

PNWS-AWWA 2022 Section Conference

Seismic Resilience without Breaking the Bank

April 29, 2022



Speaker Introductions

Bryan Robinson, PWB



Matt Perkins, Stantec



Agenda

Introduction

PWB Pump Station History

Seismic Design Criteria

Project Design Phase

Next Steps: Implementation

Q&A

Introduction

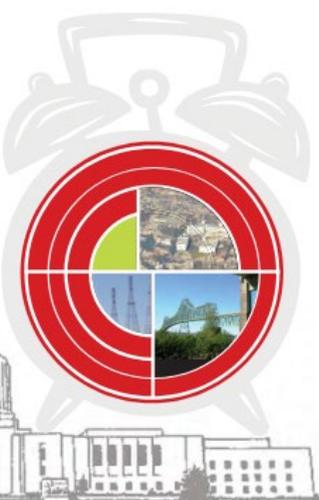
Problem Identification

The Oregon Resilience Plan

Reducing Risk and Improving Recovery
for the Next Cascadia Earthquake and Tsunami

Report to the
77th Legislative Assembly

from
Oregon Seismic Safety Policy
Advisory Commission (OSSPAC)

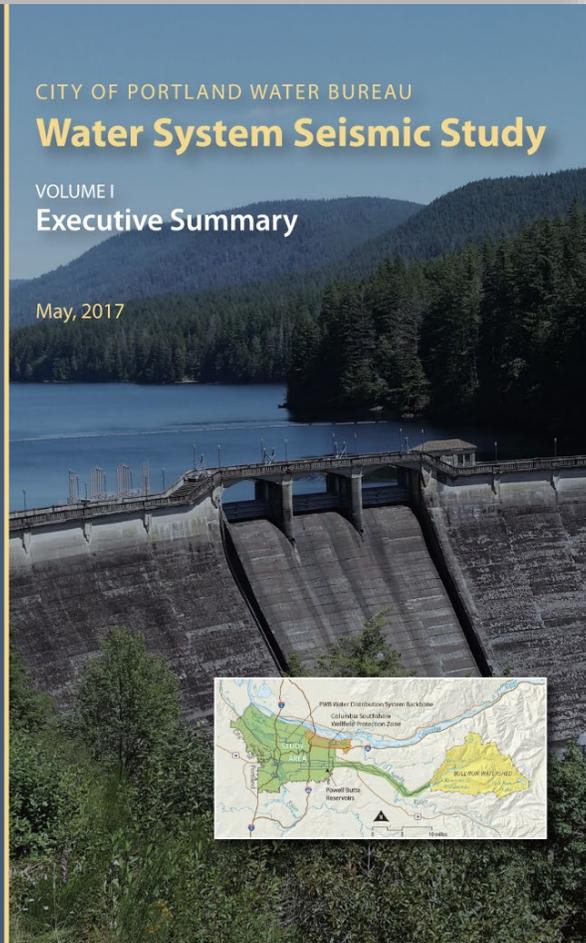


Salem, Oregon
February 2013

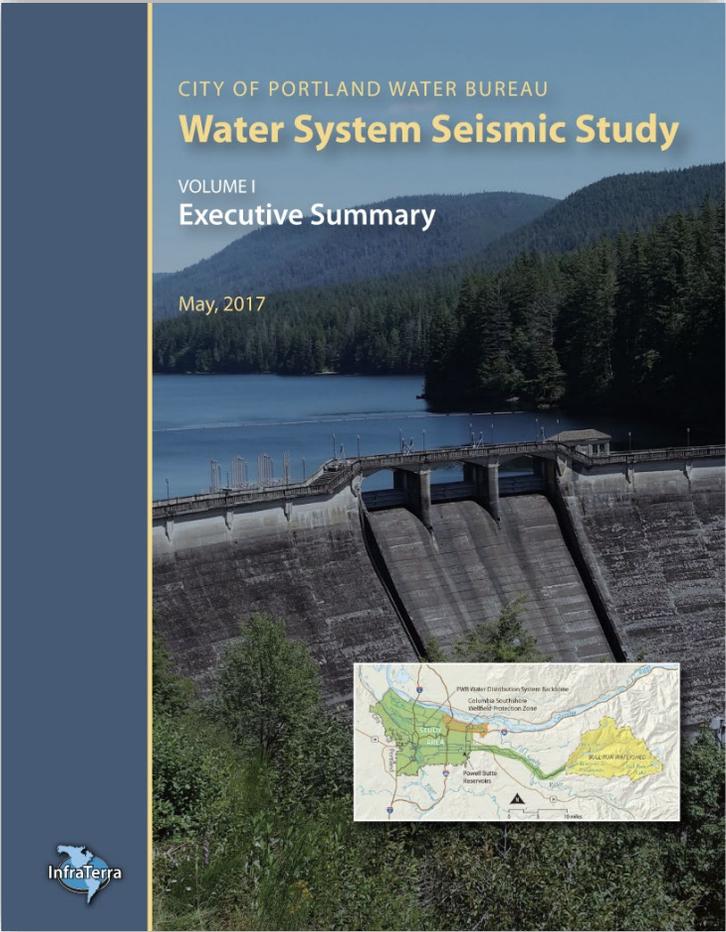
CITY OF PORTLAND WATER BUREAU
Water System Seismic Study

