ELIGIBILITY EVALUATION REPORT

School District:	Bakersfield City School District	Original Report Date:	August 15, 2018
School Campus:	Horace Mann Elementary School		
School Address:	2710 Niles Street, Bakersfield, CA 93306	Last Revision Date:	
Building Name/ID:	1930 Classrooms		
Project Tracking No.:			Page 1 of 40

The purpose of this evaluation report is to establish eligibility for retrofit funding under Proposition 1D (AB 127, 2006). It is not the intent of this evaluation to provide a complete Life Safety evaluation. The evaluation is complete when eligibility has been determined.

Report Outline

SSG

SMITH STRUCTURAL GROUP, LLP

REGISTERED PROFESSIONAL ENGINEER
MICHAEL E. PAROLINI
No. 5405
STRUCTURAL
STATE OF CALIFORNIA

SE Firm Name: Smith Structural Group, LLP

SE Address: 811 El Capitan Way, Suite 240
San Luis Obispo, CA 93401

Phone: 805-439-2110
Email: michael@smithstructural.com

Michael E. Parolini
Name of SE whose stamp is above

1. Eligibility Check Summary

	YES	NO
1.1 Building Occupancy: The building's current or planned use involves regular occupancy by students and staff, as detailed in Section 3.2.	☒	☐
1.2 Structural System: The building's seismic force-resisting system includes at least one of the types listed in Section 3.5.	☒	☐
1.3 Collapse Potential: The building has deficiencies associated with a high potential for local or global collapse in the evaluation earthquake. See Sections 4 and 5 for a list of identified deficiencies. Among the identified deficiencies are the critical items checked in Section 1.3.3:	☒	☐

1.3.1 ☒ Collapse Potential Due to Ground Shaking: Ss = 1.18g for ASCE 7-05 Occupancy III, Site Class D

1.3.2 Collapse Potential Due to One of the Following Geologic Hazards (CGS Approved Geologic Hazard Report Required):

☐ LIQUEFACTION ☐ SLOPE STABILITY FAILURE ☐ SURFACE FAULT RUPTURE

UNKNOWN AT THIS TIME

1.3.3 Identified Deficiencies:

☒ LOAD PATH	☐ SHEAR STRESS CHECK (COLUMN)	☐ UNREINFORCED MASONRY BEARING WALLS (RESISTING MAJORITY OF SHEAR LOAD)
☐ WEAK STORY	☐ AXIAL STRESS CHECK	
☐ SOFT STORY	☐ FLAT SLAB FRAMES	☐ SHEAR STRESS CHECK (SHEAR WALL OR INFILL)
☐ VERTICAL DISCONTINUITIES	☐ CAPTIVE COLUMNS	☐ REDUNDANCY (SHEAR WALL)
☐ MASS	☐ BEAM BARS	☒ OPENINGS AT SHEAR WALLS
☐ TORSION	☐ DEFLECTION COMPATIBILITY	☐ TOPPING SLAB
☒ ADJACENT BUILDINGS	☐ FLAT SLABS	☒ WALL ANCHORAGE
☐ MEZZANINES	☐ REDUNDANCY	☒ OTHER: URM NOT ANCHORED TO GUNITE

2. Evaluation Process

2.1 Purpose and Scope

As described in DSA Procedure 08-03, the primary purpose of this evaluation is to confirm the subject building's eligibility for Proposition 1D (AB 127, 2006) retrofit funding.
As noted in DSA Procedure 08-03, the intent of this evaluation is to identify conditions that represent "a high potential for catastrophic collapse." As described further in Sections 2.2 through 2.4, the evaluation includes:

- Completion of a standardized checklist developed specially for this project (Section 2.2). As described in Section 2.2, once a critical deficiency is confirmed, the balance of the checklist need not be completed.
- A site visit (Section 2.3)
- Document review (Section 2.4)

It is not the intent of this evaluation to provide a complete Life Safety evaluation; earthquake safety hazards other than those listed in this report might exist. Further, it is not the intent of this evaluation to identify deficiencies with respect to post-earthquake use or recovery feasibility. In particular, except where specifically noted, the scope of this evaluation does not include:

- Material testing or destructive investigation
- Comprehensive condition assessment or verification of construction documents
- Assessment of code compliance, either at present or at the time of construction
- Assessment for load combinations not including earthquake effects
- Consideration of Life Safety hazards related to egress
- Consideration of Life Safety hazards related to hazardous materials

- Consideration of the effects of damage to nonstructural components or contents.

Building located on sites with geologic hazards (liquefaction, slope failure, faulting) may be eligible for the Proposition 1D funding if it can be demonstrated that the geologic hazard may cause the building to have a high potential for catastrophic collapse. In this case, a geologic hazard report shall be prepared and submitted to CGS for approval and a copy included with evaluation report. The geologic hazard report shall identify the resulting displacements that will be imposed on the structure so a structural analysis can be performed. If eligibility is being sought for a deficiency that is not related to geologic hazards, then a geologic hazard report does not need to be prepared for the purpose of this evaluation report.
With respect to DSA Procedure 08-03, this report fulfills the intent of its Section 1. The remaining sections of Procedure 08-03 are outside the scope of this evaluation and report:

2.2 Evaluation criteria: Modifications to ASCE 31

As noted in DSA Procedure 08-03, the evaluation applies ASCE 31[1], an engineering standard that allows the user to choose a performance level of either Life Safety or Immediate Occupancy. Procedure 08-03 suggests that Life Safety is the performance level of interest, but the Procedure also focuses on collapse, a lesser performance level not explicitly addressed by ASCE 31. For this evaluation, DSA has clarified that only collapse-prone conditions need to be identified. Further, because the focus of this evaluation is on checking eligibility for retrofit funding, as opposed to producing a comprehensive list of potential deficiencies, the full evaluation need not be completed once a critical deficiency is identified.

ASCE 31 involves three “tiers” of evaluation. Tier 1 uses a set of generic, mostly qualitative “evaluation statements” (also called checklists) to identify potential deficiencies. Tier 2 applies more quantitative checks to confirm or correct the Tier 1 findings. Tier 3 involves a more thorough structural analysis. For this evaluation, DSA has clarified that only Tier 1 is required for most issues, with Tier 2 evaluation for specific issues.

The criteria used for this evaluation therefore are based on the ASCE 31 Tier 1 checklists, with the following modifications:

- Basic Structural, Supplemental Structural, and Foundations checklists are considered.
- Nonstructural checklists are excluded. While some issues addressed by these checklists are relevant to nonstructural collapse potential, their completion is beyond the scope of this evaluation. While not considered for purposes of establishing funding eligibility, relevant deficiencies will be investigated and addressed during a retrofit design phase.
- Evaluation statements required by ASCE 31 for Immediate Occupancy only are excluded.
- Evaluation statements not associated with one of the eligible structure types are excluded.
- Certain evaluation statements related to “critical deficiencies” indicative of a high potential for structural collapse are identified. If a critical deficiency is confirmed, the balance of the evaluation need not be completed. The critical deficiencies are those listed in Section 1. They were selected by DSA for this project based in part on precedents set by the California Office of Statewide Health Planning and Development.[2]

[1] *Seismic Evaluation of Existing Buildings* (ASCE/SEI 31-03), American Society of Civil Engineers, 2003.

[2] *2007 California Building Standards Administrative Code (California Code of Regulations, Title 24 Part 1)*, Chapter 6, “Seismic Evaluation Procedures for Hospital Buildings,” Section 1.4.5.1.2, October 23, 2008 Emergency Supplement.

- For Quick Checks and Tier 2 evaluations, the ASCE 31 criteria for Life Safety performance are used, except that *m* values, where needed, are increased by an additional factor of 1.33.
- The Tier 1 evaluation statements are modified to reflect emphasis on collapse-level performance:
    - Since the presence of an unreinforced masonry bearing wall system is deemed a critical deficiency, an evaluation statement to that effect is added, and detailed ASCE 31 evaluation statements specific to that system are omitted.
    - Condition of Materials: Evaluation statements are edited to focus less on presence of damage and more on significance of damage. Note that Masonry Lay-up and Foundation Performance evaluation statements are relocated to the Condition of Materials subsection of Section 5.
    - Except for cracks in certain concrete members, Condition of Materials evaluation statements related to existing cracks are omitted.
    - Beam Bars: The requirement for 25 percent of the joint bars to be continuous for the length of the member is removed.
    - Redundancy (Moment frame and Braced frame): The requirement for two bays per frame line is removed.
    - Stiffness of wall anchors: The limitation of 1/8-inch gap prior to anchor engagement is removed.
    - Overturning: This statement is removed.
    - In general, statements are modified for clarity and consistency with this DSA program.
- Tier 2 evaluation is required for any critical item (see Section 1) found to be non-compliant by Tier 1. The potential requirement for full-building Tier 2 evaluation found in ASCE 31 Table 3-3 is waived.

