

# SEATTLE PARKS AND RECREATION

## MAGNUSON BUILDING 2

### Roof Analysis Study Upgrade



## Final Report

January 30, 2013

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## **Main Report**

## **MAGNUSON BUILDING 2 ROOF ANALYSIS STUDY UPDATE**

**January 30, 2013-Final Report**

### **Executive Summary**

This historic structure, originally built more than 80 years ago, has recently experienced failure of the building envelope, especially at the roof line. Deterioration of the roof structure has continued. Damage to interior finishes at the 2<sup>nd</sup> Floor of the North Wing has also occurred. Further damage and deterioration can be expected if no action is taken.

Additionally, the building has never been seismically upgraded, as have other similar buildings on the Magnuson/Sand Point Campus, including Building 30 (under construction) and Building 27. A complete seismic upgrade of this building would be more involved than either of these buildings, because of its size and structural system.

In this study, intermediate repairs and upgrades have been identified, and cost estimates provided, to allow continued occupancy for the north wing of this facility. In addition to envelope repairs, especially at the roof, interior renovation of the 2<sup>nd</sup> Floor of the north wing is included in our repair description and cost estimates. Partial seismic upgrade items that could be included as ancillary to a roof repair project are also included. Cost for some more extensive seismic upgrade items are listed, but the complete extent of a full-building seismic upgrade is unknown at this time.

In an earlier study (2010), we provided scope and cost estimates for more extensive seismic upgrades, and architectural life safety upgrades, at the North Wing.

The Scope includes a request to provide *“A professional opinion on whether and how long the existing roof system can continue to provide reasonably safe and secure occupancy in the north end of the building.”* In our opinion, the North Wing roof system is beyond its useful life, and should be replaced prior to further occupancy of the second floor of the North Wing. We are less certain about the condition of the roof over the unoccupied South Wing, as we didn’t have access to directly observe the roof surface.

### **Narrative in Response to Scope**

The Scope includes specific items and areas for investigation and review.

This section was completed in conjunction with **S.M. Stemper Architects**, who provided expertise on building envelope issues.

We have responded to this section by using the same numbering system as the Scope, and restating the Tasks in abbreviated form.

(a. *“Identify roof deficiencies and changes since 2010...”*).

## **1. North Section Reroofing**

a. *“Identify roof deficiencies and changes since 2010...”*

The roof membrane at all areas inspected is in “dire” need of replacement. The existing roof membrane has deteriorated to the extent that patching no longer appears to be a viable option.

### Roof slope:

The existing roof slope appears to be provided by the supporting structure: there was no tapered insulation revealed in the roof cuts. The roof appears to have relative good drainage; there was no significant ponding. One exception is that crickets installed to direct water to the roof drains appears to be inadequate and ponded water was observed at these locations.



### Roof drains:

The existing roof drains are routed through the interior of the building. The drains appear to be inadequately sized; they should all be replaced. The condition of the piping serving the roof drains is not determined at this time. This piping has rusted out in other Sandpoint buildings we have observed (Building 18 and Building 30).

### Roof Deck



The structural engineer has probed the underneath side of the existing roof deck and there



appears to be widespread deterioration of the tongue and groove wood decking. We also observed significant “wrinkling” of the

roof membrane at the NE corner of the North Roof. We were not able to determine the exact cause of the observed condition; but we believe it is related to deterioration of the roof deck at this location due to sustained water infiltration.

Flashings:

All of the existing flashings should be replaced. This would extend to cap flashing at exterior walls; base flashing at clerestory transitions; equipment curb flashings and the vertical membrane flashing at parapets.



*b. "Provide work description and budget level cost estimates ..."*

Roofing Recommendations (North)

1. Replace all rotted decking
2. Remove and replace existing roof membrane
3. Add new ½" plywood over entire deck.
4. Construct new crickets at roof drains
5. Replace roof drains and rain water piping routed through the building interior.
6. Replace all flashings.
7. Recommended roof assembly:
  - a. Complete tear-off
  - b. Rosen paper
  - c. Two-ply base-sheet (first ply nailed; second ply set in hot asphalt)
  - d. Two intermediate roof plies set in hot asphalt
  - e. Granulated cap sheet set in hot asphalt
8. Remove all non-functioning mechanical equipment and patch roof deck. Install new roof curbs for all function mechanical equipment.

**See cost estimates in Summary Table.**

### Limited Seismic Upgrade (North)

In addition to providing 1/2" plywood as part of the reroof, the following minimal seismic upgrade items should be considered in conjunction with the north reroof:

1. Add Roof-Wall Ties at N, W and E Walls:
  - a. Perpendicular wall ties at 4' o.c.
  - b. Transfer in-plane shear to walls with continuous angle
  - c. Provide Ties at each steel beam bearing directly on unreinforced masonry (E and W walls only)
2. Provide positive collector attachment at the roof line at each frame in the north south direction.
3. Provide in-plane shear transfer to frames/walls at south side on north wing
4. Provide upgraded connection of north office wing frames to main hangar frames



**See cost estimates in Summary Table.**

### *c. "Identify conditions and deficiencies in the interior of the second floor ..."*

#### Interior Conditions of the North Wing - Interiors

There is widespread water infiltration that is occurring for most of the north roof. Water infiltration is most pronounced at the west end of the north wing. Several of the second floor rooms at the west end were totally saturated and sections of the existing ceiling had collapsed or were near collapse. Carpets in these rooms were also saturated. Fortunately the walls observed were in good condition and the electrical systems remained functional.

Water infiltration in other areas of the north wing was "spotty"; with several drips and or wet ceiling tiles noticed.

A telling observation for the entire second floor of the west wing is the number of stains that were observed in the ceiling tiles throughout the entire floor area:

We observed many stains that looked to be recent.

We observed many stains that were dry (and did not appear to be currently leaking).



We observed ceiling tiles with no stains.

The roof is currently leaking in many locations; this would account for the more recent ceiling stains;

It appears that there has been significant effort made by Seattle Parks to patch roof leaks in the past; this would account for the older ceiling stains.

It appears that Seattle Parks is now replacing stained tiles with new tiles after leaks have been repaired; this would explain the ceiling tiles were not leaks were observed.

#### Light Fixtures:

All of the light fixtures we observed were functioning. Many of the light fixtures have water stained lenses.

#### Ceiling Thermal Insulation

Unfaced fiberglass batts have been installed directly of the existing ceiling tile. (It should be noted that unfaced batts are not allowed where exposed to the "air stream"). The batt insulation is and has been exposed to roof leaks which has potential to expedite mold development.



#### Interior Conditions of the North Wing – Floor Finishes

In several rooms (at the west end) the existing carpet is completely saturated with water. It is unlikely that the existing carpet can be salvaged.

The carpet and other floor finishes on the second floor do not appear to have been overly damaged by water infiltration. The existing floor finishes (marginal due to age and extended use) appear to be intact and useable.

d. *“Develop work descriptions and cost estimates for interior renovation ...”*

Recommendations (North Wing Interior)

1. All interior repairs should occur after roof has been replaced.
2. Replace floor finishes (carpet at rooms recently inundated from roof leaks)
3. Replace all existing ceiling tile.
4. Clean light fixture lenses.
5. Remove/replace all existing batt insulation. Suspend new insulation from the underneath side of roof deck. Install airtight membrane at underneath side of insulation (as commonly seen in pre-fabricated metal buildings).

**See cost estimates in Summary Table.**

## **2. North Roof Reroofing and Seismic Upgrade**

a. *“Identify seismic deficiencies and changes since 2010 ...”*

Further investigation of the overall structure has shown that the south hangar appears to be laterally supported for north-south forces by the frames in the north hangar. This means that seismic upgrade of the complex will be more extensive than previously anticipated.

Additionally, field measurements indicate that the north hangar roof may be taller than designed. This would make the limited resistance in the north-south direction even less effective.



b. *“Provide work description and budget level cost estimates to effect full voluntary seismic retrofit to the north wing building structure...”*

The north wing building can't be seismically upgraded separately from the entire building. Some east-west improvements could be added, but the north-south direction is part of the overall structure. Costs for the east-west upgrades are repeated from the 2010 report. North-south costs are uncertain, and will be significant.

c. *“Identify conditions and deficiencies in the interior of the second floor ...”*

Same as for 1.d above.

### **3. High (Central) Roof Reroofing**

a. *“Identify roof deficiencies, ...”* (Existing conditions)

We physically reviewed the underside of the high bay roof in the north hangar, from a bucket lift. Extensive probing revealed very few areas of deterioration of the underside of the deck. (Far less on a percentage basis than that found in the north office area.) This roof membrane shows extensive bubbling at the top.



