WOODSTOCK ELEMENTARY SCHOOL
5601 SE 50th

SEISMIC IMPROVEMENTS MADE TO FACILITY IN CONJUNCTION WITH THE 2009 REROOFING PROJECTS

LATERAL UPGRADE AND REROOFING SCOPE IN 2009

The 2009 Reroofing Project for Woodstock Elementary included portions of just about all sectors of the school except for the west classroom wing of the 1954 Addition. See the attached 2008 Roofing Assessment plan of Woodstock by Professional Roof Consultants and our calculation sketch of the various dates of construction for more understanding of the sectors addressed in 2009..

Generally all reroofed sections received supplemental roof diaphragm strengthening with added plywood plus strengthened connections to major interior and all perimeter walls - particularly tile and concrete ones. The project was limited to the roof level, and so while we planned and provided for continuation of the seismic loads paths through attic zones of pitched roof areas, work needed below the roof level of the building was postponed for future projects. A scheme for diagonal cable bracing of the existing masonry chimney was preliminarily developed for the future if the more desirable option of reducing the height of the chimney cannot be undertaken. We provided one steel bracket built into the 1917 Covered Play roof in order to avoid a major disruption of the new roofing if diagonal cable braces need to be installed for chimney stability in the future. The other three cable connection points of our scheme are to walls and did not need to be provided for in this roofing project.

The Upgrade Philosophy narrative which is included on our structural drawings is reproduced and attached. It outlines the lateral upgrade design level as being ASCE 41-06 and identifies areas of the building needing future upgrade. Generally all seismic improvements to the roof level of Woodstock believed to be required is completed by this and prior upgrades, but we have not constructed the projected load paths through attic zones below the roof level since this 2009 project was limited to reroofing done by roofing contractors.

1954 CAFETORIUM

A major summer rain occurred during the 2009 construction and resulted in a considerable amount of water into the building in this zone. We believe there was no damage to any structural elements, but there was a good bit of architectural effect. This section received supplemental plywood continuous over the two framing zone areas and connections to perimeter walls, specifically consisting of the following:

- Added ½" plywood to top of 3" nominal sawn deck which is supported by wood girders spanning N/S across the Cafetorium area.
- Added ½" plywood to top of 1" nominal straight sheathing over Stage area.
- Connected roof diaphragm to perimeter concrete walls surrounding the space.

1954 KITCHEN AREA [East of Cafetorium}

- Added ½" plywood over 1" nominal straight sheathing which is supported by sawn sleepers to create slope over the 2 x 14 rafters which frame the roof.
- Provided diaphragm to concrete wall connection along west side of roof to cafeteria wall.
- Provided drag strut connection at kitchen skylight area into concrete walls at northeast corner of cafeteria.

1917 & 1924 CLASSROOM WINGS [these are the "L" shaped wings at N & S ends of building]

Our structural concept for the lateral load paths in these portions of Woodstock is for a future upgrade to provide shearwall sheathing onto studs existing in the attics and located along corridor wall lines below. We believe the corridor walls can act as shearwalls if the forces can reach them. As existing, a transfer of forces from roof diaphragm through the open attic zone to the corridor walls which stop at the ceiling level level of the main floor is lacking. We provided new blocking at the tops of these attic wall lines where they intersect the roofs, so that the attic shearwalls can be constructed in the future at selected locations to transfer the forces without requiring any damages to the roofing membranes installed in 2009.

- Added ½" plywood onto 1" nominal straight roof sheathing which is supported by the rafters which frame these areas. Note that the area of this project is generally the back side of the pitched roof and is identified as Zones "B" on the Professional Roof Consultant roof plan. Front sides of these roof has previously been reroofed and provided with supplemental plywood by others in the late 1990's.
- Added load transfer blocking at roof interface above corridor wall lines projected to be the future attic zone lateral load path.

1917 GYM / PLAYROOM / FAN ROOM

Original documents are unclear as to the construction of the wall between the Gym and the Fan Room, particularly how or if it is connected at the top into the roof framing. We determined that the wall is constructed of clay tile and certainly needs out of plane strengthening as part of a future upgrade,

but we could not view the top of wall to determine what connections and support mechanism were existing there. The reroofing project was then used to open up a section of the roof and view and photograph the existing conditions. We believe strongbacks or some other means of strengthening the wall for out of plane forces will be required, and have some ideas for how that might occur and how those braces could be connected into the roof framing in the concealed zone which was viewed. Otherwise, the following upgrades were completed for this sector of the building:

- Added ½" plywood over 1" nominal straight sheathing roofs of this whole zone
- Provided steel straps on all four sides to reinforce the diaphragm opening through the Gym roof formed by the original skylight which had been previously covered over, but still remains as a penetration through the roof diaphragm level.
- Added steel bracket in roof of Covered Play for possible future connection of diagonal cable brace for chimney.
- Added in-plane and out of plane connections to all concrete and perimeter walls.