2.3 Document review

The following documents were provided for use in completing the evaluation, in general compliance with ASCE 31, Section 2.2. The Set ID is used to identify the documents cited in Section 5 of this report.

SET ID	DATE	DESCRIPTION
1	1930	Horace Mann School, Charles H. Biggar, Original Construction, 6 sheets (pre-DSA, A# does not exist)
2	1953	A-10777, Rehab of Horace Mann Elem. School, Ernest L. McCoy, 22 sheets
3	1953	A-11363, Additions and Alterations to Horace Mann Elem School, Ernest L. McCoy, 23 sheets
4	1978	A-41306 - Additions and Alterations Horace Mann Elem School, Eddy, Paynter, Renfro & Associates, 48 sheets (Original Classroom Building is referred to as Building R)
5	1989	A-51532 - Horace Mann Modernization, BFGC Architects-Planners, 42 sheets (Original Classroom Building is referred to as Building 500)

2.4 Site visit

In general compliance with ASCE 31, Sections 2.2 and 2.3, a site visit shall be made to verify the building configuration and conditions and to assist in completing the evaluation.

Date of site visit:	July 5, 2018
Visiting engineer(s) and staff:	Jessica Napier, Deryk Izuo
School district contact person:	Randy Rowles
School campus representative (if different than above):	same as above

The scope of the site visit was based on our judgment, accessibility of certain areas, and convenience of the school on-site liaison. The purpose of the following list is merely to record the work that was done. The site visit included (check all applicable boxes):

- ☒ Interview w/ on-site liaison
- ☒ Grounds, for observation of soil, slopes, drainage, general condition
- ☒ Exterior observation to verify basic massing, configuration, general condition
- ☒ Interior observation to verify use, wall line configuration, general condition
- ☐ Roof
- ☐ Basement
- ☒ Ceiling plenum
- ☒ Unfinished spaces
- ☒ Details of structure-architecture interaction
- ☐ Roof-to-wall connections (not visible)
- ☒ Gravity system framing
- ☒ Seismic force resisting system elements or components
- ☒ Adjacent buildings subject to pounding
- ☐ Other:

The site visit confirmed that the existing structure generally conforms to the available drawings listed in Section 2.3.

3. Site and Building Description

3.1 Building description

General

Year originally built: 1931 (est.)

DSA Application number: none ☒ Original Construction ☐ Work done pursuant to the Garrison Act (Ed Code 17367)

Number of stories above grade: One

Number of stories below grade: None

Total floor area (sq ft, approx): 15,550 sq. ft.

Other essentially identical buildings on this campus? ☐ Yes ☒ No

Although there are no other URM-type structures on this campus, there are two concrete buildings that are being evaluated with separate reports at this time. One was designed in 1937, and the other in 1940.

Overhead view of Horace Mann Elementary, taken: July 26, 2018 using Google Earth

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Photographs

Exterior elevation photograph, looking North, taken: July 26, 2018 using Google Earth

Exterior elevation photograph, looking West, taken: July 5, 2018

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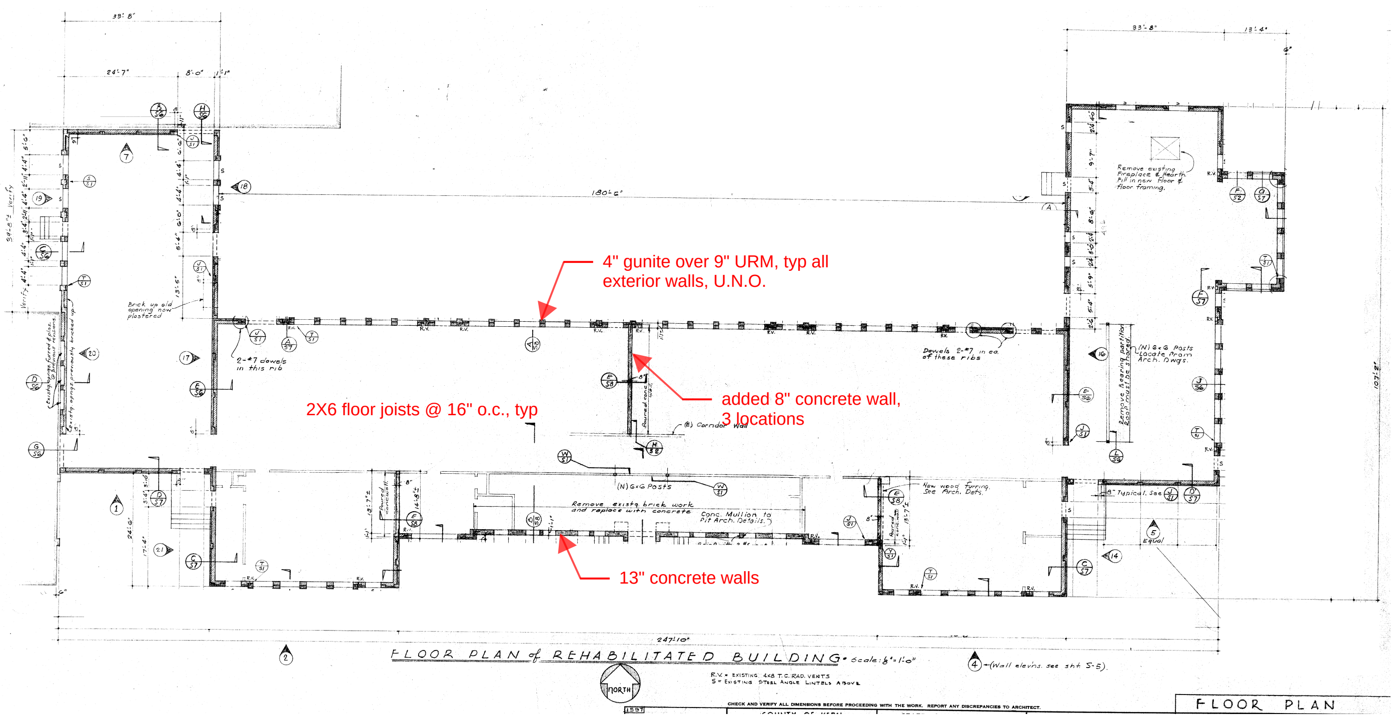
Ground floor plan



3.2 Building Occupancy

Original, current, and planned uses of the building include those indicated here:

	Original Use	Current Use	Planned Future Use
Office / Administration	☐	☐	☐
Classrooms / Instruction Areas	☒	☒	☒
Kitchen	☐	☐	☐
Assembly: Dining	☐	☐	☐
Assembly: Auditorium	☐	☐	☐
Assembly: Gymnasium	☐	☐	☐
Locker rooms	☐	☐	☐
Patio cover / bus shelter / walkway cover	☐	☐	☐
Bleachers / stadium structure	☐	☐	☐
Other occupied	☐	☐	☐
Mechanical / utility rooms or enclosures	☐	☐	☐
Bulk storage	☐	☐	☐
Vacant / unused	☐	☐	☐
Other unoccupied:	☐	☐	☐

3.3 Seismicity

Latitude: 35.37691

Longitude: -118.95744

Site Class per ASCE 31, Section 3.5.2.3: D

Basis for Site Class determination: Default

Period [sec]	Mapped MCE values from ASCE 7-05 [g]	Site Coefficients from ASCE 31 Tables 3-5, 3-6	Design values per ASCE 31 section 3.5.2.3.1 [g]	S_a per ASCE 31 section 3.5.2.3.1, [g]
0.2	$S_S = 1.18$	$F_a = 1.028$	$S_{DS} = (2/3)\ S_S\ F_a = 0.809$	$S_{a,0.2} = S_{DS} = 0.809$
1.0	$S_1 = 0.419$	$F_v = 1.581$	$S_{D1} = (2/3)\ S_1\ F_v = 0.441$	$S_{a,1.0} = \min\ (S_{DS}\ ,\ S_{D1}/T) = 0.441$

3.4 Gravity System

Roof diaphragm and framing:

- Original roof diaphragm 1x6 straight sheathing. Diagonal sheathing added over top (1953). Note that immediately adjacent to walls, 2’-0” width of diaphragm is sheathed with added sheathing only.
- Trussed 2x rafters
- Trussed roof rafters perpendicular to shear walls are either seated on a concrete ledge or a wood ledger.
  - For OOP loads, every other truss is anchored to the concrete wall with an embedded strap, at the roof elevation. See details C and D/S6 of Set 2 for examples of concrete ledge connection. See details E and F/S6 for examples of wood ledger connection. Connection to wall at bottom chord/ceiling level is intermittent.
  - For IP loads, sheathing is nailed to ledger or blocking, and the ledger or blocking is attached to the concrete with 5/8” diameter bolts. Bolts are 48” o.c. at ledger and 24” o.c. at blocking. See E/S1, Set 2 and details noted above.
- Where roof rafters are parallel to shear walls
  - For OOP loads, embedded strap is connected to one full depth block and one flat block at 48” o.c. See detail F/S1 of Set 2.
  - For IP loads, sheathing is nailed to ledger, and ledger is attached to concrete with 5/8” diameter bolts at 48” o.c. See F/S1 of Set 2.

