PIANC Workshop
13-14th September 2011

Innovations in Lock Equipment

Olli Holm,
Finnish Transport Agency, Finland
Jörg Bödefeld,
Bundesanstalt für Wasserbau, Germany

PIANC
Setting the course

Contents

- Mooring Equipment
- Protection of the Gates and Gate Maintenance Equipment
- Signalling, Marking and Illumination
- Aids to Navigation
- Security
- Safety of Public, Users and Personnel

Mooring Equipment

Failure modes

- High strength mooring lines available nowadays
  - Mooring line is no more the weakest link in the system
  - Danger of bollards being catapulted (dangerous!)
  - Danger of damaged construction (expensive!)

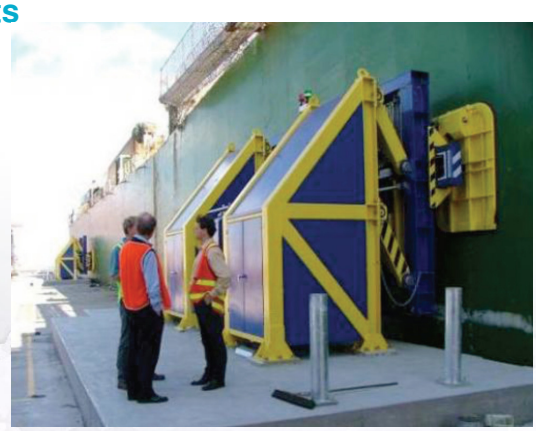
Influence on design

- Replacable bollards
- Avoiding damage of the construction

Mooring Equipment

Automatic Mooring units

- For sea locks
- Vacuum principle
- Uniform shape of vessels necessary



Cavotec®, New Zealand

Mooring Equipment

Floating pontoon

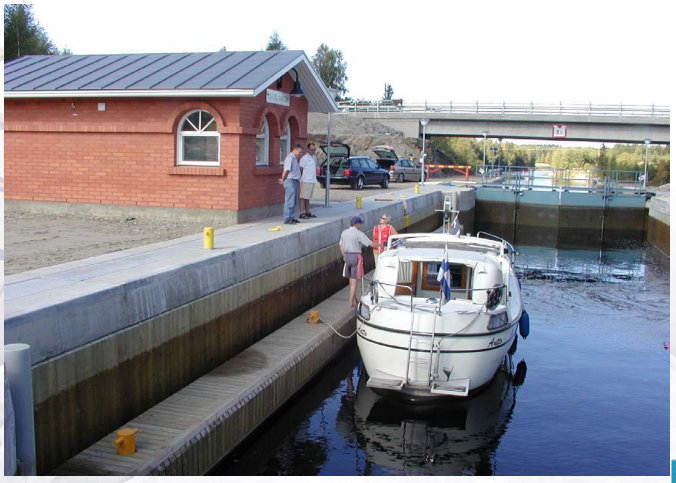
- Two parallel steel piles attached to two steel pillars
- Bollards for mooring on the pontoon
- Wooden boarding for walking

Fit well for

- Recreational navigation or smaller ships
- Locks in rock

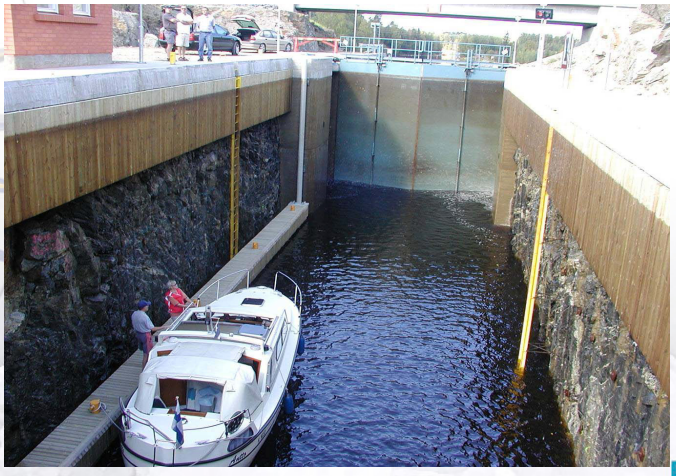
Mooring Equipment

Floating pontoon (Juankoski Canal, Finland)



Mooring Equipment

Floating pontoon (Juankoski Canal, Finland)



Protection of Gates and Gate Maintenace Equipment

Gate protection

- In open position usually wooden planking or rubber pumpers
- In closed position several option to hinder vessels from colliding with gates
  - Traditionally rubber or spring pumpers
  - Double set of gates
  - Special protecting structure

Flood control

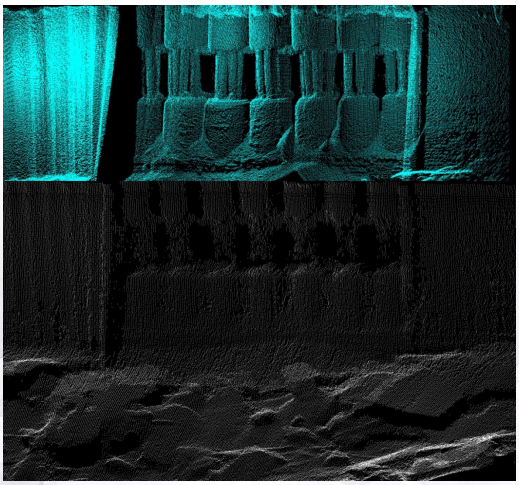
- Possible in some gate types; enabling that gates can be secured in any partially open position. Public safety also vital!

