

Hyper-K Liner and PMT Support

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for the Cavity and Tank WG

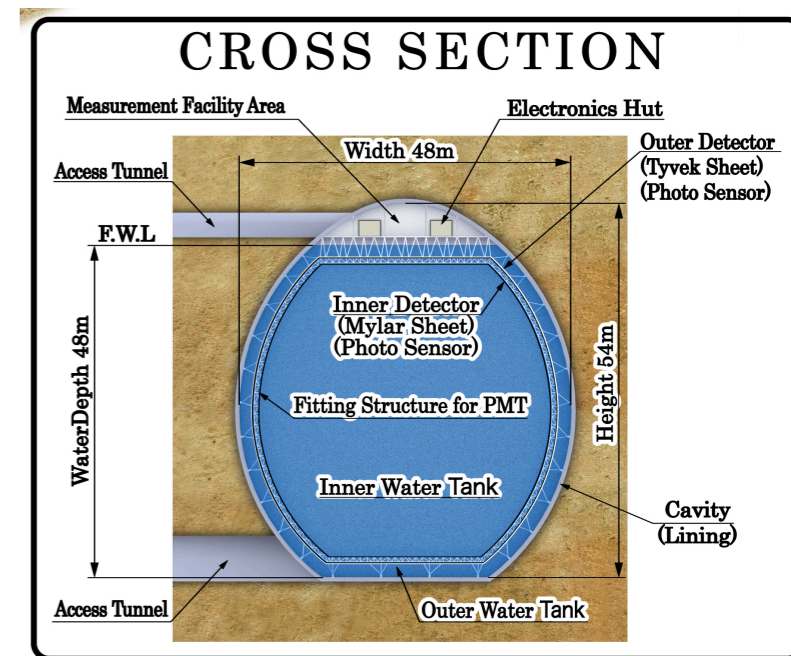
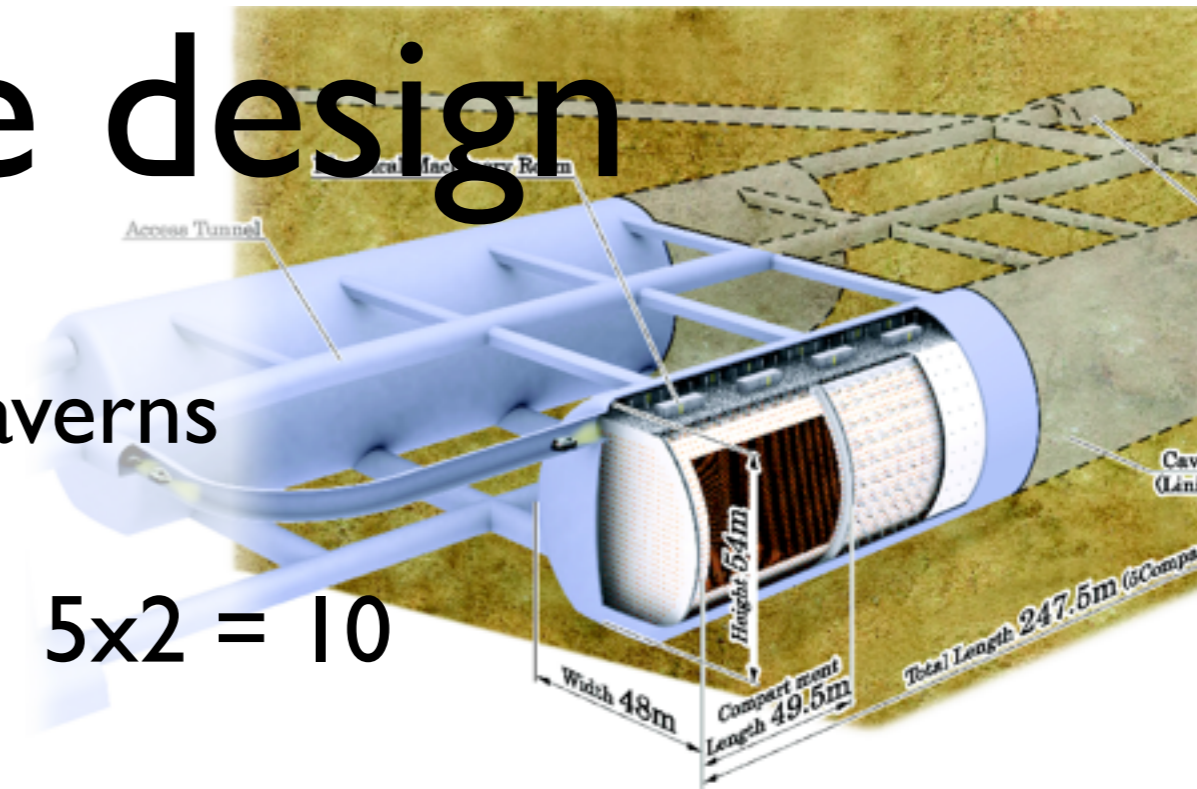
Hyper-K 3rd Open Meeting, June 21st, 2013

Updates from 2nd HK mtg

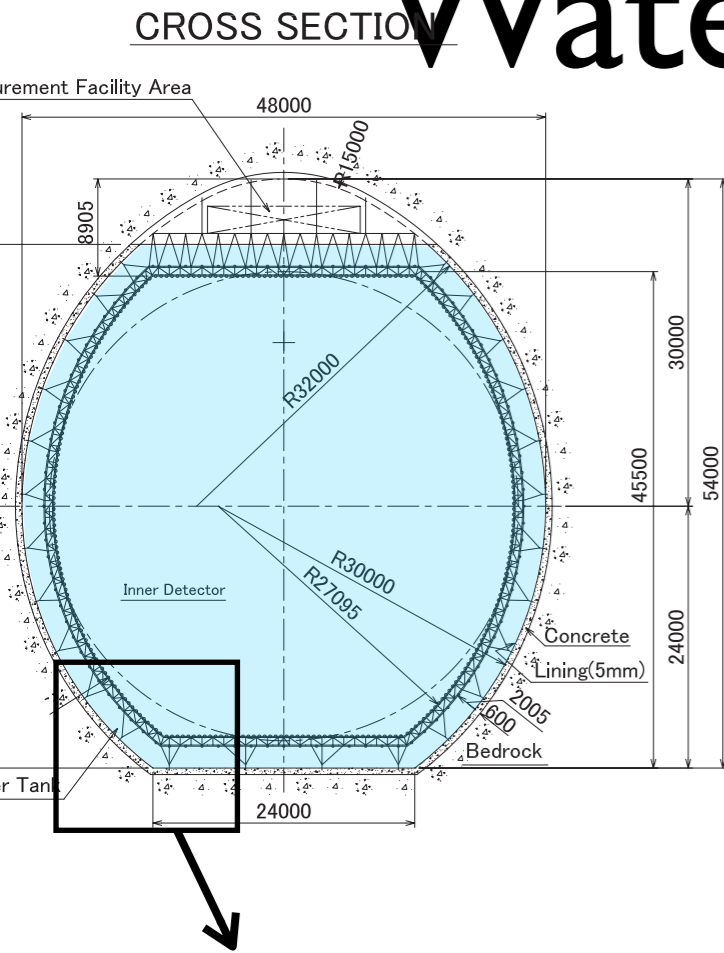
- Design details of the tank-water leak draining system
- Preliminary “overall” construction schedule and cost
- Technical design document on HK tank started drafting

