



May 17, 2017

**Project Number 217-142**

Board of Education  
Alameda Unified School District  
2060 Challenger Drive  
Alameda, CA 94501

Dear Board:

**Subject: Structural Peer Review of Liquefaction Settlement  
Lum Elementary School, Alameda Unified School District  
1801 Sandcreek Way, Alameda, CA**

Murphy Burr Curry has performed a peer review of the soil liquefaction concerns at Donald D. Lum Elementary School in Alameda, CA. As part of this study, we have reviewed the following documents:

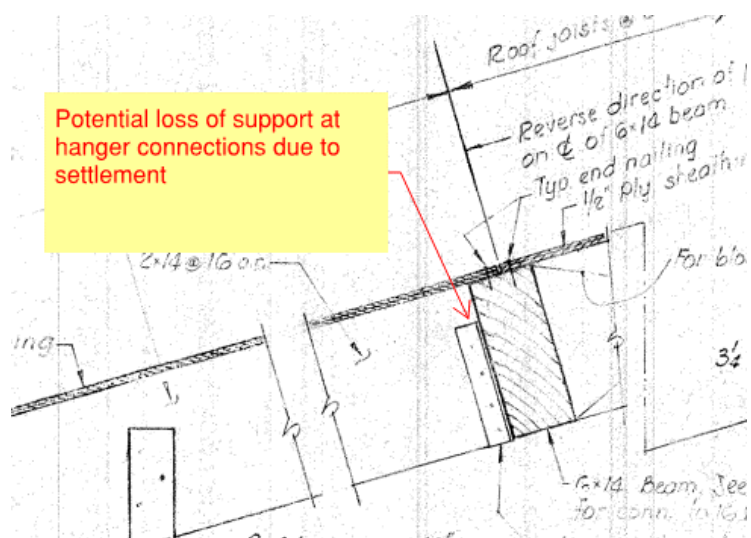
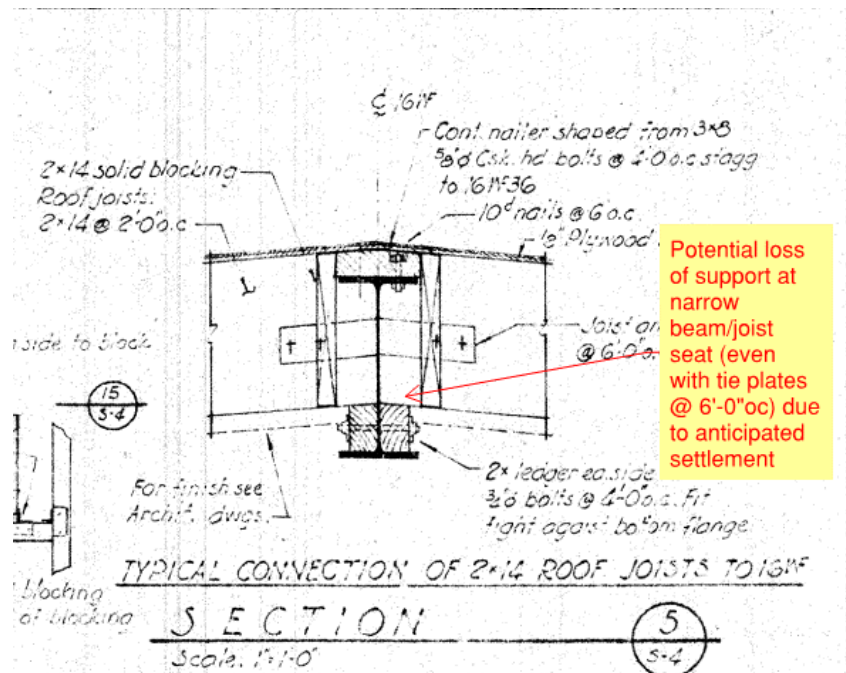
- "Donald Lum Elementary School Liquefaction Settlement" letter by ZFA Structural Engineers dated April 24, 2017.
- "Geotechnical Peer Review – Liquefaction Evaluation - Donald D. Lum Elementary School Campus" by RGH Consultants dated April 24, 2017
- "Geotechnical Engineering Investigation – Evaluation of Liquefaction Risk and Liquefaction Induced Settlement Potential - Donald D. Lum Elementary School Campus" by Miller Pacific Engineering Group dated March 17, 2017
- "Geologic Hazards and Geotechnical Investigation for Day Care Facility – Donald Lum Elementary School, Alameda California" by Kaldveer Associates dated March 23, 1990.
- Base building drawings for various campus construction projects from 1959, 1964, 1974, 2000, and 2006.

From the documentation above, we understand that the overall seismic liquefaction potential for the site is in the order of 5 to 10 inches. The differential settlement for a given building footprint is estimated to be in the order of 3 to 7 inches. The depth of the liquefiable zone extends from grade to roughly 50 feet deep.

