LENT ELEMENTARY SCHOOL
5105 SE 97th AVENUE

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

LATERAL UPGRADE AND REROOFING SCOPE IN 2009

The 2009 Reroofing Project for Lent Elementary included all sectors of the main building with the exception of the Multipurpose Room and the Classroom Wing immediately north of the Multipurpose. Roofs of those two areas were rebuilt in 2003 by James G. Pierson Inc. after an extensive fire and received all needed lateral upgrading at that time. The 2009 Reroof Project went back and forth as to whether or not plywood should be added over the original diagonal orientation one inch nominal sawn roof sheathing since the reroofing work would strip down to the deck. The structural calculations we performed according to ASCE 41-06 Seismic Rehabilitation Standard indicated that the diagonal sawn sheathing acting alone was sufficient. Finally the project went forward without plywood after changing back and forth during planning.

The two outbuildings to the north of the main facility were included in the 2009 Reroof. During construction we confirmed that 3/8" plywood was present over the 2 x 6 sawn sheathing of the 1966 Industrial Arts Building and that adequate roof to wall connections existed, so it needed no seismic improvements. The wood frame "Portable Classroom" buildings adjacent to it was also deemed acceptable without upgrade.

The separate building to the southwest of the main facility, which is believed to have been constructed in 1958 was not included in this reroofing project. It should be evaluated for seismic upgrade whenever reroofed in the future.

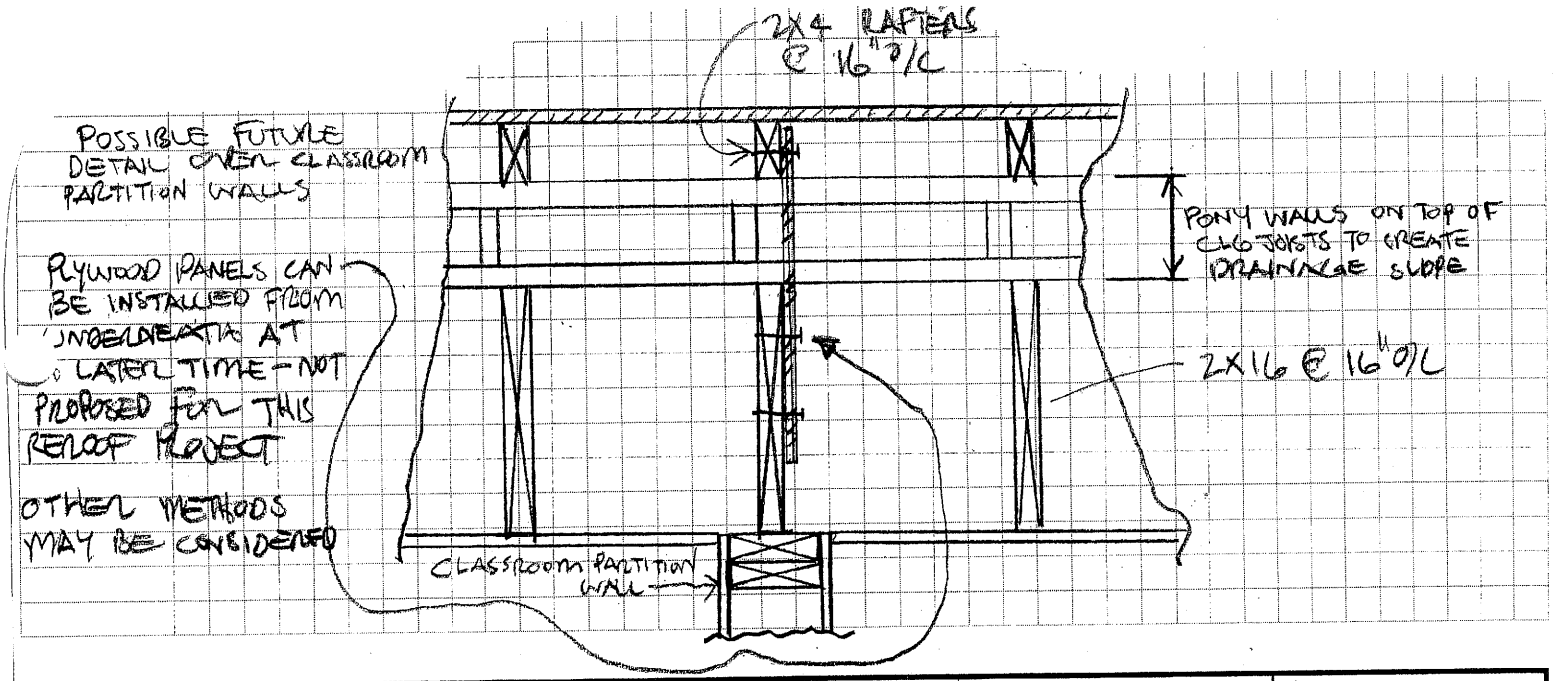
1949 MAIN BUILDING

We believe that all needed roof level seismic upgrade is completed for this building. Attached is the summary included on the Permit Drawings for the 2009 Reroof, which outlines the work done and the design philosophy we were directed to employ. We consider the roof level of Lent Elementary seismically upgraded to ASCE 41-06 Standards. We suggest that further completion of the load path to allow the transverse walls between classrooms to function as shearwalls is needed for the full upgrade to be considered completed.