Other comments for the north wing roof from Item 1.a. apply.

b. *“Provide work description and budget level cost estimates ...”*

#### Roofing Recommendations (High Central)

1. Replace all rotted decking
  2. Remove and replace existing roof membrane
  3. Add new 1/2" plywood over entire deck.
  4. Construct new crickets at roof drains
  5. Replace roof drains and rain water piping routed through the building interior.
  6. Replace all flashings.
  7. Recommended roof assembly:
    - a. Complete tear-off
    - b. Rosen paper
    - c. Two-ply base-sheet (first ply nailed; second ply set in hot asphalt)
    - d. Two intermediate roof plies set in hot asphalt
    - e. Granulated cap sheet set in hot asphalt
  8. Remove all non-functioning mechanical equipment and patch roof deck. Install new roof curbs for all function mechanical equipment.
- Limited Seismic upgrade work will include:
1. 1/2" plywood over existing deck.
  2. Provide positive collector attachment at the roof line at each frame in the north south direction.

**See cost estimates in Summary Table.**

#### **4. North and High Roof Reroofing and Seismic Upgrade**

a. *“Determine if there are any critical connections ...”*

No drawings are available for this critical junction between the original and later construction of this complex. Critical connections will include drag connections in the north-south direction at each frame line, and east-west connections at the shear wall, including connection of the wood diaphragm.



**See cost estimates in Summary Table for other scope areas defined above.**

#### **5. South Roof**

a. *“Determine the remaining life expectancy of the south roof section and ...”*

We were unable to access the south roof, because of hazardous material concerns. Square foot costs for roof removal and replacement are in the summary table. Conditions are assumed the same as for the north roof areas.

Seismic issues were not considered in this area, other than 1/2" plywood over the existing wood decking.

**See cost estimates in Summary Table.**

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## Summary Table

**Summary Table**  
**Magnuson Building 2- ROOF ANALYSIS STUDY UPDATE**  
**January 30, 2013**

<b>Area and Scope</b>	<b>Work Description</b>	<b>Budget</b> <i>(With Soft Costs @ 60%)</i>	<b>Comments</b>
<p><b><u>1. North Section Reroofing</u></b>  <i>Budget level cost estimates to effect minimal repairs to the roof structure; reroof the north roof</i></p>	<ol style="list-style-type: none"> <li>1. Replace all rotted decking</li> <li>2. Remove and replace existing roof membrane</li> <li>3. Add new 1/2" plywood over entire deck.</li> <li>4. Construct new crickets at roof drains</li> <li>5. Replace roof drains and rain water piping routed through the building interior.</li> <li>6. Replace all flashings.</li> <li>7. Recommended roof assembly:               <ol style="list-style-type: none"> <li>a. Complete tear-off</li> <li>b. Rosen paper</li> <li>c. Two-ply base-sheet (first ply nailed; second ply set in hot asphalt)</li> <li>d. Two intermediate roof plies set in hot asphalt</li> <li>e. Granulated cap sheet set in hot asphalt</li> </ol> </li> <li>8. Remove all non-functioning mechanical equipment and patch roof deck. Install new roof curbs for all functioning mechanical equipment.</li> </ol>	<p>\$530,000            (\$848,000)</p>	<p><i>Higher than average \$/SF costs here, because of extra deck replacement, fall protection, and insulation. See Photos 1 and 8, for example.</i></p>
<p><b><u>1. North Section Reroofing</u></b>  <i>Limited seismic improvements to effect proper connection of the roof diaphragm.</i></p>	<ol style="list-style-type: none"> <li>1. Add Roof-Wall Ties at N, W and E Walls:               <ol style="list-style-type: none"> <li>a. Perpendicular wall ties at 4' o.c.</li> <li>b. Transfer in-plane shear to walls with continuous angle</li> <li>c. Provide Ties at each steel beam bearing directly on unreinforced masonry (E and W walls only)</li> </ol> </li> <li>2. Provide positive collector attachment at the roof line at each frame in the north south direction.</li> <li>3. Provide in-plane shear transfer to frames/walls at south side on north wing</li> <li>4. Provide upgraded connection of north office wing frames to main hangar frames</li> </ol>	<p>\$190,000            (\$305,000)</p>	<p><i>As described. Primarily Seismic restraint at the roof line that would either damage the new roof membrane if installed later, or would be difficult to accomplish after new ceiling is in place in the North Wing. See Photos 7, 11, and 13, for example.</i></p>
<p><b><u>1. North Section Reroofing</u></b>  <i>Cost estimates for interior renovation of the north end second floor to make it operational for current use (offices and meeting space).</i></p>	<ol style="list-style-type: none"> <li>1. All interior repairs should occur after roof has been replaced.</li> <li>2. Replace floor finishes (carpet at rooms recently inundated from roof leaks)</li> <li>3. Replace all existing ceiling tile.</li> <li>4. Clean light fixture lenses.</li> <li>5. Remove/replace all existing batt insulation. Suspend new insulation from the underneath side of roof deck. Install airtight membrane.</li> </ol>	<p>\$160,000            (\$256,000)</p>	<p><i>Minimal upgrades to restore usability. Ceiling removed and replaced for various reasons. Light fixtures cleaned and reused. Carpet only replaced in limited areas. See Photos 14 and 15.</i></p>
<b>Total=</b>		<p><b>\$880,000</b>  <b>(\$1,409,000)</b></p>	

<p><b><u>2. North Roof Reroofing and Seismic Upgrade</u></b>  <i>Budget level cost estimates to effect full voluntary seismic retrofit to the north wing building structure</i></p>	<ol style="list-style-type: none"> <li>1. Upgrade Hangar Braced Frames</li> <li>2. Add shear walls at west mezzanine area</li> <li>3. Add infill shear walls at north wing</li> <li>4. Repair West Side Masonry</li> <li>5. Strengthen Hollow Clay Tile Walls Near Exit Paths</li> </ol>	<p>\$270,000                  (\$430,000)</p>	<p><i>Items and Costs are from 2010 Report. Items selected include structural and non-structural seismic upgrades to enhance life safety.</i></p> <p><i>Full voluntary seismic upgrade of north wing not feasible without upgrade of entire building. In particular, the north-south direction is interconnected for the entire length of the building.</i></p>
<p><b><u>2. North Roof Reroofing and Seismic Upgrade.</u></b>  <i>Repair of the roof structure and reroof the north wing.</i></p>	<p>As Above for Task 1.</p>	<p>\$530,000                  (\$849,000)</p>	<p><i>Same component as above.</i></p>
<p><b><u>2. North Section Reroofing</u></b>  <i>Limited seismic improvements to effect proper connection of the roof diaphragm.</i></p>	<p>As above for Task 1.</p>	<p>\$190,000                  (\$305,000)</p>	
<p><b><u>2. North Section Reroofing</u></b>  <i>Cost estimates for interior renovation of the north end second floor to make it operational for current use (offices and meeting space).</i></p>	<p>As above for Task 1.</p>	<p>\$160,000                  (\$256,000)</p>	
<b>Totals=</b>		<p><b>\$1,150,000</b>  <b>(\$1,840,000)</b></p>	

<p><b><u>3. Central Roof Reroofing, Including High Central</u></b>  <i>Budget level cost estimates to effect minimal repairs to the roof structure; reroof the central roof,</i></p>	<ol style="list-style-type: none"> <li>1. Replace all rotted decking</li> <li>2. Remove and replace existing roof membrane</li> <li>3. Add new 1/2" plywood over entire deck.</li> <li>4. Construct new crickets at roof drains</li> <li>5. Replace roof drains and rain water piping routed through the building interior.</li> <li>6. Replace all flashings.</li> <li>7. Recommended roof assembly:               <ol style="list-style-type: none"> <li>a. Complete tear-off</li> <li>b. Rosen paper</li> <li>c. Two-ply base-sheet (first ply nailed; second ply set in hot asphalt)</li> <li>d. Two intermediate roof plies set in hot asphalt</li> <li>e. Granulated cap sheet set in hot asphalt</li> </ol> </li> <li>8. Remove all non-functioning mechanical equipment and patch roof deck. Install new roof curbs for all function mechanical equipment.</li> </ol>	<p>\$720,000            (\$1,152,000)</p>	<p><i>Includes High Bay area over North Hangar, and remainder of Central Area.</i></p>
<p><b><u>3. Central Roof Reroofing, Including High Central</u></b>  <i>Limited seismic improvements to effect proper connection of the roof diaphragm.</i></p>	<ol style="list-style-type: none"> <li>1. Connect Frames to diaphragms.</li> <li>2. Connect Hangar to Adjacent Wings.</li> </ol>	<p>\$60,000            (\$96,000)</p>	
<b>Totals=</b>		<p><b>\$780,000</b>  <b>(\$1,248,000)</b></p>	
<p><b><u>4. North and High Roof Reroofing and Seismic Upgrade</u></b>  <i>Budget level cost estimates to reroof and add seismic retrofitting for the north and high roofs, and connections between the high roof and south roof.</i></p>	<p>See Individual Elements Above.</p>	<p><i>See Above.</i></p>	
<b>Totals=</b>			

