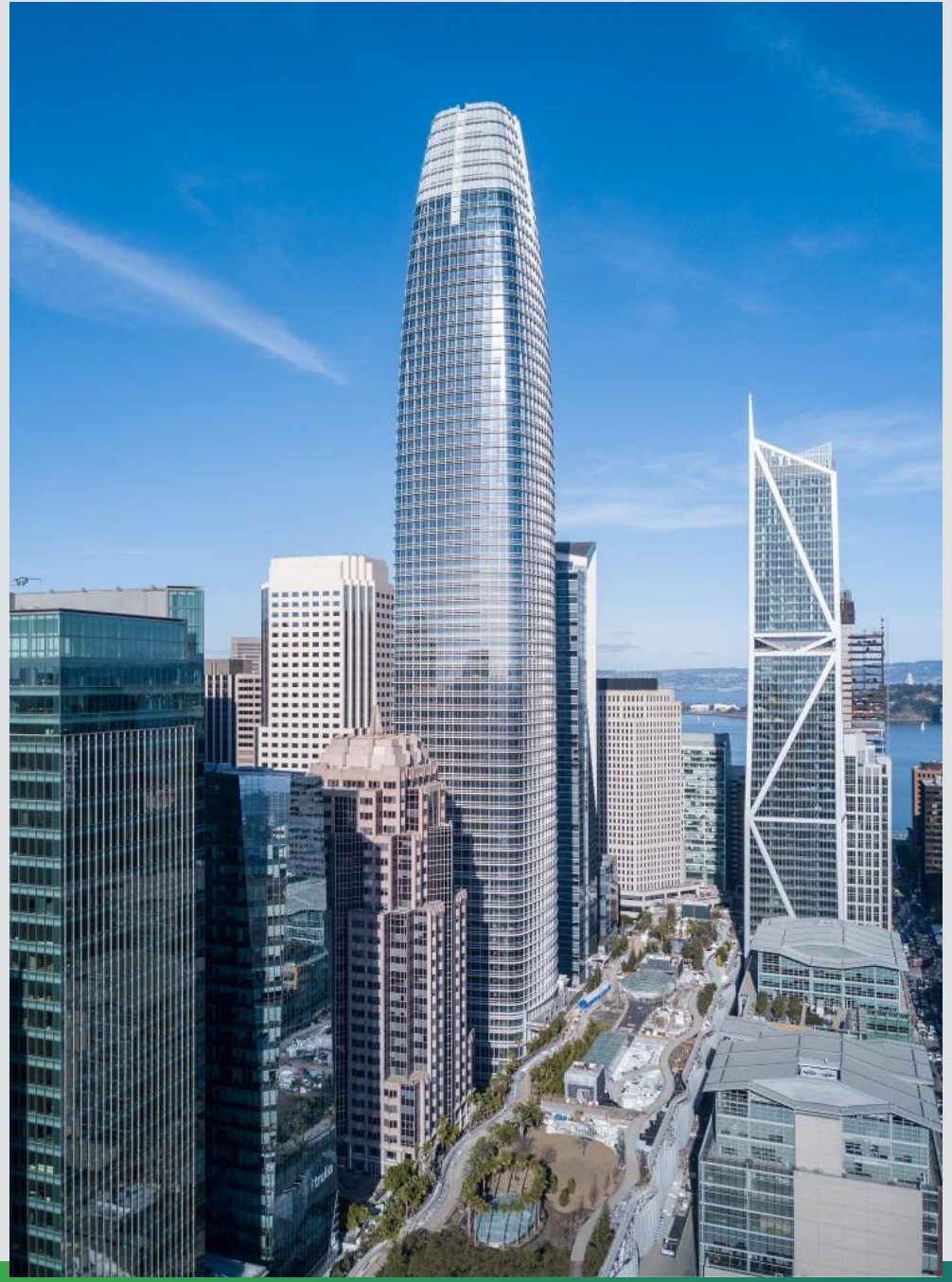

Source: USGlass Magazine

Salesforce Tower Pressure Differential Cross-Connection Shutdown Test for a Dual-Plumbed System

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Salesforce Tower

- Located at 415 Mission Street, San Francisco
- 1,079-foot office skyscraper
- 1,600,000 square feet of commercial/office space
- 63 floors and three parking levels
- Current water use:
  - Potable water
  - Non-Potable: Rainwater and make-up recycled water for irrigation, cooling tower make-up water supply, and toilets/urinals

Blackwater Recycling System

- Aquacell membrane bioreactor system located in the P2 and P3 parking levels
- Will treat wastewater collected from sources such as hand basins, toilets/urinals, office kitchens and dishwashers, etc.
- Produces up to 30,000 gallons per day of tertiary treated recycled water
- RW will be blended, via an air gap, to the non-potable water system at the existing non-potable water storage tank

Cross-Connection Shutdown Test

- Last cross-connection test was conducted in 2018 when construction was completed (no tenants)
- Test was performed by the San Francisco Building Inspection Department following the San Francisco Public Utilities Commission (SFPUC) Manual for Cross-Connection Control (Manual) – Plumbing Test (Visual Test)
- 1,300 or more potable water fixtures were operated to confirm visually the presence / absence of flow
- New Cross-Connection Shutdown Test is required. Alternative to the visual test is needed for logistical reasons - Access to suites is limited, cost (resources needed), and duration of the visual test.

