ROSEWAY HEIGHTS MIDDLE SCHOOL [Formerly Gregory Heights]
7334 NE SISKIYOU STREET

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

LATERAL UPGRADE AND REROOFING SCOPE IN 2009

The 2009 Reroofing Project for Roseway Heights originally was to include Sectors A, B, C, G, H, I, L and K shown by Professional Roof Consultants 2008 Survey. These include the bulk of the 1923 and 1929 sections of the building plus areas added in 1981. At the tail end of the project it was decided to include Sectors O, R & S, all of which were parts of the 1989 Addition.

The 1981 and 1989 portions were all constructed with a steel deck roof diaphragm. In the case of the 1981 zones, our inspections during the design phase of this project indicated that the quality of original construction work for those decks was not the highest. Subsequently there was quite a bit of remedial work undertaken on the 1981 roof decks, which will be described below. We were not engaged to do a lateral analysis for the added scope 1989 sectors, but we did observe that their construction matched the original documents and was apparently of good quality.

The bulk of the 1923 original building [Sector B] and all of the 1929 addition [Sector A] are concrete roof slab and did not require any lateral work. We did structurally repair a 4' x 6' opening through the roof framing of Sector B which was poorly infilled during a prior reroofing.

Sector C is the flat roof portion at the center of the original 1923 Auditorium roof. That original auditorium space is framed with heavy sawn wood trusses which span in the east/west direction across the large room. Original drawings show the roof to be a 2x4 laminated deck spanning between the trusses, but actually 2x8 rafters at 24 inch spacing supporting 1" nominal straight sheathing was actually what was constructed. We provided supplemental plywood to strengthen the diaphragm which consisted of 1" nominal sawn sheathing originally. It should be noted that the sloped part of this roof on the east and west sides of the space [Sectors M] was not included in the reroofing scope and so the strengthened diaphragms stop short of the east and west perimeter walls, and should be completed in the future.

Specific work performed in each area of the building is further described as follows:

1923 ORIGINAL BUILDING [Sector B] and 1929 CLASSROOM WING ADDITION [Sector A]

These roof zones are original concrete construction with concrete exterior walls. There was no lateral upgrade needed at roof level.

1923 ORIGINAL AUDITORIUM ROOF [Sector C]

This roof consists of 1" nominal straight sheathing supported by 2x8 rafters at 24 inch spacing. The Sector C zone is the relatively flat section in the middle of the roof, with steeply sloping areas at the west and east sides not included in the 2009 Reroofing work. We provided plywood overlay to the deck and would recommend the same in the future for both sloped sides, which were identified as Sectors M by project documents. A future connection of Sectors M to the walls at the east and west sides of the auditorium space will be needed to finish the upgrade of this space, and that be a difficult connection to accomplish because of the steeply sloped Sector M roofs. Improvements made were:

- Added ½" plywood over existing 1" nominal sawn roof sheathing of Sector C.
- Provided diaphragm to wall connection at the north end of Sector C, connecting into an 8" thick CMU wall added there in the 1981 Addition project.

1923 ALTERNATE CLASSROOM AT NORTH [Sector G]

This portion of the building was apparently built under an alternate shown on the 1923 drawings. The roof was to be laminated 2x4 decking but like the Auditorium roof, it was actually built using 1" nominal straight sheathing on sawn rafters at 24 inch spacing. It received the following upgrades:

- Added ½" plywood over existing 1" nominal sawn roof sheathing.
- Provided diaphragm to perimeter wall connections all sides.

1981 ADDITION

The 1981 addition modified or added sections to several locations in the building. Sectors H, I and L are the zones identified on the Professional Roof Consultant Survey and our project drawings for reroofing under the 2009 Reroof Project, and our construction documents use the same H, I and L identifications. These areas all have steel roof decking and CMU walls and were constructed under drawings bearing Richard Gessforth Architect title blocks. Our initial inspections during the design phase indicated that the quality of original construction was not good. Areas we were able to view had gaps between steel decking and supporting ledgers and other visible defects. When these areas were exposed further during the reroofing work, other workmanship problems were found. The following modifications were made to each specific zone of the roofs:

SECTOR H - ABOVE LOCKERS WEST OF AUDITORIUM

- Inspected existing deck welding and supplemented undersize or missing welds with Hilti Drive Pin fasteners to achieve 12" o/c net connection spacing counting pins and welds

This strengthened the steel deck diaphragm, repaired defects and provided adequate connection to perimeter walls.

