PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

PNWS-AWWA 2022 Section Conference

Seismic Resilience without Breaking the Bank

April 29, 2022

Speaker Introductions

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Matt Perkins, Stantec

Agenda

Introduction

PWB Pump Station History

Seismic Design Criteria

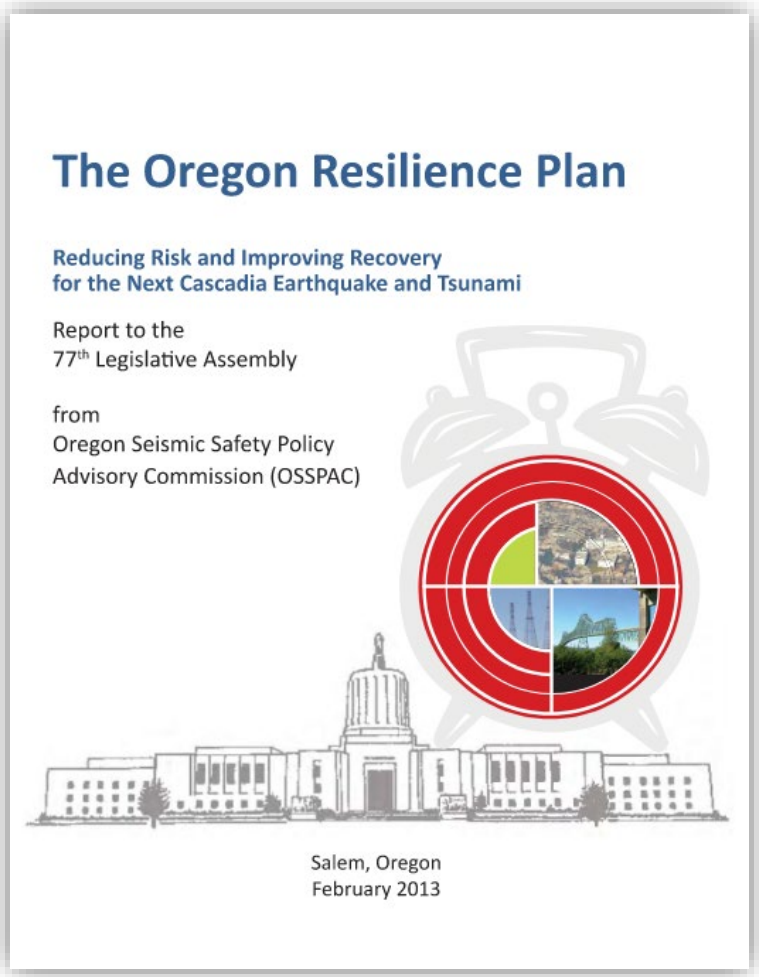
Project Design Phase

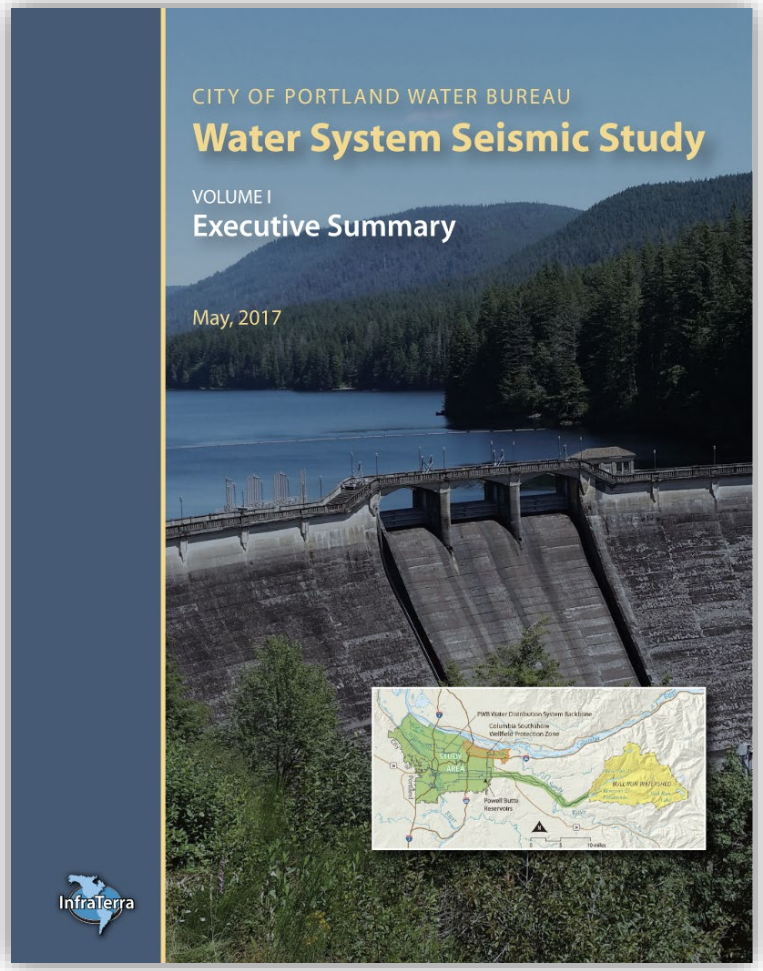
Next Steps: Implementation

Q&A

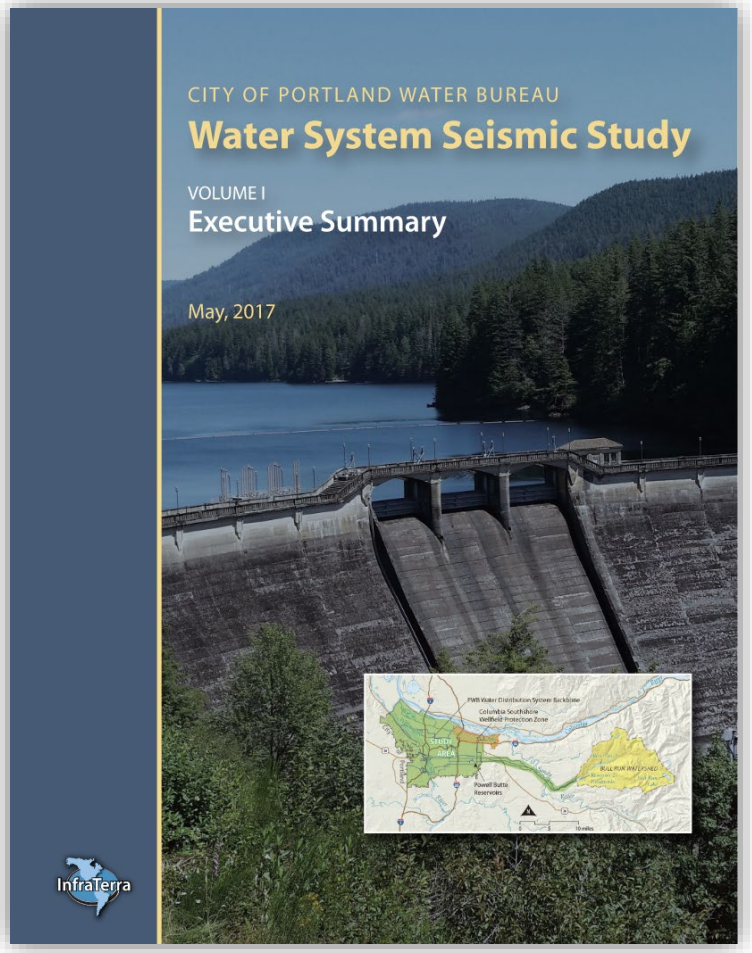
Introduction

Problem Identification