Key parameters of the baseline design

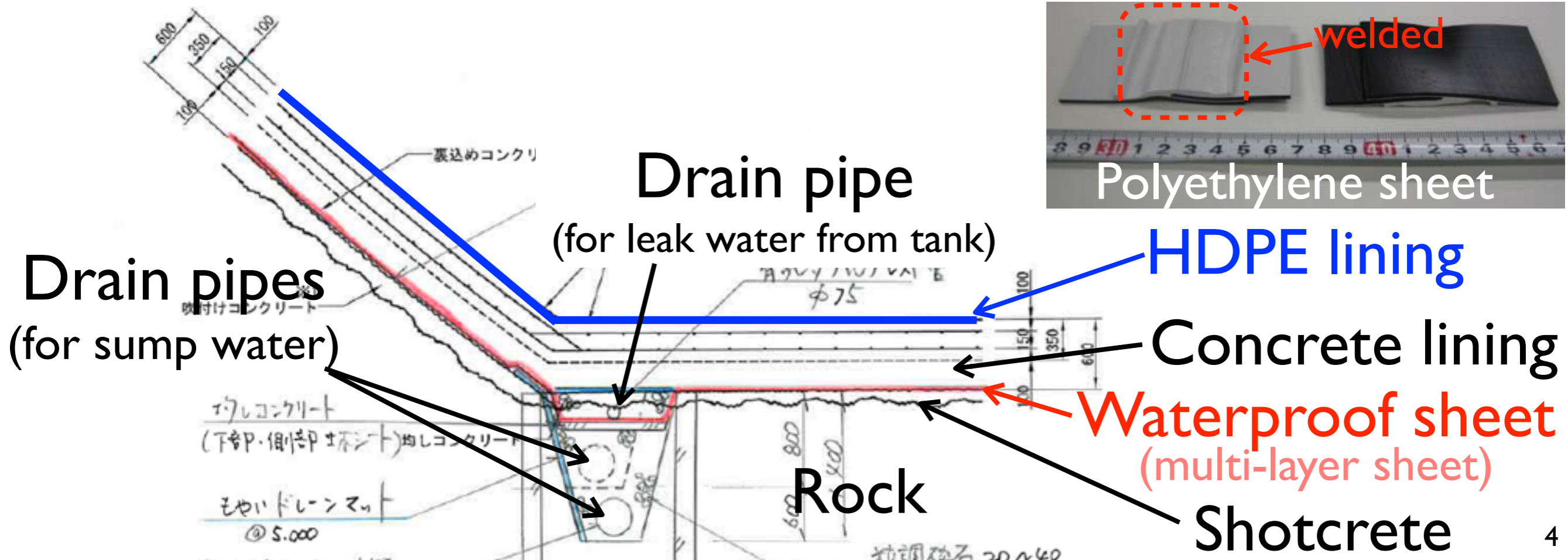
- Cavern size:
48m(W) x 54m(H) x 250m(L) x 2 caverns
- Cavern shape: oval shape (egg shape)
- Optically separated compartments: $5 \times 2 = 10$
- Water Volume:
 - Total: $0.496 \times 2 = 0.992$ Megaton
 - ID volume: 0.74 Mton
 - Fiducial Volume: $0.056 \times 10 = 0.56$ Mton
(25 x Super-K)
 - Depth of tank water: 48m
- PMT
 - ID: ~99,000 20" PMTs (20% photo-coverage)
 - OD: ~25,000 8" PMTs (same coverage as SK)



