RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE
NESTE

CIVIL BASIS OF DESIGN

RDCG Project

REV.	DATE	STATUS	WRITTEN BY (name & visa)	CHECKED BY (name & visa)	APPROV./AUTHOR. BY (name & visa)
			2E		
			2E		
B	10/08/2021	ISSUED FOR LOCAL AUTHORITIES			
A	30/06/2020	ISSUED FOR PRE-STUDY			

DOCUMENT REVISIONS

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1. INTRODUCTION

The objective of RDCG Project (Rotterdam Capacity Growth) is to increase the production capacity, at NESTE Rotterdam Refinery located in the Maasvlakte Industrial site (see figure 1), with a new production line rated for a 1.0 Mt nameplate Renewable Diesel capacity. The feedstock used for the process is pre-treated vegetable oils, animal fats and fatty acid distillate.

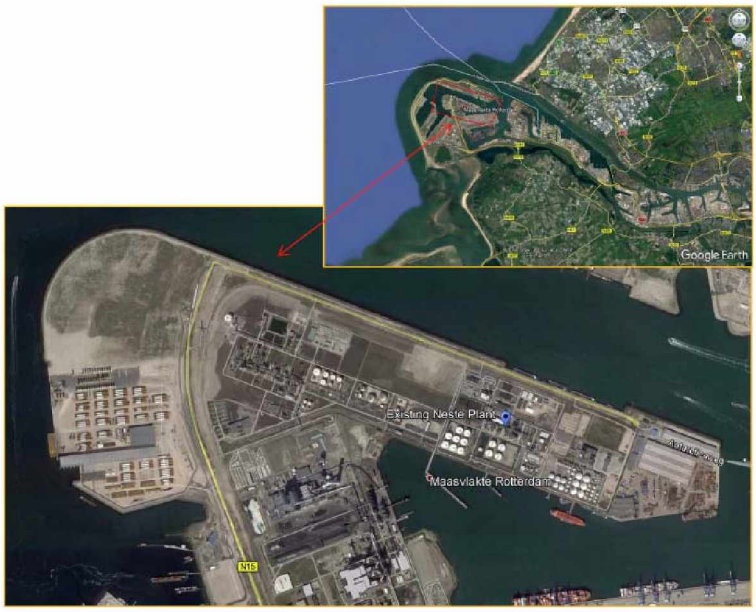

Figure 1: Maaasvlakte Industrial site (Google Earth screen)

High quality NEXBTL Renewable Diesel is produced in the NEXBTL Unit by hydrotreating and isomerization. Other main products produced in the NEXBTL unit are Renewable Jet, Renewable Naphtha and Renewable Bio-Propane.

The documents issued during Feasibility phase constitutes the starting and reference point for the development of the Definition phase.

1.1. Project Scope of Work

As represented in the figure 2, the Contractor Project scope of work is defined by three different areas (see Figure 2):

- **MNA Area**
- **Corridor Area**
- **Existing Refinery Area**

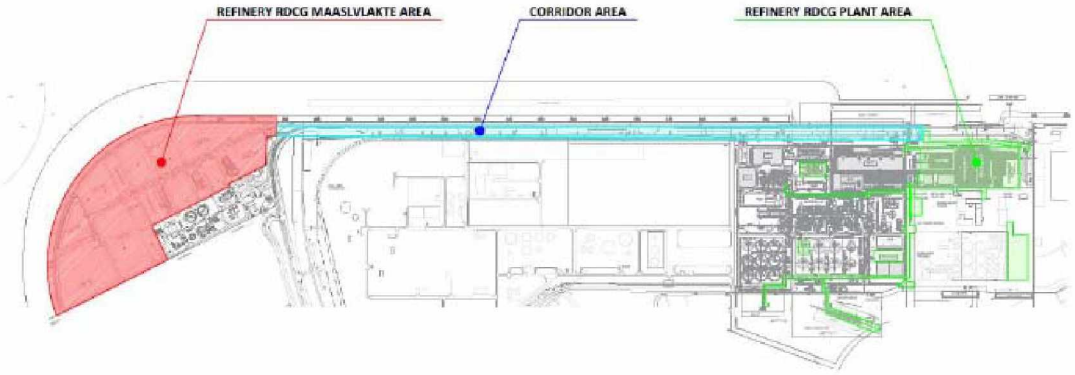

Figure 2: Scope of works Areas

As defined in the Figure 3 and from a "construction point of view", a further identification of the RDCG Project areas can be defined as follow:

- **A - Greenfield area** for the new NexBTL 2 units and the associated Utilities and Offsite, called *New Maasvlakte Area (MNA)* in the West side of Maasvlakte
- **B - Brownfield areas** for the works within the existing Refinery for the Naphtha tank and Bio-Propane Bullets, new Loading arms at Jetty 1 and Jetty 2, interconnecting lines and process and utilities tie-ins
- **C - Greenfield areas** for the new tank farm at north-East of existing Refinery, in the area identifies as *Maasvlakte Optional Area (MOA)*. Although located in existing facilities, this area can be managed as greenfield from a construction point of view (to be further assessed and agreed with NESTE during Definition phase)
- **D - Interconnecting** corridor between the 2 areas

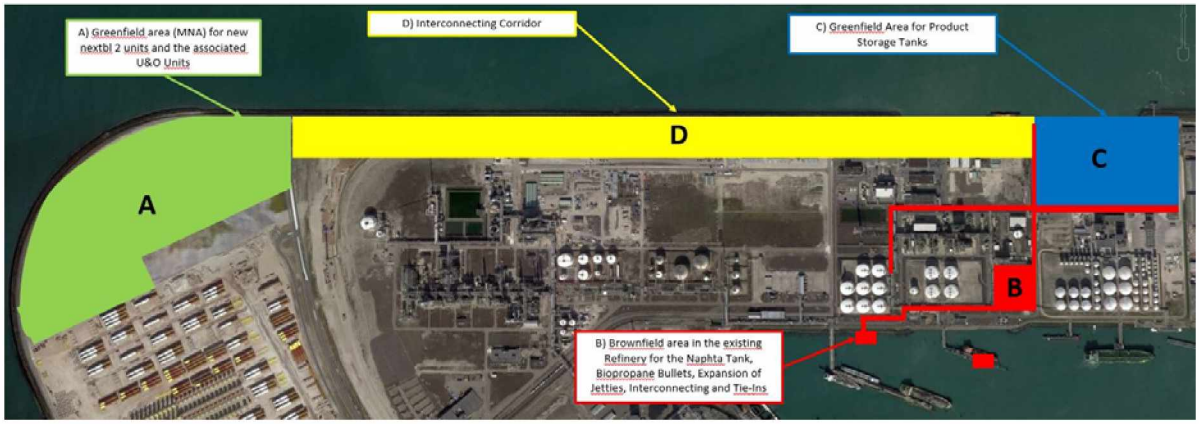

Figure 3 – Scope of works Areas (Greenfield & Brownfield)

In general, for the three different areas defined in the figure 2 and as per WBS reported in the figure 4, the T.EN scope of works includes the following Units:

- **New Process Units in MNA:**

  UNIT 011 – HEAT TREATMENT UNIT (HTU)
  UNIT 012 – PRE-TREATMENT UNIT (PTU)
  UNIT 021 – NEXBTL 2
  UNIT 057 – HOT OIL UNIT

- **New Utilities and Off-sites Units/Systems** as required to support the Refinery capacity increase:

  UNIT 052 – REFINERY UTILITIES
  UNIT 053 – MNA UTILITIES
  UNIT 060 – REFINERY WASTE WATER HANDLING
  UNIT 062 – MNA WASTE WATER HANDLING
  UNIT 067 – MNA FLARE
  UNIT 086 – MNA FIRE WATER

- **New tank storages:**

  UNIT 040 – EXISTING TANK FARM (REFINERY – EXPANSION)
  UNIT 041 – NEW TANK FARM (REFINERY)
  UNIT 042 – TANK FARM (MNA)
  UNIT 045 – JETTY LOADING EXPANSION (EXISTING JETTY 1 – EXPANSION)
  UNIT 046 – JETTY LOADING EXPANSION (NEW JETTY 2 - EXPANSION)

- **Interconnecting:**

  UNIT 080 – REFINERY INTERCONNECTING within the existing refinery for tanks, loading facilities and interconnecting of the new units/systems to the existing facilities including Tie-ins
  UNIT 081 – MNA INTERCONNECTING among the new units
  UNIT 082 – INTERCONNECTING CORRIDOR between the two areas

- **Buildings:**

  UNIT 075 – TECHNICAL BUILDINGS in REFINERY, namely the revamping of the Operator Control Building and Laboratory and existing Substations, new Electrical Satellite Substation

  UNIT 076 – TECHNICAL BUILDINGS in MNA, namely the new Operator Control Building including new Laboratory and new Electrical Substations

As per the following Project WBS (Figure 4) and in line with the Definition Phase, the overall list of Units is the following:

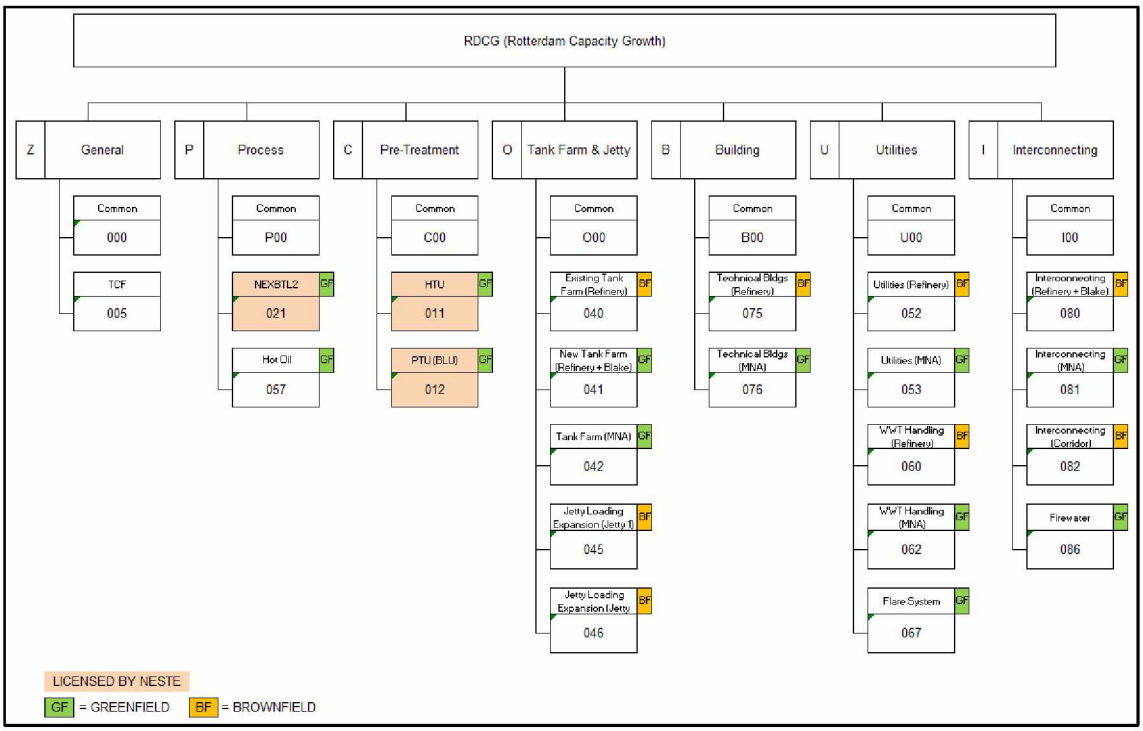

Figure 4: Project Work Breakdown Structure (WBS)

UNIT 000 – GENERAL

UNIT 005 – TCF

UNIT 011 – HEAT TREATMENT UNIT (HTU)

UNIT 012 – PRE-TREATMENT UNIT (PTU)

UNIT 021 – NEXBTL 2

UNIT 040 – EXISTING TANK FARM (REFINERY)

UNIT 041 – NEW TANK FARM (REFINERY)

UNIT 042 – MNA TANK FARM
UNIT 045 – JETTY LOADING EXPANSION (EXISTING)
UNIT 046 – JETTY LOADING EXPANSION (NEW)
UNIT 052 – REFINERY UTILITIES (REVAMPING)
UNIT 053 – MNA UTILITIES
UNIT 057 – HOT OIL
UNIT 060 – REFINERY WASTE WATER HANDLING
UNIT 062 – MNA WASTE WATER TREATMENT HANDLING
UNIT 067 – MNA FLARE
UNIT 075 – TECHNICAL BUILDINGS (EXISTING REFINERY)
UNIT 076 – TECHNICAL BUILDINGS (MNA)
UNIT 080 – REFINERY INTERCONNECTING
UNIT 081 – MNA INTERCONNECTING
UNIT 082 – INTERCONNECTING CORRIDOR
UNIT 086 – MNA FIREWATER

For the Units location, refer to the following figures:

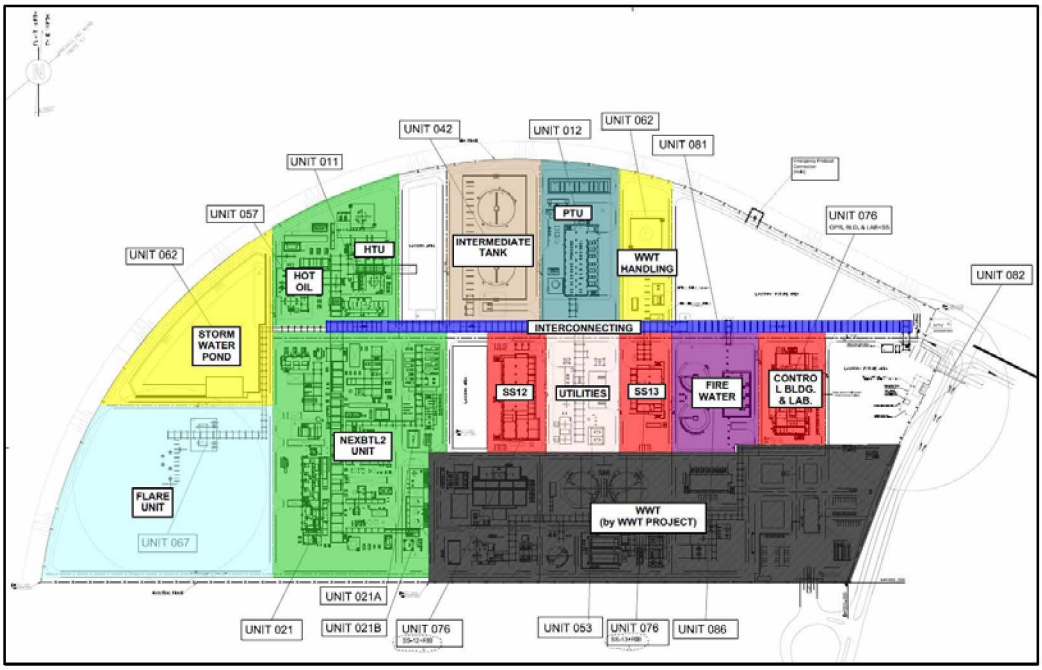

Figure 5 – Identification of main facilities in MNA

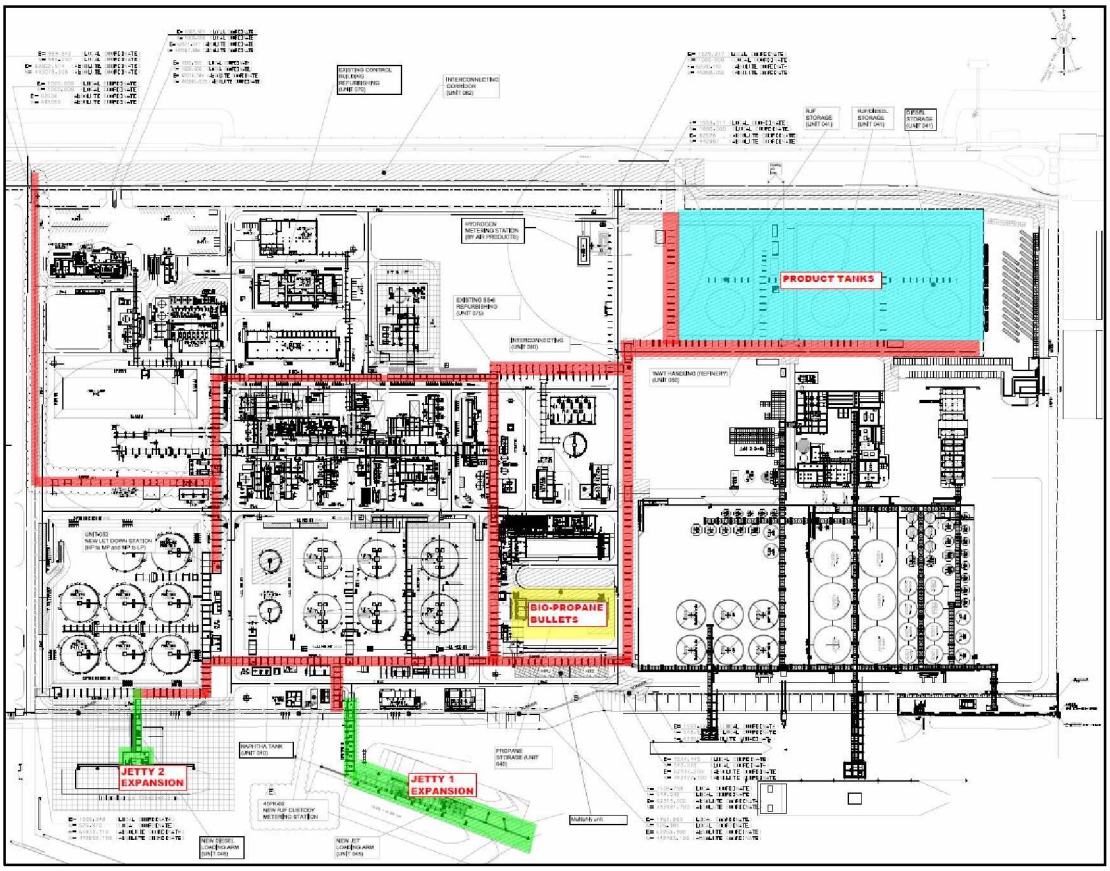

Figure 6 – Identification of main facilities in Existing refinery

2. SCOPE

The scope of this documents is to describe the Civil works for the **RDCG Project**; in particular, it include material, codes and general design data for foundations, concrete structures and steel structures.

3. CODES

For material selection and design criteria European Codes (EUROCODES) shall be applied.

Reference has been made to Eurocodes introduced into the *Building Decree of the Netherlands* from July 2008 as equivalent replacement to National Netherlands Codes (NEN).
Requirements of Eurocode have been compared with requirements of applicable National Codes and the most stringent has been applied.

Also, the following Project Specifications, Standards and General Notes, relevant to *NESTE-Rotterdam Capacity Growth*, shall be applied:

082755C-000-DW-1802-001	GENERAL NOTES FOR STEEL STRUCTURE
082755C-000-DW-1702-001	GENERAL NOTES FOR CONCRETE WORKS
082755C-000-DW-1402-001	GENERAL NOTES FOR UNDERGROUND WORKS
082755C-000-DW-1403-001	GENERAL NOTES FOR PILES
082755C-000-STC-1890-001	CONSTRUCTION STD. FOR STEEL STRUCTURES
082755C-000-STC-1790-001	CONSTRUCTION STD. FOR CONCRETE WORKS
082755C-000-STC-1490-001	CONSTRUCTIOND STD. FOR U/G SYSTEM, SITE FINISHING & MISCELLANEOUS
082755C-000-JSD-1700-001	JSD FOR STEEL STRUCTURES AND CIVIL WORKS
082755C-000-JSD-1400-001	JSD FOR UNDERGROUND SYSTEMS
082755C-000-JSD-1422-001	JSD FOR SOIL IMPROVEMENT
082755C-000-JSD-1430-001/3/4	JSD FOR PILES
082755C-000-JSD-1410-001/2/3/4	JSD FOR GEOTECHNICAL RECOMMENDATIONS

4. BASIC DATA

The design of concrete works and steel structures shall be carried out on the base of the ***site general data*** applicable to the project and reported in the *JSD for Steel Structures and Civil Works* and *JSD for UG systems*.

Furthermore, the prescriptions included in the *JSD for Geotechnical Recommendations* shall be followed in order to define foundations typologies for different structures and equipment.

The initial data, to base the civil and structural design on, are provided by other departments like piping, electrical & instrumentation, process and mechanical, which produce:

- General Plot Plans
- Detail Plot Plans
- 3D Model (Preliminary)
- Electrical and Instrumentation Layouts
- PIDs
- Data Sheets

General structural design and main actions on structures will be defined according to EN-1990 Eurocode 0 - *Basis of Structural Design* and EN-1991 Eurocode 1 - *Actions on structures*.
Eurocode 2 and Eurocode 3 shall be used respectively for design of reinforced concrete structures and steel structures.
As already defined in the paragraph 3, all requirements of Eurocode have been compared with requirements of applicable National Codes and the most stringent has been applied.