Typical floor diaphragm and framing: N/A

Ground floor framing:

- 1 layer of 1x diagonal sheathing with wood finish floor over top (1x straight). See D/S1, Set 2.
- 2x6 floor joists over cripple walls at interior and hung from wood ledger at exterior concrete stem wall. See C/S1, Set 2.

Vertical load-bearing elements:

- Exterior bearing walls are typically 9” URM (1930) with 4” added reinforced gunite thicknesses (1953). Entire south entry wall (grid x to grid x) replaced with reinforced cast-in-place concrete
- Interior bearing walls are wood stud-framed

Basement walls: N/A, no basement.

Foundation:

- Continuous concrete footings under exterior walls
- Pad footings at interior, under wood cripple walls, see C/S1, Set 2.

Snow load for use in load combinations involving earthquake: N/A, snow load not required.

3.5 Structural System per ASCE 31 Classifications (Category 2 Buildings Types per AB 300 Report)

		North-South	East-West
C1	Concrete Moment Frames	☐	☐
C1B*	Reinforced Concrete Cantilever Columns	☐	☐
C2A	Concrete Shear Walls, Flexible Diaphragm	☐	☐
C3A	Concrete Frame with Infill Masonry Shear Walls, Flexible Diaphragm	☐	☐
PC1	Precast/Tilt-up Concrete Shear Walls, Flexible Diaphragm	☐	☐
PC1A	Precast/Tilt-up Concrete Shear Walls, Rigid Diaphragm	☐	☐
PC2	Precast Concrete Frames with Shear Walls, Rigid Diaphragm	☐	☐
PC2A	Precast Concrete Frames without Shear Walls, Rigid Diaphragm	☐	☐
RM1	Reinforced Masonry Bearing Walls, Flexible Diaphragm	☐	☐
S1B*	Steel Cantilever Columns	☐	☐
S3	Steel Light Frames	☐	☐
URM	Unreinforced Masonry Bearing Walls, Flexible Diaphragm	☒	☒
URMA	Unreinforced Masonry Bearing Walls, Rigid Diaphragm	☐	☐
M*	Mixed Systems - construction containing at least one of the above lateral-force-resisting systems in at least one direction of seismic loading.	☐	☐
None of the above		☐	☐

* These structural systems are a subset of the classification in ASCE 31 and are defined in the Category 2 building types in the AB 300 Seismic Safety Inventory of California Public Schools report (2002).

Note that this report recognizes gunite addition in 1953, and the structural system may possibly be considered C2A or a combination of URM and C2A.

Brief description of structural systems:

Horizontal system combinations	Roof • 1x6 straight sheathing with 1x6 diagonal sheathing added over top • Trussed 2x rafters Floor • 1x6 diagonal sheathing • 2x8 floor joists @ 16” o.c.
Vertical system combinations	• 9” URM walls with 4” reinforced gunite, exterior • 2x6 wood stud walls, interior
SFRS foundation	• Continuous concrete footings
Gravity loading	Approximately half of the gravity loads are carried by the exterior URM/gunite walls, which also act as the SFRS. The remainder of the gravity load is carried by interior wood-framed stud walls. The exceptions to this are the north and south walls of the kindergarten wing and the north and south walls of the kitchen. These walls carry their own self weight, but little roof load.
System details	The SFRS in both directions consists of a wood-framed diaphragm with diagonal sheathing over straight sheathing and 9” brick masonry shear walls with 4” gunite. South entry is cast in place concrete. Walls are tied to diaphragm for in-plane loads with ledger anchor bolts. Walls are tied to diaphragm for out-of-plane loads with strap embedded in concrete parapet wall (above gunite and URM). Strap is nailed to blocking, blocking is nailed to sheathing.

Structural materials	1930 URM construction – no material properties listed 1953 Rehabilitation – Sheet S1 of Set 2 3,000-psi gunite 2,000-psi concrete A305 rebar (most likely 33-ksi) Doug Fir lumber Common wire nails 1978 Alterations – planned canopies removed or not constructed, no need for materials information 1989 Modernization – Sheet S1 of Set 5 3,000-psi concrete A615 rebar, grade 40 Doug Fir lumber A36 steel WF, L, PL A500 TS, Fy=46ksiA 36 or A307 bolts and anchor bolts
Original design code	1927 Uniform Building Code (assumed)
History of seismic retrofit or significant alteration	Retrofit in 1953 under 1952 UBC. Reinforced 4” gunite walls added at all URM locations with the exception of the south entry, which was completely removed and replaced with cast-in-place concrete. OOP anchorage added, but subdiaphragm/continuous ties not created. High roof area at south entry removed and replaced with roof at same elevation as rest of structure. Sheet S4, Set ID 2. Alterations in 1978 under 1976 UBC. Addition of a walkway canopy on north face of building. See Sheet 6 of Set ID 4. Canopy either not constructed or removed prior to 1989 modernization. No anchors from URM to gunite or concrete Exterior plaster added in 1953 over gunite (added weight)
Benchmark year check	*No Benchmark for URM Buildings*

4. Deficiency list

The following table summarizes the potential deficiencies identified in Section 5 of this report.

Non-compliant condition	Discussion	Additional evaluation recommended
DETERIORATION OF WOOD	• Seen in ceiling space of kindergarten room (east wing) • Local collapse mechanism	None
DETERIORATION OF CONCRETE	• Seen in ceiling space of south wall in one location • Local collapse mechanism	None
DETERIORATION OF STEEL	• Seen in ceiling space over kitchen • Local collapse mechanism, as rust seen is most likely surficial in most cases	Additional non-destructive investigation
LOAD PATH ***Critical Item***	• See “Cross Ties” non-compliant condition	None
ADJACENT BUILDINGS	• Separation of 6” between adjacent structures is noted on the plans and verified in the field • Local collapse mechanism • It is most likely that pounding will not occur, as the SFRS is concrete shear walls in both adjacent structures, and a combination of URM and gunite (also very stiff) in the building being reviewed	None
WALL OPENINGS	• Wall piers less than 2:1 ratio in most locations • Local collapse mechanism, but could extend to along length of wall with adjacent tall piers	None
CROSS TIES	• Cross ties do not exist where rafters are parallel to shear walls • Global collapse mechanism	None
UNBLOCKED DIAPHRAGMS	• Unblocked diaphragm with 1x6 diagonal sheathing over the top of 1x6 straight sheathing • Global collapse mechanism	None

WALL ANCHORAGE ***Critical Item***	• Anchors added in 1953 are not adequate to resist OOP forces • Global collapse mechanism	None
GIRDERS	• Ties at beam anchor bolts are most likely placed so that only one tie is around the bolts • Local collapse mechanism	None
TIES BETWEEN FOUNDATION ELEMENTS	• There are no ties between exterior wall continuous footings and interior shallow pier footings • Local collapse mechanism	None

Unknown condition	Discussion	Additional evaluation recommended
LIQUEFACTION	• If liquefaction is a hazard on this site, the foundation would not be adequate for supporting the structure • Global collapse mechanism	None
SURFACE FAULT RUPTURE	• If surface fault rupture is a hazard on this site, the foundation would not be adequate for the soil • Global collapse mechanism	None

5. ASCE 31 Evaluation Statements

Evaluation statements provided in this section are from ASCE 31. They have been modified for this project with DSA approval as described in Section 2.2 of this report. References within the evaluation statements to other section numbers are generally to sections of ASCE 31.

C = Compliant
NC = Non-compliant
U = Unknown or not investigated
NA = Not applicable to this building

Items marked NC or U are summarized in Section 4 of this report.

