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## **ELEVATOR MODERNIZATION REPORT**

### **EXECUTIVE BUILDING (DAS WEST)**

155 Cottage Street NE  
Salem, OR 97301

### **TWO (2) HYDRAULIC PASSENGER ELEVATORS**

**2/12/2019**

#### **Prepared For**

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## **I. Executive Summary**

This report was commissioned to inspect and analyze 2 hydraulic elevators at Executive Building to determine the current condition and compliance with current code and safety requirements, and to identify and recommend options for an elevator modernization. During our on-site audit, we inspected each elevator component to determine whether it should be reused, refurbished, or replaced with new equipment with much improved technology as part of an elevator modernization.

### **Audit Findings**

The 2 elevators being audited were installed in 1979. They are both five stop, hydraulic passenger elevators. One car has a conventional “in-ground” jack and the adjacent car has a two-stage, telescoping jack. Both elevators are “dry” systems and have had no significant upgrades made to the controllers or power units since installation. The elevators share a common machine room. The machine room is large and will need to be brought up to current code requirements. During my audit time the elevators’ use was low-moderate. Both elevators have front and rear entrances that open at each landing. Elevators appear to be used mainly by building staff and are well protected from the environment (however there is water entering the pit along the bottom of the rear wall). The elevators have had some minor upgrades such as fixtures, ADA phones and electronic door safe edges added at some point in the past.

### **Elevator Safety and Code Compliance**

While the elevators comply with the code that was in effect at the time of installation, they do not comply with the 2010 ASME A17.1 Safety Code for Elevator and Escalators currently in effect in the State of Oregon.

While there are many code compliance issues with these elevators, there are several that pose **life safety issues**:

1. Do not comply with current code related to firefighter service.
  - A modernization would include the latest Firefighter’s Emergency Operation safety features.
2. Hall and car operating panel do not comply with latest codes.
  - The hall fixtures are at code height, but the car operating panel does not have a dedicated firefighter’s lockable panel. The main lobby hall fixtures do not have the required communications failure indicator.
3. The elevators comply with current ADA requirements. A detailed ADA compliance checklist can be found in Section VI.

### **Conclusions**

These elevators have surpassed the end of their designed useful life. U.S. Elevators are no longer supported, and most components of the controllers are obsolete. Modernization of the elevators

will improve safety, reliability and reduce the maintenance required on elevator control, valve, and pump units.

## Recommendations

It is our recommendation that these elevators are modernized as soon as possible. Several major components should be replaced with new equipment that complies with current safety requirements, will improve the elevators operation and reliability, reduce energy consumption, and improve quality of life enhancements. Modernization will offer performance improvements, and significantly reduce the maintenance required on equipment that has surpassed its useful life, allowing service personnel to spend more time on areas that require diligent maintenance, such as hoistway door equipment.

Although a modernization of the elevator system is a large investment, the advantages are many, including:

1. Building and Personal Safety Code Requirements
  - Fire safety
  - Seismic safety
  - Passenger protection
2. Operation and Performance
  - More efficient building traffic
  - Reduced maintenance to keep obsolete equipment functioning, and more maintenance on the proper areas
  - Savings on electrical power
  - Longer life of retained equipment
3. Appearance and Quality of Life
  - New cab interior (optional) and fixtures
  - New elevator lobby fixtures
4. Increased Value of the Building
5. Reduced Owner Liability
6. Reduced Environmental Risks

## Cost Estimates

The cost estimate to modernize the elevators as outlined in Section IV below is **\$175,000 per elevator**. This estimate does not include ancillary work by other trades that would be required in support of the elevator modernization. The specific items we recommend as part of a modernization are detailed in Section IV, the Elevator Modernization Plan, including the required ancillary work.

### **Estimated Schedule**

New elevator equipment is custom manufactured for each job, which means a significant lead time before actual construction begins. The following table highlights some of the major tasks that must be accomplished as part of an elevator modernization project:

Develop specifications and bid documents	4-8 weeks
Bid process and review	6 weeks
Contract negotiations to NTP	4-8 weeks
Provide and review drawings and submittals	10 weeks
Order and deliver equipment	16-24 weeks
Elevator Construction – Two elevators	6-8 weeks
Final inspection and punch list completion	2-4 weeks
Total Modernization Construction Schedule	48-68 weeks

