Outline of First AP1000 NPP Construction

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China Nuclear industry fifth construction corporation

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1. Outline of china AP1000 NPP

- From 1980’s to now, 11 units have been built in china and 24 units are ongoing, In the next 10 years, 4~6 units will be started construction each year.
- Different types of NPPs has been built in china, the newest is AP1000.
- all this NPPs constructed by CNEC (China Nuclear Engineering Group corporation) which is the only contractor of NI construction in China.
- CNF (China nuclear industry 5th construction corporation) , the subsidiary of CNEC undertakes the civil&erection construction of 4 AP1000 units.

1. Outline of China AP1000 NPP

- AP1000 is the 3rd generation PWR with passive safety system design and modularization construction feature.
- The China AP1000 project is the first of this type ever built, 4 units are built in Sanmen and Haiyang respectively, 10 months interval.
- WEC (Westinghouse) is responsible for NI design and provision of main equipment. SNPTC (State nuclear power technology corporation) is responsible for procurement balance of the main equipment.
- Joint project management organization by WEC&SHAW and SNPTC is responsible for NI project management.
- SNPEMC, established by CNEC/SNPTC, is responsible for module and containment vessel (CV) prefabrication.

1. Outline of china AP1000 NPP

Sanmen Milestone schedule

No	Description	Unit 1 (ATP+)	Unit 2 (ATP+)
1	Effective Date of the Contract	-3	-3
2	ATP (2007.12.31)	0	0
3	Start NI Excavation	+3	+13
4	Module Fabrication Shop Operational	+5	+5
5	Heavy Crane Available	+15	+15
6	First Concrete Date	+15	+25
7	Set CA20 Module	+17	+27
8	Set CV Bottom Head	+18	+28
9	Reactor Vessel Delivered on site	+40	+50
10	Two SGs Delivered on site	+44	+54
11	Set CV Top Head	+46	+56
12	Station Service Bus Energized	+48	+58

1. Outline of china AP1000 NPP

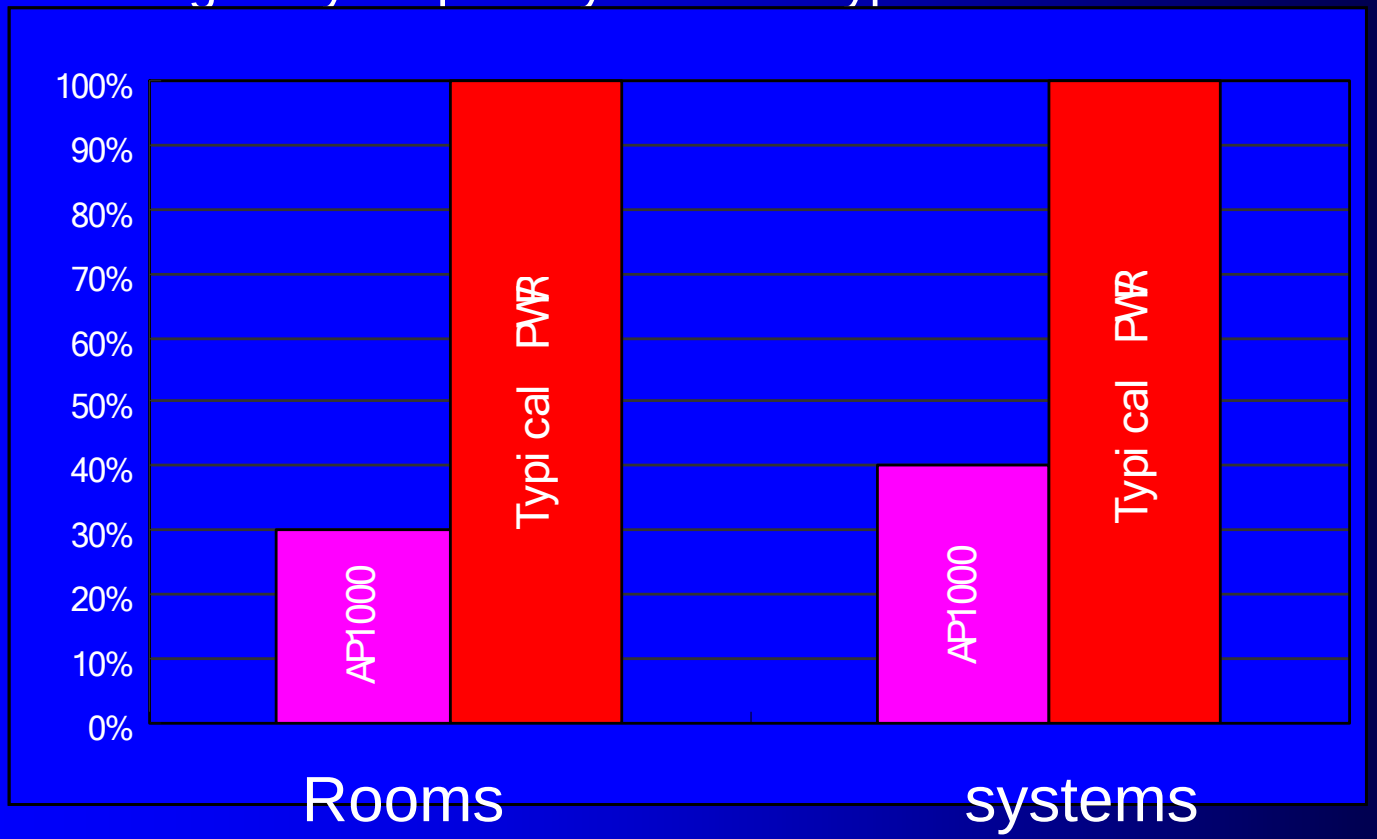
No	**Description**	**Unit 1 (ATP+)**	**Unit 2 (ATP+)**
13	Polar Crane Available	**+48**	**+58**
14	FSAR Submitted	**+50**	**+50**
15	Reactor Coolant Pumps Delivered on Site	**+51**	**+61**
16	Simulator available for operator training	**ATP+53**	
17	RCS System Turnover	**+54**	**+64**
18	Main Control Room (MCR) Operational	**+56**	**+66**
19	Start cold functional test	**+58**	**+68**
20	Turbine Ready for Steam	**+60**	**+70**
21	Start hot functional test	**+60**	**+70**
22	Start fuel loading	**+65**	**+75**
23	First criticality	**+67**	**+77**
24	First connection to the grid	**+68**	**+78**
25	End of Performance Test (2013.11.31)	**+71**	**+81**

1. Outline of china AP1000 NPP

1. Outline
2. Construction features
3. Practice of AP1000 Modularization construction

2. Construction features of AP1000 NPP

2.1 Due to the plant design simplification and compact building arrangement , the rooms ,systems and commodities reduced greatly in quantity than the typical PWR.



2. Construction features of AP1000 NPP

2.2 Modularization construction

Adopting a large amount of modules is the notable features of AP1000, which brings about a series of tremendous changes in overall execution plan ,construction sequence and technology, etc.