VOLUME I
Executive Summary

May, 2017



Problem Identification

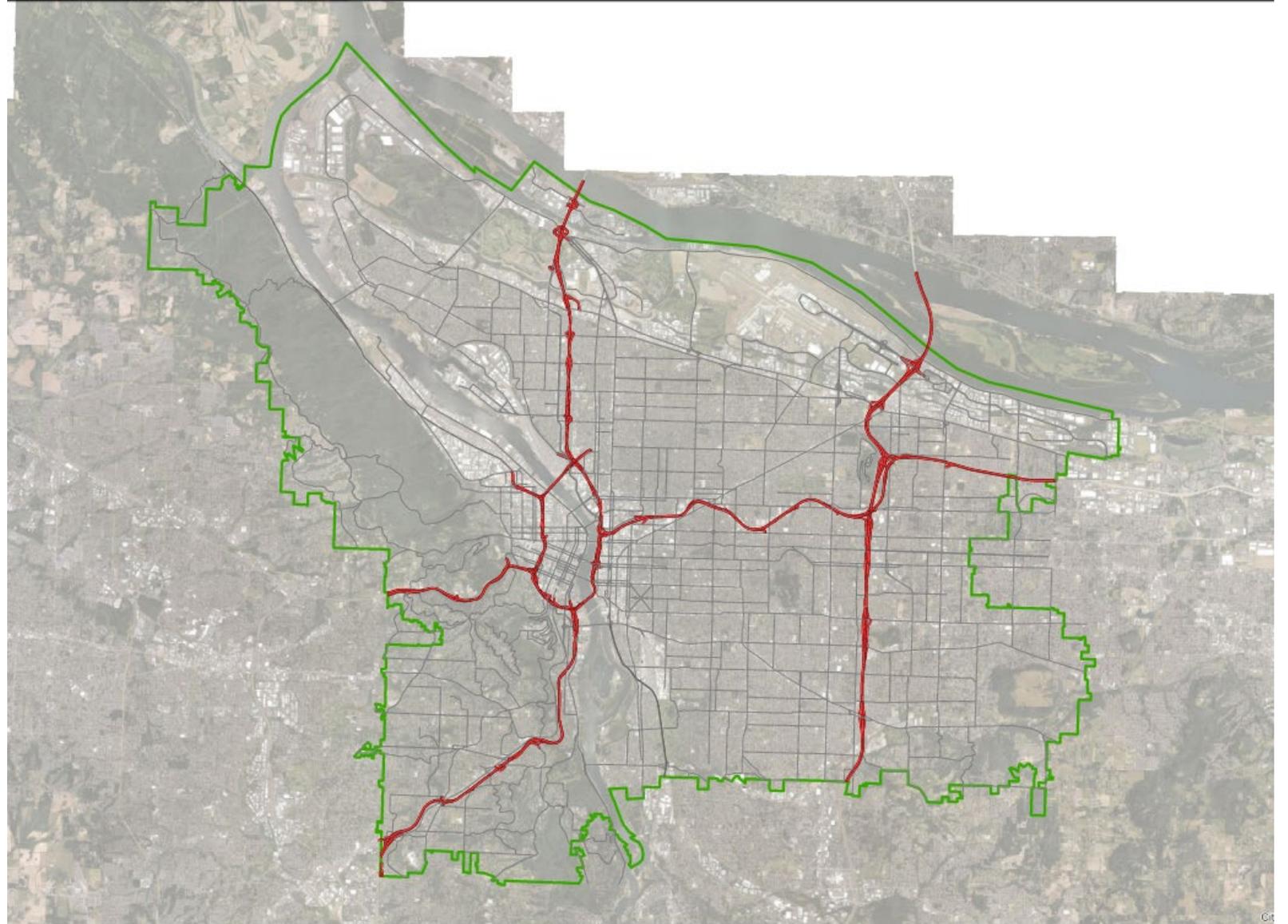


<p>Non-CIP Projects</p>	<p>Develop a program to anchor and restrain all electrical and communication equipment</p>	<p>TBD</p>	<p>High</p>	<p>Equipment damage is most common in an earthquake, and easiest to prevent with a pro-active anchorage program.</p>
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Pump Station History

