Assess & Prioritize
Keys to Asset Management

Carl J. Larosche, PE
Presentation Outline

- The Case for Asset Management
- Executive Decision-making
- Element-based Inspection
  - Process & Procedure
  - Asset Rating
Port Facilities - Asset Management
Establish Priorities

- Structural
- Operational
- Environmental
- Safety Hazards
- Return on Investment
- Cost
Basis for Prioritization

- Overall Priority
- Condition Assessment
- Repair Recommendations
- Wharf/Structural Asset Characteristics
- Cost & Revenue
Cost & Revenue

- Cost of Repair Program
  - Maintain current loads?
  - Upgrade to greater loads?

- Revenue
  - Current
  - Projected (no repairs)
  - Projected (with repairs)
Condition Assessment

- Element-by-Element
- Current Condition
- Future Condition
- Years of Service Remaining
Wharf Characteristics

- Dock Configuration
- Area
- Usage
- Load Rating
- Location on Site
- Channel
Asset Management Plan

- Objectives and Measure
- Performance Gap Identification
- Lifecycle Cost & Risk Management Analysis
- Financial Planning – Capital Budget
Asset Management

- Policies, Goals, & Objectives
- Integrated Alternative Analysis of Options & Tradeoffs
- Resource Allocation Decisions/ Project Selection
- Program Delivery
- Systems Monitoring & Performance Results

Source: NCHRP 20-24 (11) - Asset Management Guidance for Transportation Agencies
Facility Inspection Program

- Database of Asset inspection and inventory
- Element-level Inspection
  - Feeds into Component Level Data
  - Rates Asset Performance
  - Monitors Deterioration
- Maximizes Owner Benefits
- Minimizes Owner costs
Hierarchy of Facility Terms - Elemental Based

- **Property or Terminal**
  - Consists of several maritime assets
  - e.g., Container Terminal, Bulk Caro Terminal, Transportation Area

- **Maritime Asset**
  - Wharf
  - Boat Dock
  - Bulkhead
  - Shoreline
  - Consists of one or more components

- **Component**
  - Structural or non-structural system of elements
  - Structural (e.g., superstructure, bulkhead)
  - Berthing system
  - Shoreline
  - Ancillary (e.g., crane rails, access systems)

- **Element**
  - Individual elements that make up a component
  - Structural or non-structural
  - e.g., RC slab, RC deck beam, steel pile, timber pile, cleat, bollard, wearing surface
## Inspection Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Sub-type</th>
<th>Primary Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Above water</td>
<td>Inspection to establish the baseline (initial) asset inventory information, element condition states, component ratings and asset condition for a new asset or for an existing asset where no previous record exists.</td>
</tr>
<tr>
<td></td>
<td>Underwater</td>
<td></td>
</tr>
<tr>
<td>Routine</td>
<td>Above water</td>
<td>Regularly-scheduled inspection to define asset condition, component ratings, and element condition states at a point in time and to allow tracking of conditions over time.</td>
</tr>
<tr>
<td></td>
<td>Underwater</td>
<td></td>
</tr>
<tr>
<td>Special</td>
<td>Post-event</td>
<td>Rapid inspection to assess overall condition following an extreme event such as a hurricane, flood, or vessel impact.</td>
</tr>
<tr>
<td></td>
<td>In-Depth</td>
<td>In-Depth inspection to determine cause and/or significance of damage or distress, to aid in determining a suitable repair approach, or to define quantities necessary for repair purposes.</td>
</tr>
<tr>
<td></td>
<td>Due Diligence</td>
<td>Inspection to establish the general condition, asset value, or need for and approximate cost of repairs, at times of change of ownership, lease, or for insurance purposes.</td>
</tr>
</tbody>
</table>
**Baseline Inspection**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>No Action</th>
<th>More information or repairs needed</th>
<th>Immediate Action*</th>
</tr>
</thead>
</table>

**Routine Inspection**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>No Action</th>
<th>More information or repairs needed</th>
<th>Immediate Action*</th>
</tr>
</thead>
</table>

**In-depth Inspection**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>No Action</th>
<th>More info needed</th>
<th>Repair/ Strengthen</th>
<th>Immediate Action*</th>
</tr>
</thead>
</table>