CONDITION OF MATERIALS	
C [NC] U NA	DETERIORATION OF WOOD. There shall be no evidence of or reason to suspect structural capacity loss due to decay, shrinkage, splitting, fire damage, or sagging in wood members or deterioration, damage, or loosening in metal connection hardware. ***Some water intrusion in the roof; seen in the ceiling space over the kindergarten room (east wing and also in kitchen ceiling space.***
C [NC] U NA	DETERIORATION OF CONCRETE. There shall be no evidence of or reason to suspect structural capacity loss due to cracking of concrete or deterioration of concrete or reinforcing steel in gravity or seismic force-resisting elements. ***Some deterioration in ceiling space; seen in the ceiling space above the south entry.***
C [NC] U NA	DETERIORATION OF STEEL. There shall be no evidence of or reason to suspect structural capacity loss due to rusting, corrosion, cracking, or other deterioration in any of the steel elements or connections in the gravity or seismic force-resisting elements. ***Steel observed during site visit in kitchen area only. WF beams appeared ok. Bolt heads at ledgers and blocking are rusted.***
C NC U [NA]	POST-TENSIONING ANCHORS. There shall be no evidence of or reason to suspect structural capacity loss due to corrosion or spalling in the vicinity of post-tensioning or end fittings. Coil anchors shall not have been used. ***(Post-tensioning not used)***

C NC U [NA]	PRECAST CONCRETE WALLS. There shall be no evidence of or reason to suspect structural capacity loss due to deterioration of concrete or reinforcing steel or distress, especially at connections. ***(Precast concrete not used)***
[C] NC U NA	MASONRY UNITS. There shall be no evidence of or reason to suspect structural capacity loss due to deterioration of masonry units. ***Masonry units not exposed at classroom area. Units at kitchen appear acceptable.***
[C] NC U NA	MASONRY JOINTS. The mortar shall not be easily scraped away from the joints by hand with a metal tool, and there shall be no evidence of or reason to suspect structural capacity loss due to eroded mortar. ***Joints not exposed at classroom area. Joints at kitchen not accessible for scraping, but appear in good condition.***
C NC U [NA]	MASONRY LAY-UP. Filled collar joints of multi-wythe masonry infill walls shall have negligible voids. ***(Infill walls not used)***
[C] NC U NA	FOUNDATION PERFORMANCE. There shall be no evidence of or reason to suspect existing foundation movement (due to settlement, heave, or other causes) that would affect the integrity or strength of the structure. ***Limited cracks in exterior walls***
BUILDING CONFIGURATION	
C [NC] U NA **Critical Item**	LOAD PATH. The structure shall contain a minimum of one complete load path for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. ***See following assessment items: Cross ties***

C NC U **[NA]** **Critical Item**	WEAK STORY. The strength of the seismic force-resisting system in any story shall not be less than 80% of the strength in an adjacent story, above or below. ***One story***
C NC U **[NA]** **Critical Item**	SOFT STORY. The stiffness of the seismic force-resisting system in any story shall not be less than 70% of the seismic force-resisting system stiffness in an adjacent story above or below, or less than 80% of the average seismic force-resisting system stiffness of the three stories above or below. ***One story***
C NC U **[NA]**	GEOMETRY. There shall be no changes in 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. ***One story***
[C] NC U NA **Critical Item**	VERTICAL DISCONTINUITIES. All vertical elements of the seismic force-resisting system shall be continuous to the foundation. ***One story***
C NC U **[NA]** **Critical Item**	MASS. There shall be no change in effective mass more than 50% from one story to the next. Light roofs, penthouses and mezzanines need not be considered. ***One story***
[C] NC U NA **Critical Item**	TORSION. The estimated distance between the story center of mass and the story center of rigidity shall be less than 20% of the building width in either plan dimension. ***Building has a flexible diaphragm, and is fairly well balanced with shear wall layout all around the exterior. Openings in the shear walls are consistent, as well.***

C [NC] U NA	ADJACENT BUILDINGS. The clear distance between the building being evaluated and any adjacent building shall be greater than 4% of the height of the shorter building. Alternatively, if the 4% separation does not exist, the two buildings shall be configured such that pounding would not damage the columns of the subject building within the clear span of the columns. ***Roof height of original classroom building at west end is 15'-10", and aligns vertically within 12" of 1940 classroom building. There is a 6" separation between the two structures.*** ***15.83' x 4% = 0.63', or 7.6" separation required per this check*** ***Roof height of original classroom building at north wall of kitchen is 16'-7" average. Roof height of adjacent kitchen area is 13'-0". There is a 6" separation between the two structures.*** ***13.0' x 4% = 0.52', or 6.2" separation required per this check*** ***Deflection of adjacent concrete shear wall structures and the URM/gunite structure would be much lower than other SFRS systems. Therefore, although the buildings may move toward each other in a seismic event, the chance of them pounding with the current 6" separation is very low. Tier 2 check not performed.***
C NC U [NA] **Critical Item**	MEZZANINES. Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the seismic force-resisting elements of the main structure. ***No mezzanine***
MOMENT FRAMES	
C NC U [NA] **Critical Item**	SHEAR STRESS CHECK (Columns). The shear stress in concrete columns of the seismic force-resisting system, calculated using the Quick Check procedure of Section 3.5.3.2, shall be less than the greater of 100 psi or $2\sqrt{f'_c}$. ***(Moment frames not used)***
C NC U [NA] **Critical Item**	AXIAL STRESS CHECK (Concrete columns). The axial stress due to gravity loads in columns subjected to seismic overturning forces shall be less than $0.10f'_c$. Alternatively, the axial stresses due to overturning forces alone, calculated using the Quick Check procedure of Section 3.5.3.6, shall be less than $0.30f'_c$. ***(Moment frames not used)***

C NC U NA	AXIAL STRESS CHECK (Steel columns). The axial stress due to gravity loads in steel columns subjected to seismic overturning forces shall be less than $0.10F_y$. Alternatively, the axial stresses due to overturning forces alone, calculated using the Quick Check procedure of Section 3.5.3.6, shall be less than $0.30F_y$. ***(Moment frames not used)***
C NC U NA **Critical Item**	FLAT SLAB FRAMES. The seismic force-resisting system shall not be a frame consisting of columns and a flat slab/plate without beams. ***(Moment frames not used)***
C NC U NA	PRESTRESSED FRAME ELEMENTS. The seismic force-resisting frames shall not include any prestressed or post-tensioned elements where the average prestress exceeds the lesser of 700 psi or $f'_c/6$ at potential hinge locations. The average prestress shall be calculated in accordance with the Quick Check Procedure of Section 3.5.3.8. ***(Moment frames not used)***
C NC U NA **Critical Item**	CAPTIVE COLUMNS. There shall be no columns at a level with height/depth ratios less than 50% of the nominal height/depth ratio of the typical columns at that level. ***(Moment frames not used)***
C NC U NA	NO SHEAR FAILURES. The shear capacity of frame members in the seismic force-resisting system shall be able to develop the moment capacity at the ends of the members. ***(Moment frames not used)***
C NC U NA	STRONG COLUMN/WEAK BEAM. The sum of the moment capacity of the columns shall be 20% greater than that of the beams at concrete frame joints. ***(Moment frames not used)***
C NC U NA	STRONG COLUMN/WEAK BEAM. The percent of strong column/weak beam joints in each story of each line of steel moment-resisting frames shall be greater than 50%. This check need not apply for 1-story structures. ***(Moment frames not used)***

C NC U **[NA]** **Critical Item**	BEAM BARS. At least two longitudinal top and two longitudinal bottom bars shall extend continuously throughout the length of each frame beam. ***(Moment frames not used)***
C NC U **[NA]**	COLUMN BAR SPLICES. All column bar lap splice lengths shall be greater than 35d_b, and shall be enclosed by ties spaced at or less than 8d_b. Alternatively, column bars shall be spliced with mechanical couplers with a capacity of at least 1.25 times the nominal yield strength of the spliced bar. ***(Moment frames not used)***
C NC U **[NA]**	BEAM BAR SPLICES. The lap splices or mechanical couplers for longitudinal beam reinforcing shall not be located within l_b/4 of the joints and shall not be located in the vicinity of potential plastic hinge locations. ***(Moment frames not used)***
C NC U **[NA]**	COLUMN TIE SPACING. Frame columns shall have ties spaced at or less than d/4 throughout their length and at or less than 8d_b at all potential plastic hinge locations. ***(Moment frames not used)***
C NC U **[NA]**	STIRRUP SPACING. All beams shall have stirrups spaced at or less than d/2 throughout their length. At potential plastic hinge locations stirrups shall be spaced at or less than the minimum of 8d_b or d/4. ***(Moment frames not used)***
C NC U **[NA]**	JOINT REINFORCING. Beam-column joints shall have ties spaced at or less than 8d_b. ***(Moment frames not used)***
C NC U **[NA]**	COMPLETE FRAMES. Concrete frames that are not part of the seismic force-resisting system shall form a complete gravity load carrying system. ***(Moment frames not used)***

