

MEMORANDUM

February 8, 2018

TO: MEMBERS, PORT COMMISSION
Hon. Kimberly Brandon, President
Hon. Willie Adams, Vice President
Hon. Leslie Katz
Hon. Doreen Woo Ho

FROM: Elaine Forbes
Executive Director

SUBJECT: Informational Presentation on the Port's Structural Assessment Program
and Overview of Load Restricted Facilities

DIRECTOR'S RECOMMENDATION: Informational Only; No Action Required

SUMMARY

This staff report provides an update on the structural condition of the Port's Facilities and an overview of Port Engineering's structural assessment program. Port staff's last update was presented [to the Port Commission](#), February 2016.

BACKGROUND

The Structural Assessment Program consists of regular inspections of approximately 150 marine structures and 200 buildings and other above grade structures. Port Engineering manages the program and works with other Port divisions to inform tenants and the public of inspection findings, implement load restrictions, and install safety signs and barricades. The inspection findings are also used to document maintenance and repair needs for the Port's structures.

Compared to structures on land, deterioration of the Port's piers and wharves occurs relatively quickly due to the aggressive marine environment and is not as easily detected due to the inaccessibility of areas exposed to the water. Consequently, inspection of structures built over the water has been an important function of the Engineering Division since the earliest years of the Port. Inspection findings drove the progression from short lived untreated wood piles to the durable reinforced concrete Piers that make up most of the historic waterfront that we know today. Most of these structures have now been standing for more than 100 years.

The current Structural Assessment Program began in 2002 and has regularly inspected all of the Port's non-floating structures on a frequency determined by the structure's materials of construction and its occupancy or use. This is true for marine structures as well as buildings constructed over piers and on land. For each facility, the structural inspection findings and recommendations are summarized in a Rapid Structural Assessment (RSA) report which includes a structural rating of the respective facility indicated by a coloring scheme shown on a schematic map of the facility. The structural rating coloring scheme is described below:

- Green (serviceable condition, no live load reductions/restrictions and unrestricted use consistent with original design)
- Yellow with Green Hatching (restricted use, load limit signs indicating reduced live loads and/or barricades, further structural review and structural repairs required)
- Red (restricted access, unsafe, poor structural condition)

Attachment 1 graphically depicts the current structural ratings of the Port Facilities as of the date of this memorandum.

It is important to note that a Green rated facility may still have significant repair needs. The Green rating means that damage observed by inspection has not progressed to the point where a load restriction is warranted, based on engineering analysis and professional judgement. The damage observed in Green tagged structures is documented in the inspection report for future monitoring and prioritization of repair work.

IMPROVEMENTS SINCE FEBRUARY 2016

Several Port buildings and substructures have been repaired through Port capital projects as well as developer and tenant lead projects since the last presentation to the Port Commission on this topic. As projects are completed, the structural rating map is updated and the cycle of regular inspections begins for the renewed facility. The following is a list of facilities with upgraded structural ratings since February 2016.

- Fish Processing Facility – Wharf J9 (Yellow to Green)
The tenant performed repairs to deteriorated timber piles at their facility after Port Property Manager notified them of the latest RSA report findings and made tenant aware of their responsibility to maintain the facility.
- Pier 31 and 29.5 Roof Repair and Apron Infill Projects (Red to Green)
Port Engineering designed and implemented a major structural repair and roofing project for the dilapidated timber shed and bulkhead buildings. This challenging project was constructed by Roebuck Construction, a Local Business Enterprise (LBE) firm. The depressed rail track along the Pier 31 North Apron was also

infilled with timber framing by Port Maintenance to create a safe, pedestrian accessible apron for the public and future building tenants.

