GRINNELL NEWBURG COMMUNITY SCHOOL DISTRICT

DAVIS ELEMENTARY SCHOOL – FAILING MASONRY STUDY REPORT

CMBA # 24216
NOVEMBER 07, 2024

CMBA ARCHITECTS

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PREFACE

The Grinnell Newburg Community School District has commissioned this report to investigate exterior masonry conditions of the Davis Elementary School. In several locations around the building, the exterior masonry veneer is showing signs of failure. The intent of this document is to provide an understanding of the existing structure and veneer conditions for the school board to determine the next steps for resolution.

ARCHITECTURAL

Davis Elementary School was designed by Reimer & Herlin Architects and completed construction in 1917. The building was constructed of cast-in-place concrete columns, beams, and floors, with a multi-wythe masonry exterior veneer and infill. Various replacements have been conducted to maintain the exterior, such as a window replacement in 1997 and a roof replacement in 2019. The scope of this study investigated potential failure of existing structure and exterior masonry veneer conditions.

Each façade was evaluated for masonry failure. The most extensive failures are located on the north and east façades, at the window headers and lintels. The brick veneer appears to be crumbling at the top header course and beginning to protrude from the concrete beam due to years of continuous weather saturation (Figure 2 & 3). It was determined after brick removal that the existing steel angle lintels are intended to be anchored to the perimeter concrete beams. In most cases the angles are anchored to this beam, however, at one of the locations where brick was removed (Figure 2), the angles do not anchor into the concrete. All the steel angles are deteriorating to some degree, several are severely deteriorated. This deterioration is causing the brick veneer to sag and fail. Where the lintels are not attached to the beams this sagging and failure is even more apparent (Figure 5). Through-wall flashing was not found within system. This was typical in the era when the building was constructed and explains why water is penetrating the wall assembly.

Additionally, there are locations on each façade where the masonry veneer and mortar joints are cracking in a stair-step pattern indicative of settling or load shift issues. There are also locations of potential settling occurring at the north, east and west portions of the building (Figure 10 &11) where the exterior plaster veneer is cracking below the windows on the main level.

Façade masonry failures were rated on a priority scale for repairs and noted in the appendix photos attached to this report.

Priority 1: highlighted in orange

- Recommended large opening repairs: Remove existing exterior wythe of brick and associated steel angle lintels, replace lintels with hot-dipped galvanized angles and fasteners, install flashings to protect lintels, install sheet metal flashing above belt courses, sills and projected courses, reinstall / replace brick to match existing coursing and patterns.

Priority 2: highlighted in green

- Small opening repairs: Remove existing exterior wythe of brick and associated steel angle lintels, replace lintels with hot-dipped galvanized angles and fastener, install flashings to protect lintels, sills and projected courses, reinstall / replace brick to match existing coursing and patterns.
- Tuck pointing for beige brick (Figure 12)

Priority 3: highlighted in blue

- Patch and repair of plaster veneer (Figure 13)

Items highlighted as Priority 1 are a potential life safety concern and should be resolved as soon as possible. These concerns stem from the possibility of brick veneer falling off the building. The primary structural frame of the building appears to be in good condition.

