Keeping Things Running
Preventative Maintenance

Presentation for PCC Conference, Friday Harbor, April 2007
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Preventative Maintenance

“The act of fixing something before it breaks”

Planning
Facility Inspections
Budgeting
Scheduling
Group Discussion:
Maintenance Techniques
Why Do Preventative Maintenance?

- Marine facilities are costly to build and generally require more PM than most upland facilities.

  ✓ Marine environment causes accelerated wear & tear
  ✓ Wear & tear goes undetected (underwater)
  ✓ Generally more susceptible to damage:
    - Weather
    - Corrosive environment
    - Users

- Don’t wait for it to break, cause injury or excessive damage before you fix it.
PM - The key to facility safety & long-term survival

- A good PM program:
  - Reduces risk/ liability
  - Helps prevent loss or major damage
  - Minimizes down time & lost revenue
  - Increases life of facilities
  - Protects your investment
  - Keeps long-term maintenance costs down
Develop Long-term Maintenance & Replacement Plan

- Important planning & budgeting tool:
  - Helps finance people prepare for future expense
  - Keeps your community leaders informed
  - Allows for more scheduling flexibility
  - Improves funding opportunities
  - Keeps costs down
Maintenance Planning

Maintenance can generally be grouped into two categories:

- **Unscheduled**
  - Needs immediate attention (safety issue)
  - Damage control

- **Scheduled**
  - Planned major repairs
  - Required service, inspection or certification
  - Completing deferred maintenance
Maintenance Planning

STEP 1 - Inventory your Assets:

- Docks
- Piers
- Floats
- Grids
- Buildings
- Launch ramps
- Dry Stack
- Upland
- Parking Areas
- Haul out facilities
- Fueling facilities
- Breakwaters
- Floating attenuators
- Bulkheads
- Equipment

(Itemize all components for each facility)
Create Inspection Checklists

- STEP 2 - Gather info for each facility:
  - Design drawings
  - Specifications
  - Maintenance history
  - Previous inspection reports
  - Maps
  - Photos

- STEP 3 - Create detailed inspection checklists:
  - Field diagrams
  - Itemize components
  - Use field codes & grading system
  - Method of mapping/documenting findings
  - Take photos
  - Keep it simple
  - Use waterproof paper
Checklist Items

Gangways:
- Decking - fastenings, nonskid, deck secure
- Rails - sound, smooth
- Cord members, weld or bolt condition
- Fixed end fastenings - hinges
- Rolling end - freedom of roll, condition of roller & wheels, guides
- Transition plate - smooth, secure
- Cables & pipes hanging from gangway
- Lateral movement - sideways
- Covering - secure, water tight
- Signage
# Gangway Inspection Checklist

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>Top&amp; Bottom Chords</th>
<th>Web Members</th>
<th>Hinge</th>
<th>Sideway</th>
<th>Skid Resistant Surface</th>
<th>Steepness</th>
<th>Float Buoyancy</th>
<th>Signing</th>
<th>Lighting</th>
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<tbody>
<tr>
<td>Gangway</td>
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</table>
## Float Inspection Checklist

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>FLOAT ITEMS</th>
<th>FLOAT PILES</th>
<th>WATER SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullrail &amp; Cleats</td>
<td>Deck</td>
<td>Walers/Thru Rods</td>
<td>Floatation (Billets)</td>
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<td>B-FLOAT</td>
<td>Mainwalk Float</td>
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<tr>
<td>Slip #</td>
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<td>2</td>
<td>3</td>
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</tbody>
</table>

**WATER SYSTEMS**

- FLOAT PILES
- Type

**FLOAT ITEMS**

- Utility Hangers
- Freeboard
- Pile Hoops
- Float Connections
- Floatation (Billets)
- Walers/Thru Rods
- Deck
- Bullrail & Cleats
STEP 4 - Conduct facility inspections

- Should be part of the daily routine
- More detailed inspections should be done semi-annually or annually (by qualified staff)
- Professional inspection every 3 to 5 years or as required.
  - By: engineers, electricians, divers...
  - For: certification, calibration, load ratings...
Give your staff tools to inspect facilities, report & document damage:

- Inspection checklists
- Activity logs
- Accident reports
- Incident report forms
- Hazard reports
- Use Outlook
Follow Through

- **STEP 5** - Make sure the repairs get done!
  - Compile inspection data:
    - Summary of findings
    - Photo documentation
  - Generate final report & recommendations
  - Conduct repairs in-house
  
  Or

  - Develop a project for outsource
    - Budget considerations?
    - Define scope of work
    - Prep bid documents
    - Get bids (unit prices)
    - Schedule work

  - Document completion of work
Maintenance Budget

- **Budget Items:**
  - Unscheduled R&M
  - Scheduled R&M
  - Replacement
  - Capital improvements
  - New Facilities

- **Get budget estimates:**
  - In House staff
  - Engineer
  - Contractor
  - Suppliers
  - Permits etc…

- **Budget for:**
  - Engineering/ design / inspection/ admin
  - Construction
  - Materials
  - Permits
  - Mobilization
  - Contingency (20%)

- **Rule of thumb:**
  - Budget 2% to 5% of facilities original cost for maintenance annually
  - (10m x 2% = 200k)
Maintenance Budget

Funding sources:
- From operating revenue
- Community development funds
- Bonds, loans, etc..
- Grants
- Reimbursement for damages
- Other?
Scheduling

- Scheduling Considerations:
  - Construction season
  - Contractor/ material availability
  - User disruption/ busy season
  - Environmental window/ permit restrictions
  - Lost revenue/ down time
  - Funding
What are your biggest maintenance issues?

Group discussion:
- Concrete floats
- Wood floats
- Electrical
- Docks & Piers
- And more.....
Concrete Float Repair

- Decking
- Bull rails
- Whalers
- Through rods
- Floatation
- Whalers
- Through rods
- Floatation
- Cleats/ bollards
- Pile collars
- Connection
  - hardware
- Fenders
- Utilities
- signage

Crack repair
Top coats
Float Decks

- Concrete deck problems
Float Decks

- Concrete edge spalls
Cleat & Bullrails
Float units attachment

- Pile hoops
Float to float connections

- Timber walers
Float to float connections

- Timber walers
- Low Freeboard
Wood Float Repair

- Decking
- Bull rails
- Whalers
- Floatation
- Cleats/ bollards
- Pile collars/ piling
- Connection hardware
- Fenders
- Utilities
- signage
Electrical

- Power pedestals
- Metering
- Receptacles
- Circuit breakers
- Main panels
- Sub panels
- Lighting
- Polarity
- Ground fault detection
- Feed wiring
- Vault covers
Docks & Piers

- Decking
- Railings
- Piling/ caps/ stringers
- Diagonal bracing
- Load rating
- Fenders
- Utilities
- Fuel systems
- Lighting
- Signage
- Security
Docks & Piers

- Structural evaluations
- Load Ratings
Destructive Inspection

- Stringer rot
Stages of Pile Damage

- Worn piles
Timber Piles

- Worn piles
Reference Materials & Information

Sources

- Marinas & Small Craft Harbors, 2nd Addition
  By: Bruce O. Tobiasson P.E & Ronald C. Kollmeyer, Ph.D.

- Northern Harbors & Small Ports, Operation and Maintenance, By: Alan Sorum

- PND Engineers, Inc. Kodiak Harbors Facility Condition Report, Jon Keiser

- USE PCC NET!