Problem Identification

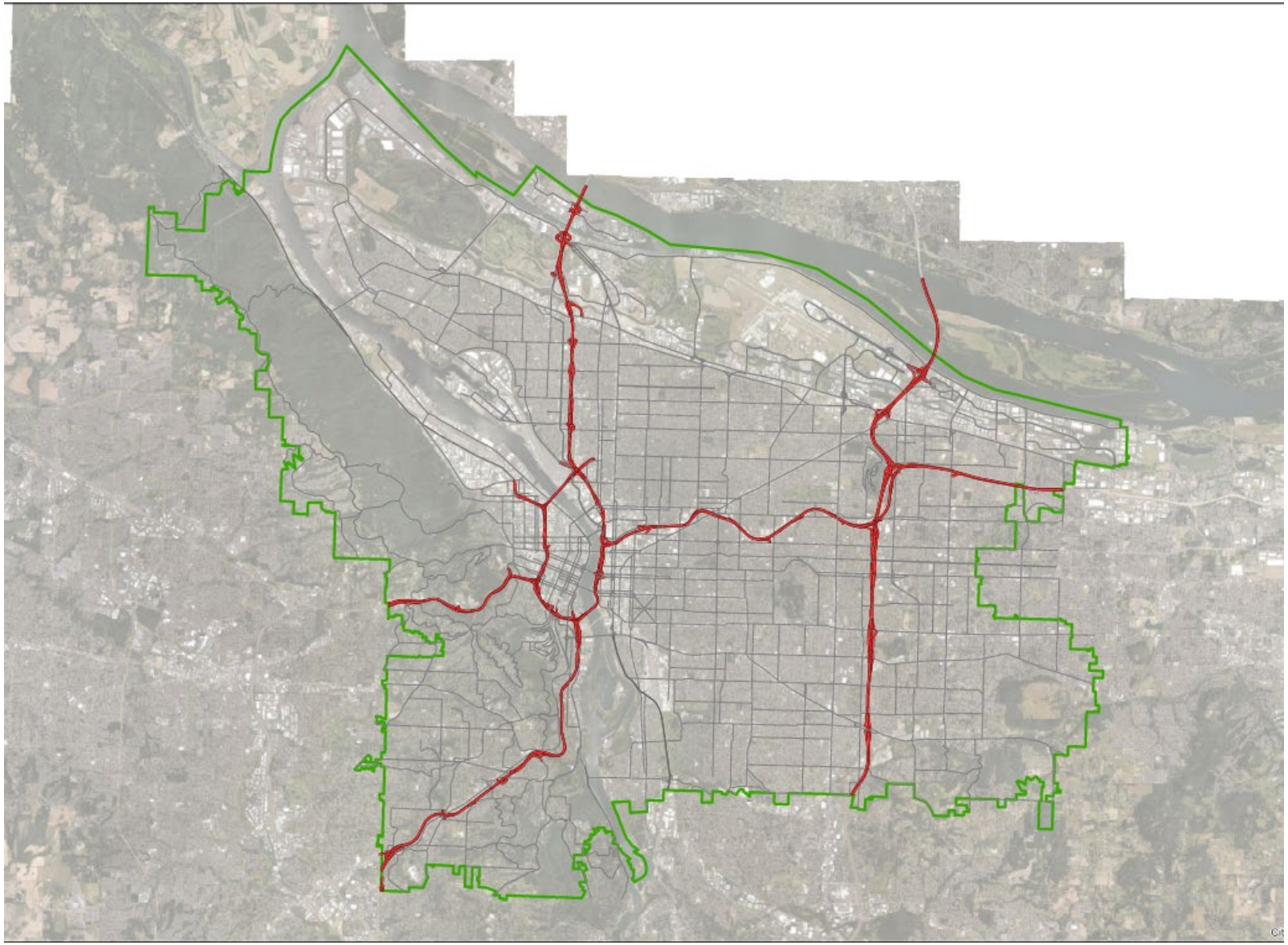


Non-CIP Projects	Develop a program to anchor and restrain all electrical and communication equipment	TBD	High	Equipment damage is most common in an earthquake, and easiest to prevent with a pro-active anchorage program.

