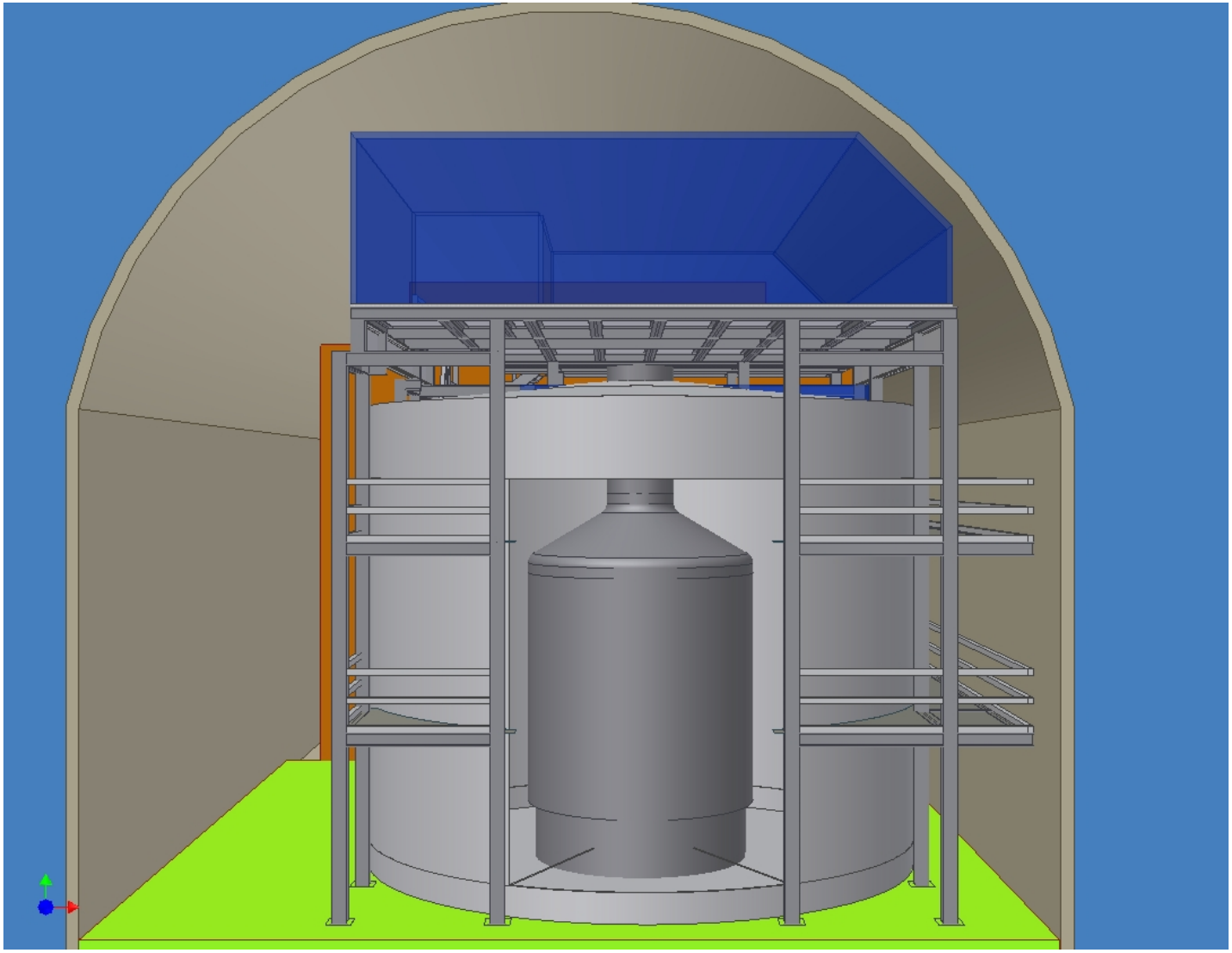
GERDA Water Tank: Status of the executive project



Milestones and relevant roles.

- Contract signed by company (Dell'Acqua Costruzioni Generali - Naples) 14/09/2006
- Start of executive projects 19th/10/2006
- Executive project is due for the 4th/12/2006
- 10 November received an intermediate executive project.

Structural analysis performed and confirmed the preliminary project computation (bottom plate 14 mm thick, mantle 14- to 10 mm thick)

- Appointed roles

Ing. Paolo Martella (Unique responsible of the procedure)

