



# Steel Pontoon Corrosion Prevention and Maintenance Plans for A Floating Bridge in Osaka

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# The Yumemai Bridge







# MAINTENANCE

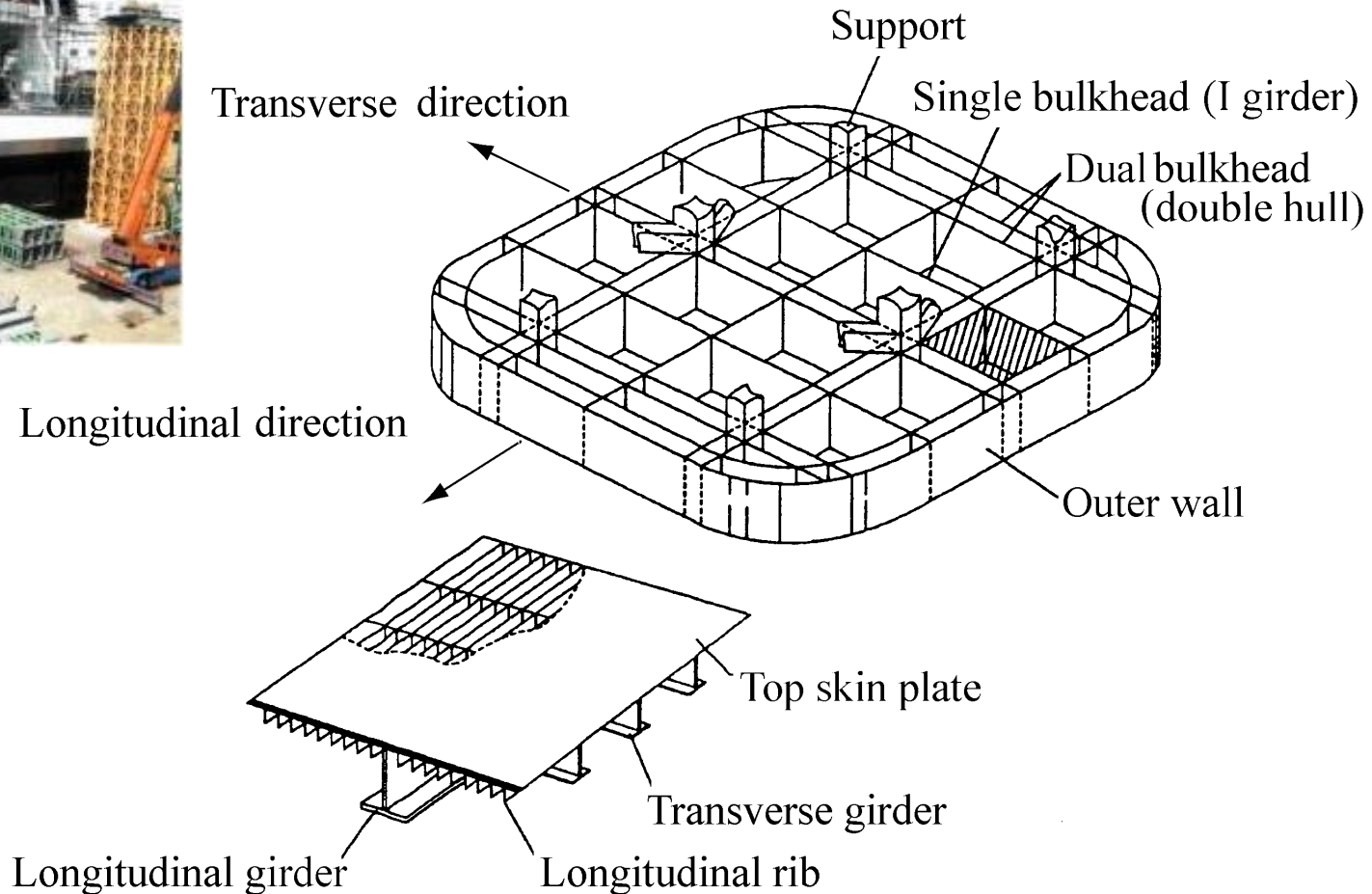
## Floating bridge superstructure

- Outer surface ▪ ▪ ▪ ▪ ▪ Fluororesin coating
  - 1) Excellent durability
  - 2) Good gloss
  - 3) Minimum service life may be 10 years
- Girder inside ▪ ▪ ▪ ▪ ▪ Epoxy coating
  - 1) Thermal effected parts ▪ ▪ ▪ Modified epoxy coats
  - 2) Non-thermal effected parts ▪ ▪ ▪ Coal tar epoxy coats