## II. Existing Equipment

Elevator Type	In Ground Hydraulic Elevator
ID Number	PXH-7277 & PXH-7278
Year Installed	1979
Manufacturer	U.S. Elevator
Control System	Selective Collective-Duplex
Controller/Selector	U.S. Elevator
Pump Unit	U.S. Elevator
Door Equipment	GAL
Door Size	3' 6" x 7' 0"
Door Type	Single Speed, Side Slide
Door Operation	Power
Landings/Openings	5/5 (Front @ 1 & 4, Rear 2, 3 & 5)
Floor Designation	1, *2, 3, 4, 5
Capacity	2,500 LBS
Speed	150 FPM
Machine Room Location	Adjacent, bottom landing
Disconnect (AMPS/VAC)	200 AMP/240 VAC

### **III. Modernization Audit and Evaluation**

To evaluate the need for an elevator modernization, Elevator Consulting Services examines the elevator based on the following eight key categories to calculate the Elevator Profile Score. The Elevator Profile Score determines when an elevator modernization should be considered. These categories are:

1. Age of Equipment
2. Code Compliance
3. Preventive Maintenance
4. Operation and Performance
5. Frequency of Use
6. Energy Efficiency
7. Environmental Conditions
8. Design and Installation

#### **1. Age of Equipment**

If any factor drives the need for an elevator modernization, it is age of the equipment. Even with proper preventive maintenance, elevator equipment will not last forever, and substandard preventive maintenance can drastically reduce the life expectancy. With proper preventive maintenance, elevator equipment should be expected to last 25 to 30 years.

- The elevators at the Executive Building are 40 years old and have received only minor upgrades since the original installation. The elevator controllers, pump units, door operator equipment, and fixtures are operating beyond their useful life. In some cases, replacement parts are no longer available or soon will be obsolete. Additionally, technology has significantly improved on energy efficiency and maintenance requirements of some of the major elevator equipment.

#### **2. Code Compliance**

Codes are evolutionary by design. New technology and better designs provide for safer equipment. An elevator can comply with the code under which it was installed but not have any of the latest safety features required on new equipment.

- The elevators do comply with the 40 year old code that was in effect at the time of the installation, but do not comply with the current (ASME 17.1 2010) mandated code enforced by the State of Oregon.

#### **3. Preventive Maintenance**

Preventive maintenance is the activity of performing systematic and periodic checks, tests and service on elevator equipment to ensure that it operates safely and within design parameters. Its goal is to ensure that the equipment will last and operate safely for its anticipated life span.

Indicators of poor preventive maintenance are repeated shut downs and trouble calls, unscheduled repairs, poor adjustment, poor ride quality, accumulation of dirt and debris, and improper or lack of lubrication.

- The preventive maintenance needed to maintain these vintage elevators is relatively high. The higher level of required maintenance is primarily due to age and type of system.

#### **4. Operation and Performance**

Operation and performance of the elevator refers to how each component and the overall elevator system performs. It's directly related to rider experience waiting for and riding the elevator. Elevator operation during starting, acceleration, deceleration, leveling, and door operation can give good indications of the quality of operation and performance. Continuous operation without numerous mechanical problems can also be a good indicator of operation and performance.

- The existing elevators' operation and performance is not acceptable based primarily on the age of the equipment. The existing components rely on outdated technology which cannot provide acceptable reliability, power efficiency, leveling accuracy, response to traffic demands, and ride quality.

#### **5. Frequency of Use**

The frequency of use illustrates how often demand is placed on the elevator equipment. More use results in more wear on the controls and mechanical components of an elevator. For example, office buildings will typically use elevators less than facilities that are active 24-hours per day such as airports, hospitals, apartments, and condominiums.

- The elevators do not appear to be heavily used which has likely prolonged the life of the equipment.

#### **6. Energy Efficiency**

Today's technology seeks ways to make elevator equipment perform better while using less energy. New systems take advantage of Permanent Magnet Synchronous Motors (PMSM), which consume less energy than previous AC and generator control systems. Door operators are using newer technology to provide more efficient door operation with better control and safer operation, while also using less energy. Operating fixtures are beginning to use LED lamps that consume less energy and reduce overall fixture maintenance. Regenerative power is being provided on some systems that allow power to be fed back to the grid, thus reducing overall elevator energy costs to the building.

- The existing equipment relies on 40 year-old technology and includes pump units and pump motors. This outdated equipment requires large amounts of energy and generates a great deal of excess heat. Newer elevator controls include auto light/fan shut off devices.