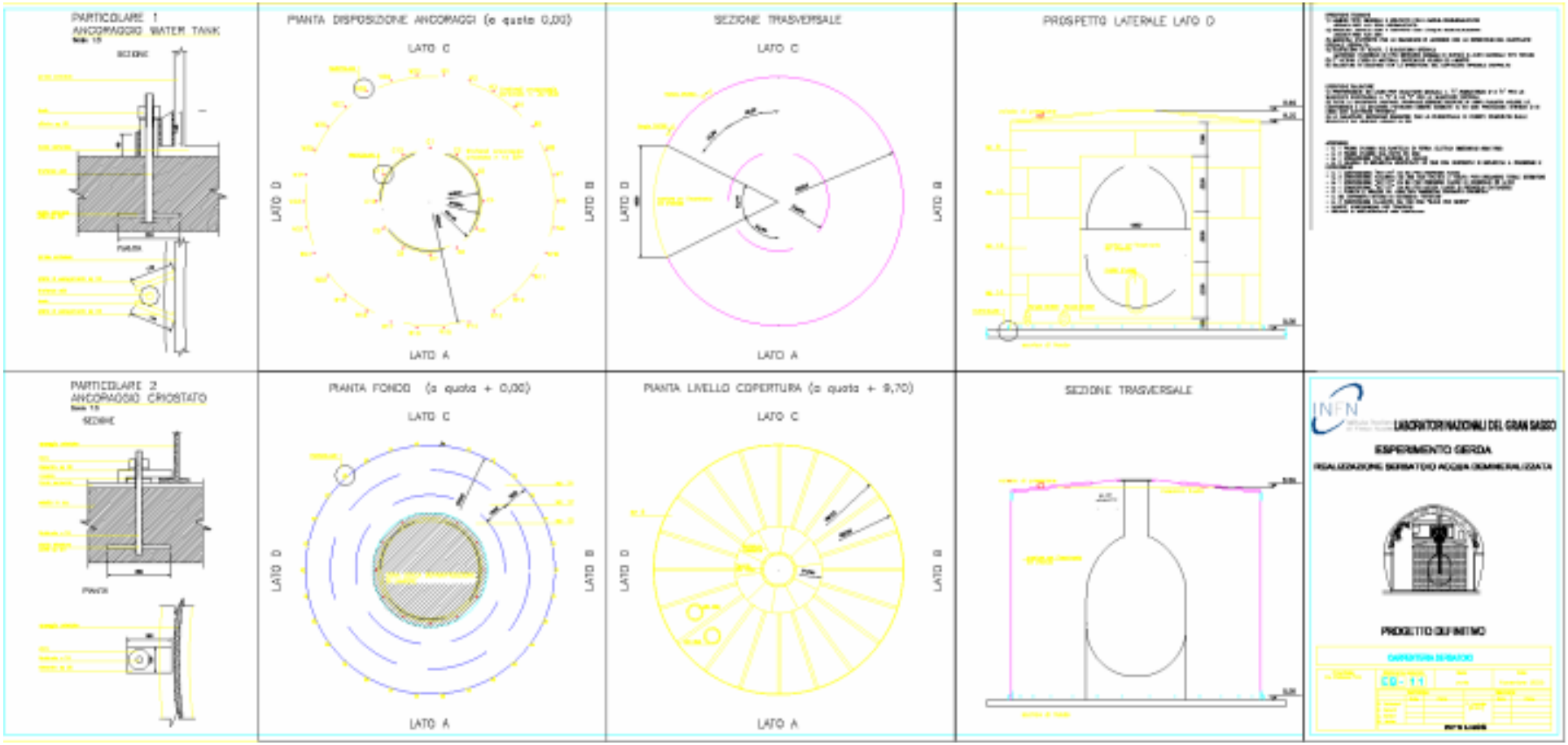
Ing. Marco Tobia (Safety coordinator during execution) M. Tobia

Ing. G. Pace and ing. Donato Orlandi (support) : director of work on site.

Prof. E. Coccia: Responsible of works (by definition).

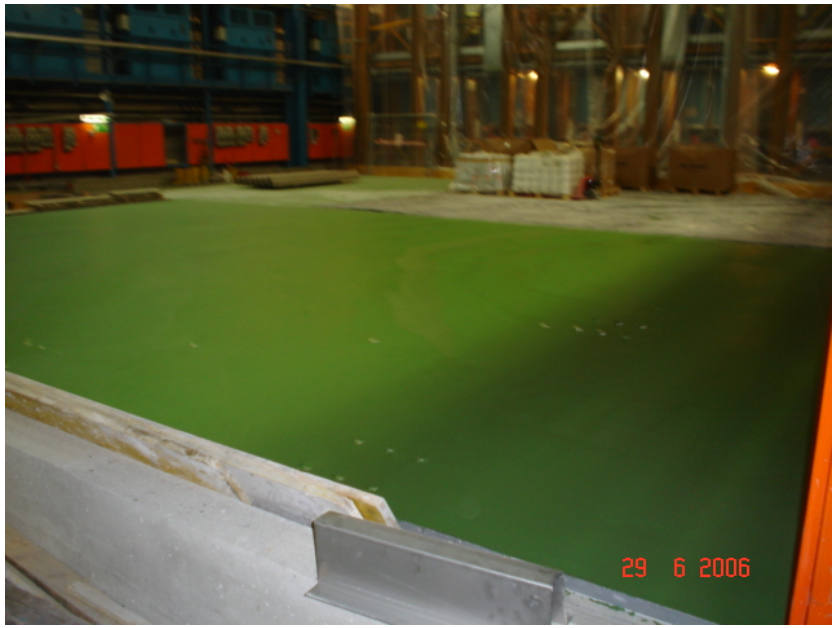
Start of work on site for the company 5/02/2007

