SCOTT ELEMENTARY SCHOOL
6700 NE PRESCOTT

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

LATERAL UPGRADE AND REROOFING SCOPE IN 2009

The 2009 Reroofing Project for Scott Elementary reroofed all sectors of the facility with the exception of the Playshelter [Area N] at the southwest portion of the site which was initially planned for reroofing, but was removed from the work scope.

The original main structure at Scott dates from 1949 and has wood roofs at all zones except for the concrete roofed entry at the north [Area G] The wood zones are either 2x6 T&G decking in perpendicular orientation or 1" nominal sheathing in diagonal orientation. Because the diagonally oriented sawn sheathing had sufficient diaphragm strength in some zones, it did not always receive supplemental plywood. Otherwise ½" plywood sheathing was added to the roofs of the main building generally.

The 1951 Classroom Wing [Area K & L] at the southeast part of the facility is constructed with 1" nominal sawn sheathing in diagonal orientation supported by sawn rafters and pretty much duplicates the construction of the main building classroom wings. It did not require plywood to supplement the existing diaphragm.

A former 1968 Industrial Arts building [Area M] to the south of the main facility was included in the reroofing. During construction we confirmed that plywood was present over the 2 x 6 sawn sheathing and that adequate roof to wall connections existed, so it needed no seismic improvements except for increased nailing of the existing plywood overlay to strengthen the diaphragm.

The separate Playshelter [Area N] which was not reroofed has plywood roof sheathing already existing and is not believed to need any lateral upgrades when it ultimately does receive a new roof.

AREA A - GYMNASIUM

This zone has concrete perimeter walls with adhered brick veneers. The roof system is 2x6 T&G decking laid in perpendicular orientation supported by steel trusses topped with wood bearing plates. Trusses are spaced at 6 feet on center. It received the following upgrades:

- Added ½" plywood overlay to strengthen the diaphragm.
- Connected roof system to perimeter walls for in-plane and out of plane forces.

A chimney exists at the southeast corner of the Gym and projects a substantial distance above the roof. Previously the chimney has been encased with a framework of steel angles, likely intended to improve lateral stability, but that bracing terminates a short way above the support, and so a zone of unbraced length occurs just above the roof interface. We believe the chimney is as vulnerable to failure at this weak zone, just as if the enclosing steel was not present. We therefore recommend further lateral upgrading for the chimney. The best option we believe, is always to reduce the height of the chimney to a projection of less than 2 times its least dimension above supports, if that could be allowed by the mechanical draft requirements. Alternately we think it possible to laterally brace the encased chimney in both major axis directions using two compression capable bracing struts attached to available building walls. Since it is possible to attach to the walls without need to disturb the roofing in the future, we provided no provisions for connection built into the new roof membrane areas.

AREA B - INCLUDES LOCKERS & STORAGE AT SOUTH SIDE OF GYM PLUS CORRIDOR TO WEST AND ADMINISTRATIVE AREA TO NORTHWEST OF GYM

The roof of the portion to the south of the Gym is constructed with 2" decking in the same manner as the Gym roof. Area B also wraps around the west side of the gym where the roof construction changes to 1" nominal sawn sheathing in diagonal orientation, and continues on over the Administrative Area at the northwest where it is also 1" nominal diagonal sheathing on sawn rafters at 16 inch spacing. All areas received the same upgrades under the 2009 Reroofing which consisting of:

- Added ½" plywood overlay to strengthen the diaphragm.
- Connected roof system to perimeter walls for in-pane and out of plane forces.

AREA H - ADMINISTRATIVE AREA NORTHEAST OF GYM

The roof here matches that of Area B to the northwest of the Gym and is 1" nominal sheathing in diagonal orientation on sawn rafters at 16" spacing. It received the same upgrade as Area B above.

AREA D, E & I - CLASSROOM WINGS

These zones are all basically of the same double loaded corridor classroom plan. Roofs are constructed with 1" nominal diagonal sheathing supported by 2" or 3" nominal sawn rafters typically at 16 inch spacing. The inner end of each wing adjoins the center part of the building and butts into the side of concrete walls. At this inner edge, each wing received a 12' band of plywood to strengthen the diaphragm in order to facilitate the out of plane connection and support of the concrete walls. Beyond this 12' width of plywood the remaining existing 1" diagonal sawn sheathing was not supplemented.

