nineteen six 196 ARCHITECTS & ENGINEERS
formerly Ehlen Spiess & Haight

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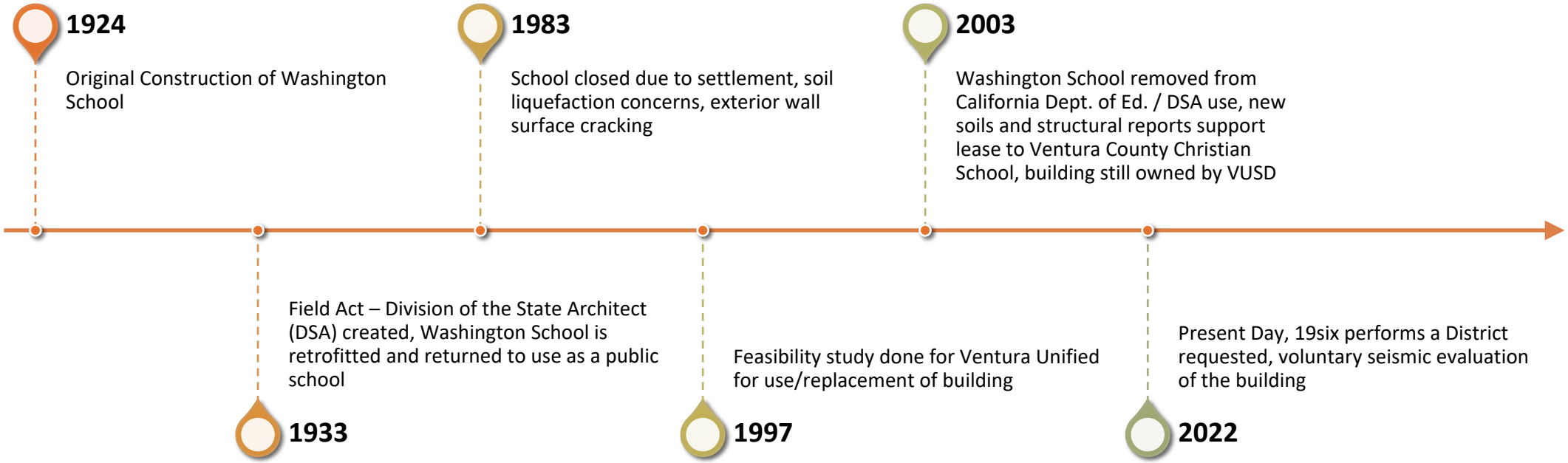
Ventura Unified SCHOOL DISTRICT

Washington School Structural Evaluation

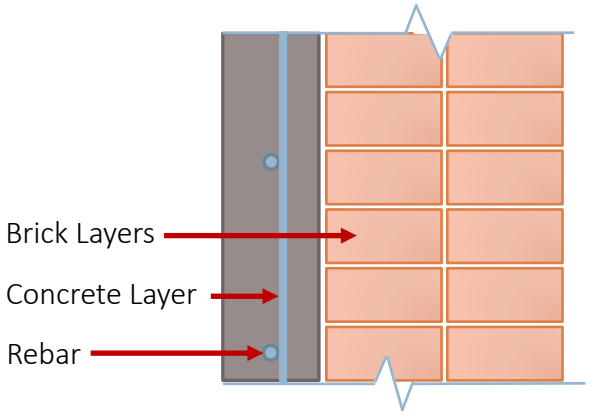
SPECIAL BOARD MEETING AUGUST 12, 2022

History


1924
Original Construction of Washington School
1933
Field Act – Division of the State Architect (DSA) created, Washington School is retrofitted and returned to use as a public school
1983
School closed due to settlement, soil liquefaction concerns, exterior wall surface cracking
1997
Feasibility study done for Ventura Unified for use/replacement of building
2003
Washington School removed from California Dept. of Ed. / DSA use, new soils and structural reports support lease to Ventura County Christian School, building still owned by VUSD
2022
Present Day, 19six performs a District requested, voluntary seismic evaluation of the building

Building Information

3D Model of the Building



Typical Wall Section

- Building Type is “Enhanced” Unreinforced Masonry, meaning the brick has been improved with a layer of concrete
- Unreinforced Masonry (URM) has been phased out of construction entirely in CA due to poor seismic performance