The GERDA WT : Top view and anchorages

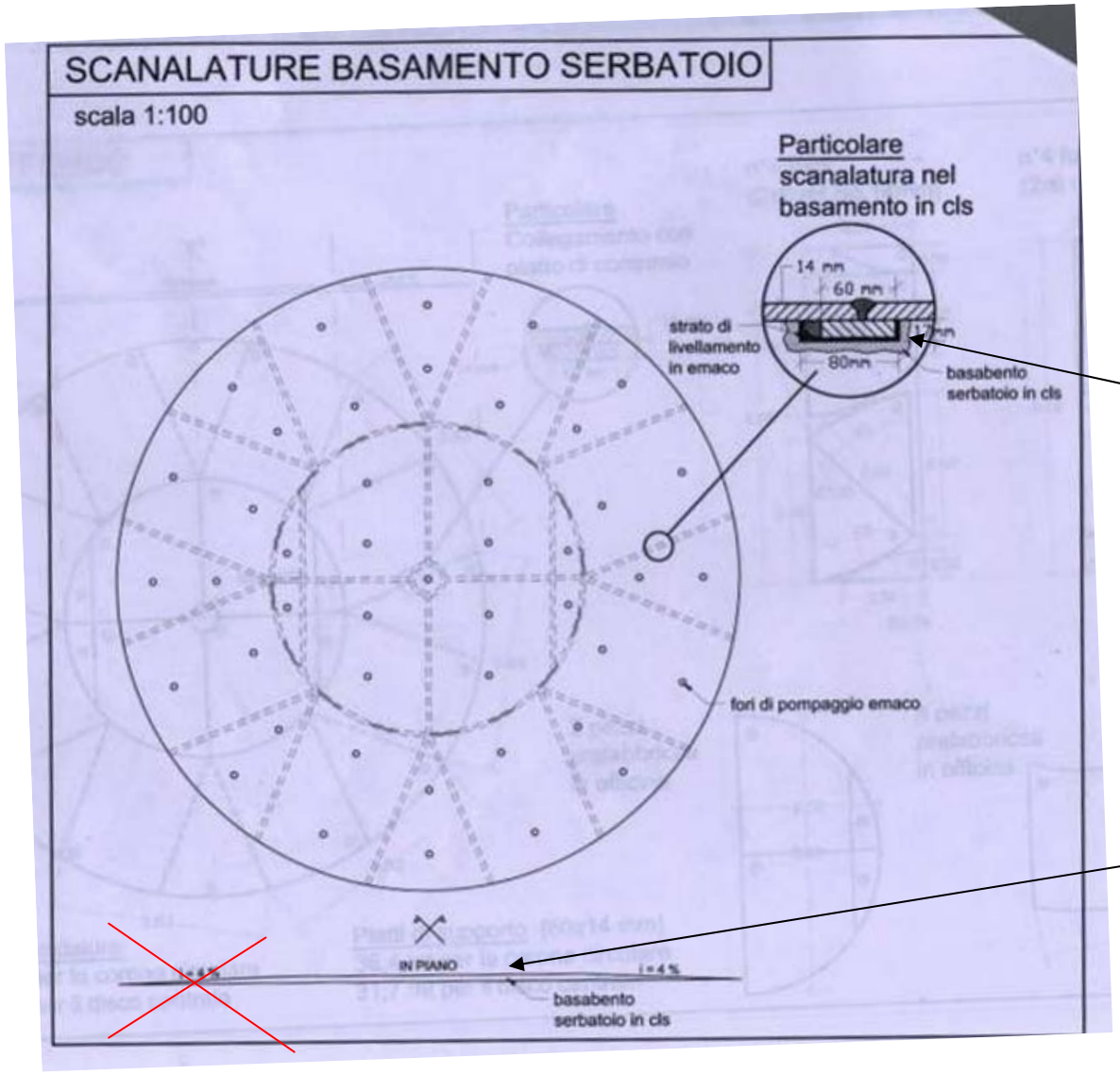


Works to be performed preliminarily to WT installation

- Clean up the area from Opera wood boxes (15 days from now).
- Measure the actual slope of the floor as left from commissioner works
- Remove upper layer of concrete below the WT footprint
- Fix the cryostat anchorage point. Very Last check and confirmation needed
- Apply a layer of leveling concrete to obtain the appropriate flatness → need to know tolerances for cryostat.



WT Bottom Plate (BP)



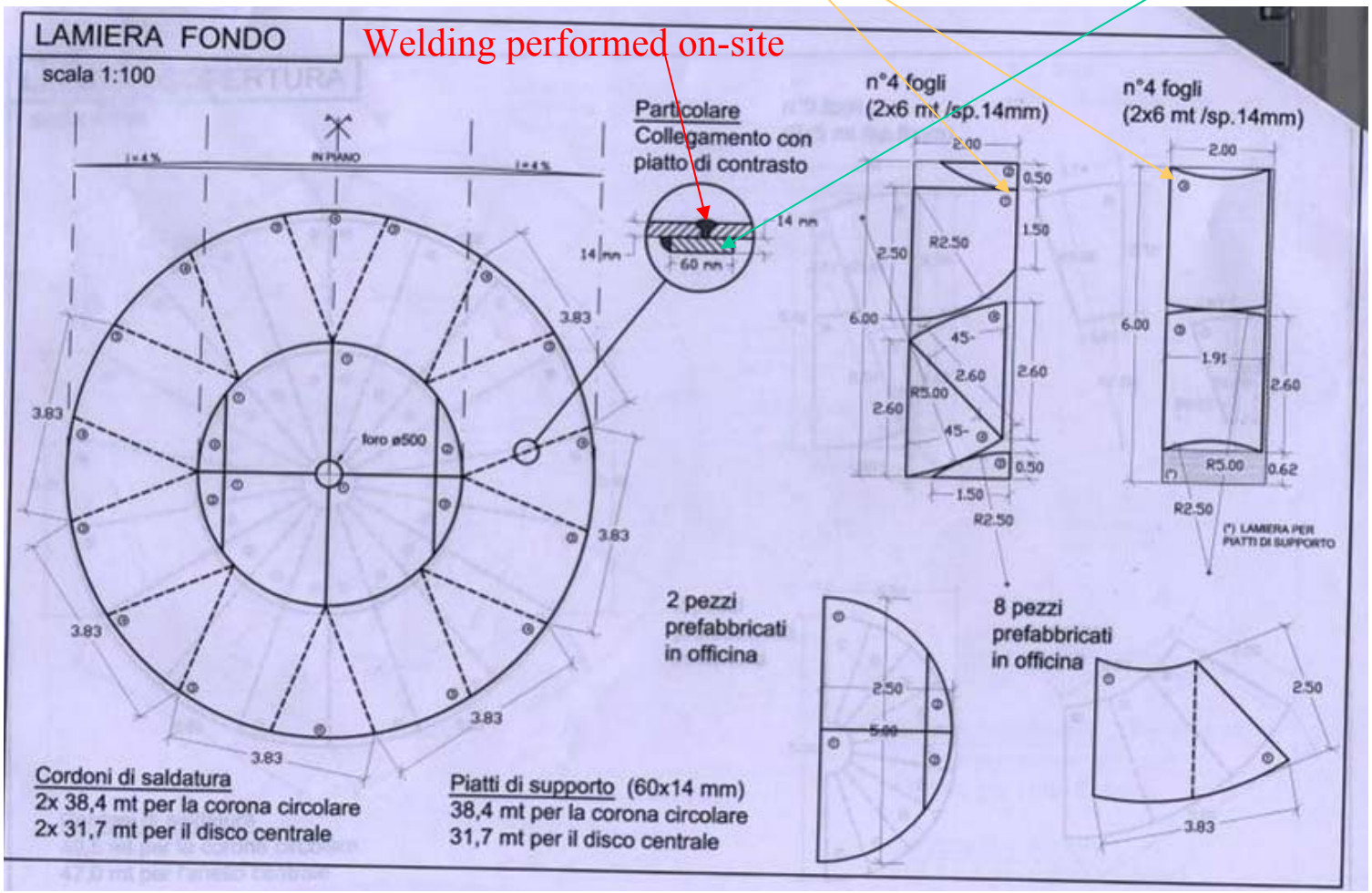
To have flat bottom plate without sheets superimpositions and without welding cords

• head weldings between plates and not superimposed sheets →support from below needed (by API rules) → traces needed in the floor to allow BP to touch uniformly the floor