Cross-Connection Shutdown Test

- West Yost was hired by Salesforce to prepare a pressure differential shutdown test protocol and to conduct the actual pressure differential cross-connection test
- Held several calls with San Francisco Department of Public Health (SFDPH) and San Francisco Public Utilities Commission (SFPUC) to discuss options
- The protocol was submitted to the SFDPH and SFPUC for review and approval
- Protocol proposed modifications to the SFPUC Manual Section 9.3.3 Dynamic Pressure Differential Test as follows:
  - Duration of the test
  - Pressure differential methodology
  - Testing approach

Cross-Connection Shutdown Test Visual Test

- Requires entering the buildings for observation of all potable water fixtures
- Challenging and time consuming
- Requires identifying and locating every fixture
- More subject to error as may miss some fixtures
- Fixtures that are inadvertently left on after test can lead to water damage
- Some areas of buildings may be difficult to access for security/privacy reasons
- Covid creates additional hurdles and concerns when large groups of unknown people must enter a building to operate and observe all plumbing fixtures

Cross-Connection Shutdown Test Pressure Test

- Pressure gauges installed outside at backflow preventer fittings and RW system
- Typically, 2-4 hours shutdown test of each system
- Provides written pressure test record (instrument vs relying on visual observation of fixtures)
- Cost savings – Less staff involved
- Can be conducted night or weekends – Less staff involved
- Easier to do complex sites, such as tech campuses, hotels, commercial buildings, hospitals, etc.
- **Only test approved in Southern California by the DDW for all site types (parks, schools, medians, golf courses, etc.)**

Main Challenges

- Pressures on both systems are set to 420 psi (booster pumps)
- Height of the building prevents a typical pressure differential test (at POC) → no residual pressure in most of the building
- Testing at night to minimize impacts to tenants