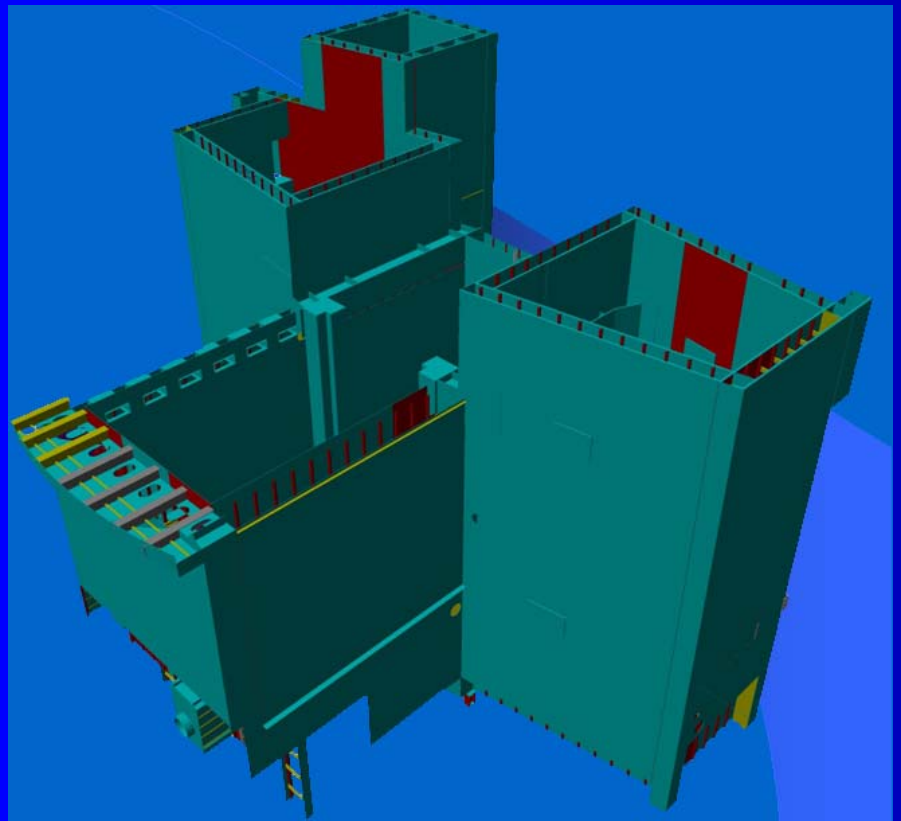
No.	Building	Equipment module	Structural module	Subtotal	Remarks
1	Reactor building	15	55	70	Each unit
2	Auxiliary building	48	43	91	
3	Annex building		10	10	
4	Turbine building	7		7	
5	Total	70	108	178	

2. Construction features of AP1000 NPP

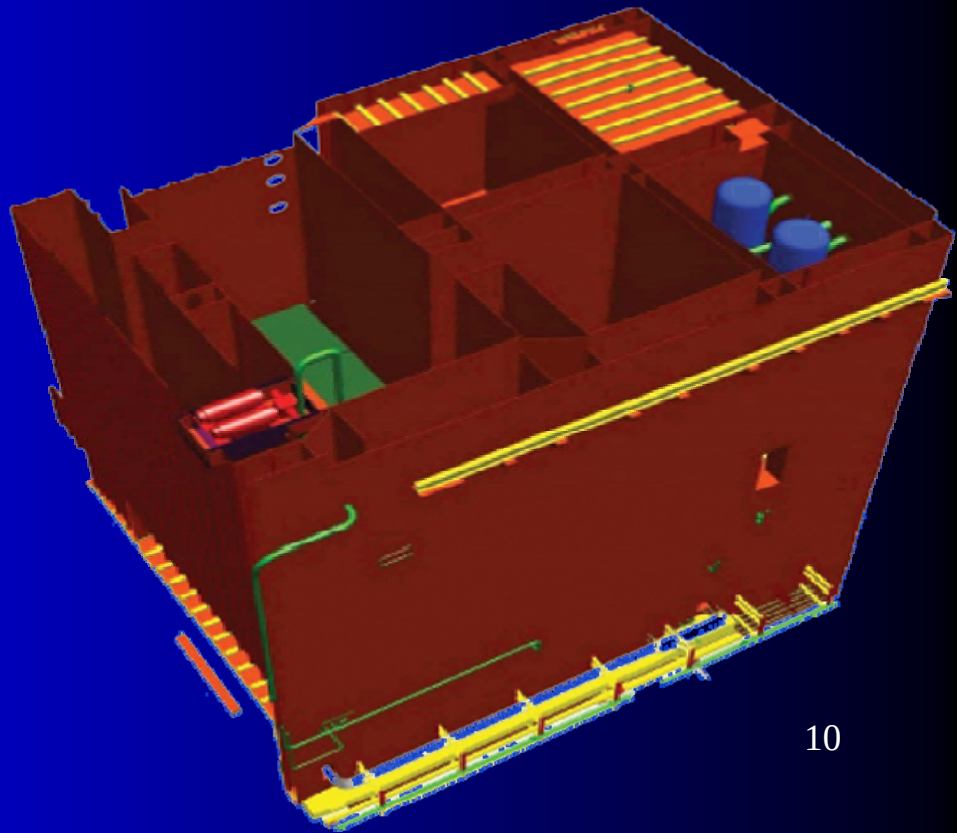
Modules categories :

Structural module

CA01 25mX29mX26m,750T



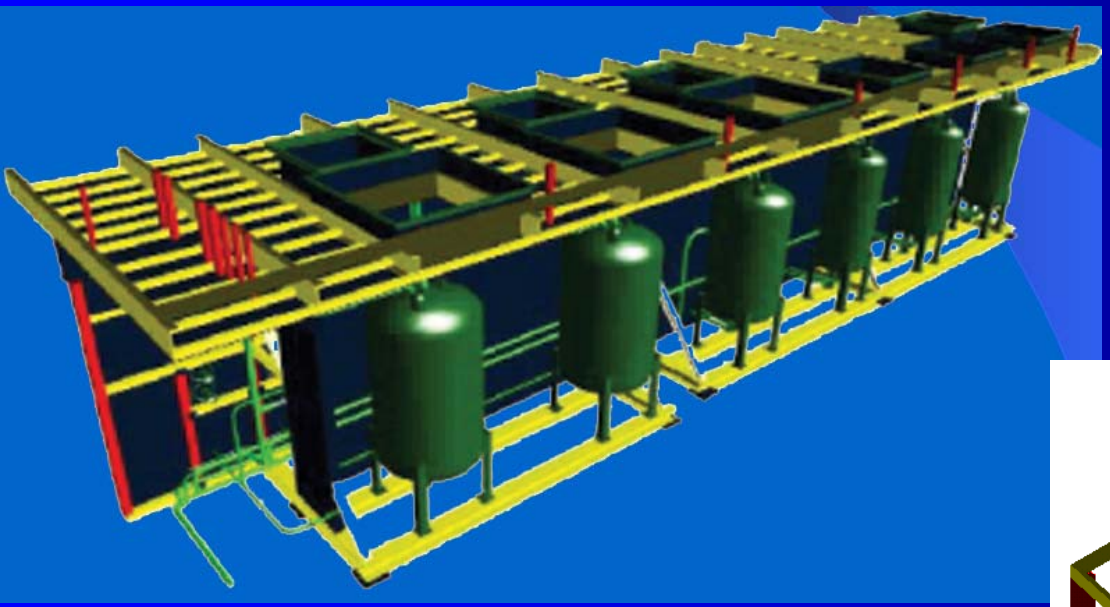
CA20 21mX14mX21m,872T

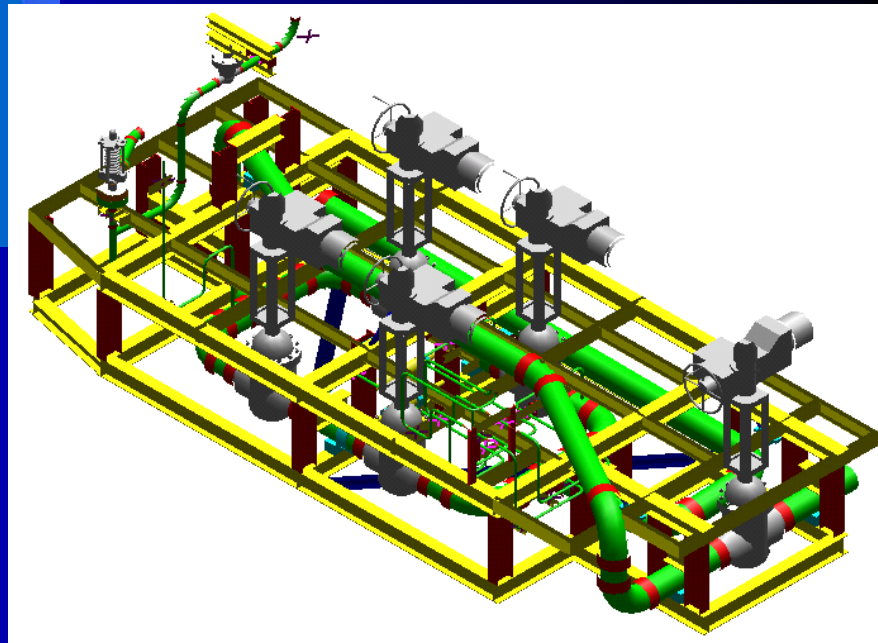


2. Construction features of AP1000 NPP

Modules categories :