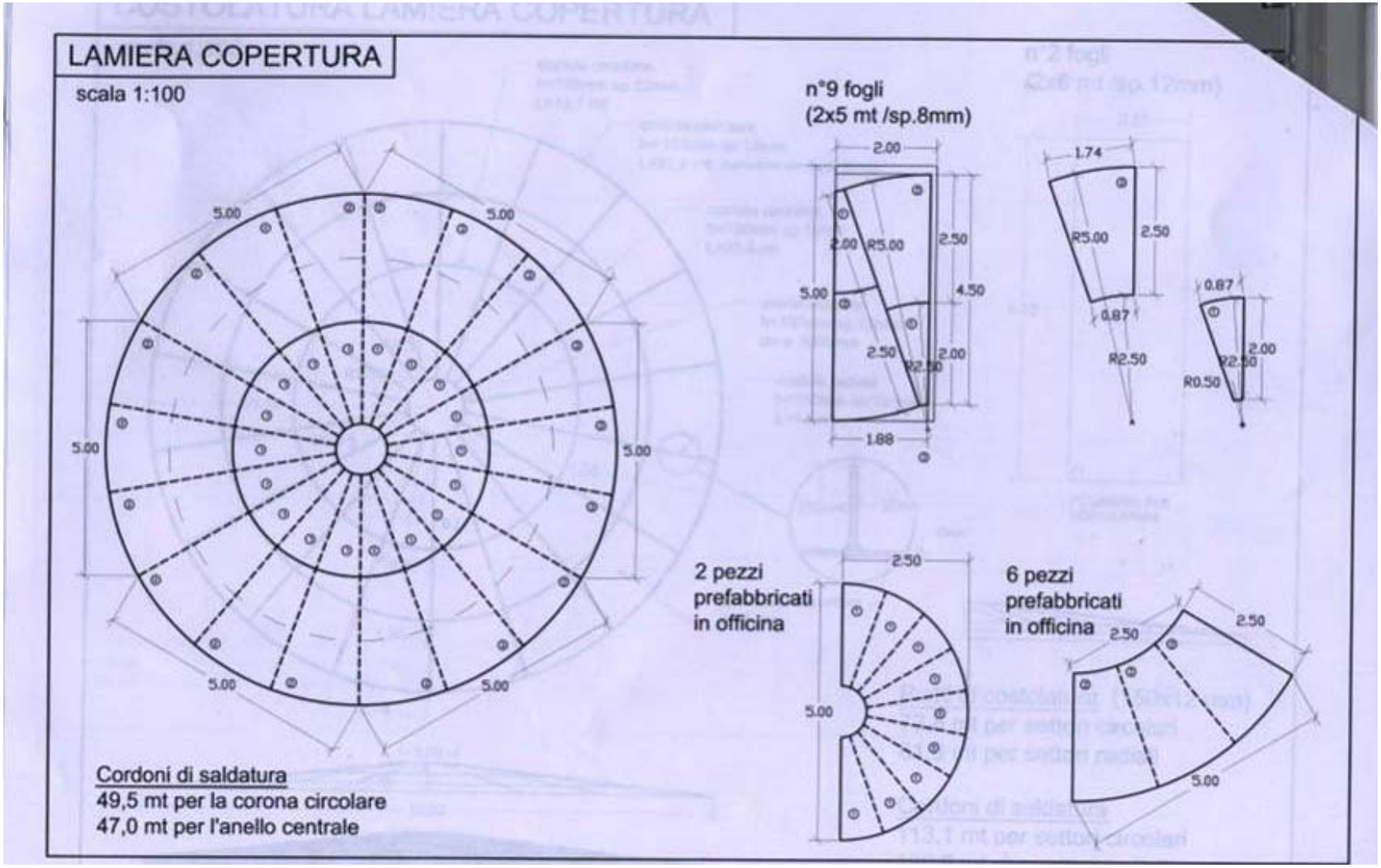
For simplicity we decide to have 1 flat bottom (not two slopes as

WT Bottom Plate:

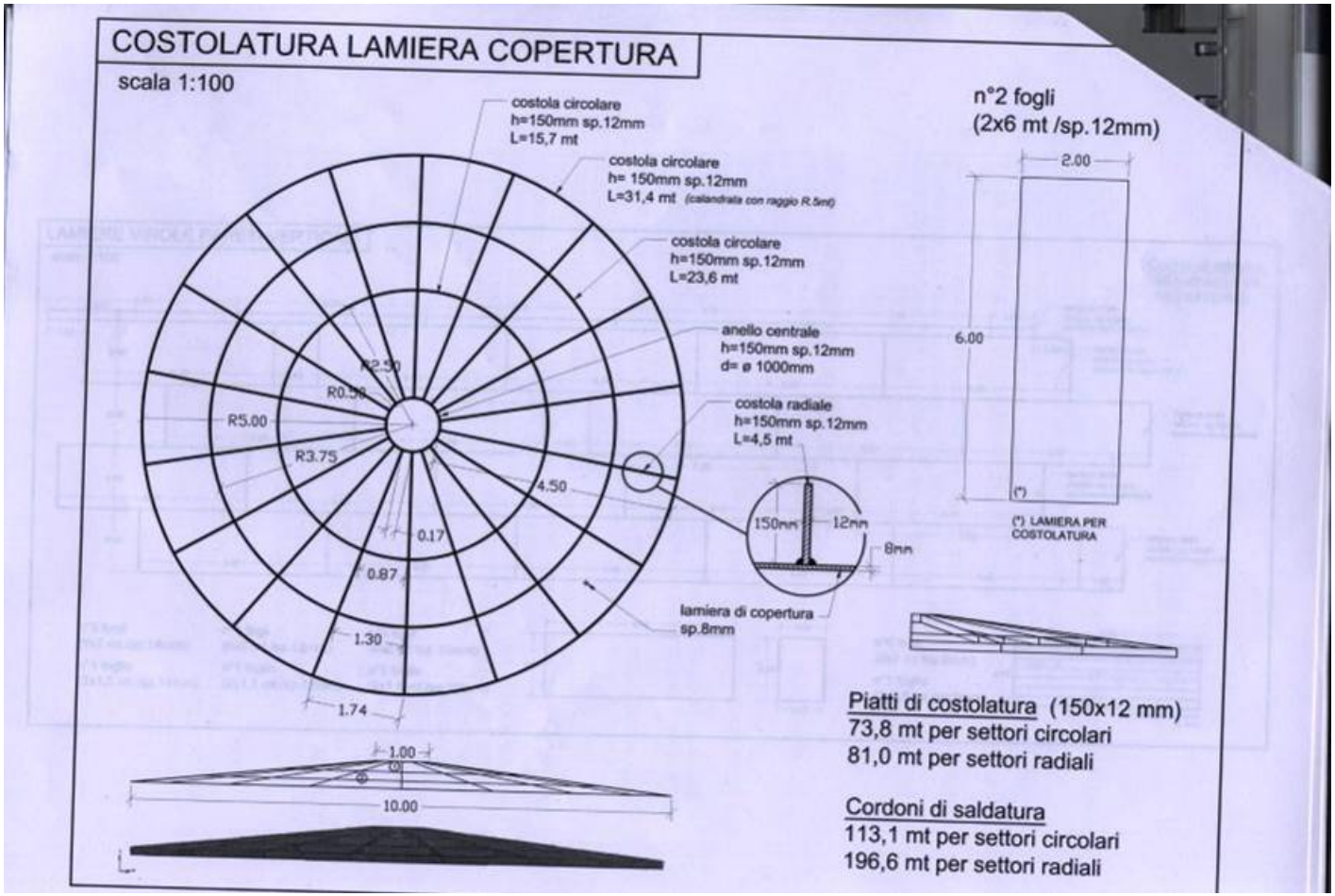
At the company workshop : Sheets pre-cutted, support beam welded below, holes for fluid cement injections



