

JUNO

Jiangmen Underground Neutrino Observatory

Distillation and Stripping plants: status report & installation

Cecilia Landini

On behalf of the Italian Liquid Scintillator Group

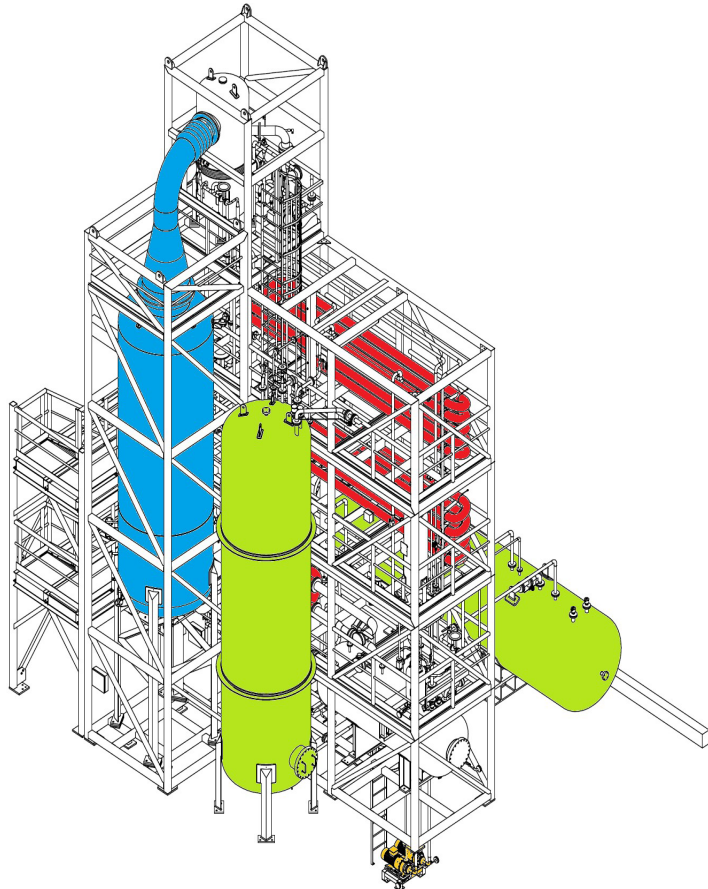
Remote installation of Stripping and Distillation Plants



- Distillation and Stripping plants are in China since the end of 2020. They were stored in a temporary repository 20 km far from JUNO site.
- Now **installation operations** have started and are **currently ongoing**.

Distillation Plant:

- Shipped on: **10 November 2020**
- Delivered on: **24 December 2020**

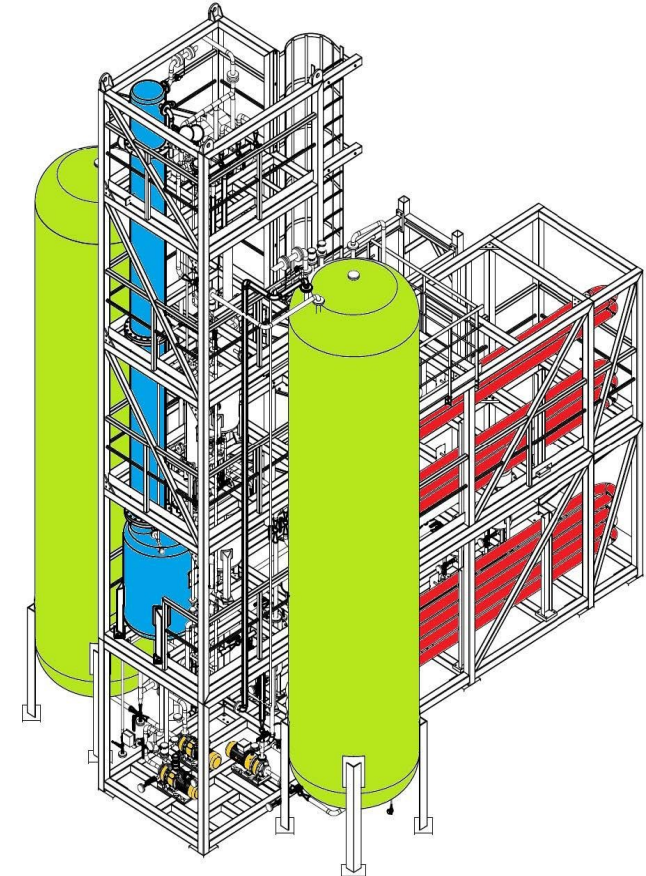


Operation	Status
Equipment and piping construction	✓
Cleaning	✓
Equipment installation inside skids	✓
Instrument and piping connections	✓
Insulation	✓
Helium leak test	✓
DCS tests	✓
FAT	✓
Preparation for transport & shipping	✓


Installation has started

Stripping Plant :

- Shipped on: **29 July 2020**
- Delivered on: **01 October 2020**



- Due to Covid-19 restrictions, we are forced to go for a (partial) **remote installation** of the 2 Italian purification plants.
- Installation is divided in 3 main phases (see table below).
- Now, installation operations of **Phase 1** have **started and are in progress**. Paolo Lombardi and Michele Montuschi are at Juno site to guide and manage the operations.

	Operation	Mode	Requirements	Due Costs
Phase 1	PLANTS ERECTION	Remotely	<ul style="list-style-type: none"> Local Chinese installation company (Maoze Mechanical) 2 INFN plants managers onsite (Paolo and Michele) Other INFN operators remotely connected (Hololens2) 	425 kRMB (60 k€)
Phase 2	PLANT SEALING, LEAK TEST, ELECTRIC CONNECTION	Depending on Covid19 restrictions	<div style="text-align: center;">  <p>OR</p> </div> <ul style="list-style-type: none"> All INFN operators onsite (very unlikely) Local Chinese company (FINE) for cleaning processes, leak testing 1 INFN plants managers onsite? 	30 k€
Phase 3	COMMISSIONING	Onsite	<ul style="list-style-type: none"> All INFN operators onsite (depending on Covid19 restrictions) Some Polaris company operators onsite (?) Some Chinese collaborators for helping and training 	0 - 5 k€

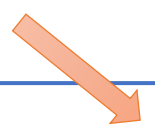
Installation of interconnection pipes and auxiliary plants. This activity is under control of the Chinese LS Group

Phase 1:

- Plants skids transportation to JUNO site (and to the underground laboratory in case of Stripping)
- Preparation for installation (logistics, lifting devices, tools...)
- Positioning and erection of all the main plant components (skids, tanks, pumps, stairs,...)
- Ground anchoring with chemical bolts

➤ **NOT included in phase 1:**

- No interconnections between skids or any external pipeline → the sealing of interconnecting flanges requires a dedicated and careful cleaning process for both the flange surfaces and the O-rings to be positioned inside. **See next slides on Phase 2.**
- No leak tests (except for 1 very special line of Distillation Plant)
- No instruments mounting or electrical connections



Postponed to phase 2:
made by INFN experts or a dedicated local
company (not the same of installation)

- Installation procedures (also Chinese version) uploaded on Project-DB and Eng-DB and approved by JUNO Chief Engineer.
- A **local Chinese company** is doing the “Phase 1” installation
 - **Zhongshan Saifu Maoze Mechanical and Electrical Engineering Co., Ltd** company was selected and the contract signed
 - The installation operations of phase 1 started on **25 April**. Distillation plant is going to be installed first.
Expected time required for installation: ~ **20-22 days** for both plants (7 days/week and 8 h/day – 7h/day underground)
 - Manpower: about 15 operators are present on site every day + all the required lifting devices
 - Quotation: 425 kRMB (~ 60 k€) with 10% contingency (+ 5 k€) to cover unexpected expenses due to JUNO site constrains
- **2 INFN plant managers present onsite**
 - Paolo Lombardi and Michele Montuschi finally succeeded to go to Juno site in China
 - It was very hard to manage to go to China. Very convoluted procedure, both for bureaucratic, practical and logistic aspects (a lot of documents and medical exams required; requirements may change from week to week; few flights and often they are canceled at very short notice). Paolo and Michele are writing a guideline to travel to China based on their personal experience.
 - Logistics: 2 weeks of quarantine + 1 week of surveillance (precautionary quarantine) = 3 weeks off before starting work

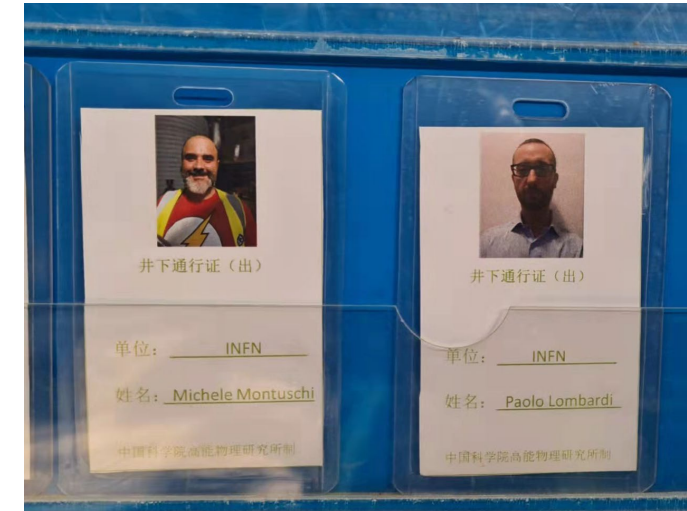
Foreseen schedule	
Arrival of Paolo and Michele at Juno	22 April 2022
Start of Distillation plant installation	25 April 2022
Start of Stripping plant installation	5 May 2022
Michele's return flight	18 May 2022
Paolo's return flight	27 May 2022



Paolo and Michele at Juno site



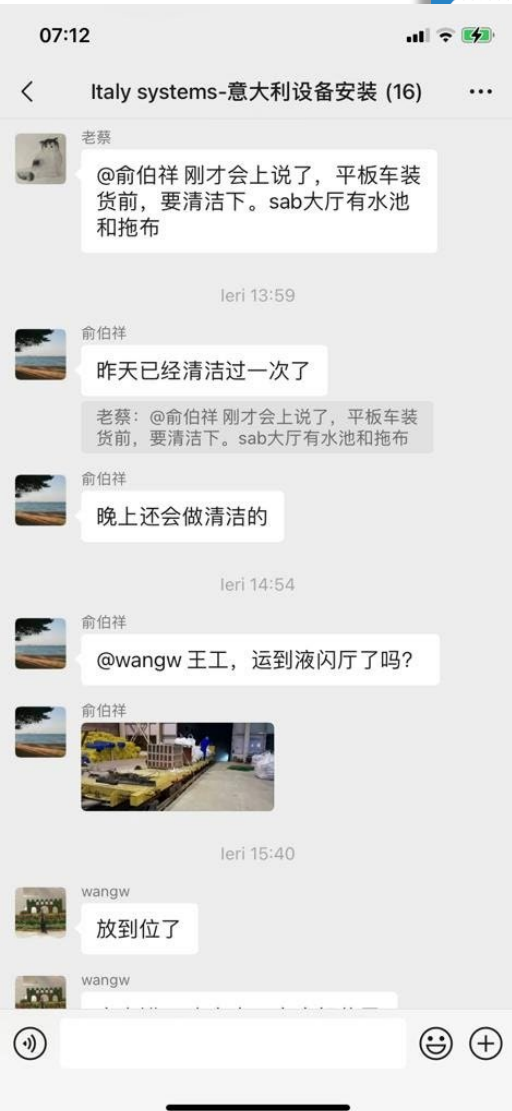
- 3 days of quarantine once arrived at Juno site
- They live in the dormitory of Juno. They share one apartment with two bedrooms.





目录

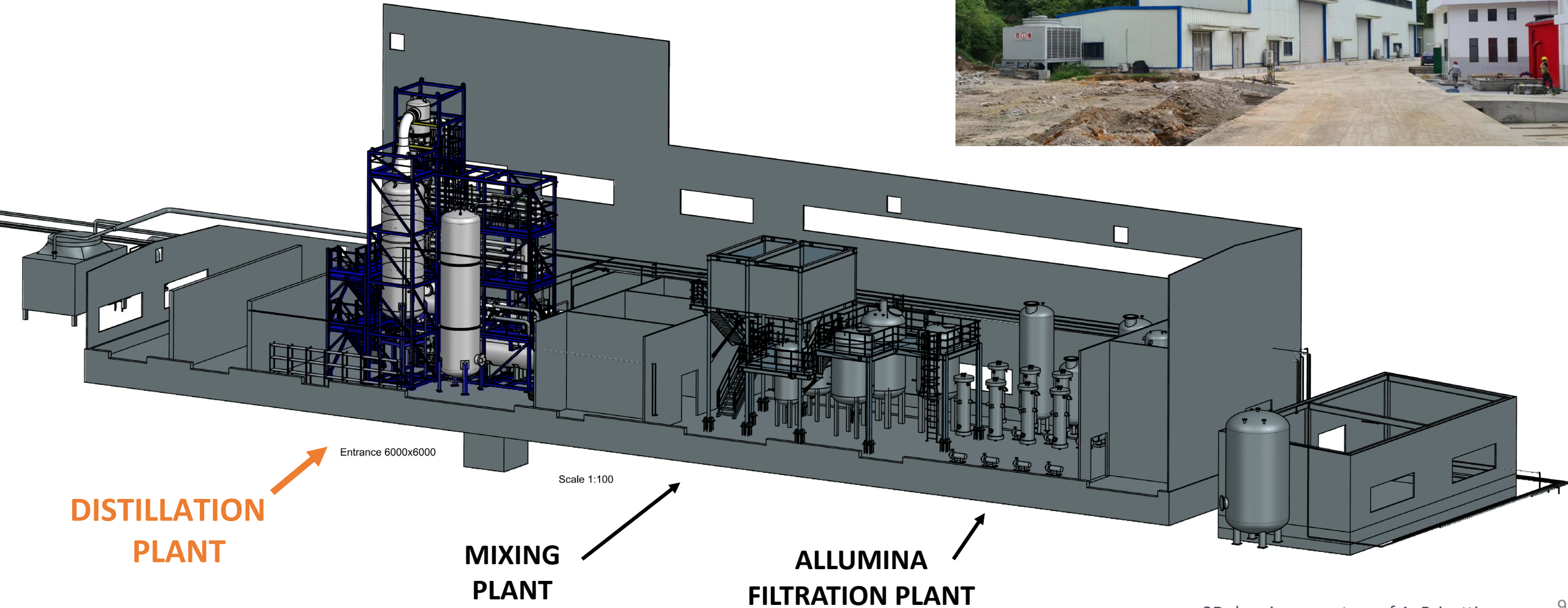
- 一、地面纯化厅蒸馏装置安装工期计划表
- 二、地下的液闪处理间汽提装置安装工期计划表
- 三、项目部成员名单
- 四、现场作业人员配置
- 五、绑扎固定作业工具配备
- 六、起重吊车配备
- 七、起重搬运作业工具配备
- 八、项目作业前检查工具，消除隐患。
- 九、项目作业前方案的安全培训，学习；
- 十、现场作业前列队讲安全、讲要求、布置作业任务；
- 十一、作业中的注意事项



Distillation Plant Phase 1

Over Ground Liquid Scintillator Hall

Over Ground LS Hall Layout



Distillation plant installation (phase 1)



➤ Where:

installation in the Over Ground LS building

➤ When:

25 April - start of the Distillation plant installation

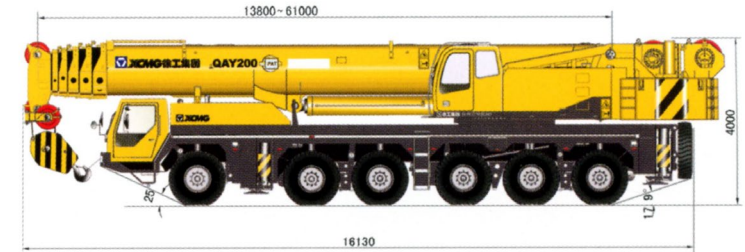
5 May - end of “Phase 1” of Distillation plant installation

➤ 6 skids, 1 vertical tank, 1 horizontal tank, 1 pump skid

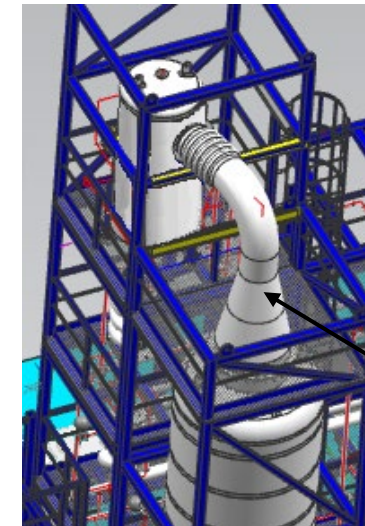
➤ Main issues:

- Installation to be performed from the roof of the building using dedicated truck cranes (QAY200T – 200 tons truck crane; QY25T – 25 tons truck crane)
- Removal of the roof of the building (safety issues, wind, weather conditions,...); to be done by Juno site workers
- Some heavy and large flanges need to be mounted, sealed with ORs and leak tested during this phase of installation (e.g. line 163 between C-101 distillation column and E-101 condenser with DN500 and DN1000 flanges)
 - Heavy line, need a crane to be moved
 - Accurate cleaning of flange surfaces, O-rings insertion and sealing
 - Leak test from purge port to verify flange tightness (otherwise installation repeated)
- Huge plant, a lot of components, to be aligned very precisely

QAY200T – 200 tons truck crane



QY25T – 25 tons truck crane



Line 163 (DN1000 – DN500 flanges to be leak tested)

Gantt schedule for distillation plant erection



DISTILLATION PLANT INSTALLATION SCHEDULE

For more details about each installation operation, see the detailed installation procedure document (I.P.): "C-367 distillation Erection works description", uploaded on EngDB-doc-11.