PWB Pump Stations

- 36 Active Pump Stations throughout the distribution system



PWB Pump Station History

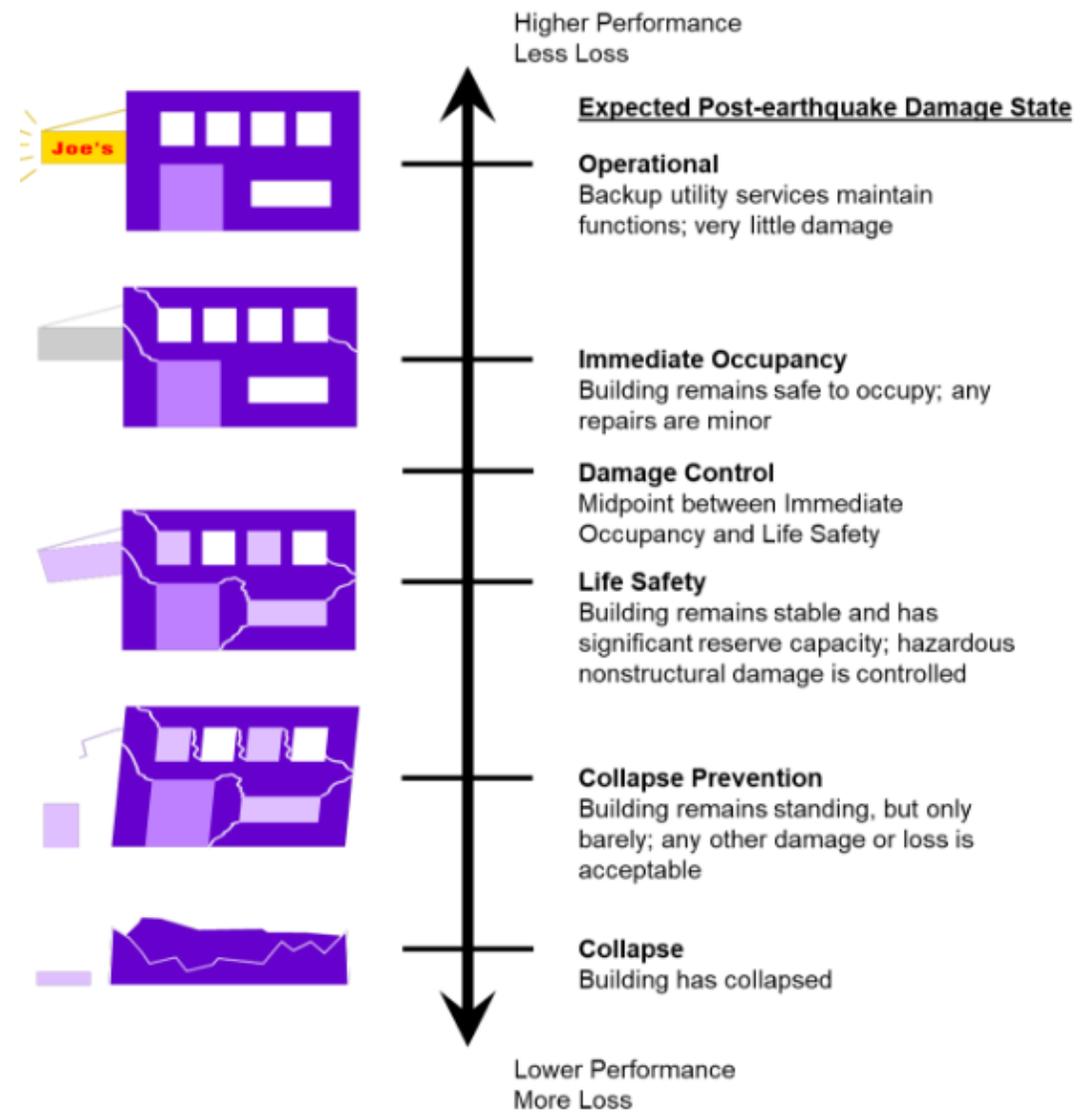


Portland Water Bureau Priority Ranking

Category	Criteria
4	Pump stations constructed or upgraded since 1995.
3	Pump stations where upgrades are scheduled.
2	Pump stations not considered part of the backbone distribution system or supply less than 50 services and are not considered backup stations.
1	Remainder of pump stations.

Seismic Design Criteria

Performance Level



Existing Anchorage Conditions

Anchorage Condition	Technical Description	Practical Description
Anchorage Condition 1	Anchorage exists and adequate records showing the electrical cabinet anchorage meets the demands from the design earthquake using the analytical procedure of ASCE 41 Section 13.4.3.	Cabinet is anchored. Anchorage has been designed by an engineer and adequate records of design and installation are available.
Anchorage Condition 2	Anchorage exists and meets the prescriptive evaluation requirements of ASCE 41-17 Section 13.4.2.	Cabinet is anchored. Anchorage appears to be acceptable based on visual observation by an engineer.
Anchorage Condition 3	Anchorage exists and does not meet the prescriptive evaluation requirements of ASCE 41-17 Section 13.4.2.	Cabinet is anchored. Anchorage does not appear to be acceptable based on visual observation by an engineer.
Anchorage Condition 4	No existing anchorage.	Cabinet is not anchored.



OKAY

???

NOT ACCEPTABLE

Anchorage Installation Instructions

HILTI

HIT-HY 200-A
HIT-HY 200-R

Indicaciones de uso
Mode d'emploi
Manual de instrucciones
Istruzioni di utilizzo

Warning

(A, B) (C)

Evitar el contacto con los ojos (A, B) (C)
Evitar el contacto con la piel (B)
Evitar el contacto con la ropa (B)
Evitar el contacto con el agua (B)
Evitar el contacto con el suelo (B)

