed investigation is indicated for structural design and detailing
3) Blatchley Middle School: 1969 Original Construction
   - Reinforced concrete shear wall construction
   - Final score = 0.8; FEMA estimate of collapse risk: 16%
   - Detailed investigation is indicated for structural design and detailing
   - Detailed investigation is indicated for potential pounding at electrical shed in rear
4) Keet Gooshi Heen Middle School: 1988 Original Construction
   - Steel braced frame construction
   - Final score = 0.9; estimate of collapse risk: 12.6%
   - Detailed investigation is indicated for structural design and detailing

With relatively little time or expense, this study has identified several structures that may perform poorly during a major earthquake. The schools appear to pose a significant risk to students in the Sitka School District and to the community they serve. All four original buildings and additions were flagged as requiring further structural attention. In other words, they may pose an unacceptable risk of at least partial collapse during a major earthquake. Following FEMA Publication 154, the four largest contributors to a building's seismic risk are: a) common industry practices when the structure was built, b) type of structural system, c) the presence of and type of structural irregularities, and d) the seismicity of the region.

The study of these schools in the Sitka School District indicates there would be great value in conducting similar studies statewide, where more than 500 public schools serve kindergarten through twelfth grade. It is the responsibility of school districts and school boards, as well as local and statewide governing bodies, to reduce the risk earthquakes currently pose to students and facilities alike, and this rapid evaluation method would quickly and economically identify those structures requiring further attention.

In a December 17, 2014, interview aired by the Alaska Public Radio Network, Alaska Governor Bill Walker pointed out that the tightness of today's Alaskan economy requires policymakers to be particularly focused on our state's priorities, and that education is a high priority. Fortunately, structural review and upgrade is truly one area where "a stitch in time saves nine." Over time, the cost of not upgrading a deficient structure typically exceeds the cost of improving the structure before a major earthquake hits, and even more so when lives and disruption to society are factored in.

Effectiveness of Seismic Retrofit:

Various earthquakes have shown that seismic retrofits to a building can substantially improve its performance during a major earthquake. For example, the 2001 Nisqually Earthquake near Olympia, Washington, produced peak ground accelerations 10% to 30% as strong as the acceleration due to gravity. Reviewing the aftermath, the California Seismic Safety Commission determined that "One hundred and one schools and buildings had been retrofitted for structural components and seven had been retrofitted for non-structural components in the Seattle Public Schools District when the Nisqually earthquake occurred. None of the districts schools suffered significant structural damage. Non-structural damage to colleges and universities included toppling of bookcases and the localized flooding due to a ruptured water line. Some primary and secondary schools in Olympia and Seattle suffered limited structural (damaged beams and columns) and non-structural damage from strong ground shaking."

A second example is the magnitude 6 earthquake that struck Napa, California, in 2014, producing peak ground accelerations of 60% to 100% as strong as the acceleration due to gravity. The earthquake and its aftershocks injured 90 people and caused approximately $1 billion of damage. Engineering News-Record reported on September 3, 2014:

> The epicenter of the American Canyon quake was at the heart of the Napa school district's 30 campuses. Subsequently, three architectural and engineering teams assessed "every room in every school" and observed no structural damage following the quake, says Mark Quattrocchi, principal of Kwok Quattrocchi Architects and one of the survey team members… The schools performed so well because they are built or retrofitted according to much stricter seismic codes than commercial and residential buildings.
>
> "There was no structural damage to any school in the district, even the ones built to older codes in the 1940s, 1950s and 1960s," says Quattrocchi. "Part of this is because seismic upgrades at the schools are treated the same as building an entirely new facility," he adds.
>
> Schools fared well for three reasons: seismic building codes that are more stringent than those for commercial buildings, methodical reviews by the Division of the State Architect and "full-time" state inspection on school construction sites, Quattrocchi says."

For buildings shown to be vulnerable to collapse during earthquakes, seismic retrofit can substantially improve the buildings' performance during a major earthquake.

Further, grants may be available from FEMA and other groups to facilitate seismic upgrades to school buildings.

Recommendations:

We urge planners and policymakers to implement a program to assess rapidly and inexpensively the vulnerability of schools to earthquakes, both for the safety of the students and to protect financial investments across the state. The cost would be approximately about $700 to $1,200 per original structure or addition, depending on availability of drawings, ease of access to the schools, and number of schools being included in the study.

We also encourage further structural review for the four structures identified in this report as posing unacceptable seismic risk. That review should be performed by a qualified structural engineering firm and should include a careful review of the specific loads, members, and connection details specific to these structures. Where appropriate, this additional analysis should include preliminary recommendations for structural upgrade, which can be fleshed out under a separate contract for preparation of construction documents.