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<b>5. South Roof</b> <i>Budget level cost estimate to replace it.</i>	Roof removal and replacement, similar to other areas.	High Roof: \$780,000 <i>(\$1,250,000)</i> Low Roof: \$352,000 <i>(\$560,000)</i>	<i>No access to this area. Costs based on \$22/SF. Roofing only. No Seismic Improvements included.</i>
		<b>Totals=</b>	<b>\$1,132,000</b> <b><i>(\$1,810,000)</i></b>

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## **Plans and Schematic Details**

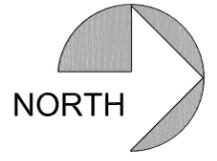


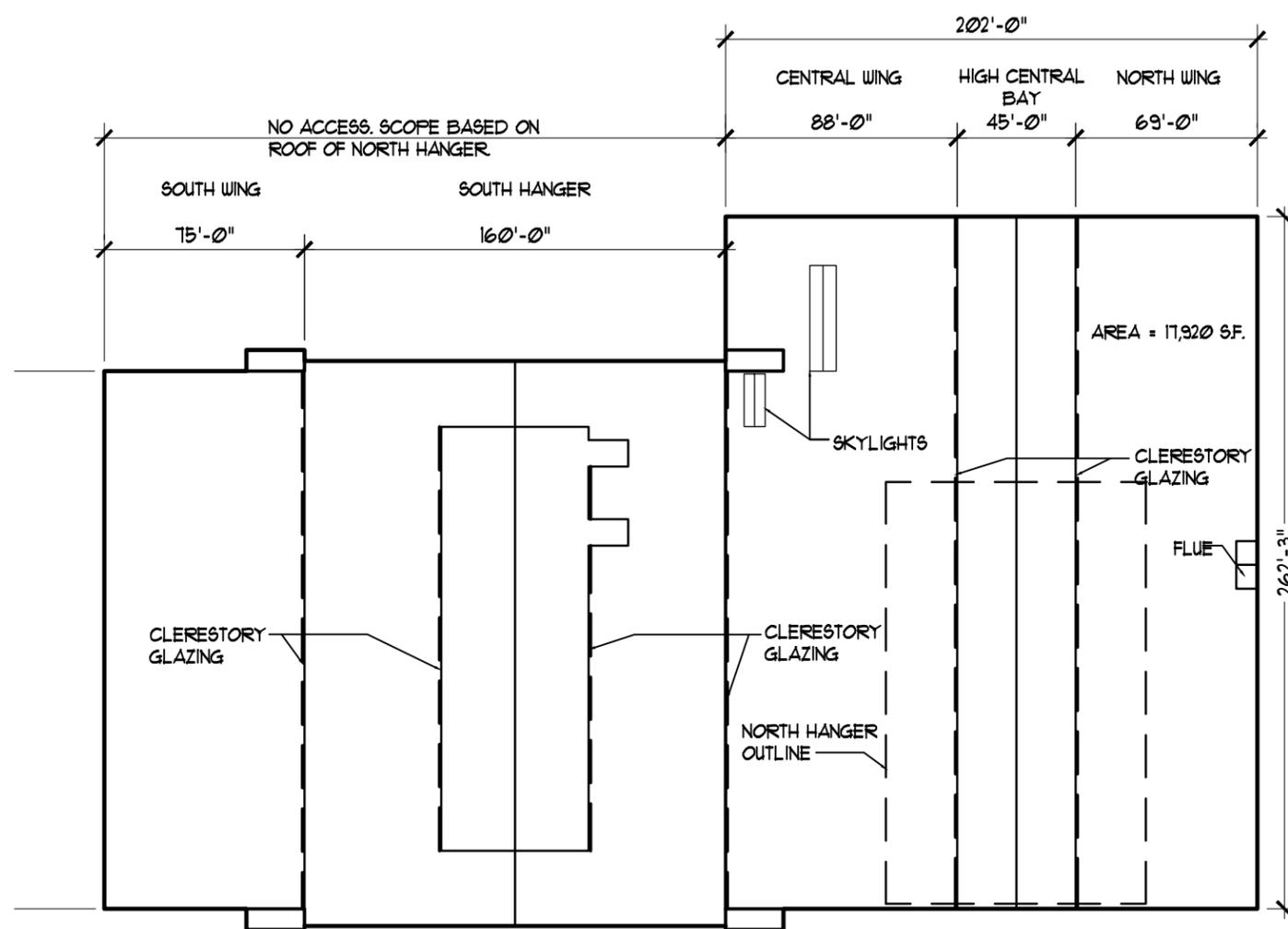
- 1. DEMO (E) CEILING
- 2. DEMO (E) BATT INSUL
- 3. DEMO (E) LIGHT FIXTURES
- 4. FURNISH INSTALL NEW ACCOUSTICAL CEILING
- 5. FURNISH AND INSTALL NEW SUSPENDED THERMAL INSULATION SYSTEM
- 6. FURNISH AND INFILL NEW LIGHT FIXTURES

DEMO DAMAGED CARPET  
 FURNISH AND INSTALL  
 NEW CARPET

1

**MEZZANINE PLAN**  
 1/32" = 1' - 0"





- NORTH WING ROOF REPLACEMENT**
- 1) DEMO (E) ROOF
  - 2) REPLACE 20% OF (E) ROOF DECK
  - 3) NEW BUILTUP ROOF SYSTEM
  - 4) REPLACE ALL FLASHING
  - 5) REPLACE ROOD DRAINS
  - 6) ALLOWANCE TO REPLACE MAIN WATER LEADER

**SOUTH HANGER AND SOUTH WING**  
SIMILAR TO CENTRAL WING

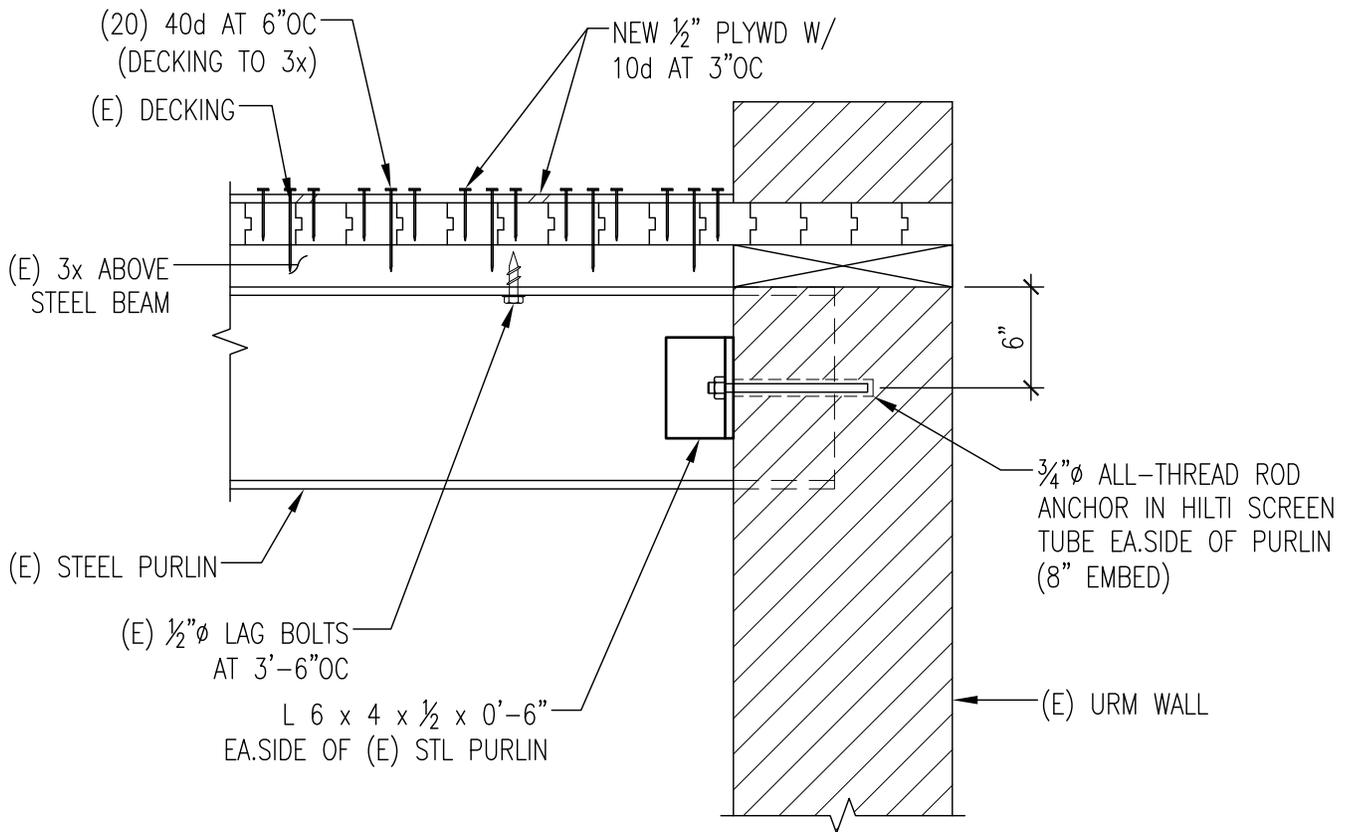
- CENTRAL WING ROOF**
- 1) DEMO (E) ROOF
  - 2) DEMO (E) SKYLIGHT
  - 3) DEMO-NON USED HVAC EQUIPMENT AND INFILL ROOF DECK
  - 4) REPLACE 5% OF (E) DECK
  - 5) NEW BUILTUP ROOF
  - 6) REPLACE SKYLIGHTS
  - 7) REPLACE ALL FLASHING
  - 8) ALLOWANCE TO REPLACE MAIN WATER LEADER