## **7. Environmental Conditions**

Environmental conditions such as heat, moisture, salt water, caustic materials, and many other types of conditions contribute to the degradation of elevator equipment. Equipment installed in an enclosed, controlled environment tends to have the least impact from these environmental conditions. Equipment exposed to the outside environment will be more prone to deterioration that will contribute to more unscheduled shutdowns and requires more intense preventive maintenance. Environment can also include the locality of operation and the clientele that will normally use the equipment. Using a passenger elevator to carry freight can also have a negative impact on the life of the equipment.

- The elevator equipment is fairly well protected from the environment. One item to note is that there was water flowing into the pit from near the incoming elevator piping. Another environmental factor is heat in the elevator machine room. Added ventilation or air conditioning should be considered to protect the more sensitive solid-state equipment that will be installed as part of the modernization.

## **8. Design and Installation**

The engineering design and installation of the elevator incorporates strength and durability, operational and performance standards, professional craftsmanship, adherence to code requirements, proper installation, and ease of maintenance and repairs. Strength of components and structural equipment is important to ensure that the guide rails, car platform, machines and overhead and pit structures do not shift during building settling or during normal operation and will also withstand the loads imposed on the equipment. Field installation is a critical component of design. A poor installation will lead to continuous maintenance and repair problems and a shorter than expected life cycle. One factor that often lacks attention in designs is the ease with which equipment can be maintained and repaired. Designs that allow for the quick procurement of parts and reduced lubrication are desired.

- The design and installation of the elevators was acceptable based on the technology and standards when they were installed. After 40 years, a large portion of the existing equipment needs to be replaced as part of an elevator modernization to meet today's technological and safety requirements and avoid risk of long shut downs due to obsolete components.

## Elevator Consulting Services Elevator Equipment Profile

Client / Job Site: **SOLARC-Executive Building**

Equipment: **Two (2) Hydraulic Passenger Elevators**

	Age	Code Compliance	Preventive Maintenance	Performance & Operation	Frequency of Use	Environmental Conditions	Energy Efficiency	Design & Installation	TOTAL
5 Extreme	5								5
4 High		4	4				4	4	16
3 Moderate				3	3	3			9
2 Low									
1 Minimal									
	= Critical Conditions								
	= Moderate Conditions						Profile Score =	30	
	= Acceptable Conditions								
Profile Score	Description								Time Frame to Replace
Greater than 30	Equipment condition is extreme. Major components expected to fail. Proper maintenance is difficult and parts are, or will become, obsolete. Multiple safety and code concerns. Modernize immediately.								Immediately
25 – 30	Equipment is nearing end of expected life. Potential failure of major components. Proper maintenance is becoming difficult and parts are becoming obsolete. Potential safety and code issues. Begin planning for modernization.								2 to 5 years
17 – 24	Equipment shows normal wear based on current age. Update and improve maintenance program. Include modernization in long term planning.								6 to 9 years
Less than 17	Equipment shows normal wear based on current age. Maintain existing maintenance program. Modernization should not be needed for 10+ years.								10 + years

## IV. Elevator Modernization Plan

### ELEVATOR CONTRACTOR

EQUIPMENT LOCATION	DISPOSITION	NOTES
<b>MACHINE ROOM</b>		
Controller	Replace	New Solid-State Controller.
Pump Unit, Tank, Valve	Replace	New fully contained submersible pump and valve.
Muffler	New	New gas charged muffler.
Oil Lines	Replace	Replace oil lines.
Battery lowering / emergency power	New	New battery lowering device.
<b>HOISTWAY</b>		
Hoistway Doors	Retain /Refurbish	Hoistway doors are fire rated and in good condition.
Hoistway Door Sills	Retain / Refurbish	Door sills are in good condition and will be cleaned. Install new door gibs.
Hoistway Door Frames	Retain / Refurbish	Door frames are suitable for reuse. Backfill with flame retardant material.
Door Headers, Tracks and Interlocks	Retain / Refurbish	Retain door header and tracks. Provide new interlocks.
Car Door Detector	Replace	Provide new 3D door detector
Car Door Operator and Clutch	Replace	Provide new door operator and door rollers.
Hoistway Wiring	Replace	All hoistway wiring will be replaced with new. All existing conduit (EMT) will be retained provided it complies with current NEC.
Slide Guides	Replace	Existing slide guide assemblies will be replaced with heavier duty adjustable roller guides. Provides much better ride quality. One car has rollers guides already and only needs new rollers.
Guide Rails and Brackets	Retain / Refurbish	The existing guide rails and brackets are suitable for reuse. Clean and paint as required
Guide Rail Fishplates	Replace	Recommend new seismic rated fishplates be installed.