	TOTAL DURATION [working days]	Detailed operation	Expected duration [h]	DAY 1		DAY 2		DAY 3		DAY 4		DAY 5		DAY 6		DAY 7		DAY 8		DAY 9		DAY 10																									
				1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4
TRANSPORTATION	2 days	Transportation from storage warehouse to LS ground hall	2 days	[Pattern: 2 days of orange bars]																																											
PREPARATION FOR INSTALLATION	0.5 day	Draw on the floor the shape of skid 1 in its expected position	4 h	[Pattern: 4 blue bars on Day 1]																																											
ROOF REMOVAL	1 day	Removal of the roof of the building	1 day	[Pattern: 1 day of green bars]																																											
PLANT ERECTION AND INSTALLATION (continue...)	3 days	Mounting of T-102 tank legs	2 h	[Pattern: 2 pink bars on Day 3]																																											
		Insertion of T-102 horizontal tank into the building	1 h	[Pattern: 1 pink bar on Day 3]																																											
		Insertion and positioning of the pump skid into the well	2 h	[Pattern: 2 pink bars on Day 3]																																											
		Insertion of lines 121, 122, 106, 127 into the well	2 h	[Pattern: 2 pink bars on Day 3]																																											
		Insertion and positioning of skid 1 (horizontal)	3 h	[Pattern: 3 pink bars on Day 3]																																											
		Preparation for T-102 tank positioning (metallic spacers/template)	1 h	[Pattern: 1 blue bar on Day 4]																																											
		Precise positioning of T-102 tank	1 h	[Pattern: 1 pink bar on Day 4]																																											
		Check the relative position of T-102, pump skid and skid 1	3 h	[Pattern: 3 blue bars on Day 4]																																											
GROUND ANCHORING	1 day + 1 night	Chemical anchors of T-102 and skid 1 (drytime: one night) Fix anchors with bolts	5 h 1 h	[Pattern: 5 blue bars on Day 5, 1 blue bar on Day 6]																																											
(...continue) PLANT ERECTION AND INSTALLATION	5 days	Prepare interconnecting flanges between skids 1-2, 2-3 and 2-6	4 h	[Pattern: 4 blue bars on Day 5]																																											
		Insertion and positioning of skid 2 (horizontal, on skid 1)	2 h	[Pattern: 2 blue bars on Day 5]																																											
		Fix together skids 1 and 2	1 h	[Pattern: 1 blue bar on Day 5]																																											
		Prepare interconnecting flanges between skids 2-3, 3-4 and 3-6	4 h	[Pattern: 4 blue bars on Day 5]																																											
		Insertion and positioning of skid 3 (horizontal, on skid 2)	2 h	[Pattern: 2 blue bars on Day 5]																																											
		Fix together skids 2 and 3	1 h	[Pattern: 1 blue bar on Day 5]																																											
		Prepare interconnecting flanges between skids 3-4, 4-5 and 4-6	3 h	[Pattern: 3 blue bars on Day 5]																																											
		Insertion and positioning of skid 4 (horizontal, on skid 3)	2 h	[Pattern: 2 blue bars on Day 5]																																											
		Fix together skids 3 and 4	1 h	[Pattern: 1 blue bar on Day 5]																																											
		Prepare interconnecting flanges between skids 6-1, 6-2, 6-3 and 6-4	3 h	[Pattern: 3 blue bars on Day 5]																																											
		Insertion, erection and positioning of skid 6 (vertical, near skid 1)	3 h	[Pattern: 3 blue bars on Day 5]																																											
		Fix together skids 1-6 and 4-6	1 h	[Pattern: 1 blue bar on Day 5]																																											
		Prepare interconnecting flanges between skids 4-5 before skid 5	1 h	[Pattern: 1 blue bar on Day 5]																																											
		Insertion, erection and positioning of skid 5 (vertical, on skid 4)	2 h	[Pattern: 2 blue bars on Day 5]																																											
		Fix together skids 4 and 5	1 h	[Pattern: 1 blue bar on Day 5]																																											
		Prepare interconnecting flanges of line 163 before mounting	3 h	[Pattern: 3 blue bars on Day 5]																																											
		Erection and installation of line 163	4 h	[Pattern: 4 blue bars on Day 5]																																											
		Leak test of line 163	3 h	[Pattern: 3 red bars on Day 5]																																											
Preparation for T-101 tank positioning (metallic spacers/template)	1 h	[Pattern: 1 blue bar on Day 6]																																													
Erection, insertion and positioning of T-101 tank (vertical)	1 h	[Pattern: 1 pink bar on Day 6]																																													
Check T-101 position	3 h	[Pattern: 3 pink bars on Day 6]																																													
Mounting and installation of external stairs	5 h	[Pattern: 5 blue bars on Day 6]																																													
Mounting and installation of internal ladder (vertical)	2 h	[Pattern: 2 blue bars on Day 6]																																													
GROUND ANCHORING	1 day	Ground anchoring of skid 6, T-101 tank, stairs with chemical bolts	3 h	[Pattern: 3 blue bars on Day 6]																																											
ROOF INSTALLATION	1 day	Close the roof of the building	6 h	[Pattern: 6 green bars on Day 6]																																											
Total Time			10 days																																												

- = no lifting tool required
- = 25 or 120 ton truck crane required
- = 120 ton truck crane required
- = other lifting tools required (depending on availability onsite)
- = mobile platform or scaffolding required (min height: 10 m)
- = leak detector required

➤ Total time required (only phase 1): ~ 10 days

➤ Installation tools:

- Chemical bolts and hammer drill provided by INFN
- All main installation tools provided by the installation company (cranes, chain winches, spreader beam, hooks, ropes, lifting platform, forklift, ladders, protective equipment,...)

Transportation and preparation for installation

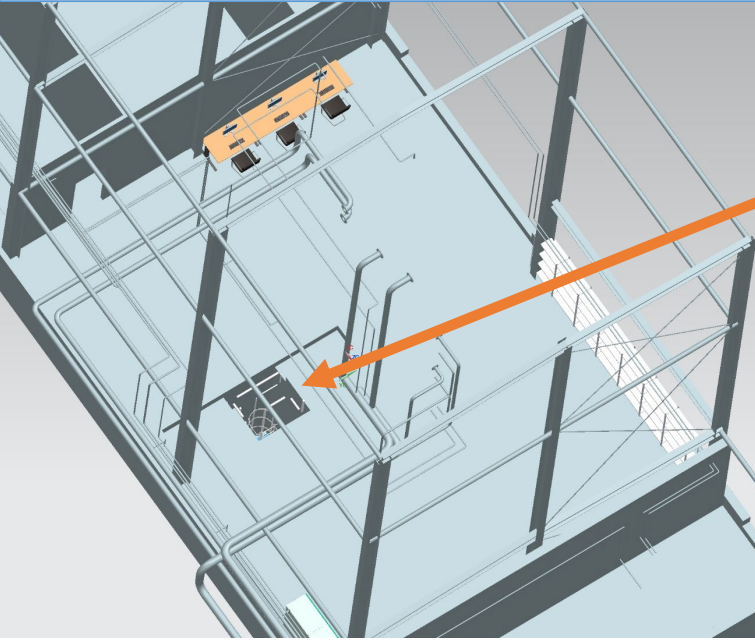


- Inspection of installation site, cleaning and preparation of the building, roof removal

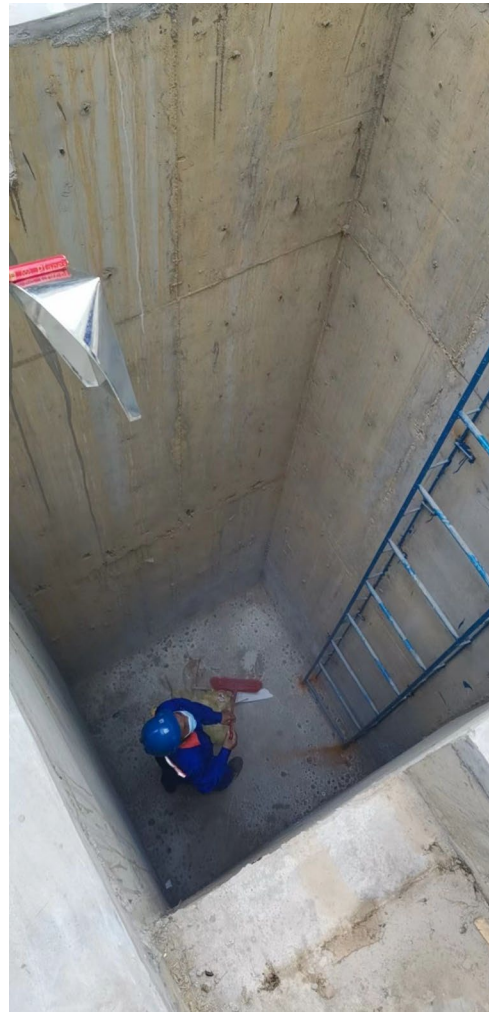


- Transportation of plants skids from the temporary repository to JUNO site (20 km far) by flat racks.





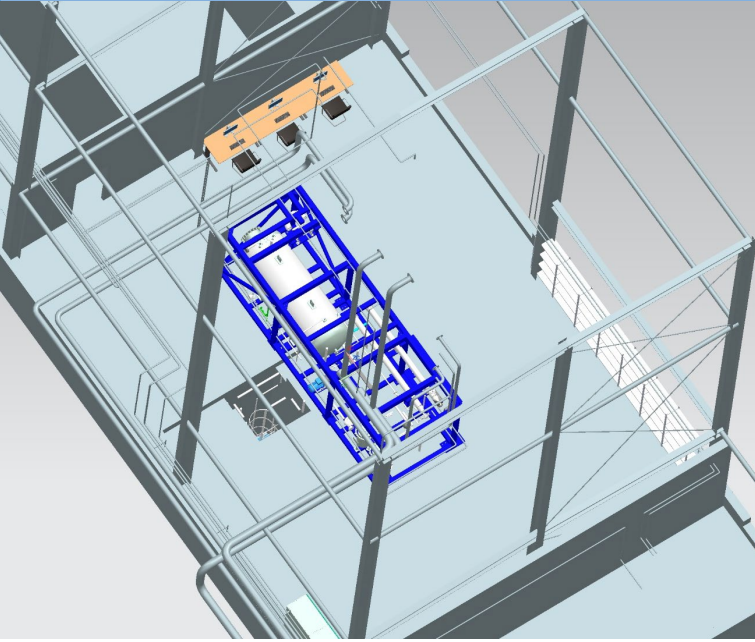
1. Pump skid (into the well)



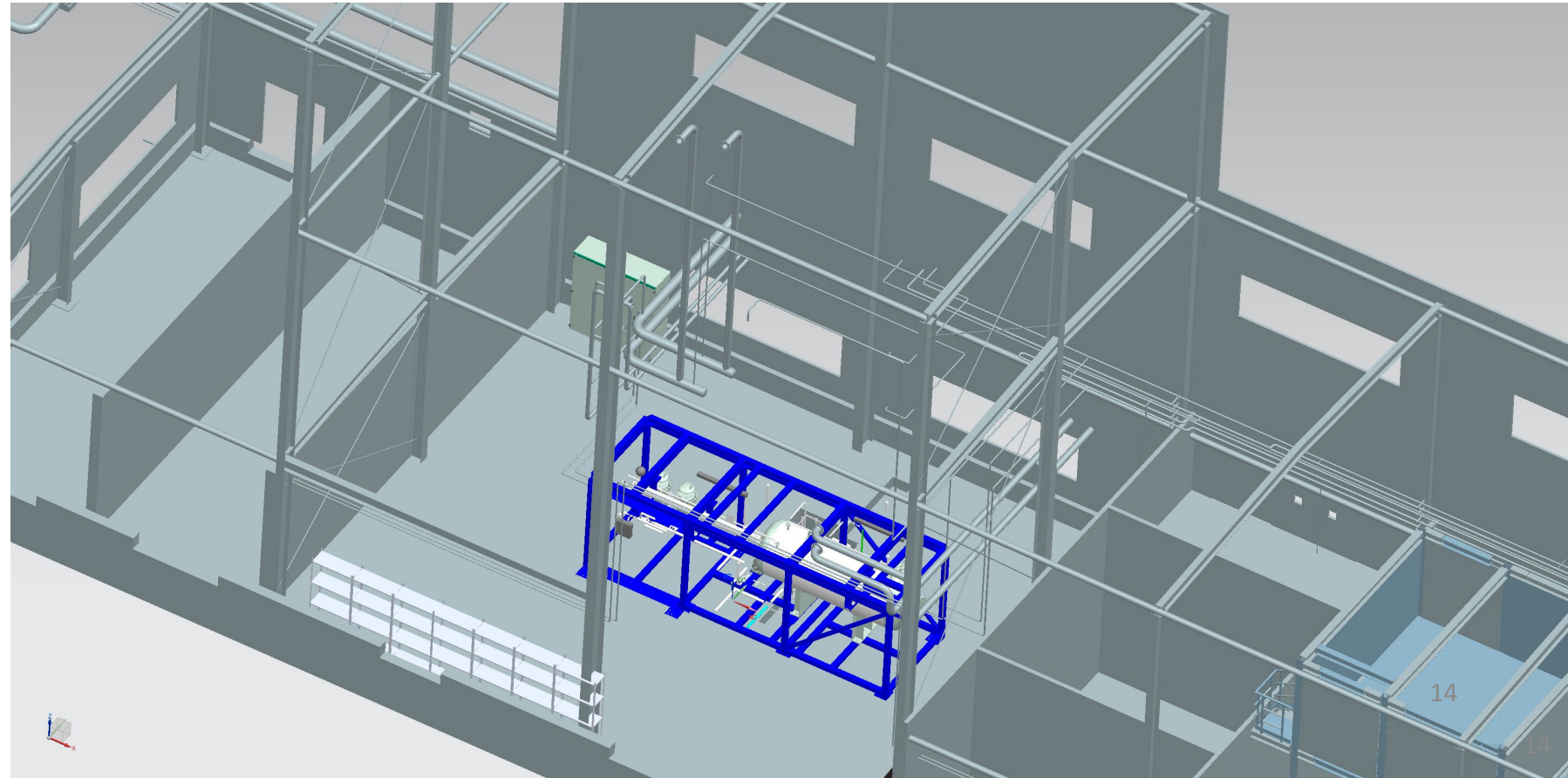
MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
3. Horizontal tank
4. Skid 2
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
8. Skid 5
9. Vertical tank
10. Stairs and ground anchoring