SCHOOL NUMBER

BUILDING SUMMARY

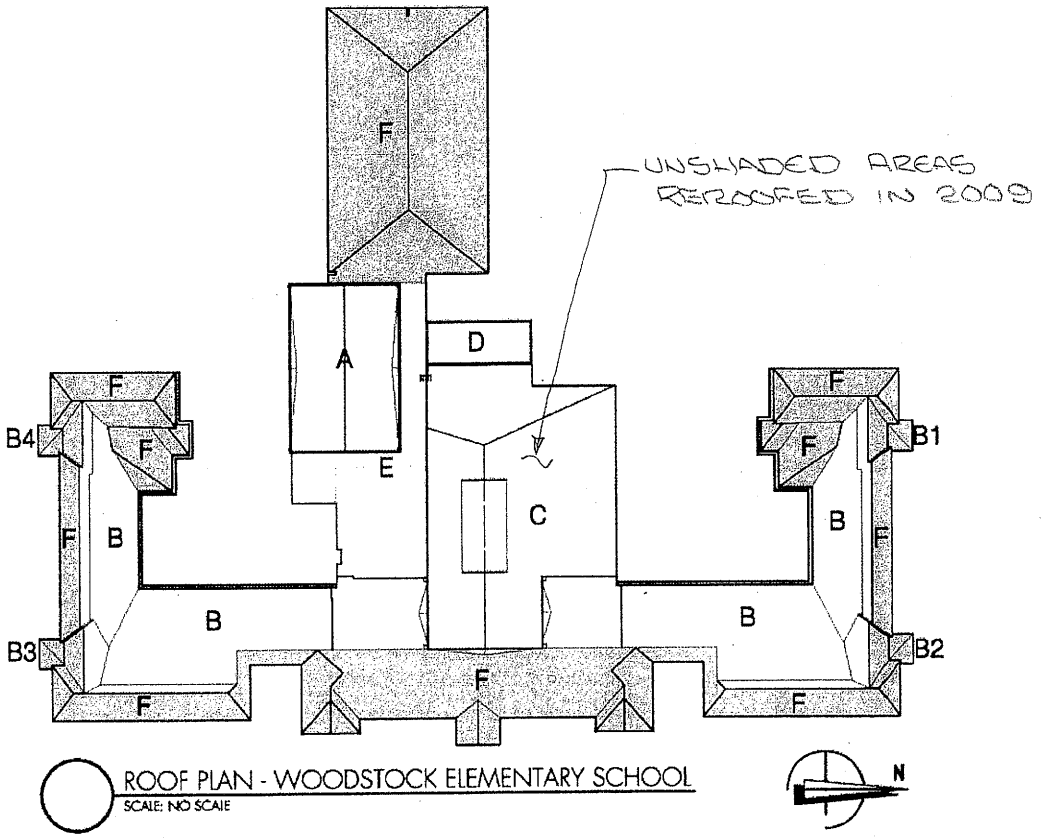
297

PROJECT GROUP

Repair - A

SCHOOL NAME

WOODSTOCK ELEMENTARY SCHOOL



ROOF PLAN - WOODSTOCK ELEMENTARY SCHOOL
SCALE: NO SCALE

Priority 1

Existing roof system has generally expired. Repair scopes should not be considered an option. ***Replace in 2009.***

Priority 2

Roof systems are approaching the end of their service life. Roof system replacement could be deferred. ***Repair in 2009.***

P.V. Option

As denoted with a hatch pattern, these areas could be considered for installation of a rooftop P.V. system.