ANTICIPATED COST TO REPAIR

Cost Estimate				Priority 1 Repairs	Priority 2 Repairs	Priority 3 Repairs
DIVISION 1 GENERAL REQUIREMENTS						
General conditions	20%			$36,900	$126,700	$65,500
			Sub-total	**$36,900**	**$126,700**	**$65,500**
DIVISION 2 EXISTING CONDITIONS						
Masonry Demolition	300	sf	$6	$1,800	N/A	N/A
Masonry Demolition	500	sf	$6	N/A	$3,000	N/A
			Sub-total	**$1,800**	**$3,000**	**$0**
DIVISION 3 CONCRETE						
Repair Plaster	8	ea	$2,000	N/A	N/A	$16,000
			Sub-total	**$0**	**$0**	**$16,000**
DIVISION 4 MASONRY						
Replace Exterior Brick Above Lintels (1)	140	lf	$1,000	$140,000	N/A	N/A
Replace Exterior Brick Above Lintels (2)	500	lf	$1,000	N/A	$500,000	N/A
Tuckpointing	13000	sf	$24	N/A	N/A	$312,000
			Sub-total	**$140,000**	**$500,000**	**$312,000**
DIVISION 5 METALS						
Replace Steel Angle Lintels (1)	140	lf	$200	$28,000	N/A	N/A
Replace Steel Angle Lintels (2)	500	lf	$200	N/A	$100,000	N/A
			Sub-total	**$28,000**	**$100,000**	**$0**
DIVISION 7 THERMAL & MOISTURE PROTECTION						
Install Flashing (1)	140	lf	$45	$6,300	N/A	N/A
Install Flashing (2)	500	lf	$45	N/A	$22,500	N/A
			Sub-total	**$6,300**	**$22,500**	**$0**
DIVISION 9 FINISHES						
Replace Ceilings and Gypsum Board Bulkheads	400	sf	$20	$8,000	$8,000	N/A
			Sub-total	**$8,000**	**$8,000**	**$0**
			Sub-total Division 1-28	**$221,000**	**$760,200**	**$393,600**
		Overhead & Profit	15%	$33,150	$114,300	$59,040
		Design Contingency	15%	$33,150	$114,300	$59,040
			Construction Total	**$287,300**	**$988,300**	**$511,700**