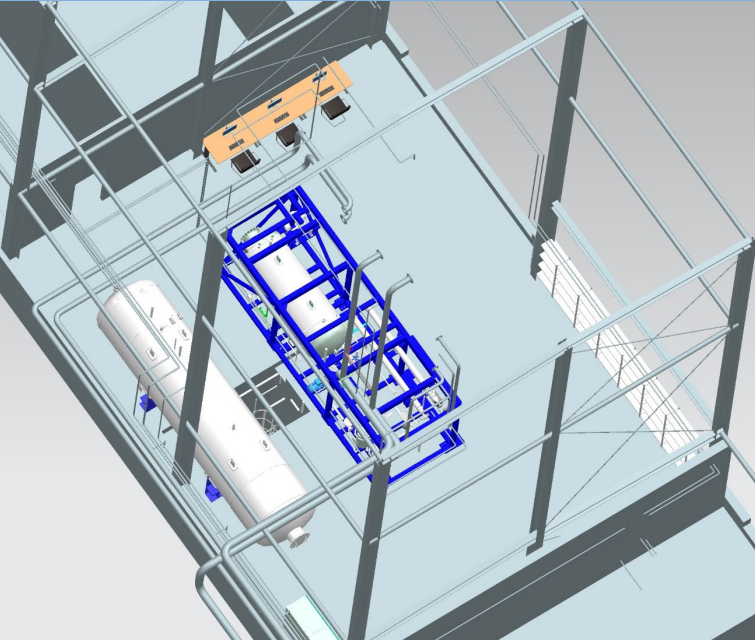


2. Skid 1

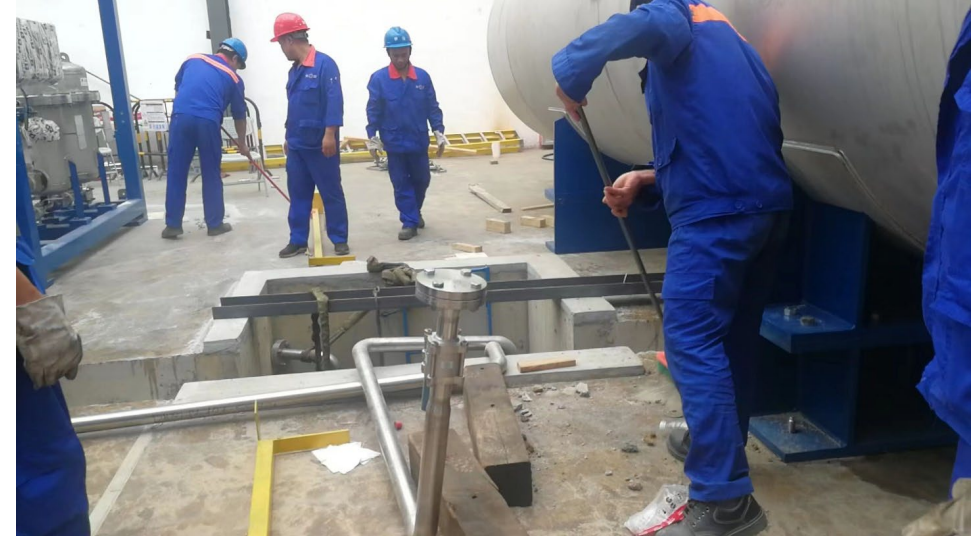


MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
- 2. Skid 1**
3. Horizontal tank
4. Skid 2
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
8. Skid 5
9. Vertical tank
10. Stairs and ground anchoring



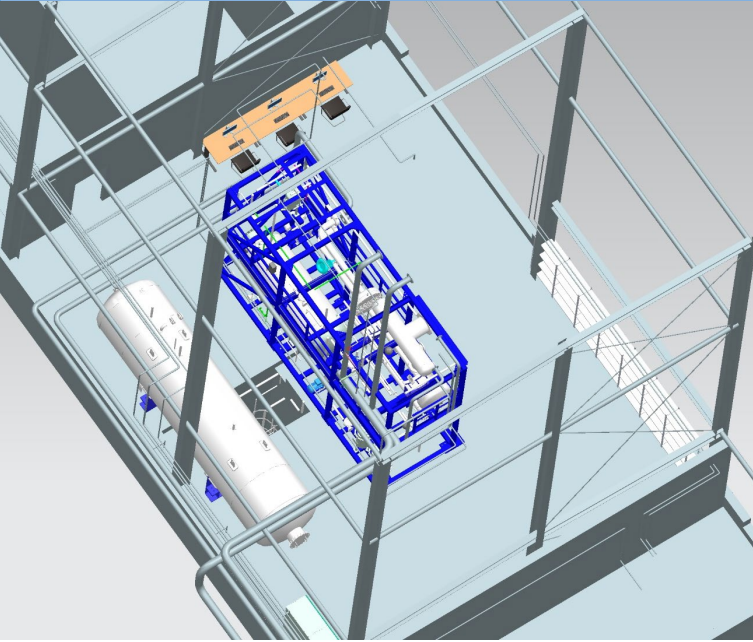
3. Horizontal tank



MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
- 3. Horizontal tank**
4. Skid 2
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
8. Skid 5
9. Vertical tank
10. Stairs and ground anchoring





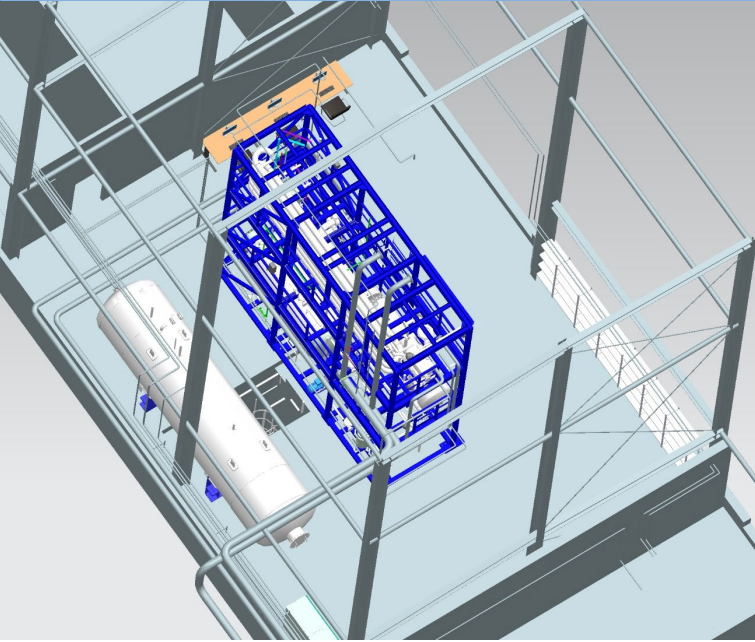
4. Skid 2

Spreader beam, custom made for lifting and installing skids

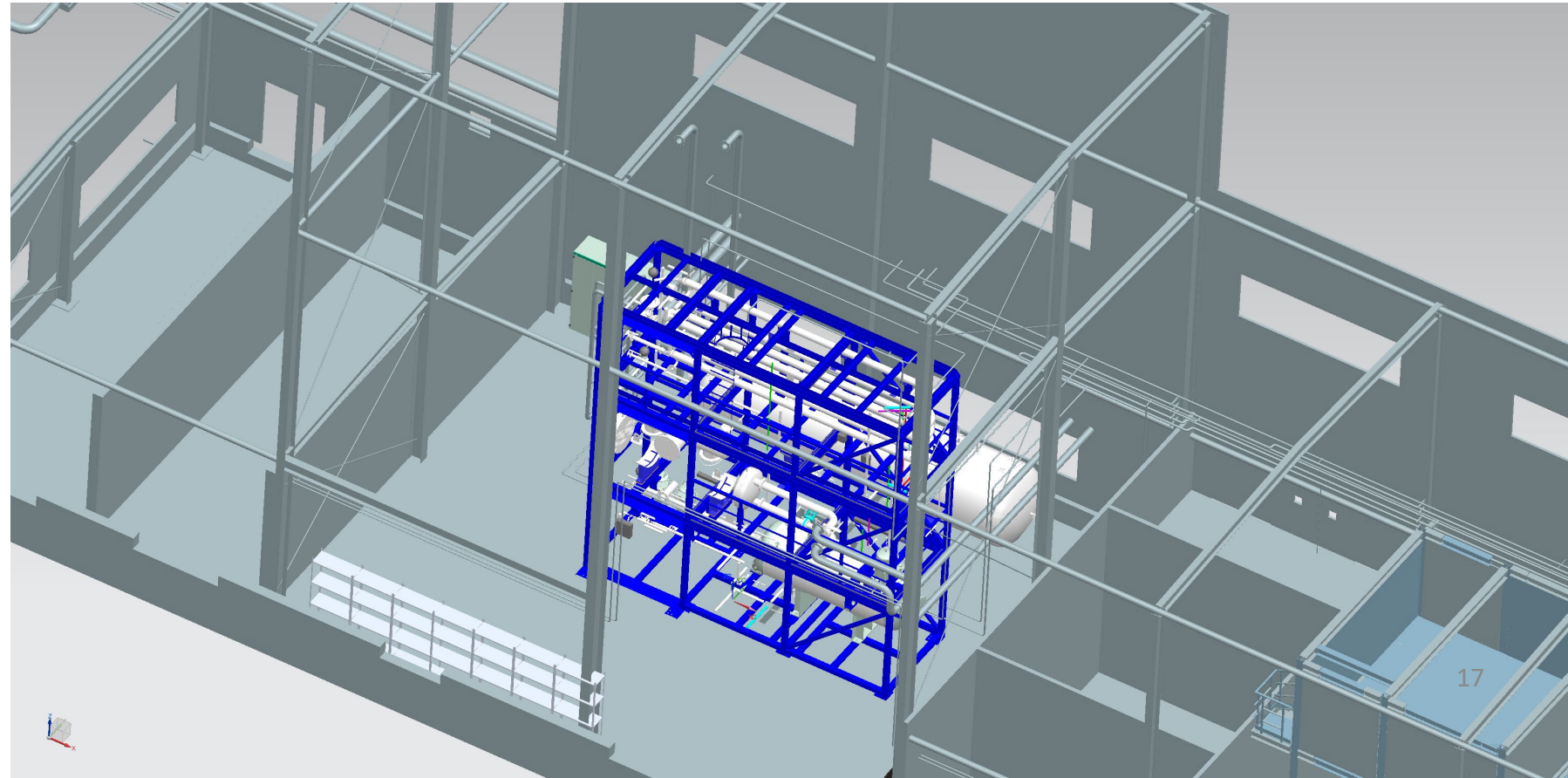
MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
3. Horizontal tank
- 4. Skid 2**
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
8. Skid 5
9. Vertical tank
10. Stairs and ground anchoring



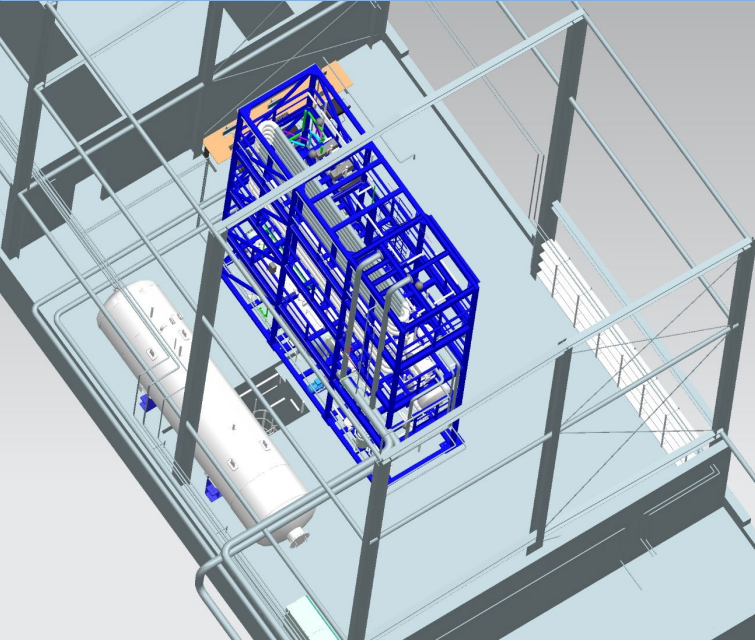


5. Skid 3



MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
3. Horizontal tank
4. Skid 2
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
8. Skid 5
9. Vertical tank
10. Stairs and ground anchoring

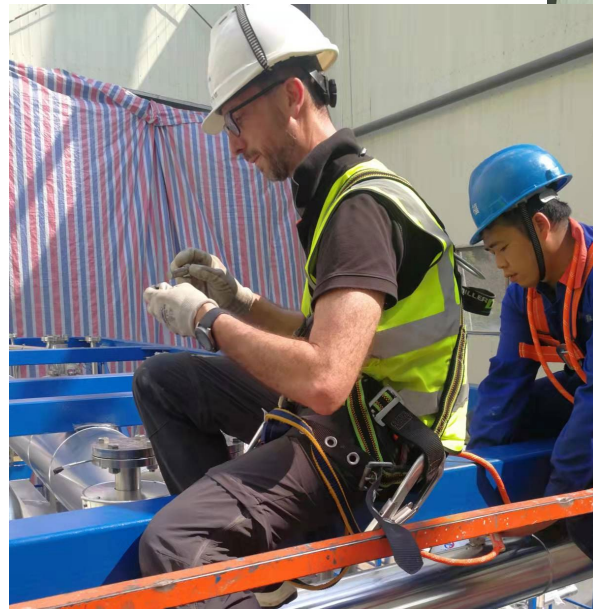


6. Skid 4

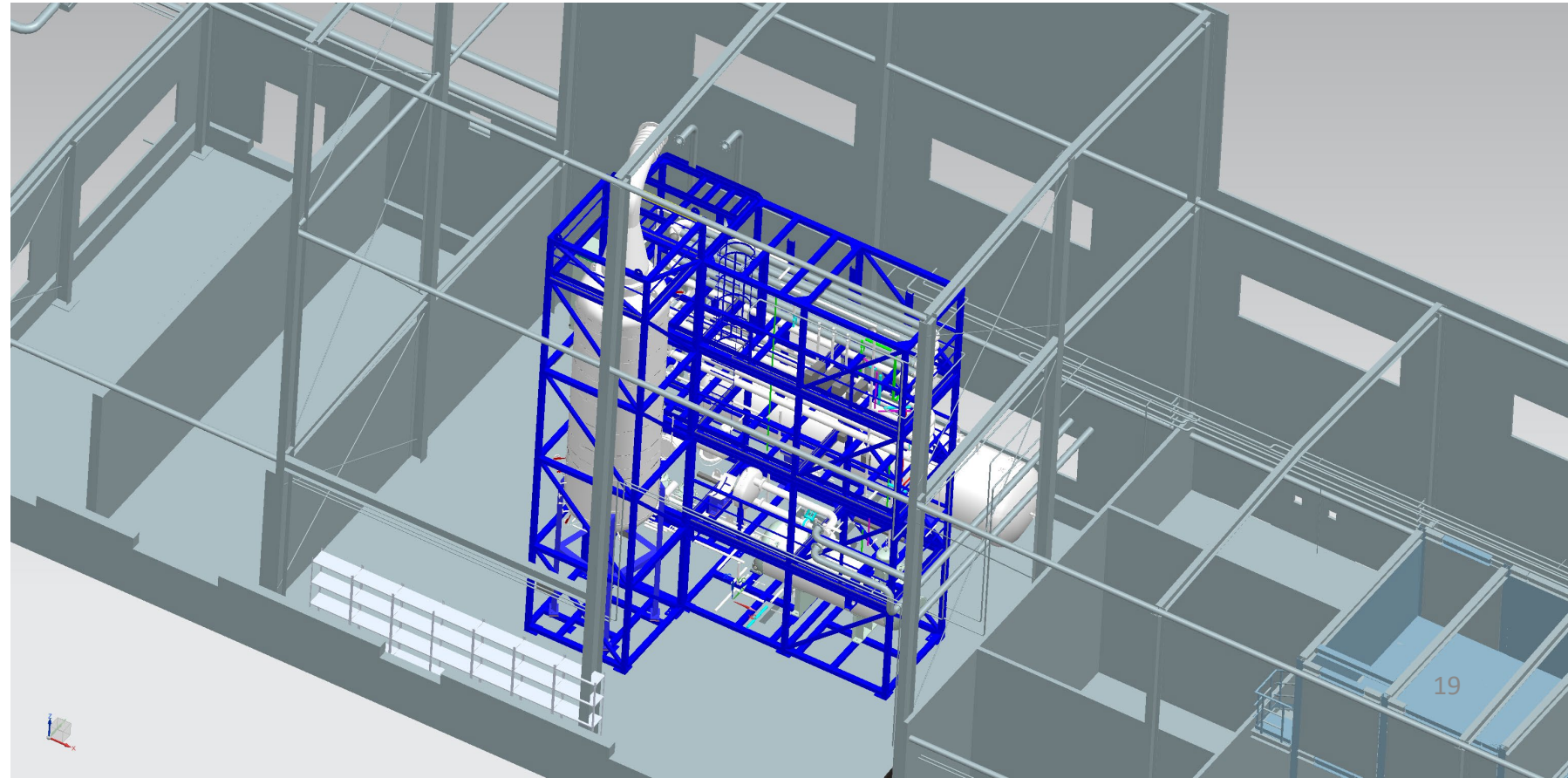
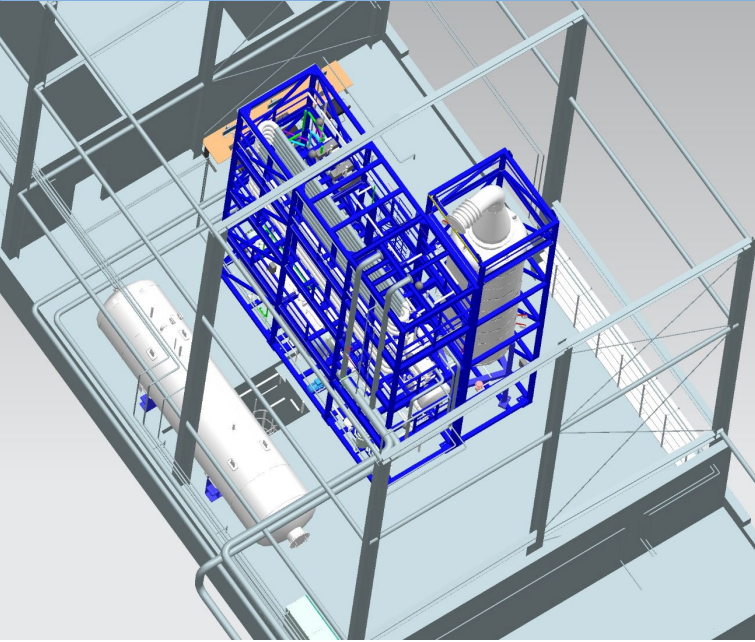


MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
3. Horizontal tank
4. Skid 2
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
8. Skid 5
9. Vertical tank
10. Stairs and ground anchoring

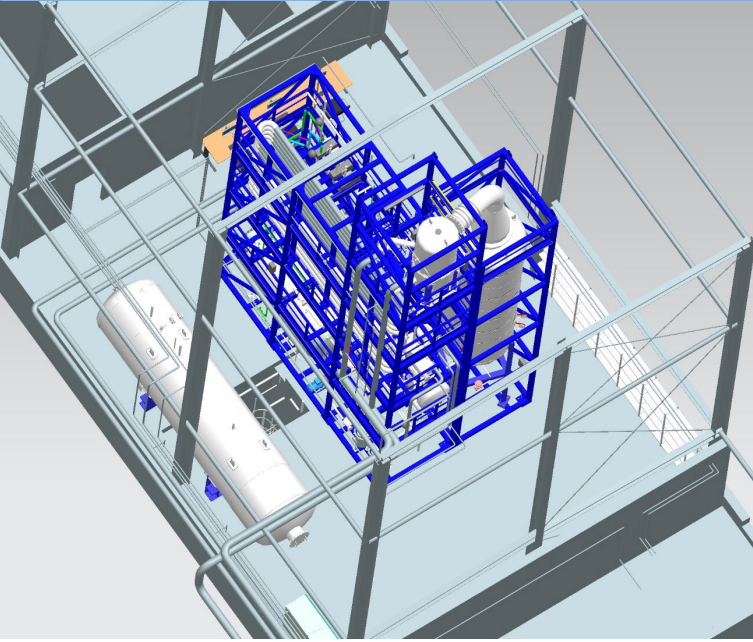


7. Skid 6 (vertical position)



MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
3. Horizontal tank
4. Skid 2
5. Skid 3
6. Skid 4
- 7. Skid 6 (vertical position)**
8. Skid 5
9. Vertical tank
10. Stairs and ground anchoring



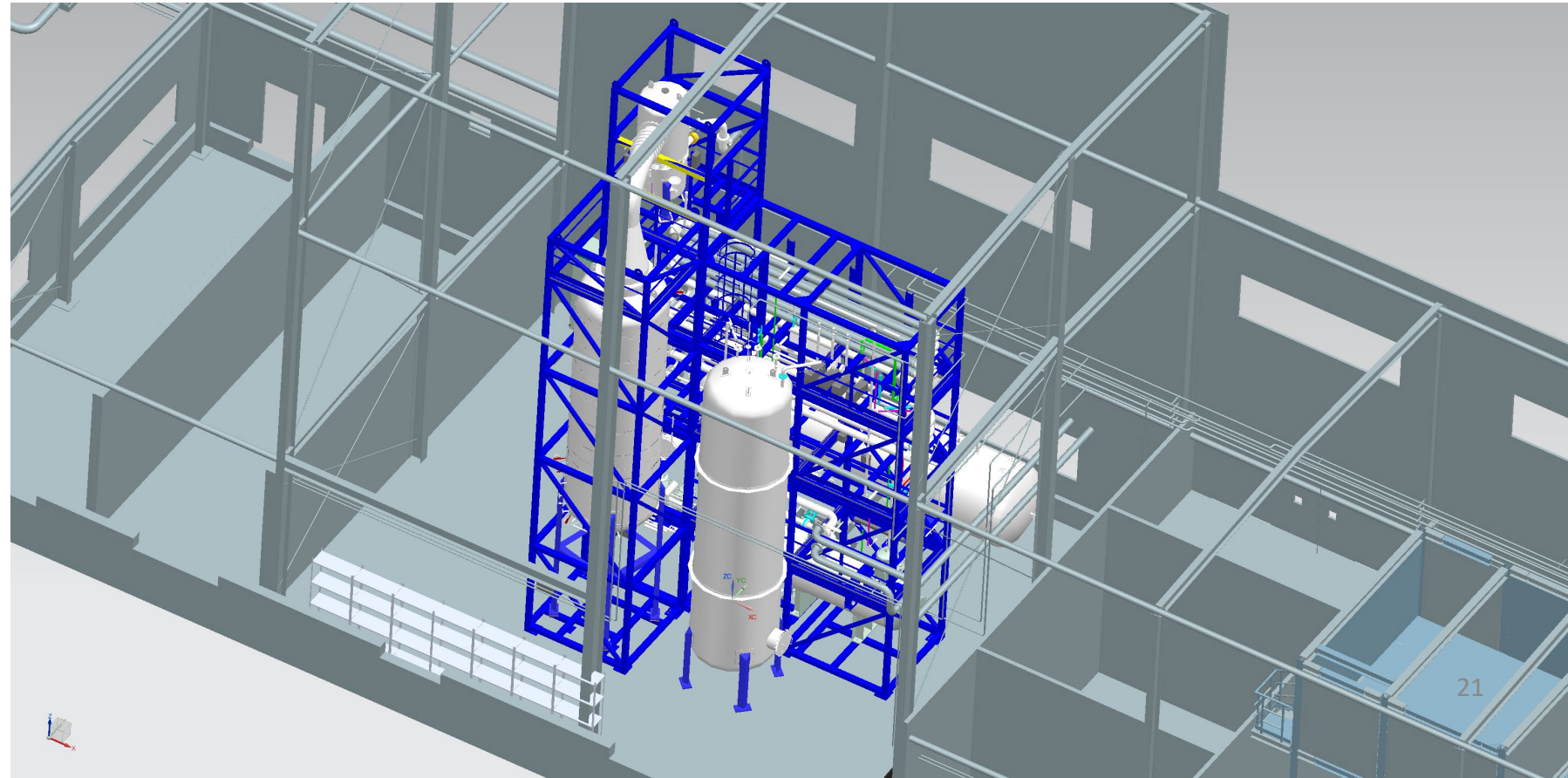
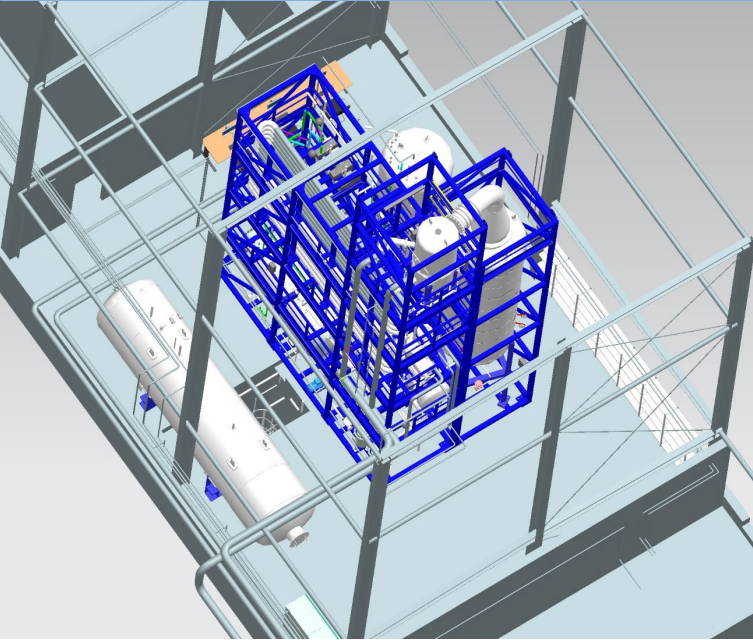
8. Skid 5

MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
3. Horizontal tank
4. Skid 2
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
- 8. Skid 5**
9. Vertical tank
10. Stairs and ground anchoring



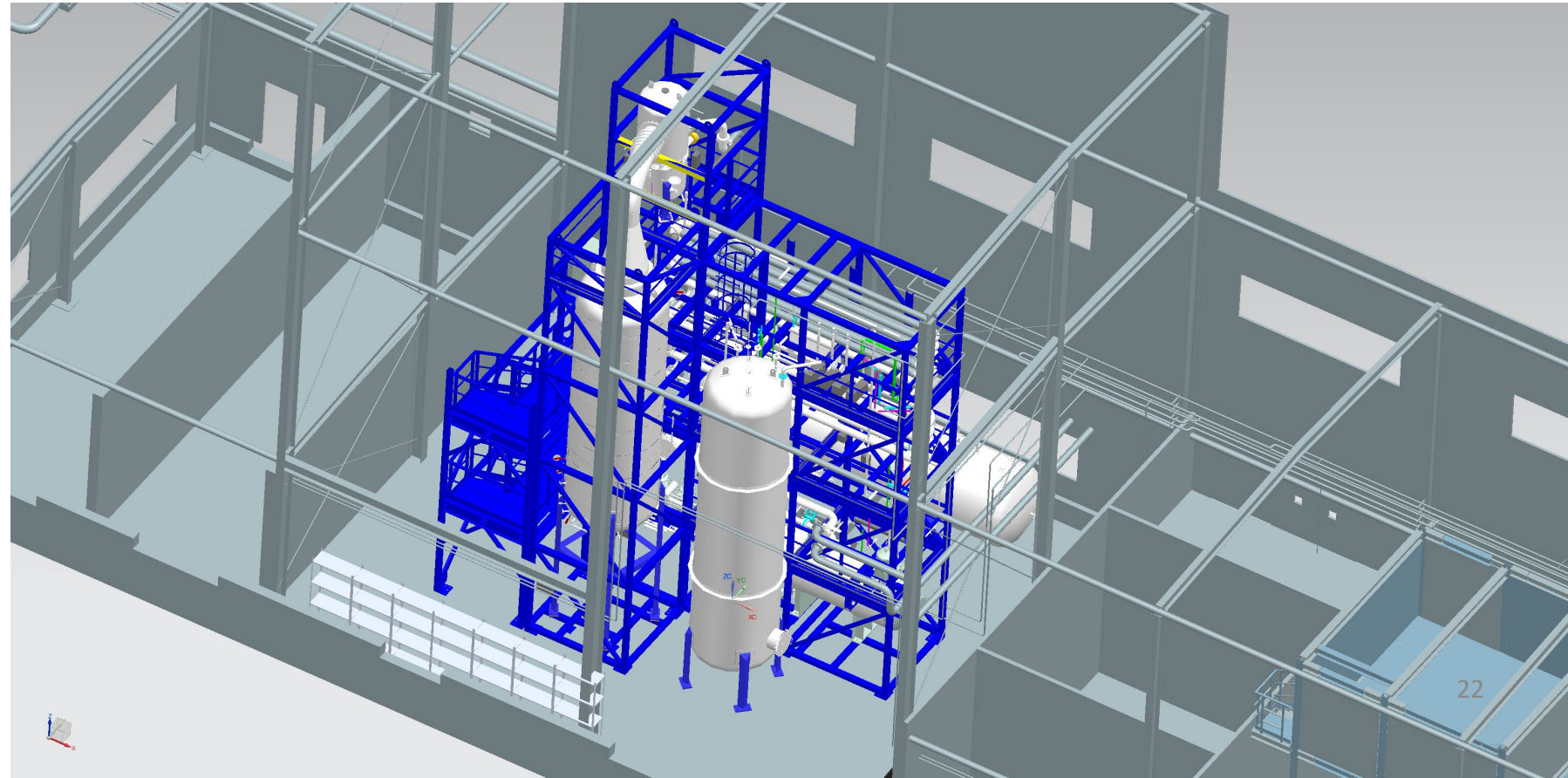
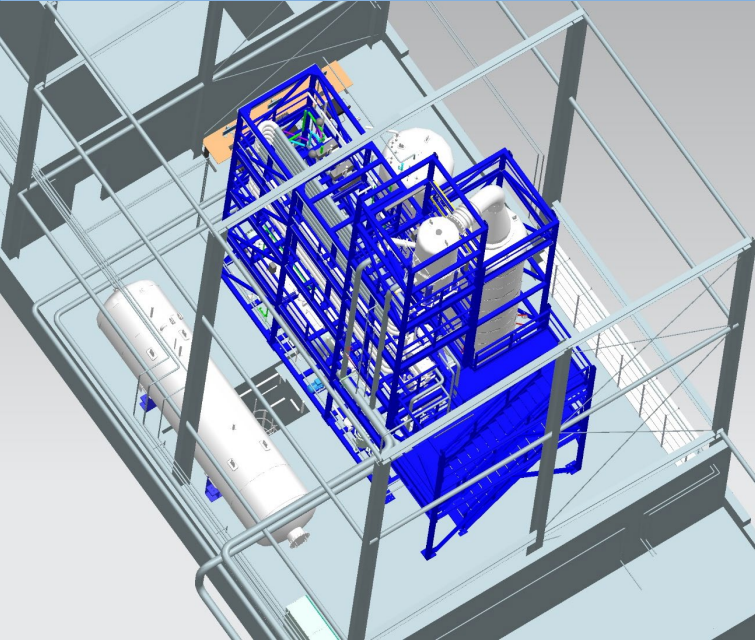
9. Vertical Tank



MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
3. Horizontal tank
4. Skid 2
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
8. Skid 5
- 9. Vertical tank**
10. Stairs and ground anchoring

10. Stairs and ground anchoring with chemical bolts



MAIN ERECTION SEQUENCE:

1. Pump skid (into the well)
2. Skid 1
3. Horizontal tank
4. Skid 2
5. Skid 3
6. Skid 4
7. Skid 6 (vertical position)
8. Skid 5
9. Vertical tank

10. Stairs and ground anchoring

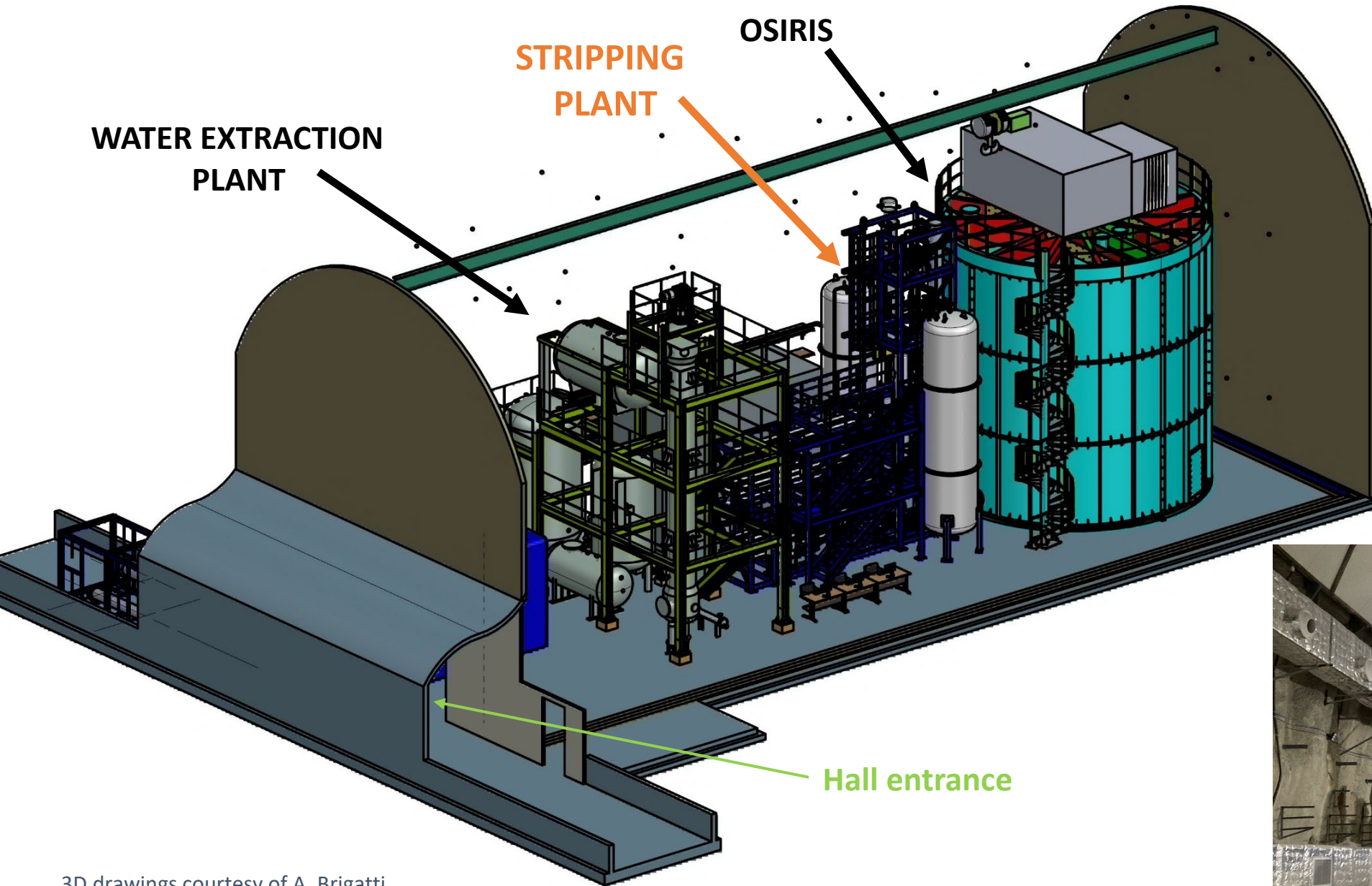
'Phase 1' of Distillation plant installation is (almost) completed!