For the safety of the students and to protect financial investments across the state, we urge planners and policymakers to implement a program to assess rapidly the vulnerability of schools to earthquakes. This program can be surprisingly inexpensive, costing as little as $700 to $1200 per structure, while effectively indicating which structures would or would not warrant further review. An added benefit of this process is that we have developed a database of photographs, structural plans, and other critical information and placed it on the cloud, where it will be readily available after a major earthquake. We also encourage further structural review and possible seismic retrofit for the four structures identified in this report as requiring a more detailed investigation.

BBFM Engineers

Scott Gruhn

Scott Gruhn, Principal and Project Manager

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Rapid Visual Screening of Sitka Schools for Seismic Risk

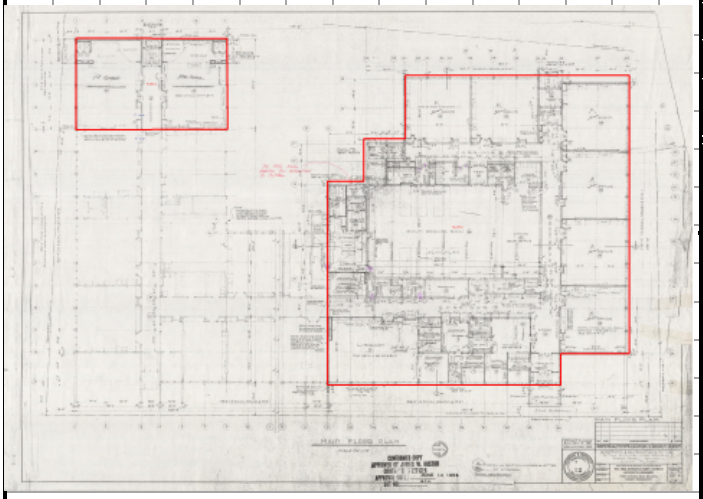
Appendix A

FEMA P-154 Third Edition Data Collection Forms

Dennis L. Berry, PE Troy J. Feller, PE Colin Maynard, PE Scott M. Gruhn, PE Greg Latreille, PE

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

Level 1
VERY HIGH Seismicity



SKETCH

Address: 305 Baranof St
Sitka, AK **Zip:** 99835
Other Identifiers:
Building Name: Baranof Elementary School, 1954 Addition
Use: school
Latitude: 57.0532211 **Longitude:** -135.3310141
S_S: **S_1:**
Screener(s): Scott Gruhn **Date/Time:** March 20, 2018

No. Stories: Above Grade: 1 Below Grade: 0 **Year Built:** 1954 ☐ EST
Total Floor Area (sq. ft.): 22,000 **Code Year:** 1952
Additions: ☐ None ☒ Yes, Year(s) Built: 1954, 1982

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) Moderate: split level
☐ Plan (type) Reentrant corners

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

EXTENT OF REVIEW

Exterior: ☐ Partial ☒ All Sides ☐ Aerial
Interior: ☒ None ☐ Visible ☐ Entered
Drawings Reviewed: ☒ Yes ☐ No
Soil Type Source:
Geologic Hazards Source:
Contact Person:

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)*

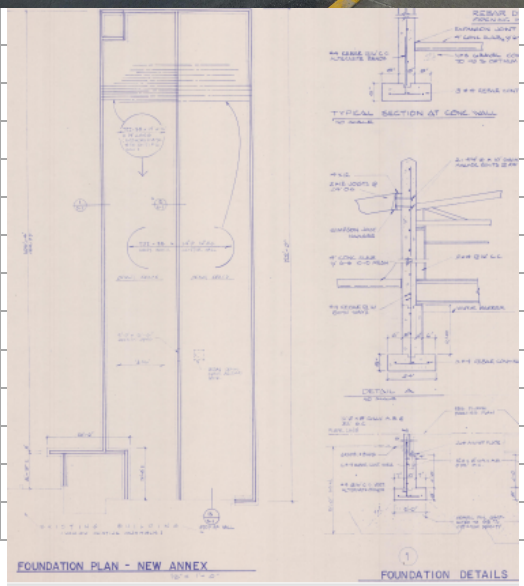
☐ Yes, nonstructural hazards identified that should be evaluated
☐ No, nonstructural hazards exist that may require mitigation, but a detailed evaluation is not necessary
☐ No, no nonstructural hazards identified ☐ DNK

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

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

Level 1
VERY HIGH Seismicity



Address: 305 Baranof St
Sitka, AK **Zip:** 99835
Other Identifiers:
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Use: school
Latitude: 57.0532211 **Longitude:** -135.3310141
S_S: **S_1:**
Screener(s): Scott Gruhn **Date/Time:** March 20, 2018

No. Stories: Above Grade: 1 Below Grade: 0 **Year Built:** 1982 ☐ EST
Total Floor Area (sq. ft.): 4,750 **Code Year:** 1979
Additions: ☐ None ☒ Yes, Year(s) Built: 1954, 1982

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) Moderate: split level
☐ Plan (type)