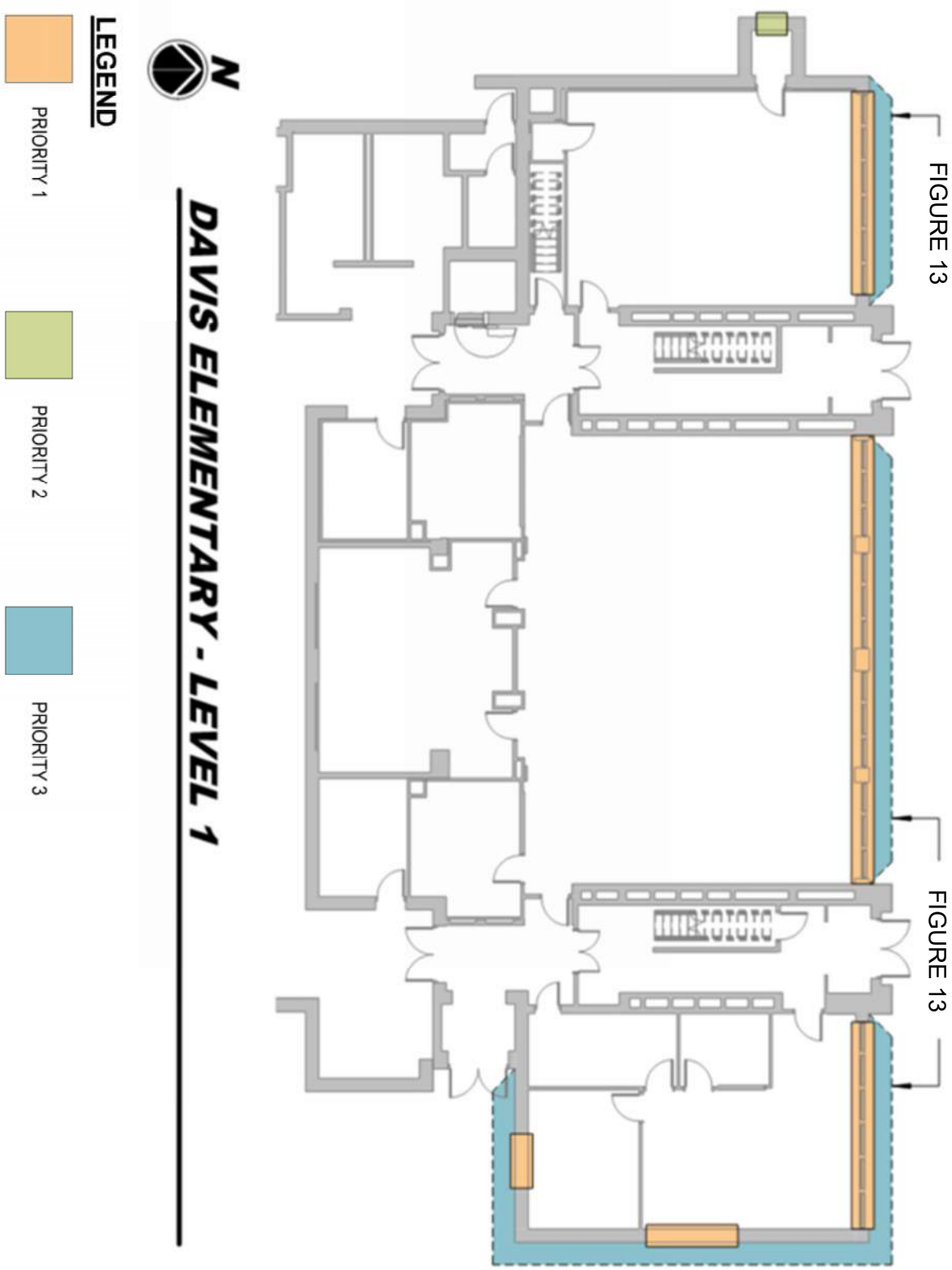
SUMMARY

It was identified that each façade is showing signs of masonry veneer failure. The extensive failures are located on the north and east façades, at the window headers and lintels. The brick veneer in many of these locations is crumbling and protruding from the concrete beam. Further investigation was carried out in the worst locations and determined that the existing steel angles are deteriorating, do not anchor into the concrete, and are causing the brick veneer to sag and fail. Through wall flashing was not found within the system. This condition is typical in the era when the building was constructed and explains why water is penetrating the wall assembly.

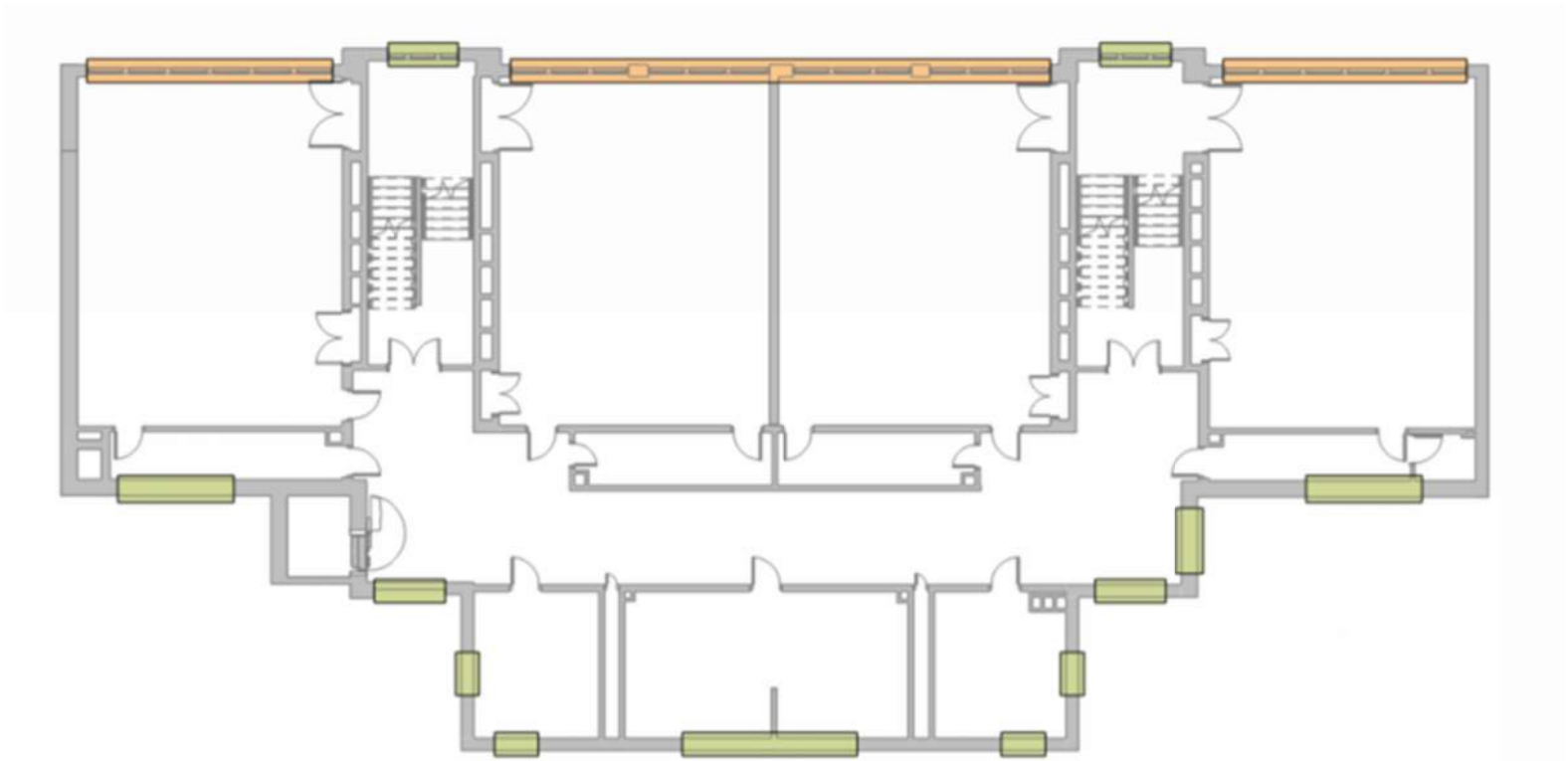
Additionally, cracking is occurring below windows in the exterior plaster on the main level and the masonry veneer and mortar joints are cracking in a stair-step pattern along the south and west façades. Both situations are indicative of settling or load shifting issues. Though this is occurring, the primary structural frame of the building appears to be in good condition.