Equipment module

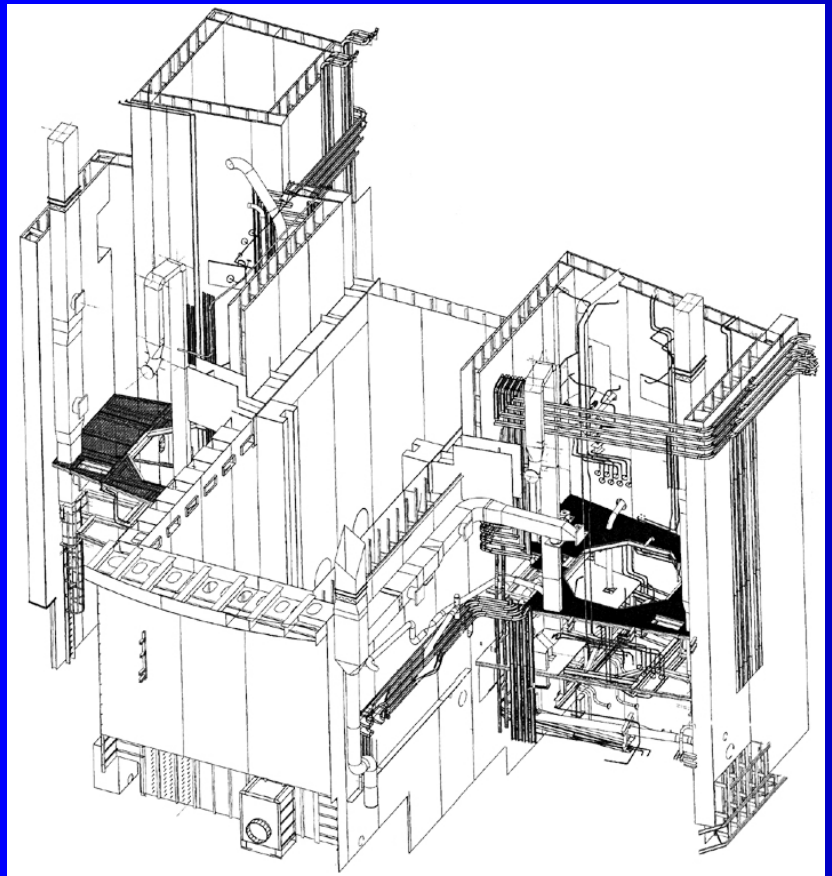


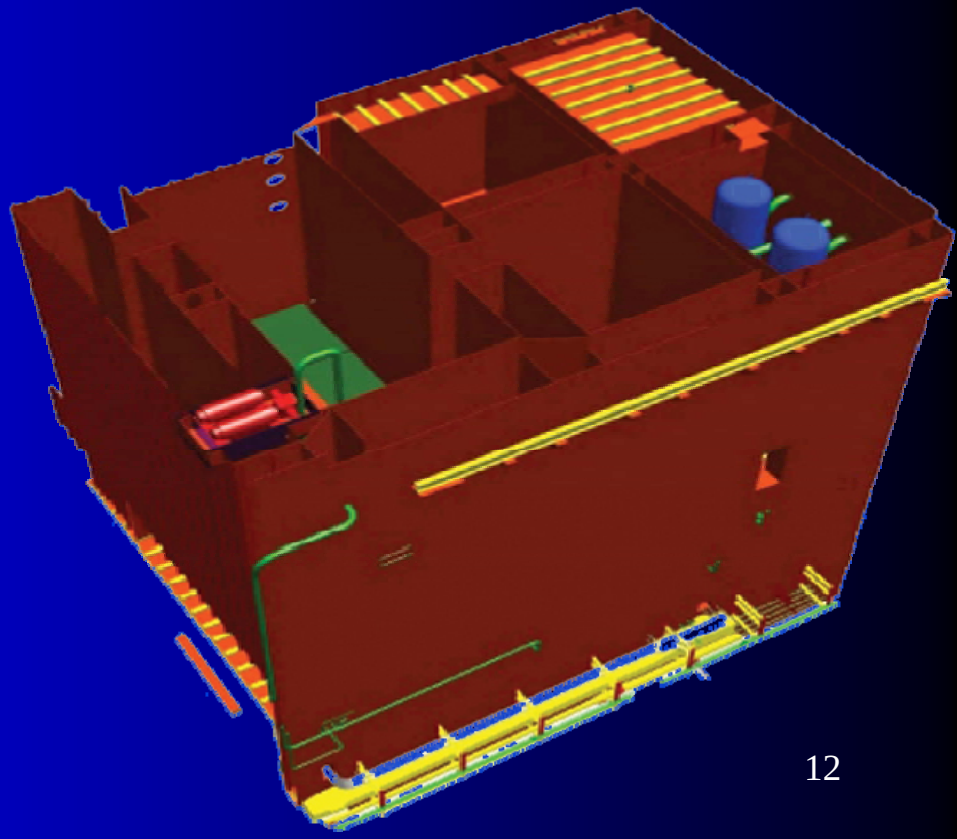


2. Construction features of AP1000 NPP

2.2 Modularization construction

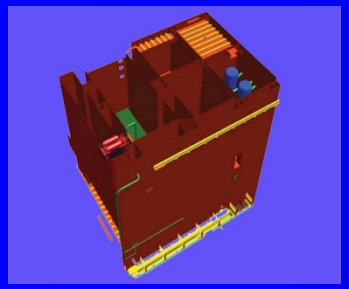
The scope of the modules covers both commodities of traditional civil and erection. Both civil and erection items exist in one module, making the boundary between civil and erection indistinct in module.





2. Construction features of AP1000 NPP

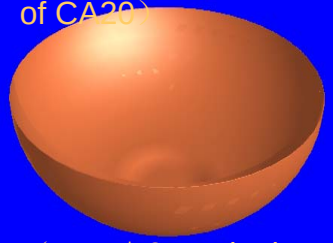
2.3 parallel fabrication off-site:
The off-site module prefabrication and on-site construction are parallel.



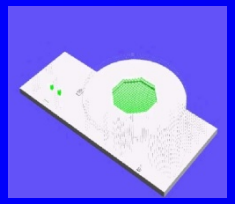
（ATP＋5 Begin the prefabrication&Assembly of CA20）

ATP+17 Installation at final position

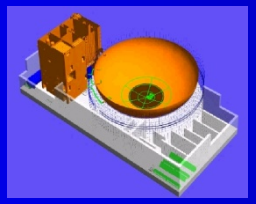
ATP+16 Installation at final position



（ATP＋6 Begin the Prefabrication&Assembly of CV bottom head）

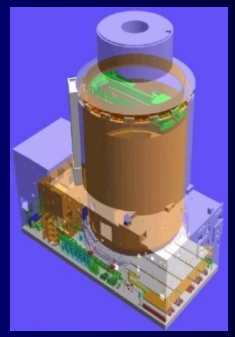


（ATP+15 FCD）



（Installation of equipment begin）

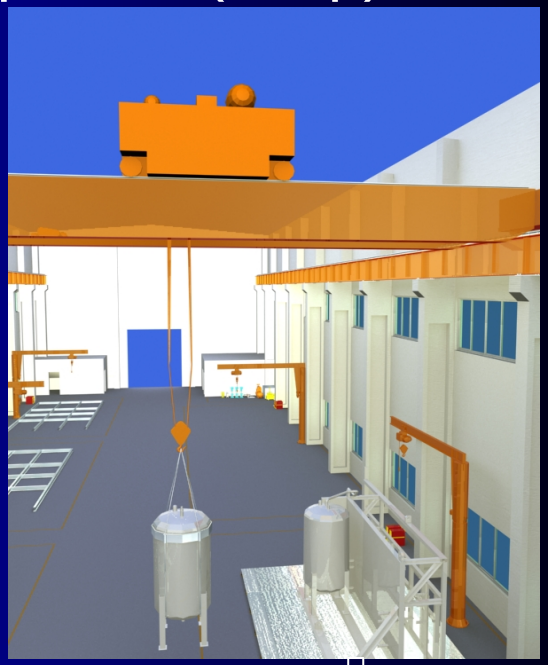
（parallel construction of civil & installation ）