Recycled Water Flow

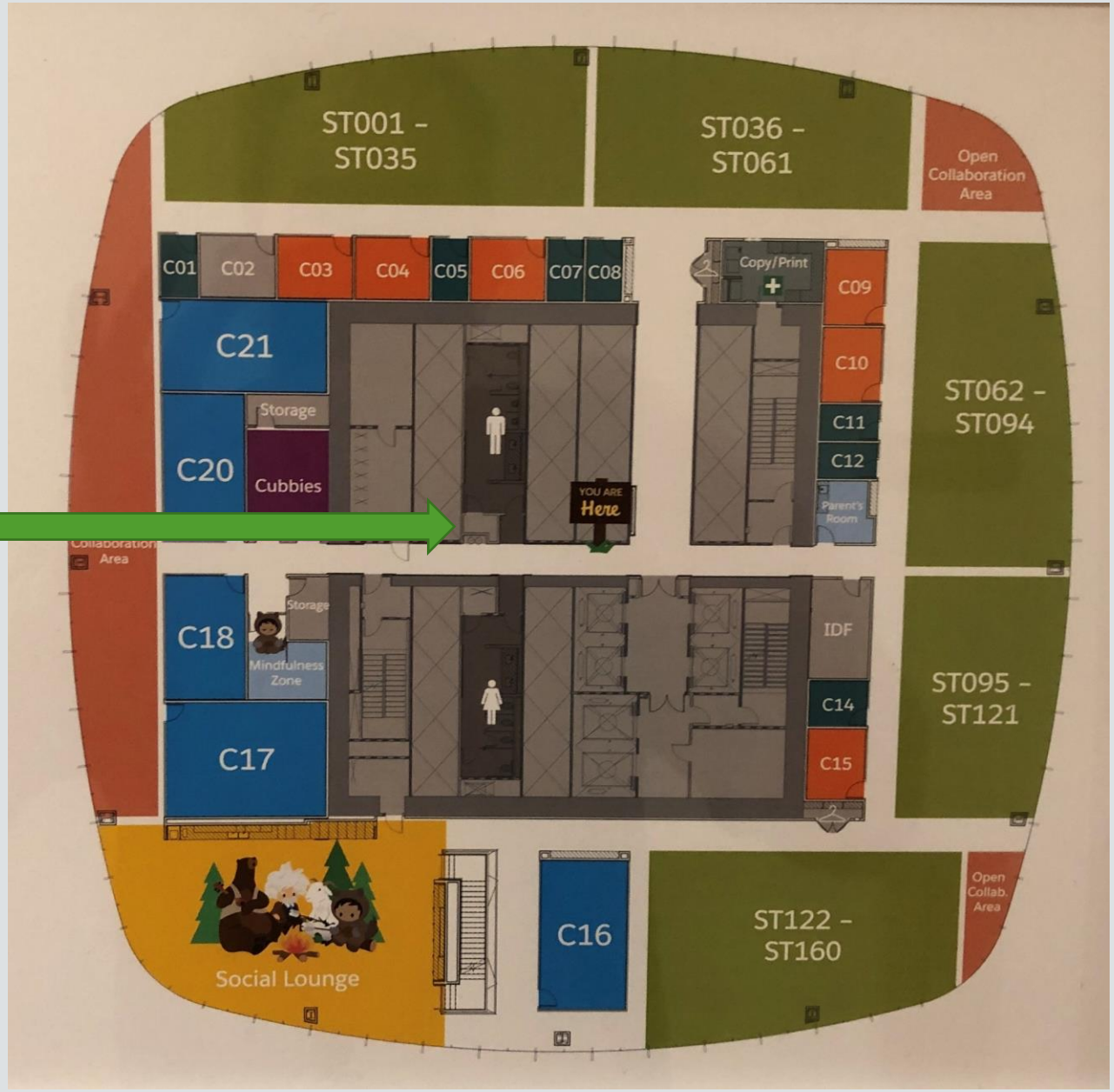
RW and Potable
Water Backflows

3,750 gallons RW Tank

Booster Pumps (3) and
RW mainline to the building

Water Fixtures

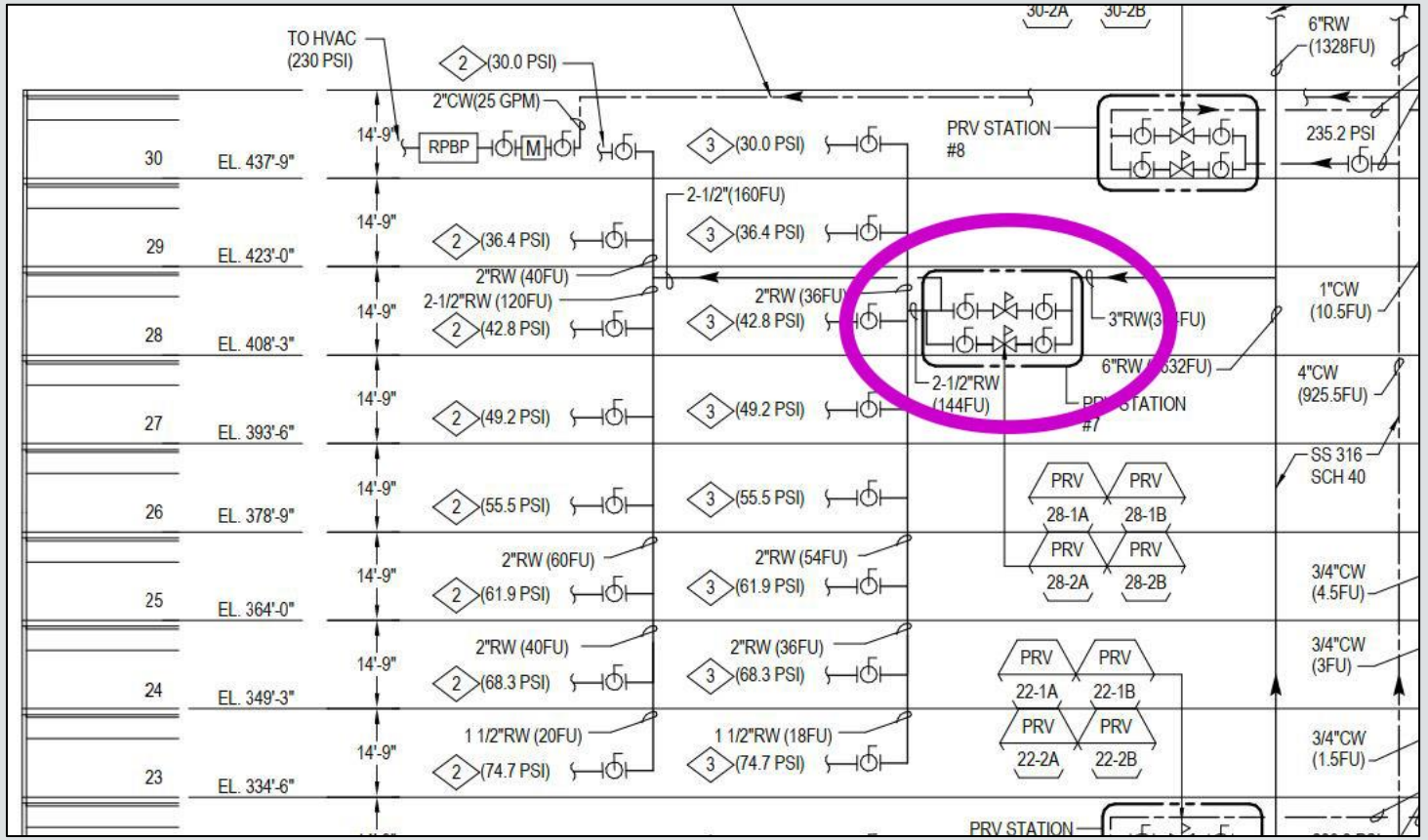
- Potable and recycled water piping systems are located in the men's restrooms (walls)
- Recycled water used only in bathrooms
- Potable water for the entire floor