SECTOR I - NORTHEAST STAIRWELL

- Repaired existing gap between steel deck and sidewall ledger by adding supplemental diaphragm to wall ledger member and connecting to deck and to wall..
- Added supplemental Hilti Drive Pin attachments between decking and supports where needed when original welds were missing or undersize. This strengthened diaphragm, repaired defects and provided adequate connection to perimeter walls.

SECTOR L - TWO STORY REPLACEMENT AT NORTH END OF AUDITORIUM

- Repaired existing gap between steel deck and sidewall ledger by adding supplemental diaphragm to wall ledger member and connecting to deck and to wall..
- Added supplemental Hilti Drive Pin attachments between decking and supports where needed when original welds were missing or undersize. This strengthened diaphragm, repaired defects and provided adequate connection to perimeter walls.
- Repaired vertical load support mechanism at one original unreinforced mechanical opening penetration through the steel deck.

ADDED SCOPE - PORTIONS OF 1989 ADDITION [SECTOR O, R & S]

Additional reroofing was added to the project scope toward the end of the contract and included three roof areas constructed in 1989 by Gazeley Plowman Architects. The roof diaphragms of these zones is all the same and consists of a 22 gauge Type B steel deck diaphragm attached to perimeter walls using steel angle ledgers in pretty much a conventional manner. James G. Pierson Inc. was not engaged to perform an ASCE 41-06 seismic capacity review since these sectors of the building are relatively modern and we saw no indications of lateral problems. Because of the poor original construction quality issues experienced at the roofs in the project which were built in 1981, we did inspect the original decking a couple of times when it was exposed for roofing. We observed these areas to be a match for the original 1989 drawings, with the decking fastening being 5 weld per sheet at supports, side lap button punching at 24 inch spacing, and parallel to span deck to wall ledger welds at 12 inches on center.

No lateral upgrade modifications were performed in these three added zones, and we believe it is unlikely that a full lateral analysis would indicate any are needed, but as noted, we were not directed to perform that service.

UPGRADE PHILOSOPHY

THIS IS A PARTIAL REROOFING PROJECT THAT ADDRESSES PORTIONS OF THE AUDITORIUM, CLASSROOMS, STORAGE AREA AND STAIRWELL OF ROSEWAY HEIGHTS, WHICH ARE PRIMARILY ON THE NORTH AND EAST SIDE OF THE BUILDING. SEISMIC UPGRADES ARE INCLUDED ONLY IN THE AREAS WITHIN THE SCOPE OF THE REROOFING PROJECT THAT CONSIST OF STRAIGHT SHEATHING AND METAL DECK DIAPHRAGMS WHERE ROOF MEMBRANES ARE BEING REMOVED AND REPLACED.

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 NARRATIVE IN THE SUPPORTING STRUCTURAL CALCULATIONS FOR MORE DETAILS 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 RECEIVING SEISMIC UPGRADE AT THIS TIME (SEE PLAN FOR AREAS NOTED)</u>

1. AREAS C AND G: STRENGTHEN (E) ROOF DIAPHRAGM BY ADDING PLYWOOD ON TOP OF (E) STRAIGHT SAWN SHEATHING.
2. AREAS C AND G: STRENGTHEN IN-PLANE SHEAR TRANSFER BETWEEN ROOF DIAPHRAGM AND (E) CONCRETE AND MASONRY WALLS.
3. STRENGTHEN OUT-OF-PLANE CONNECTIONS BETWEEN ROOF DIAPHRAGM AND (E) CONCRETE AND MASONRY WALLS IN AREAS C AND G.
4. VERIFYING AND INSTALLING WHERE NECESSARY PUDDLE WELDS AND BUTTON PUNCHES TO THE (E) METAL DECK OF AREAS L, H, AND I.
5. WHERE NECESSARY ADDING SHIMS BETWEEN (E) METAL DECK AND (E) STEEL ANGLE TO PROVIDE COMPLETE LOAD PATH IN AREA I