C NC U NA **Critical Item**	DEFLECTION COMPATIBILITY. Elements of concrete frames that are not part of the seismic force-resisting system shall have the shear capacity to develop the flexural strength of the components. ***(Moment frames not used)***
C NC U NA **Critical Item**	FLAT SLABS. Flat slabs/plates that are not part of the seismic force-resisting system shall have continuous bottom steel through the column joints. ***(Moment frames not used)***
C NC U NA **Critical Item**	REDUNDANCY (Moment frame). The number of lines of moment frames in each principal direction shall be greater than or equal to 2. ***(Moment frames not used)***
C NC U NA	INTERFERING WALLS. All concrete and masonry infill walls placed in moment frames shall be isolated from structural elements. (This evaluation statement does not apply to seismic force-resisting system type C3A or others where the infill is being evaluated as a shear wall or force-resisting element.) ***(Moment frames not used)***
C NC U NA	PRECAST CONNECTION CHECK. The connections at joints of precast concrete frames shall have the capacity to resist the shear and moment demands calculated using the Quick Procedure of Section 3.5.3.5 ***(Moment frames not used)***
C NC U NA	PRECAST FRAMES. For buildings with concrete shear walls, precast concrete frame elements shall not be necessary as primary components for resisting seismic forces. ***(Moment frames not used)***
C NC U NA	PRECAST CONNECTIONS. For buildings with concrete shear walls, the connections between precast frame elements such as chords, ties, and collectors in the seismic force-resisting system shall develop the capacity of the connected members. ***(Moment frames not used)***

C NC U [NA]	DRIFT CHECK: The drift ratio of the steel moment frames, calculated using the Quick Check procedure of Section 3.5.3.1, shall be less than 0.025. ***(Moment frames not used)***
C NC U [NA]	MOMENT-RESISTING CONNECTIONS: All moment connections shall be able to develop the strength of the adjoining members or panel zones. ***(Moment frames not used)***
C NC U [NA]	PANEL ZONES: All panel zones shall have the shear capacity to resist the shear demand required to develop 0.8 times the sum of the flexural strengths of the girders framing in at the face of the column. ***(Moment frames not used)***
C NC U [NA]	COLUM SPLICES: All column splice details located in moment-resisting frames shall include connection of both flanges and the web. ***(Moment frames not used)***
C NC U [NA]	COMPACT MEMBERS: All frame elements shall meet section requirements set forth by Table I-9-1 of Seismic Provisions for Structural Steel Buildings (AISC, 1997). ***(Moment frames not used)***
SHEAR WALLS	
[C] NC U NA **Critical Item**	UNREINFORCED MASONRY BEARING WALLS. The seismic force-resisting system in any direction shall not rely on or consist primarily of unreinforced masonry bearing walls. ***Original design and construction was non-compliant, but 1953 rehab added gunite and concrete system to all walls.***
[C] NC U NA **Critical Item**	SHEAR STRESS CHECK (Shear wall). The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than the greater of 100 psi or $2\sqrt{f'_c}$. ***See Appendix A.1 for load take-off and Appendix A.2 for calculations. The concrete and the gunite pass this shear stress check.***

[C] NC U NA	REINFORCING STEEL. In concrete or precast shear walls, the ratio of reinforcing steel area to gross concrete area shall be not less than 0.0015 in the vertical direction and 0.0025 in the horizontal direction. The spacing of reinforcing steel shall be equal to or less than 18 inches. ***See Appendix A.2 for calculations and details E/S6 & C2/S8 from Set 2 for reinforcement size and spacing.***
C NC U [NA]	COUPLING BEAMS. The stirrups in coupling beams over means of egress shall be spaced at or less than d/2 and shall be anchored into the confined core of the beam with hooks of 135º or more. ***One story***
[C] NC U NA **Critical Item**	REDUNDANCY (Shear wall). The number of lines of shear walls in each principal direction shall be greater than or equal to 2.
C NC U [NA]	PROPORTIONS. The height-to-thickness ratio of masonry infill walls at each story shall be less than 9. (This evaluation statement applies only to seismic force-resisting system type C3A and others where the infill is being evaluated as a shear wall or force-resisting element.) ***(Infill walls not used)***
C NC U [NA]	SOLID WALLS. The masonry infill walls shall not be of cavity construction. (This evaluation statement applies only to seismic force-resisting system type C3A and others where the infill is being evaluated as a shear wall or force-resisting element.) ***(Infill walls not used)***
C NC U [NA]	INFILL WALLS. The infill walls shall be continuous to the soffits of the frame beams and to the columns to either side. (This evaluation statement applies only to seismic force-resisting system type C3A and others where the infill is being evaluated as a shear wall or force-resisting element.) ***(Infill walls not used)***
C NC U [NA] **Critical Item**	SHEAR STRESS CHECK (Precast concrete shear walls). The shear stress in the precast panels, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than the greater of 100 psi or $2\sqrt{f'_c}$. ***(Precast concrete shear walls not used)***

C [NC] U NA	WALL OPENINGS. The total width of openings along any perimeter wall line shall constitute less than 75% of the length of any perimeter shear wall, with the wall piers having height-to-width ratios of less than 2 to 1. ***Worst-case wall opening ratio is along north classroom wall, with 66% open. Wall pier height-to-width ratio in that area is 7.5.***
[C] NC U NA	CORNER OPENINGS. Walls with openings at a building corner larger than the width of a typical panel shall be connected to the remainder of the wall with collector reinforcing.
[C] NC U NA **Critical Item**	SHEAR STRESS CHECK (Brick or hollow clay masonry infill). The shear stress in the masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 30 psi for clay units. ***The Tier 1 check of the URM, acting alone is NC. However, the added gunite Tier 1 check is C for all the in-plane lateral load. So "C" is selected here.***
C NC U [NA] **Critical Item**	SHEAR STRESS CHECK (Concrete block infill and reinforced masonry shear walls). The shear stress in the masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 70 psi for concrete units. ***(Concrete block infill and reinforced masonry shear walls not used)***
C NC U [NA]	PROPORTIONS. The height-to-thickness ratio of unreinforced masonry infill shear walls shall be less than the following: Top story of multi-story building: 9, First story of multi-story building: 15, All other conditions: 13 ***(URM infill shear walls not used)***
C NC U [NA]	REINFORCING STEEL. In reinforced masonry shear walls, the total vertical and horizontal reinforcing steel ratio shall be greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel shall be less than 48"; and all vertical bars shall extend to the top of the walls. ***(Reinforced masonry shear walls not used)***
BRACED FRAMES	

C NC U [NA] **Critical Item**	REDUNDANCY: The number of lines of braced frames in each principal direction shall be greater than or equal to 2. ***(Braced frames not used)***
C NC U [NA] **Critical Item**	AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check Procedure of Section 3.5.3.4, shall be less than $0.50F_y$. ***(Braced frames not used)***
C NC U [NA]	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression shall have Kl/r ratios less than 120. ***(Braced frames not used)***
C NC U [NA]	CONNECTION STRENGTH: All the brace connections shall develop the yield capacity of the diagonals. ***(Braced frames not used)***
C NC U [NA]	K-BRACING: The bracing system shall not include K-braced bays. ***(Braced frames not used)***
DIAPHRAGMS	
[C] NC U NA	DIAPHRAGM CONTINUITY. The diaphragm shall not be composed of split-level floors and shall not have expansion joints.
C [NC] U NA	CROSS TIES. There shall be continuous cross ties between diaphragm chords. ***Cross ties do not exist where roof rafters are parallel to shear walls. The added blocking in 1953 only engages 4' of the diaphragm. Using the current code 2.5:1 ratio for cross ties, the blocking and strapping would need to be at least 14' long at the east and west wings. See Roof Framing Plan, Sheet S4 of Set 2 and corresponding details (such as C/S7) called out on that plan.***

[C] NC U NA	ROOF CHORD CONTINUITY. All roof chord elements shall be continuous, regardless of changes in roof elevation. ***Chord is made up of horizontal reinforcing bars that do appear to be continuous in wall. Lap splices are specified on sheet S1 of Set 2 as 30 x bar diameter.***
C NC U [NA] **Critical Item**	OPENINGS AT SHEAR WALLS. Diaphragm openings immediately adjacent to the shear walls shall be less than 25% of the wall length, and diaphragm openings immediately adjacent to exterior masonry shear walls shall not be greater than 8 ft long. ***No diaphragm openings immediately adjacent to shear walls.***
C NC U [NA]	OPENINGS AT BRACED FRAMES. Diaphragm openings immediately adjacent to the braced frames shall extend less than 25% of the frame length. ***(Braced frames not used)***
C NC U [NA]	OTHER DIAPHRAGMS. The diaphragm shall not consist of a system other than wood, metal deck, concrete or horizontal bracing. ***Wood diaphragms used***
C NC U [NA] **Critical Item**	TOPPING SLAB. Precast concrete diaphragm elements shall be interconnected by a continuous reinforced concrete topping slab. ***(Topping slab not used)***
C NC U [NA]	STRAIGHT SHEATHING. All straight sheathed diaphragms shall have aspect ratios less than 2 to 1 in the direction being considered. ***Diagonal sheathing added in 1953***
[C] NC U NA	SPANS. All wood diaphragms with spans greater than 24 ft shall consist of wood structural panels or diagonal sheathing. ***Diagonal sheathing added in 1953. See Set 2, sheet S4.***