Calculation to check soil pressure and foundations stability and define foundations typology shall also be required during *Definition* phase for specific structures/equipment, with the aim to define relevant foundations size in relation to their placement inside existing plant and greenfield areas, adjacent to other equipment/structures foundations and concrete trenches or UG piping.

Calculation report for structures and foundations shall be issued during Detail Design phase.

All structural checks shall be in accordance either with loads specified in EN 1991-1 or standard piping loads and equipment loads provided in data sheets.

5. SCOPE OF CIVIL WORKS

The main task will involve study and elaboration of documents consisting of: site preparation, ground levelling, demolition of existing concrete structures, earthworks, backfilling, construction of new shallow and piles foundations, concrete structures, steel structures, race rings for tanks, retaining walls, new buildings, revamping of existing buildings, new paved areas, drainage system and Oily water gravity lines.

5.1. Concrete Structures

Both *cast in place* concrete and *precast* concrete elements shall be used in the project:

- *cast in place concrete* is generally for equipment foundations, foundations of structures requiring large slabs, structures with top slab, piles, retaining walls, basins, buildings frame, pits and paving.
- *precast concrete* can be used for plinths, piles, sleepers, pedestals, underground cable trenches, closed drains, manholes and catch basins.

Classifications, execution and installation of concrete are based on standards EN13670: *Execution of concrete structures*, EN1992 Eurocode 2: *Design of concrete structures*, EN1990 Eurocode: *Basis of structural design*.

Specified characteristic compressive strength at 28 days, on cylinder, shall be considered:

Concrete class	f_{ck} [N/mm^2]	
C16/20	16	Fill and lean concrete.
C25/30	25	Fireproofing, concrete duct banks, sleepers and stair foundations.
C30/37	30	Elevated cast in situ, slabs, foundations, foundation for vibrating machineries, basins, pits, ditches, retaining walls, paving 100,150 and 200mm thk, slab for soil improvement.
C35/45	35	Cast in situ structural piles, rigid inclusions for soil improvement, precast structural members.

Reinforcing bars shall be grade B500B having minimum specified characteristic yield stress of 500 N/mm², according to EN 10080.

The main **Cast in Situ Concrete** items in MNA area are:

- Concrete structure 021-STR-1300 (see figure 7)
- Foundations for shelter
- Foundations for compressors
- Basins for UG vessels (see figure 8)
- Concrete Basins
- Ring foundations for Tanks and dike walls (see figure 9)
- Foundations for PTU buildings (see figure 10)
- Foundations for main steel structures and pipe racks (see figure 11)
- Foundations for main process equipment (Columns, Pumps, Packages, Exchangers, etc...)

The main **Precast Concrete** items in MNA area are:

- Interconnecting Pipe Rack 081-PR-100 & Process Pipe Rack 021-PR-100 (see figure 14)
- Compressors Shelter in Unit 21 (021-SHT-100, see figure 15)

Following, some Concrete structures example:

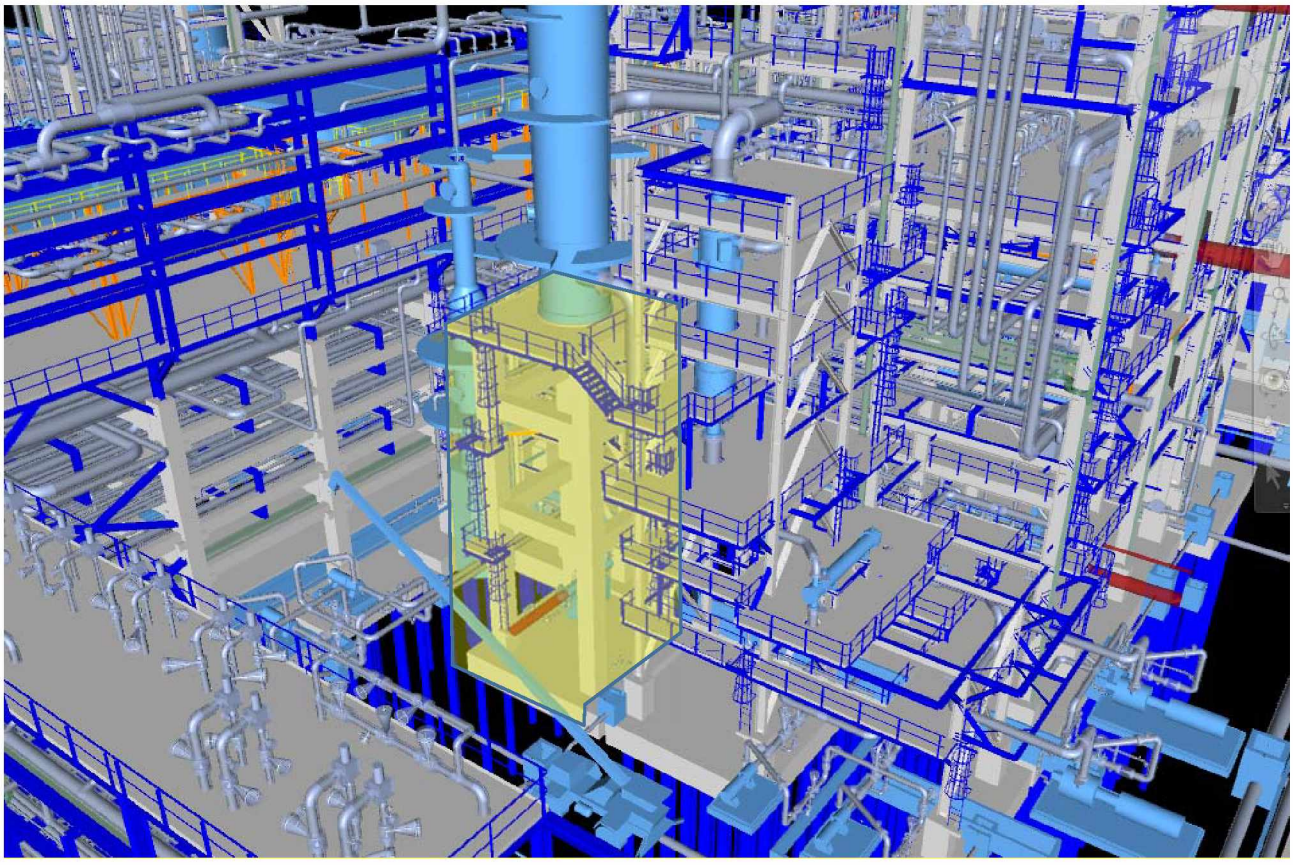

Figure 7: Concrete structure 021-STR-1300

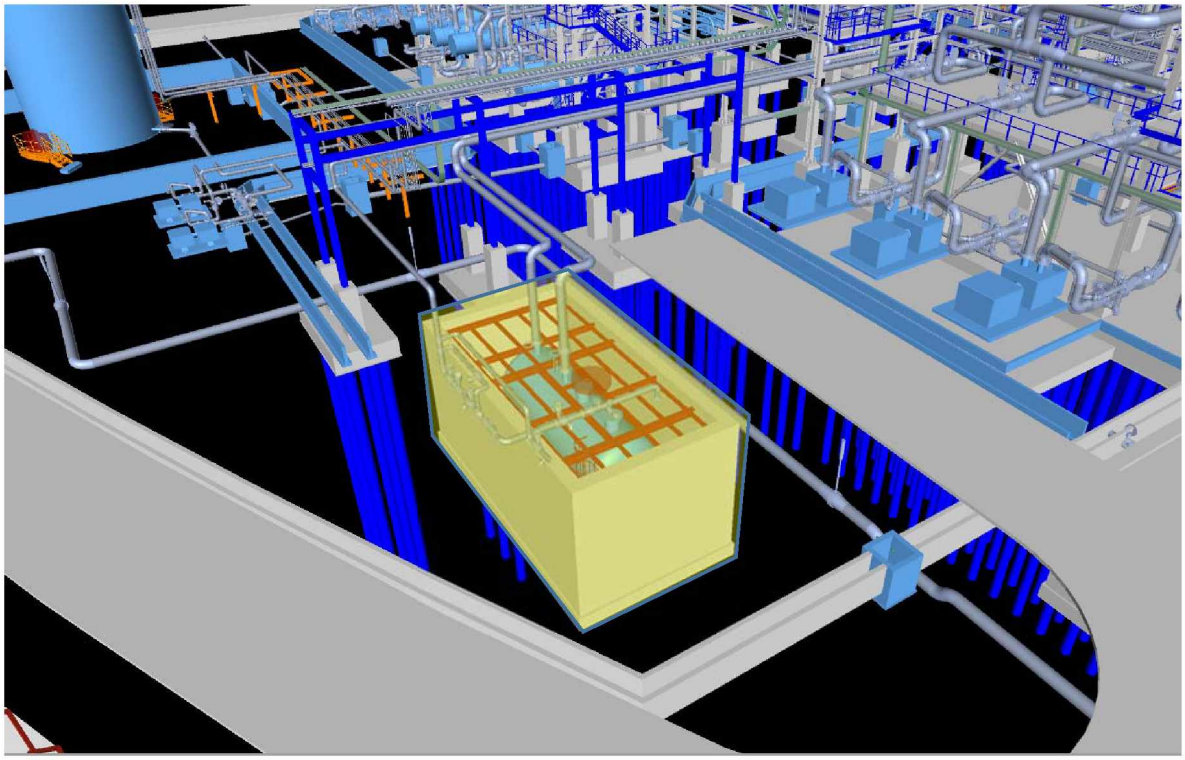

Figure 8: Concrete Basin for 11FA-08

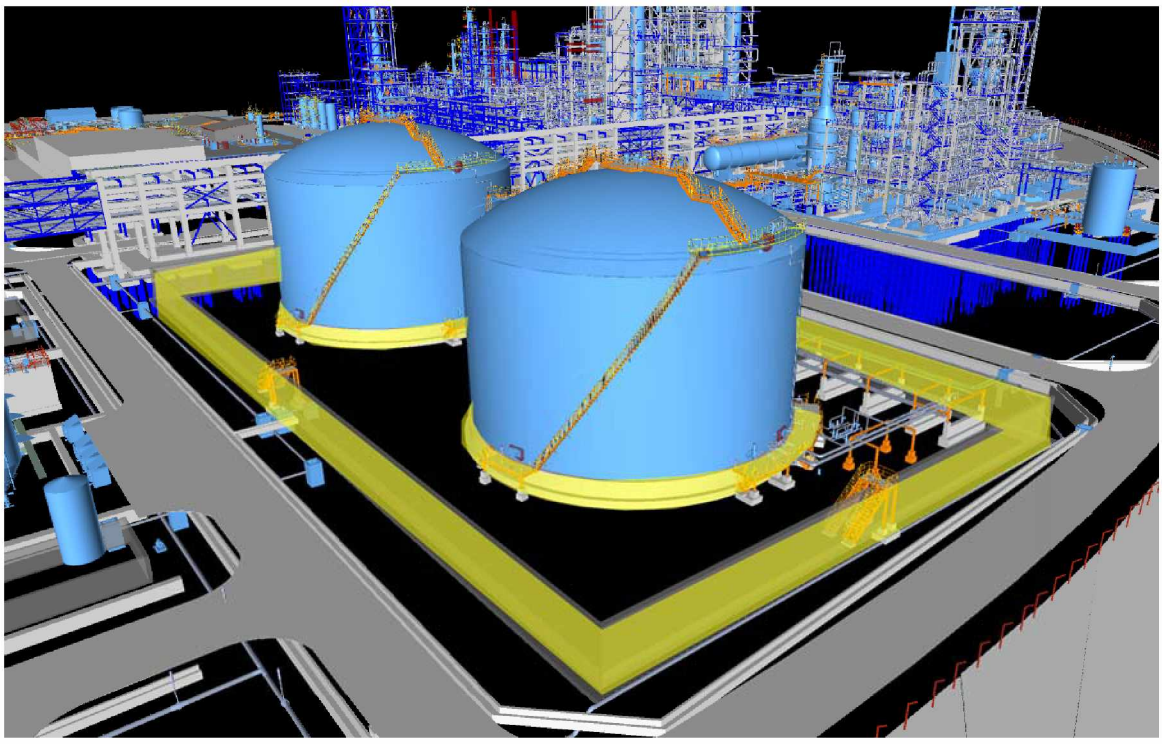

Figure 9: Concrete Dike and Ring foundation for 42FB-01/02