Pump Station History

PWB Pump Stations

- 36 Active Pump Stations throughout the distribution system



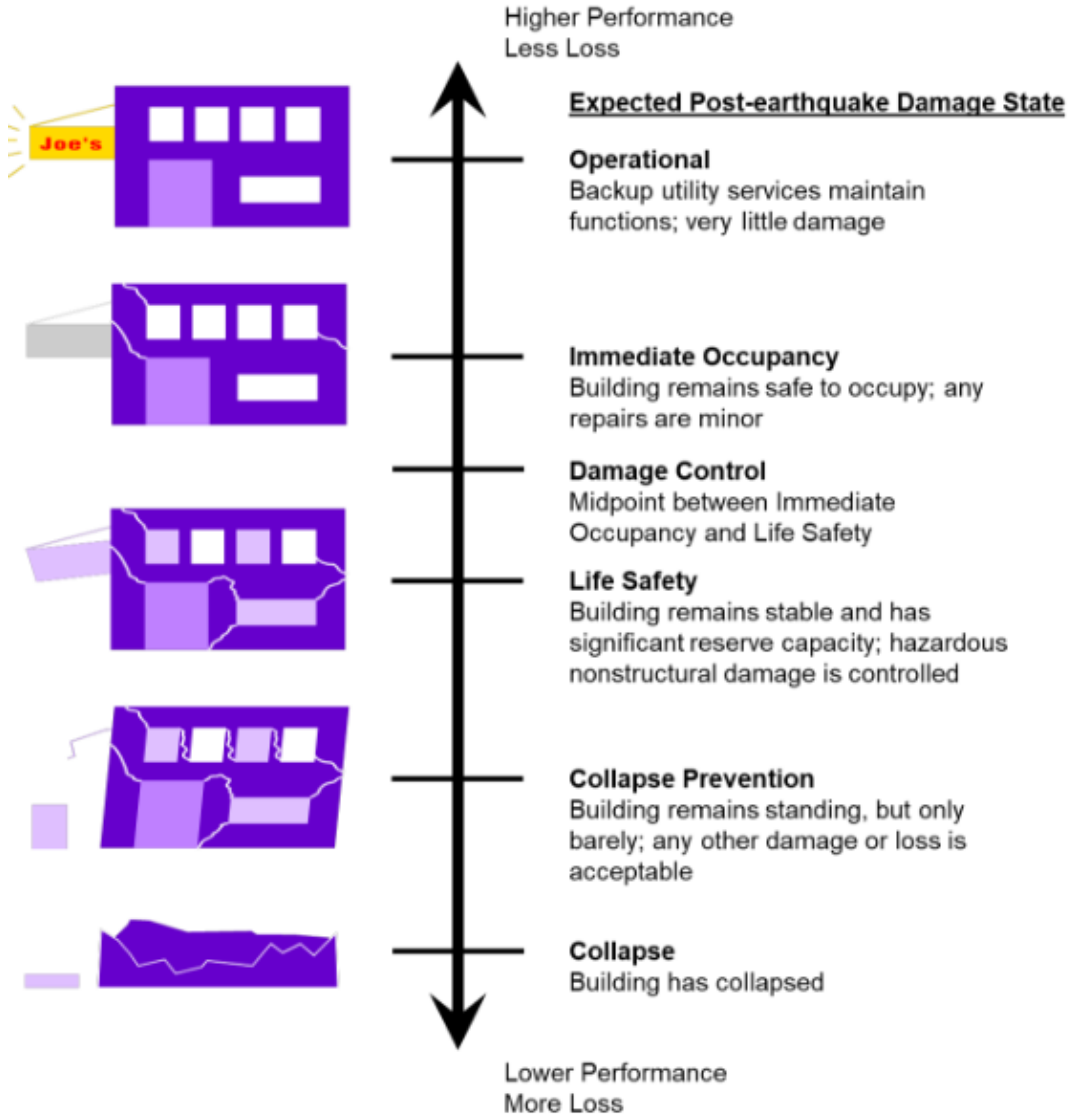
PWB Pump Station History

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

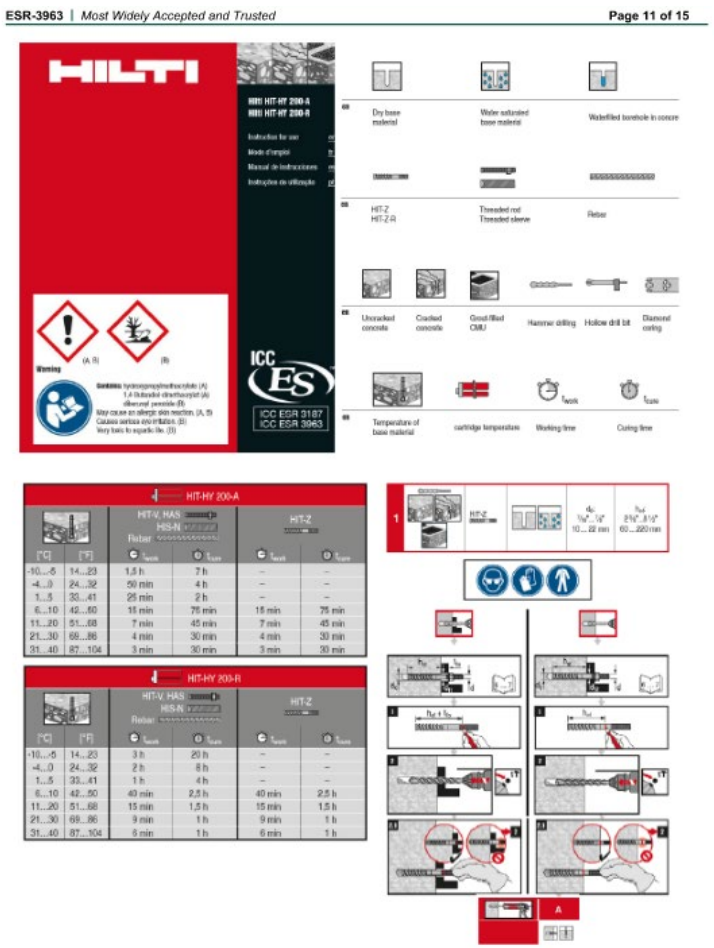


FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII)