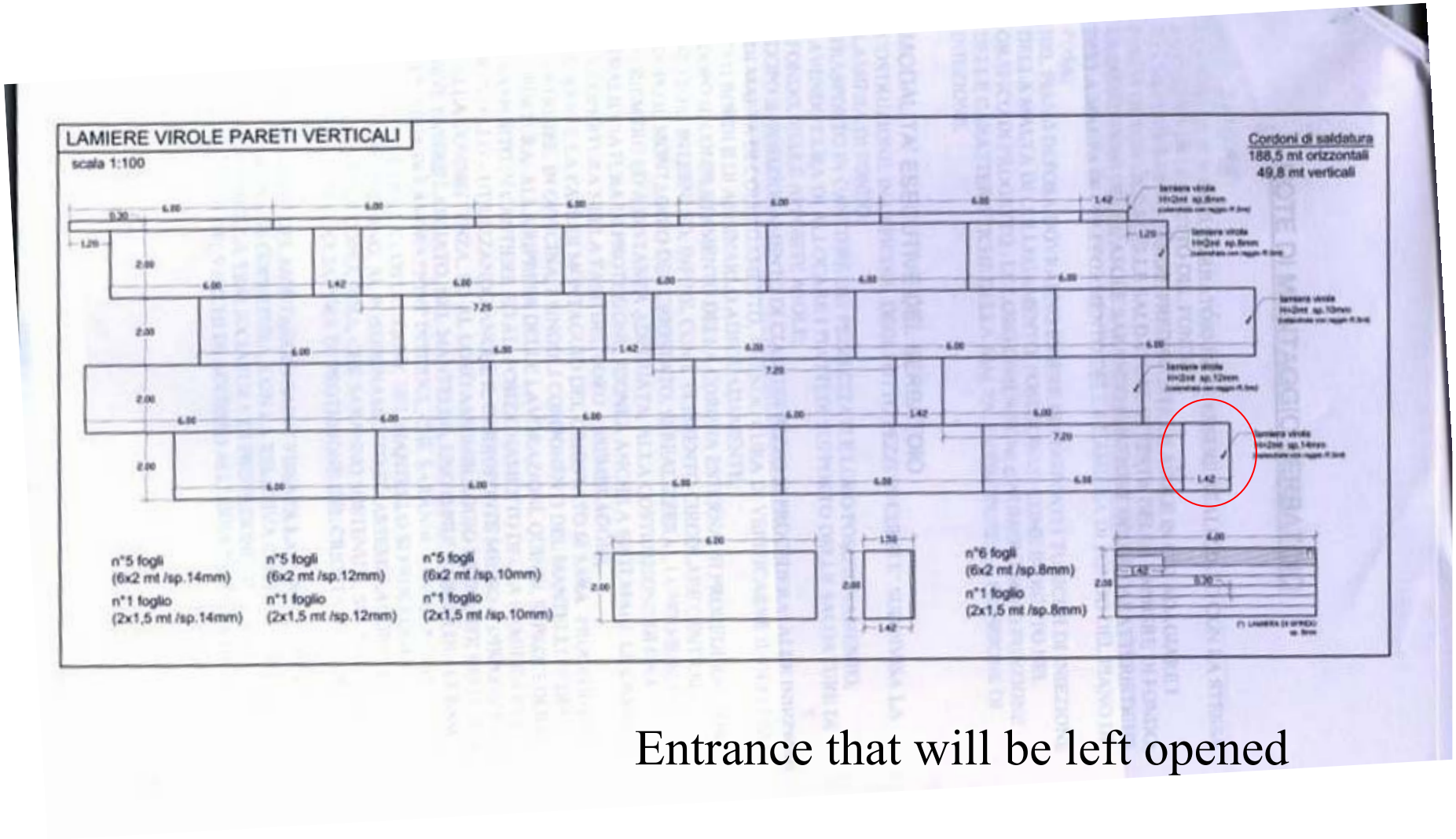
WT Top Plates



WT Top Renforcements beams (from above)