- HIGH CENTRAL BAY ROOF**
- 1) DEMO (E) ROOF
  - 2) REPLACE 5% (E) ROOF DECK
  - 3) NEW BUILTUP ROOF
  - 4) REPLACE ALL FLASHING AND GUTTER

**1** **ROOF PLAN**  
 1/64" = 1' - 0" 

**WARREN G. MAGNUSON PARK**  
**BUILDING 2**

CITY OF SEATTLE DEPARTMENT OF PARKS AND RECREATION  
 6310 NE 74TH ST. SEATTLE WA 98115



# (E) URM WALL TO ROOF PURLIN CONNECTION

SCALE: 1" = 1'-0"



NOTE:  
AT EAST AND WEST WALLS  
OF NORTH WING.

## MAGNUSON BLDG #2 ROOF & SEISMIC STUDY

PROJECT No: 12143

DATE: 1-30-13

DWN BY: MB

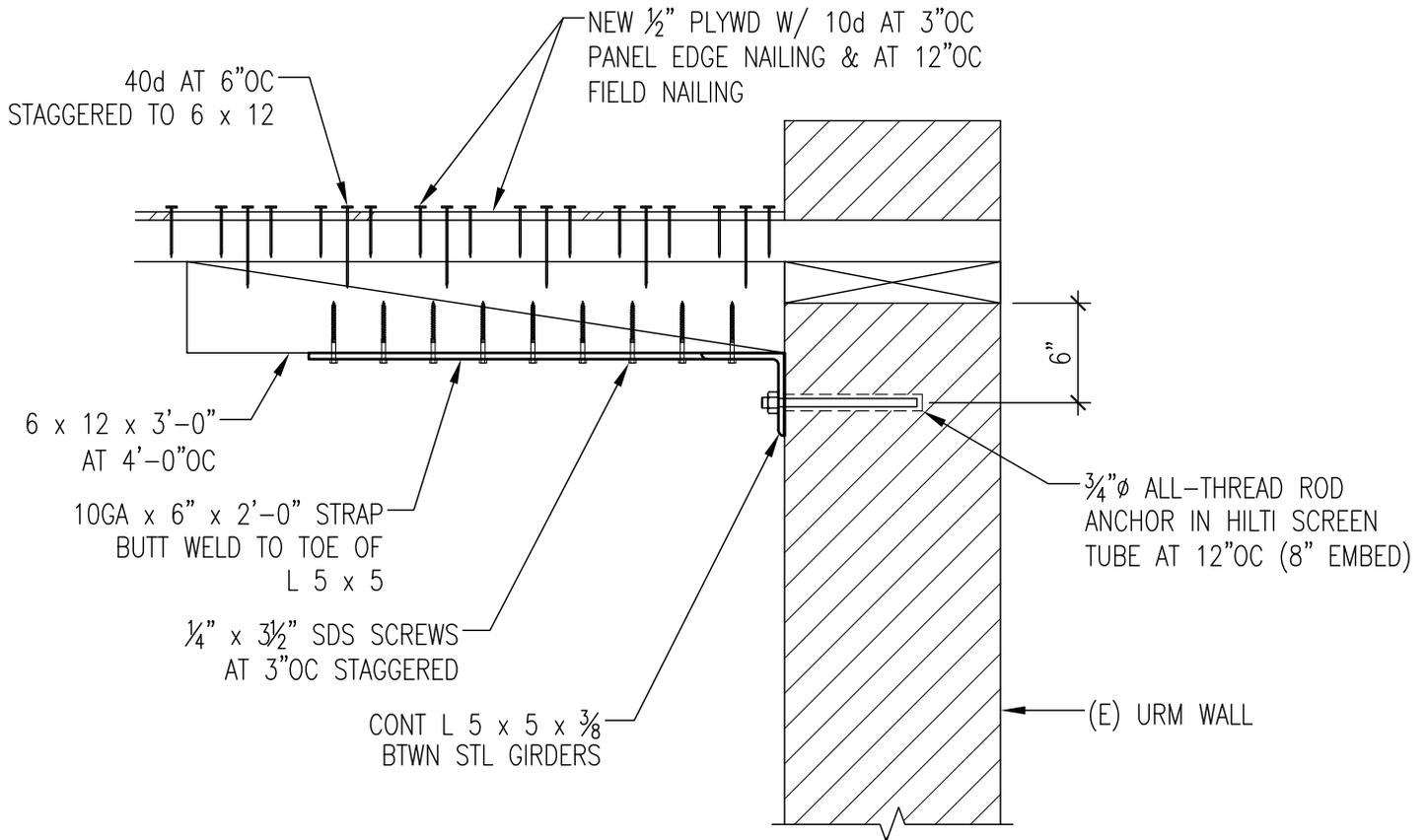
CHKD BY: REM

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SK1



**(E) URM WALL AT WOOD DECKING CONNECTION**

2

SCALE: 1" = 1'-0"

NOTE:  
NORTH WALL OF NORTH WING  
(EAST & WEST WALLS SIMILAR)