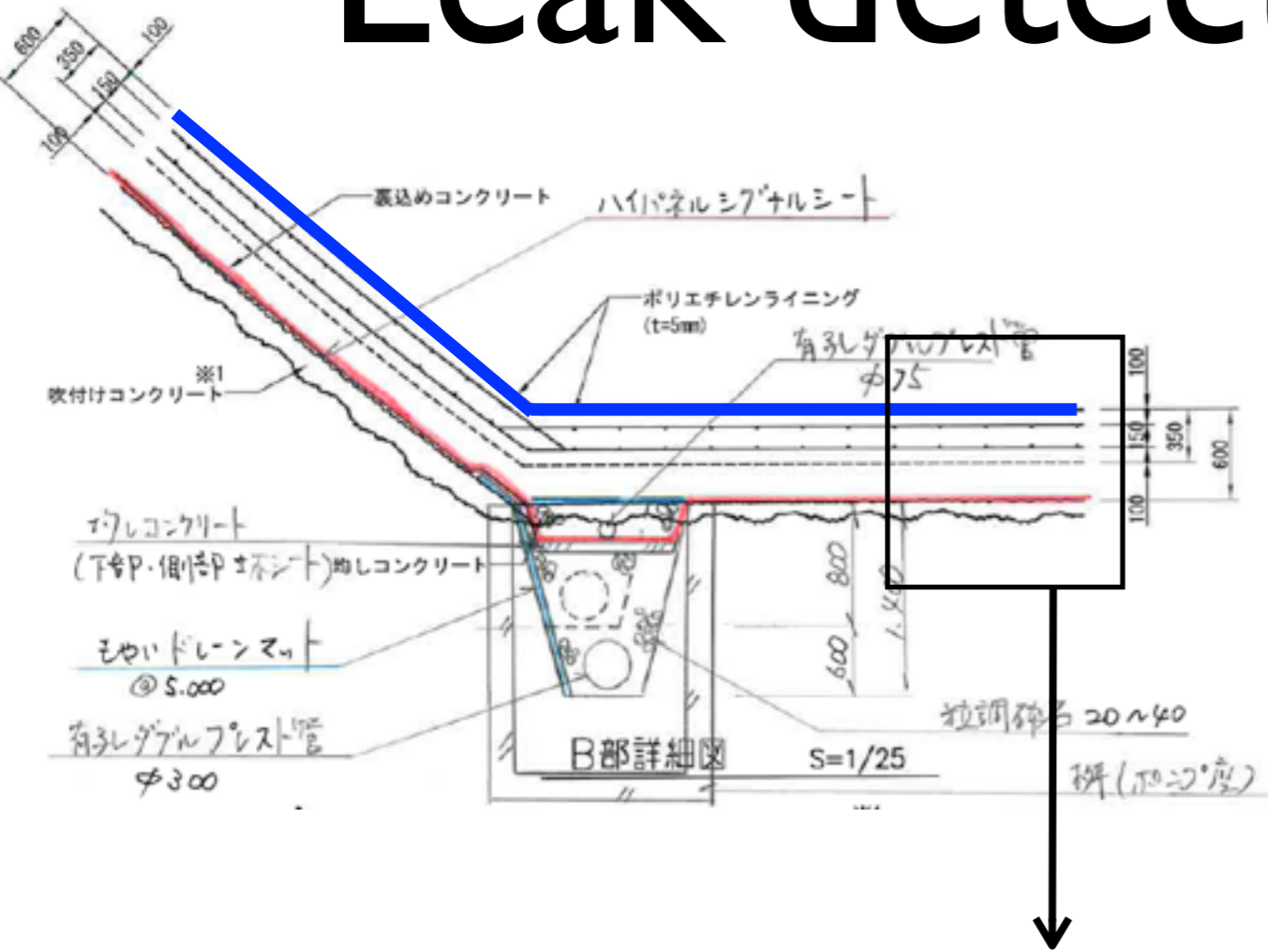
Water Containment System



- Tank lining consists of concrete (60cm) and Polyethylene (5mm) linings
- Plus, additional lining with a waterproof sheet
- Preventing to mix sump-water and tank-water in drain system
- Drain lines are separated for sump-water and tank-water.

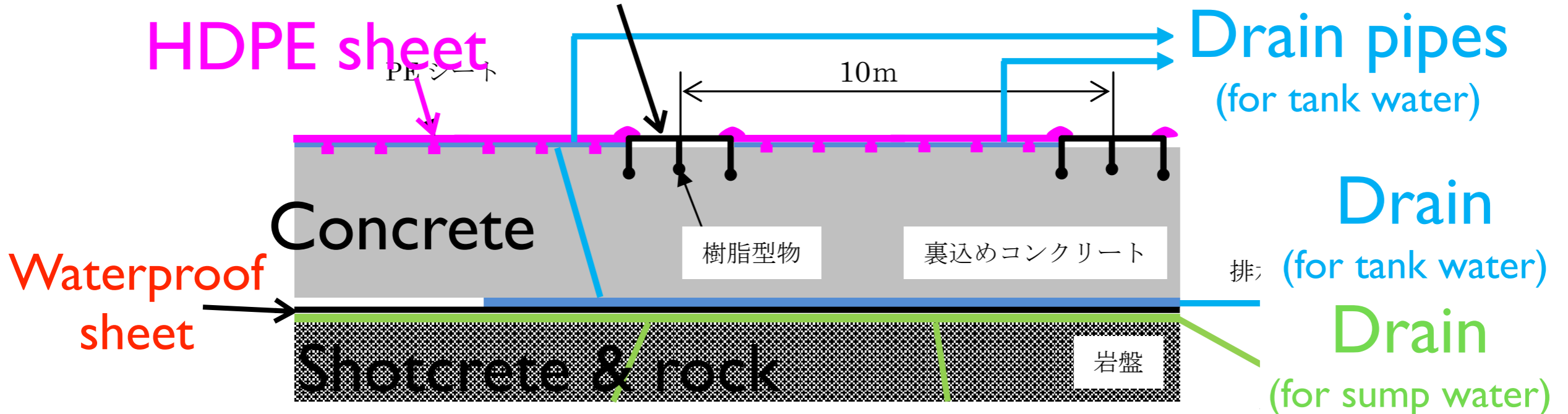


Leak detection system



- HDPE liner segmented into multiple partitions
- Each partition has own drain line, that allows to identify where the leak occurred.
- Need to test the design with a prototype.

Plastic partition



Lining construction

- Use a “movable” scaffolding for constructing the lining (concrete, HDPE etc)
- Size of the scaffolding is about a compartment
- When one compartment construction finished, slide/move the scaffold to next compartment.