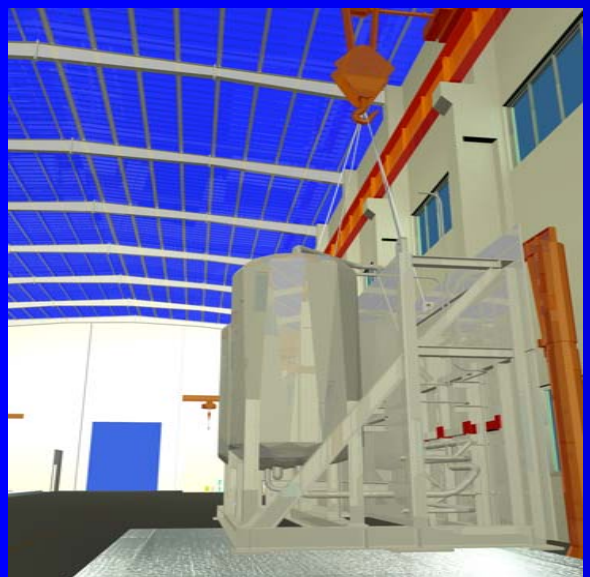


（The construction is completed ）

2. Construction features of AP1000 NPP

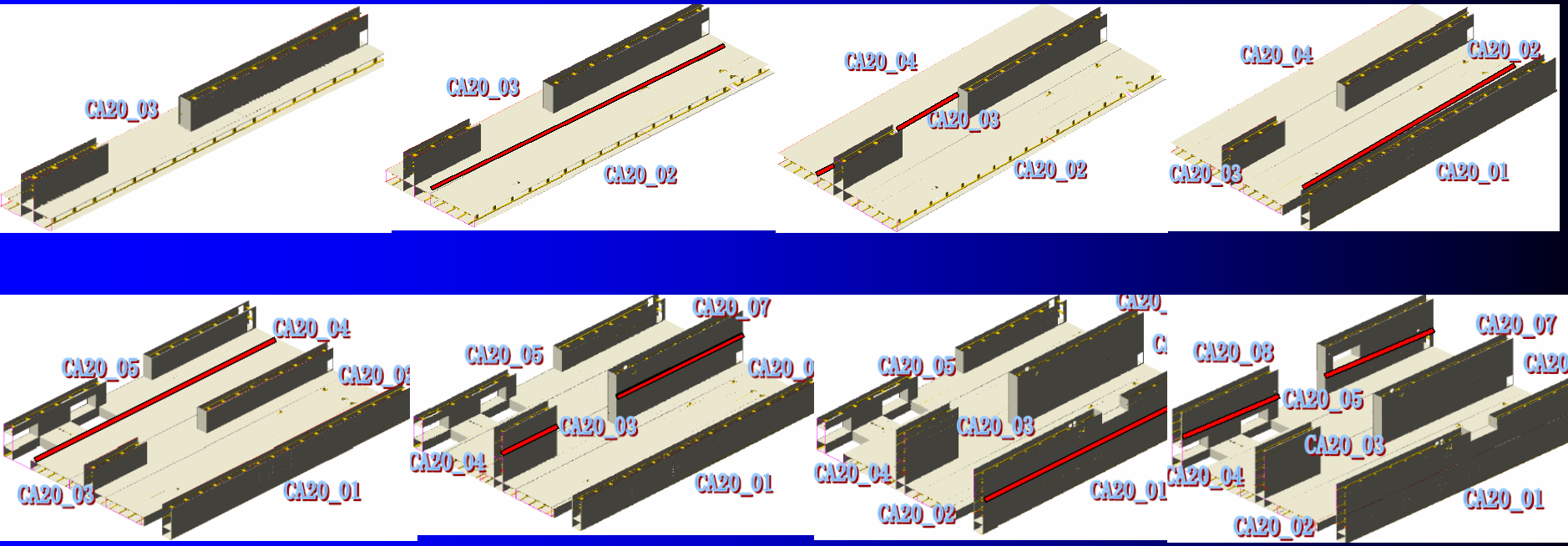
- Typical equipment module fabrication sequence (shop)