**MAGNUSON BLDG #2  
ROOF & SEISMIC STUDY**

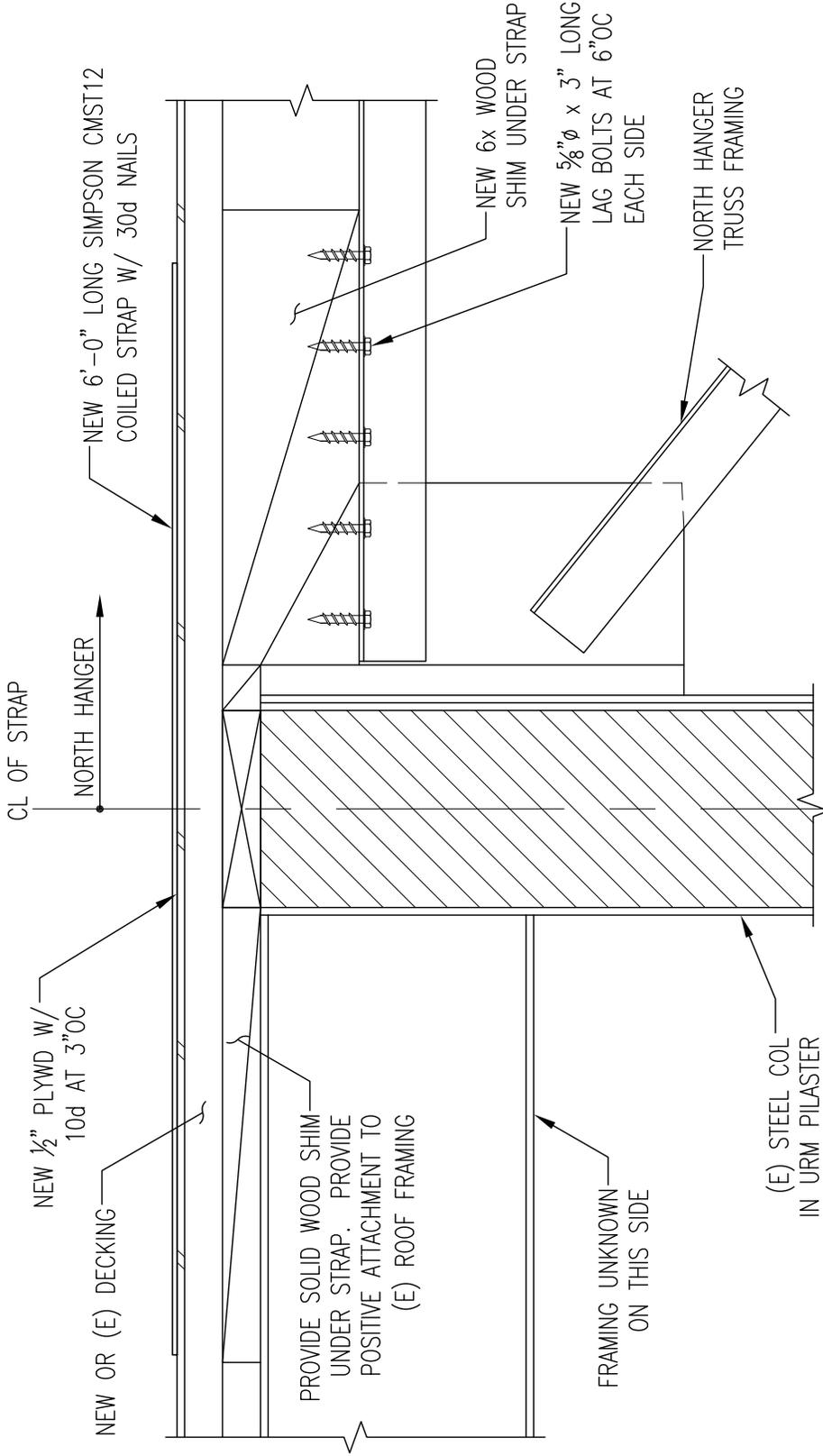
PROJECT No: 12143

DATE: 1-30-13	DWN BY: MB	CHKD BY: REM
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**SK2**



# NORTH HANGER TO SOUTH HANGER CONNECTION 3

SCALE: 1" = 1'-0"

NOTE:  
SIMILAR AT NORTH WING TO  
NORTH HANGER

## MAGNUSON BLDG #2 ROOF & SEISMIC STUDY

PROJECT No: 12143

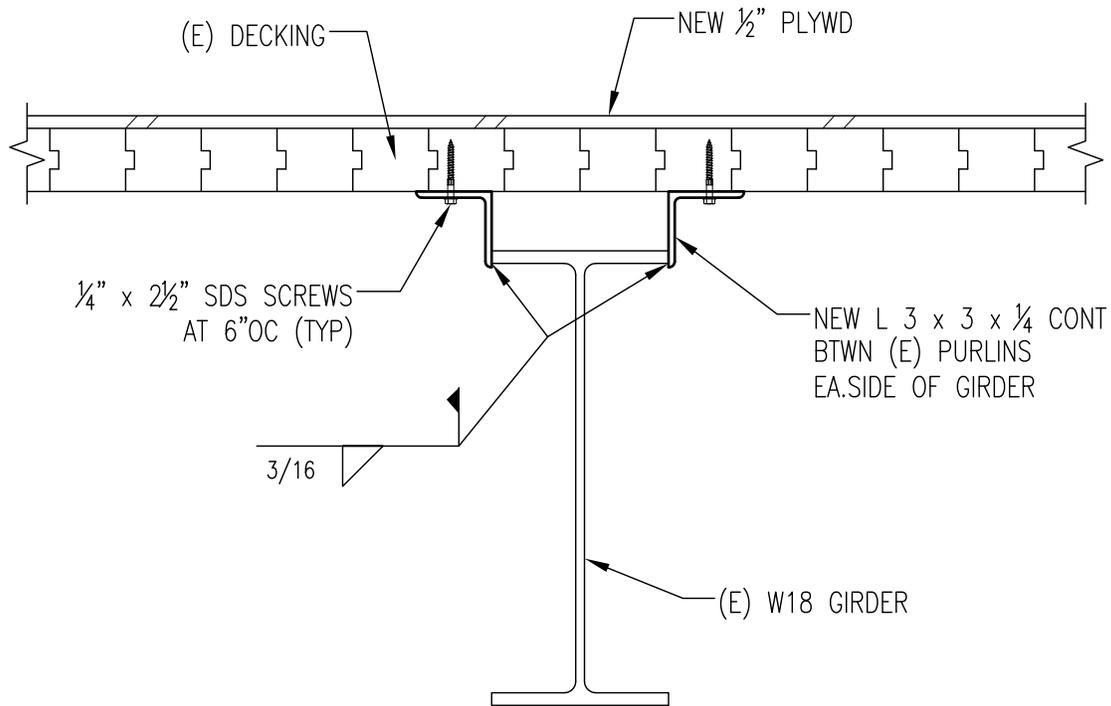
DATE: 1-30-13 DWN BY: MB

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## GIRDER TO ROOF DECK CONNECTION

SCALE: 1 1/2" = 1'-0"

4

### MAGNUSON PARK BLDG #2 ROOF & SEISMIC STUDY

PROJECT No: 12143

DATE: 1-30-13

DWN BY: MB

CHKD BY: REM

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SK4

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## **Photographs**



Photo 1-Northeast Corner of North Wing. Roofing Material is Deteriorated and Wrinkled.



Photo 2-Flashing and Roofing at North Elevator Room



Photo 3-North Clerestory of North Hangar



Photo 4-Southwest Corner of North Hangar, Showing Interior Roof Drain.



Photo 5-West Edge of North Hangar, Showing Missing Cap Flashing

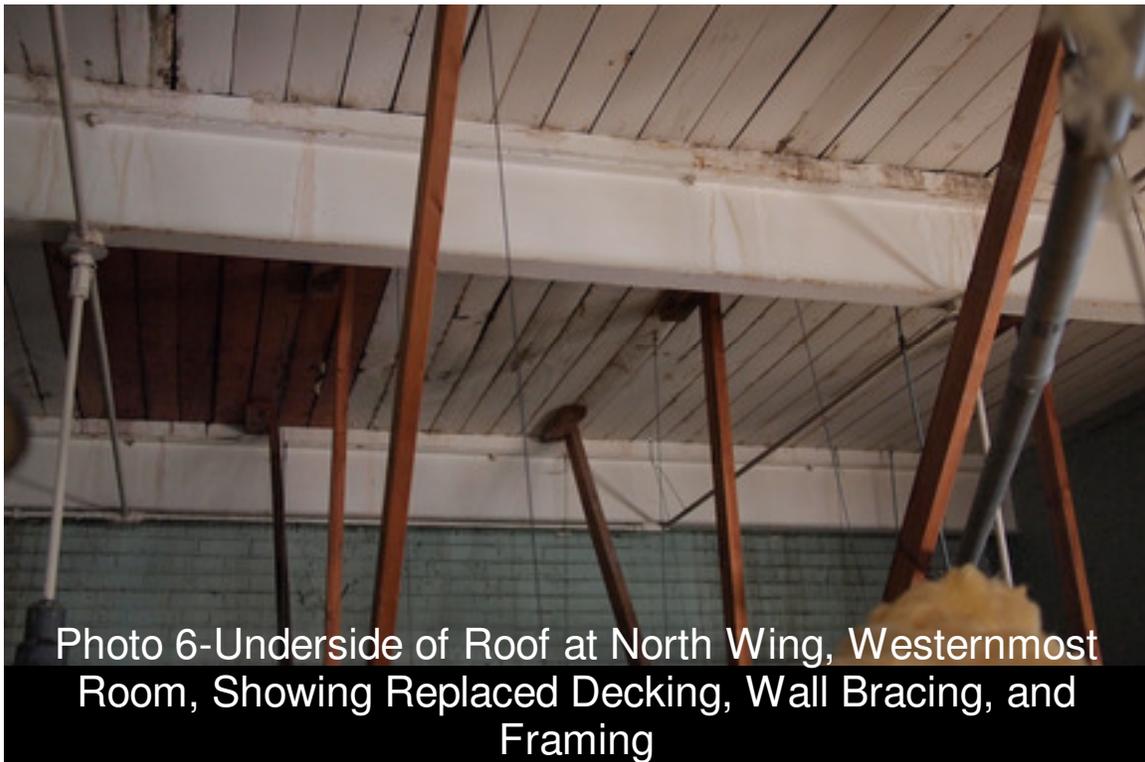


Photo 6-Underside of Roof at North Wing, Westernmost Room, Showing Replaced Decking, Wall Bracing, and Framing