The future needs of the building are projected to be best done from below and consist of a shear transfer mechanism from the roof diaphragm to the transverse walls which divide the classrooms. A shallow ceiling cavity is present, and the proposed in-plane shear transfer element can be as simple

as a plywood gusset connecting the roof rafters to the ceiling joist and the classroom wall below. A sketch from the structural calculations performed for the permit is reproduced below which shows our initial concept for this detail. We believe that virtually all transverse walls between classrooms need to be mobilized by an in-plane shear transfer connection of this or some similar form.

PROPOSED DETAIL FOR FUTURE LATERAL UPGRADE TO ALLOW TRANSVERSE WALLS BETWEEN CLASSROOMS TO PARTICIPATE IN THE MECHANISM



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	Location PORTLAND, OR	Date 1/26/09
	Client McBride	Sheet no. 2

UPGRADE PHILOSOPHY

THIS IS A REROOFING PROJECT WHICH ADDRESSES THE WHOLE OF THE MAIN BUILDING EXCEPT FOR THE MULTIPUPOSE AREA AND NEARBY CLASSROOMS AT THE NORTHWEST QUADRANT OF THE CENTER WING, BOTH OF THE LATTER BEING PREVIOUSLY REROOFED WHEN DAMAGED BY FIRE IN 2003. A NEW ROOF IS ALSO INCLUDED FOR THE STAND ALONE FORMER INDUSTRIAL ARTS BUILDING LOCATED AT THE NORTH END OF THE FACILITY. SEISMIC UPGRADES ARE INCLUDED ONLY IN AREAS 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 GOAL 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 ORIGINAL BUILDING RECEIVING SEISMIC UPGRADE AT THIS TIME</u>

1. STRENGTHEN EXISTING ROOF DIAPHRAGM CONSISTING OF DIAGONAL SAWN SHEATHING BY ADDING BLOCKING TO TRANSFER LATERAL FORCES FROM DIAPHRAGM TO CORRIDOR WALLS BELOW.
2. ADD BLOCKING FROM ROOF DIAPHRAGM TO EXTERIOR CLASSROOM PERIMETER WALLS SOUTH OF MULTIPURPOSE ROOM.
3. ADD STEEL COIL STRAPS ON DIAPHRAGM PERIMETER OF MAIN BUILDING TO STRENGTHEN DIAPHRAGM CHORDS.
4. SUPPLEMENT NAILING OF EXISTING ROOF DIAPHRAGMS AS NOTED ON THE DRAWINGS.

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

1. STRENGTHEN/REPLACE ROOF DIAPHRAGM AND SHEARWALL CONNECTIONS AT MULTIPURPOSE AND CLASSROOMS DAMAGED BY FIRE IN 2003.
2. EXISTING URM CHIMNEY LATERALLY BRACED IN 2003.

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

1. IN-PLANE SHEAR ATTACHMENTS TO CLASSROOM PARTITION WALLS.

SCHOOL NUMBER

BUILDING SUMMARY

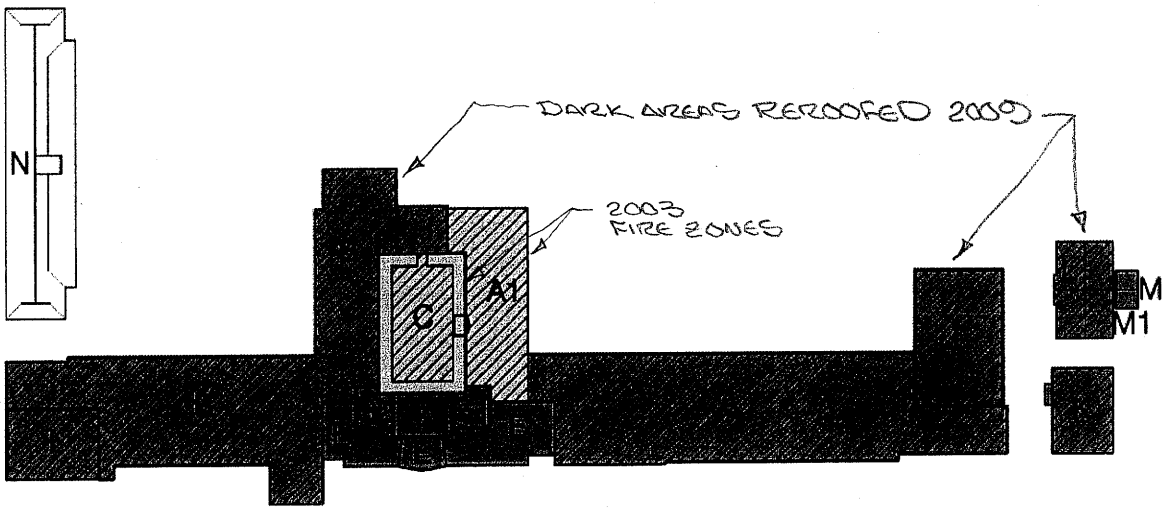
266

PROJECT GROUP

Replace - B

SCHOOL NAME

LENT ELEMENTARY SCHOOL



ROOF PLAN - LENT 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 – LENT ELEMENTARY SCHOOL		
2009 Replacement	*Areas A, B, E, F, G, H, I, J, K, L, M, N*	***$1,203,000.00***
2009 Repair	*Area N*	***$2000.00***
Structural Scope	*n/a*	***n/a***
TOTAL		**$1,205,000.00**