Keeping Things Running

Preventative Maintenance

Presentation for PCC Conference, Friday Harbor, April 2007

By: Lon A. White & Ray Majeski,

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

STRUCTURE	Top& Bottom Chords	Web Members	Hinge	Sidesway	Skid Resistant Surface	Steepness	Float Buoyancy	Signing	Lighting
Gangway									
Sheikok Ramp									
Dock 1 Ramp									
SHH Ramp 1									
SHH Ramp 2									
CTF Ramp									

Float Inspection Checklist

STRUCTURE	FLOAT ITEMS								FLOAT PILES	WATER SYSTEMS
	Bullrail & Cleats	Deck	Walers/ Thru Rods	Floatation (Billets)	Float Connections	Pile Hoops	Freeboard	Utility Hangers	Type	
B-FLOAT										
Mainwalk Float										
Slip #										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
12										

Facility Inspections

- 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…

Documentation

- 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

Maintenance Techniques

What are your biggest maintenance issues?

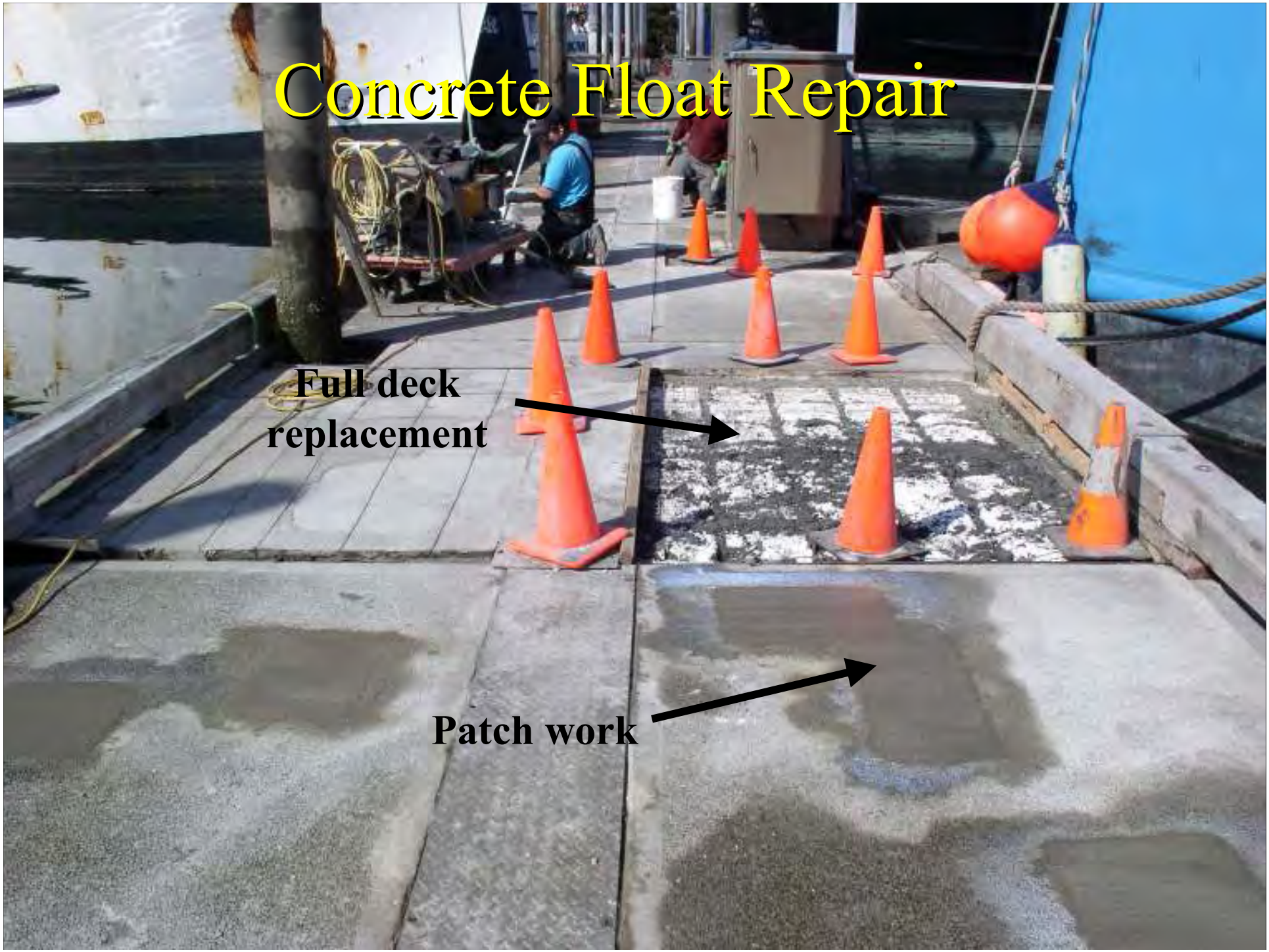
<u>Group discussion:</u>

- Concrete floats
- Wood floats
- Electrical
- Docks & Piers
- And more…..