Protection of Gates and Gate Maintenace Equipment

Maintenance

- Usually bulkheads for dewatering of the lock
- Inspection tunnels etc. also used in some locks
- Minor maintenance by divers
- Multi-beam sonar in surveys

Example of Multi-beam Survey Results



Signalling, Marking and Illumination

Signalling
- Local legislation and international agreements
- Illumination should support colour recognisation

Marking
- Visual guidance is important
- White stripes are efficient
- Moderate use of reflecting surfaces

Illumination
- Low level of illumination
- Illumination directed into most important places in locks only

Aids to Navigation

National or international standards or legistlation must be followed

Extra navigational aids in locks, which are not usually covered by standards or legistlation

- Stop stripes
- Marks on the gates
- Distance marks

Freedom of choice in type and colour, but clarity is very important

Should be similar in every lock

Security

Level of needed security measures varies

- Locks often interests public, so a suitable combination is needed
- Sightseeing places for public (also a safety question…)
- Risk level i.e. hazardous cargo, results of lock failure etc…
- Nature, landscape, cultural heritage
- Some features from airports and railway stations can be adopted
  - Fenches, controlled entrances and electronic monitoring is needed
- Security features should be intergrated in lock desing to minimise negative influences
- In existing locks security features should be designed as an entinity

Safety of Public, Users and Personnel

Typical risks

- Person falling into the lock
- Accidents caused by moving gates
- Fire or spill of hazardous cargo
- Vandalism

Safety risks for public and vandalism can be reduced by security measures

Safety of Public, Users and Personnel

Public safety

- Life rescue equipment
- Monitoring

Users and personnel safety

- Prevention of gate misuse
- Safety sensors

In addition in remote operated locks and user-operated locks

- Enough cameras to monitor the lock traffic
- Possibility to take over the lock operation
- Telephone connections, instructions signs, loudspeakers
- Possibility for local operation of lock

Safety of Public, Users and Personnel

In addition in user-operated locks

•Slow operation speed

•Stand-by personnel

Note! Quality of data connections is important (damages from thunder, damages caused by humans etc..)

Flood control

•Warning system and prevention of entering the lock

Fire fighting

•Fire-fighting equipment

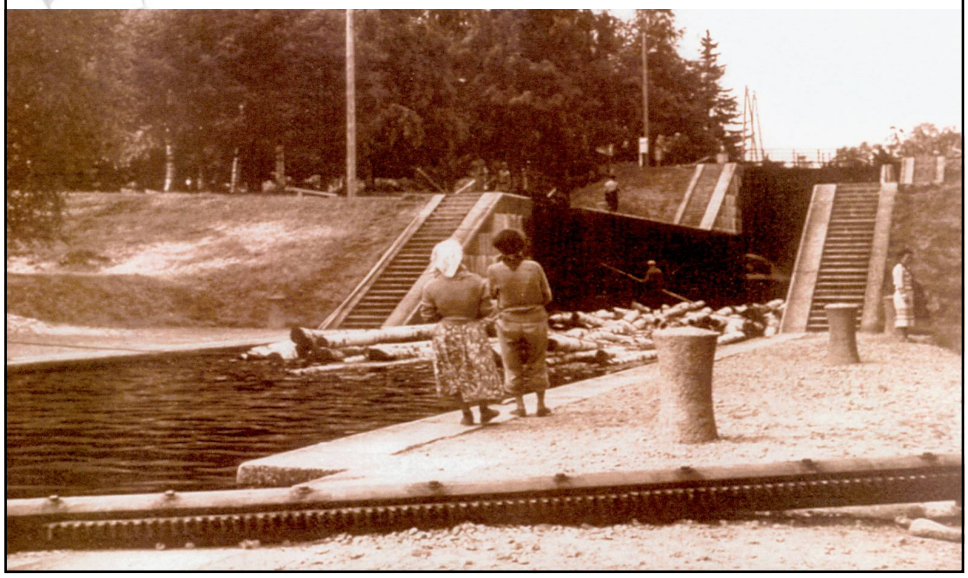
•At least two evacuation routes

•Routes for fire brigade both from land and water side

Safety of Public, Users and Personnel

Hazardous cargo

Codecs usually set demands

- Distances to other vessels, other facilities and public
- Operation of locks
- Lock equipment and escape routes
- Safety procedures

Thank you!