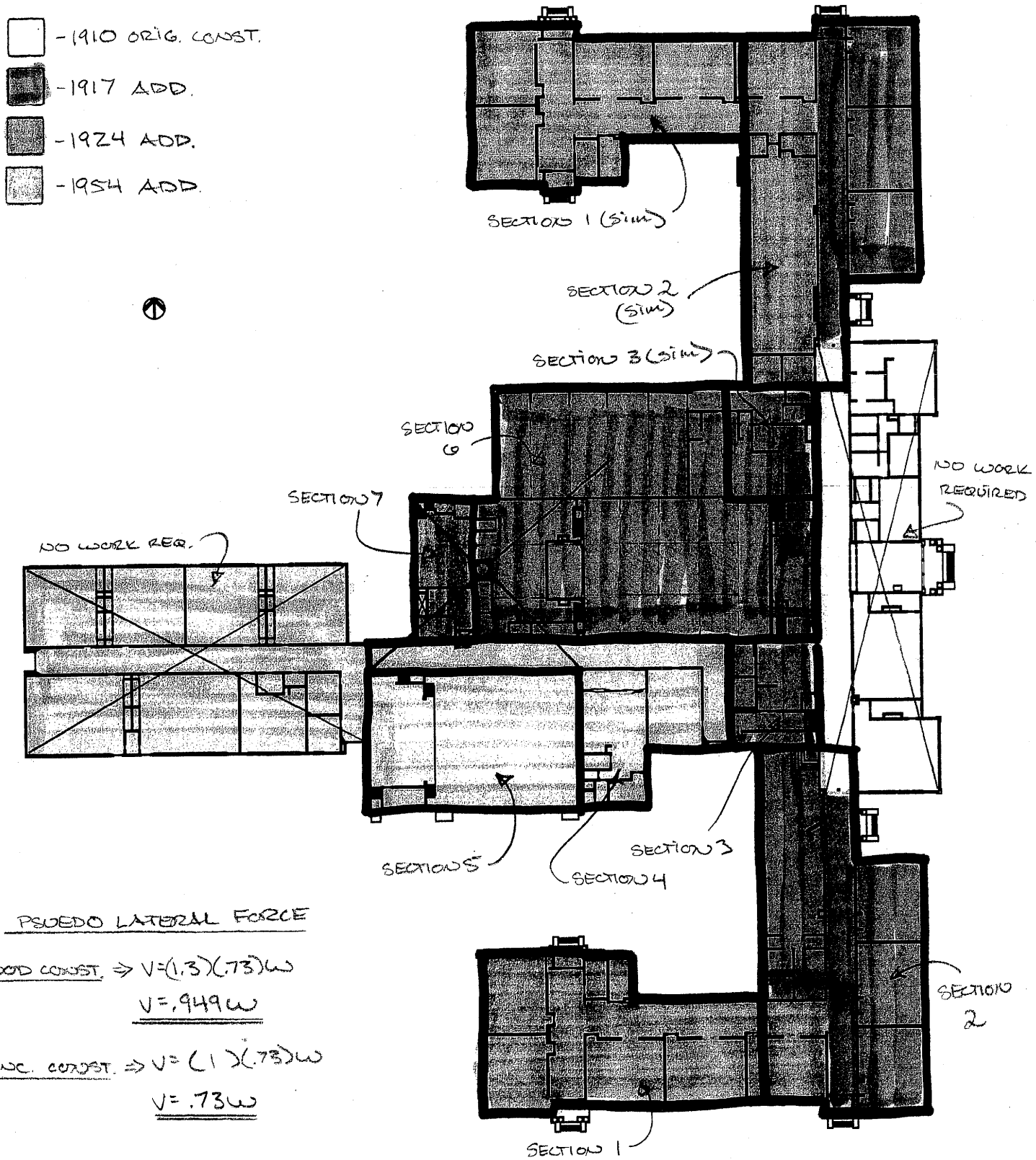
Priority 3

Roof system replacement or major repair is not immediately required.

2009 COST SUMMARY – WOODSTOCK ELEMENTARY SCHOOL		
2009 Replacement	*n/a*	***n/a***
2009 Repair	*Areas A, B, C, C1, D, E,*	***$15,000.00***
Structural Scope	*n/a*	***n/a***
TOTAL		**$15,000.00**

ASCE 31 TIER 1 ANALYSIS OF EXISTING BUILDINGS

- BUILDINGS HAVE BEEN BROKEN INTO SECTIONS TO SIMPLIFY THE ANALYSIS OF THE EXISTING BUILDING'S SHEARWALLS + DIAPHRAGMS.