We understand that the existing buildings on campus are one-story wood and steel framed structures. Plywood shear walls and concrete block walls are provided as the seismic lateral force resisting system. The buildings are supported on isolated shallow concrete spread footings. In the 1974 central classroom building addition, these isolated elements are connected by nominal concrete tie beams, however, we were not able to find evidence of any connection between foundation elements (except for the minimal slab on grade dowels) for the 1964 Classroom Building #3 Addition nor the 1959 Administration Building and Classroom Buildings #1 and #2.

This type of construction is not well suited for differential settlements of the order of the magnitude expected. The existing foundations do not appear to have the capacity or interconnected layout to mitigate the expected differential settlement. Therefore, the wall and roof framing would be subjected to the same

differential movement. This could result in life-safety concerns, such as partial roof collapse due to roof beams or joists becoming unseated from their connections or hangers (for examples, see the attached detail sections below from the 1959 structural set). Additionally, non-structural finishes, such as ceilings, light fixtures, doors, etc. are generally not designed for this magnitude of differential settlement and could present fall or egress concerns.



From 1959 Structural Set

As noted in previous reviews, the California Building Code does not require that the buildings or site be vacated by the district due to this condition. However, any future structural modifications to the existing buildings or significant retrofit work may invoke a full building upgrade to current code requirements including seismic and access.

In our professional opinion, given the life safety and egress concerns outlined above, we agree that the district develop a plan to provide alternate accommodations for students and faculty and/or if feasible, perform a seismic foundation retrofit as outlined below.

It may be possible to perform extensive modifications to directly address the liquefaction settlement concerns. This work could include a major soil improvement program utilizing soil grouting/compaction. Based on discussions with the project geotechnical engineer, this intrusive work would require soil grouting to depths of roughly 30 feet below grade and at a grid pattern of five foot on center each way over the entire footprint of the building. This design would not only need to be submitted to DSA for approval, but may trigger additional building upgrade requirements as noted above.

Given the age of buildings and scale of this work, the district would need to evaluate if this approach is feasible from a cost, timing, and serviceability perspective.

Please let us know if you have any questions.

Sincerely,

**MURPHY BURR CURRY, INC.**

Steven F. Curry, SE 3364  
Vice President



## Statement of Qualifications for Murphy Burr Curry, Inc.

Murphy Burr Curry, Inc. offers structural engineering consultation encompassing a variety of design and engineering for schools, commercial, private and public developments in the Bay Area and other major cities on the west and east coast. This letter includes a firm description, project information, resumes of key staff, and hourly rate schedule.

### ***THE FIRM***

Murphy Burr Curry, Inc. is a consulting structural engineering company founded in 1997. Murphy Burr Curry, Inc. currently has a total of 17 engineers and technical staff.

The firm offers structural engineering consultation specializing in building design and engineering services. The collective experience of the principals has resulted in the completion of a large number of new school buildings as well as the rehabilitation of existing school structures, including an emphasis on historic buildings.

The goal of Murphy Burr Curry, Inc. is to create innovative, imaginative, appropriate and cost-effective structural design, and client satisfaction. Our commitment to our projects is reflected in the fact that most of our workload is based on referrals from owners, architects and contractors.

Murphy Burr Curry's recent award-winning projects include the 2013 Citation Award for Nespresso, San Francisco; Neiman Marcus, Walnut Creek for the 2012 Grand Award, 110 First Street in Los Altos, which received the 2012 Platinum LEED Award for Commercial Interiors, The Sherman Clay Building, 2012 Architectural Precast Association award in two categories: GFRC Excellence and Craftsmanship. One South Park received the Gold Nugget Grand Award in recognition of Excellence by the 2011 Pacific Coast Builders Conference, Cavallo Point which won the SEAONC 2010 Excellence in Structural Engineering Award. Please refer to our web site, [www.mbcse.com](http://www.mbcse.com), for additional details of our firm. Attached are some examples of projects recently completed by Murphy Burr Curry.

Please call if you have any questions or require further information.

Sincerely,

**MURPHY BURR CURRY, INC.**

Steven F. Curry, SE  
Vice President

*REPRESENTATIVE PROJECTS*



<p><b>Emery Center of Community Life (ECCL)</b> Emeryville, CA</p> <p><i>Architect</i> Nexus Partners (dsk architects/Concordia/ MKThink)</p>	<p>The new school for Emery Center for Community life in Emeryville consist of a K-12 facility with four new buildings and a retrofit gymnasium. The new buildings include a one –and two wood framed buildings for a kindergarten and community/medical facility and two-two story steel framed buildings for classrooms and a auditorium. The project budget was approximately \$55 million. All buildings were designed for Seismic Occupancy Category III in accordance with the 2010 California Building Code.</p>
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**Palo Alto High School  
Classroom and Media Arts  
Center**  
Palo Alto, CA

*Architect*  
Deems Lewis McKinley

Murphy Burr Curry provided structural engineering services for two buildings on this high school campus: The Media Arts Center and a new classroom building. Both two-story structures are steel-framed with concrete slab over metal deck at the floors and the roof. The lateral system consists of braced frames and moment frames.