Typical floor layout

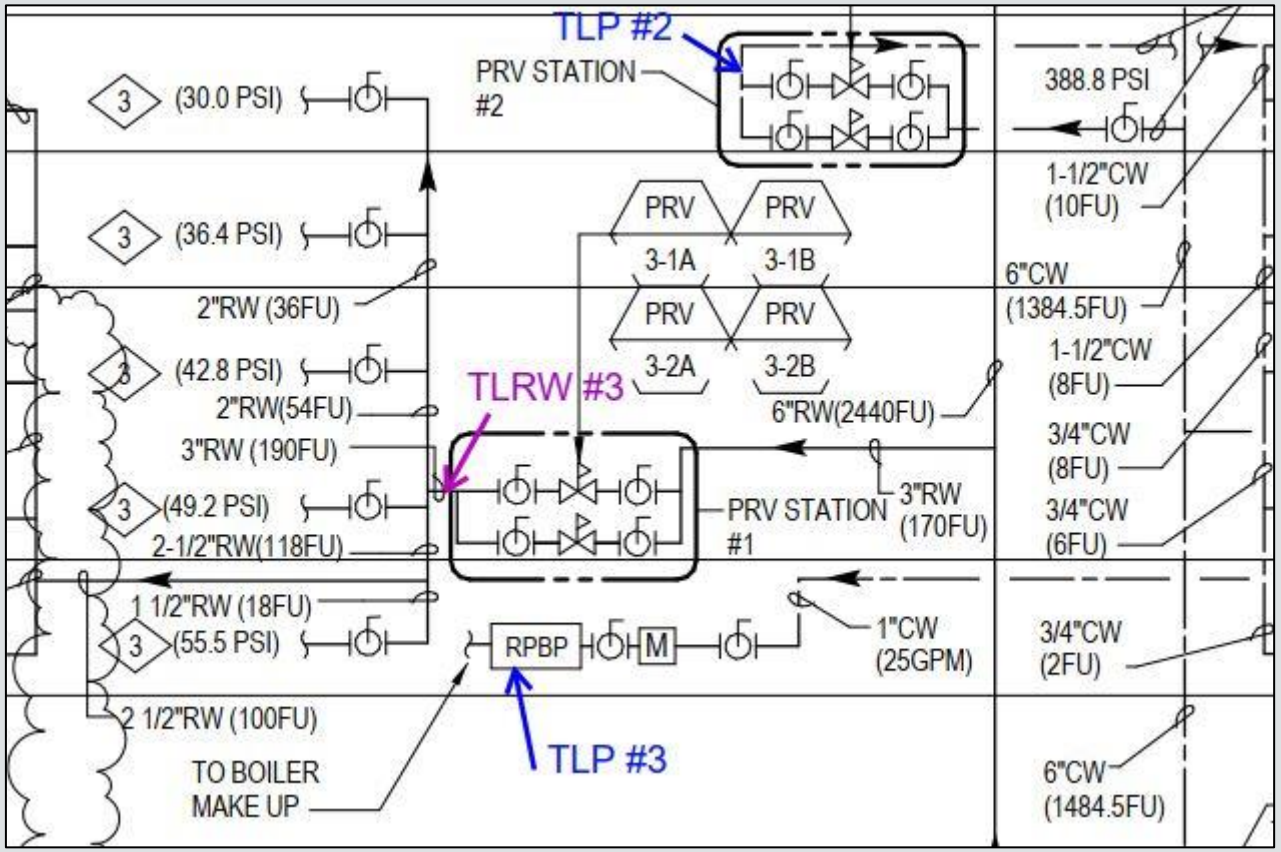
Facilities

- Pressure reducing valve serve / isolate 7 to 9 floors



Testing Protocol

- SFDPH requirement: Certified Cross-Connection Control Specialist
- Duration: 2-hour on both systems
- Approach:
  - Use digital pressure gauges
  - Typical pressure differential test for the irrigation system @backflow
  - Test building floors after the PRVs (Gauge fittings needed)
  - Change pressure settings of the PRVs
    - **System tested - lower**
    - **Other system - no changes**