WT mantle



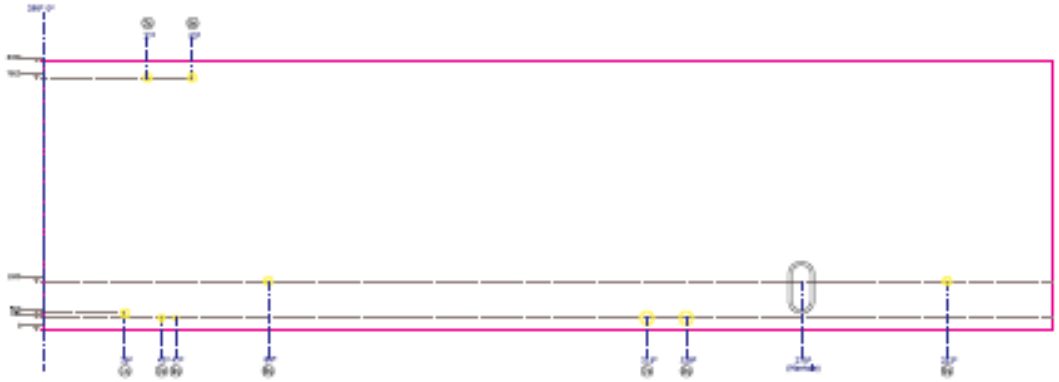
Entrance that will be left opened

WT mounting procedure

- Beginning of february 2007: Start work on site.
  - Installation of working site
  - Bottom plate put in place (from outer circle-crown to inner one). Fluid cement injection to guarantee uniform contact between metal and concrete floor) and minimize roughness.
- End of April (TBC) arrival of cryostat
- Beginning of june 2007 resume WT mantle construction
- TBD mantle mounting procedure
  - Roof with $\Phi \sim 5$ m hole +connect first sheet metal plate + lift up + second sheet metal plate + lift up + etc… (preferable)
  - Build up from bottom to top one sheet metal plate after the other. (scaffold needed, and mainly needed to lift up by crane the metal plates and fly above cryostat etc.).
- Company is studying both. They claim increase of risk and responsibility compared to tendered mounting procedure where they have free field to build up the WT without the cryostat on-site. Need to know outer dimensions of cryostat protecting castle

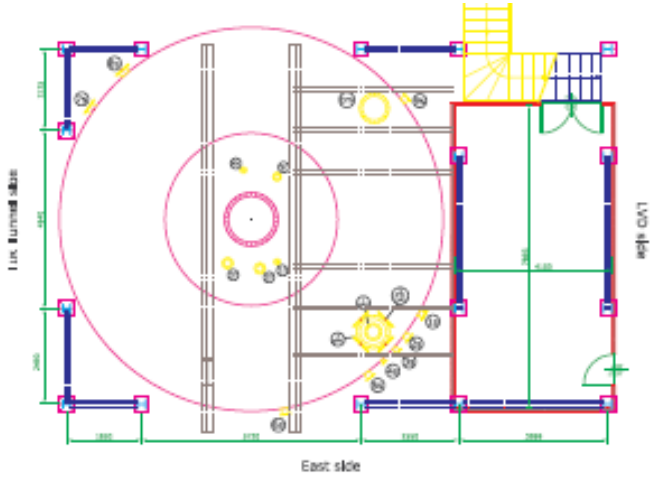
WT Shell nozzles: for water filling, emptying and recirculation.

SHELL NOZZLES



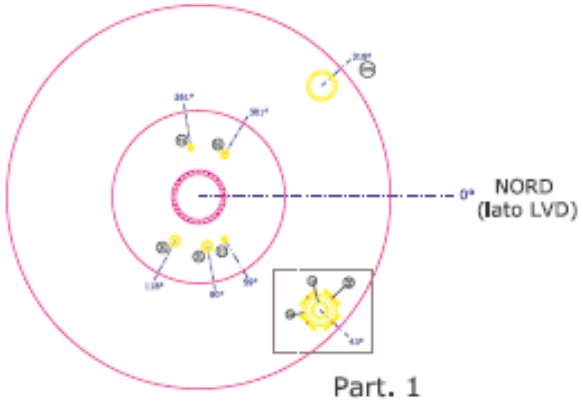
Flange UNI EN 1092-1 (o equivalent)				
PN=10				
#	DN (mm)	h (mm)	Pos.	note
1s	150	500	29°	H2O In
2s	150	7800	37°	H2O Out
3s	100	<=350	42°	Spare
4s	50	<=350	47°	H2O Level
5s	150	7800	53°	Spare
6s	150	1500	80°	Spare
7s	300	<=350	215°	Drain
8s	300	<=350	229°	Drain
9s	150	1500	322°	Sampling ports

Nozzles and flanges on the WT Roof

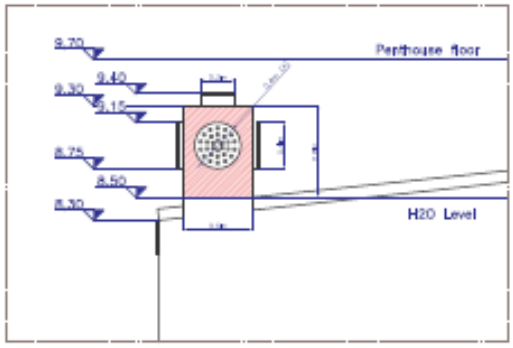


Flange UNI EN 1092-1 (o equivalent) PN=10				
#	DN (mm)	h (mm)	Pos.	note
1r	50	>=8600	59°	H2O Level
2r	150	>=8600	80°	GN2 Out
3r	150	>=8600	118°	Spare
4r	50	>=8600	261°	GN2 In
5r	100	>=8600	301°	Spare
Dm	600		318°	Manhole
1p	300	vedi part.1	43°	Chimney for PMT
2p	600	vedi part.1	43°	
3p	400	vedi part.1		

