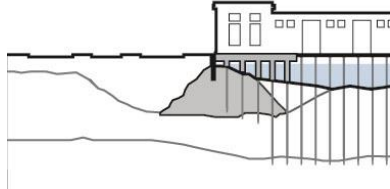


# Bulkhead Wharf Retrofit

## Seismic Adaptation Measure



### TARGETED MEASURE



**TYPE:** Structural

### SHORELINE LOCATION:



Nearshore



Working at low tide to strengthen wharf decks and piers © SGH

#### DESIGN LIFE

30 years

#### ADAPTABILITY

Low

#### IMPACT ON THE WATERFRONT

Minor Waterside Intervention

#### CONSTRUCTION COST

Low to High

### SEISMIC HAZARDS MITIGATED:

Lateral Spreading



Liquefaction



### SEISMIC PERFORMANCE IMPROVED:

Structures



Utilities and Transportation



### MEASURES COMPATIBILITY:

Flood

Building Adaptation | Raised Marine Structure

Seismic

Shoreline Stabilization

### DESCRIPTION:

Retrofit of an existing wharf structure. This would improve its performance when subjected to seismic-induced ground shaking and ground displacements.

### CONSIDERATIONS:

- Retrofit work may include strengthening the existing structure and/or adding new structural elements.
- Extent of work will vary by structure and by the reduction of ground displacement achieved by shoreline stabilization measures.

### ADVANTAGES:

- Likely minimal construction impact to the Embarcadero and promenade and to the occupants of the pier being retrofitted.
- Increases seismic performance of existing structure.

### DISADVANTAGES:

- Not likely to extend the life of already deteriorated wharf structures.

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### CONSTRUCTION IMPACTS TO THE PUBLIC:

- Likely minimal construction impact to the Embarcadero and promenade and to the occupants of the pier being retrofitted.

### SEA LEVEL RISE ADAPTATION OPPORTUNITIES:

- A retrofitted wharf may be necessary to accommodate an elevated waterfront building or raised marine structure, but is unlikely to meet performance requirements in areas with high seawall instability.

### DESIGN CONSIDERATIONS:

- Retrofit work would include strengthening the existing structure and/or adding new structural elements such as piles.
- Type and extent of retrofit would vary by structure and by the reduction of ground displacements achieved by shoreline stabilization measures.

### SITE-SPECIFIC CONSIDERATIONS:

- Type and extent of retrofit will vary by structure and by the reduction of ground displacement achieved by shoreline stabilization measures.

### URBAN DESIGN CONSIDERATIONS:

- This measure does not present any urban design opportunities or considerations.

### HISTORICAL RESOURCE CONSIDERATIONS:

- This measure would likely not impact any historical buildings, but may impact historic pier/wharves.

### INSTALLATION AND CONSTRUCTABILITY CONSIDERATIONS:

- Strengthening of the existing structure would be accomplished by working off of temporary platforms during low tide.