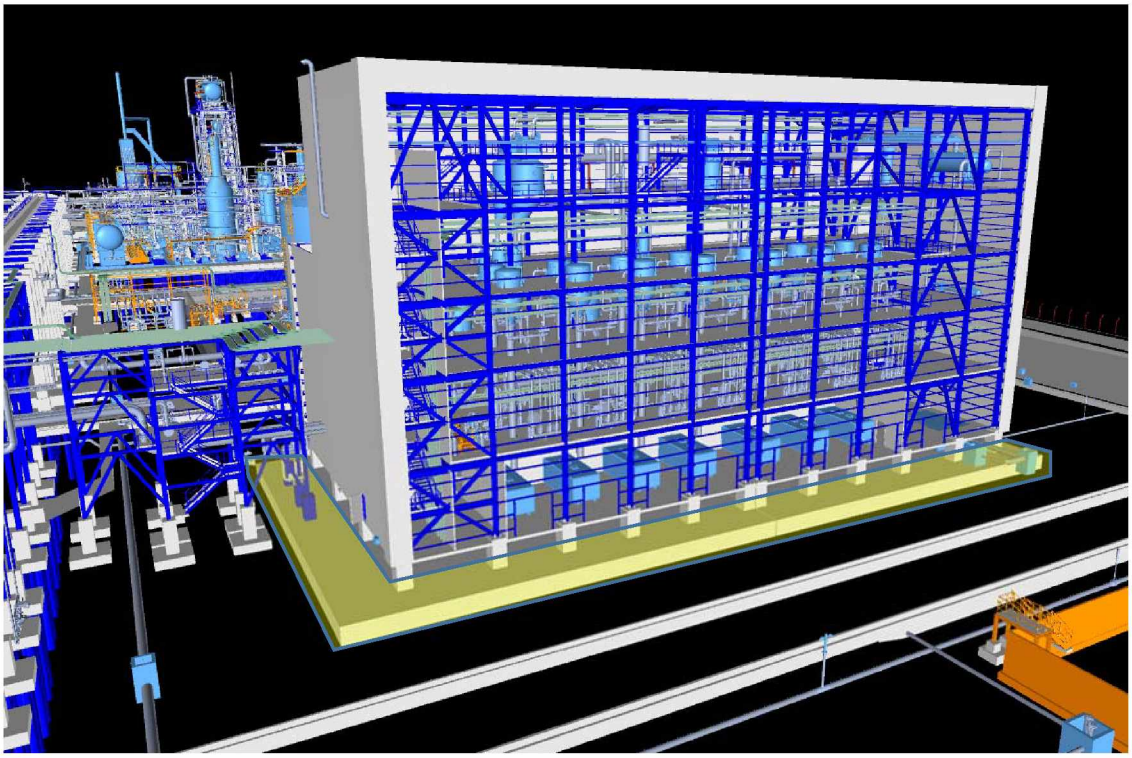

Figure 10: Concrete foundation for PTU Building

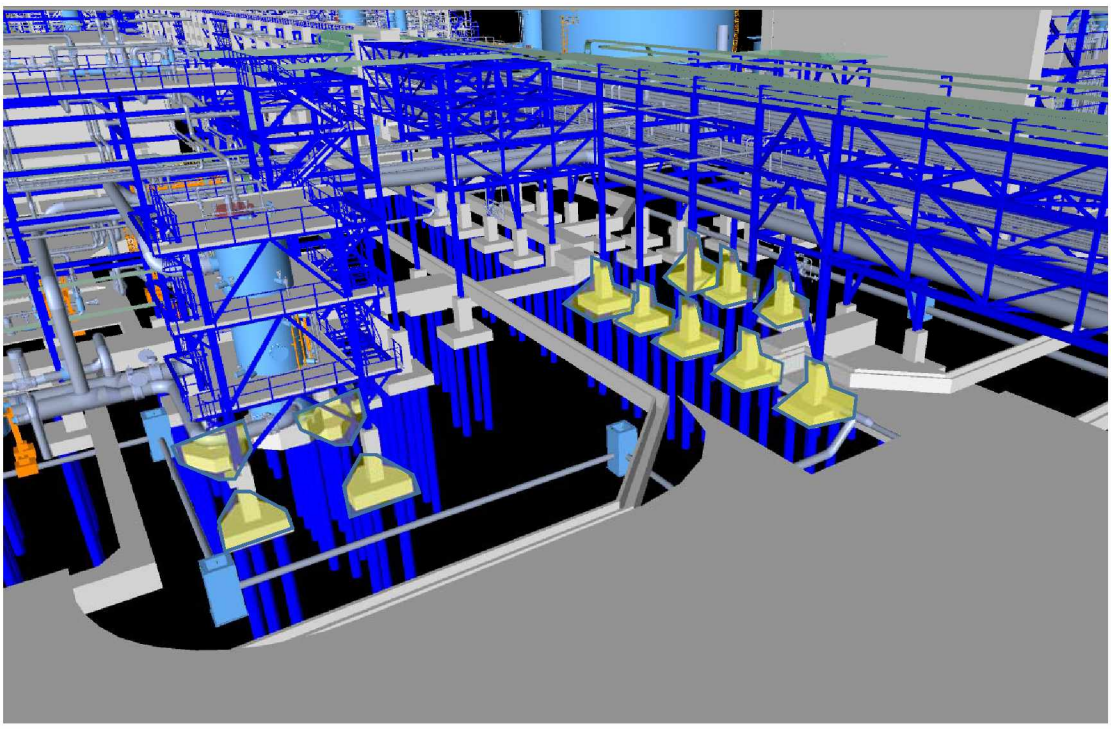

Figure 11: Concrete foundation for 053-STR-100 & 081-PR-300

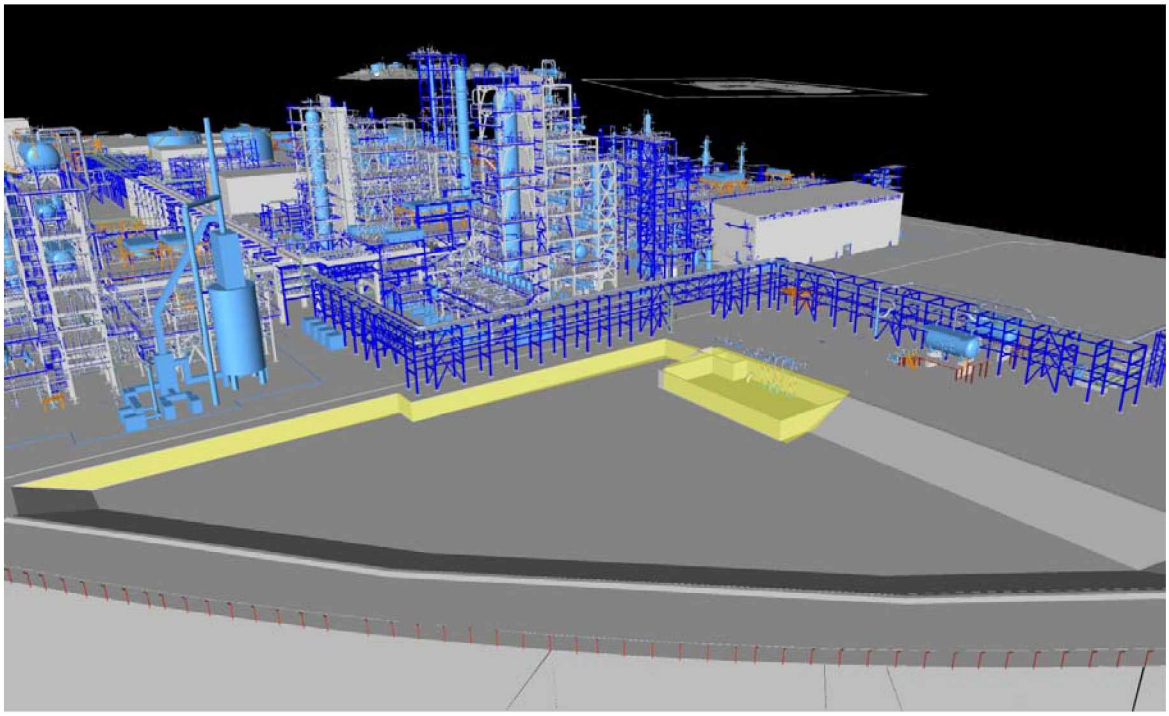

Figure 12: Concrete for Unit 062 Storm Water Pond (Wall and Basin)