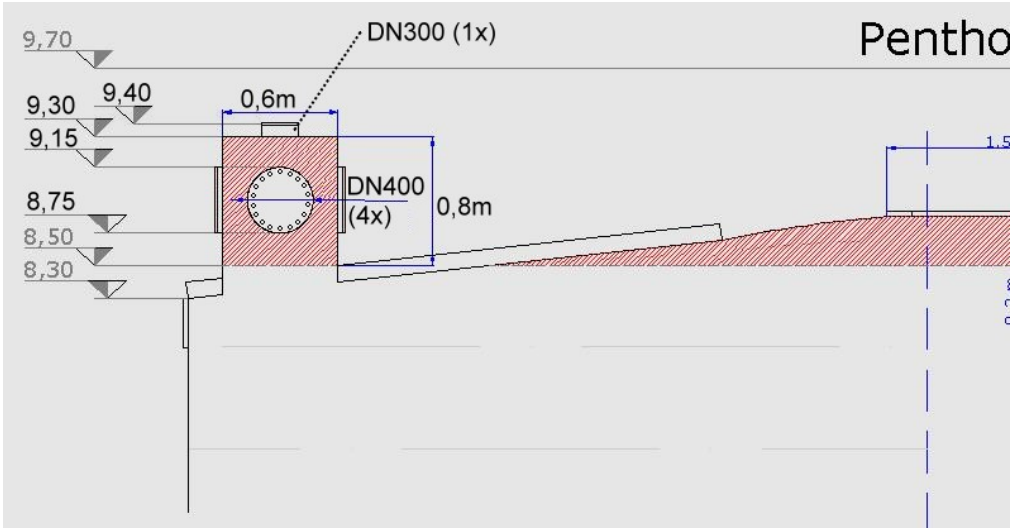
ROOF NOZZLES

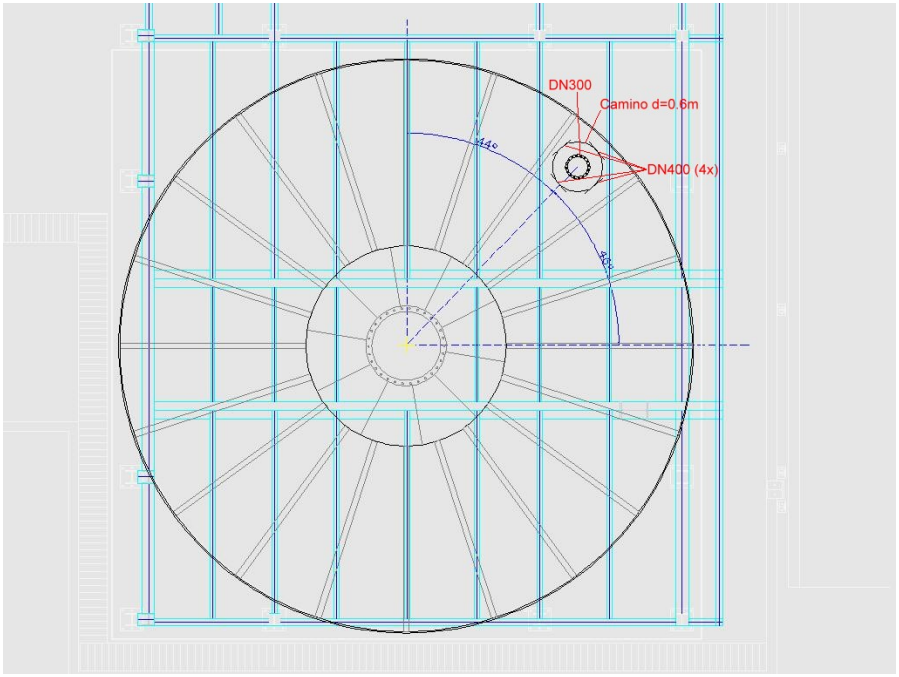


Part. 1



Chimneys for PMs cables





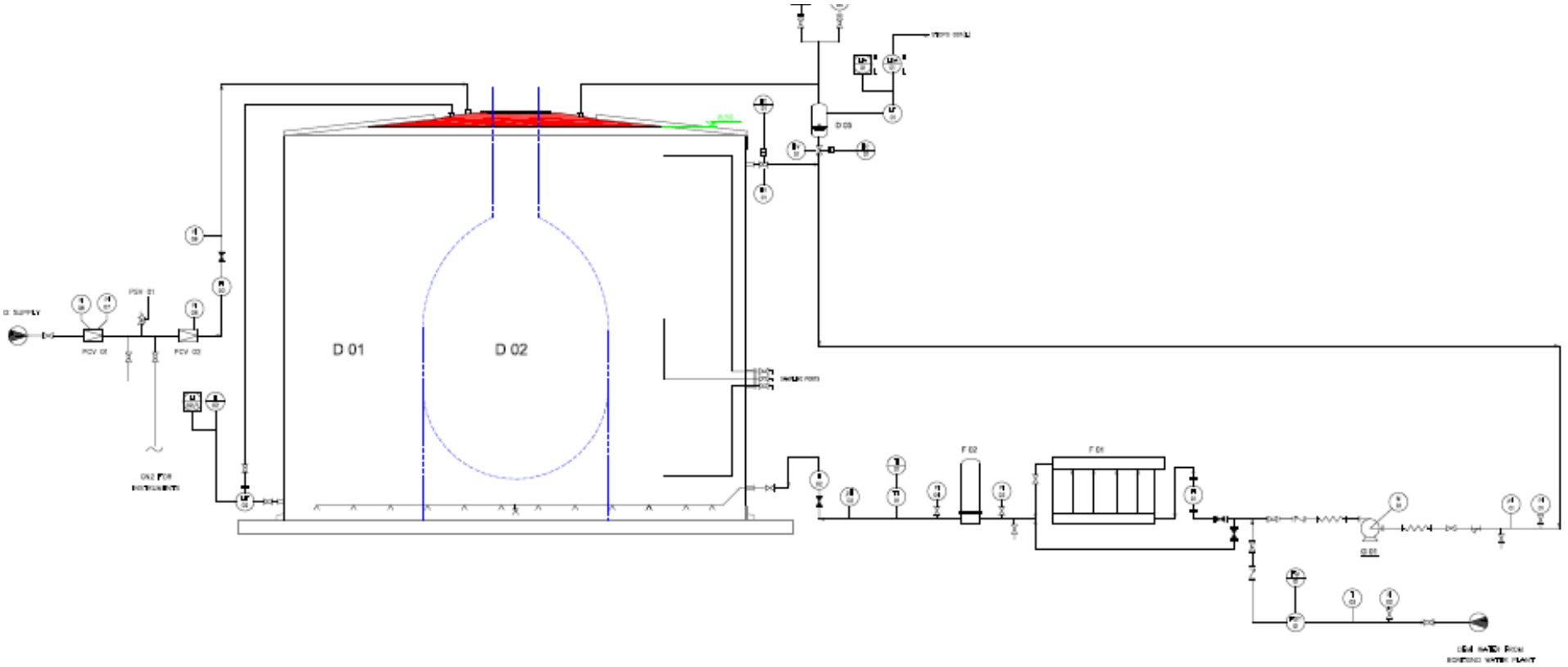
The water system: filling, recirculation and emptying

Filling:

•Use the Demi water produced by the Borexino: resistivity >15MΩcm;

• Max Flow rate: 8 m3/h, we need 25 days for filling the tank (12h/day)