Testing Protocol Approach

- Protocol lists all the test point locations in the building

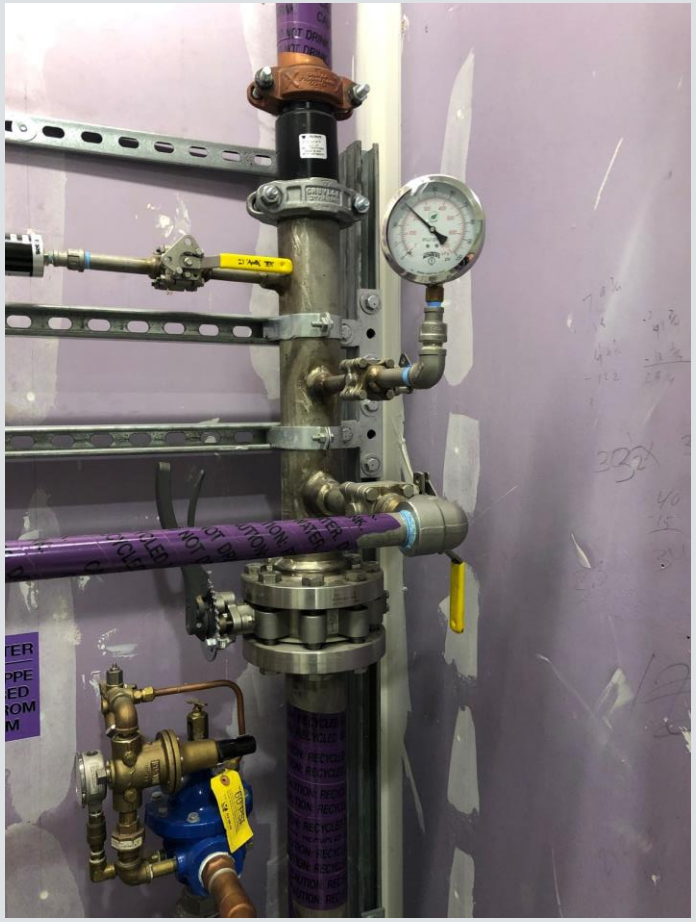


Table 5. Pressure Recorders Test Locations and Areas Tested

Test Location ID #	Pressure Recorder Location	Area Tested
Potable Water System		
TLP #1	#4 Test Cock of main RP #9367C room P1-86	Water facilities in parking structure and piping to the booster pump
TLP #2	After Station #2 PRV floor 6	Water facilities floors 2-6
TLP #3	#4 Test Cock of RP floor 2	Make-up water to Boiler fed from Station #2
TLP #4	After SOV Hot Water System floor 4	Hot water facilities floors 2-6
TLP #5	After Station #4 PRV floor 14	Water facilities floors 7-14

Testing Protocol Approach

- Testing Schedule and areas tested

Table 6. Proposed Schedule

Day	Potable Test Locations (TLP #)	Start Time	Recycled Water Test Locations (TLRW #)	Start Time	Areas Tested
Monday	1–8	6 PM	1–5	9 PM	• Potable fixtures and restroom in the parking structure • Recycled water irrigation at ground level • Piping to tank and booster pumps • Potable fixtures and restrooms floors 1–22
Tuesday	9–17	6 PM	6–8	9 PM	• Potable fixtures and restrooms floors 23–46
Wednesday	18–24	6 PM	9–13	9 PM	• Potable fixtures and restrooms floors 47–roof • Cooling tower

Pressure Gauges

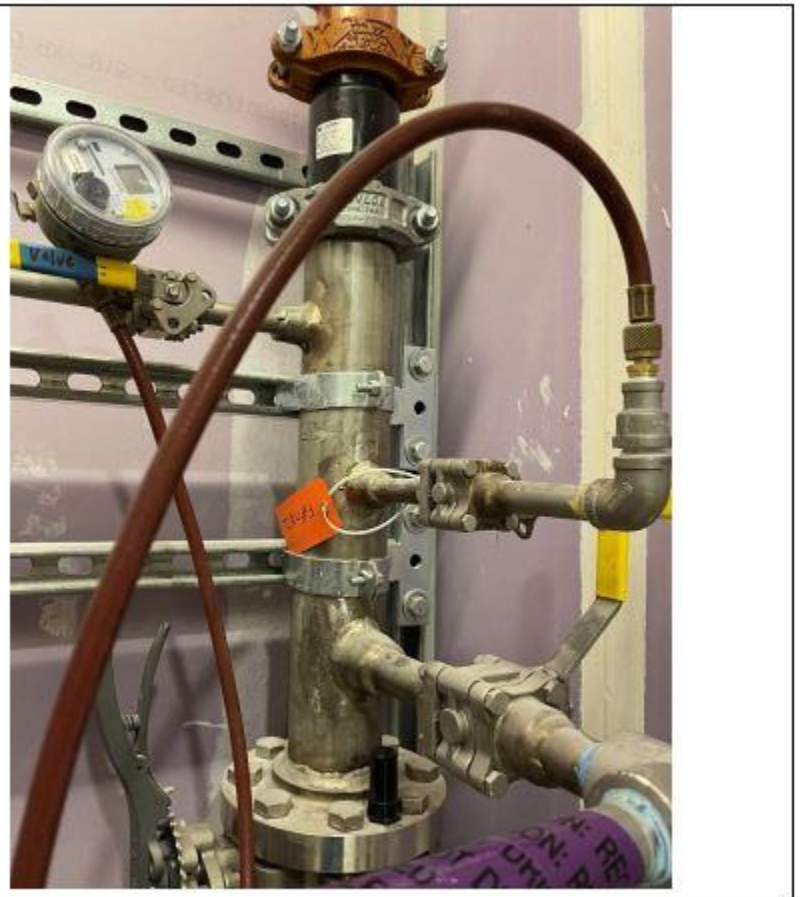


Photo 6
TLRW #3 recycled water PRV located on floor 3 (floors 1-7)