- Pier 19 North Apron (Red to Demolished, replacement planned)
Port Engineering designed, permitted, and contracted the demolition of the severely dilapidated Pier 19 North Apron before it collapsed in to the Bay. Demolition work by Silverado Contractors was completed on time, on budget, and with no environmental incidents. Port Maintenance Divers provided post-demolition verification inspection. A replacement apron is currently being designed by Port Engineering.
- Pier 9 South Apron (Red to Green)
Port Maintenance repaired a nearly 300 ft long section of timber apron based on a repair design by Port Engineering. About 1/3 of the apron nearest to shore had severely deteriorated piles. The apron serves as critical emergency egress for Pier 9 tenants, as well as provides public access.
- Pier 3 Substructure (Yellow to Green)
Hornblower Cruises and Events and their construction contractor Valentine Corp. completed a major project to repair the deteriorated Pier 3 substructure utilizing Port rent credits for funding.
- Pier 2 - Former Sinbad's Restaurant (Red to Demolished, replacement planned)
The deteriorated timber decking and remainder of concrete and timber piles were demolished by Power Engineering and their subcontractor Silverado. The Downtown Ferry Terminal Expansion project is currently constructing a larger, more resilient public plaza and expanded ferry landing in this location.
- Pier 70 Historic Core Buildings (Yellow and Red to Green)
Orton Development Inc. has substantially completed construction of Building 104 and all buildings south of 20th Street within the Historic Core area. Planned improvements to the remaining buildings north of 20th Street are at various stages of design and construction. Previously vacant historic structures have been rehabilitated and seismically retrofitted. The improvements completed so far have created more than 250,000 square feet of usable building space.
- Pier 92 Timber Apron Repair (Yellow and Red to Green)
Port Maintenance completed removal of deteriorated piles and driving of more than 300 new replacement piles. Repairs to the timber deck are ongoing. At the completion of construction the project will renew and restore the maritime berthing capabilities for the City's only concrete batch plants located at Pier 92.

LOAD RESTRICTED FACILITIES – YELLOW RATING

Load restricted or yellow tagged facilities have experienced deterioration to structural components that reduces their ability to resist loading. Throughout the Port's facilities, the most common forms of deterioration are corrosion of structural steel and rebar in concrete, and biological damage to wood from marine borers and dryrot. In some cases, deterioration has been accelerated by excessive loading from heavy vehicles and moored vessels. The time frame from when a facility is load restricted to when some or all of the facility must be completely vacated (red tagged) depends on the type of deterioration, the amount of redundancy and overdesign in the original structure, and the use of the facility. In general, wood structures tend to deteriorate the most quickly once deterioration is detectable by a Rapid Structural Assessment.

The following is a list of Yellow Tagged facilities that have significant operational/usage constraints as a result of lower allowable loads. In some cases, there are active projects to repair these facilities and restore full functionality. In other cases there is no funding identified to perform such repairs. Facilities are listed in geographic order from north to south.

- Wharf J9 and Pier 43.5 Timber Sea Walls
These two historic timber sea wall segments have experienced biological deterioration which partially compromises their ability to retain the soil backfill behind the wall. These sea walls provide support to adjacent timber wharves on the water side and influence secondary roadways and some building foundations on the land side. Port Engineering is currently engaged in a peer review of the recently completed conceptual design and construction is fully funded based on current cost estimates. The Port's intent is for the Maintenance Division Pile Drivers to perform the repair work.
- Pier 35 Substructure
The Pier 35 substructure and adjacent marginal wharf are constructed of reinforced concrete beams, deck slab, and piles. Rebar has corroded and resulted in concrete spalls throughout the substructure. Port Engineering has completed structural repair drawings and specifications to repair the most critical damage. There is currently \$3 million of funding allocated to these repairs, and the Port's intent is to self-perform these repairs using a future Concrete Repair Crew within the Maintenance Division.
- Marginal Wharves From Pier 33 to Pier 31
The marginal wharf substructures are immediately adjacent to the sea wall. They support the bulkhead buildings and provide access to the rest of the piers. The concrete deck and piles have corroded and spalled in various locations throughout this area. The Marine Structural Project IV (MSP IV) scope includes repairs and strengthening for heavier vehicle loads at the marginal wharf adjacent to the National Park Service's Alcatraz Landing facility. Bids for the project have been received and are currently being evaluated by Port Engineering.