The Media Arts Center features clerestory windows and a centrally located atrium, with the roof approximately 8’ above the main building roof. There are moment frames at this level to resist the lateral forces and increase sunlight infiltration at the clerestory. The main entrance consists of a large glass storefront and canopy supported on tube steel cantilevers from the main structure. Multiple canopies, covered walkways and sunshades grace the exterior of the building.

The classroom building houses classrooms and study areas and features three skylights, as well as the clerestory windows at the stepped roofs. Three moment frames at the large entry allow for spacious openings along the entrance façade.

<p><b>Urban School</b> San Francisco, CA</p> <p><i>Architect</i> Pfau Long Architecture</p>	<p>Murphy Burr Curry designed a new 60,000 square foot addition for the Urban School. The four story building includes a two lower levels of parking, two levels of classrooms and a double-height gymnasium with a rooftop playground. The structure consists of reinforced concrete two-way spanning concrete flat slabs at the lower levels to maximize headroom and a structural steel superstructure above the parking levels with long-span structural steel trusses above the gym to support the playground. The seismic lateral system includes reinforced concrete walls and structural steel concentric braced frames. To accommodate the new building on its urban site, an historic Victorian era residence was moved onto a new foundation at an adjacent site and was seismically retrofit to meet code requirements.</p>
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<p><b>Encinal Elementary School Multi Use and Classroom Addition</b> Atherton, CA</p> <p><i>Architect</i> Deems Lewis McKinley</p>	<p>Murphy Burr Curry, Inc. provided full structural engineering services to develop a multi-use building and classroom addition for this elementary school campus. The project, which focused on a high-bay, two-story facility, utilized exposed structural steel framing and concrete. The new facilities included a multipurpose room with stage, 18 new lab and classrooms, and a kitchen.</p>
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<p><b>Sir Francis Drake High School</b> San Anselmo, CA</p> <p><i>Architect</i> Deems Lewis McKinley San Francisco</p>	<p>This Marin County high school needed a venue for holding student gathering and community events. Murphy Burr Curry, Inc. delivered structural and design services for expanding the school's existing student center and replacing the food service kitchen facilities. The project incorporated an all-exposed steel framework with exposed steel trusses.</p>
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<p><b>Newark Memorial High School-Student Commons</b></p> <p><i>Owner</i> Newark U.S.D.</p> <p><i>Architect</i> Deems Lewis McKinley San Francisco</p>	<p>This expansion of the existing school's cafeteria includes a 20,000 square foot open assembly area. The new structure consists of curved steel trusses with exposed steel bracing. The new addition creates a 140-foot clear opening across the building. The existing cafeteria was seismically upgraded and integrated with the new commons addition. This new addition will also serve as a new and inviting "face" to the primary student entry point to the campus.</p>
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<b>Bay Area Public Schools</b>	Murphy Burr Curry has performed a number of seismic evaluations and designs for Bay Area schools, which are under the jurisdiction of the Division of the State Architect and are typically Occupancy Category III buildings. Recent evaluations for the San Francisco Unified School District and San Jose School District include seismic evaluations in accordance with ASCE 41-13 for a seismic performance of Life Safety. Following completion of the seismic evaluations we have completed seismic retrofit designs for over 20 schools for the SFUSD.
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## RESUME 2017

**Steve Curry**, Vice President

[scurry@mbcse.com](mailto:scurry@mbcse.com)

**Professional Registration:** Registered Professional Engineer- California S3364 (Exp. Date: 3-31-2019)

**Professional Registration:** Registered Professional Engineer- California C40623 (Exp. Date: 3-31-2019)

### **Education:**

B.S. Architectural Engineering

California Polytechnic State University, San Luis Obispo, CA

### **Professional Experience:**

1997- Present - Murphy Burr Curry, Inc., San Francisco, CA

1983-1997 - Culley Associates, Inc., San Francisco, CA

### **Relevant Recent School Projects:**

Encinal Elementary School, Menlo Park, CA

Laurel Upper Campus, Menlo Park, CA

Palo Alto High School Theatre, Palo Alto, CA

Newark Memorial High School, Newark, CA

Drake High School, Larkspur, CA

El Camino High School South San Francisco, CA

Santa Teresa High School, San Jose, CA

Saint Marks School, San Rafael, CA

Woodbridge Elementary School, Roseville, CA

Petaluma High School, Petaluma, CA

Waldorf School, San Francisco, CA

Alice Fong Yu Elementary School, SFUSD

Cobb Elementary School, SFUSD

Cleveland Elementary School, SFUSD

DeAvila Elementary School, SFUSD

Francisco Middle School, SFUSD

Gateway/Kipp High School, SFUSD

Grattan Elementary School, SFUSD

Junipero Serra Elementary School, SFUSD

Luther Burbank Middle School, SFUSD

McLaren Child Development School, SFUSD

Presidio Middle School, SFUSD

Raoul Wallenberg High School, SFUSD

Roosevelt Middle School, SFUSD

Sunset Elementary School, SFUSD

### **Affiliations:**

Board Member, Architectural Foundation of San Francisco

Structural Engineers Association of California