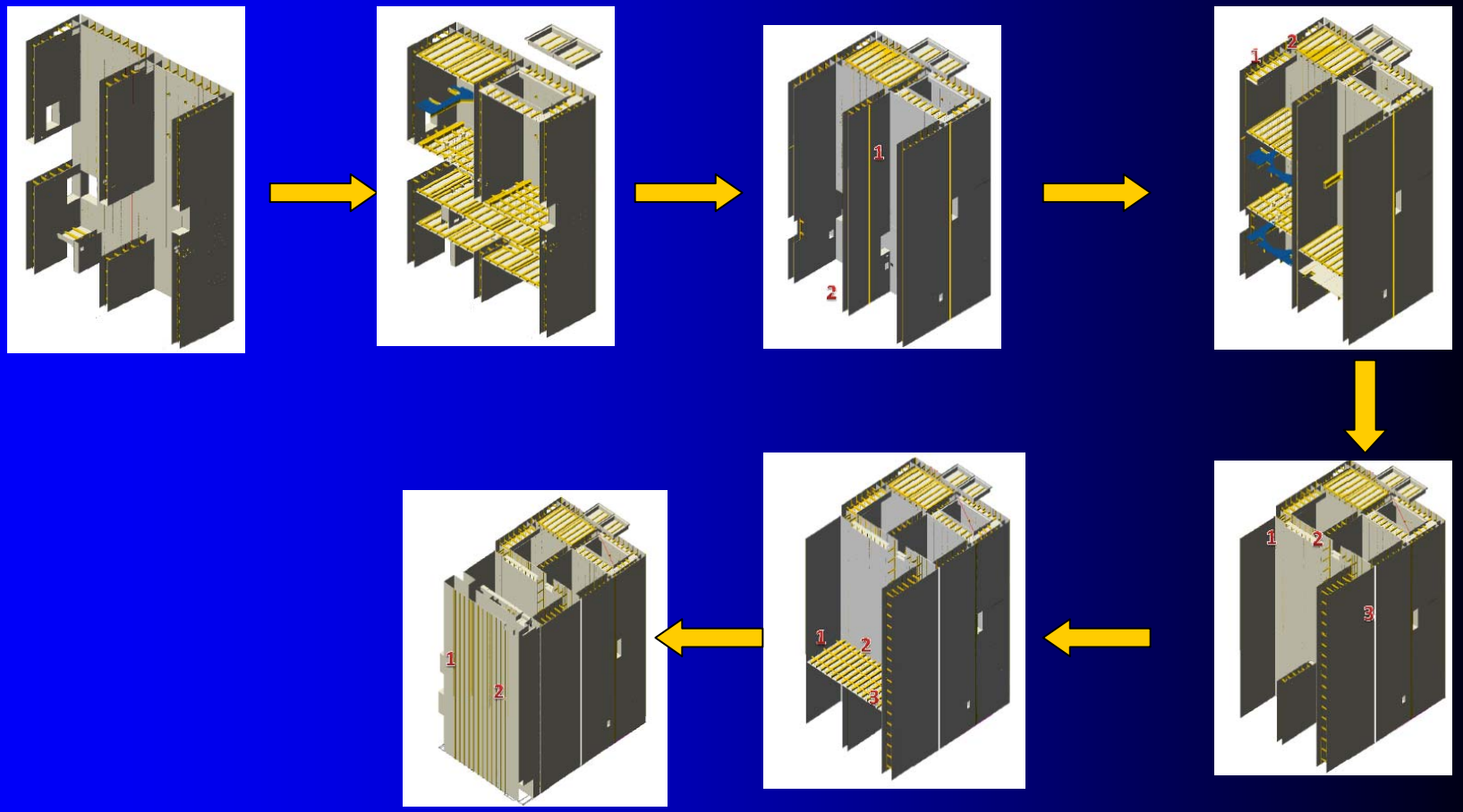
2. Construction features of AP1000 NPP

- Typical structural module assembly sequence (site)
- CA20



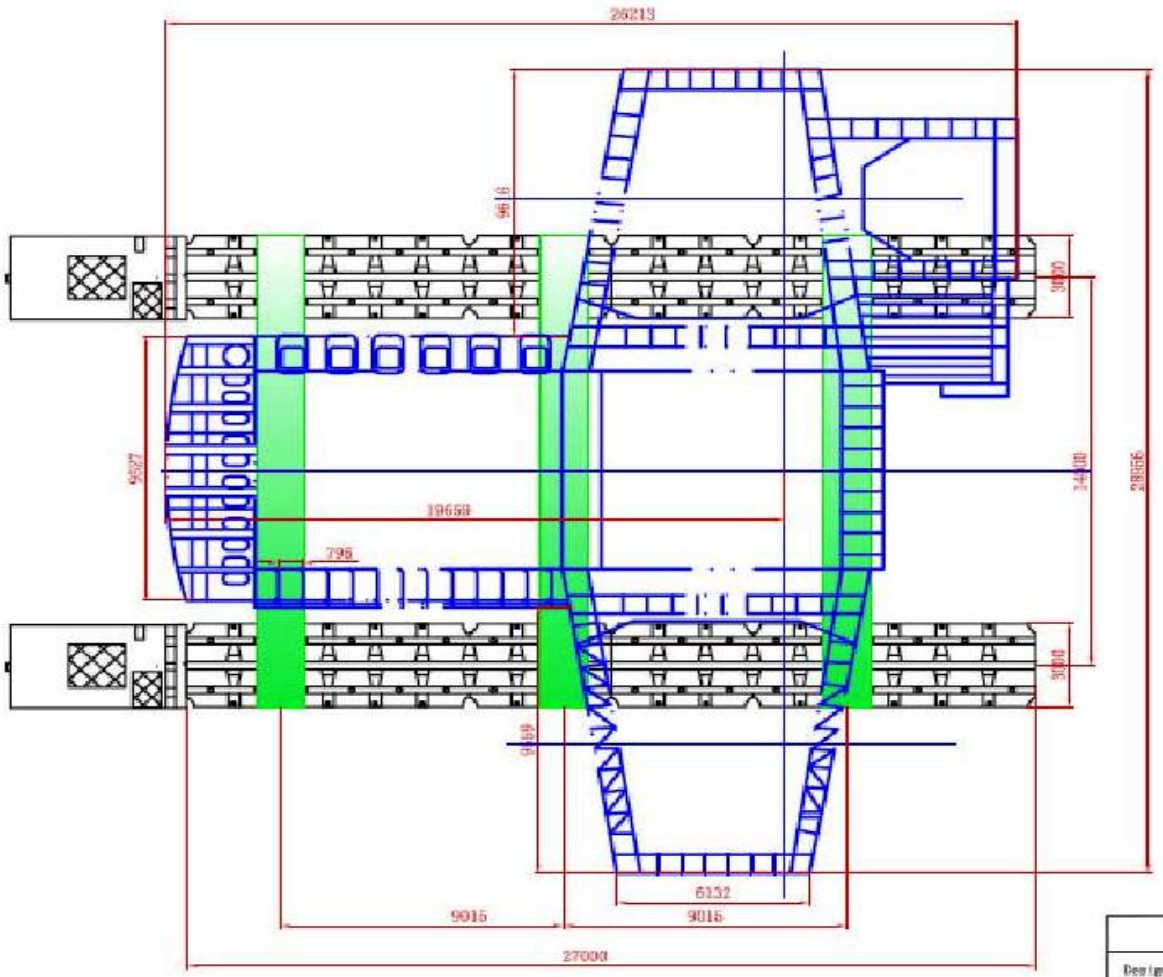
2. Construction features of AP1000 NPP

- Typical structural module assembly sequence
- CA20



2. Construction features of AP1000 NPP

- Typical structural module assembly sequence CA01



设备名称：CA01
设备尺寸：长26.213m，宽28.956m，高21.336m
设备重量：450吨

运输车辆：索埃勒自行平板挂车
车辆规格：18轴线4纵列
车辆参数：
总长：32m
总宽：17m
车高：1.19±0.35m
额定载重量：1098吨
道路参数：
最小弯道半径：12.5m
最小半径通道宽度：23.5m
内侧扫空：6m
最小竖曲线半径：>215m
道路折角：<4.5°

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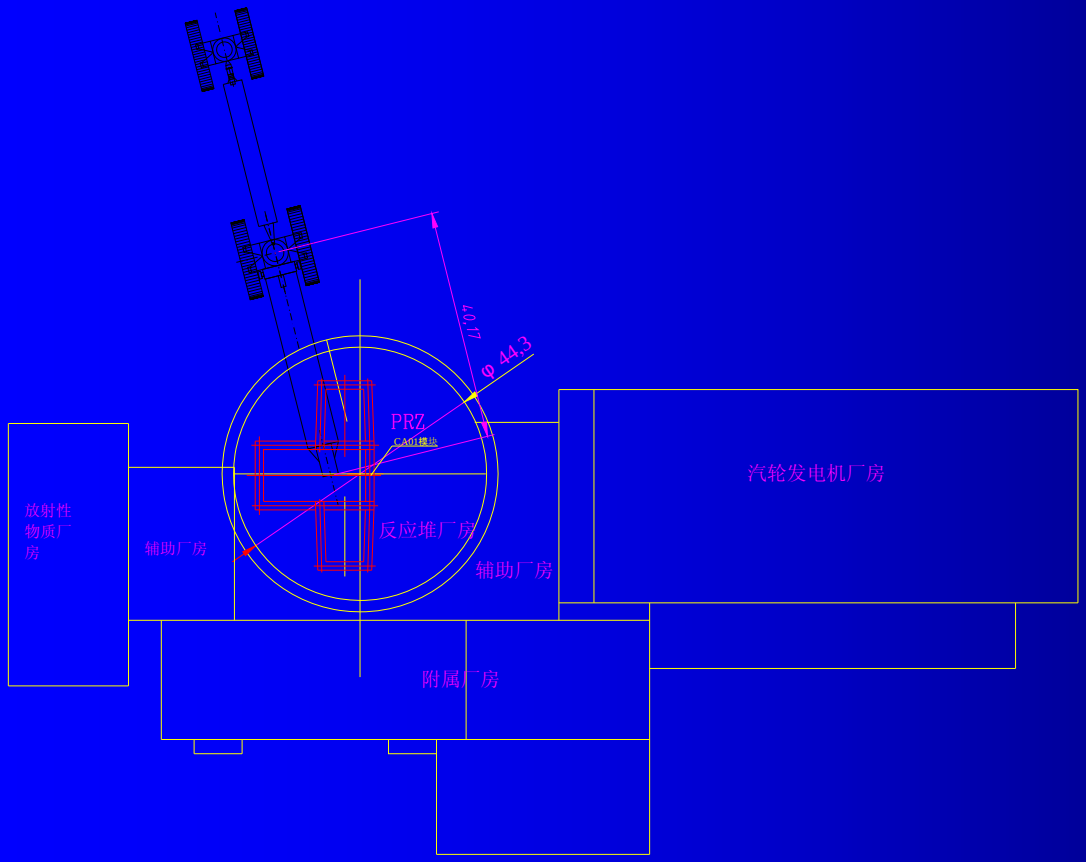
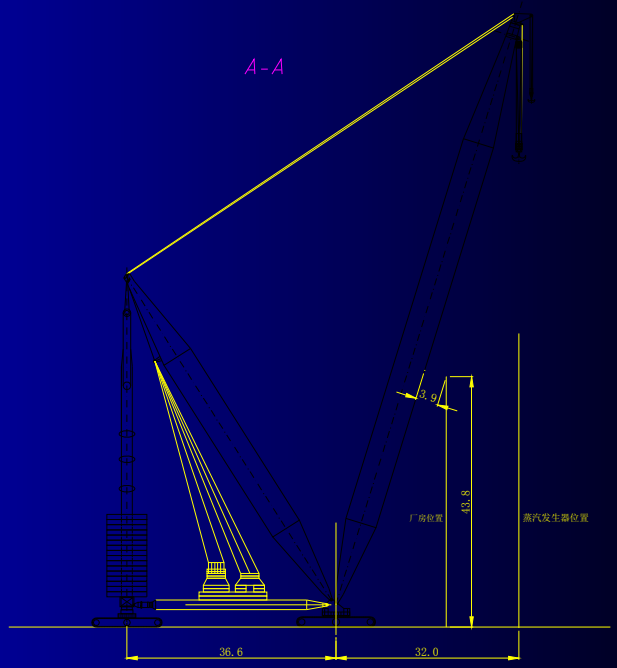
Designed by	Drawn by	Checked by	Approved by	Date	Rev.	Sheet
23公司AP1000项目			CA01模块运输			