Stripping Plant Phase 1

Underground Liquid Scintillator Hall

Underground LS Hall Layout



Stripping plant installation (phase 1)

- The installation of OSIRIS tank/vessel is completed in the underground LS Hall, so the installation of Stripping plant can start.

- **Where:**

installation in the Underground LS Hall

- **Foreseen schedule:**

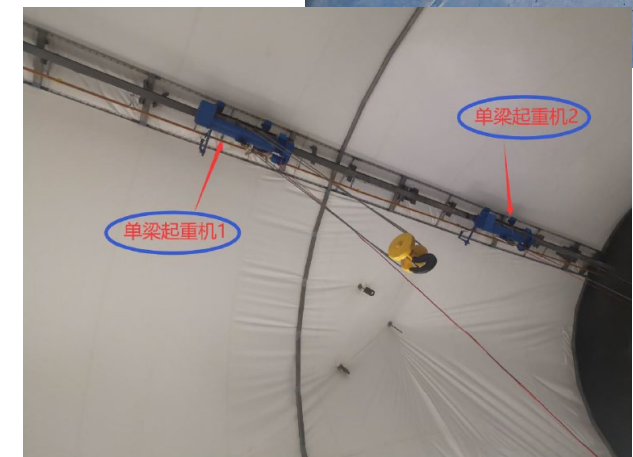
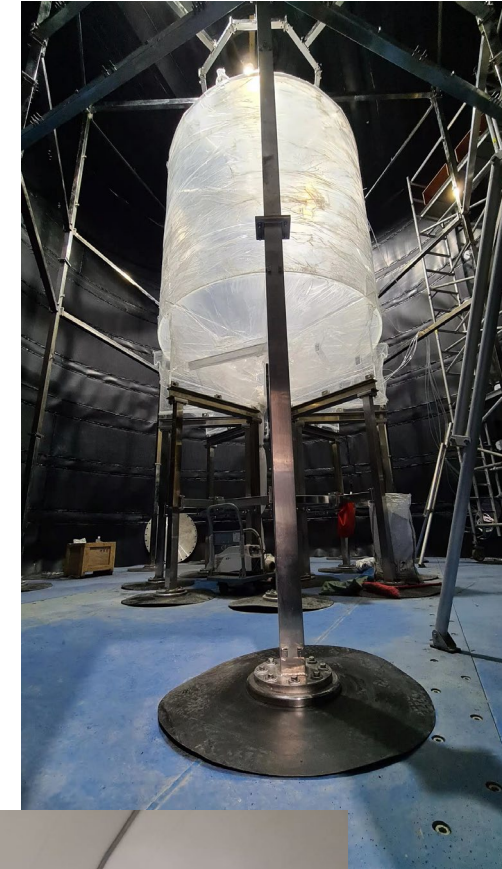
5 May - start of the Stripping plant transportation and installation

14 May - end of “Phase 1” of Stripping plant installation

- **3 skids (1 vertical skid) and 2 vertical tanks**

- **Main issues: :**



- Transportation to underground through the slope tunnel to be booked and organized in advance
- Coordination with other plants to be installed in the Hall. We don't want to be the bottle neck for underground installations.
- Few lifting devices in underground (uniaxial overhead crane of LS Hall). Vertical tanks moved to their installation position through a set of winches and ropes



Gantt schedule for Stripping Plant erection



INFN		STRIPPING PLANT INSTALLATION SCHEDULE																												INFN																															
For more details about each installation operation, see the detailed installation procedure document (I.P.): "C-367 stripping Erection works description", uploaded on EngDB-doc-13.																																																													
	TOTAL DURATION [working days]	Detailed operation	Expected duration [h]	Day 1							Day 2							Day 3							Day 4							Day 5							Day 6							Day 7							Day 8							Day 9	
				1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2
TRANSPORTATION	3 days	Transportation from storage warehouse to underground LS	3 days	[Gantt bars for Day 1-3]																																																									
PREPARATION FOR INSTALLATION	0,5 day	Draw on the floor the shape of skid 1, T-201, T-202 and stairs	2 h	[Gantt bar on Day 4]																																																									
PLANT ERECTION AND INSTALLATION	4 days	Prepare skids and tanks for positioning	2 h	[Gantt bars on Day 4]																																																									
		Positioning of skid 1 (horizontal)	3 h	[Gantt bars on Day 4]																																																									
		Installation of vertical ladder on skid 3	2 h	[Gantt bars on Day 4]																																																									
		Prepare interconnecting pipelines between skids 1-3 and 2-3	3 h	[Gantt bars on Day 4]																																																									
		Erection and positioning of skid 3 (vertical, on skid 1)	3 h	[Gantt bars on Day 4]																																																									
		Fix together skids 1 and 3	1 h	[Gantt bars on Day 4]																																																									
		Prepare interconnecting pipelines between skids 1-2 and 2-3	1 h	[Gantt bars on Day 4]																																																									
		Erection and positioning of skid 2 (horizontal, on skid 1)	3 h	[Gantt bars on Day 4]																																																									
		Fix together skids 1-2 and skids 1-3	1 h	[Gantt bars on Day 4]																																																									
		T-201 tank insulation (to be done by a specific and expert contractor)	6 h	[Gantt bars on Day 4]																																																									
		Preparation for T-201 tank positioning (metallic spacers/terminals)	1 h	[Gantt bars on Day 4]																																																									
		Erection and positioning of T-201 tank	3 h	[Gantt bars on Day 4]																																																									
		Check T-201 position	2 h	[Gantt bars on Day 4]																																																									
		Preparation for T-202 tank positioning (metallic spacers/terminals)	1 h	[Gantt bars on Day 4]																																																									
Erection and positioning of T-202 tank	3 h	[Gantt bars on Day 4]																																																											
Check T-202 position	2 h	[Gantt bars on Day 4]																																																											
Mounting and installation of external stairs	5 h	[Gantt bars on Day 4]																																																											
GROUND ANCHORING	1 day	Ground anchoring of T-201, T-202, skid 1, stairs with chemical anchors	9 h	[Gantt bars on Day 8]																																																									
Total Time			58 h ~8.5 days																																																										

 = no lifting tool required
 = overhead crane or lifting tools required

➤ **Total time required (only phase 1): ~ 8-9 days**

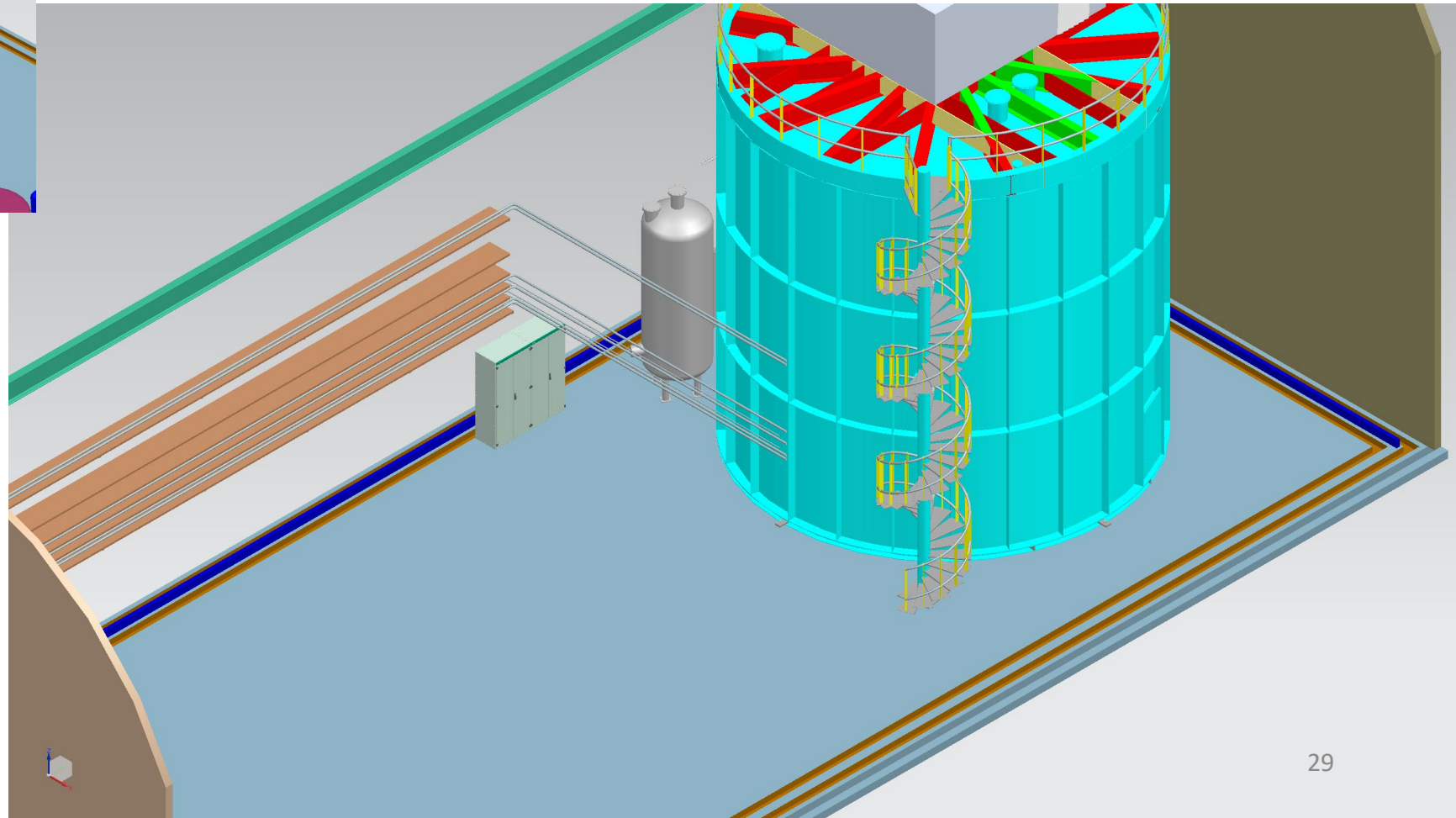
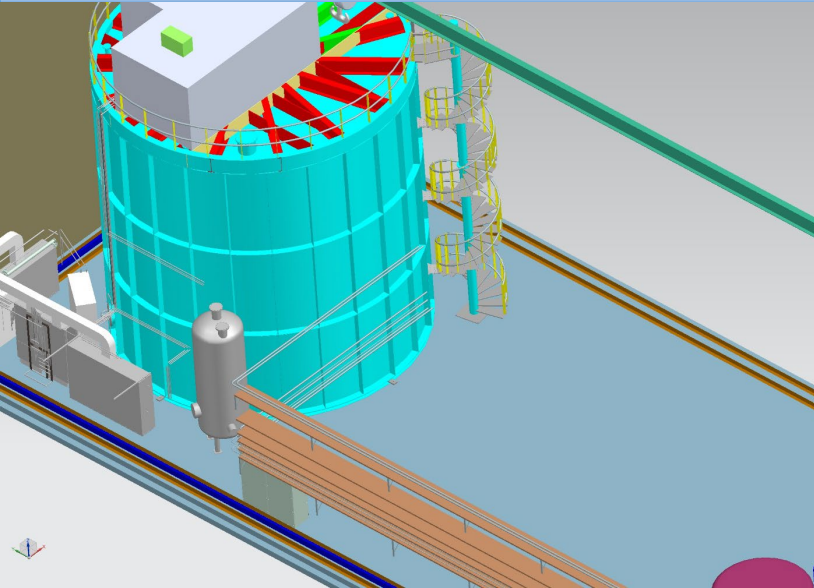
➤ **Installation tools:**

- Chemical bolts and hammer drill provided by INFN
- All main installation tools provided by the installation company (cranes, chain winches, spreader beam, hooks, ropes, lifting platform, forklift, ladders, protective equipment,...)

- Transportation of plants skids from the temporary repository to JUNO site (20 km far) by flat racks and to underground through the cable car of the slope tunnel.



Start of the sequence



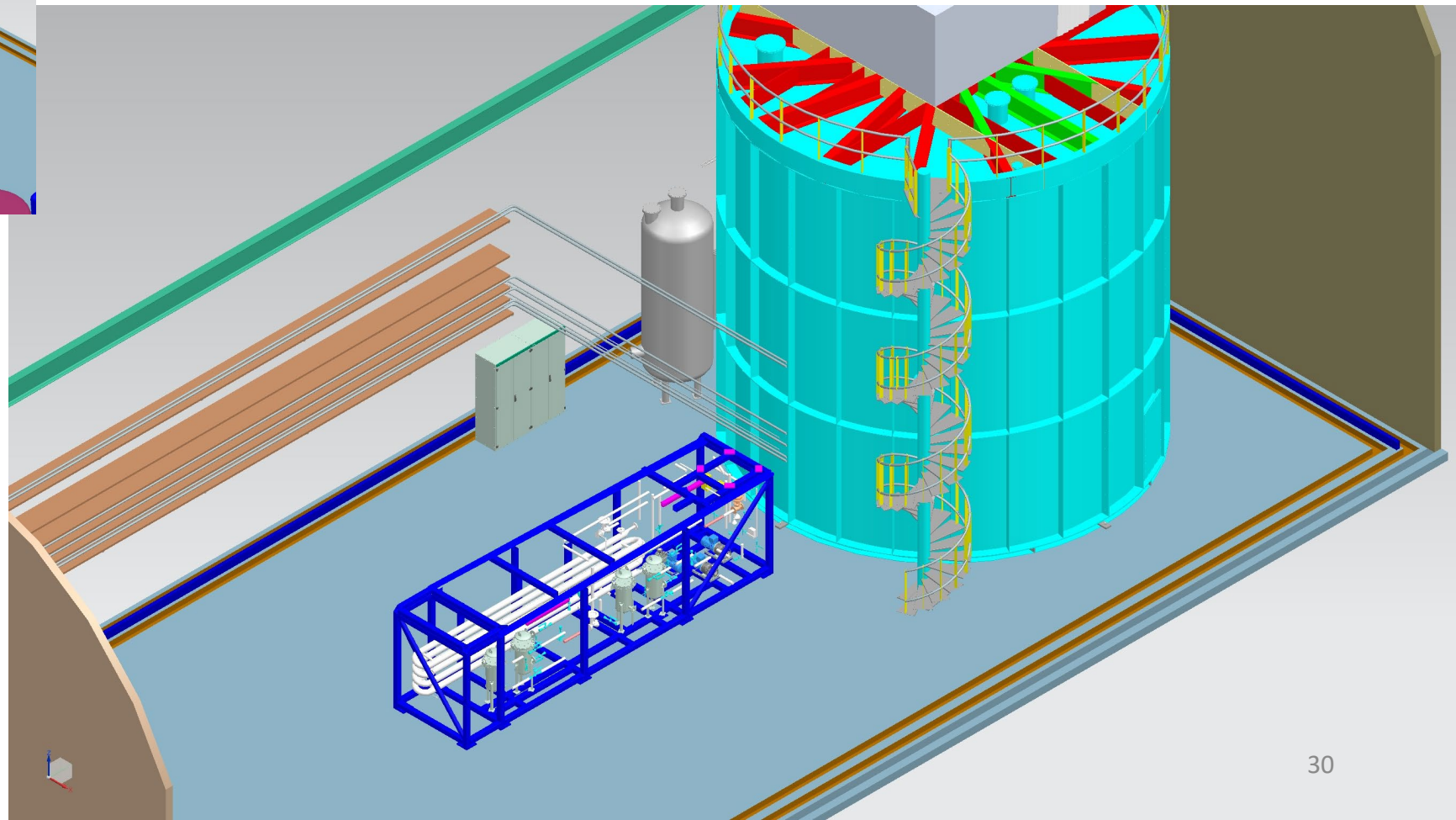
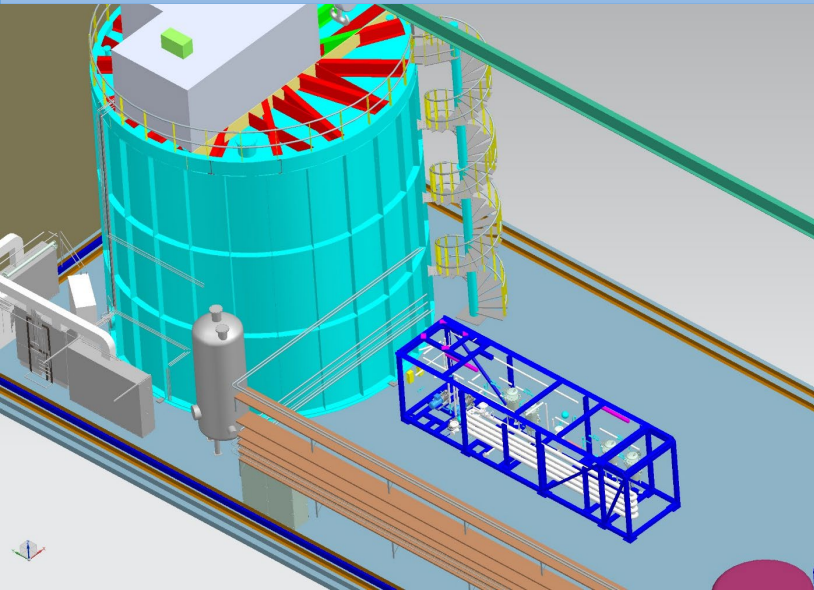
MAIN ERECTION SEQUENCE:

1. Skid 1
2. Skid 3 (vertical position)
3. Skid 2
4. T-201 vertical tank
5. T-202 vertical tank
6. Stairs and grounding

1. Skid 1

MAIN ERECTION SEQUENCE:

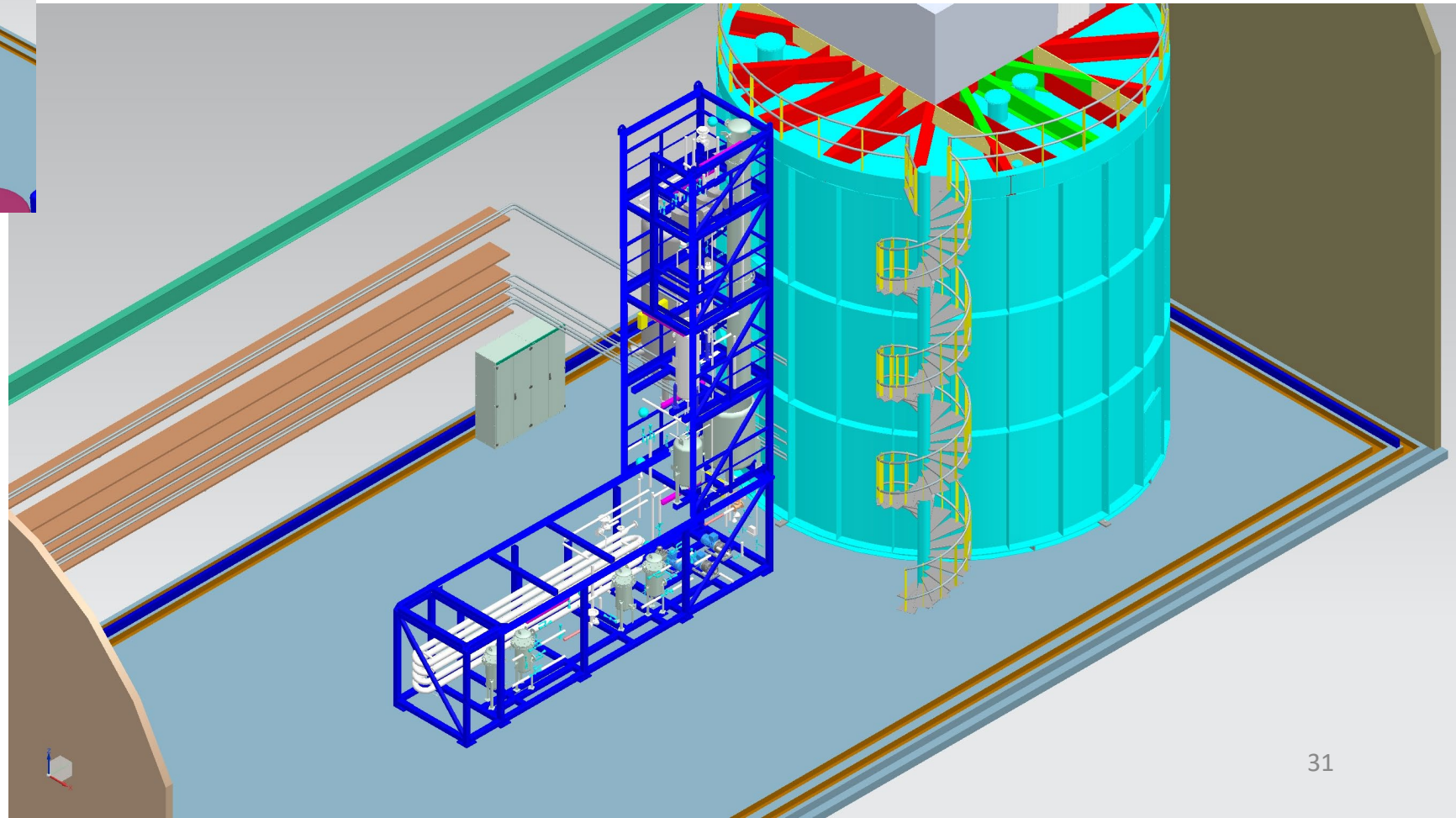
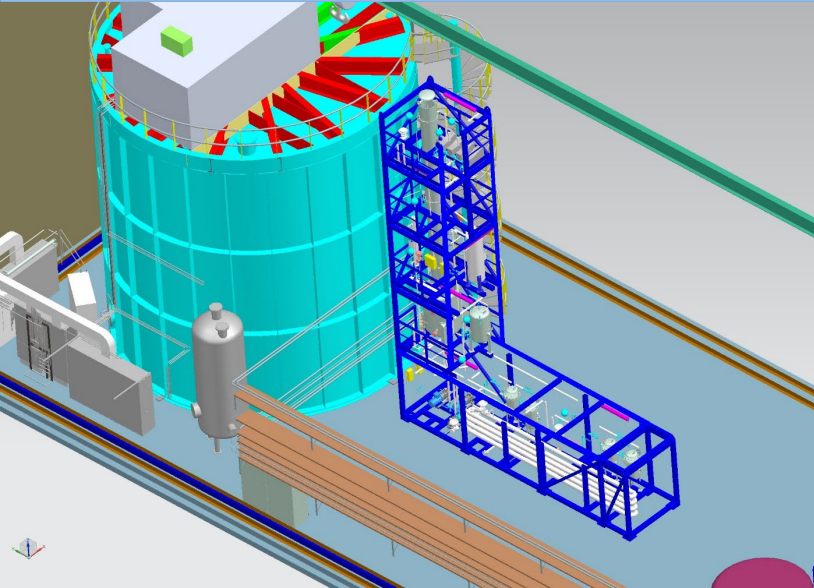
1. Skid 1
2. Skid 3 (vertical position)
3. Skid 2
4. T-201 vertical tank
5. T-202 vertical tank
6. Stairs and grounding



2. Skid 3 (vertical position)

MAIN ERECTION SEQUENCE:

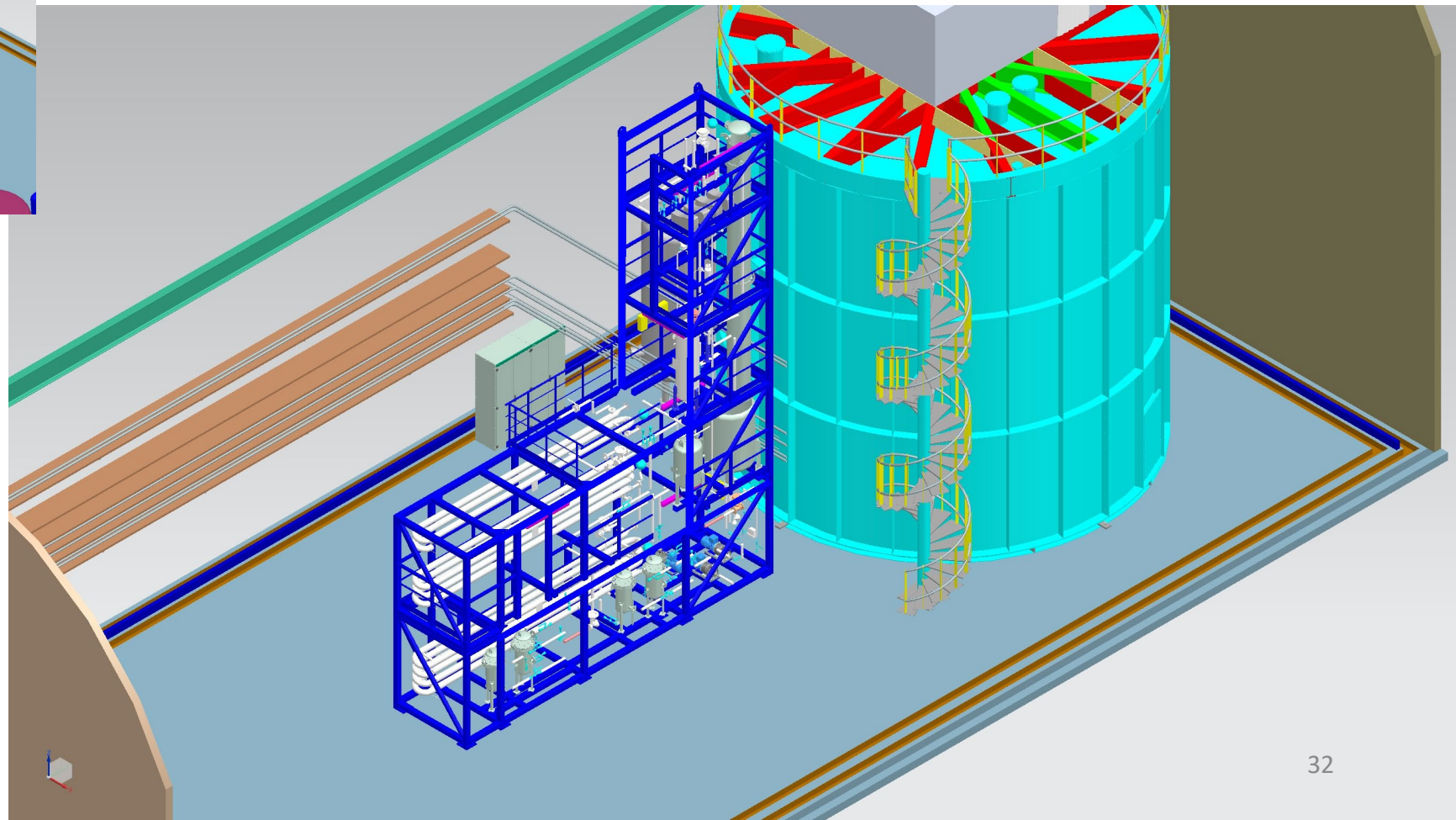
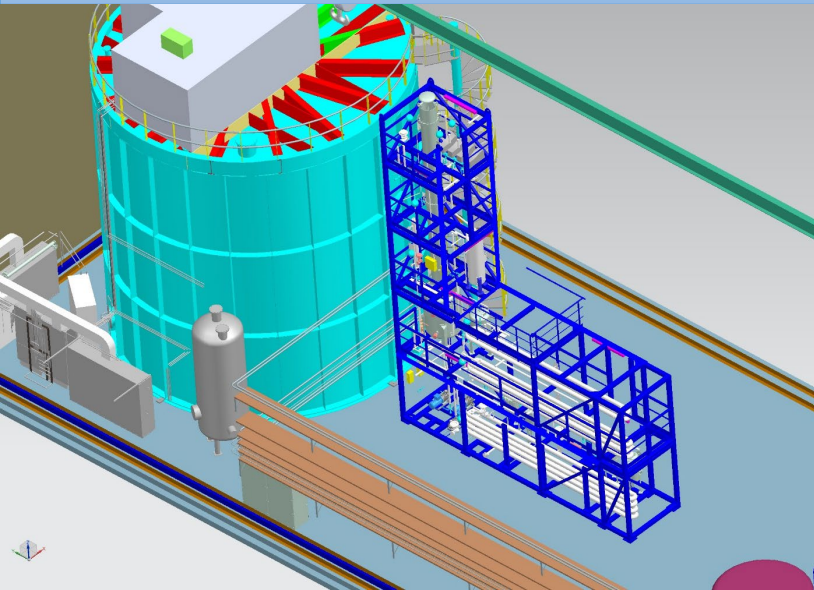
1. Skid 1
2. Skid 3 (vertical position)
3. Skid 2
4. T-201 vertical tank
5. T-202 vertical tank
6. Stairs and grounding



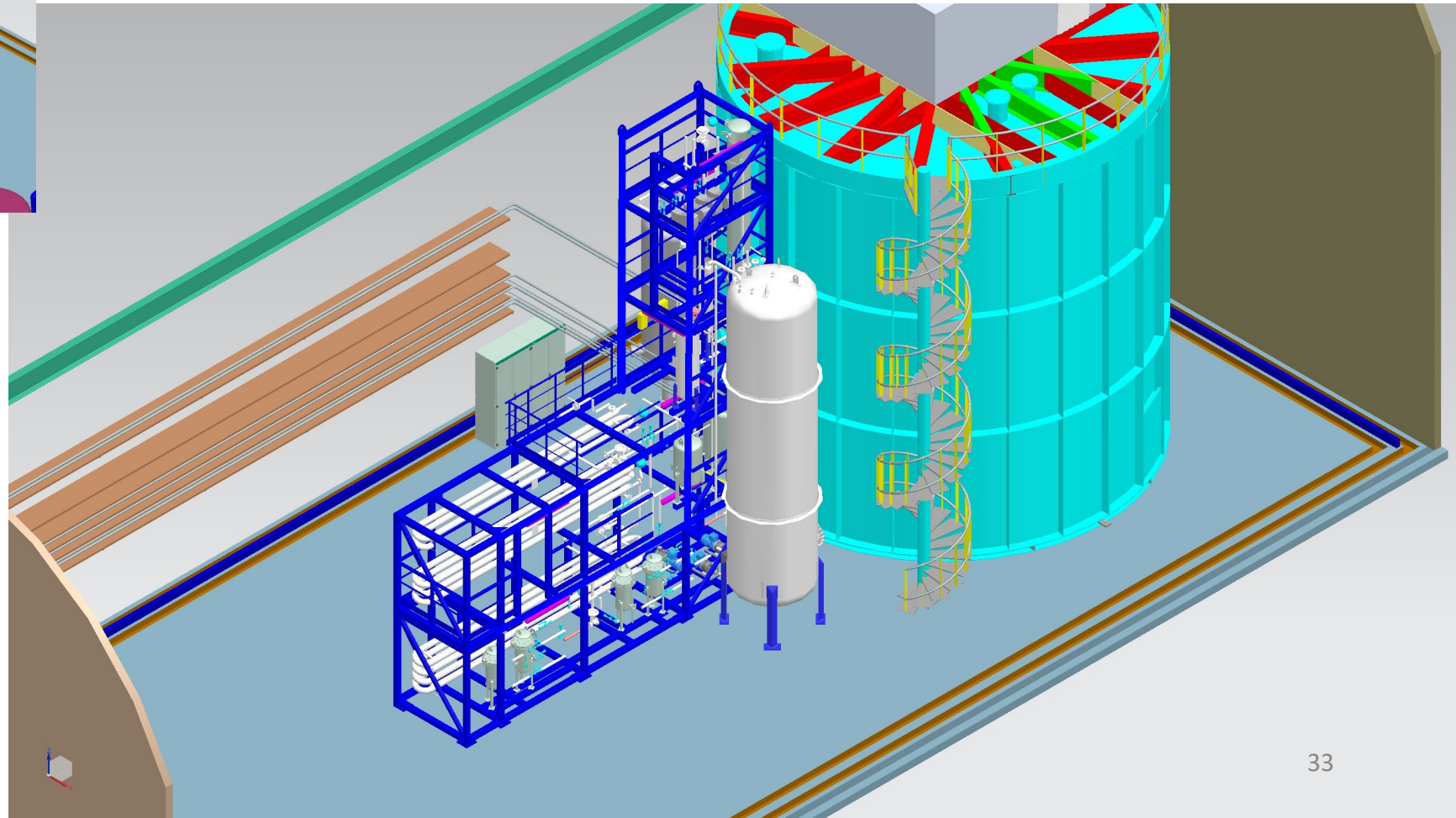
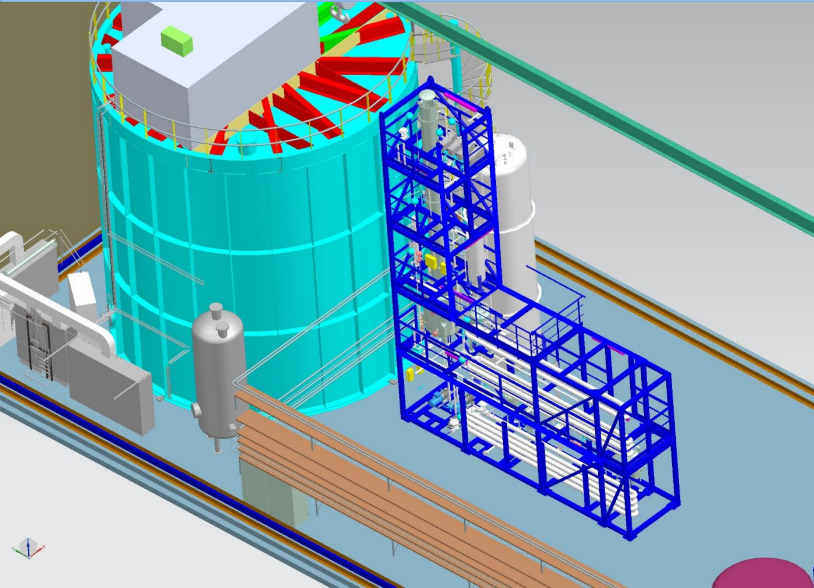
3. Skid 2