C **[NC]** U NA	UNBLOCKED DIAPHRAGMS. All diagonally sheathed or unblocked wood structural panel diaphragms shall have horizontal spans less than 40 ft and shall have aspect ratios less than or equal to 4 to 1. ***1x6 diagonal sheathing over 1x6 straight sheathing, with no blocking. Horizontal spans of 50'-8" at center of building, when loaded N-S. See sheet S4 of Set 2.***
CONNECTIONS	
C **[NC]** U NA **Critical Item**	WALL ANCHORAGE. Exterior concrete or masonry walls shall be anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps developed into the diaphragm. Connections shall have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 3.5.3.7. ***Anchors added in 1953 are not adequate for OOP forces per Tier 2 check. See details E and F/S1 in Set 2.***
[C] NC U NA	WOOD LEDGERS. The connection between the wall panels and the diaphragm shall not induce cross-grain bending or tension in the wood ledgers. ***Cross-grain bending is not likely for lateral loads applied to the improved details in Set 2. However, for gravity loads, there are some cross-grain bending scenarios. See details E and F/S6 Set 2. This item is still marked as compliant since the ledgers in cross-grain bending are below the members being used for transferring lateral loads.***
C NC U **[NA]**	PRECAST PANEL CONNECTIONS. There shall be at least two anchors from each precast wall panel into the diaphragm elements. ***(Precast panels not used)***
C NC U **[NA]**	STIFFNESS OF WALL ANCHORS. Anchors of concrete or masonry walls to wood structural elements shall be installed taut and shall be stiff enough to limit the relative movement between the wall and the diaphragm prior to engagement of the anchors, as needed for reliable bearing. ***Wall anchors for IP and OOP loads were cast in place with the concrete portion of the walls and as such are most likely to meet this check.***

[C] NC U NA	GIRDER/COLUMN CONNECTION. There shall be a positive connection utilizing plates, connection hardware, or straps between girders and their supporting columns. (This evaluation statement applies primarily to precast concrete and masonry systems.) ***Steel beams over wood framing are connected with clips and bolts. See detail L/S6 from set 2***
C [NC] U NA	GIRDERS. Girders supported by walls or pilasters shall have at least two additional column ties securing the anchor bolts. (This evaluation statement applies primarily to precast concrete systems.) ***Added steel beams are anchored to concrete, and do have anchor ties. However, the detail and spacing of the ties indicate that it is most likely that only one tie would be engaged during lateral movement. See detail F/S7 from Set 2.***
C NC U [NA]	CORBEL BEARING. If precast concrete frame girders bear on column corbels, the length of bearing shall be greater than 3". ***(Precast frame not used)***
C NC U [NA]	CORBEL CONNECTIONS. Precast concrete frame girders shall not be connected to corbels with welded elements. ***(Precast frame not used)***
[C] NC U NA	TRANSFER TO SHEAR WALLS. Diaphragms shall be connected for transfer of loads to shear walls. ***Refer to the Set ID and page/detail as listed in Section 2.3***
C NC U [NA]	TRANSFER TO STEEL FRAMES. Diaphragms shall be connected for transfer of loads to the steel frames. ***(Steel frames not used)***
C NC U [NA]	TOPPING SLAB TO WALLS OR FRAMES. Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements shall be doweled for transfer of forces into shear wall or frame elements. ***(Topping slab not used)***

C NC U [NA]	CONCRETE COLUMNS. All concrete columns shall be doweled into the foundation. ***(Concrete columns not used)***
[C] NC U NA	FOUNDATION DOWELS. Wall reinforcement shall be doweled into the foundation. ***#4 reinforcing bars embedded 8" into existing concrete stemwall and grouted (#5 bars at "ribs" embedded 12") as a part of gunite wall work in 1953. See U/S1 in Set 2. Note that length of bar in gunite wall is not enough for a tension lap splice with the wall steel. #4 length is 14" and #5 length is 20".***
C NC U [NA]	PRECAST WALL PANELS. Precast wall panels shall be connected to the foundation. ***(Precast wall panels not used)***
C NC U [NA]	UPLIFT AT PILE CAPS. Pile caps shall have top reinforcement and piles shall be anchored to the pile caps. ***(Piles not used)***
C NC U [NA]	STEEL COLUMNS: The columns in lateral-force-resisting frames shall be anchored to the building foundation. ***(Steel frames not used)***
C NC U [NA]	WALL PANELS: Metal, fiberglass or cementitious wall panels shall be positively attached to the foundation. ***(Cladding panels not used)***
C NC U [NA]	ROOF PANELS: Metal, plastic, or cementitious roof panels shall be positively attached to the roof framing to resist seismic forces. ***(Cladding panels not used)***
C NC U [NA]	WALL PANELS: Metal, fiberglass or cementitious wall panels shall be positively attached to the framing to resist seismic forces. ***Note, however, that the URM is not anchored to the gunite.***

FOUNDATION	
C NC U [NA]	POLE FOUNDATIONS. Pole foundations shall have a minimum embedment depth of 4 ft. ***(Pole foundations not used)***
C [NC] U NA	TIES BETWEEN FOUNDATION ELEMENTS. The foundation shall have ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils in Site Class A, B, or C. ***Interior shallow pier footings are not tied to the exterior wall continuous footings. See Sheet 2 of Set 1 and Sheet 2 of Set 2.***
GEOLOGIC SITE HAZARDS	
C NC [U] NA **Critical Item**	LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 feet.
C NC U [NA] **Critical Item**	SLOPE FAILURE: The building site shall be sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or shall be capable of accommodating any predicted movements without failure.
C NC [U] NA **Critical Item**	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site is not anticipated.

Appendices

A.1 Structural calculations

UNIT WEIGHTS

CLASSROOMS + KITCHEN UNIT WEIGHT BREAKDOWN

ROOF

COMP. ROOFING	3.0 PSF
(2 LAYERS) 1X6 SHT'G	4.5 PSF
TRUSSED RAFTERS	5.0 PSF
OLD ACOUSTIC TILES	1.0 PSF
PLASTER CEILING (OLD)	8.0 PSF
6-8" BATT. INSULATION	1.0 PSF
MEP	0.5 PSF
SPRINKLERS	0.5 PSF
T-BAR CEILING	2.0 PSF
ACOUSTIC TILES	1.0 PSF
	26.5 PSF

WALLS

9" URM = 10PSF/in (9") = 90PSF

4" GUNITE = 150PCF (4"/12) = 50PSF

13" CONC = 150 PCF (13"/12) = 162.5PSF

GLAZING = 15.0PSF

ELIGIBILITY EVALUATION REPORT

School District:	Bakersfield City School District	Original Report Date:	August 15, 2018
School Campus:	Horace Mann Elementary School		
School Address:	2710 Niles Street, Bakersfield, CA 93306	Last Revision Date:	
Building Name/ID:	1930 Classrooms		
Project Tracking No.:			

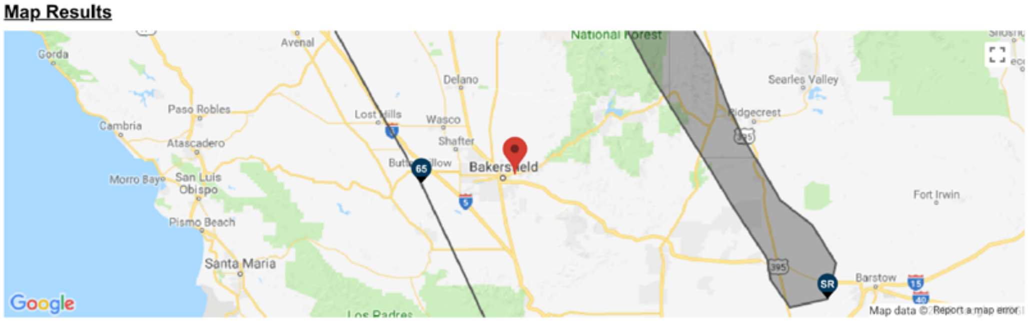
ATC HAZARDS RESPONSE SPERCTRUM INFORMATION