Photo 5
TLP #3 potable water PRV located on floor 6 (floors 1-7)

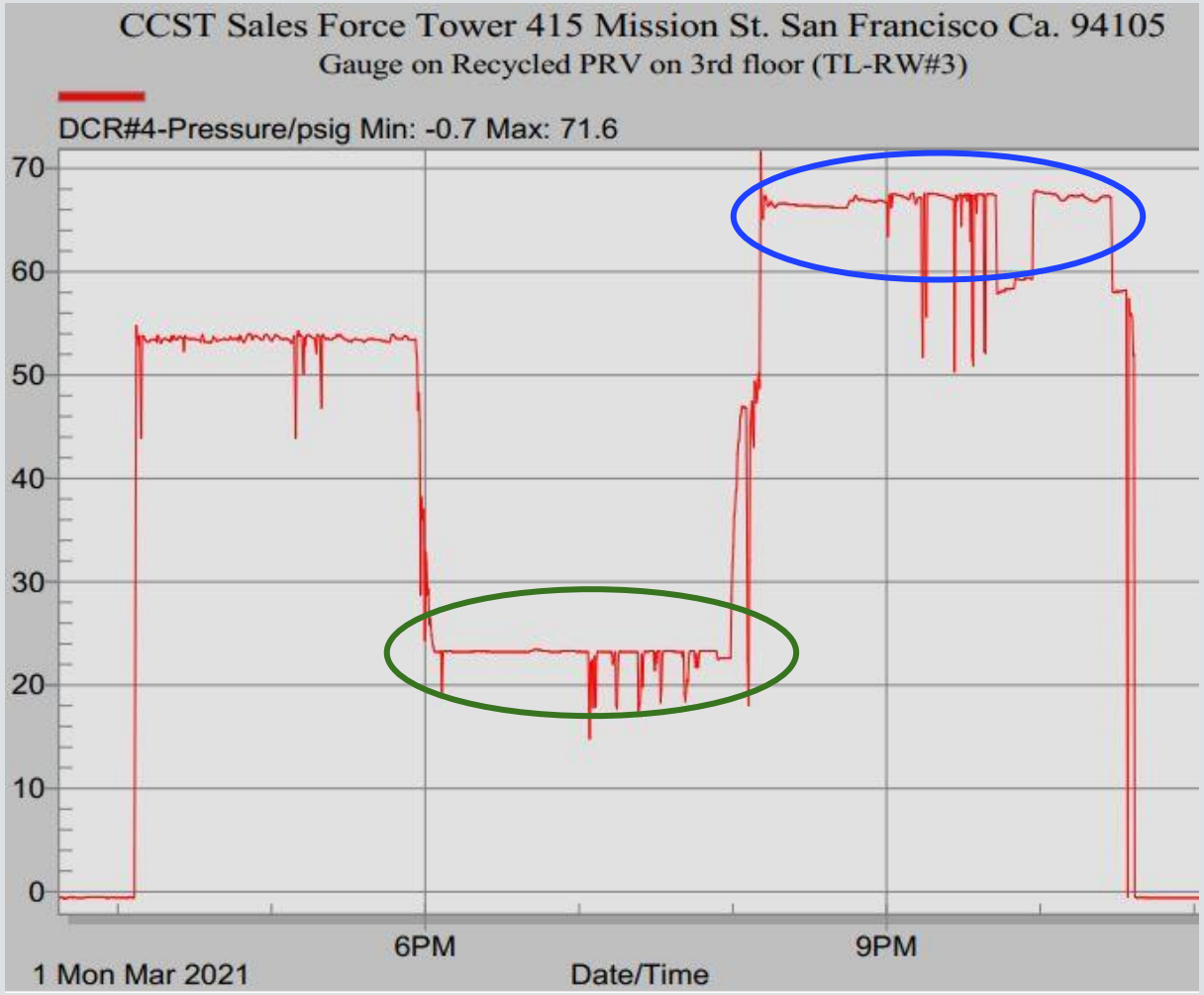
Test Results

Shutdown Test was conducted between March 1st - March 4th (Monday – Friday)