Items were categorized by priority of life safety concerns. Recommendations for remediation and a cost estimate associated were determined for each failure to provide an understanding of future repairs. For priority 1, if unresolved as soon as possible, there is a concern of the possibility of brick veneer falling off the building.

REFERENCE FLOOR PLANS



DAVIS ELEMENTARY - LEVEL 2
N
LEGEND
PRIORITY 1
PRIORITY 2
PRIORITY 3



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DAVIS ELEMENTARY - LEVEL 3

LEGEND

PRIORITY 1

PRIORITY 2

PRIORITY 3

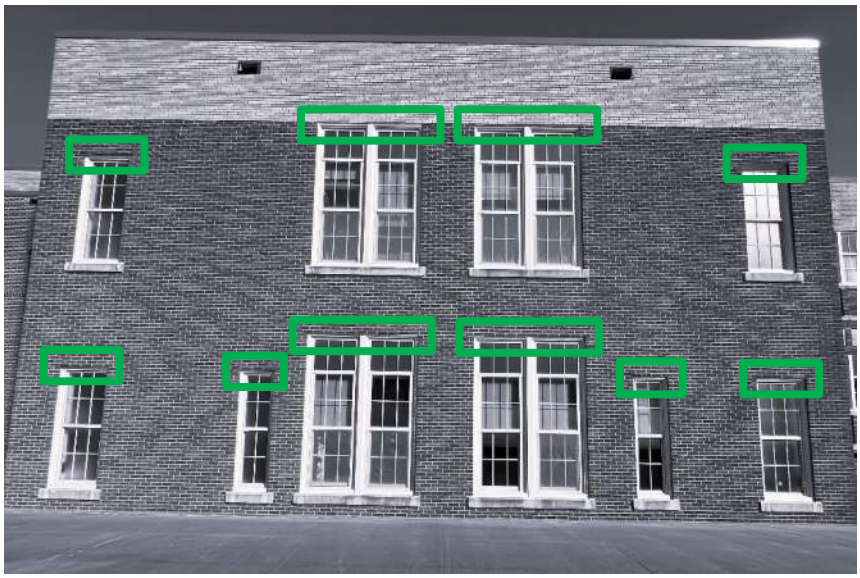
Figure 1: North Façade – Masonry failure locations; Red highlights indicate areas of investigation

Figure 2: Masonry Failure – North center lintel at library / no concrete beam attachment

Figure 3: Masonry Failure – Northwest protruding brick; lintel deteriorating

Figure 4: East Façade – Masonry failure locations
Orange highlights indicate areas of investigation