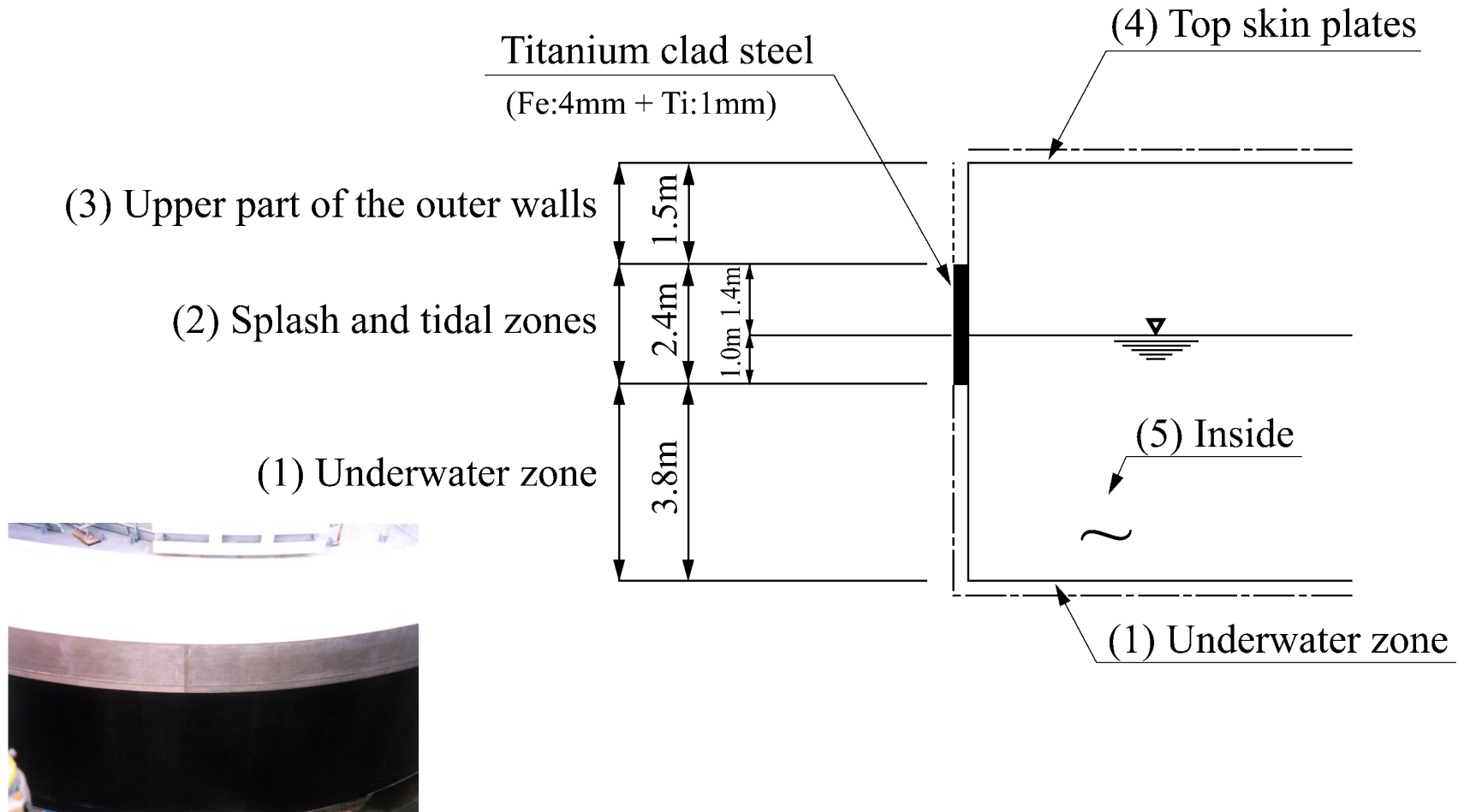
Figure 11. Scene of Bridge Swinging



# PONTOONS



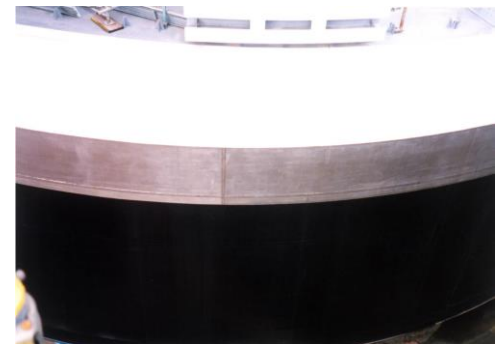
# PONTOONS



# PONTOONS

- 5 Classifications

- (1) **Under water zone**: Coal tar epoxy coating and Cathode protection
- (2) **Splash & tidal zones**: titanium clad steel lining
- (3) **Upper part of outer walls**: heavy-duty high-build urethane coating(2500μm)
- (4) **Top skin plates**: fluororesin coating
- (5) **Inside**: coal tar epoxy coating