- Pier 29 Substructure
 The Pier 29 substructure and adjacent marginal wharf are constructed of reinforced concrete beams, deck slab, and a combination of concrete piles and large diameter concrete cylinders. Rebar has corroded and resulted in concrete spalls throughout the substructure. Some of the concrete cylinders have chemical degradation of concrete in the tidal zone. The Marine Structural Project IV project scope includes repairs to the entire Pier 29 marginal wharf and approximately 10,000 square feet of the main pier adjacent to the marginal wharf. The Port's intent is to self-perform the remainder of Pier 29 substructure repairs using a future Concrete Repair Crew within the Maintenance Division. Bids for MSP IV have been received and are currently being evaluated by Port Engineering.
- Agriculture Building
 As reported in the 2015 and 2016 presentations, the East and South Aprons surrounding the Agriculture Building have significant deterioration due to corrosion of slab and beam rebar. The substructure directly supporting the building is in better condition due to repairs and protective coating installed in the 1950's but still has areas of deterioration. The building's steel frame is structurally sound but there is widespread cracking at various façade elements. At present, the South Apron is restricted to light passenger vehicles while no vehicular traffic is allowed on the East Apron. No funding source has been identified for repair of the Agriculture Building and further deterioration of the substructure may lead to more stringent load restrictions in the future.
- Pier 30-32 Substructure
 Pier 30-32 was originally built in 1912 and this 1912 construction makes up the majority of the current facility. This portion of the Pier has deterioration of deck slab and beams due to rebar corrosion and deterioration of concrete cylinder columns due to a combination of chemical degradation of concrete and rebar corrosion. The remainder of the Pier 30-32 substructure is in better condition but still has some deteriorated structural components. At present, the majority of Pier 30-32 is used for passenger vehicle parking due to substructure load restrictions. No funding source has been identified for the repair of the Pier 30-32 substructure.
- Pier 50 South Timber Apron
 The Pier 50 South Timber Apron has a significant number of wood piles that have severe biological deterioration. As a result, the entire apron is either yellow tagged or red tagged depending on the extent of the damage in specific areas. The apron is frequently inspected to verify that it is still safe to use as emergency egress where required for certain tenant operations in Shed B. A capital improvement project to replace piles at a portion of the apron is included in the proposed Fiscal Year 2018-19 and FY 2019-20 Capital Budget. It is expected that Port Maintenance will perform the repairs in 2019 or 2020 once funds become available.

- Pier 54 Substructure
As reported in 2015 and 2016, Pier 54 has a widespread damage to reinforced concrete beams and girders due to corrosion of rebar. Recent inspection has reinforced the need to increase enforcement of existing load restrictions. Within the past two years, a 3,800 square feet portion of the north apron constructed with timber piles was red tagged and barricaded due to severe deterioration. Port Real Estate has held discussions with several tenants about load restrictions and the effect on tenants' business activities. Port Engineering and Maintenance are in the process of designing and constructing an overhead barrier that will prevent larger vehicles from accessing the Pier. No funding source has been identified for the repair of the Pier 54 substructure, which is estimated to cost tens of millions of dollars.
- Pier 68 - Shipyard High Water Platform Substructure
The High Water Platform substructure at the Shipyard facility has a significant number of deteriorated beams with corroded rebar. Much of the damage is concentrated along the only access between the larger Dry Dock No. 2 and shore, which was a constraint on yard operations. The Maritime Division is currently evaluating options for performing repairs to critical locations using settlement funds.

The entire list of fully or partially yellow tagged facilities are listed in **Exhibit No. 1**.