Future lateral upgrading below the roof level is recommended for these three wings to strengthen them for forces acting in the transverse [north/south] direction. We recommend that

demising walls between classrooms be integrated into the overall lateral resisting mechanism by providing a connections between the tops of walls where they stop at the ceiling level and the roof diaphragm system. Rafters and ceiling joists run parallel from outer walls to corridor with a variable gap up to about 24 inches in depth between them. The added seismic connection might be as simple as a plywood gusset if rafter and ceiling joist align over the walls, or could be a short cripple wall with plywood sheathing. The bulk of the existing classroom walls are believed to have sufficient shearwall capacity as currently constructed, but some specific walls of lesser length will likely need in-plane shear strengthening in the future.

The following lateral improvements were made to Areas D, E & I:

- Added ½" plywood overlay to strengthen the diaphragm for 12' width adjacent to the inner edge where abutting concrete wall. Remaining portion of roof consisting of 1" nominal diagonal sheathing was deemed acceptable as existing when transverse walls between classrooms are connected into the mechanism in the future.
- Connected roof system to inner edge concrete wall and to remaining perimeter walls at other diaphragm boundaries.
- Connected diaphragms to tops of corridor walls for longitudinal direction shear transfer.

AREA F - LOBBY

Original framing of the lobby roof is with 2" T&G decking in perpendicular orientation over steel trusses. It received the following upgrades:

- Added ½" plywood overlay to strengthen the diaphragm.
- Connected roof system to perimeter walls for in-pane and out of plane forces.

AREA K & L - 1951 CLASSROOM WING AT SOUTHEAST

This wing generally has similar plan and construction as those of the 1949 Main Building. It is framed with 1" nominal sawn sheathing in diagonal orientation supported by sawn rafters at 16 inch spacing. Because there was no tall concrete wall at the end to connect to as at Areas E, D & I, it did not need the 12' strip of plywood at the end, and so received no plywood overlay. The building needs the same future upgrade consisting of added connections from the tops of transverse walls between classrooms into the roof diaphragm as described above for the Main Building Classroom Wings. The following improvements were made to this zone as part of the 2009 reroofing:

- Improved connection of roof diaphragm to perimeter walls of the wing
- Connected diaphragm to top of corridor walls for longitudinal direction shear transfer.

AREA M - 1968 INDUSTRIAL ARTS BUILDING

We confirmed that this building has existing plywood sheathing over the sawn 2" T&G decking, although that fact is unclear from original documents. Also confirmed was the fact that connections between roof and perimeter CMU walls are adequate as existing for ASCE 41-06 forces. The following lateral upgrade was performed when the roofing was removed:

- Supplemental nailing of existing plywood present over sawn 2" decking to strengthen diaphragm shear capacity to meet ASCE 41-06 force requirements.

AREA G - ENTRY

The roof here is a concrete structure surrounded by concrete walls on three sides. No lateral upgrades were needed as part of the reroofing.

AREA J - ATTACHED PLAYSHELTER AT EAST SIDE OF GYM

Roof framing of this portion of the original 1949 building uses the same system as the Gym. The space is surrounded by a multi-wythe brick URM wall at the south and a line of URM brick piers supporting steel beams between them along the east side. It abuts the east concrete wall of the gym and the concrete south wall of Area H on the north. It received the following improvements:

- Added ½" plywood overlay to strengthen the diaphragm.
- Connected roof system to perimeter walls for in-pane and out of plane forces.

AREA N - 1977 PLAYSHELTER BUILDING TO SOUTHWEST

This separate building was not reroofed as part of this project. It is constructed with a plywood roof supported by purlins and wood chord/metal web trusses. It is not believed to need lateral improvements under the current PPS lateral policies when it does receive reroofing.