2. Construction features of AP1000 NPP

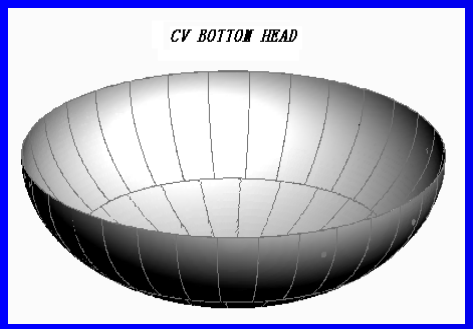
- Typical structural module assembly sequence CA01

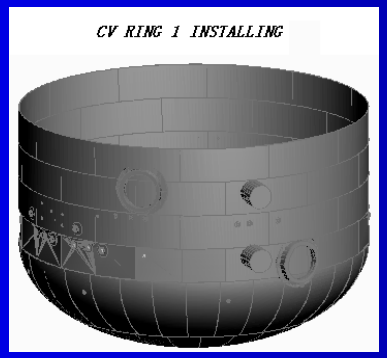


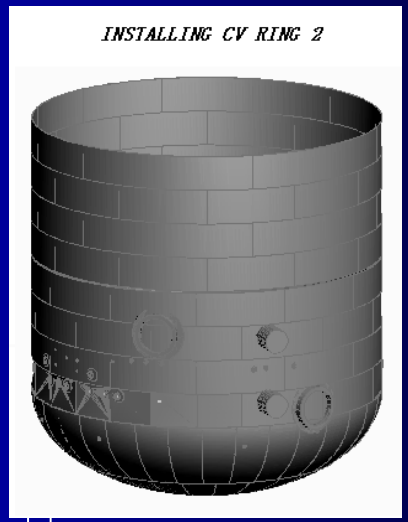


2. Construction features of AP1000 NPP

CV assembly plan



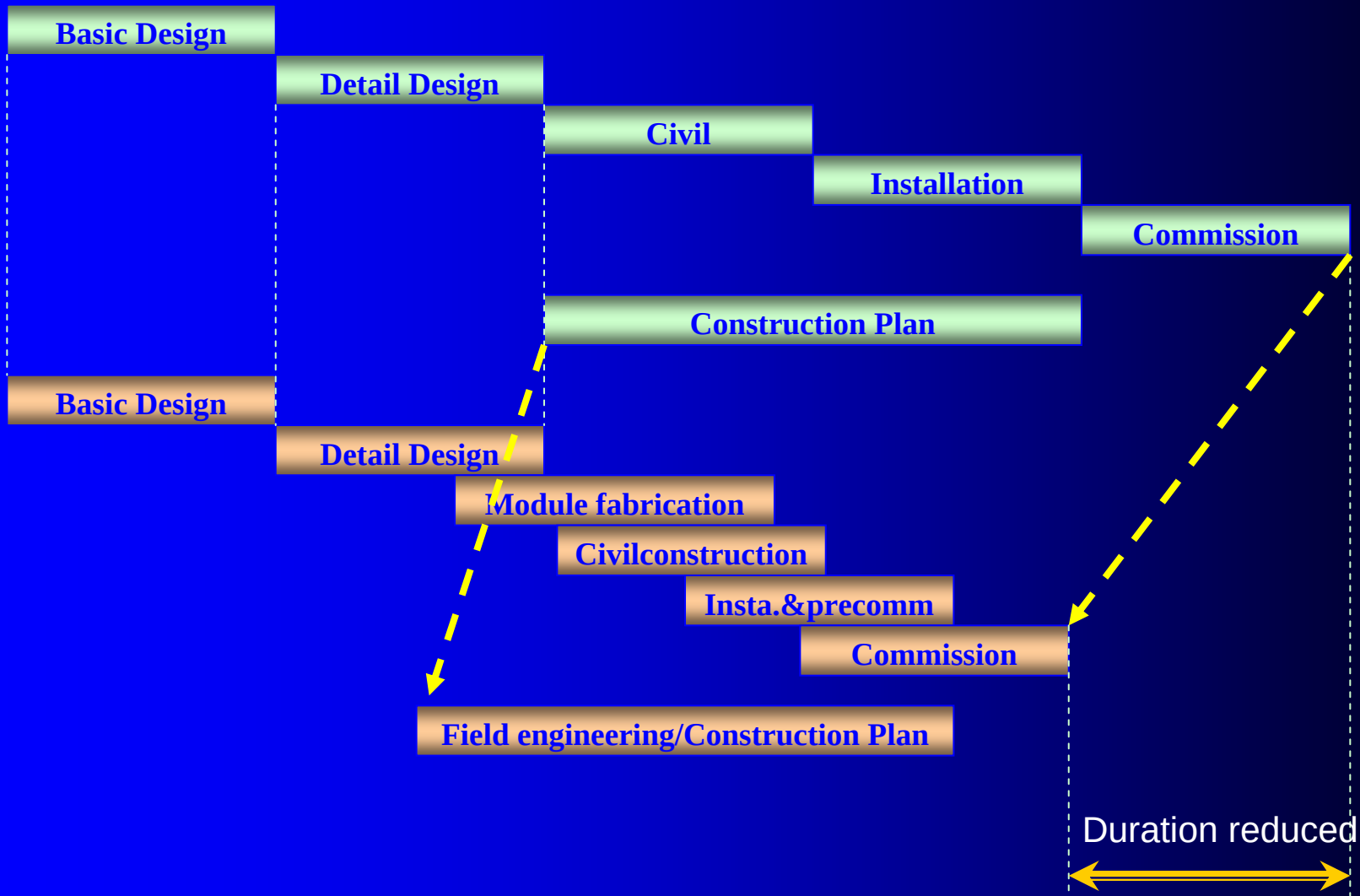




	Weight (T)
CVBH	575
ring1	738.5
ring2	727.6
ring3	736.2
CVTH	575

2. Construction features of AP1000 NPP

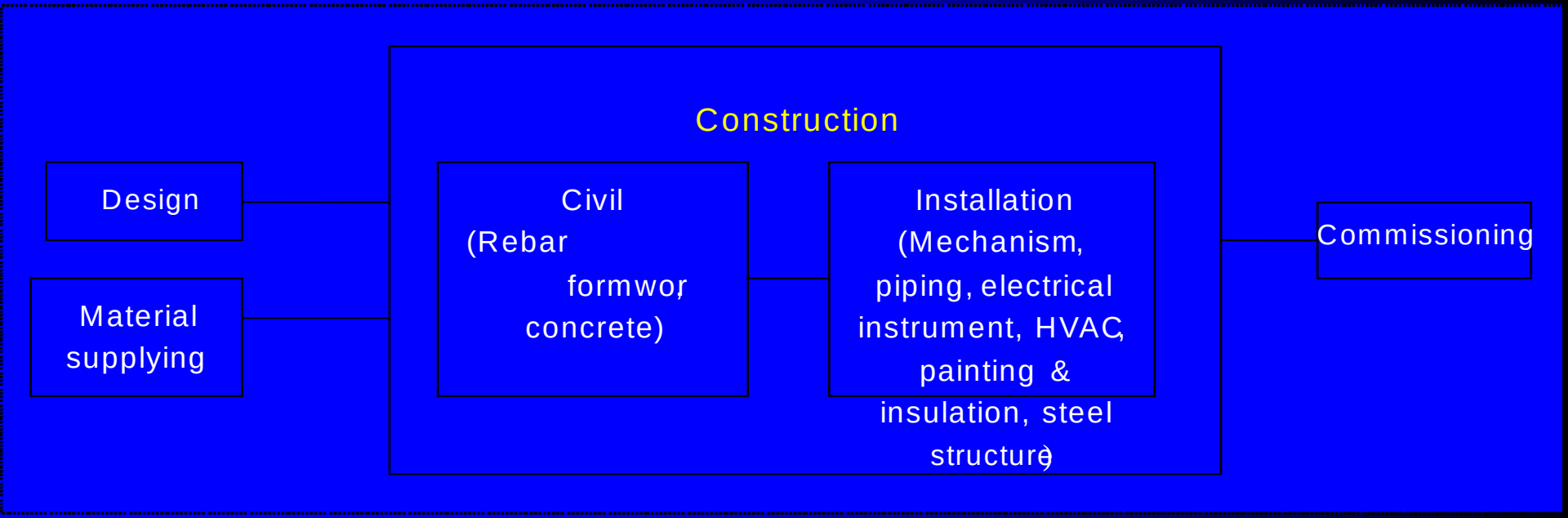
2.4 parallel construction on site：



2. Construction features of AP1000 NPP

2.4 parallel construction on site Traditional construction flow:

Constr. buildings and structures → Install equipments ,piping, instru.