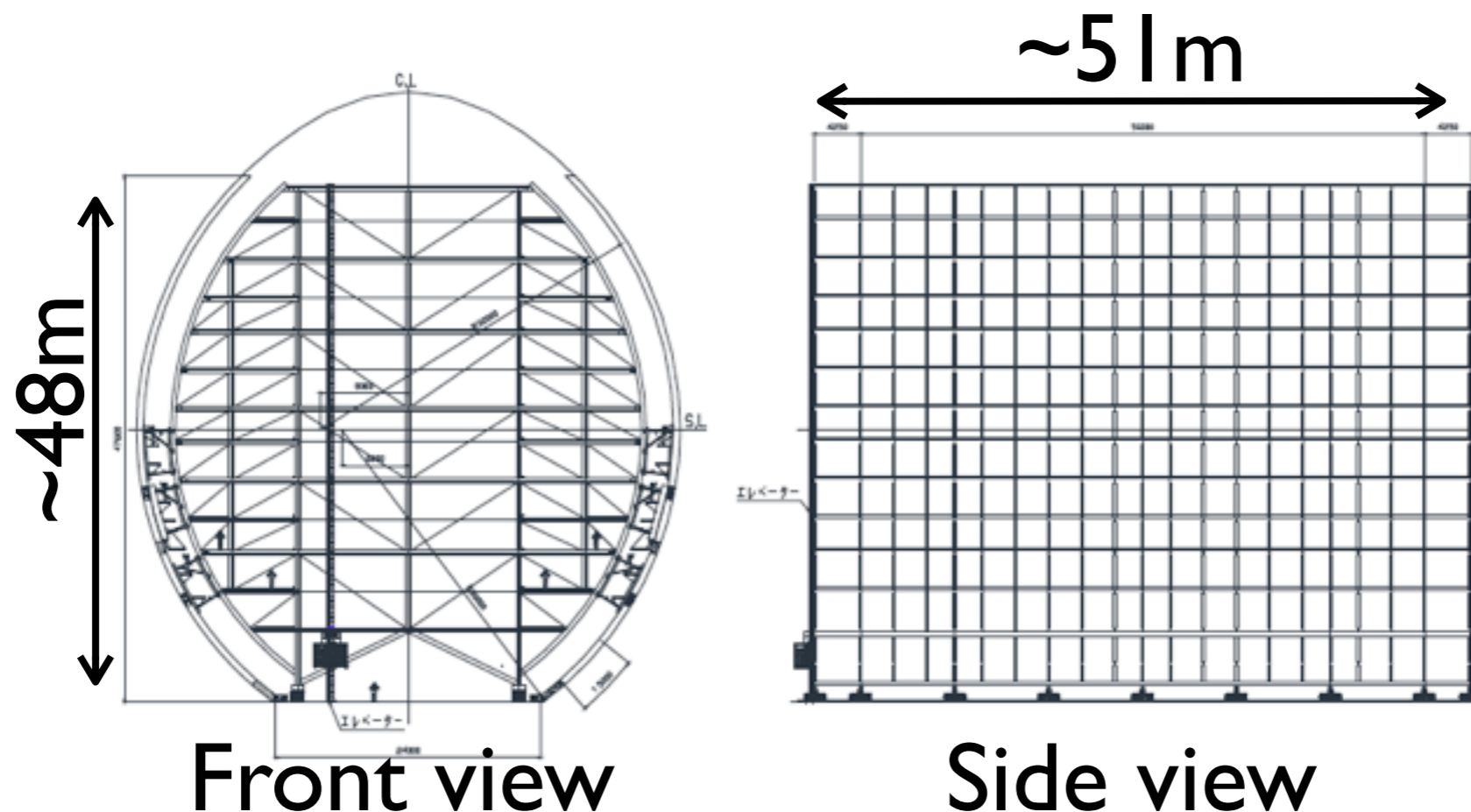
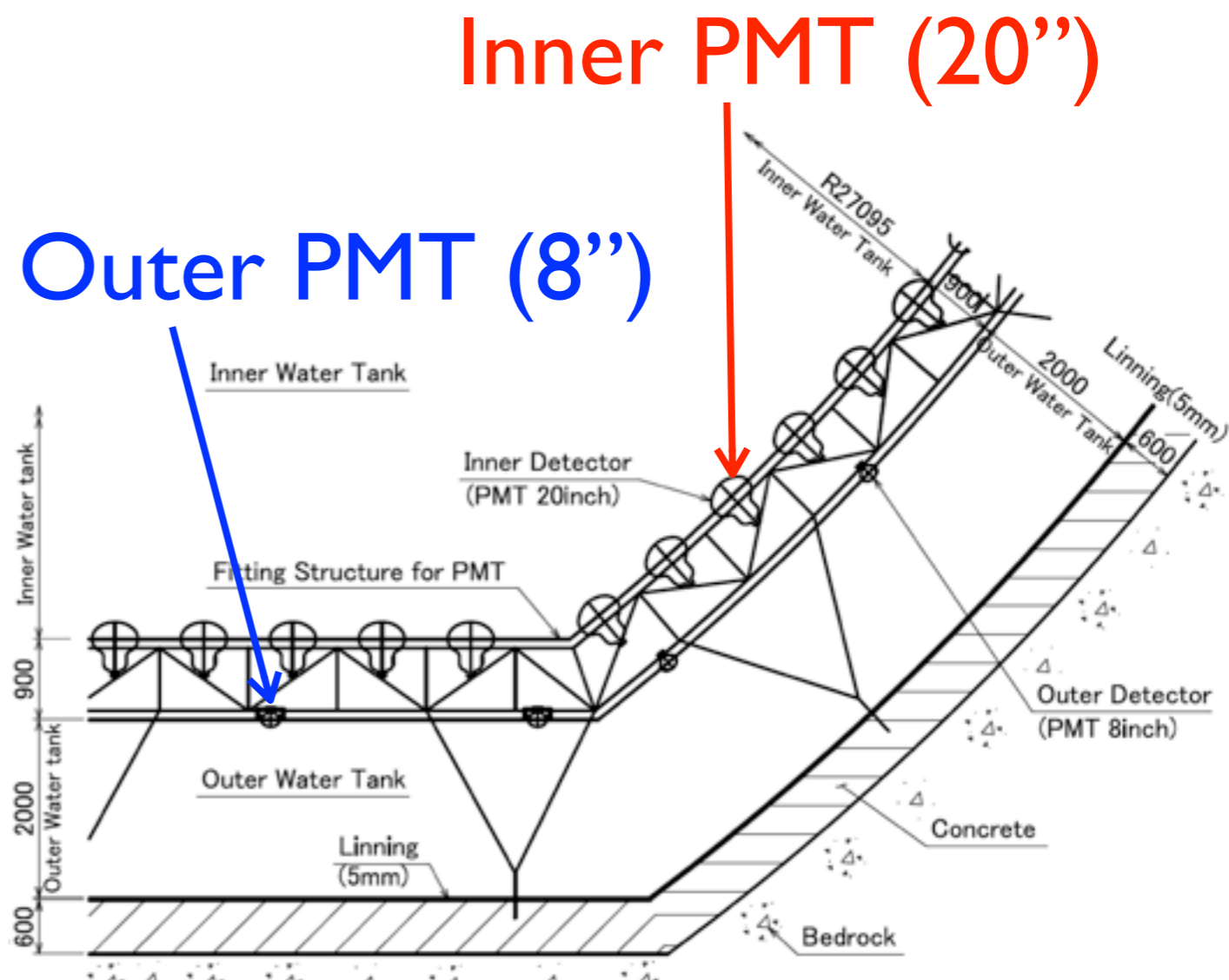