ATC Hazards by Location

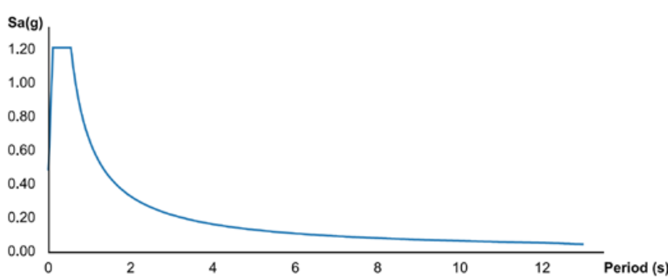
Search Information

Address:	2710 Niles St, Bakersfield, CA 93306, USA
Coordinates:	35.37690810000001, -118.9574422
Timestamp:	2018-07-16T17:06:25.321Z
Hazard Type:	Seismic
Reference Document:	ASCE7-05
Risk Category:	III
Site Class:	D
Report Title:	Horace Mann Elementary School

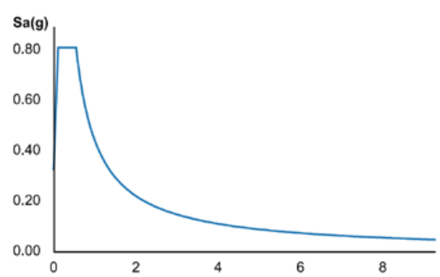
Map Results



MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Text Results

Basic Parameters

Name	Value	Description
S_S	1.18	MCE_R ground motion (period=0.2s)
S_1	0.419	MCE_R ground motion (period=1.0s)
S_{MS}	1.213	Site-modified spectral acceleration value
S_{M1}	0.662	Site-modified spectral acceleration value
S_{DS}	0.809	Numeric seismic design value at 0.2s SA
S_{D1}	0.441	Numeric seismic design value at 1.0s SA

ATC HAZARDS RESPONSE SPERCTRUM INFORMATION (continued)

SDC	D	Seismic design category
F_a	1.028	Site amplification factor at 0.2s
F_v	1.581	Site amplification factor at 1.0s
T_L	12	Long-period transition period (s)

BASE SHEAR/PSEUDO-LATERAL FORCE

PSUEDO LATERAL FORCE

$V = C S_a W$ ASCE 31, EQN. 3-1

$S_a = \frac{S_{D1}}{T}$, BUT $\leq S_{DS}$ § EQN. 3-4

$S_{DS} = 0.809g$

$= 2.28$

$S_{D1} = 0.441g$

$\therefore S_a = S_{DS} = 0.809g$

$T = C_t h_n^{\beta}$ § EQN. 3-8

$C_t = 0.020$
$h_n = 20.5'$
$\beta = 0.75$
§ SEC. 3.5.2.4

$T = 0.193s$

$C = 1.0$ § TABLE 3-4

W = EFFECTIVE SEISMIC WEIGHT

$W_{ROOF} = 15{,}000 ft^2 (26.5 PSF) = 397.5^k$

W_{WALLS} (URM W/GUNITE) $= 6'(90PSF + 50PSF) \times 662'$
$+ 4'(90PSF + 50PSF)(0.7) \times 662'$ $= 816^k$

GLAZING $= 4'(15PSF)(0.3) \times 662' = 12^k$

W_{WALLS} (CONCRETE) $= 12'(162.5PSF) \times 70' = 136.5^k$

$W_{TOTAL} = 1362^k$

$V = C S_a W$

$V = 1.0 (0.809)(1362^k) \longrightarrow V = 1102^k$

A.2 Evaluation statement notes

SHEAR STRESS (URM, Gunite, Concrete)

STRESS IN SHEARWALLS

$v_j^{AVG} = \frac{1}{m}\left(\frac{V_j}{A_W}\right)$ § EQN 3-12 $V_j = V = 1102^k$

A_W OF WALLS IN EACH DIRECTION (URM ONLY):

(TOTAL WALL LENGTH, OPENINGS)

SOUTH WALLS: $9'' \times (253' - 36(4')) = 11,772 in^2$ 43.1% SOLID

NORTH WALLS: $9'' \times (253' - 37(4')) = 11,340 in^2$ 41.5% SOLID

EAST WALLS: $9'' \times (113' - 13(4')) = 6,588 in^2$ ~ CRITICAL 54% SOLID

WEST WALLS: $9'' \times (110' - 10(4')) = 7,560 in^2$ 63.6% SOLID

URM SHEAR CHECK @ EAST WALLS

V_j @ EAST WALLS $= \frac{1102^k}{2} = 551^k$ $m = 1.5$, URM § TABLE 3-7

$v_{AVG} = \frac{1}{1.5}\left(\frac{551^k}{6,588 in^2}\right) = 0.056$ KSI (56 PSI) ~ URM

EAST WALLS (GUNITE SHEAR CHECK)

$A_W = 4'' \times (113' - 13(4')) = 2,928 in^2$

$m = 4.0$, RM / CONCRETE § TABLE 3-7

$v_{AVG} = \frac{1}{4.0}\left(\frac{551^k}{2,928 in^2}\right) = 0.047$ KSI (47 PSI) ~ GUNITE

SHEAR STRESS (continued)

SOUTH WALL (CONCRETE): CONCRETE SHEAR CHECK

$A_W = 18'' \times (70' - 8(6.5')) = 2{,}808 in^2$ 25.7% SOLID

$m = 4.0$

$V_{AVG.} = \frac{1}{4.0}\left(\frac{551^K}{2{,}808 in^2}\right) = 0.049 ksi$ (49psi) ~ CONCRETE

COMPARE ALLOWED VALUES TO SHEAR APPLIED

→ BRICK, URM ~ 30psi IS MAX SHEAR STRESS ALLOWED

FACTOR FROM DSA → $\frac{56 psi}{1.33} = 43 psi$ IS APPLIED

∴ 43psi > 30psi, MAXIMUM ALLOWED SHEAR IS EXCEEDED

→ CONCRETE, GUNITE ~ 100psi OR $2\sqrt{f'c}$ IS MAX SHEAR STRESS ALLOWED

$2\sqrt{3{,}000 psi} = 109 psi$

∴ 100psi ALLOWED

$\frac{47 psi}{1.33} = 36 psi$ IS APPLIED

∴ 36psi < 100psi, O.K.

→ CONCRETE, C.I.P. ~ 100psi OR $2\sqrt{f'c}$ IS MAX SHEAR STRESS ALLOWED

$2\sqrt{2{,}000 psi} = 89 psi$

∴ 89psi ALLOWED

$\frac{49 psi}{1.33} = 37 psi$ IS APPLIED

∴ 37psi < 89psi, O.K.

NOTE THAT ALL CHECKS ARE BASED ON EACH MATERIAL TAKING ALL SHEAR ALONG A MAJOR WALL LINE, WHICH IS CONSERVATIVE. BOTH THE GUNITE + CONC PASS THIS CHECK

REINFORCING STEEL

REINFORCING STEEL CHECK

→ 1953 4" GUNITE WALLS

VERTICAL STEEL: #3 @ 14" o.c

CONCRETE AREA (14" SECTION): 4" × 14" = 56 in²

STEEL AREA: 1-#3 BAR: 0.11 in²

RATIO: $\frac{0.11}{56}$ = 0.00196 > 0.0015 O.K.

HORIZONTAL STEEL: #3 @ 9" o.c

CONCRETE AREA (9" SECTION): 4" × 9" = 36 in²

STEEL AREA: 1-#3 BAR: 0.11 in²

RATIO: $\frac{0.11}{36}$ = 0.0030 > 0.0025 O.K.

→ 1953 CONCRETE FRONT

VERTICAL STEEL: #4 @ 15" o.c. EACH FACE

CONCRETE AREA (15" SECTION): 13" × 15" = 195 in²

STEEL AREA: 2-#4 BAR: 0.44 in²

RATIO: $\frac{0.44}{195}$ = 0.00225 > 0.0015 O.K.