ICC ESR
ICC ESR 3187
ICC ESR 3963

1 Dry base material Water saturated base material Waterfilled hole in concrete

2 HIT-Z HIT-Z-R Treaded rod Treaded sleeve Rebar

3 Uncoated concrete Coated concrete Good (R4) Old (R1) Narrow chiseling Hollow drill bit Diamond cutting

4 Temperature of base material cartridge temperature Working time Curing time

3

HIT-V HAS
HAS-N
HAS-R
Rebar

1 1/2" - 1 1/4" 2 1/4" - 30 1/4"
12...32 mm 60...1000 mm

4

HIT-V HAS
HAS-N
HAS-R
Rebar

1 1/2" - 1 1/4" 2 1/4" - 75 1/4"
10...40 mm 60...1920 mm

A

HIT-Z HIT-Z-R

2 1/2" - 3 1/2" 60...220 mm HIT-RE-M

B

HIT-Z HIT-Z-R

2 1/2" - 3 1/2" 60...220 mm HIT-RE-M

Product Information

- Always keep these instructions together with the product even when given to other persons.
- Read Safety Data Sheet** (view the MSDS) before use.
- Check application site**: See imprint on full pack manual (see below). Do not use expired product.
- Full pack temperature during usage**: 1 °C to 40 °C / 32 °F to 104 °F.
- Base material temperature at time of installation**: HIT: between 5 °C and 40 °C / 41 °F and 104 °F; HIT-Z: between 10 °C and 40 °C / 50 °F and 104 °F.
- Conditions for transport and storage**: Keep in a cool, dry and dark place between 5 °C and 25 °C / 41 °F and 77 °F.
- For any application not covered by this document / beyond values specified, please contact Hilti.
- Partly used full packs must remain in the cassette** and have to be used within **4 weeks**. Leave the mixer adhesive on the full pack manifold and store within the cassette under the recommended storage conditions. If unused, attach a new mixer and discard the initial quantity of adhesive.

NOTE

A The surface of the HIT-Z anchor rod must not be altered in any way.

B Improper handling may cause mortar splatter.

- Always wear safety glasses, gloves and protective clothes during installation.
- Never shut dispensing without a mixer properly connected on.
- Attach a new mixer prior to dispensing a new full pack (ensure wrap fit).
- Use only the type of mixer (HIT-RE-M) supplied with the adhesive. Do not modify the mixer in any way.
- Never use damaged full packs and/or damaged or unclean full pack holders (cassettes).

C Full pack return / potential failure or leaking points due to inadequate handling.

- The backflow must be free of debris, dust, water, oil, grease and other contaminants prior to adhesive injection.
- For opening the backflow – blow out with oil free air until return air stream is free of incompressible dust.
- For flushing the backflow – flush with water (no pressure) until water runs clear.
- For breaking the backflow – only use specified wire brush. The brush must avoid insertion into the backflow – if not the brush is too small and must be replaced.

D Ensure that backflow are fixed from the back of the backflow without turning air vents.

- If necessary use the accessories / reference to reach the back of the backflow.
- For overhead applications use the overhead accessories HIT-AC and take special care when mounting the holding element. Excess adhesive may be forced out of the backflow. Make sure that no mortar drips onto the installer.

E Not adhering to these setting instructions can result in failure of fastening point!

HIT-HY 200-A / -R

Adhesive anchoring system for rebar and anchor fastenings in concrete and masonry.

Substrate: 1.6 (stone/porphyry/brick) (A), 1.4 (stone/brick/concrete) (B), 1.3 (stone/brick/concrete) (C)

Warning

(A, B) (C)

H017 Do not get in eyes, on skin or on clothing.
H019 May cause an allergic skin reaction (A, B)
H400 Causes serious aquatic toxicity (C)

P202 Do not get in eyes, on skin or on clothing.
P203 If on skin: Wash with plenty of soap and water.
P273 P303+P361+P533 If in (cont.): Remove contaminated clothing and shoes. Rinse thoroughly. Remove contact lenses, if present and easy to do. Continue rinsing.
P305+P351+P338 If in (cont.): Rinse eyes thoroughly with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 P313 If skin irritation or rash occurs: Get medical advice/attention.
P321 P337+P313 If eye irritation persists: Get medical advice/attention.

Storage considerations

Empty packs:

- Leave the mixer attached and dispose of via the local Green Dec recovery system.
- or ESR waste material code: 190102 plastic packaging

Full or partly emptied packs:

- Must be disposed of in a special waste in accordance with official regulations.
- EJAK waste material code: 05 04 00* waste adhesives and sealants containing organic solvents or other dangerous substances.
- or ESR waste material code: 05 02 27* paint, ink, adhesives and resin containing dangerous substances.