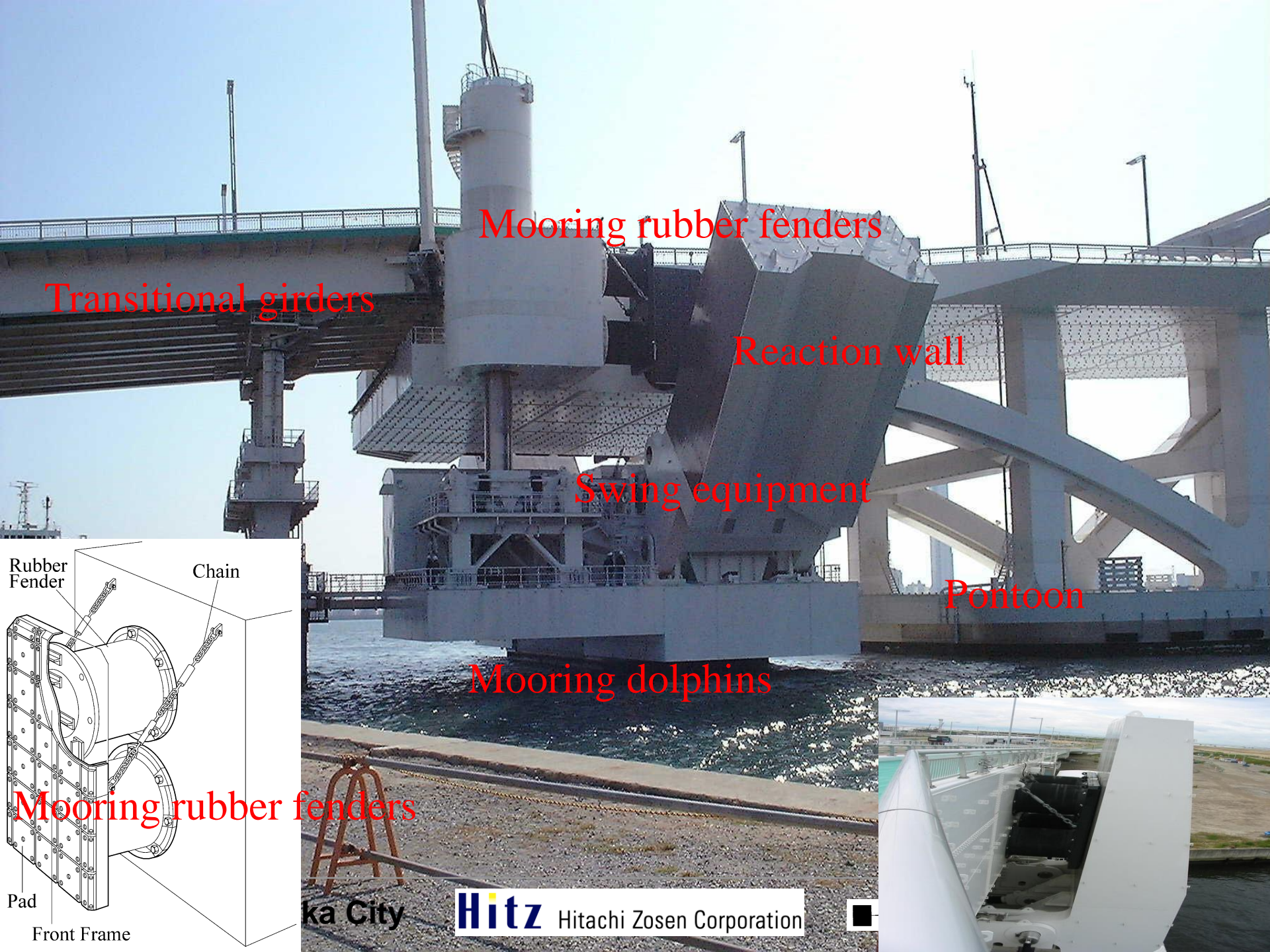
# PONTOONS

- Underwater zone
  - 1) Cathode protection rate is 90 %  
Aluminum cathodes are used
  - 2) 10% is shared by the increase of outer wall thickness ( 1mm: service life 50 years)



# PONTOONS

- Application of **titanium clad steel lining** for splash zone (the most severe corrosion zone)
  - 1) Excellent resistance against corrosion conditions
  - 2) Long-term durability without maintenance
- **High cost and need for good welding circumstance**
- **Reason of application**