**Photo 7-Northwest Corner of North Wing, showing locations of future seismic restraint locations**



**Photo 8-Soffit of Roof Deck at North Wing, Showing Deteriorated and Replaced Decking**



**Photo 9-Water-Stained and Deteriorated Roof Decking at Mechanical Penetration**



**Photo 10-Inside View of North Wing North Wall, Showing Framing System and Congestion**



Photo 11-North Wing, looking east, showing insulation, framing system



Photo 12-Above 2nd Floor of North Wing, Showing Congestion of Mechanical Equipment and Framing



Photo 13-South Edge of North Office Wing



Photo 14-Floor Damage from Water Intrusion at Northwest Rooms



Photo 15-Ceiling and Roof Damage at Northwest Corner from Water Intrusion



Photo 16-Water-Stained Ceiling Tiles at North Office Wing



Photo 17-North Edge of North Hangar at Junction with North Office

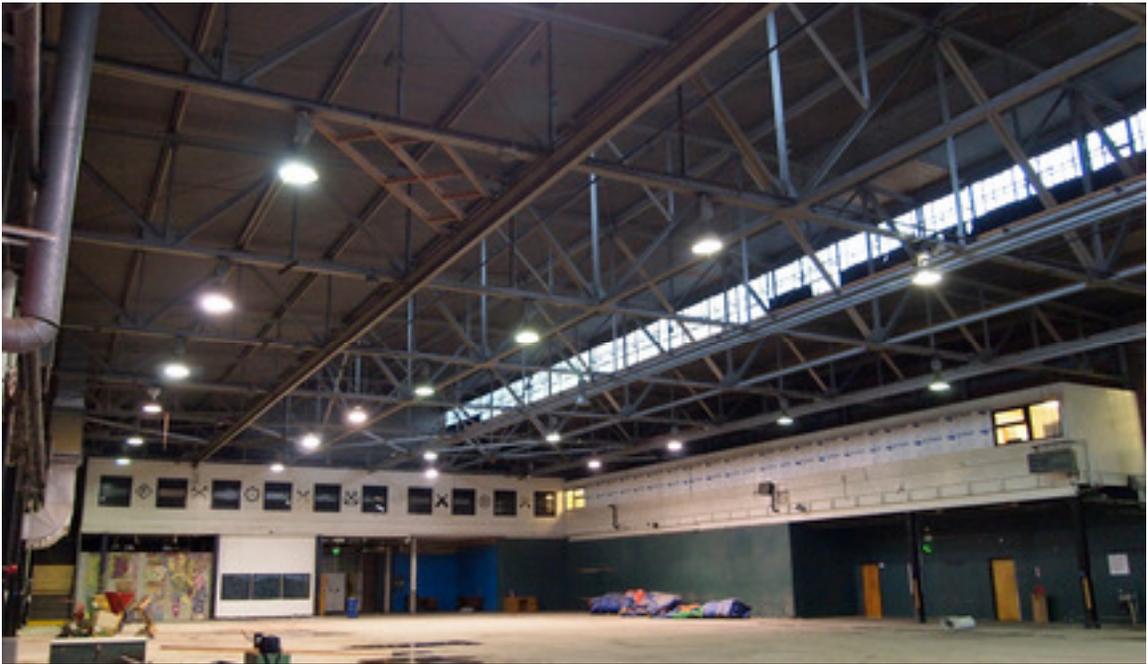


Photo 18-Overall View of North Hangar



Photo 19-Trusses at North Hangar



Photo 20 Clerestory Window at North Hangar



Photo 21 South Hangar Truss Bearing Condition

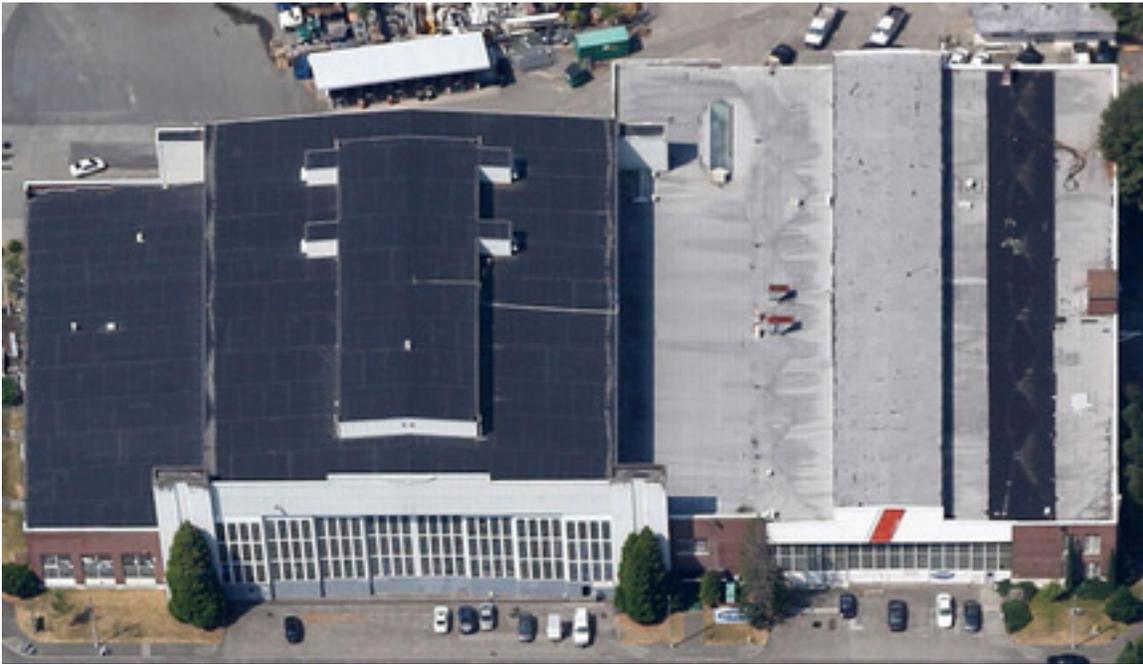


Photo 22-Aerial Looking West

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## **Appendix**

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## **Attachment A-Original Draft Scope**

# Attachment A

Draft 11.1.12

## SCOPE OF WORK

### MAGNUSON BUILDING 2 ROOF ANALYSIS STUDY UPDATE

Agreement No \_\_\_\_\_

#### BACKGROUND:

Seattle Parks also wants to undertake renovations to Building #2 for life-safety improvements and to protect the building which is located in the Sand Point Naval Air Base Landmarks District. The Consultant shall update the 2010 Magnuson Building 2 Structural/Seismic Analysis Study and assess the high (central) and south roofs of the building. The purpose of this study is to determine the structural integrity of the existing north and high (central) roofs, roof diaphragms, and associated structure, to provide an updated budget-level cost estimate for the roof replacement options detailed below, and to provide a professional opinion on whether and how long the existing roof system can continue to provide reasonably safe and secure occupancy for staff occupying the north wing of the building. [Note that sections of the high (central) and south roofs were reported to have radium contamination and are scheduled to be abated by the Navy in 2013/14 per Parks' Environmental Analyst Marrell Livesay.]

#### SCOPE:

Work and Deliverables shall include but not be limited to:

- Two site visits to gather data on Building #2.
- Review existing report, as-built drawings, and records of the existing structure.
- Update the 2010 Report
- Determine if the Energy code or other codes will be triggered by any of the alternatives below.

##### 1. North Section Reroofing

- a. Identify roof deficiencies and changes since 2010, including roofing conditions, loss of flashing materials, interior leaks, drainage issues, etc. (There isn't any known radiation contamination in the north section.)
- b. Provide work description and budget level cost estimates to effect minimal repairs to the roof structure, reroof the north roof, and limited seismic improvements to effect proper connection of the roof diaphragm.
- c. Identify conditions and deficiencies in the interior of the second floor of the north end, including leaks, ceiling and carpet damage, and related issues.
- d. Develop work descriptions and cost estimates for interior renovation of the north end second floor to make it operational for current use (offices and meeting space).