Structural Evaluation

19six Engineers conducted the following:

- On site structural visual observations
- Review of prior structural and geotechnical reports, as-built drawings, local and state jurisdiction correspondence
- Prepare ASCE41 Tier 1 Evaluation of the building for Life Safety level of seismic performance, identifying potential deficiencies based on prescriptive checklists
- Obtain an updated soils report for the site

Life Safety – Structural Performance Level

- Different seismic performance levels exist and are chosen based on the building's use, occupancy
- Performance levels define the level of earthquake applied and the relative safety of structure after the seismic event
- The District has chosen Life Safety, defined by ASCE41-17 as:

  "…the post-earthquake damage state in which a structure has damaged components but retains a margin of safety against the onset of partial or total collapse." (2.3.1.3)

- Life Safety is recommended for cases:

  "Where public safety is the primary concern, the standard's Life Safety Performance Level is often appropriate… [The] provisions were developed to support programs focused on the safety of persons, as opposed to programs seeking to minimize repair cost or downtime." (B2.1)

Findings – Structural Deficiencies

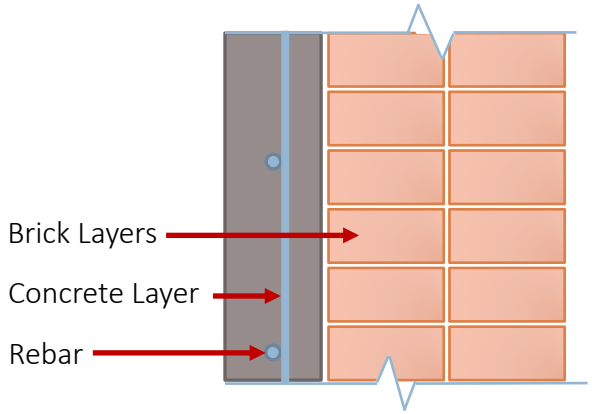
Deficiencies – Wall Anchors

• These type of wall anchors are not recommended to resist seismic forces without further enhancement. Therefore, the walls are missing proper out-of-plane anchorage.

Deficiencies – Wall Cracking

- Presence of surface cracking indicates possible damage to reinforcing and/or concrete layer.

Deficiencies – Overstressed and Slender Walls



Typical Wall Section

- When analyzing the walls for seismic forces, a vast majority of the shear walls are overstressed when considering the shear walls as unreinforced masonry (URM). Only one of the walls is overstressed when analyzed as concrete.
- The height-to-thickness proportions of the masonry and concrete walls exceed the limits of the checklists.

Unknowns

- Extent of damage to the exterior walls - Cracking, multiple past repairs, deterioration of shotcrete coating, bond between the brick and shotcrete are unknown
- Seismic retrofit detailing – Detailing of rebar, embedment length into foundation elements will affect seismic performance
- Behavior of floor diaphragms - Damage can result from incompatibility between flexible wood floors and rigid concrete floors during a seismic event
- Reliability of existing “Government” type wall anchors – These are now considered unreliable, can be enhanced
- Enhanced masonry bearing wall seismic performance – Shotcrete was added to the URM walls to improve performance. However, limited testing and real-world examples make it difficult to predict how well the system will perform.

Conclusions

Can Washington School be DSA Approved as a Public School?

Feasibility of returning school building to DSA-use:

- DSA does not allow the use of unreinforced brick masonry walls (URM) to support gravity or seismic loads, therefore a new structural system would be required to be constructed within the building. Rehabilitation costs are likely to exceed replacement costs for the building, due to fire / life safety, accessibility, and structural upgrades.

Does the building meet the District's chosen ASCE41 seismic performance criteria (Life Safety) for its current use as a non-DSA educational facility?

- Not at present time. Mitigation of the checklist of deficiencies is possible.
- Mitigating the Tier 1 checklist items will bring the building into conformance with the ASCE41 Tier 1 seismic performance criteria and certainly improve on certain seismic weaknesses of the building. However, due to building age and construction type, its seismic performance cannot be determined with a great deal of accuracy. The Significance of Unknown Information section of the report highlights the concerns that cannot be mitigated without substantial retrofit work.

Questions?


WASHINGTON SCHOOL
VENTURA COUNTY CHRISTIAN SCHOOL
Grades K4-12
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