Content: 300 ml / 11.1 fl.oz. 500 ml / 16.9 fl.oz. **Weight:** 500 g / 20.0 oz. 800 g / 28.4 oz.

Failure to observe these installation instructions, use of non-Hilti anchors, poor or questionable base material conditions, or unique applications may affect the reliability or performance of the fastening.

HIT-HY 200-A									
		HIT-V HAS			HIS-N			HIT-Z	
		Factor			Factor			Factor	
°C	°F	C	D	E	C	D	E	C	D
-10...-5	14...23	1.5 h	7 h	—	—	—	—	—	—
-4...0	24...32	50 min	4 h	—	—	—	—	—	—
1...5	33...41	25 min	2 h	—	—	—	—	—	—
6...10	42...50	15 min	75 min	18 min	75 min	—	—	—	—
11...20	51...68	7 min	45 min	7 min	45 min	—	—	—	—
21...30	69...86	4 min	30 min	4 min	30 min	—	—	—	—
31...40	87...104	3 min	30 min	3 min	30 min	—	—	—	—

HIT-HY 200-R									
		HIT-V HAS			HIS-N			HIT-Z	
		Rebar			Rebar			Rebar	
°C	°F	C	D	E	C	D	E	C	D
-10...-5	14...23	3 h	25 h	—	—	—	—	—	—
-4...0	24...32	2 h	8 h	—	—	—	—	—	—
1...5	33...41	1 h	4 h	—	—	—	—	—	—
6...10	42...50	40 min	2.5 h	40 min	2.5 h	—	—	—	—
11...20	51...68	15 min	1.5 h	15 min	1.5 h	—	—	—	—
21...30	69...86	9 min	1 h	9 min	1 h	—	—	—	—
31...40	87...104	5 min	1 h	5 min	1 h	—	—	—	—

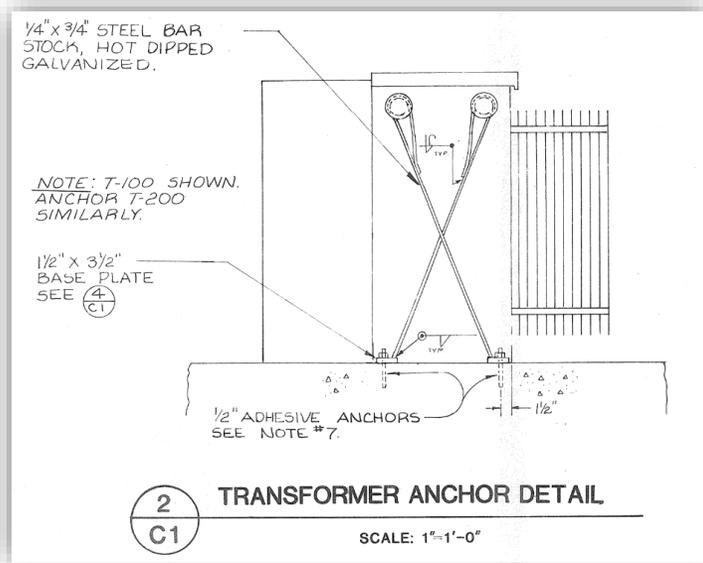
FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII)