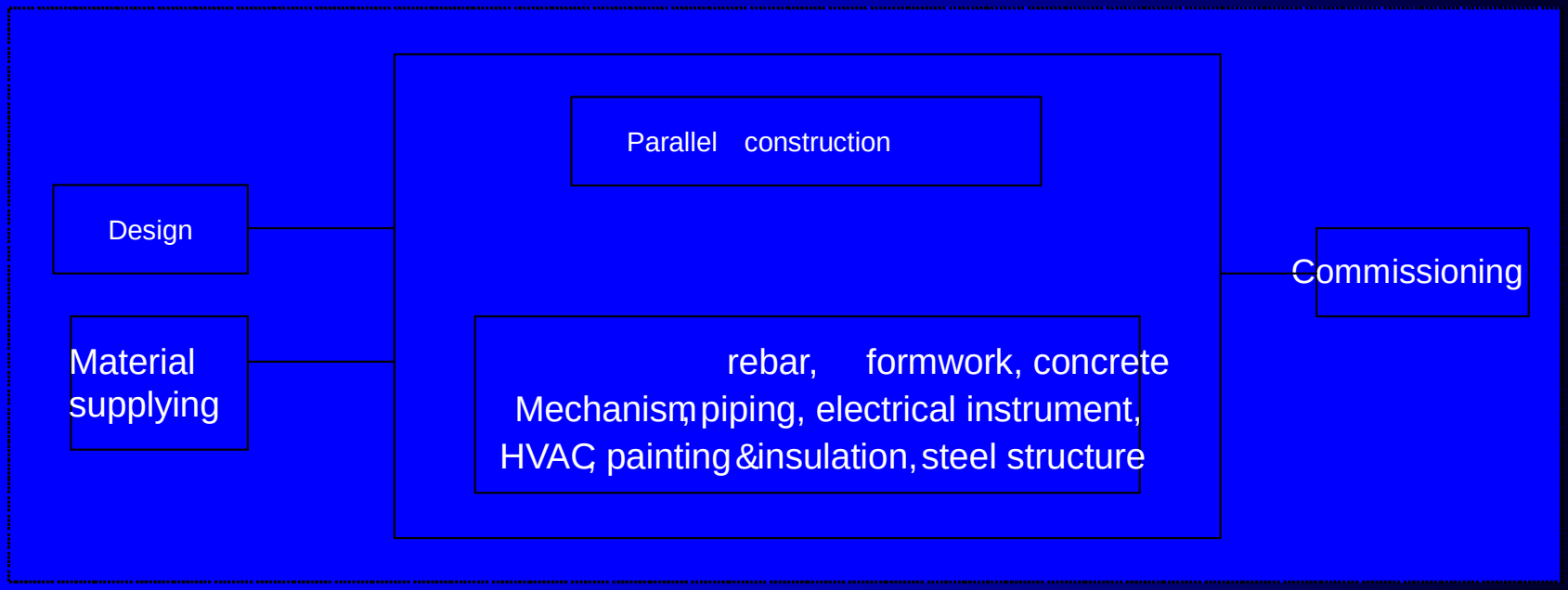


2. Construction features of AP1000 NPP

2.4 parallel construction on site parallel construction flow:

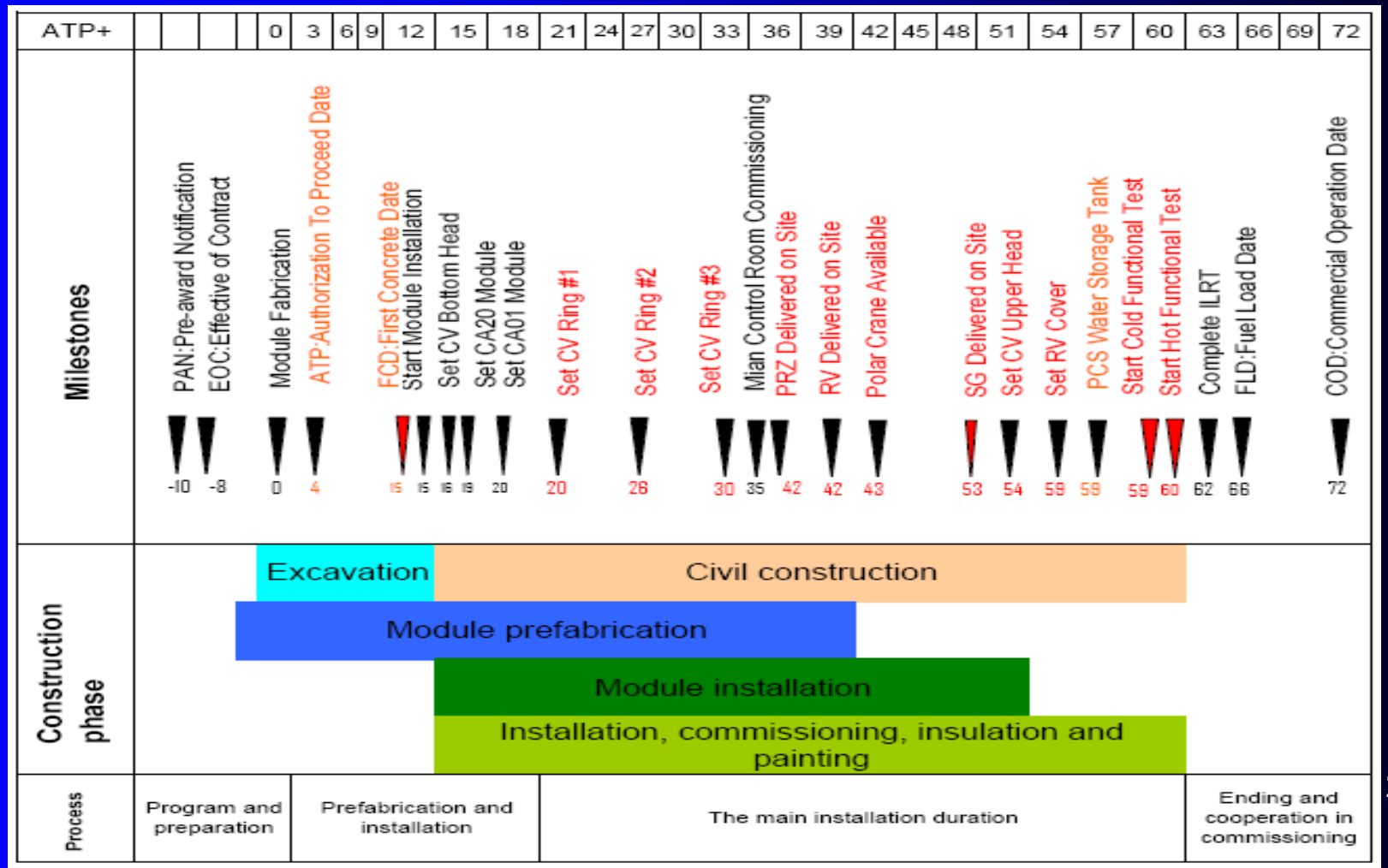
construct buildings
Install modules and equipments