FULLY RESTRICTED FACILITIES – RED RATING

Fully restricted or red tagged facilities have more advanced deterioration and usually have experienced localized failures of primary structural elements. Red tagged facilities must be completely vacated before more widespread failures and/or collapse occur. In some cases red tagged facilities can be repaired but it is often more cost effective to demolish and replace structures that have advanced levels of structural deterioration.

Even after a facility has been red tagged and vacated, Engineering Staff continues to perform regular inspections to monitor for any signs of imminent collapse. Port Pile Removal funds, Port Capital Project funds and Port Maintenance resources are directed to demolishing the highest risk red tagged structures.

In some cases, buildings may be red tagged due to serious life safety concerns about safe exiting and egress features. The structure of the facility may be adequate (i.e. not a collapse risk) but without proper egress the building is not safe for occupancy. These egress issues are not a part of the Structural Assessment Program, but are brought to the Engineering Division's attention after regular Fire Inspections performed by Fire Marshall staff.

All fully or partially red tagged facilities are listed in **Exhibit No. 2**.

FUTURE ENVIRONMENTAL FACTORS

A combination of future environmental factors will likely contribute to accelerated deterioration of the Port's substructure assets and make inspection and repair of these assets more difficult and costly. With sea level rise, the underside of pier decks will be more frequently exposed to corrosive sea water. The available windows to inspect and perform repair work underneath the piers will also decrease as the sea rises.

Simultaneously, environmental degradation of the reinforced concrete that makes up most of the Port's historic finger piers tends to be an accelerating process unless repairs are made. This degradation both increases the amount of structural repair needed and also restricts the future use of heavy construction equipment above the pier decks. Both of these factors will likely drive up the cost of future repair projects beyond the typical year to year escalation in construction costs.

Port Staff have been actively engaging the public at large about the challenge of preserving the Port's historic piers in the face of increasing environmental threats. In October 2016 the Embarcadero Historic District was named as one of eleven *Most Endangered Historic Places* by the National Trust for Historic Preservation precisely because of the "major physical threats" to the District's infrastructure. Port Planning's ongoing process to update the Port's Waterfront Land Use Plan seeks to build consensus on the types of land use that could feasibly support the cost of maintaining and rehabilitating our 100 year old piers.

CAPITAL PLANNING

The latest update to the Port's 10 Year Capital Plan identifies, at a high level, \$1.6 billion in deferred maintenance needs over all the Port's facilities. Structural repair and building envelope repair represents the majority of the Port's capital needs. The Structural Assessment Program provides valuable data to the biennial updates to the 10 Year Capital Plan.

The list of *Improvements Since February 2016* demonstrates the variety of mechanisms for funding structural repairs and improving the status of the Port's Red and Yellow Tagged facilities: Port capital projects constructed by Port Maintenance or bid out to construction contractors, projects performed by other public agencies, tenant repairs with and without rent credits, and developer lead projects. For Port funded projects, the structural condition of a facility is one of several factors evaluated by the Port Capital Planning Committee when allocating capital project funding. Given this extent of the Port's deferred maintenance backlog compared to the Port's limited two year Capital Budget it is clear that not every yellow or red tagged facility can have a fully funded repair project. The Structural Assessment Program seeks to provide Capital Planning Committee decision makers with accurate and up to date information on the condition of the Port's structures so that projects can be prioritized appropriately.

CONCLUSION

The safety of the Port's facilities is critical to tenant businesses, the public, and the Port's day to day operations. Maintenance and repair of the Port's historic buildings, piers and wharves are major economic factors in the Port's land use planning and capital planning. The Structural Assessment Program provides valuable, up to date information on the structural condition of these facilities. The primary function of these assessments is to identify and mitigate public safety issues. The Structural Assessment Program also provides a basis for the Port's maintenance and repair programs, capital improvement programs, and land use strategy.

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EXHIBITS

1. List of Yellow Rated Facilities – Restricted Use
2. List of Red Rated Facilities – No Use Permitted Without Repairs

ATTACHMENTS

1. Structural Rating Maps (5 Sheets)