Figure 5: Masonry failure – East
sagging brick above window; crumbling brick



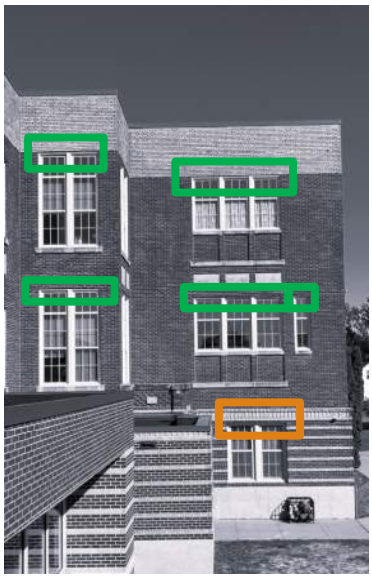
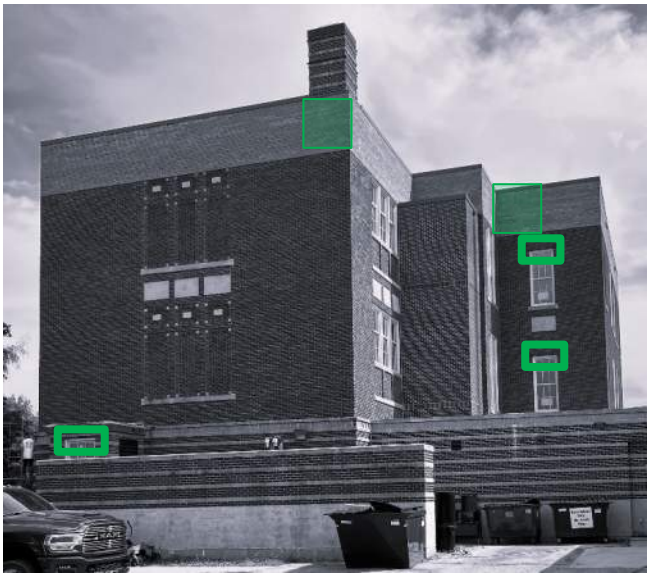


Figure 6 & 7: South/Southeast Façade – Masonry failure locations



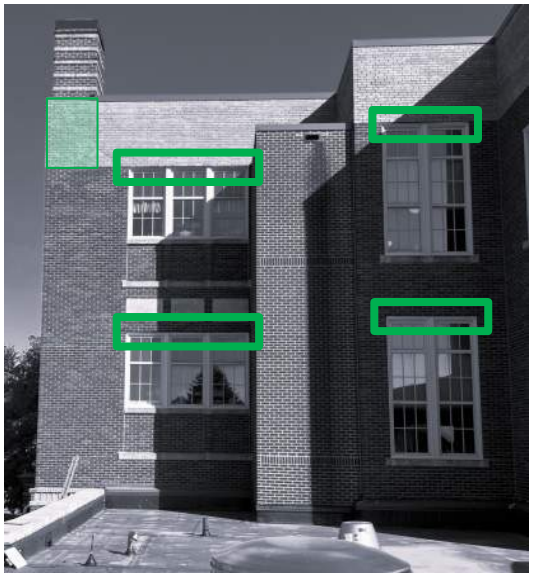


Figure 8 & 9: West/Southwest Façade – Masonry failure locations
Green highlights indicate area of investigation

Figure 10: Masonry failure – West stair stepping cracking

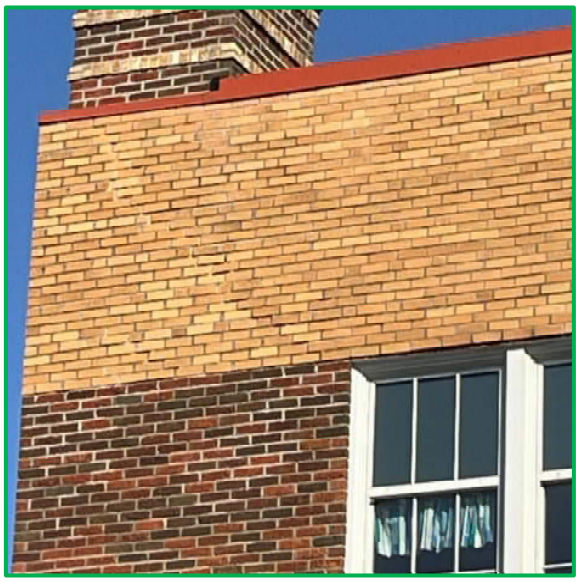


Figure 11: Masonry Failure – Southwest Stair stepping cracking

Figure 12: Masonry Failure – Beige Brick Tuckpointing – priority 2

Figure 13: Masonry Failure – See Reference Floor Plan plaster veneer cracking – priority 3