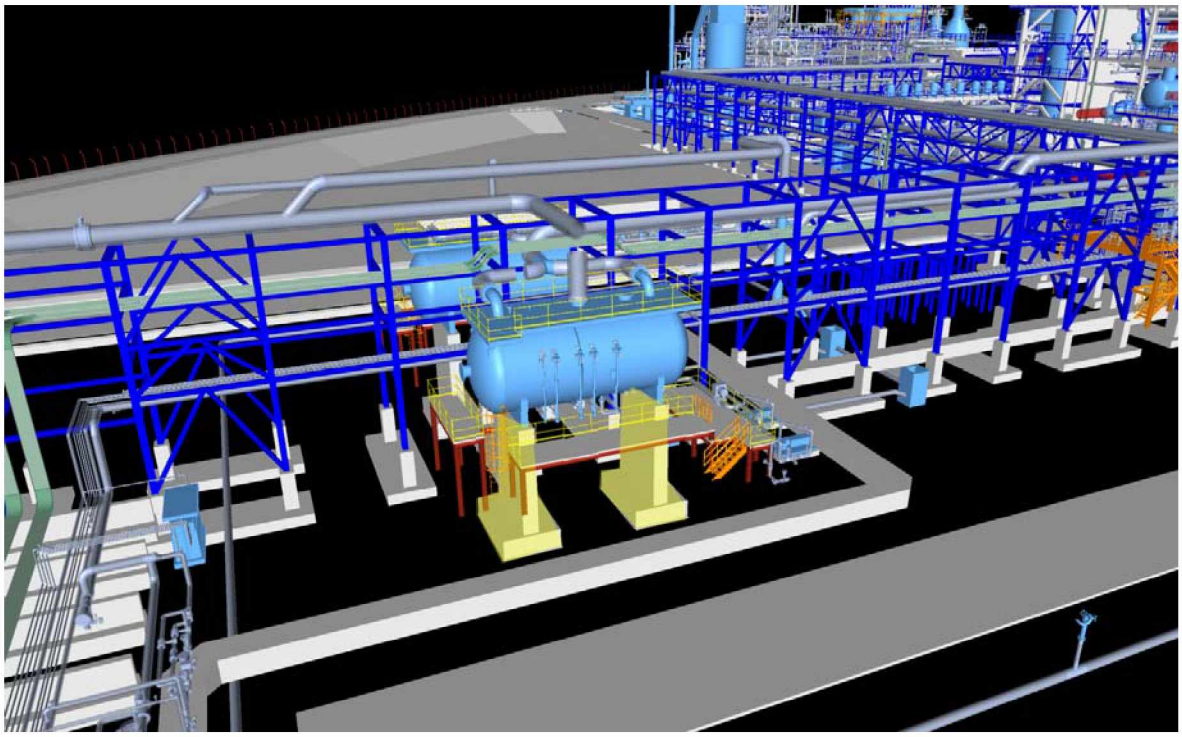

Figure 13: Concrete foundation for K.O Drum 67FA-01

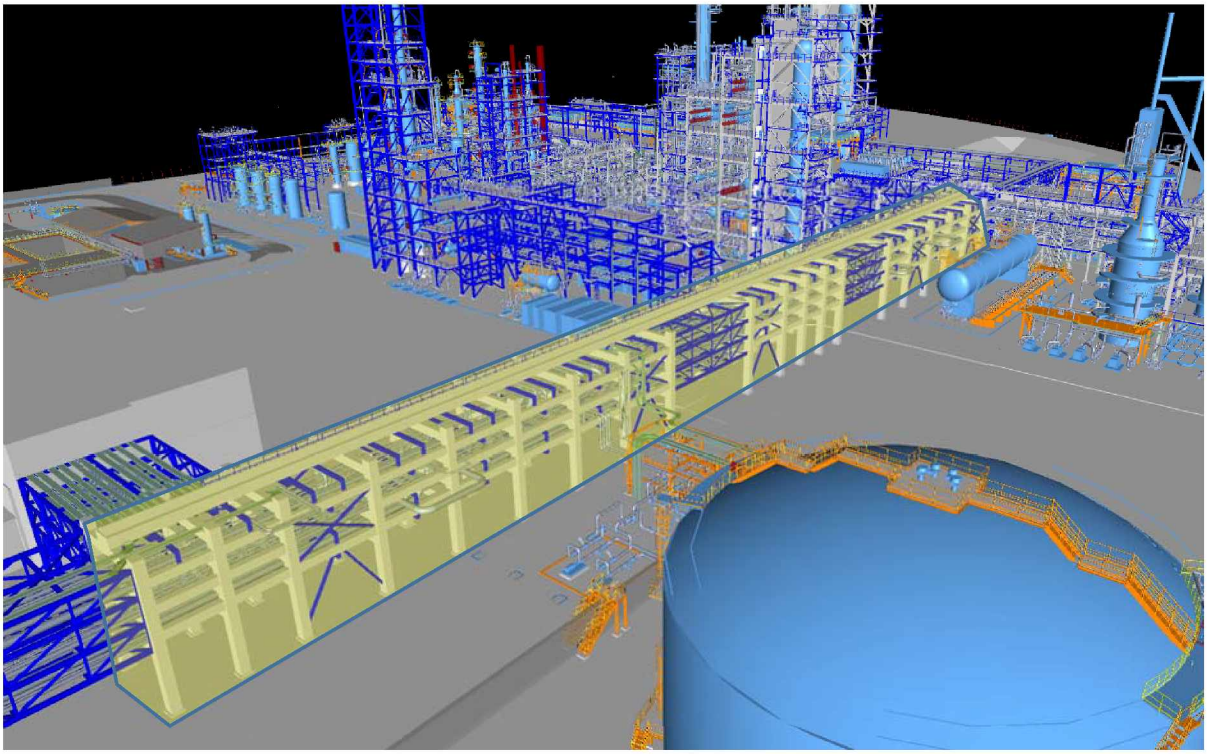

Figure 14: Interconnecting Precast Pipe Rack 081-PR-100

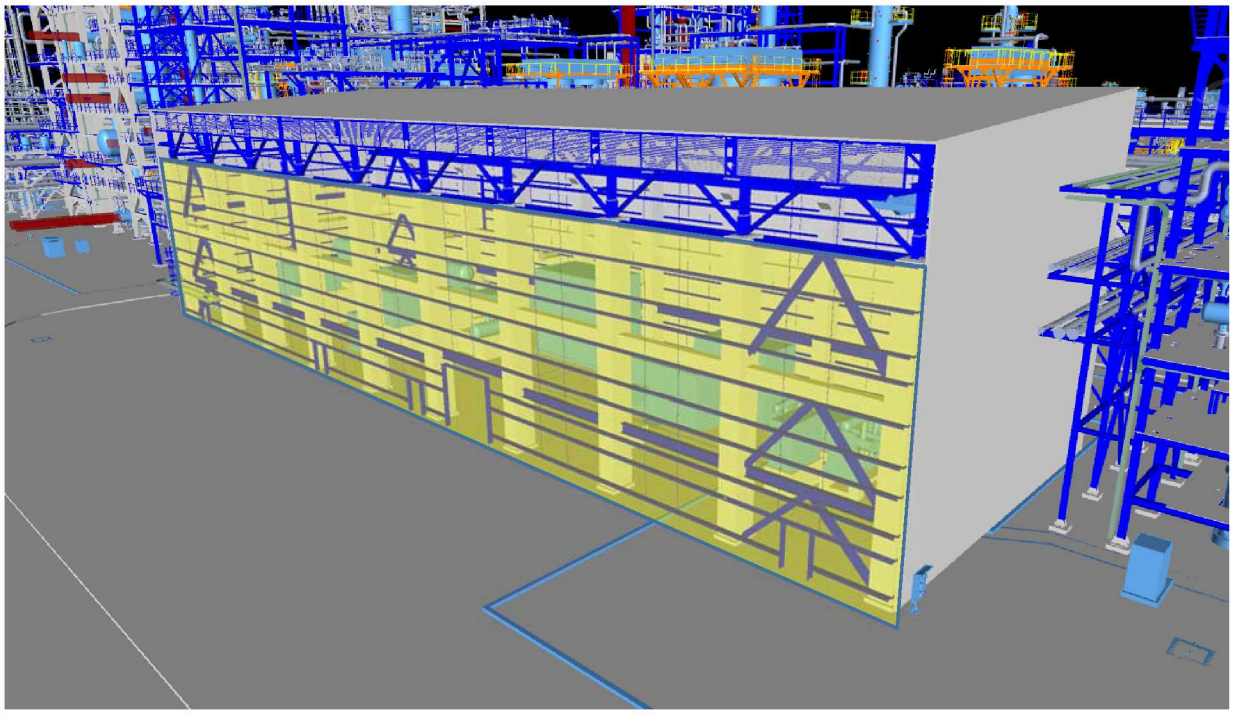

Figure 15: Precast Shelter 021-SHT-100

Some new Concrete Works are also provided in the Existing Refinery, the main interventions are:

- New Concrete foundation for Storage Tanks 40FB-18/19
- Installation of a new loading arm on Jetty 1 (Unit 045)

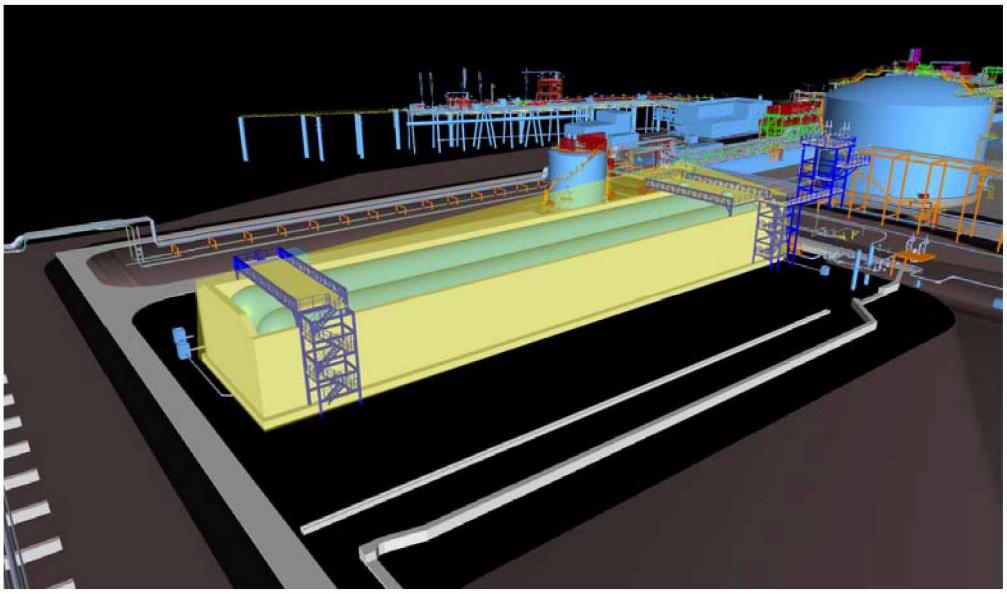

Figure 16: Concrete foundation and basin for new Storage Tanks 40FB-18/19

