



Memorandum

To: HKIT Architects **Date:** 2/16/2023
Project Name: BUSD PV Bridging Documents MLK, Willard, Acty **Project No.:** 22023.1
From: Amruta Chanabasanavar **No. of pages:** 7
Subject: Phase 1 Evaluation

IDA has performed an analysis of the primary structural system to assess if the existing building roof structures are sufficient to support new solar panels (PV).

The following buildings were analyzed:

Martin Luther King, Jr. Middle School – 1781 Rose, CA 94703

1. Science Building
2. Media Center
3. Main Classroom building
4. Dining Commons Building
5. Gymnasium

Willard Middle School – 2425 Stuart St, Berkley, CA 94705

1. Building A (Admin)
2. Building B (Cafeteria)
3. Building C (Classrooms)
4. Building D (Elective Arts)
5. Gymnasium

Ruth Acty (Formerly Jefferson) Elementary School – 1400 Ada St, Berkley, CA 94702

1. Classroom Wing 1
2. Classroom Wing 2
3. Classroom Wing 3
4. Classroom Building A
5. Classroom Building B

Record Drawings

Record drawings were available for analysis for all buildings.

Martin Luther King, Jr. Middle School:

	Record Drawings Available
Science Building	January 27, 1964 Dalton & Dalton Consulting Structural Engineers
Media Center	December 1, 1980 Shapiro, Okino, Hom and Associates Engineers
Main Classroom Building	February 01, 2001 SOHA Engineers
Dining Commons Building	January 16, 2004 ZFA Structural Engineers
Gymnasium	January 31, 1955 Masten and Hurd Architects

Willard Middle School:

	Record Drawings Available
Building A (Admin)	May 5, 1964 Milton G Long Structural Engineer
Building B (Cafeteria)	May 5, 1964 Milton G Long Structural Engineer
Building C (Classrooms)	January 15, 1951 HJ Brunnier Structural Engineer
Building D (Elective Arts)	January 15, 1951 HJ Brunnier Structural Engineer
Gymnasium	October 15, 1950 HJ Brunnier Structural Engineer

Ruth Acty (Formerly Jefferson) Elementary School:

	Record Drawings Available
Classroom Wing 1	February 7, 1950 Mark Falk Structural Engineer
Classroom Wing 2	February 7, 1950 Mark Falk Structural Engineer
Classroom Wing 3	February 7, 1950 Mark Falk Structural Engineer

Classroom Building A	KPW Structural Engineers March 11, 2013
Classroom Building B	KPW Structural Engineers March 11, 2013

Building Information

Martin Luther King, Jr. Middle School

	Science Building	Media Center	Main Classroom Building	Dining Commons Building	Gymnasium
Total Roof Area (ft²)	14263	5808	46140	14016	20841
Estimated Useful Roof Area for PV (ft²)	9984	4646	23863	10512	13546
Estimated Useful Roof Area for PV (%)	70	80	52	75	65

Willard Middle School

	Building A	Building B	Building C	Building D	Gymnasium
Total Roof Area (ft²)	12035	9487	24478	13039	9498
Estimated Useful Roof Area for PV (ft²)	8424	7115	13463	7171	6743
Estimated Useful Roof Area for PV (%)	70	75	55	55	71

Ruth Acty (Formerly Jefferson) Elementary School

	Classroom Wing 1	Classroom Wing 2	Classroom Wing 3	Classroom Building A	Classroom Building B
Total Roof Area (ft²)	7238	8052	13049	3210	3462
Estimated Useful Roof Area for PV (ft²)	5428	6039	8482	2568	2769
Estimated Useful Roof Area for PV (%)	75	75	65	80	80

Building Roof description

Martin Luther King, Jr. Middle School:

1. Science Building
The existing roof is framed with Glulam beams at 8'-0" with 2x4 joists at 24" OC in between. The beams span to bearing walls. Roof sheathing is ½" plywood w/ 10d @ 6" OC @ panel, edges and 10d @ 12" OC at intermediate supports.
2. Media Center
The existing roof is framed with 5-1/8"x18" Glulam beams with 2x8 joists at 16" OC in between. The Glulam beams are supported by 6x6 posts. Roof sheathing is ½" plywood w/ 10d @ 6" OC @ panel, edges and 10d @ 12" OC at intermediate supports.
3. Main Classroom Building
Existing roof is framed with 2x6 rafters @ 16" OC supported by wood stud bearing wall. Roof sheathing is ¾" 48/24 T&G, CDX plywood with 10d @ 6" OC edge nailing and 10d @ 12" OC field nailing. All unsupported edges without T&G are blocked.
4. Dining Commons Building
In the central portion of the building, existing roof consists of prefabricated wood trusses supported by W10 steel beams. W10 beams are supported by steel wide (WF) flange columns. The east and west portions of the building roof are framed with prefabricated wood trusses supported by W12x26
Roof sheathing is 5/8" plywood with 8d @ 6" OC edges and 12" OC field.
5. Gymnasium
Typical roof framing is 2x8 @ 24" OC supported by WF beams. WF beams are supported by steel columns. Roof sheathing is 1" diagonal sheathing. The central portion of the building has a monitor roof. The monitor roof is framed with prefabricated wood trusses @ 7'-0" OC supported by WF beams.