  - 1) Pontoons are vital parts of the floating bridge
  - 2) Application range is limited to the waterline



Mooring rubber fenders

Transitional girders

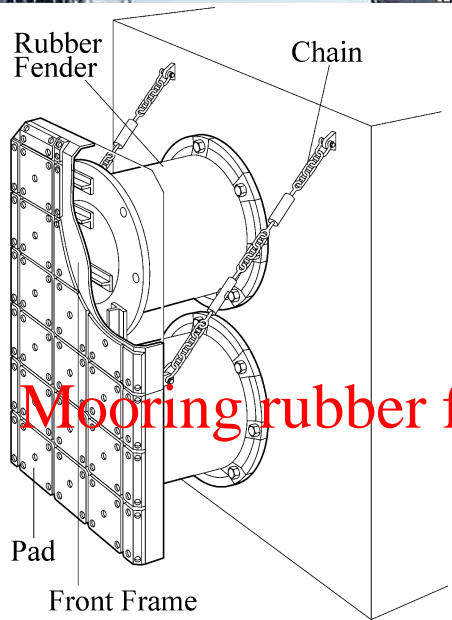
Reaction wall

Swing equipment

Pontoon

Mooring dolphins

Mooring rubber fenders



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# Swing Equipment

## Monthly inspection

- Check for oil leak from hydraulic equipment
- Check coating for signs of corrosion
- Check for any loose fasteners (i.e., bolts)