Concrete Float Repair

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

Concrete Float Repair



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

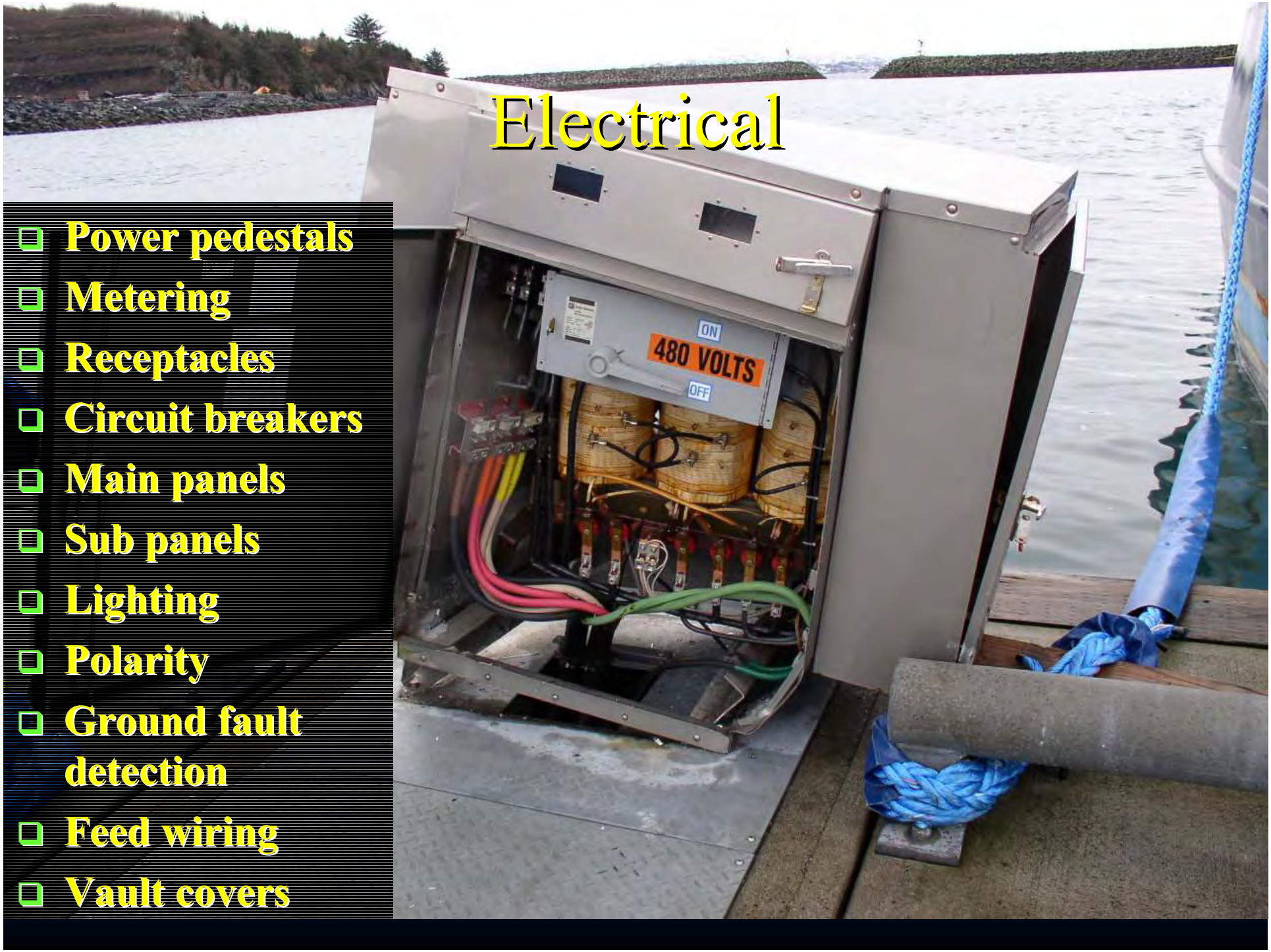
- Timber walers
- Low Freeboard

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!