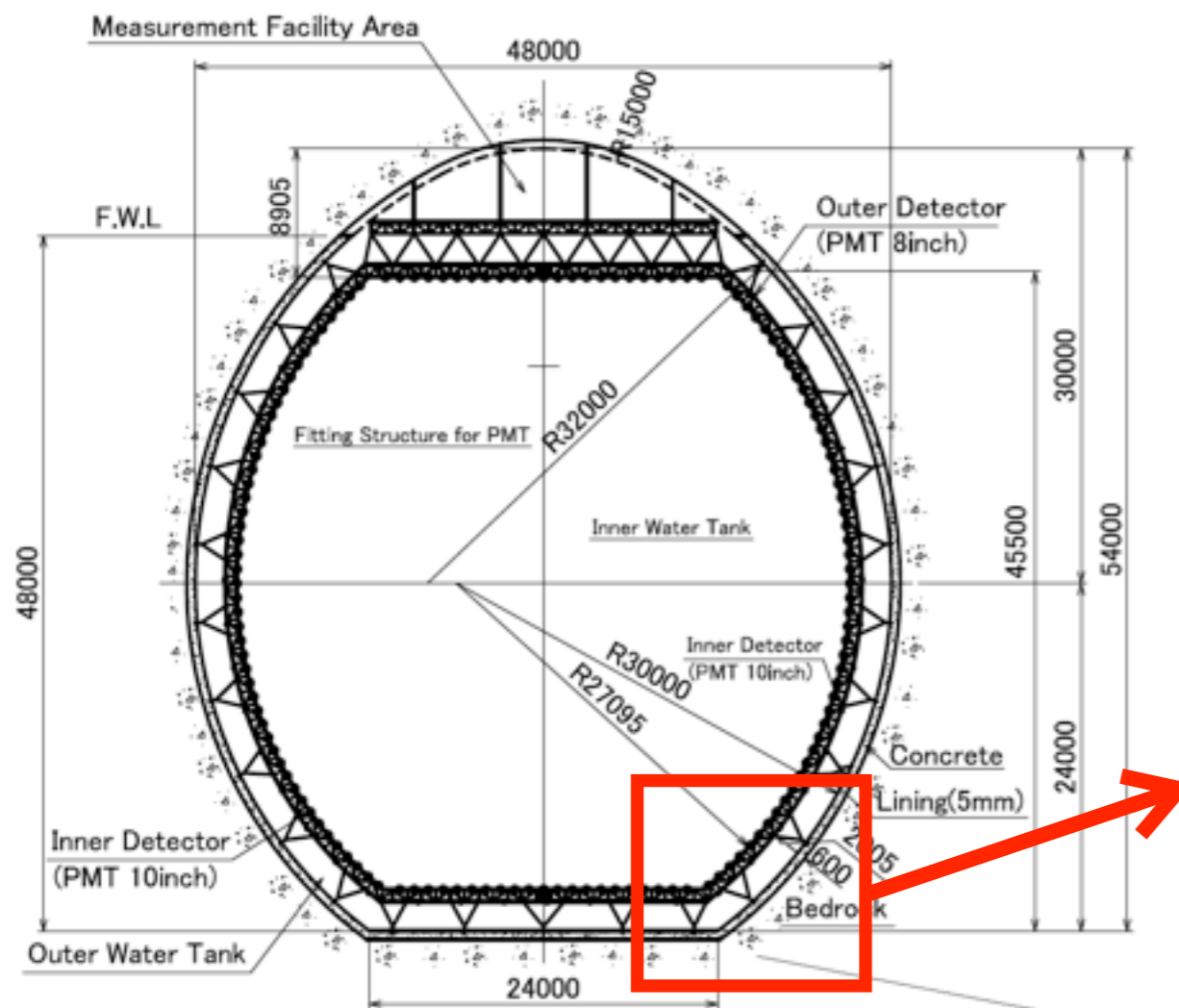