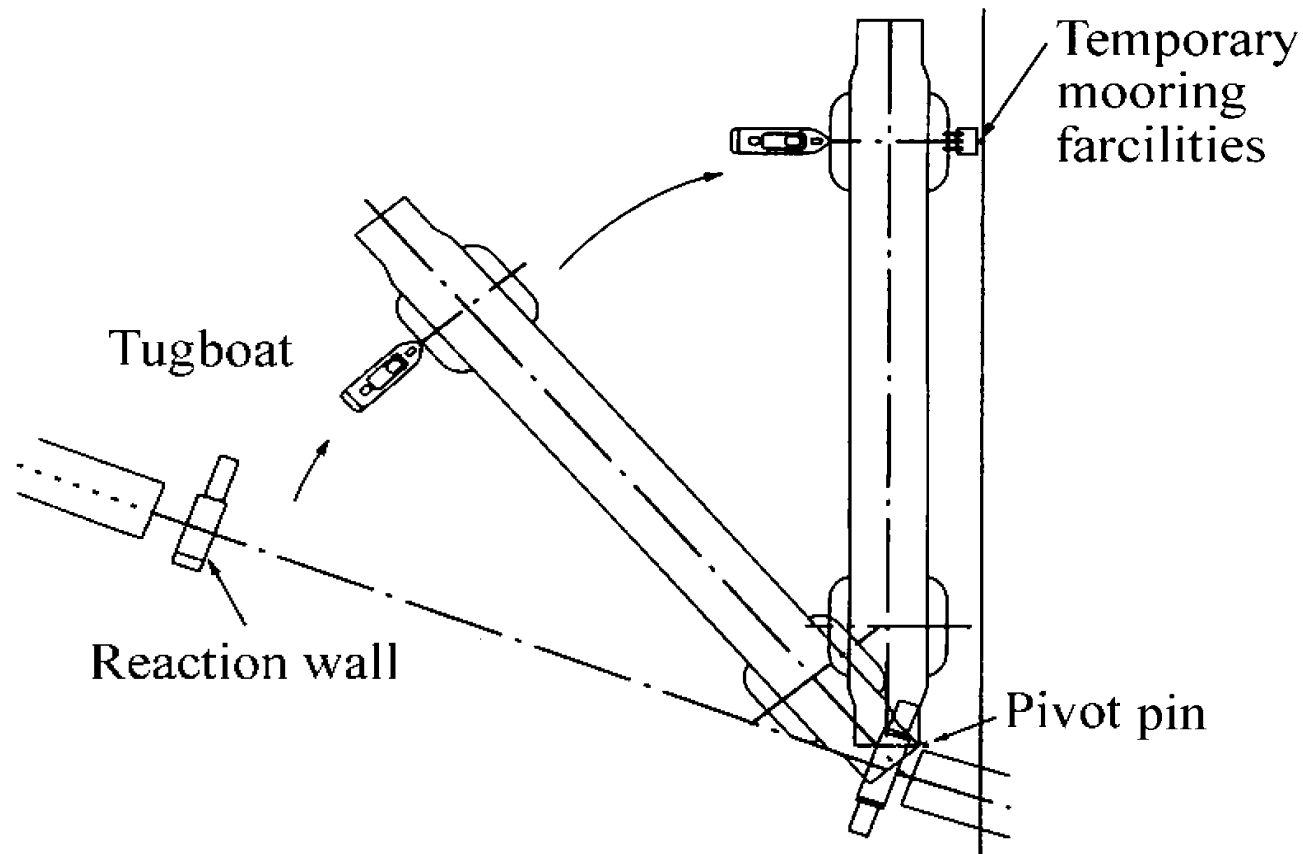
# Swing Equipment

## Annual inspection

- Hydraulic oil sampling test
- Measurement of cylinder leakage amount
- Measurement of cylinder speed



# Swing Operation



STEP4 Swing the bridge by tugging

# Swing Operation Check

- Since rarely used under the actual load, the devices are susceptible to binding and deterioration, and become inoperable.
- Rare occasions of operating it may result in the lack of skills or knowledge of operation and can lead to improper operation or judgment.

The swing operation check is performed to prevent these problems by swing the bridge open based on the operation manuals once every year.



# Special Inspection

Special inspections should be performed without delay when the mechanical and electrical equipment is likely to be damaged by an earthquake, lightning, abnormal weather or other conditions.

# Precision inspection

The precision inspection is performed when the above inspections and measurements revealed a problem or alteration in the equipment or devices, requiring further investigation and measurement. Close investigation is to be carried out in a proper manner immediately, and appropriate measurement are to be determined.