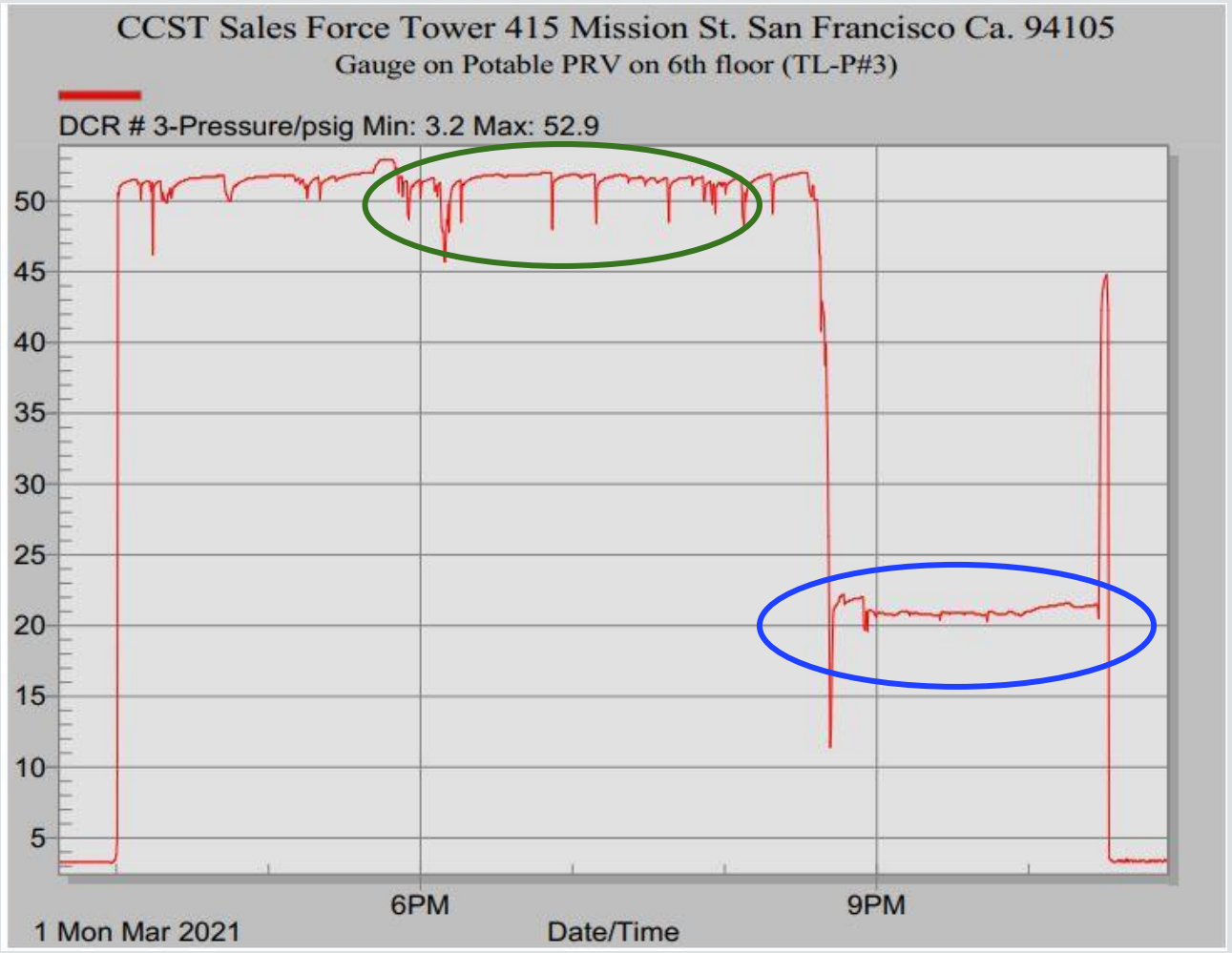
Test Point ID / Location	Initial Pressure, psi	Test Pressure, psi	Opposite System Pressure, psi	Result	Floors Tested
Potable System					
March 1, 2021					
TLP #1 / Ball valve fitting room P1-86	**64**	**8**	**68**	Pass	Parking Levels
March 1, 2021					
TLP #2 / hose bib near RP TC #1 in boiler room	79	48	54	Pass	1-7
TLP #3 / at PRV floor 6	54	22	54	Pass	1-7
TLP #4 / at PRV floor 14	49	26	45	Pass	8-14
March 2, 2021					
TLP #5 / at PRV floor 22	54	19	64	Pass	15-22
TLP #6 / at PRV floor 30	45	14	40	Pass	23-30
TLP #7 / Test done on 03/03					31-38
TLP #8 / TC #1 RP heat exchange room floor 35	61	40	60	Pass	31-38
TLP #9 / at PRV floor 37	43	25	60	Pass	31-38