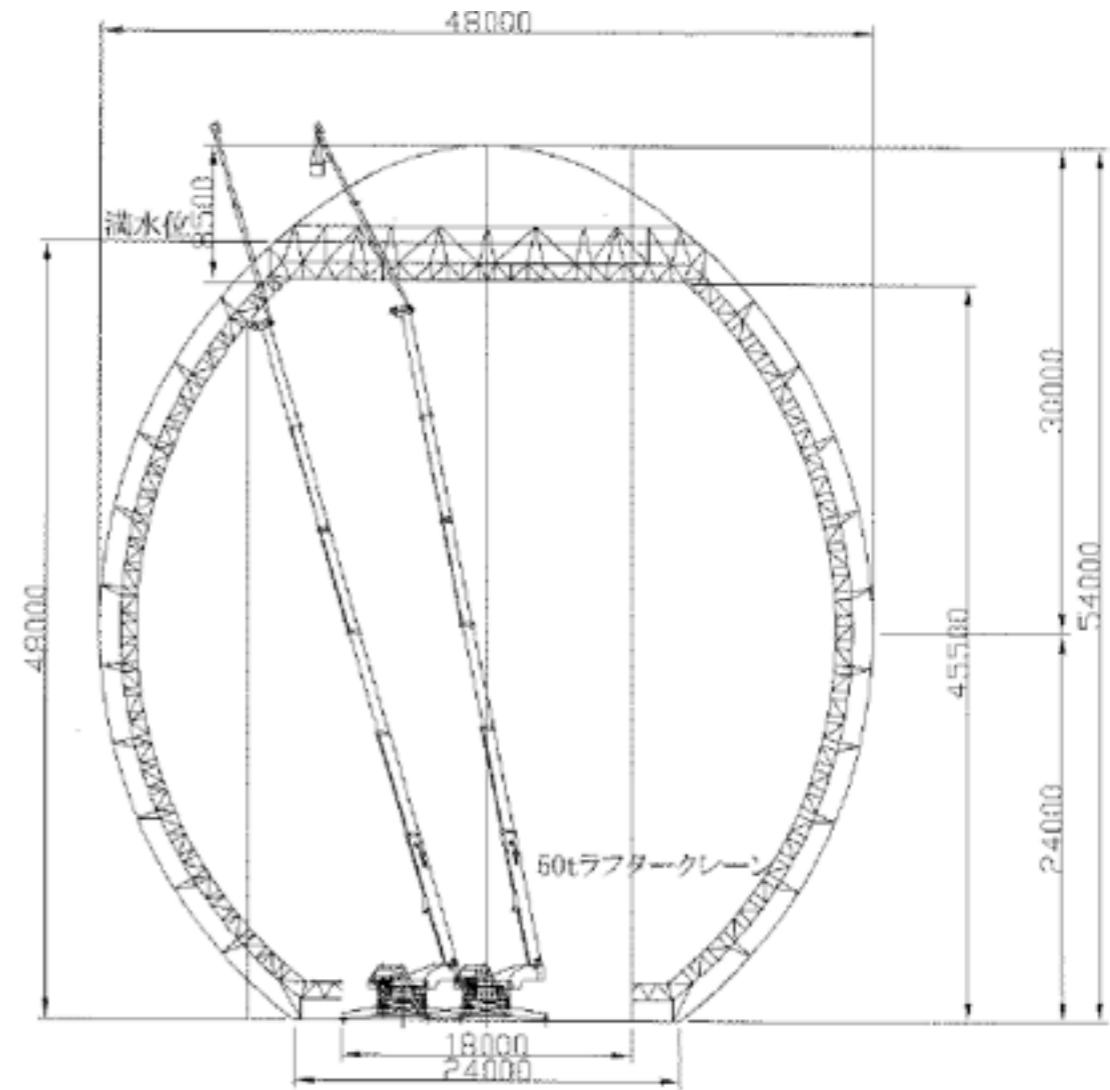
Photo-sensor support

- Number of photo-sensors
 - Inner Detector: ~99,000 of 20" (20% photo coverage)
 - Outer Detector: ~25,000 of 8" (identical coverage to SK)
- Stainless-steel supporting structure holds photo-sensors

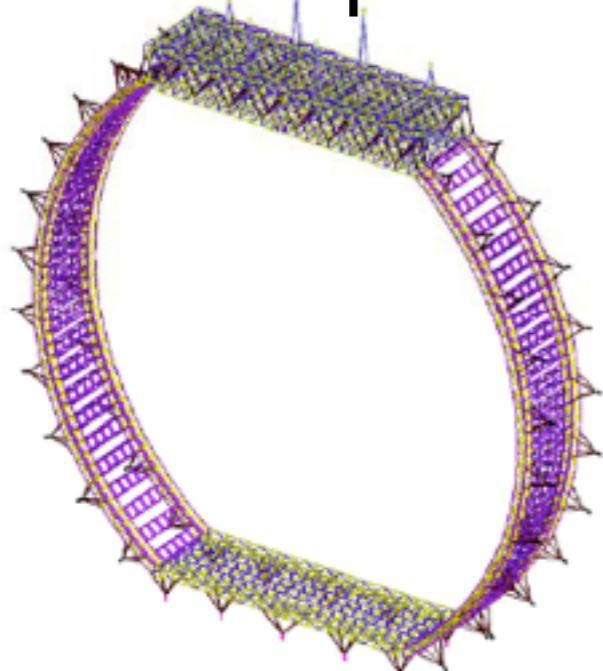


Supporting Structure

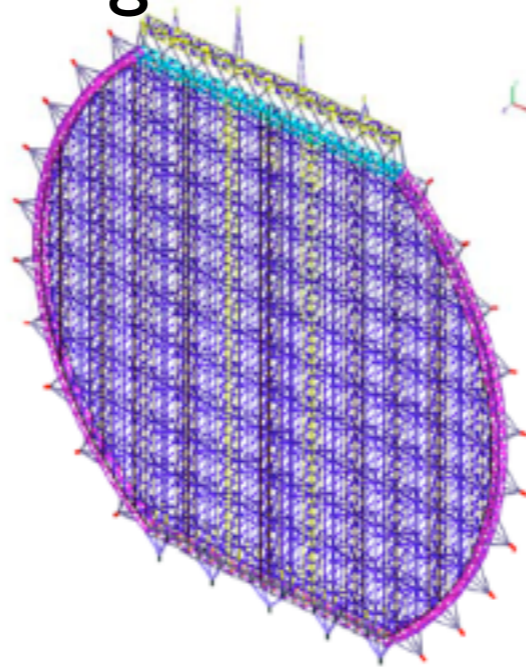
- The construction of the support structure begins after completed the tank lining and move the scaffolding to next compartment.
- Tank lining construction continued in next compartment
- Use a long-arm crane for the support structure construction.