<u>AREAS OF THE BUILDING PREVIOUSLY UPGRADED UNDER PRIOR PERMITS</u>

1. IN 2003 AT AREA C, CHIMNEY AT SOUTH SIDE OF AUDITORIUM WAS REMOVED AND NEW CMU WALL WAS INSTALLED. PLYWOOD ROOF DIAPHRAGMS AND OUT-OF-PLANE WALL ANCHORAGE WAS ADDED TO AREAS D, E, P, AND F IN 2003

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

1. AREA C: CONNECTION BETWEEN THE UPPER ROOF OF THE AUDITORIUM AND THE ADJACENT SLOPED AREAS (AREA M) NOT IN THE SCOPE OF THIS REROOF PROJECT
2. CONNECTION FOR IN PLANE SHEAR AND OUT OF PLANE WALL FORCES AT THE EAST AND WEST WALLS OF THE AUDITORIUM - (AREA M) NOT IN SCOPE OF REROOF PROJECT

SCHOOL NUMBER

BUILDING SUMMARY

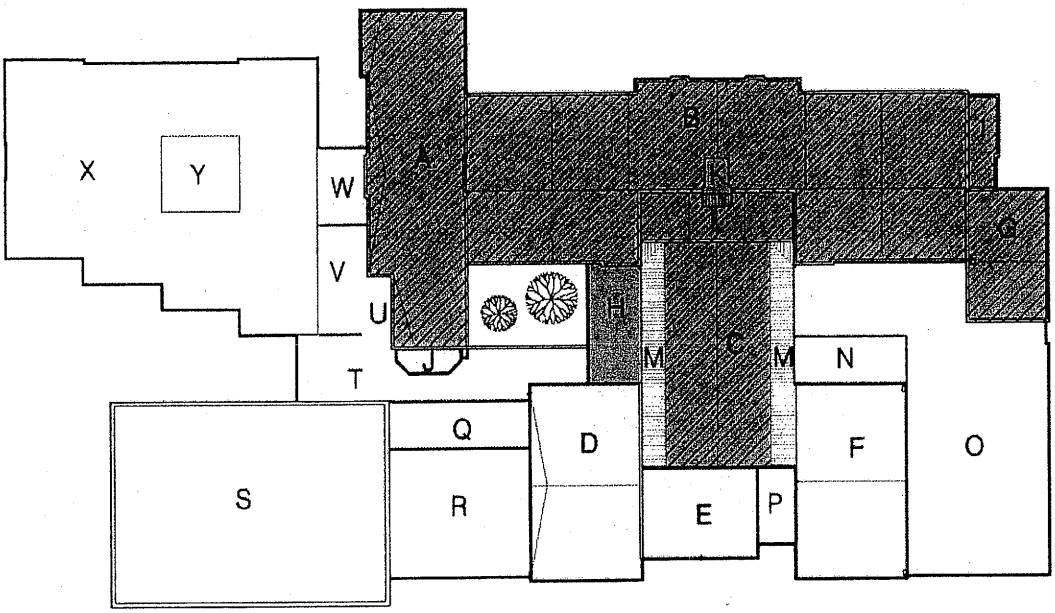
254

PROJECT GROUP

Replace - E

SCHOOL NAME

GREGORY HEIGHTS MIDDLE SCHOOL



ROOF PLAN - GREGORY HEIGHTS MIDDLE SCHOOL
SCALE: NO SCALE

N

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 – GREGORY HEIGHTS MIDDLE SCHOOL		
2009 Replacement	*Areas A, B, C, G, H, I, K, L*	***$364,400.00***
2009 Repair	*Areas M, N, O, P, Q, R, S, T, U, V, W, X, Y*	***$30,200.00***
Structural Scope	*n/a*	***n/a***
TOTAL		**$394,600.00**