FRIEDLI

SAND POINT NAVAL STATION

SEISMIC EVALUATION

VOLUME I

Prepared for

The Seattle Public Schools District
Mr. John Stanford-Superintendent
4141 Fourth Avenue South
Seattle, Washington 98134

The Seattle Public Schools

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Prepared by:

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GENERAL DESCRIPTION:

This building was originally designed and constructed around 1935. The building is situated near the center of the Sand Point Naval Station. Originally the building was approximately 109 feet long x 48 feet wide, and was only a single story structure. The building was used primarily for emergency vehicle storage and repair. In 1941 it was expanded to include a partial second floor with living quarters and offices; a 60' tall hose drying tower; new shops and storage on the south side of the building. In 1952, the last major addition included expansion of the 1941 second floor, providing more office space at the east end of the second floor. In addition, a magazine storage at the east end of the building, ground level, and more shop-storage space along the south wall of the building at ground level were constructed at an undetermined date. The total building area is approximately 16,000 square feet.

Building No. 18 houses a variety of functions, including the following:

- Five (5) Vehicle Repair-Parking Bays
- Hose Drying Tower
- Weapons magazine storage
- Shops-parts storage
- Living quarters (including a kitchen)
- Offices-administrative-dispatch areas
- Showers, locker rooms, bathrooms, laundry facilities, building mechanical-electrical rooms, as well as circulation corridors and stairways.

This building is currently heated by steam and has no interior fire sprinkling system.

BUILDING CONSTRUCTION:

Upper Roof Framing:

The upper roof is built-up construction over rigid insulation, supported by plywood which in turn spans between wood purlins. These are supported by steel beams-girders which are supported at interior locations by steel posts which transmit loads to second floor steel floor beams/girders and load bearing wood framed walls at the second floor. Exterior second floor perimeter load bearing walls (wood framed with brick veneer or cement plaster board) provide support for perimeter roof framing.

Lower Roof-Second Floor Framing:

The lower roof was largely converted to a second floor during the 1941 remodeling program. It was originally framed using 2 x 4 lam. decking which were supported by steel beams-girders which in turn were supported by steel columns located at both interior vehicle service bays as well as at embedded into exterior north and south walls.

Ground Floor Framing:

A cast-in-place concrete floor slab was used throughout the building.

BUILDING CONSTRUCTION-continued:

Wall Construction:

Lower level exterior walls are un-reinforced masonry (brick) walls with exterior brick veneer. Second floor walls are typically wood framed with brick veneer, or wood framed walls with cement plaster board (namely at the south side, second floor-1952 addition). The hose drying tower has 12" un-reinforced masonry (brick) walls and is nearly 60 feet tall.

Foundations:

The building is supported by reinforced concrete spread footings at individual column locations and continuous concrete wall footings at exterior un-reinforced masonry walls.

Lateral Load Resisting System:

The second floor of this building uses wood framed shear walls covered with either lath-plaster or cement board. Ground floor lateral loads are resisted by un-reinforced masonry (brick) walls. Because of the need for vehicle access, there is a large number of large openings along the north wall. The original south wall also had several large openings which have subsequently been in filled with plywood or masonry (the method of attachment is unknown). This situation has created potential torsional loading issues as well as walls that may be inadequate to resist required in and out-of-plane loads.

SUMMARY OF SITE RECONNAISSANCE-DRAWING REVIEWS:

SWMB toured the building on February 13, 1996. In general, observable construction appeared to reflect general framing as depicted by available drawings. The overall condition of the building appeared to be good, however several current and past roof leak locations were noted. Exterior brick appeared in good condition, with the mortar found tight when scrapped.; without significant cracks or spalls with the exception of a small area at the second floor, east wall of the toilet-shower room. There was little access to view wood framing. Where visible, observed wood construction did not indicated significant deterioration for construction in-place for over 50 years.

DEFICIENCIES:

Based on our initial field visit and cursory examination of available drawings, the following items have been identified as deficiencies with regard to seismic adequacy of this building (note, items shown may be found after further investigation, testing and inspection to either be adequate, or of such capacity as to require only less than complete strengthening measures):

Primary Structure:

1) Potential lack of positive anchorage between URM bearing-shear walls and second floor/roof diaphragms.

DEFICIENCIES-Continued:

2) Potential lack of adequate diaphragm construction (ie-straight and diagonal sheathing may not provide sufficient lateral shear capacity).

3) Potential need for additional shear walls and or braced frames to assist existing shear walls-diaphragms resist required lateral loads.

4) Potential need for external reinforcing of existing URM bearing walls for out-of-plane lateral seismic forces (if found necessary).

5) Potential need to reinforce or remove the existing hose drying tower structure.

Non-structural Elements:

1) Lack of proper bracing at suspended ceilings.
2) Potential lack of adequate top of partition wall bracing.
3) Potential lack of adequate anchorage between masonry veneer and supporting walls.
4) Lack of secondary restraint for suspended light fixtures or fluorescent light fixture lenses.
5) Lack of anchorage at the existing water tank.

FURTHER TESTING AND INSPECTION:

The following outlines additional tests, inspections, and or analysis we believe are necessary to complete a comprehensive seismic assessment program for this building:

1) Take core samples for inspection and testing to establish masonry strengths and quality.

2) Remove small sections of exterior veneer to determine the type and spacing of veneer anchorage provided.

3) Conduct in-place field tests of existing brick mortar shear strength capacity.