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

EXTENT OF REVIEW

Exterior: ☐ Partial ☒ All Sides ☐ Aerial
Interior: ☒ None ☐ Visible ☐ Entered
Drawings Reviewed: ☒ Yes ☐ No
Soil Type Source:
Geologic Hazards Source:
Contact Person:

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)*

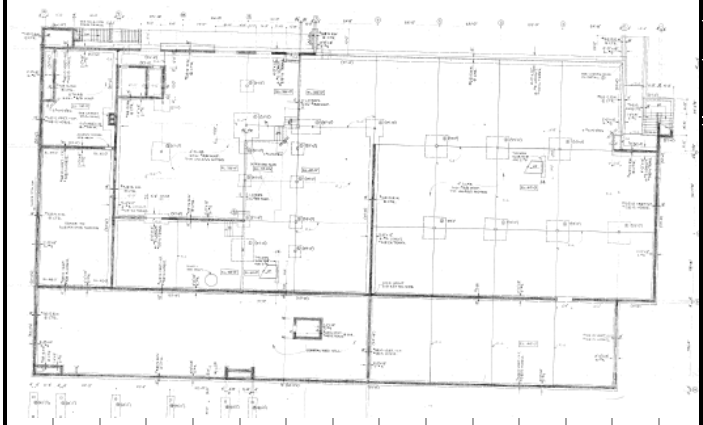
☐ Yes, nonstructural hazards identified that should be evaluated
☐ No, nonstructural hazards exist that may require mitigation, but a detailed evaluation is not necessary
☐ No, no nonstructural hazards identified ☐ DNK

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

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

Level 1
VERY HIGH Seismicity



SKETCH

Address: 601 Halibut Point Rd
Sitka, AK **Zip:** 99835
Other Identifiers:
Building Name: Blatchley Middle School, 1969 Original
Use: school
Latitude: 57.056192, **Longitude:** -135.3455367
S_S: **S_1:**
Screener(s): Scott Gruhn **Date/Time:** March 20, 2018

No. Stories: Above Grade: 1 1/2 Below Grade: 1/2 **Year Built:** 1969 ☐ EST
Total Floor Area (sq. ft.): 68,000 **Code Year:** 1967
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) Moderate: split level, sloping site
☐ Plan (type)

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

COMMENTS:

The back of the building is in contact with an electrical unit and a shed.

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

EXTENT OF REVIEW

Exterior: ☐ Partial ☒ All Sides ☐ Aerial
Interior: ☒ None ☐ Visible ☐ Entered
Drawings Reviewed: ☒ Yes ☐ No
Soil Type Source:
Geologic Hazards Source:
Contact Person:

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

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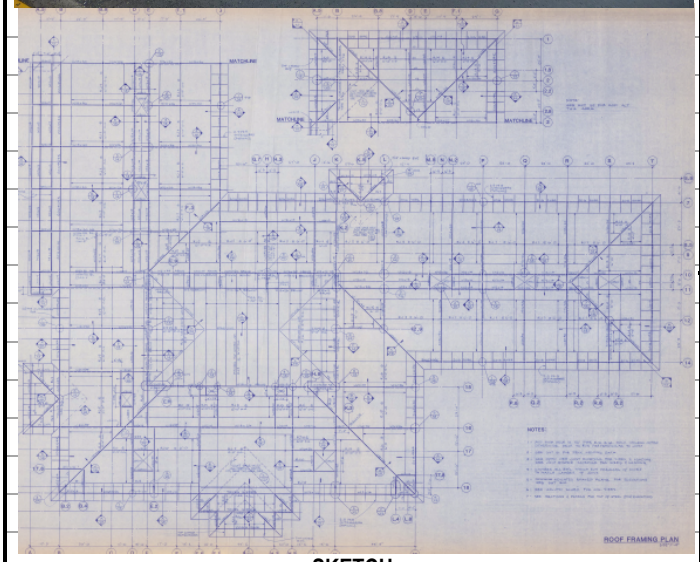
FEMA P-154 Data Collection Form

Level 1
VERY HIGH Seismicity



SKETCH

Address: 307 Kashevaroff St
Sitka, AK **Zip:** 99835
Other Identifiers:
Building Name: Keet Gooshi Heen Middle School, 1988 Original
Use: school
Latitude: 57.0645194, **Longitude:** -135.3518126,21
S_S: **S_1:**
Screener(s): Scott Gruhn **Date/Time:** March 20, 2018

No. Stories: Above Grade: 1 Below Grade: 0 **Year Built:** 1988 ☐ EST
Total Floor Area (sq. ft.): 58,000 **Code Year:** 1985
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) Reentrant corners

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

EXTENT OF REVIEW

Exterior: ☐ Partial ☒ All Sides ☐ Aerial
Interior: ☒ None ☐ Visible ☐ Entered
Drawings Reviewed: ☒ Yes ☐ No
Soil Type Source:
Geologic Hazards Source:
Contact Person:

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

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