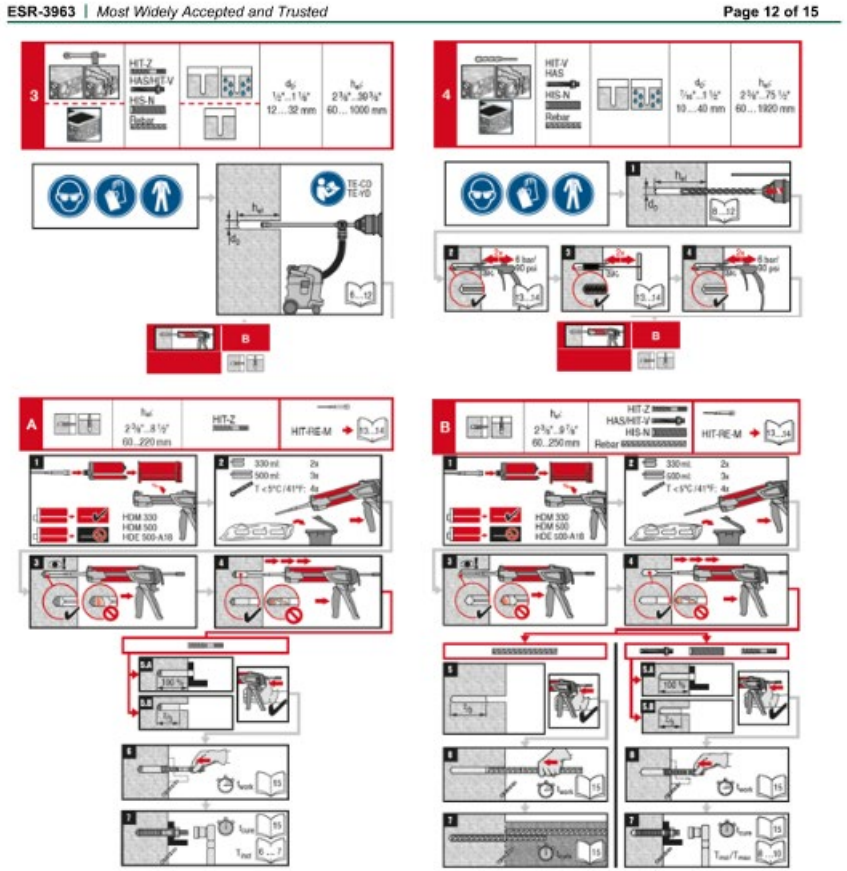


FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

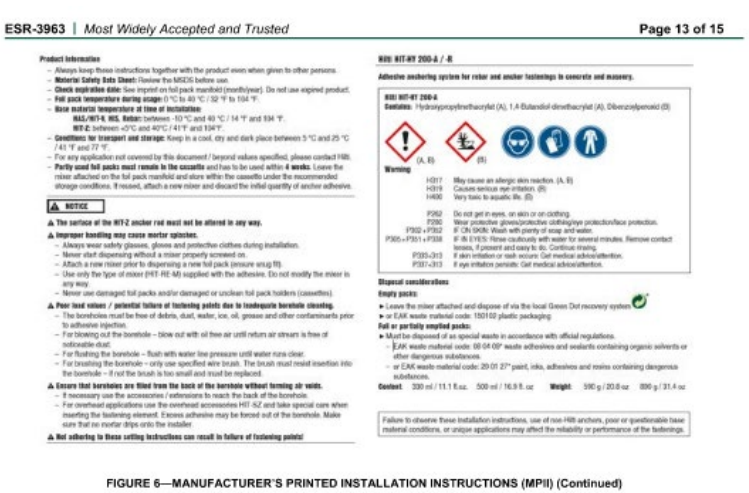
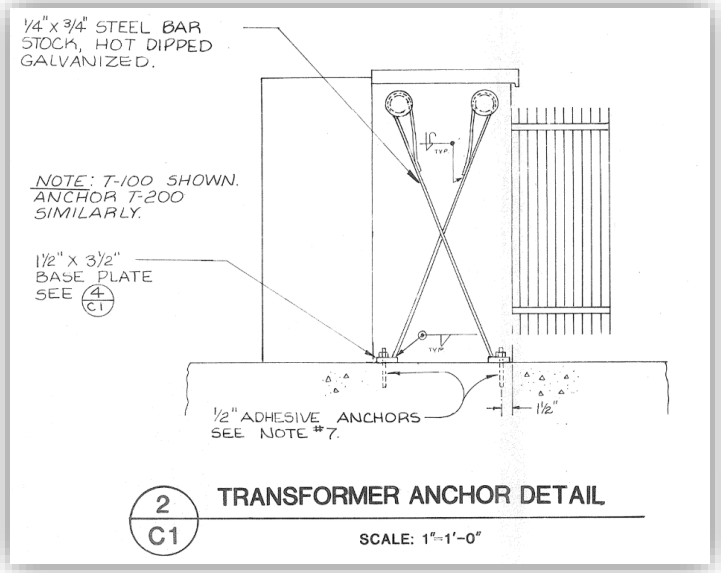
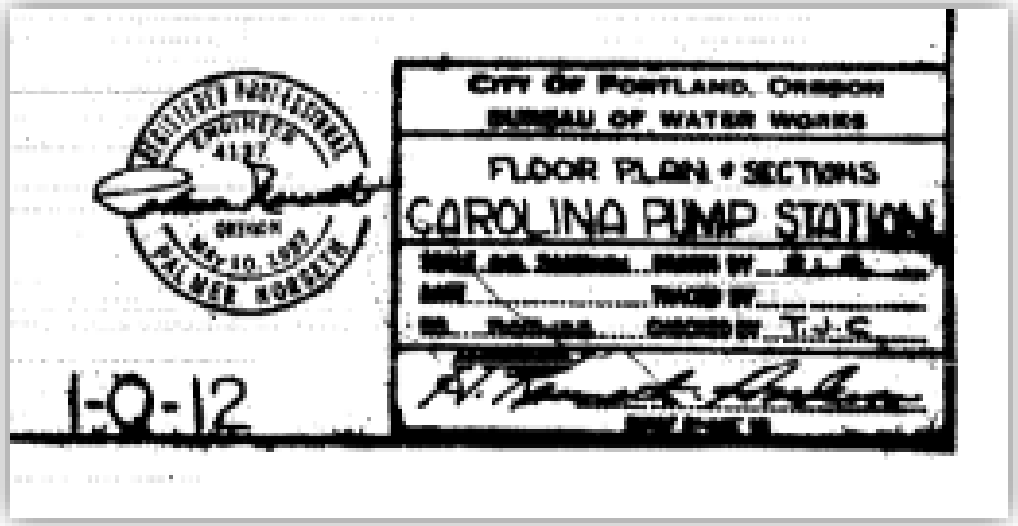