##### 2. North Roof Reroofing and Seismic Upgrade

- a. Identify seismic deficiencies and changes since 2010 that are additional to Item 1-a above.
- b. Provide work description and budget level cost estimates to effect full voluntary seismic retrofit to the north wing building structure, including repair of the roof structure and reroof the north wing.
- c. Identify conditions and deficiencies in the interior of the second floor of the north end, including leaks, ceiling and carpet damage, and related.

3. High (Central) Roof Reroofing

- a. Identify roof deficiencies, including roofing conditions, loss of flashing materials, interior leaks, drainage issues, etc.
- b. Provide work description and budget level cost estimates to effect minimal repairs to the roof structure, reroof the central roof, and limited seismic improvements to effect proper connection of the roof diaphragm.

4. North and High Roof Reroofing and Seismic Upgrade

- a. Determine if there are any critical connections between the high roof and the south roof.
- b. Provide work description and budget level cost estimates to reroof and add seismic retrofitting for the north and high roofs, and connections between the high roof and south roof.

5. South Roof

- a. Determine the remaining life expectancy of the south roof section and develop a budget level cost estimate to replace it.

Deliverables:

- Prepare a draft report the report that includes:
  - Description of the current roof condition and deficiencies for each option above.
  - Summary chart for options and cost estimates.
  - A professional opinion on whether and how long the existing roof system can continue to provide reasonably safe and secure occupancy in the north end of the building.
  - Photos of the roof and interiors' condition for each roof section.
- Make a presentation to staff on the draft report findings.
- Provide a final report (five hard copies and electronic version) that incorporates staff comments.

**SCHEDULE:** Completed final report by November 26, 2012.

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**PSM**

CONSULTING ENGINEERS

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## **Attachment B-Cost Estimate Backup**

**PROJECT :** Magnuson Building 2 North Wing Stabilization  
**LOCATION :** Seattle, WA  
**NEW SF :** 0  
**EXIST SF :** 53,200  
**TOTAL SF :** 53,200  
**EST TYPE :** Preliminary Design

<b>DIV #</b>	<b>DESCRIPTION</b>	<b>TOTAL</b>	<b>\$/SF</b>
02 07 00	Selective Demolition	\$116,692	\$2.19
02 82 00	Regulated Material Abatement	\$106,400	\$2.00
05 12 00	Structural Steel	\$0	\$0.00
05 50 00	Metal Fabrications	\$1,800	\$0.03
06 10 00	Miscellaneous Carpentry	\$293,576	\$5.52
07 20 00	Thermal Insulation	\$48,300	\$0.91
07 52 00	Modified Bitumen Roofing	\$469,028	\$8.82
07 60 00	Sheet Metal Flashings	\$89,610	\$1.68
07 92 00	Joint Sealants	\$2,741	\$0.05
09 51 13	Suspended Acoustical Ceilings	\$73,500	\$1.38
09 68 00	Replace Soiled Carpet	\$11,655	\$0.22
09 90 00	Painting	\$6,000	\$0.11
22 14 13	Mechanical	\$29,000	\$0.55
26 05 00	Electrical	\$53,500	\$1.01
<b>ESTIMATE SUBTOTAL</b>		<b>\$1,301,802</b>	
GENERAL CONDITONS @		12.00%	\$156,216
<b>SUBTOTAL</b>			<b>\$1,458,018</b>
GC O&P @		6.00%	\$87,481
			<b>\$1,545,499</b>
DESIGN CONTINGENCY @		8.00%	\$123,640
<b>SUBTOTAL</b>			<b>\$1,669,139</b>
			<b>\$31.37</b>

**EXCLUSIONS:**

STATE SALES TAX  
 TESTING AND INSPECTIONS  
 CONSTRUCTION CONTINGENCY  
 ARCHITECT/ENGINEERING FEES  
 PERMITS

OFFSITE WORK  
 APPLIANCES  
 SHOP EQUIPMENT/CASEWORK  
 FURNISHINGS

**DETAILED  
ESTIMATE  
BREAKDOWN**

**PROJECT :** Magnuson Building 2 North Wing Stabilization  
**LOCATION :** Seattle, WA  
**NEW SF :** 0  
**REMODEL SF :** 53,200  
**TOTAL SF :** 53,200  
**EST TYPE :** Preliminary Design

**Magnuson Building 2 Stabilization**

**Summary of Magnuson Building 2 Stabilization Repairs**

Replace North Roof Membrane  
 Selective Repairs of North Roof Deck  
 Replace High-Central Roof Membrane  
 Replace Central Roof Membrane  
 Replace Central Roof Skylights  
 Selective HVAC Demolition of Central Roof  
 Selective Roof Deck Infill of Central Roof  
 Allowance for Coordination with Regulated Materials  
 Perimeter Roof and Equipment Curbs  
 Perimeter and Equipment Curb Flashings  
 Roof Ladders  
 Fall Protection Anchors and Cabling Systems

Replace Existing Ceilings in North Wing  
 Selective Floor Finish Replacement in North Wing  
 Ceiling Thermal Insulation in West Wing

**TOTALS**

02 07 00	<b>Selective Demolition</b>					
	<b>North Wing Roof Tear-Off (Assumes ACM)</b>	18,000.00	sf	1.75	\$31,500	<b>\$116,692</b>
	Demolish cap flashing at parapet walls	400.00	lf	2.00	\$800	
	Demolish reglet flashing at elevator tower walls	100.00	lf	2.00	\$200	
	Demolish reglet flashing at south wall	263.00	lf	2.00	\$526	
	Demolish exiting roof drains and piping	4.00	sf	200.00	\$800	
	Misc HVAC Removal	1.00	ls	500.00	\$500	
	Suspended ceiling and insulation removal	21,000.00	sf	0.60	\$12,600	
	Misc Carpet removal	3,000.00	sf	0.60	\$1,800	<b>\$48,726</b>
	<b>High-Central Roof Tear-Off (Assumes ACM)</b>	12,100.00	sf	1.75	\$21,175	
	Demolish gutters and flashings	525.00	lf	2.00	\$1,050	
	Demolish parapet flashings	92.00	lf	2.00	\$184	
	Misc HVAC Removal	1.00	ls	500.00	\$500	<b>\$22,909</b>
	<b>Central Roof Tear-Off (Assumes ACM)</b>	23,100.00	sf	1.75	\$40,425	
	Demolish cap flashing at parapet walls	176.00	lf	2.00	\$352	
	Demolish reglet flashing at south wall	280.00	lf	2.00	\$560	
	Demolish exiting roof drains and piping	4.00	sf	200.00	\$800	
	Misc HVAC Removal	1.00	ls	1,000.00	\$1,000	
	Demo existing skylights	240.00	sf	8.00	\$1,920	<b>\$45,057</b>
<hr/>						
02 82 00	<b>Regulated Material Abatement</b>					
	Allowance for ACM	53,200.00	sf	2.00	\$106,400	<b>\$106,400</b>
<hr/>						
05 12 00	<b>Structural Steel</b>					
	Anchor bolts at cornice		ea	6.00	\$0	
<hr/>						
05 50 00	<b>Metal Fabrications</b>					
	Access ladders	3.00	ea	600.00	\$1,800	<b>\$1,800</b>
<hr/>						
06 10 00	<b>Miscellaneous Carpentry</b>					<b>\$293,576</b>
	North Wing misc structural deck replacement (20%)	3,600.00	sf	24.00	\$86,400	