# SPECIAL CONSIDERATIONS

- Ground displacement and subsidence
- Collision of ships

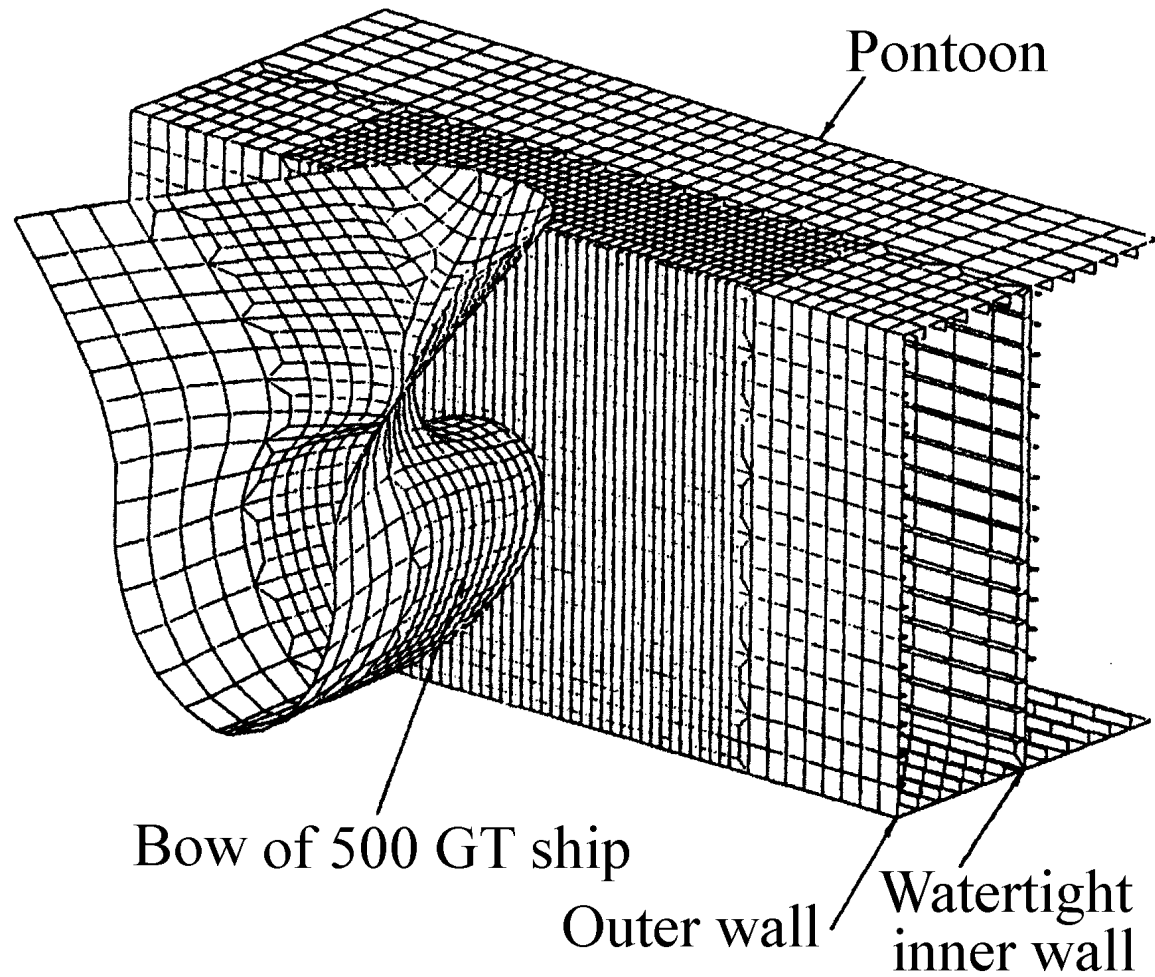


Figure 13. Ship Collision FEM Model



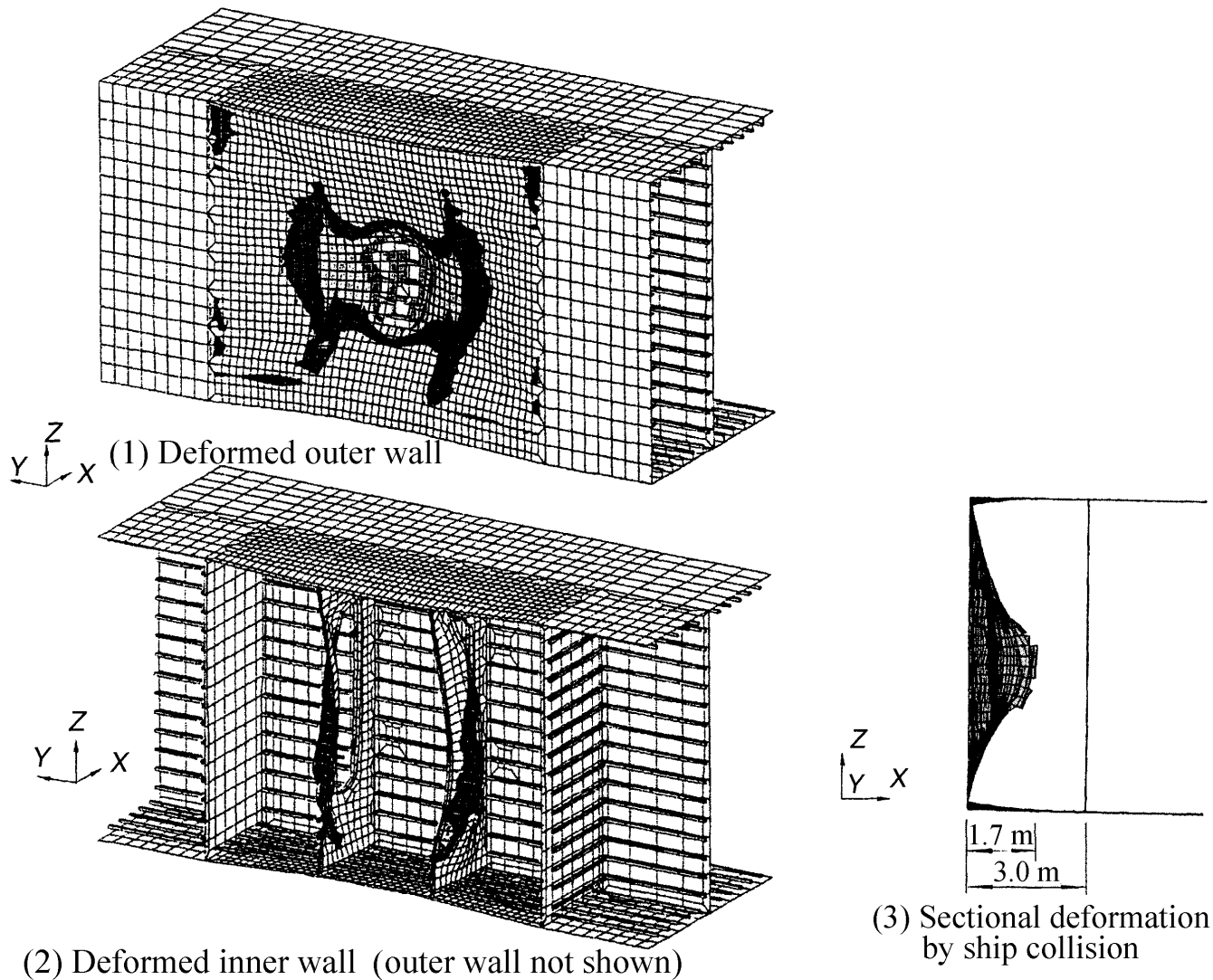


Figure 14. Results of Ship Collision FEM Analysis

# CONCLUTIONS

- This report showed unique maintenances plans for floating bridge with swing mechanicals.
- Further result will be expected to be a good example for future floating bridges.

Thank you !