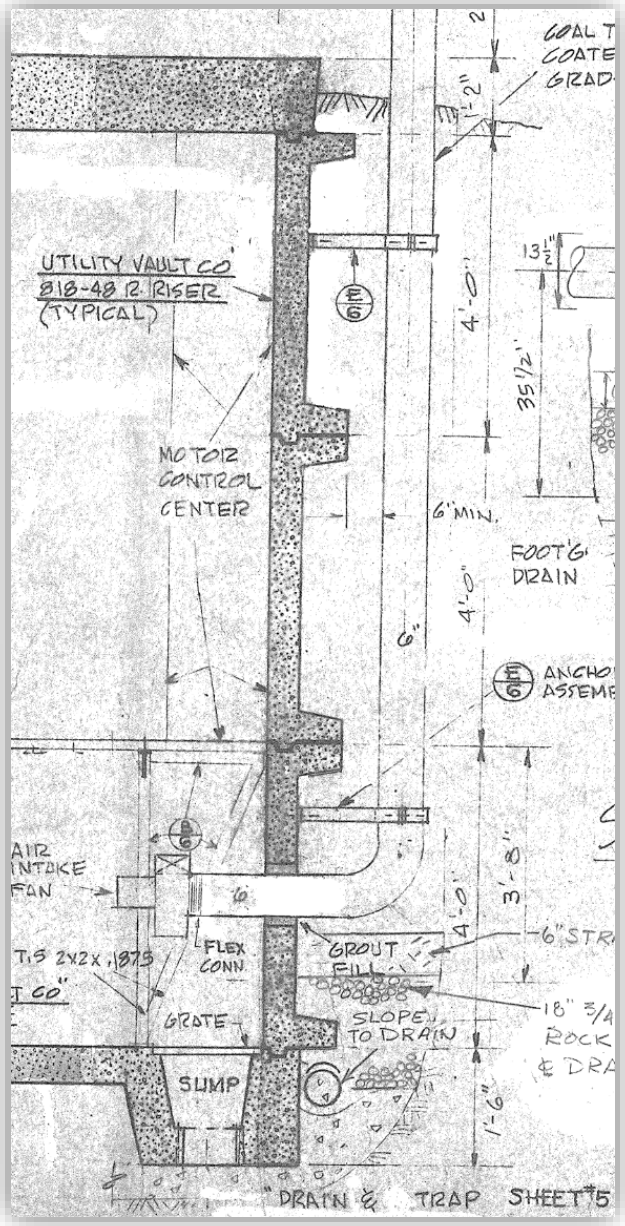
FIGURE 6—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (Continued)