*Immediate Actions*: Respond to conditions that may compromise facility operations or lead to loss of life, property damage or environmental damage.
## Discussion – Inspection Frequency

<table>
<thead>
<tr>
<th>Source</th>
<th>Max. Above Water</th>
<th>Max. Underwater</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>WJE</td>
<td>3 yrs</td>
<td>6 yrs</td>
<td>• Interval may be reduced or increased depending on condition or use</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Specific guidance is not provided in Manual</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Engineer recommends, PHA decides</td>
</tr>
<tr>
<td>Bridges (FHWA BIRM)</td>
<td>2 yrs</td>
<td>5 yrs</td>
<td>• Interval may be reduced or increased depending on condition or use</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• FHWA must approve increases</td>
</tr>
<tr>
<td>Waterfront Structures</td>
<td>0.5 to 6 yrs (ASCE 130)</td>
<td>0.5 to 6 yrs (ASCE 101)</td>
<td>• Interval depends on previous condition rating, material and environment (see ASCE 130 Table 2-2)</td>
</tr>
</tbody>
</table>
Overall Asset Condition Assessment

- **Overall Asset Rating** (AR) for Baseline, Routine, and Due Diligence Inspections
  - Reflects overall adequacy and safety of the asset
  - Based on ratings for structural and non-structural components

\[
AR = SR + FR \quad \text{for all assets except shorelines}
\]

\[
AR = 4 \times FR \quad \text{for shoreline assets}
\]

\[0 \leq AR \leq 100\]

Entirely deficient

Entirely adequate and safe
### Sample Calculations for 4 Hypothetical Assets

<table>
<thead>
<tr>
<th>Components</th>
<th>Component Ratings</th>
<th>Deductions by Component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dock1</td>
<td>Dock 5</td>
</tr>
<tr>
<td><strong>Structural Components</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superstructure</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Substructure</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Deck</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Bulkhead</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Non-Structural Components</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bearings</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Joints</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Fender System</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Mooring System</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Shoreline Comp.</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Ancillary Comp.</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

**Asset Rating**

- **Dock 1**: 52
- **Dock 5**: 90
- **Wharf 20**: 72
- **Dock 10**: 35

**SR** = 47, **FR** = 5

**Note**: NA = component type not applicable to asset.
## Example Dock 1

<table>
<thead>
<tr>
<th>Component</th>
<th>SR Deduction</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superstructure</td>
<td>For component rating of 3, SP is 13</td>
<td>A component rating of 3 represents poor condition in a key structural component, resulting in a substantial deduction of 13.</td>
</tr>
<tr>
<td>Substructure:</td>
<td>For component rating of 4, SB is 8</td>
<td>While the ratings for these components are the same, the deduction for the deck (DK) is less. While the deck is structurally significant, this slightly lower deduction reflects the fact that deck repairs are more easily implemented, and thus have a slightly lower negative impact on the overall condition of the asset.</td>
</tr>
<tr>
<td>Deck:</td>
<td>For component rating of 4, DK is 3</td>
<td></td>
</tr>
<tr>
<td>Bulkhead:</td>
<td>For component rating of 5, BH is 4</td>
<td>Minor deduction for component rating of 5 reflects satisfactory condition and limited impact on asset condition.</td>
</tr>
</tbody>
</table>

### Calculate ACR:

\[
ACR = SR + FR \\
ACR = 47 + 5 \\
ACR = 52 \text{ for Asset 1}
\]

### Calculate SR:

\[
SR = 75 - (SP + SB + DK + BH) \geq 0 \\
SR = 75 - (13 + 8 + 3 + 4) \\
SR = 47
\]

### Calculate FR:

\[
FR = 25 - (BR + JN + FS + MS + SH + AC) \geq 0 \\
FR = 25 - (0 + 2 + 13 + 2 + 0 + 3) \\
FR = 5
\]
Summary: Assess and Prioritize

1. Establish Priorities for Asset Management
2. Condition Assessment
   ✓ Concrete Inspection & Evaluation
   ✓ Predicting Service Life
3. Prioritize Based on Assessment Results
4. Use AR to develop long-time capital expenditures
Questions...?

Carl J. “Chuck” Larosche, PE

Email: clarosche@wje.com
Phone: 512-257-4811 (office)
Address: 9511 N. Lake Creek Parkway
          Austin, Texas 78717