PSUEDO LATERAL FORCE

WOOD CONST. $\Rightarrow V = (1.3)(.73)w$

$V = .949w$

CONC. CONST. $\Rightarrow V = (1)(.73)w$

$V = .73w$

UPGRADE PHILOSOPHY

THIS IS A REROOFING PROJECT WHICH ADDRESSES THE MONOSLOPE PORTION OF THE NORTH & SOUTH CLASSROOM WINGS, KITCHEN/CAFETORIUM, GYM AND COVERED PLAY AREA.

PORTLAND PUBLIC SCHOOLS HAS INITIATED A VOLUNTARY SEISMIC HAZARD REDUCTION PROGRAM FOR EXISTING SCHOOL FACILITIES WITHIN THE DISTRICT. AS PART OF THAT OVERALL PROGRAM, JAMES G. PIERSON INC. HAS BEEN INSTRUCTED TO INCORPORATE SEISMIC STRENGTHENING INTO THE REROOFING WORK WHICH EXPOSES THE STRUCTURAL ROOF SHEATHING FOR IMPROVEMENT AS PART OF THE NATURAL PROGRESS OF THE REROOFING WORK. THE CURRENT PORTLAND PUBLIC SCHOOLS LATERAL UPGRADE GOAL IS COMPLIANCE WITH THE "BASIC SAFETY OBJECTIVE" OUTLINED IN ASCE-31 AND ASCE-41 STANDARDS, USING LIFE SAFETY LEVEL FOR THE BSE-1 EARTHQUAKE, AND COLLAPSE PREVENTION FOR BSE-2 EARTHQUAKE.

STRENGTHENING OF DIAPHRAGMS, CONNECTIONS TO WALLS, AND OTHER SIMILAR SEISMIC IMPROVEMENTS LOGICALLY UNDERTAKEN IN CONJUNCTION WITH THE REROOFING PROJECT ARE INCLUDED. THE DESIGN OF THESE ROOF LEVEL ELEMENTS IS IN ACCORDANCE WITH THE ASCE-31 AND 41 DOCUMENTS IN VIEW TO AN OVERALL BUILDING UPGRADE SCHEME. THE SEISMIC IMPROVEMENTS OF THIS CONTRACT MAY TERMINATE AT OR IMMEDIATELY BELOW ROOF SURFACE LEAVING FURTHER STRENGTHENING OF THE ENTIRE LOAD PATH UNTIL SUBSEQUENT SEISMIC UPGRADE PROJECTS.

REVIEWERS ARE DIRECTED TO THE SUPPORTING STRUCTURAL CALCULATIONS FOR MORE DETAIL AS TO THE OVERALL BUILDING UPGRADE SCHEME PLANNED, AND THE ELEMENTS OF THE BUILDING WHICH PARTICIPATE IN THAT MECHANISM. ELEMENTS OF THAT SCHEME NOT STRENGTHENED AT THIS TIME (BUT IMPORTANT TO THE LATERAL RESISTANCE OF THE BUILDING) ARE IDENTIFIED SPECIFICALLY AND FULLY BY THAT PACKAGE FOR FUTURE ATTENTION, AND MAY NOT BE AS CLEARLY DEFINED IN THE SHORT SUMMARY SENTENCES WHICH FOLLOW BELOW.

FEMA 178 REPORTS FOR ALL PORTLAND PUBLIC SCHOOLS HAVE BEEN COMPLETED PREVIOUSLY IN 1997 THROUGH 1999. A FEMA REPORT BY OTHERS IS PROVIDED IN CONJUNCTION WITH THE STRUCTURAL SUBMITTAL FOR THIS BUILDING PERMIT.

<u>AREAS OF THE BUILDING IDENTIFIED FOR FUTURE UPGRADES</u>

1. LATERALLY BRACE OR REDUCE HEIGHT OF (E) URM CHIMNEY
2. ADD SUPPLEMENTAL SHEARWALLS AT COVERED PLAY AREA. REFER TO STRUCTURAL CALCULATIONS.
3. STRENGTHEN INTERIOR & EXTERIOR WOOD FRAMED SHEARWALLS THROUGHOUT THE SCHOOL AND URM CLAY TILE SHEARWALL BETWEEN THE GYM AND FAN ROOM. REFER TO STRUCTURAL CALCULATIONS.
4. CREATE LATERAL LOAD PATH THROUGH ATTIC TO SELECTED SHEARWALLS.
5. FIX ROOF TRUSS CRACKS AT THE COVERED PLAYROOM.