Project Design Phase

Review of As-Built drawings



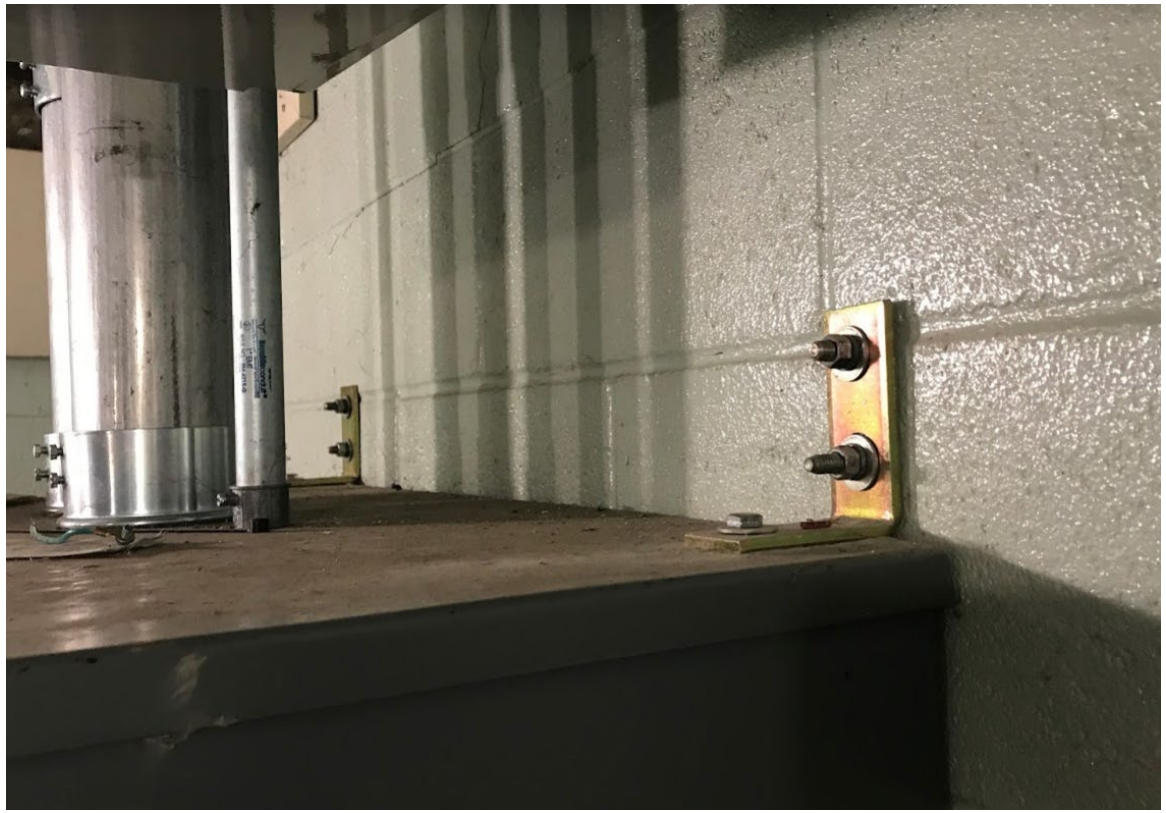




Field Investigations

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