SCHOOL NUMBER

BUILDING SUMMARY

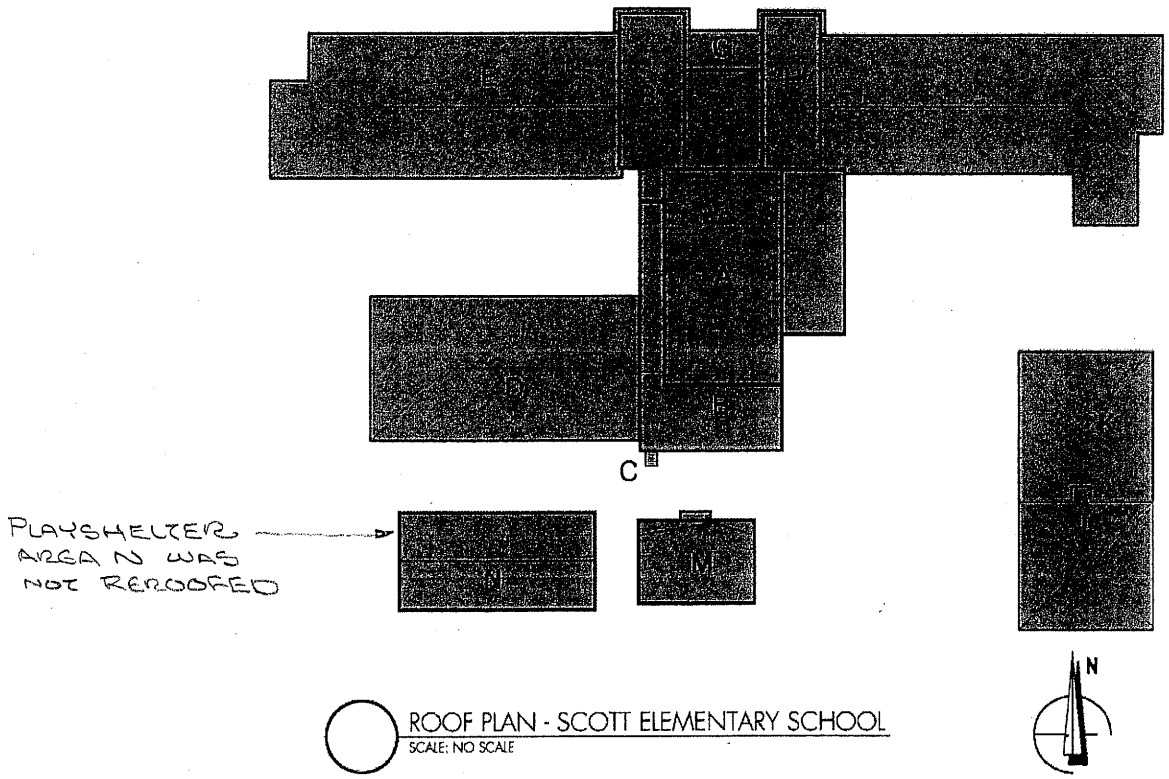
282

PROJECT GROUP

Replace - H

SCHOOL NAME

SCOTT ELEMENTARY SCHOOL



ROOF PLAN - SCOTT 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 – SCOTT ELEMENTARY SCHOOL		
2009 Replacement	*Areas A, B, C,D, E, F, G, H, I, J, K, L, M, N*	***$1,122,000.00***
2009 Repair	*TBD- Alternate scope may include repairs to Areas D, E, and I*	***n/a***
Structural Scope	*1949 Original Building / 1968 Industrial Arts Building 1951 Multipurpose Building*	***$45,100.00***
TOTAL		**$1,167,100.00**

UPGRADE PHILOSOPHY

THIS IS A REROOFING PROJECT WHICH ADDRESSES THE WHOLE MAIN BUILDING, THE 1951 CLASSROOM BUILDING, THE INDUSTRIAL ARTS BUILDING, AND THE PLAY AREA SHELTER.

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.

AREAS OF THE BUILDING RECEIVING SEISMIC UPGRADE AT THIS TIME

1. STRENGTHEN (E) ROOF DIAPHRAGM BY ADDING PLYWOOD ON TOP OF (E) STRAIGHT SAWN SHEATHING AND TOP OF (E) DIAGONALLY SAWN SHEATHING.
2. STRENGTHEN IN-PLANE SHEAR TRANSFER BETWEEN ROOF DIAPHRAGM AND (E) CONCRETE WALLS.
3. STRENGTHEN OUT-OF-PLANE CONNECTIONS BETWEEN ROOF DIAPHRAGM AND CONCRETE WALLS.
4. SUPPLEMENT NAILING OF EXISTING ROOF DIAPHRAGMS AS NOTED ON THE DRAWINGS.
5. STRENGTHEN SHEAR TRANSFER BETWEEN ROOF DIAPHRAGM AND SELECTED WOOD WALLS.
6. ADD COIL STRAPS ON ROOF TO ACT AS DRAG STRUTS.

AREAS OF THE BUILDING PREVIOUSLY UPGRADED UNDER PRIOR PERMITS

1. ADDED STEEL FRAME ENCLOSING CHIMNEY ABOVE GYM ROOF LEVEL, DATE OF CONSTRUCTION UNKNOWN.

AREAS OF THE BUILDING IDENTIFIED FOR FUTURE UPGRADES

1. REDUCE HEIGHT OF (E) URM CHIMNEY OR LATERALLY BRACE TO STRUCTURE.
2. ADD IN-PLANE SHEAR ATTACHMENTS TO CLASSROOM PARTITION WALLS.
2. ADD PLYWOOD SHEATHING TO SOME PARTITION WALLS IN CLASSROOM WINGS..