MAIN ERECTION SEQUENCE:

1. Skid 1
2. Skid 3 (vertical position)
3. Skid 2
4. T-201 vertical tank
5. T-202 vertical tank
6. Stairs and grounding



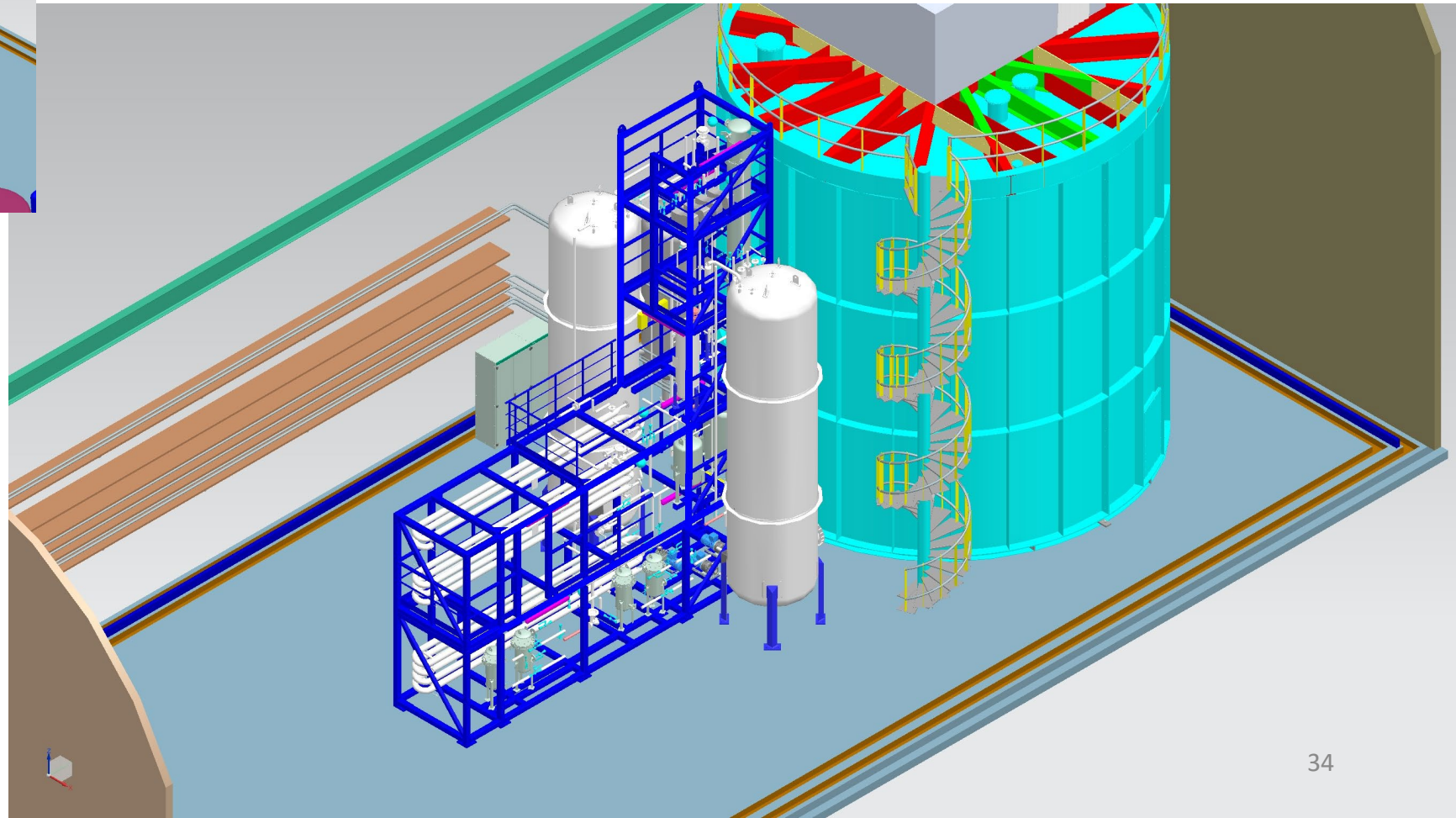
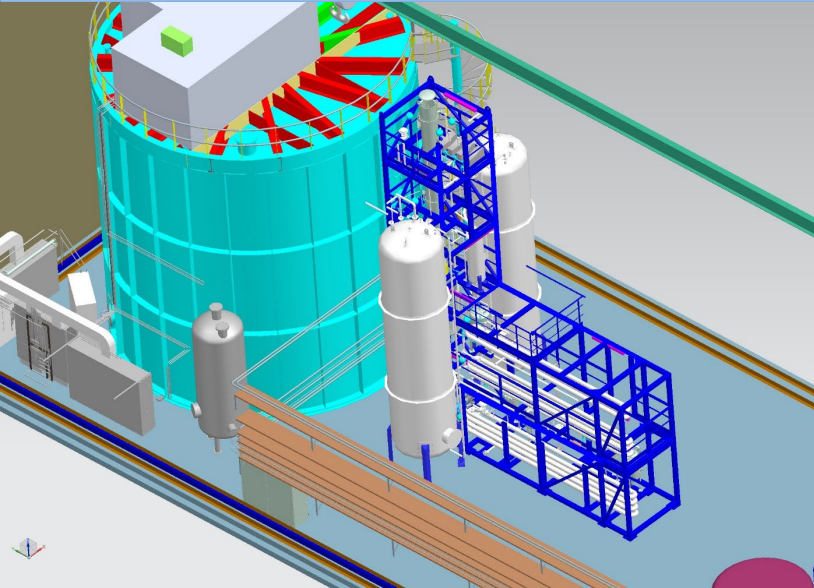
4. T-201 vertical tank



MAIN ERECTION SEQUENCE:

1. Skid 1
2. Skid 3 (vertical position)
3. Skid 2
4. T-201 vertical tank
5. T-202 vertical tank
6. Stairs and grounding

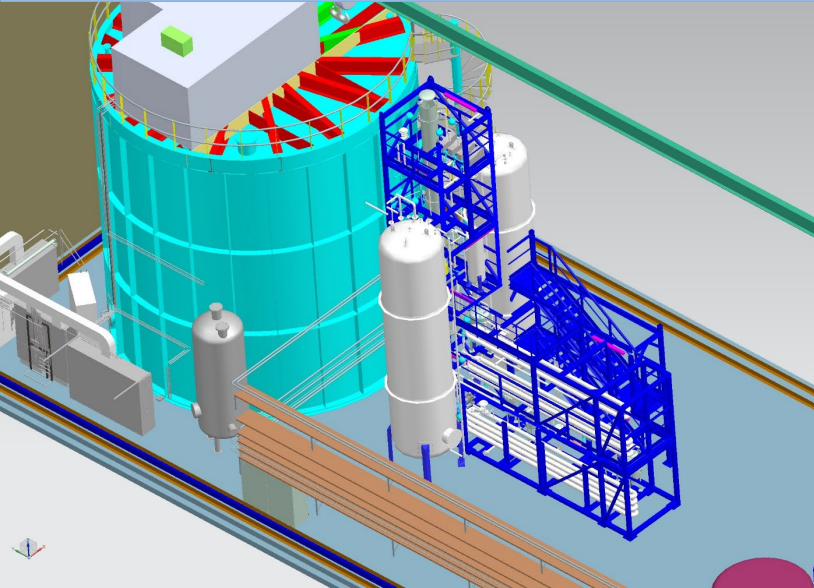
5. T-202 vertical tank



MAIN ERECTION SEQUENCE:

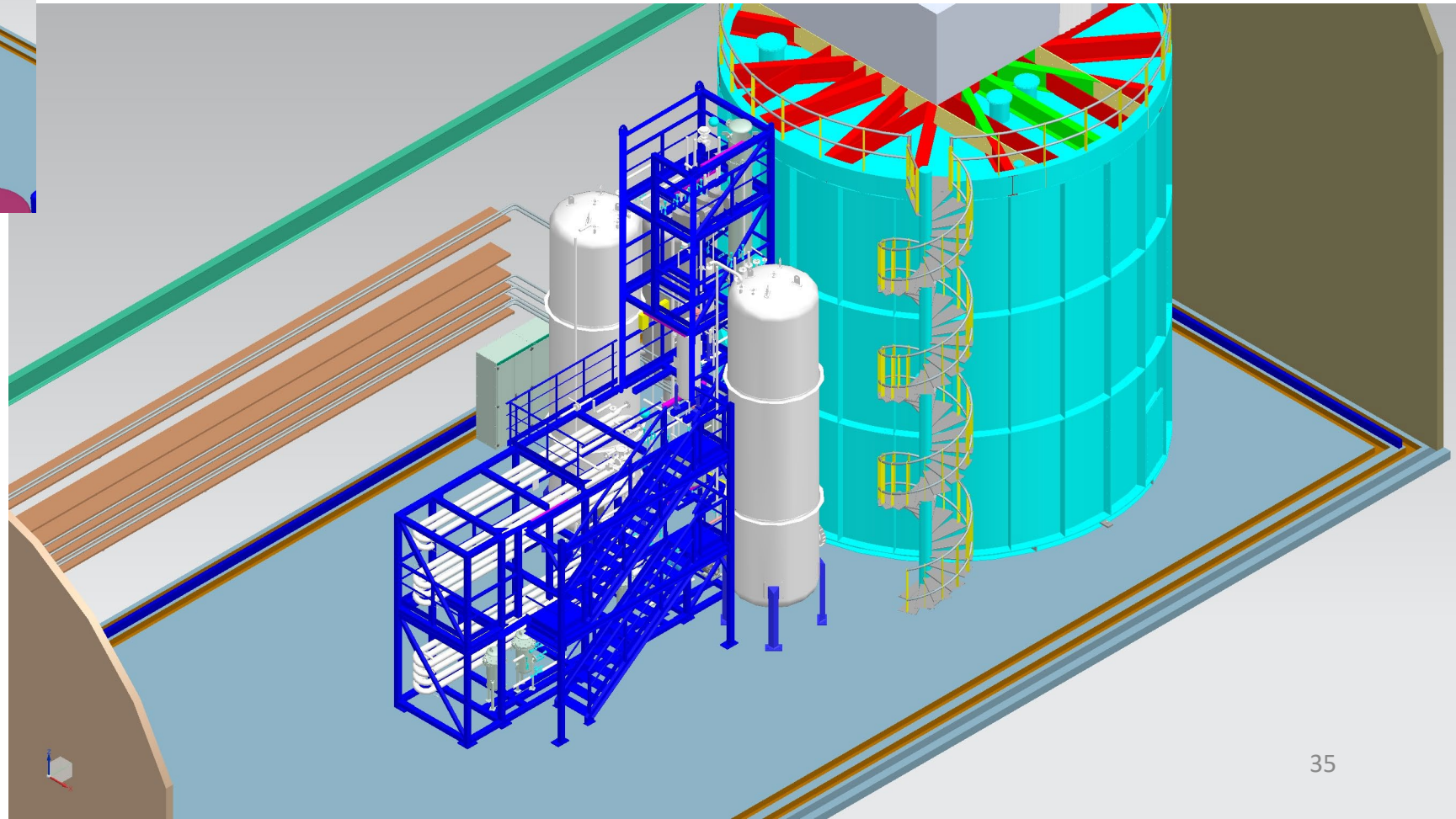
1. Skid 1
2. Skid 3 (vertical position)
3. Skid 2
4. T-201 vertical tank
5. T-202 vertical tank
6. Stairs and grounding

6. Stairs and ground anchoring with chemical bolts



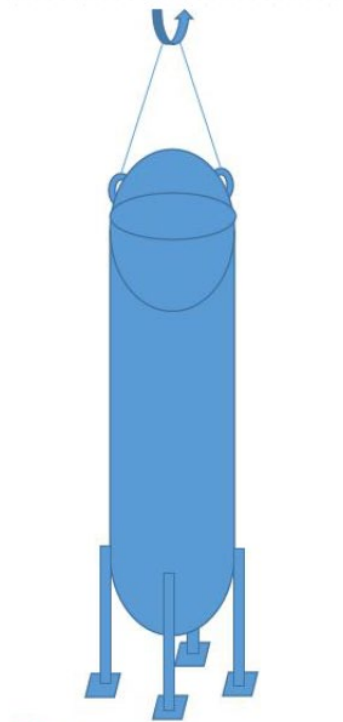
MAIN ERECTION SEQUENCE:

1. Skid 1
2. Skid 3 (vertical position)
3. Skid 2
4. T-201 vertical tank
5. T-202 vertical tank
6. Stairs and grounding



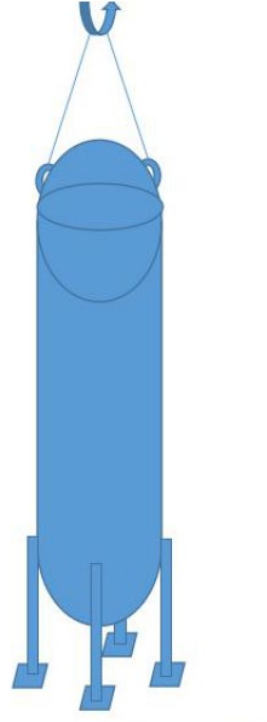
Installation sequence slightly modified: vertical tanks erection

- Just before the installation, the sequence was slightly modified: vertical tanks erected in vertical position before the positioning of skids, then moved aside with a set of winches and ropes.
- Reason: safety reasons, few lifting devices and/or anchor points in underground (just the uniaxial overhead crane along the main axis of the LS Hall)



罐体吊立后向两侧移动
move aside after lifting

中轴线
axis



罐体吊立后向两侧移动
move aside after lifting



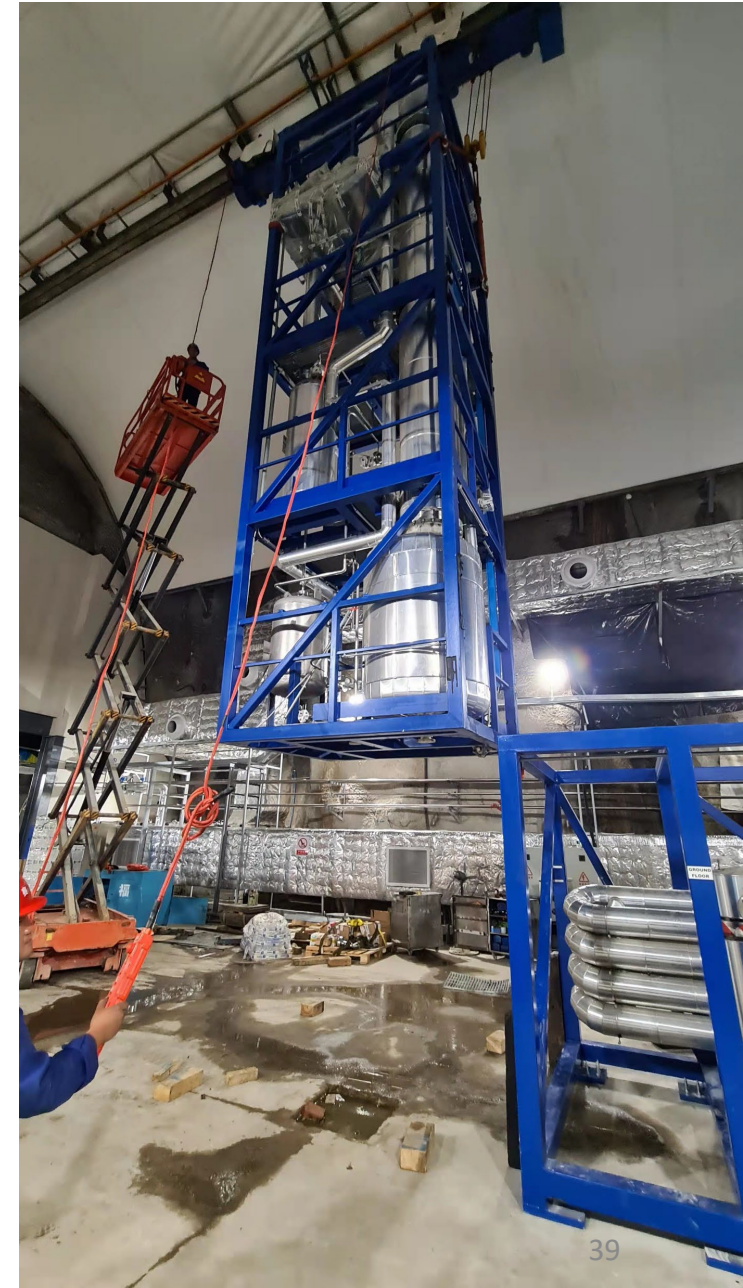
Erection of the first vertical tank (T-201)



Erection of the second vertical tank (T-202)



Installation of skids





The installation of Stripping Plant is in progress.
Phase 1 expected to be finished in about 1 week.