Willard Middle School

1. Building A (Admin)
Existing roof is framed with 2x12 @ 16" OC supported by bearing walls. Roof sheathing is ½" plywood sheathing with 10d @ 3" OC edge and 10d @ 12" OC intermediate nailing.
2. Building B (Cafeteria)
Existing roof is framed with 2x8 @ 16" OC supported by WF beams. WF beams are supported by concrete pilasters. Roof sheathing is ½" plywood sheathing with 10d @ 3" OC edge and 10d @ 12" OC intermediate nailing.

3. Building C (Classroom)
Existing roof is framed with 2x10 joists @ 16" OC supported by WF beams. The WF beams are supported on concrete walls. Roof sheathing is ½" plywood sheathing with 10d @ 3" OC edge and 10d @ 12" OC intermediate nailing.
4. Building D (Elective Arts Building)
Existing roof is framed concrete beams at 11'-0" OC. The concrete beams are supported by concrete walls.
5. Gymnasium
Existing roof is framed with prefabricated wood trusses at 8'-0" OC. Trusses bear on concrete walls. Roof sheathing is ½" plywood sheathing with 10d @ 3" OC edge and 10d @ 12" OC intermediate nailing.

Ruth Acty (Formerly Jefferson) Elementary School

1. Classroom Wing 1
Existing roof consists of steel joists @ 8'-0" supported by trusses. The trusses are supported by WF columns.
2. Classroom Wing 2
Existing roof consists of steel joists @ 8'-0" supported by trusses. The trusses are supported by WF columns.
3. Classroom Wing 3
Existing roof consists of steel joists @ 8'-0" supported by trusses. The trusses are supported by WF columns.
4. Classroom Building A
Existing roof consists of Castilated Steel Beam, WF beams and HSS Beams, supported by WF Columns.
5. Classroom Building B
Existing roof consists of steel WF beams supported by WF columns. Roof sheathing is Verco N-24 Deck.

Evaluation of Gravity Loads

The PV panel weight is assumed to be a distributed load of 5 lb/ft². Since the panels will most likely be supported on a frame with a grid of stanchions, the distributed load was converted to a concentrated load of 250 pounds. This equates to a stanchion grid spacing of approximately 6 feet x 8 feet. The roof framing members were evaluated for a concentrated load of 250 pounds at various

locations that would produce the highest stress. Per Code¹, strengthening of existing framing is not required if the stresses in the existing structural framing are not increased by more than 5%.

In all cases, additional stresses imposed by the proposed PV panels on the existing framing are less than a 5% increase. Therefore, the existing framing is adequate to support the anticipated loads from the PV panels provided the maximum loading of 250 pounds is not exceeded.

Existing framing is adequate to support a reroofing load of 3psf for all buildings.

Evaluation of Lateral Loads

An increase in the effective seismic weight in any story by more than 10% shall require a rehabilitation of the existing building². Effective seismic weight includes the weight of the roof (roofing, structure, ceiling, rooftop units, etc.) and weight of interior and exterior walls that are tributary to the roof (typically the weight of the wall from the roof to the story below divided by two). IDA has ignored the tributary wall weight for this preliminary phase in order to produce a conservative result. For each building, the increase in effective seismic weight is calculated for 5 psf additional load acting over the proposed area of the PV panels.

In all cases, the existing structures do not need to be evaluated for additional seismic loading from the new panels.

Additional wind forces on the building have not been evaluated, but are expected to be minimal. For this assumption to be accurate, the panels must be installed parallel with the roof plane, and not more than 24 inches above the roof surface. Panels on inclined frames should not be allowed without additional evaluation from the design-build team.

Panel layout spacing

The recommended panel layout spacing for the buildings are as follows:

Martin Luther King, Jr. Middle School – 1781 Rose, CA 94703

1. Science Building – 8'x8'
2. Media Center – 8'x8'
3. Main Classroom building – 8'x8'
4. Dining Commons Building – 8'x wood truss spacing
5. Gymnasium – 8'x8' at typical roof and 8'x7' at monitor roof

¹ 2019 California Existing Building Code, Section 503.3

² Division of the State Architect, Interpretation of Regulations IR EB-5

Willard Middle School – 2425 Stuart St, Berkley, CA 94705

1. Building A (Admin) - 8'x8'
2. Building B (Cafeteria) – 8'x8'
3. Building C (Classrooms) – 8'x8'
4. Building D (Elective Arts) - 8'x11'
5. Gymnasium – 8'x8'

Ruth Acty (Formerly Jefferson) Elementary School – 1400 Ada St, Berkley, CA 94702

1. Classroom Wing 1 – 8'x8'
2. Classroom Wing 2 – 8'x8'
3. Classroom Wing 3 – 8'x8'
4. Classroom Building A– 8'x Steel beam spacing
5. Classroom Building B – 8'x Steel beam spacing