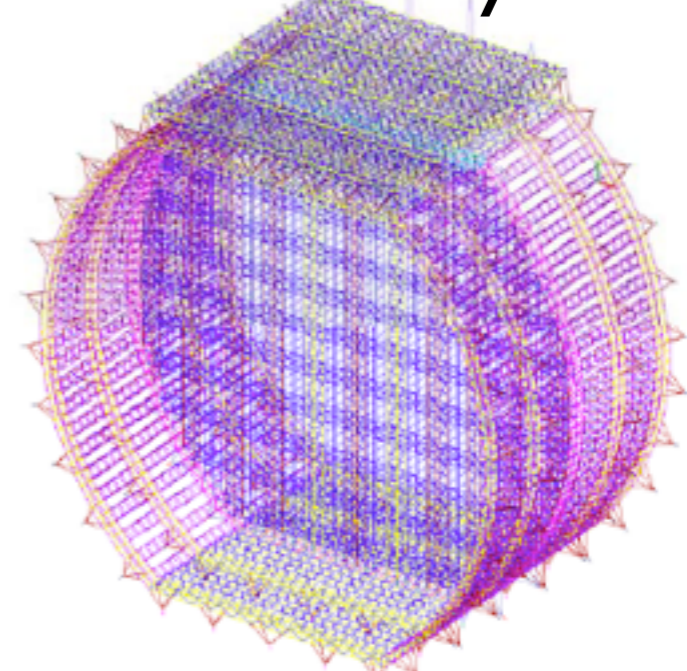
Barrel part



Segm. wall



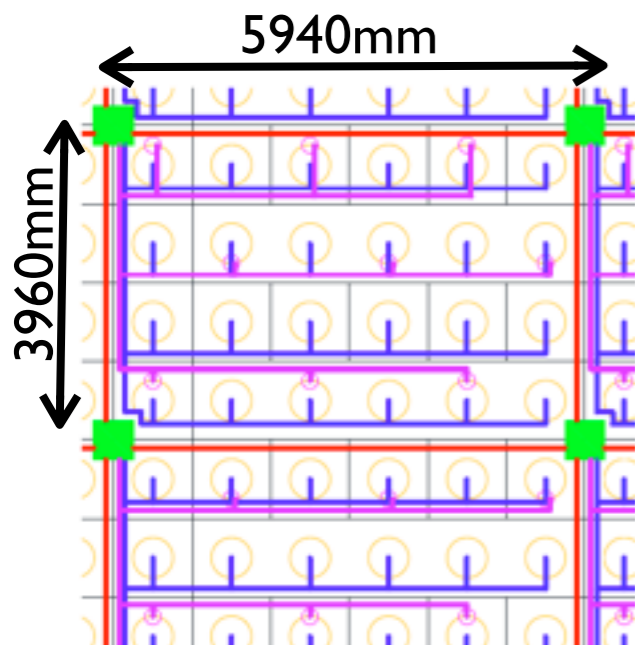
Assembly



Other designing work

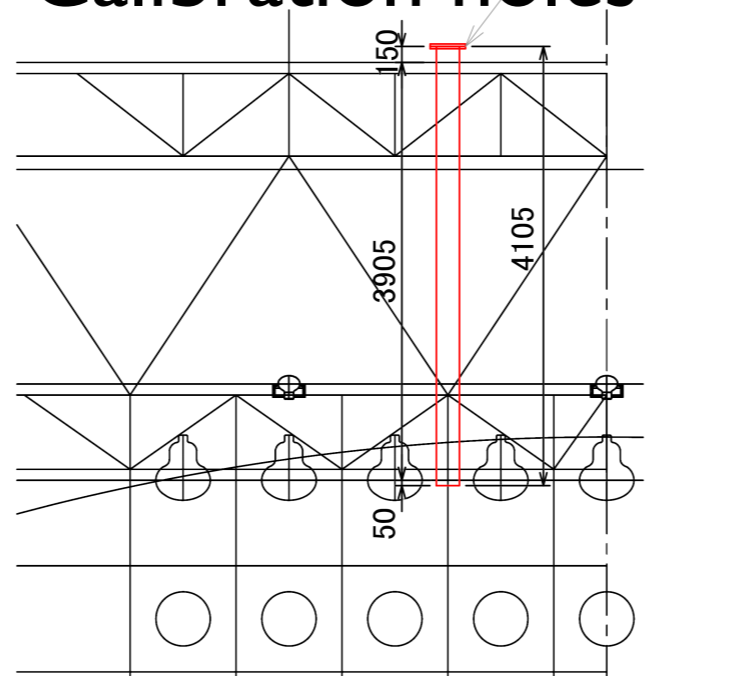
- Major part of HK tank has been designed.
- Include layout of water pipes, front-end electronics, cables, calibration holes, plug manholes, ... etc.
- See my slides in the previous HK meeting

Electronics & cable layout

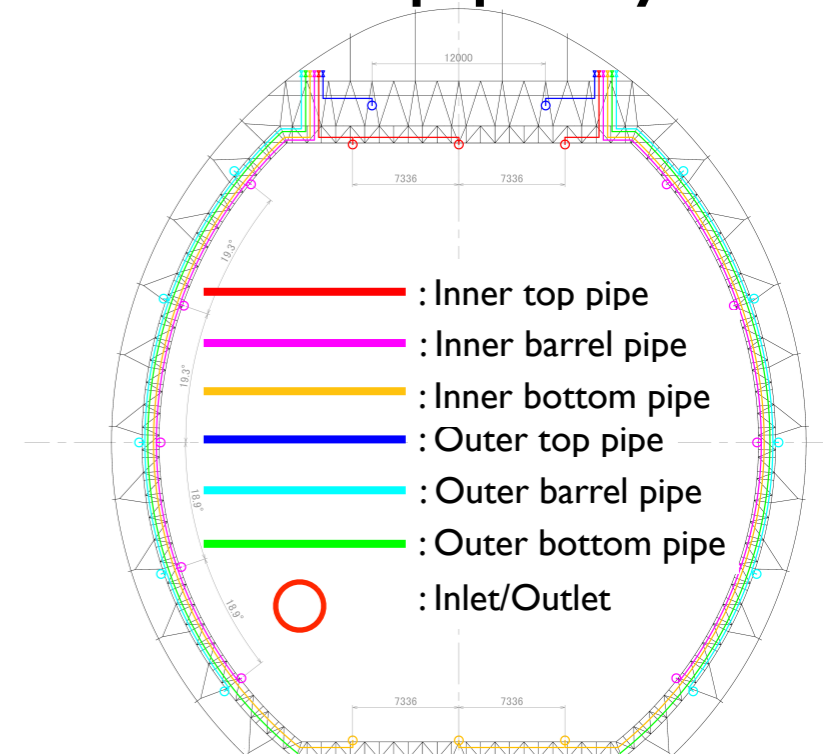


- : Support structure
- : Cable for inner PMT
- : Cable for outer PMT
- : Network/Power cable
- : Hub / Front End Electronics
- : Inner photo-sensor (20")
- : Outer photo-sensor (8")