Platform, Stiles, Crosshead	Retain	The car sling (structural members which support the platform) are suitable for reuse.
Car Top Inspection Station	Replace	A new car top inspection station will be provided for the safety of maintenance and inspection personnel.
Car Landing and Leveling Devices	Replace	A new computer controlled landing and leveling system will be provided.
Travelling Cables	Replace	All new electrical travelling cables will be provided.
<b>PIT</b>		
In-Ground Jack Unit	Retain	Jack can be retained.
Seismic Over Speed Valve	Retain	Existing seismic overspeed valve can be retained.
Jack Unit Packing	Replace	Repack with new seals.
Buffers	Retain	Retain existing spring buffers.
<b>CAB ENCLOSURE &amp; FIXTURES</b>		
Cab Enclosure	Retain	The cab shell is in decent condition and can be retained. New wall panels and drop lighting can be installed at owner's discretion.
Braille Plates	Retain	Braille plates can be retained.
Cab Wiring	Replace	All cab wiring will be replaced with new.
Car Operating Panel (COP)	Replace	New vandal resistant car operating fixtures will be provided.
Intercom to Machine Room	New	In-car intercom to machine room will be provided.
Intercom to Main Recall Floor	New	In-car to main recall floor (*1) will be provided.
ADA Emergency Communications	New	ADA approved in car emergency communications will be provided.
Hall Stations	New	New vandal resistant surface mount hall call stations will be provided.
Car Riding Lantern	New	New car riding lantern will be provided

## WORK BY OTHER TRADES

EQUIPMENT LOCATION	DISPOSITION	NOTES
<b>MACHINE ROOM</b>		
Main Line Disconnect	Replace	Main line disconnects shall be replaced with new with accessories for shunt trip and battery lowering devices.
Fire Extinguisher	Retain	Existing fire extinguisher can be retained.
Lighting and Electrical Outlets	Upgrade	Verify machine room lighting meets code required 19ft candles. Retain GFCI outlets.
Non-Elevator Equipment	Remove	Water pipes are running in the machine room overhead. Easiest option is to add drop ceiling which will separate the water pipes from the machine room.
Intercom Circuit Disconnect	New	Currently there is no dedicated intercom circuit disconnect.
Car Light Disconnect Switch	New	Currently there is no dedicated car light disconnect.
<b>PIT</b>		
Lighting	New	Provide pit lighting to meet code required 10ft candles.
Electrical Outlet	New	Existing GFCI outlet is being used by sump & scavenger pumps. Add additional outlet.
Pit Ladder	Retain	Provide pit ladder extending 4' above floor level at lowest landing.
Sump	Refurbish	Provide new pump.
<b>CAB ENCLOSURE &amp; FIXTURES</b>		
Lobby Lighting	New	Provide additional elevator lobby lighting to meet code requirement of 10 ftc at the sill area with the hoistway doors in the closed position.
Cab Flooring	Replace	Cab flooring is in good condition. New flooring can be installed at owner's discretion.
<b>FIRE SAFETY</b>		
Fire Alarm Initiating Devices	Retain	Retain fire alarm initiating devices in elevator machine room and at each elevator lobby.