**DETAILED  
ESTIMATE  
BREAKDOWN**

	High-Central misc structural deck replacement (5%)	605.00	sf	24.00	\$14,520	
	Central Wing misc structural deck replacement (5%)	1,155.00	sf	24.00	\$27,720	
	North wing roof edge blocking and cant	400.00	lf	4.00	\$1,600	
	1/2" Plywood sheathing at North Wing	18,000.00	sf	3.00	\$54,000	
	1/2" Plywood sheathing at High-Central Wing	12,100.00	sf	3.00	\$36,300	
	1/2" Plywood sheathing at Central Wing	23,100.00	sf	3.00	\$69,300	
	Misc curbs at HVAC	1.00	ls	1,000.00	\$1,000	
	Misc roof infill	4.00	ea	500.00	\$2,000	
	4 x 4 curb at skylights	92.00	lf	8.00	\$736	
<hr/>						
07 20 00	<b>Thermal Insulation</b>					<b>\$48,300</b>
	Suspended batt insulation in North Wing	21,000.00	sf	1.50	\$31,500	
	Facing barrier for suspended insulation	21,000.00	sf	0.80	\$16,800	
<hr/>						
07 52 00	<b>Modified Bitumen Roofing</b>					<b>\$469,028</b>
	<b>North Wing</b>					
	Rosin paper	18,000.00	sf	0.50	\$9,000	
	Two-ply base sheet	18,000.00	sf	1.50	\$27,000	
	Cricketts	2,500.00	sf	6.00	\$15,000	
	2-inner plies/granulated cap sheet	18,000.00	sf	5.00	\$90,000	
	Membrane wall flashing at parapet walls	0.00	sf	6.00	\$0	
	Membrane wall flashing at skylight curbs	0.00	sf	6.00	\$0	
	Walk pads	24.00	lf	12.00	\$288	<b>\$190,324</b>
	<b>High-Central Wing</b>					
	Rosin paper	12,100.00	sf	0.50	\$6,050	
	Two-ply base sheet	12,100.00	sf	1.50	\$18,150	
	2-inner plies/granulated cap sheet	12,100.00	sf	5.00	\$60,500	
	Cricketts	0.00	sf	6.00	\$0	
	Membrane wall flashing at parapet walls	0.00	sf	6.00	\$0	
	Membrane wall flashing at skylight curbs	0.00	sf	6.00	\$0	
	Walk pads	24.00	lf	12.00	\$288	<b>\$85,276</b>
	<b>Central Wing</b>					
	Rosin paper	23,100.00	sf	0.50	\$11,550	
	Two-ply base sheet	23,100.00	sf	1.50	\$34,650	
	2-inner plies/granulated cap sheet	23,100.00	sf	5.00	\$115,500	
	Cricketts	4,500.00	sf	6.00	\$27,000	
	Membrane wall flashing at parapet walls	600.00	sf	6.00	\$3,600	
	Membrane wall flashing at skylight curbs	92.00	sf	6.00	\$552	
	Walk pads	24.00	lf	12.00	\$288	<b>\$193,428</b>
<hr/>						
07 60 00	<b>Sheet Metal Flashings</b>					
	<b>North Wing parapet coping metal</b>	400.00	lf	10.50	\$4,200	<b>\$89,610</b>
	Reglet flashing at elevator tower walls	100.00	lf	12.00	\$1,200	
	Reglet flashing at south wall	263.00	lf	12.00	\$3,156	
	Misc HVAC curb flashing	1.00	ls	500.00	\$500	<b>\$9,056</b>
	<b>High-Central Wing parapet coping metal</b>	12,100.00	sf	1.75	\$21,175	
	Gutters and flashings	525.00	lf	16.00	\$8,400	
	Parapet flashings	92.00	lf	10.50	\$966	
	Misc HVAC curb flashing	1.00	ls	500.00	\$500	<b>\$31,041</b>
	<b>Central Wing parapet coping metal</b>	23,100.00	sf	1.75	\$40,425	
	Cap flashing at parapet walls	176.00	lf	10.50	\$1,848	
	Reglet flashing at south wall	280.00	lf	12.00	\$3,360	
	Misc HVAC curb flashing	1.00	ls	1,000.00	\$1,000	
	Skylights Flashings	240.00	sf	12.00	\$2,880	<b>\$49,513</b>
<hr/>						
07 92 00	<b>Joint Sealants</b>					<b>\$2,741</b>
	Joint sealants at skylights	240.00	lf	3.50	\$840	
	Joint sealants at reglets	543.00	lf	3.50	\$1,901	

**DETAILED  
ESTIMATE  
BREAKDOWN**

09 51 13	<b>Suspended Acoustical Ceilings</b>					<b>\$73,500</b>
	North Wing acoustical ceilings	21,000.00	sf	3.50	\$73,500	
09 68 00	<b>Replace Soiled Carpet</b>					<b>\$11,655</b>
	North Wing carpet replacement	333.00	sy	35.00	\$11,655	
09 90 00	<b>Painting</b>					
	Misc int painting	1.00	ls	5,000.00	\$5,000	<b>\$6,000</b>
	Misc ext painting	1.00	ls	1,000.00	\$1,000	
22 14 13	<b>Mechanical</b>					<b>\$29,000</b>
	Roof drains	10.00	ea	800.00	\$8,000	
	Overflow Scuppers	10.00	ls	600.00	\$6,000	
	Misc piping associated with roof drains	1.00	ls	15,000.00	\$15,000	
26 05 00	<b>Electrical</b>					
	Re-route electrical conduit at roof areas	3.00	ea	500.00	\$1,500	<b>\$53,500</b>
	Remove/store/reinstall existing lights N wing	100.00	ea	500.00	\$50,000	
	Clean existing diffusers	100.00	ea	20.00	\$2,000	
<b>Magnuson Building 2 Stabilization</b>						<b>\$1,301,802</b>

**DETAILED  
ESTIMATE  
BREAKDOWN**

**PROJECT :** Magnuson Building 2 North Wing Stabilization  
**LOCATION :** Seattle, WA  
**NEW SF :** 0  
**REMODEL SF :** 53,200  
**TOTAL SF :** 53,200  
**EST TYPE :** Preliminary Design

Furnish and install pipe railing fall restraint at west edge of stair tower; and the "low parapet" section of roofing along the west elevation just north of the AHU.

Furnish and install pipe railing fall restraint along the east perimeter parapet

Furnish and install fall arrest anchors and SS cable along the north side of the roof

Furnish and install fall arrest anchors and SS cable on the stair tower roof

11 10 14	<b>Fall protection systems</b>				<b>\$93,100</b>
	Perimeter cable systems North wing	362.00	lf	150	\$54,300
	Perimeter cable systems North wing	242.00	lf	150	\$36,300
	Anchor at elevator tower	1.00	ea	2500	\$2,500

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**Magnuson Building 2 Stabilization**

## Seismic Upgrade work

### North wing-Connect Purlins at East and West Walls

	Quantity	Unit Cost	Total Cost	
Install 3/4" dia. rod in Hilti Screen Tube	2	50	\$100	
Install L6x4 Each side	2	250	\$500	
			\$600	
General Conditions		10%	<u>\$60</u>	
			\$660	
GC O&P		6%	<u>\$40</u>	
			\$700	
Design Contingency		20%	<u>\$140</u>	
			\$840	
	locations			10 each location
				\$8,395

### In Plane/Out Of Plane Connection (Calculate Every 4'0" o.c.)

	Quantity	Unit Cost	Total Cost	
Install 3/4" dia. rod in Hilti Screen Tube	4	50	200	
Install L5x5	4	75	300	
Install 10 gage x 6" strap	1	150	150	
Blocking and SDS Screws	1	100	100	
40d Nailing	1	50	50	
			\$800	
General Conditions		10%	<u>\$80</u>	
			\$880	
GC O&P		6%	<u>\$53</u>	
			\$933	
Design Contingency		20%	<u>\$187</u>	
			\$1,119	
				at 4' o.c. at perimeter
perimeter N, E,W			340	\$95,146
perimeter S			\$260	\$36,379
				\$131,525

### Connect Roof Beam to Diaphragm as Drag Strut

	Quantity	Unit Cost	Total Cost	
L3x3 ea. side (40')	2	500	1000	
SDS Screws	160	3	480	
			\$1,480	
General Conditions		10%	<u>\$148</u>	
			\$1,628	
GC O&P		6%	<u>\$98</u>	
			\$1,726	
Design Contingency		20%	<u>\$345</u>	
			\$2,071	
				Each beam
	beams			12 \$24,850

Connect Hangars to Adjacent Spaces (North and South)

	Quantity	Unit Cost	Total Cost	
Strap	1	500	500	
Bolts	10	50	500	
Wood Shim	2	150	300	
			\$1,300	
General Conditions	10%		<u>\$130</u>	
			\$1,430	
GC O&P	6%		<u>\$86</u>	
			\$1,516	
Design Contingency	20%		<u>\$303</u>	
			\$1,819	each location
	each side		12	\$21,828

North Wing Roof

\$8,395  
\$131,525  
\$24,850  
\$21,828  
**\$186,597**

North wing 2010

\$15,000 west side repair  
\$150,000 braced frames  
\$50,000 inter sw at west  
\$30,000 sw  
\$25,000 HCT  
**\$270,000**