Project Design Phase

Review of As-Built drawings

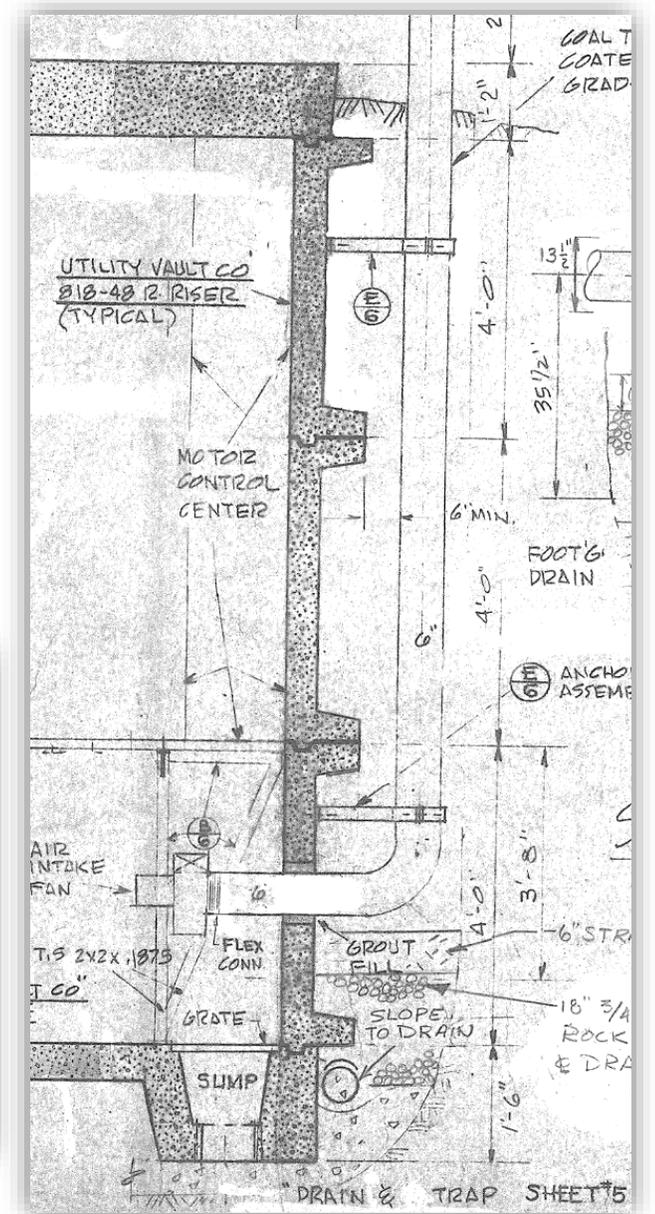


CITY OF PORTLAND, OREGON
BUREAU OF WATER WORKS

FLOOR PLAN & SECTIONS
CAROLINA PUMP STATION

DATE: 1-9-12
BY: [Signature]
CHECKED BY: J.S.