Pressure Recorder Chart

Recycled Water

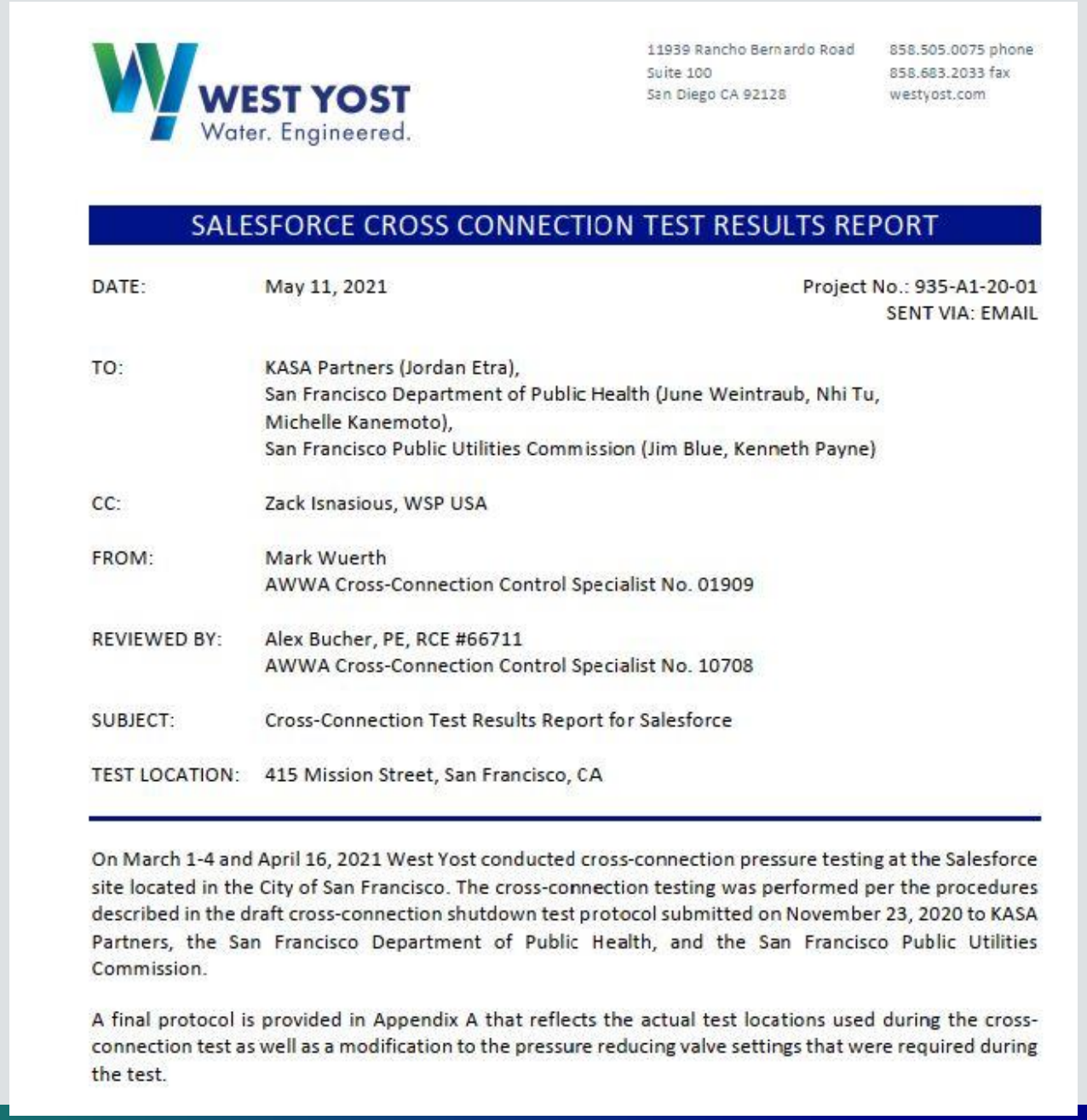


Potable Water



Test Results Report

- Submitted to SFDPH and SFPUC on May 11, 2021
- Contained:
  - test result charts and photos of each location
  - Summary tables
  - Updated protocol based on actual test locations and pressure differential requirements
- Shutdown test results successfully approved on June 28, 2021
- Next test – May 2025



WEST YOST Water. Engineered.

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San Diego CA 92128

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westyost.com

SALESFORCE CROSS CONNECTION TEST RESULTS REPORT

DATE: May 11, 2021

Project No.: 935-A1-20-01
SENT VIA: EMAIL

TO: KASA Partners (Jordan Etra),
San Francisco Department of Public Health (June Weintraub, Nhi Tu, Michelle Kanemoto),
San Francisco Public Utilities Commission (Jim Blue, Kenneth Payne)

CC: Zack Isnasious, WSP USA

FROM: Mark Wuerth
AWWA Cross-Connection Control Specialist No. 01909

REVIEWED BY: Alex Bucher, PE, RCE #66711
AWWA Cross-Connection Control Specialist No. 10708

SUBJECT: Cross-Connection Test Results Report for Salesforce

TEST LOCATION: 415 Mission Street, San Francisco, CA

On March 1-4 and April 16, 2021 West Yost conducted cross-connection pressure testing at the Salesforce site located in the City of San Francisco. The cross-connection testing was performed per the procedures described in the draft cross-connection shutdown test protocol submitted on November 23, 2020 to KASA Partners, the San Francisco Department of Public Health, and the San Francisco Public Utilities Commission.

A final protocol is provided in Appendix A that reflects the actual test locations used during the cross-connection test as well as a modification to the pressure reducing valve settings that were required during the test.

Questions?


IMPORTANT NOTICE
Salesforce Tower
Restricted Water Usage
March 1st to 3rd
8pm-2am (each evening)
NO toilet, sink, faucet, etc, use during this time.
Tenant supplemental HVAC units will be unaffected.
bxp Boston Properties
Salesforce Tower
Please contact the Property Management Office at
salesforcetower@bxp.com for more information.
ELEVATOR PEAK TIMES