4) Prepare additional structural analyses in accordance with FEMA 178 to determine if existing concrete walls can adequately resist both in and out of plane lateral seismic forces, as well as establish demand and capacity values for critical building framing elements and connections.

CONCLUSIONS AND RECOMMENDATIONS:

Based on the results of our preliminary seismic review of this building, we believe there are a number of potentially significant seismic hazards that should be addressed prior to conversion of this building into a temporary school vocational-auto repair training shop.

A review of both as-built construction and available drawings indicated there are several issues that are considered either deficiencies when compared with today's building code requirements relative to seismic design requirements and/or good engineering practice, or items that will require further field testing-inspection

and/or analysis to determine if they too are deficiencies. Using FEMA's rapid evaluation procedure, the building had a score of -2.1. This is far below FEMA's recommended minimum threshold value of 2.0. This building has withstood two moderate earthquakes in 1949 and 1965, without significant damage to our knowledge. However, this is not necessarily indicative that this building will survive a future moderate or severe earthquake.

CONCLUSIONS AND RECOMMENDATIONS-continued:

Option 1:

Implementation of the measures outlined below will not necessarily preclude major damage, collapse, or potential casualties in or around this building under moderate or severe earthquake forces , but should help mitigate current identified hazards.

1) Barricade along the exterior perimeter any walls with brick veneer (including any parapet caps) a suitable distance to preclude injuries or property damage from falling debris.

2) Close off the entire second floor (within potential collapse zone from hose drying tower).

Option 2:

1) Install wire fabric or plywood protection over the face of any brick veneer over and immediately adjacent to primary building exits.

2) Brace as required, interior partition walls at exit corridors (remove these walls if possible).

3) Remove existing hose drying tower above second floor roof line (if possible).

Option 3:

A FEMA 178 analysis has not been performed for the structure, however, we anticipate the following items will need to be addressed:

1) Provide additional shear walls or braced frames as necessary to resist required lateral forces, including torsional load effects.

2) Provide wall bracing to support un-reinforced exterior masonry walls for out-of-plane lateral loads.

3) Install sub-diaphragm ties.

4) Install plywood diaphragms over existing wood sheathed floors and roofs (with re-roofing required).

5) Install necessary straps to provide proper anchorage between load bearing-shear walls and inter-connecting floor/roof diaphragms.

6) Provide suitable anchorage between exterior veneer and supporting interior wall construction.

7) Provide lateral bracing at all suspended ceiling and interior non-bearing wall partition construction.

8) Provide seismic anchorage for plant mechanical-electrical equipment.

9) Reinforce the hose drying tower to resist required lateral loads.

Note-reinforcing of the hose drying tower should only be considered if its removal is not possible due to local historical building jurisdictional issues, or the space could be converted to a suitable alternate use.

See Section 4 of this report for preliminary estimated construction costs.

RAPID VISUAL SCREENING

Building Name: Fire Station **Building No:** 18

Survey Data

Document Survey Personnel: Marjorie Lund
Document Survey Date: Feb. 6, 1996
Field Survey Personnel: Don Barg
Field Survey Date: Feb. 13, 1995

Building Location

Bldg. Name: Fire Station
Address: Sand Point Naval Station

Arch/Engr. 1935 - Pub Works, 1941 - Austin, 1952 - Pub Works

Structural Data

Structural Scores and Modifiers

Building Type	W	S1	S2	S3	S4	C1	C2	C3/S5	PC1	PC2	RM	URM
Basic Score	4.5	4.5	3.0	5.5	3.5	2.0	3.0	1.5	2.0	1.5	23.0	1.0
High Rise	n/a	-2.0	-1.0	n/a	-1.0	-1.0	-1.0	-1.0	0.5	n/a	-0.5	-0.5
Poor Condition	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Vertical Irregularities	-0.5	-0.5	-0.5	-0.5	-0.5	-1.0	-0.5	-0.5	-1.0	-1.0	-0.5	-0.5
Soft Story	-1.0	-2.5	-2.0	-1.0	-2.0	-2.0	-2.0	-1.0	-1.0	-2.0	-2.0	-1.0
Torsion	-1.0	-2.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Plan Irregularities	-1.0	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-1.0	-1.0	-1.0	-1.0
Pounding	n/a	-0.5	-0.5	n/a	-0.5	-0.5	n/a	n/a	n/a	-0.5	n/a	n/a
Large Heavy Cladding	n/a	-2.0	n/a	n/a	n/a	-1.0	n/a	n/a	n/a	-1.0	n/a	n/a
Short Columns	n/a	n/a	n/a	n/a	n/a	-1.0	-1.0	-1.0	n/a	-1.0	n/a	n/a
Post Benchmark Year	2.0	2.0	2.0	2.0	2.0	2.0	2.0	n/a	2.0	2.0	2.0	n/a
SL2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
SL3	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Sl3 and 8 - 20 stories	n/a	-0.8	-0.8	n/a	-0.8	-0.8	-0.8	-0.8	n/a	-0.8	-0.8	-0.8

FINAL SCORE: **-2.1**

Occupancy Type
School / Voc. Training (proposed occupancy)

Emergency Bldg. (former occupancy)

No. of Occupants
11 - 100

Building Data
No. of Stories: 2 + 4-storoy hose drying tower
Year Built: 1935 + additions in 1941/1932
Design Code: Various
Total Floor Area: 16,000 ±
Structural Condition: Average condition
Drawings Available? Partial set

Building System Comments
Gravity: Load-bearing URM & steel cols.
Lateral URM / Cement Board Shear walls
Foundation Concrete spread footings
General: Mixture of framing materials