→ **internal structures and fill concrete**
→ **piping/instrumentation/HVAC**



2. Construction features of AP1000 NPP

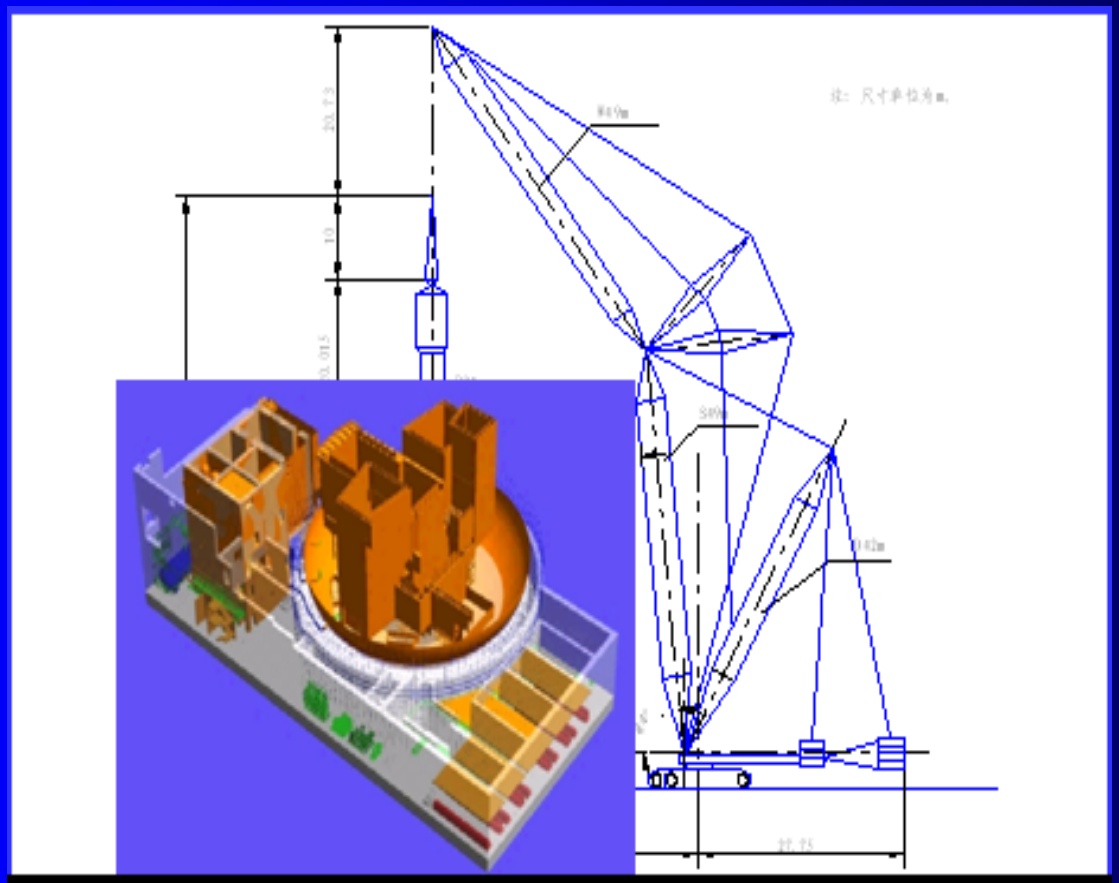
2.4 parallel construction on site The civil and erection period are similar, and almost begin and finish simultaneously.



2. Construction features of AP1000 NPP

2.5 “Open-top” construction method

almost all the equipments and modules of AP1000 are hoisted by using “**Open-top**” method, which requires close coordination between civil and erection in the aspects of schedule , crane usage and finished product protection, etc.



2. Construction features of AP1000 NPP

2.6 More frequent use of heavy load lifting and transport equipment

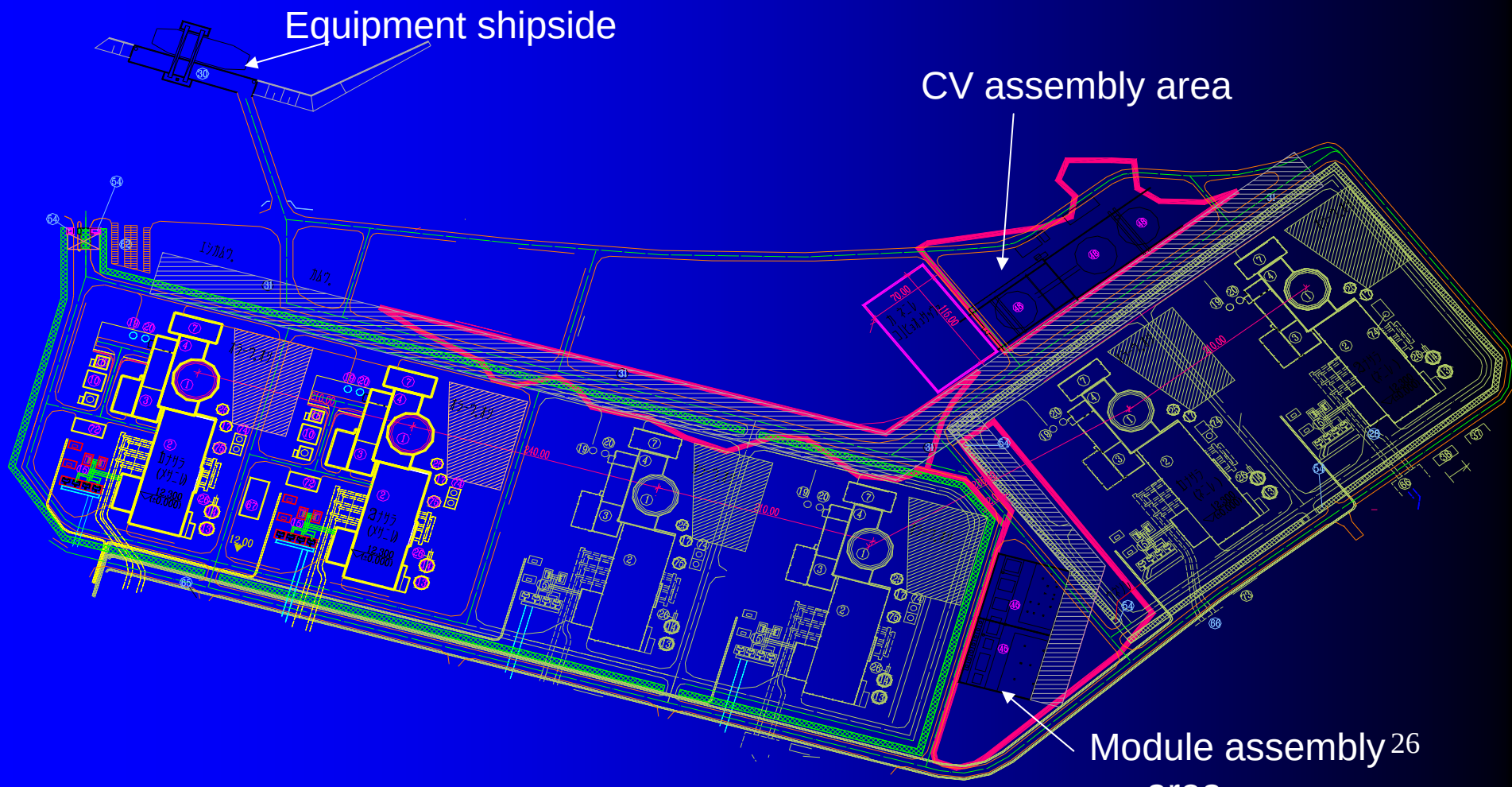
Onsite transportation and installation of CV, equipment and modules require lots of heavy lifting and transport equipment. These equipment will serve for the whole period of construction.

The biggest crane used is Lampson LTL-2600 in sanmen

Demag CC8800-1 Twin in haiyan.

2. Construction features of AP1000 NPP

2.6 general plan layout and Heavy haul road



1. Outline
2. Construction features
3. Progress of AP1000 Modularization construction

3. Progress of AP1000 Modularization construction

FCD finished on Apr. 19, 2009-0ne pour of R/B&Aux/B

3. Progress of AP1000 Modularization construction

CA20 submodule assembly

Submodule ready to go

3. Progress of AP1000 Modularization construction

CA20 submodule assembly

Submodule rotation

3. Progress of AP1000 Modularization construction

CA20 submodule assembly

Current view

3. Progress of AP1000 Modularization construction

CV assembly area

3. Progress of AP1000 Modularization construction

Bottom head assembly

3. Progress of AP1000 Modularization construction

- Heavy load crane

3. Progress of AP1000 Modularization construction

Heavy haul road

3. Progress of AP1000 Modularization construction

Equipment module installation

3. Progress of AP1000 Modularization construction

Current view of NI

3. Progress of AP1000 Modularization construction

Current view of CI&BOP

AP1000 is an advanced design,WEC will transfer design/main equipment manufacture technology to chinese part during project implementation ,so it will be the standard NPP to be built in china.

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Thanks