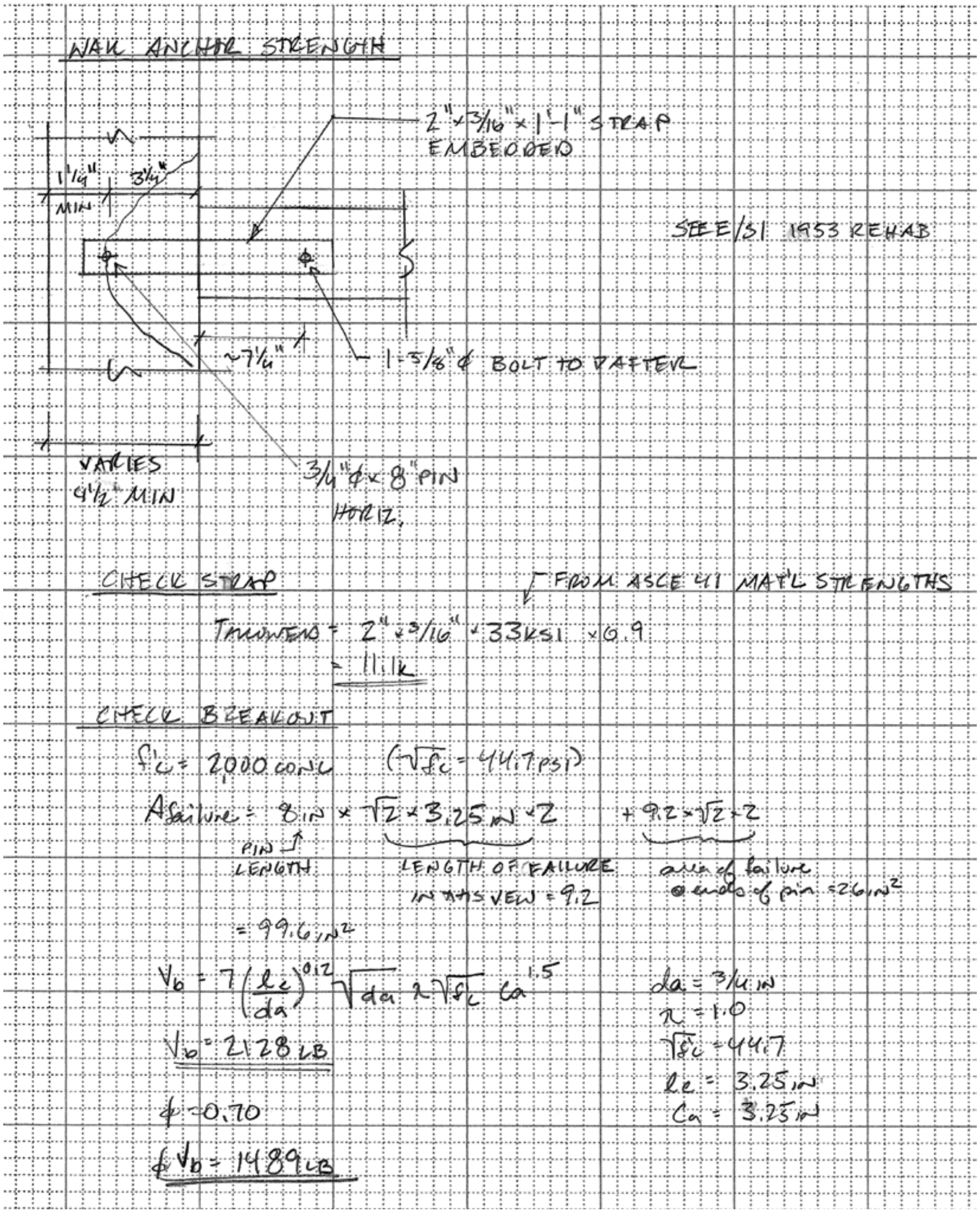
HORIZONTAL STEEL: #4 @ 10" o.c EACH FACE

CONCRETE AREA (10" SECTION): 13" × 10" = 130 in²

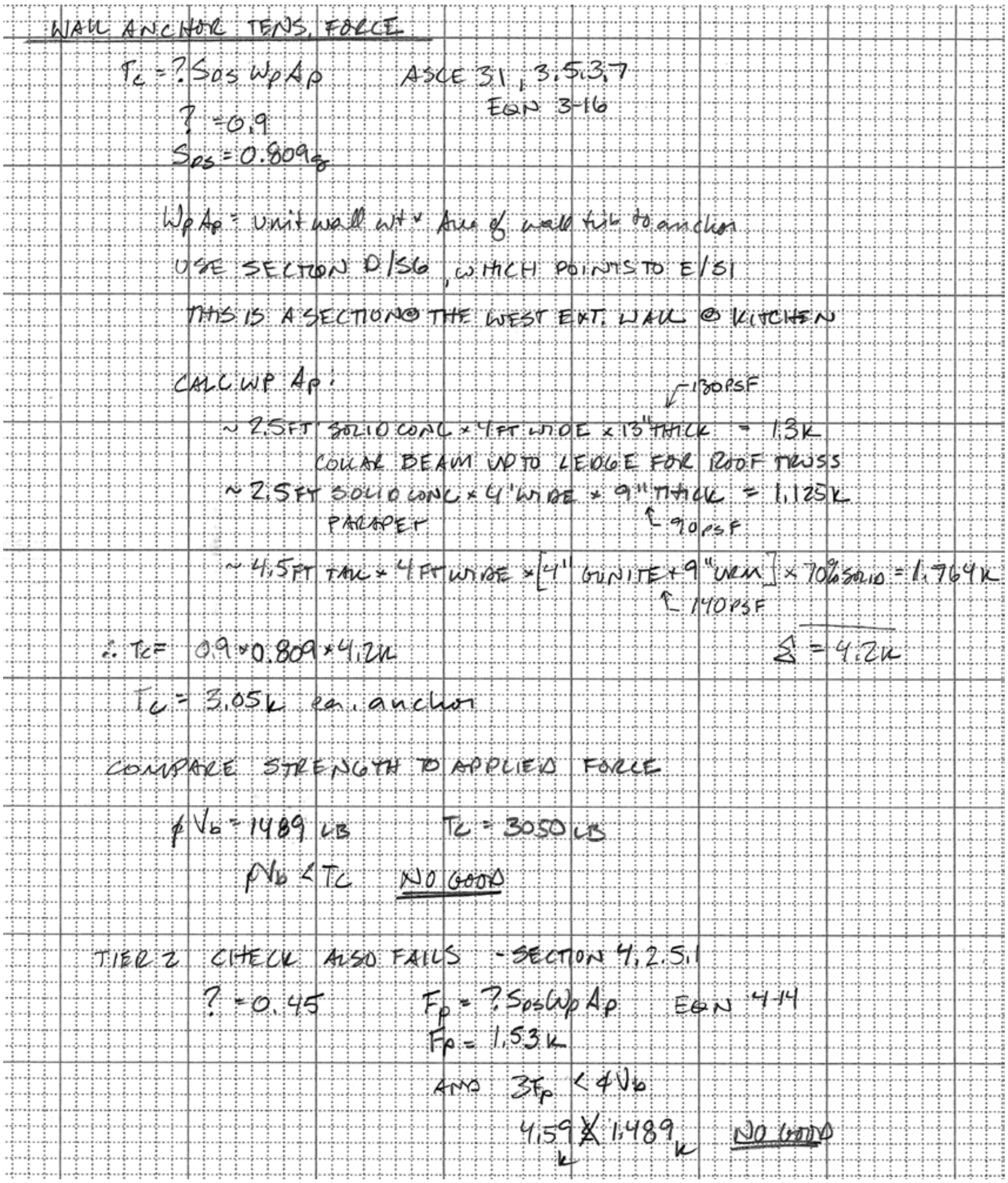
STEEL AREA: 2-#4 BAR: 0.44 in²

RATIO: $\frac{0.44}{130}$ = 0.00338 > 0.0025 O.K.

WALL ANCHORAGE (concrete)



WALL ANCHORAGE (continued)



WALL ANCHOR TENS. FORCE

$T_c = \chi S_{DS} W_p A_p$ ASCE 31, 3.5.3.7 EQN 3-16

$\chi = 0.9$

$S_{DS} = 0.809g$

$W_p A_p$ = unit wall wt × Area of wall trib to anchor

USE SECTION D/S6, WHICH POINTS TO E/S1

THIS IS A SECTION @ THE WEST EXT. WALL @ KITCHEN

CALC WP AP:

~ 2.5FT SOLID CONC × 4FT WIDE × 13" THICK = 1.3K (130PSF)
COLLAR BEAM W/ TO LEDGE FOR ROOF TRUSS

~ 2.5FT SOLID CONC × 4' WIDE × 9" THICK = 1.125K (90PSF)
PARAPET

~ 4.5FT TALL × 4FT WIDE × [4" GUNITE + 9" URM] × 70% SOLID = 1.764K (140PSF)

∴ T_c = 0.9 × 0.809 × 4.2K   Σ = 4.2K

T_c = 3.05K ea. anchor

COMPARE STRENGTH TO APPLIED FORCE

ϕV_b = 1489 LB T_c = 3050 LB

$\phi V_b < T_c$ NO GOOD

TIER 2 CHECK ALSO FAILS - SECTION 4.2.5.1

$\chi = 0.45$ $F_p = \chi S_{DS} W_p A_p$ EQN 4-14

F_p = 1.53K

AND $3F_p < 4V_b$

4.59K ≮ 1.489K NO GOOD

A.3 Photographs and details (not used)