Phase 2

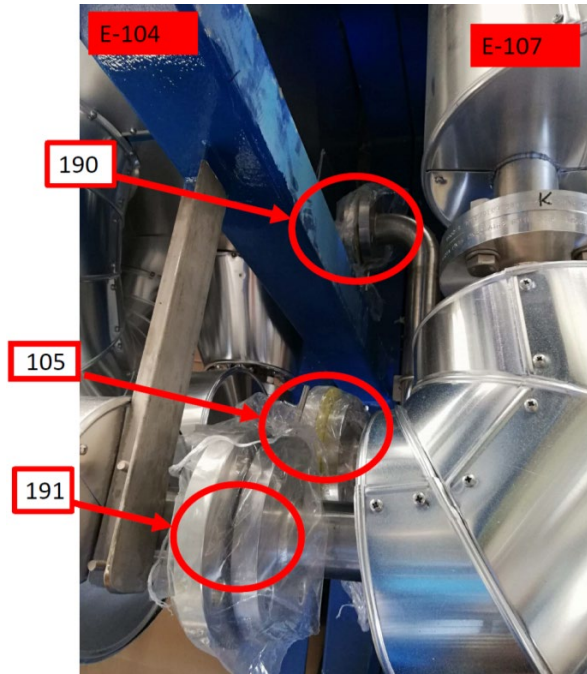
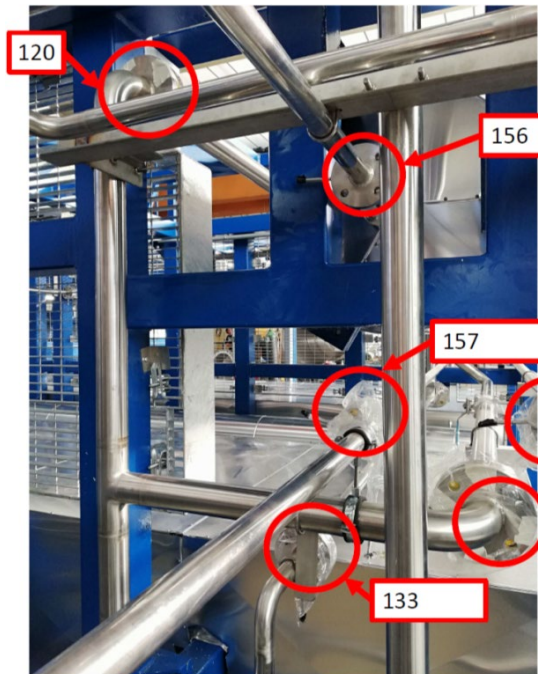
Distillation and Stripping Plants connections

Main activities : 8 days

- Mounting of external pipelines and instruments
- Coupling of interconnecting flanges between skids
- Cleaning of flange surfaces, O-rings insertion and flange sealing
- Leak test

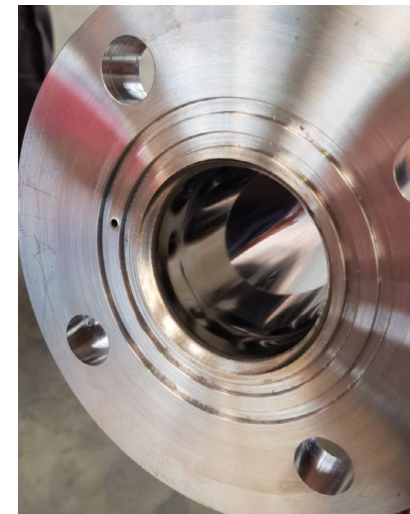
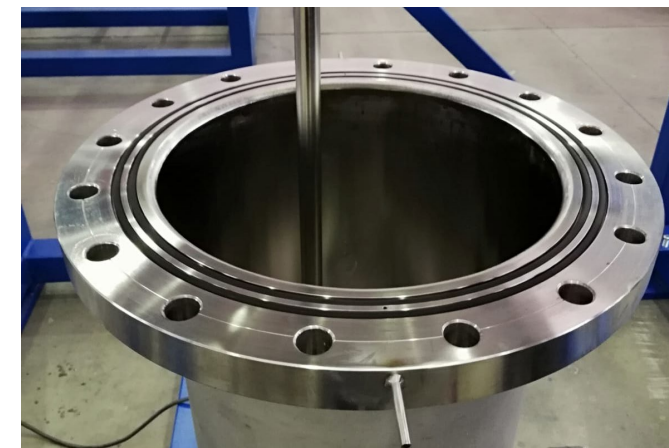


Leak detector for flange tightness certification



Interconnecting pipelines between skids

Flanges with double o-ring protection

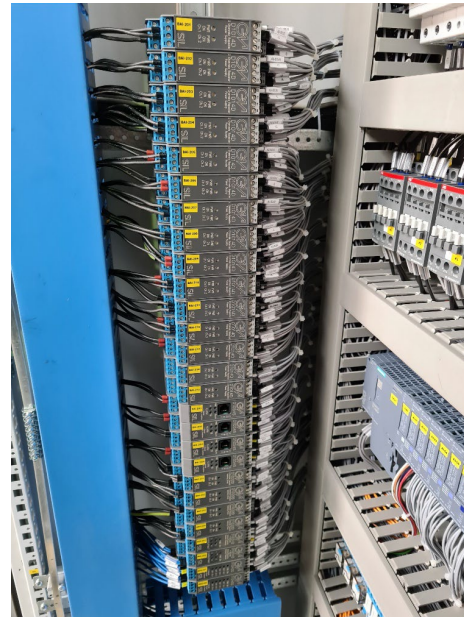


Main activities : 6 days

- Electric connections
- Installation of electric cabinet
- Cabling of instruments, pneumatic valves, pumps, junction boxes...
- DCS communication test



Cabling of valves and instruments



Electric cabinet



Junction boxes on skids



Pumps

- Another **local Chinese company** will do the installation “Phase 2” hopefully with some INFN task manager onsite
 - 1 company already contacted : **FINE company, Ltd**
 - Expected time required for installation: ~ 14 days for both plants (7 days/week and 8 h/day – 7h/day underground)
 - Manpower: to be decided by company but at list 5 operators are guarantee

- **1-2 INFN plant managers recommended to be present onsite**
 - Paolo Lombardi, Michele Montuschi, Cecilia Landini, Augusto Brigatti are possible candidates
 - Work permits and invitation letters (PU letter) should be asked in advance
 - Expected period: autumn 2022 (hopefully)
 - Logistics: hopefully the quarantine period will be relaxed at that time; if not, we should think about a remote “Phase 2”

Phase 3
Distillation and Stripping Plants
commissioning

Main activities :

- Commissioning and rinsing with **UPW**
 - First start-up of the plant
 - Commissioning with UPW; circulation in internal loop mode
 - Rinsing with UPW and drain of the plant
 - Particle counting to certify the cleanliness level
- Change filters
 - Removal of filter cartridges used for water loop (500 nm)
 - Insertion of final filter cartridges (50 nm)
- Commissioning with **LAB**
 - LAB circulation in internal loop mode and then in discharge mode
 - Tests on LAB samples (measurements of attenuation length, absorption spectra,...)
- Joint commissioning

TABLE I. Particle cleanliness levels.

Level	Particle Size, μm	Count per Liter
25	2	530
25	5	230
25	15	34
25	25	10
50	5	530
50	15	230
50	25	34
50	50	10
100	5	17850
100	15	2650
100	25	780
100	50	110
100	100	10

Particle counting



Change filter cartridges

- Decision of partial remote installation during Phase 1. Michele and Paolo succeeded to go to Juno site.
- “Phase 1” of **Distillation Plant** installation almost **completed**. One line to be checked and probably re-installed.
- “Phase 1” of **Stripping Plant** installation **in progress**.
- We hope that the travel restrictions could be a bit relaxed in autumn to allow to complete also “Phases 2 and 3” of the installation with INFN personnel onsite.

Foreseen schedule	
Arrival of Paolo and Michele at Juno	22 April 2022
Start of Distillation plant installation	25 April 2022
Start of Stripping plant installation	5 May 2022
Michele’s return flight	18 May 2022
Paolo’s return flight	27 May 2022
Phase 2	Autumn 2022

Thank you!



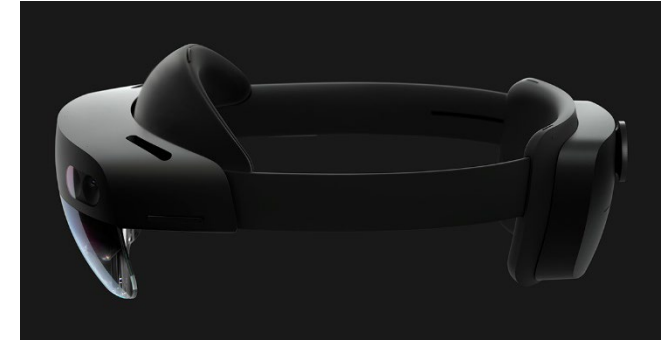
➤ Other operators from INFN remotely connected (Microsoft Teams)

- Remote INFN operators can connect to help the onsite installation operations
- All documents and all procedures easily available. They can be checked and sent to workers onsite
- With the help of glasses for augmented reality, also people connected from remote can follow the installation operations

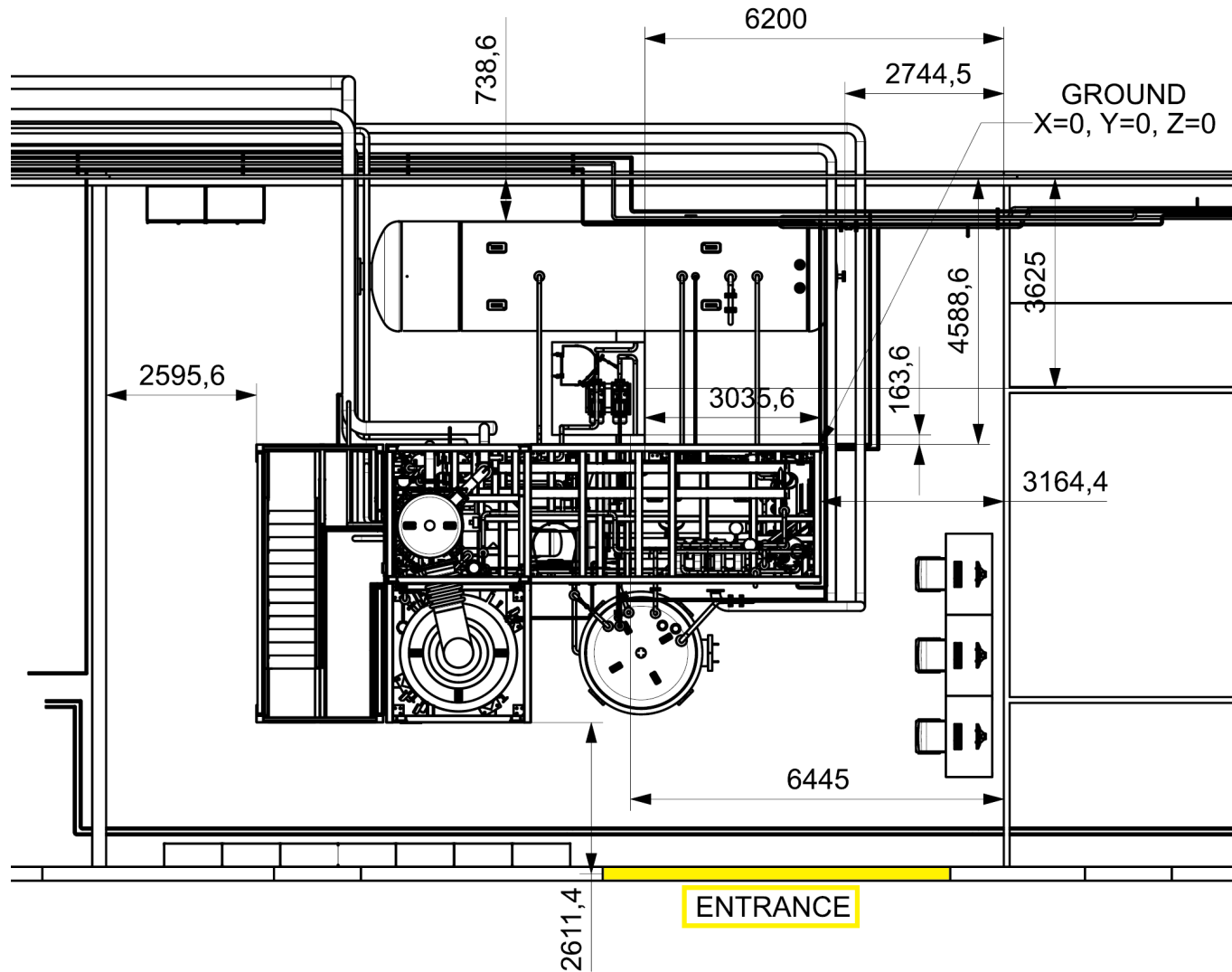
‘Microsoft HoloLens 2’ glasses:

- Innovative device for **mixed reality**
- Holograms, texts, 3D images viewable into 3D space. They can be grasped and moved like real objects
- Ergonomic, extended field of view, wireless: 100% free movements. 2-3 hours of active use
- Worn by onsite workers; people remotely connected can see 3D environments and current operations onsite

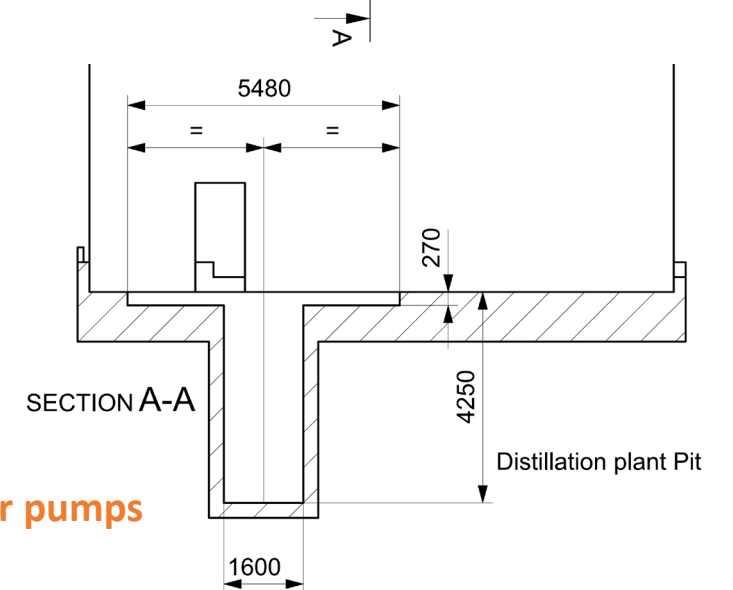
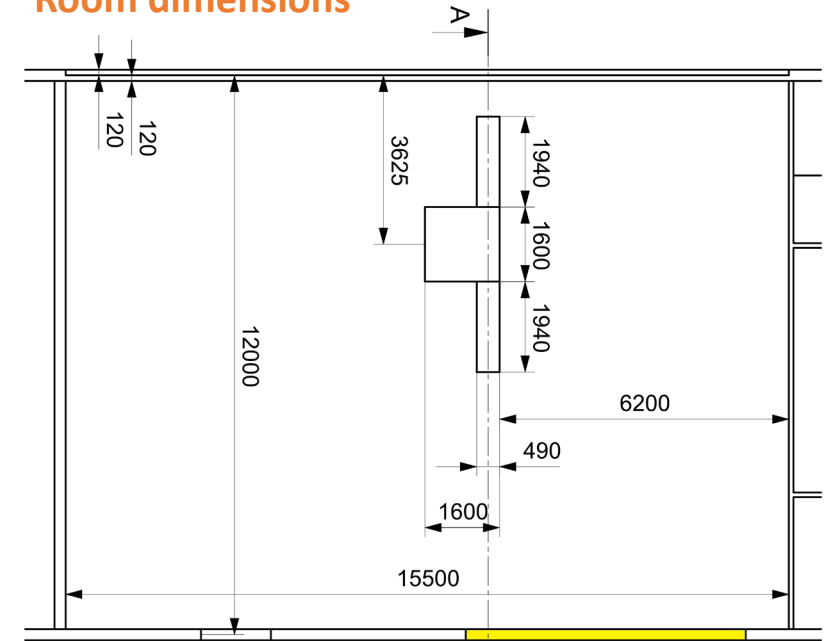
Very **useful both during installation and plant operation phases**. Onsite workers can be guided from task managers remotely connected.



DISTILLATOR ROOM



Room dimensions



Well for pumps