## V. Existing Equipment Photos



Fig. 1 – Main line disconnect



Fig. 2 – Non-elevator related piping



Fig. 3 – GFCI in machine room



Fig. 4 – Ventilation in machine room



Fig. 5 – Machine room door

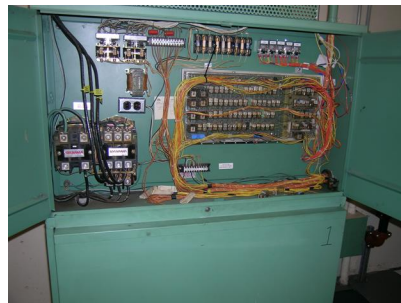


Fig. 6 – Controller



Fig. 7 – Pump motor, valve, muffler

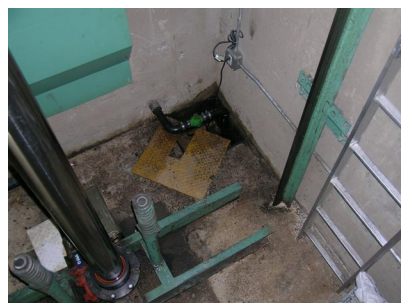


Fig. 8 – Sump pump in pit





Fig. 9 – Oil line, buffers



Fig. 10 – Telescoping piston



Fig. 11 – Door operator



Fig. 12 – Selector

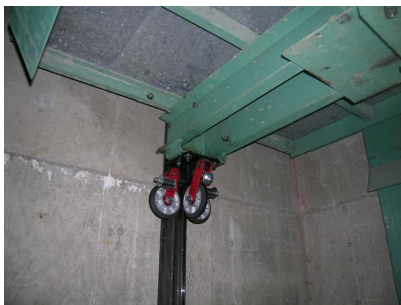


Fig. 13 – Roller guides



Fig. 14 – Slide guides

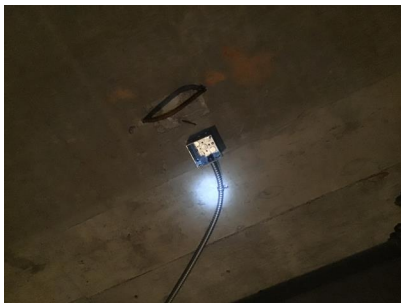


Fig. 15 – Missing smoke detectors in HW



Fig. 16 – Hall fixture



Fig. 17 – Car operating panel



Fig. 18 – Car riding lantern



Fig. 19– In-car position indicator



Fig. 20 – Lobby entrances

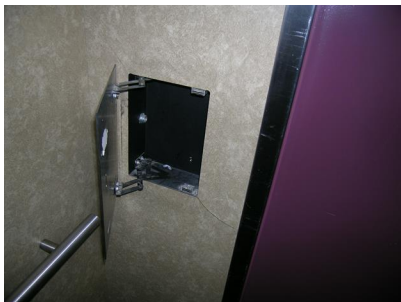


Fig. 21 – Empty phone cabinet



Fig. 22 – Smokes in hall



## VI. ADA Compliance Checklist

CODE	COMPLIANT		NOTES
	YES	NO	
4.10.3 Hall Call Buttons			
Are all buttons at least 3/4" in diameter?	X		
Are all button centered 42" above floor?	X		
Do all buttons illuminate when elevator is called and fade when answered?	X		
4.10.4 Hall Lanterns			
Are there visible and audile signals at each hoistway entrance to indicate which car is answering a call?	X		
Do audible signals sound once for "up" and twice for "down"?	X		
Are hall lantern fixtures centered at least 72" above lobby floor?			N/A
Are all visual elements at least 2 1/2" in dimension?	X		
Are signals visible from hall call button?	X		
4.10.5 Hoistway Signs			
Does elevator have Braille jamb plates on both jambs, centered 60" above floor?	X		
Are Braille characters at least 2" in height and raised 1/32" in sans serif type?	X		
4.10.6 Elevator Door Requirements			
Do doors have reopening device that will reopen doors if they becomes obstructed?	X		
Do doors remain open for at least 20 seconds?	X		
4.10.7 Door and Signal Timing for Hall Calls			
From notification that a car is answering a call until the doors start to close, does the time meet the formula of $T = D/1.5 \text{ ft./s}$ and a minimum of 5 seconds?	X		
4.10.8 Door Delay for Call Calls			
Do the elevator doors remain fully open in response to a car call for a minimum of 3 seconds?	X		
4.10.9 Floor Plan of Elevator Cars			
Is the clearance between the car platform sill and the edge of the hoistway landing no more than 1 1/4" ?	X		

CODE	COMPLIANT		NOTES
	YES	NO	
<b>4.10.11 Illumination Levels</b>			
Is the illumination at the car controls, platform, car threshold and landing sill at least 5 ftc?	X		
<b>4.10.12 Car Controls</b>			
Are controls at least 3/4" in dimension?	X		
Are all buttons accompanied by raised characters or Braille that are a minimum 5/8" in height & uppercase sans serif)?	X		
Are all raised designations to left of the button to which they apply?	X		
Do all floor buttons have visual signals in which illuminate when a call is placed and fade when each call is answered?	X		
Are all floor buttons a max. of 48" above floor when forward reach is required and a max. of 54" above floor when side reach is required?	X		
Are all emergency controls grouped at the bottom of the panel with centerlines a minimum of 35" and maximum of 54" above floor?	X		
<b>4.10.13 Car Position Indicators</b>			
Are visual car position indicators above the door or above control panel?	X		
Are the corresponding numbers illuminating when the car passes or stops at that floor, accompanied by an audible signal?	X		
Are all numerals at least 1/2" high?	X		
Are all audible signals at least 20 decibels with a frequency no higher than 1500Hz?	X		
<b>4.10.14 Emergency Communications</b>			
Does elevator have emergency communication that does not require voice communication?	X		
Is the highest operable part of the two-way communication system under the maximum 48" from the floor of the car?	X		
Is the length of the cord from the panel to the handset at least 29"?			N/A