We Looked on top for anchors



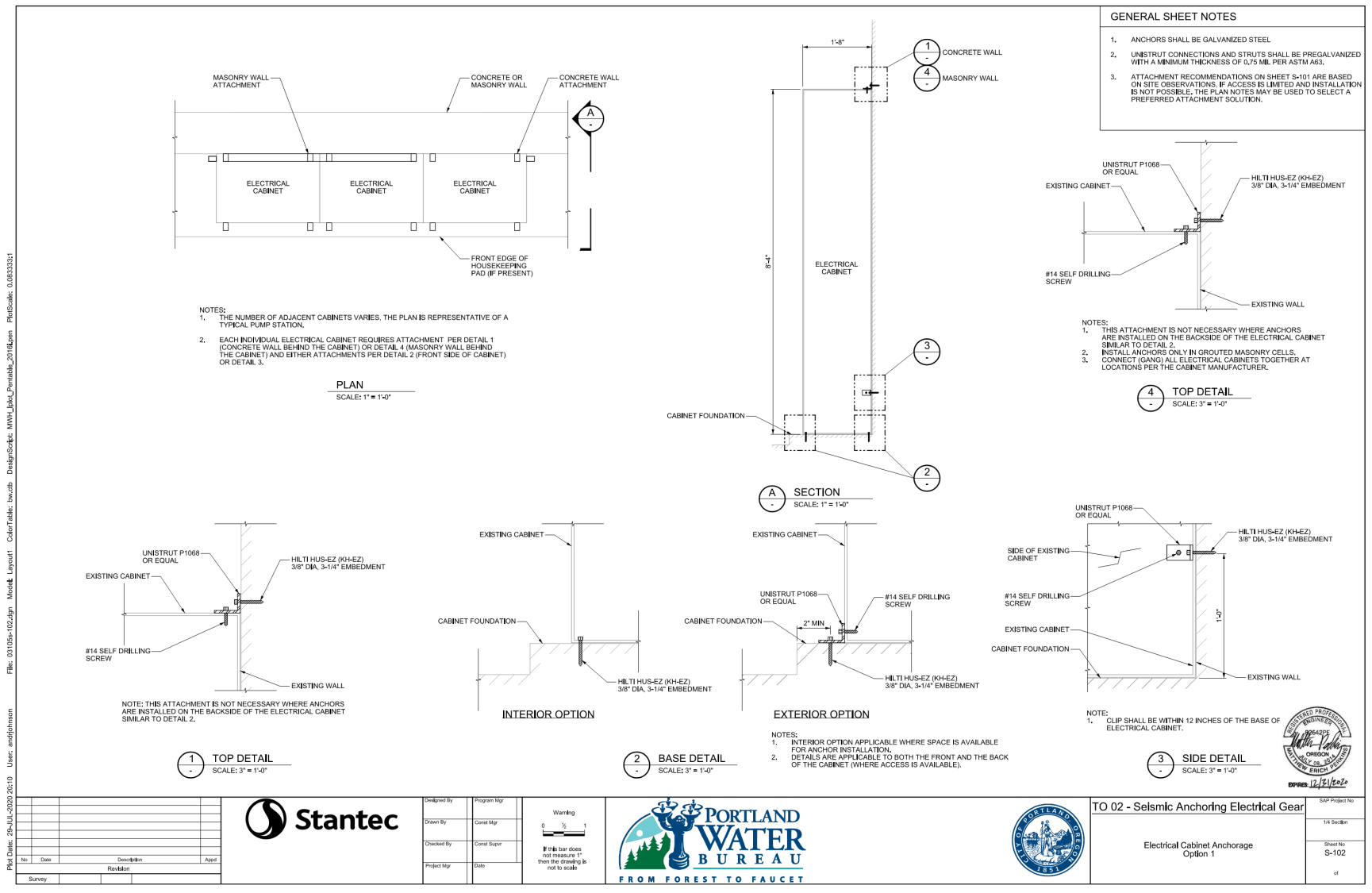
We looked to the side

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



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?