1-9-12



Field Investigations

- PWB engineer
- PWB electrical
- Stantec engineer
- Stantec note taker

We Looked on top for anchors



We looked to the side



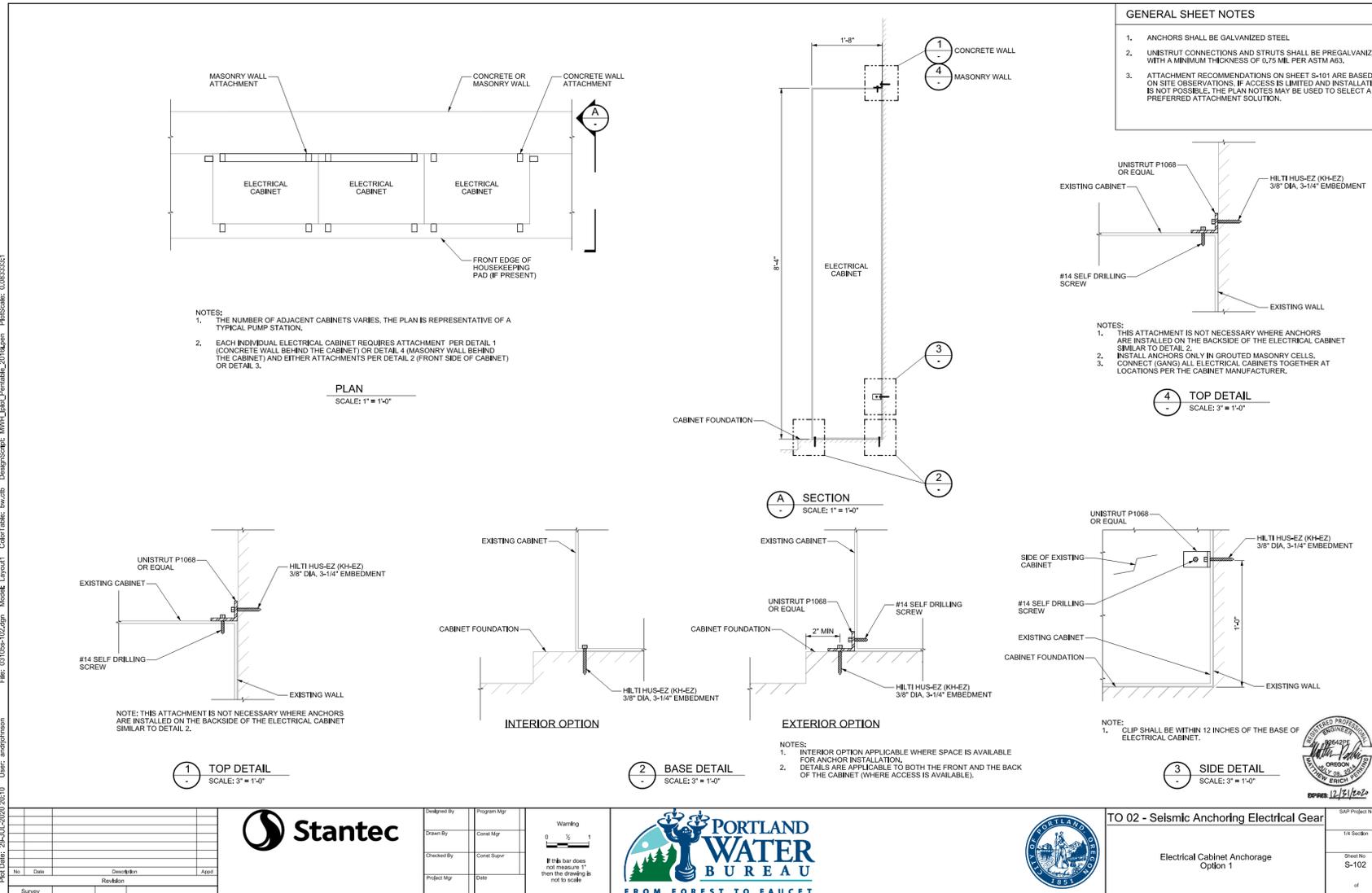
We looked below for anchors



Design Recommendations

Pump Station	Address	Description	Height (in)	Depth (in)	Width (in)	Anchors Present	Field Notes	NEHRP Site Class, see note below	S _{XS}	Anchorage Condition	PWB Priority	Recommended Attachment Improvements
Calvary		1 (left to right)	91	20	24	none	3" pad available in front of MCCs	E	0.94	4	1	1, 2 (front)
Calvary		2 (left to right)	91	20	20	none	3" pad available in front of MCCs	E	0.94	4	1	1, 2 (front)
Calvary		3 (left to right)	91	20	20	none	3" pad available in front of MCCs	E	0.94	4	1	1, 2 (front)
Calvary		4 (left to right)	91	20	20	none	3" pad available in front of MCCs	E	0.94	4	1	1, 2 (front)
Calvary		5 (left to right)	91	20	24	(4) 1/4"	Wall Mounted	E	0.94	2	1	None

Anchoring Options



Plot Date: 28-Jul-2020 20:10 User: andjpmason File: 031026-102.dgn Model: Layout1 Cabinet: hws:db Design: Seldis: MW: JPL: JPL: 2018.rvt Plot Scale: 0.0833331

Next Steps: Implementation

Implementation Plan

- PWB plans to install during annual PM
- Work is planned to start soon



What else could we have considered?

- Electrical conduits
- Pumps
- Motors
- Piping



Questions?