• Piping from Hall C to Hall A (~500m)



Water recirculation system general features

Scope: Keep the water clean to collect Cerenkov light uniformely (in time and volume)

- Standard loop rate 4 m^3/h (~ 6 cm/h speed inside the tank)
- Each 6 days we exchange one tank volume
- Max loop rate 8 m^3/h (~ 2 tank volume/week)
- Water internal distributor to keep the water as homogeneous as possible

Info needed to complete the executive project

- Confirmation of the cryostat anchorage points to position the holes through the WT bottom plates (parts machined at the company workshop.
- Confirmation of tolerance on flatness of WT BP
- Heat exchanger to heat up cryostat exhausts by water specific heat. (???? What about this?)
- Position of PMTs and design of PMTs support to prepare them already mounted at the company site.
- Dimensions of cryostat surrounded by protection castle (for roof metal plate cutting and mounting executive procedure)
- Definition of number and position of all nozzles on roof and mantle.
- Confirmation of WT build-up suspension period for cryostat delivery and tests.

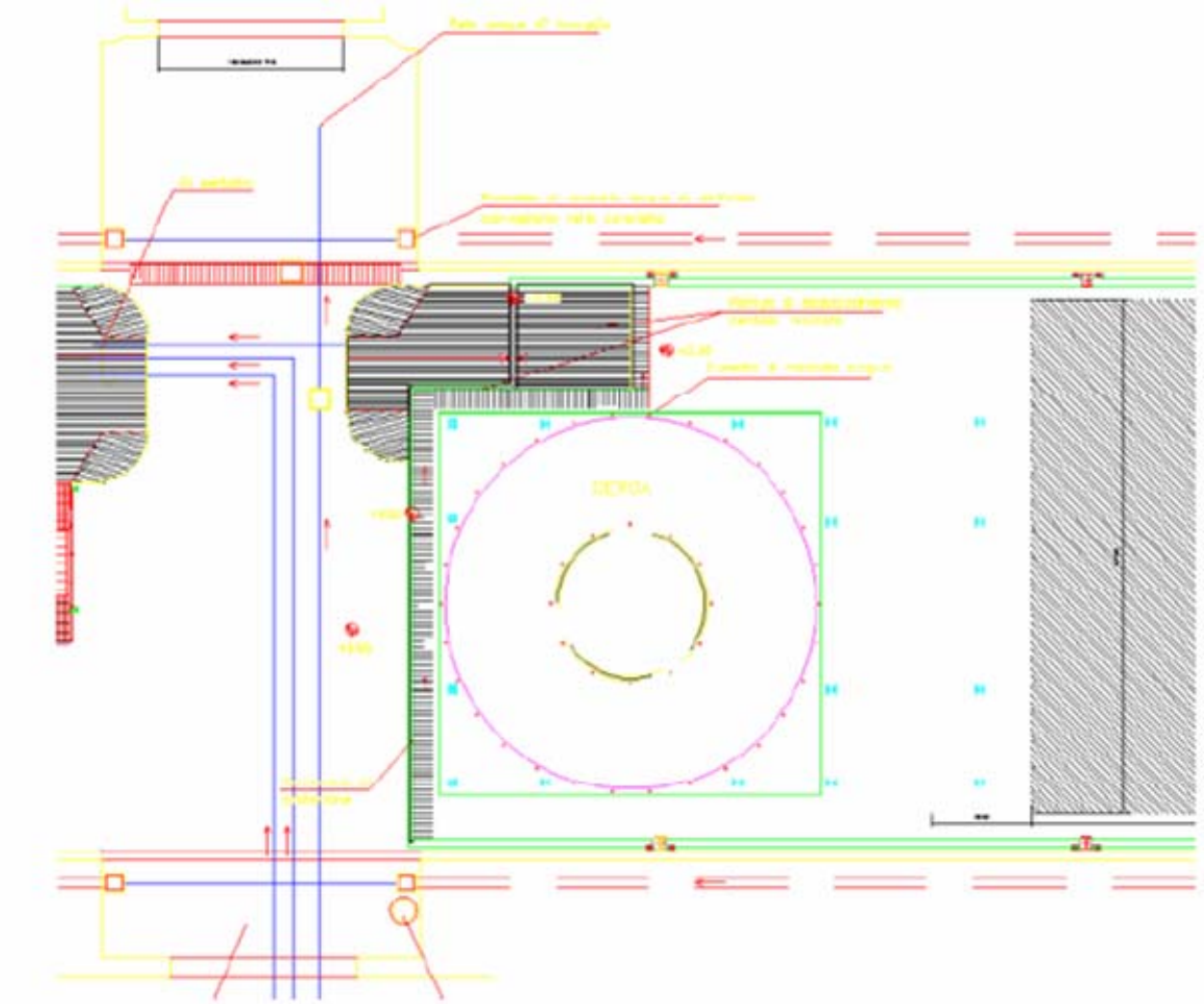
Increase of Stainless Steel in 2006.

Now rated 33000 USD/ton at the LME (London Metal Exchange)

→ Need not to add extra apart what is tendered and signed as we will have already to compensate for the SS price increase.

Emptying the WT: discharge pipe net

Through DN250 pipe running below TIR tunnel 55 l/sec corresponding to 3.5 h + 65 l/s (?) (depending on eventual bottlenecks) only in case of emergency towards the 300 m^3 PIT in Hall A.



Items To Be Defined

- Constructional details of the WT bottom plate (because of cryostat skirt interface)
- Heat exchanger to heat up cryostat exhausts by water specific heat.
- WT constructional procedure and schedule.
  - Tendered: Big aperture (4.5 m diam x 7 m h) in the WT mantle to insert the cryostat after WT completion.
  - What we need: Cryostat delivery and installed just after WT bottom plate construction.

  How long it will take realistically to install Cryostat, test it on-site (test to be defined, insert Cu, test again. Extimate >= 2 months).
- Positions of anchorage for PMs.
- …….

Contract has been signed with the company on 4th September.

Meeting with executive project engeneer after final safety review of LNGS and cryostat tender awarded.

The tendering drawing and discharge of WT:

55 l/sec corresponding to 3.5 h through DN250 pipe running below TIR tunnel + 65 l/s (? depending on eventual bottlenecks) only in case of emergency towards the 300 m^3 PIT in Hall A.