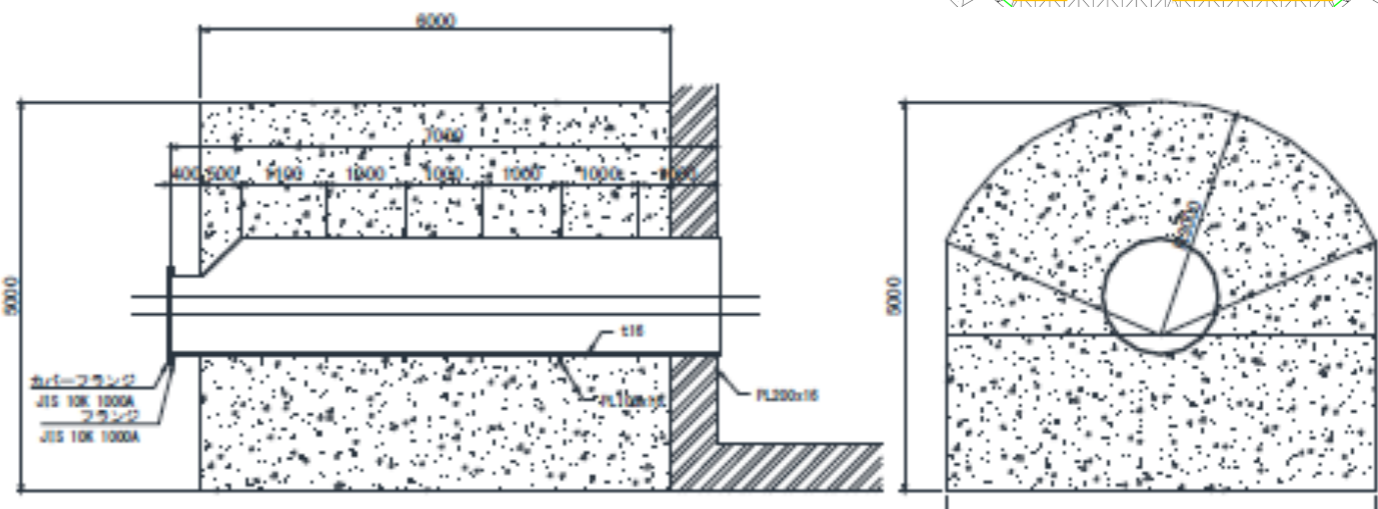
Calibration holes



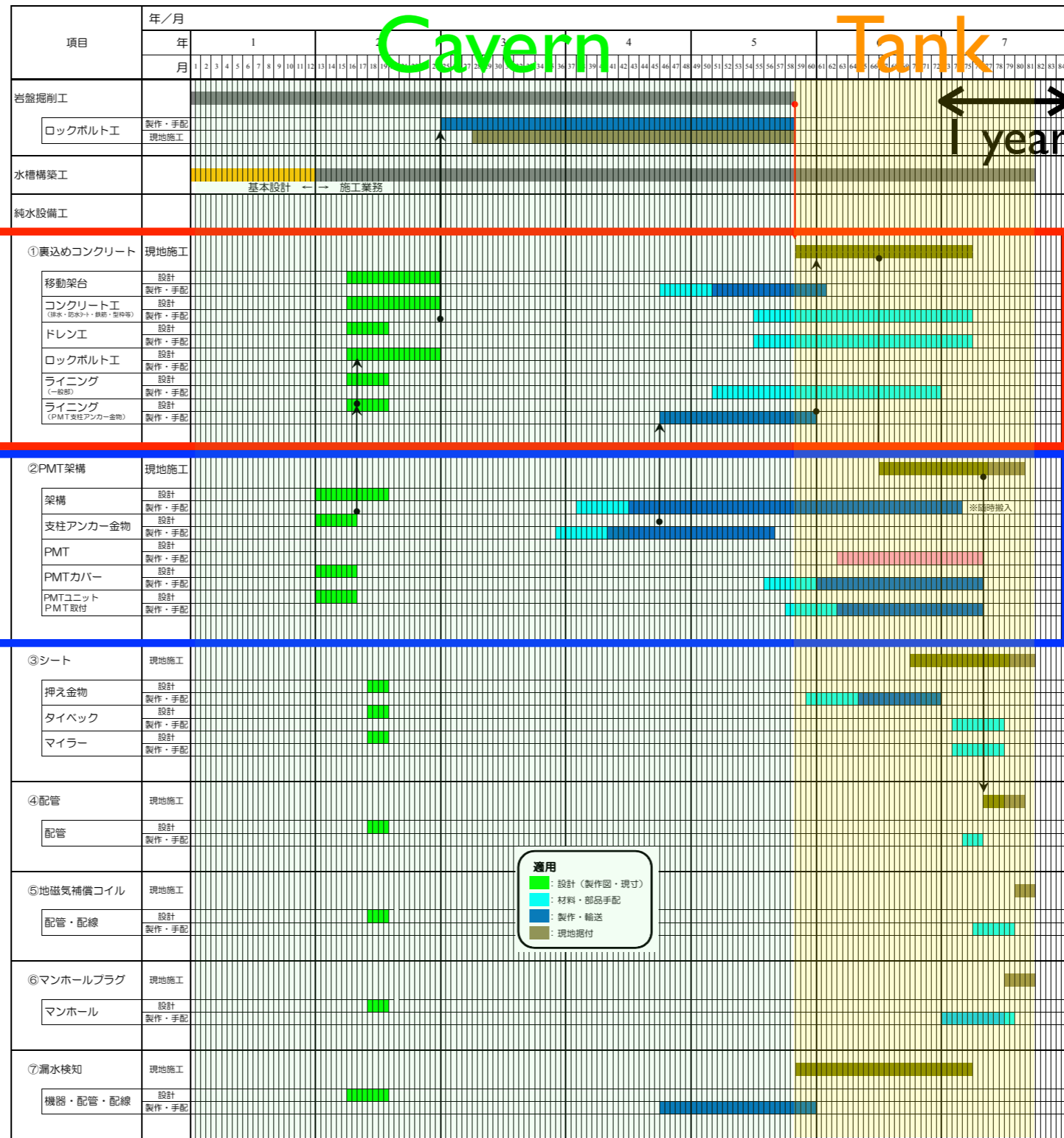
Water pipe layout



Plug manhole



Tank construction schedule



- Tank construction: ~2 years
- Lining: 1 + years, PMT installation: ~1 year

On-going work

- “Wire option” for photo-sensor support
 - in next a few months
- Details of photo-sensor installation procedure
- Photo-sensor housing
 - After photo-sensor shape (glass envelope) decided
 - Underwater implosion test
- Technical design document under drafting
 - Started with the document in Japanese
 - Written up in this summer
 - Document in English will be available by end of this year

Summary

- Major part of the tank designing has been finished.
 - a few remaining items related to photo-sensors
- Overall construction schedule and cost have been estimated
- Technical design report started drafting
 - Will be available by end of this year
- Planning to build a HK tank prototype (1kton)
 - For testing the designs of tank lining, draining system, and leak-detection system