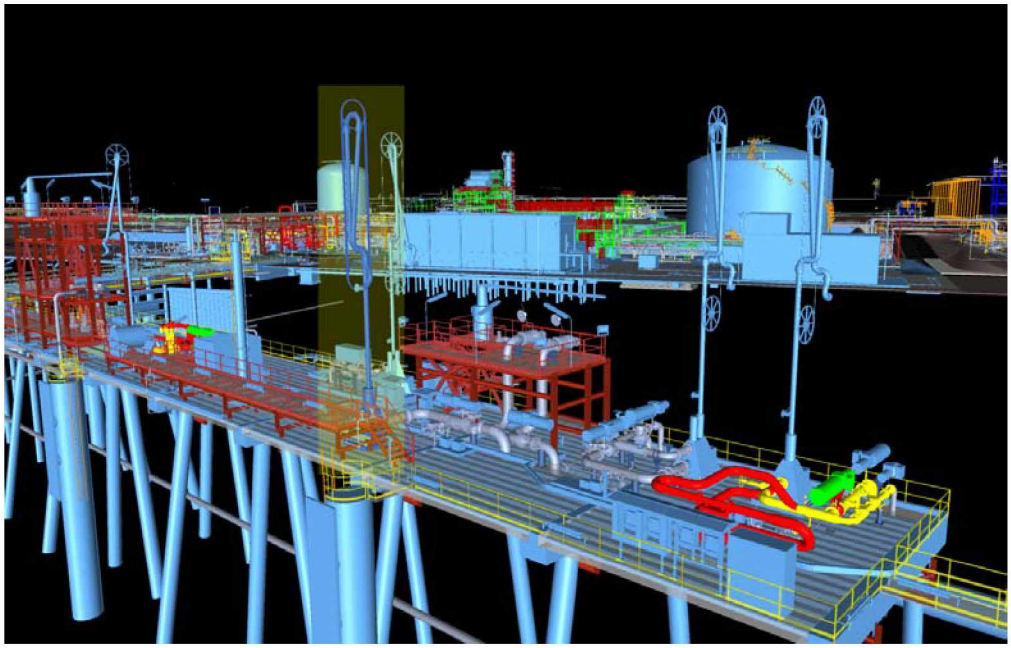

Figure 17: Installation of new loading arm on Jetty 1 (Unit 045)

5.2. Steel Structures

Steel profiles are used generally for pipe racks, process structures, road crossings, piping supports, cable trays supports, platforms, stair cage, ladders and handrails.

Classification, supply and installation of steel constructions are based on standards EN 10025: *Hot rolled products of structural steel*, EN1090-2: *Execution of steel structures and aluminum structures*, EN1993 Eurocode 3: *Design of steel structures* and EN1990 Eurocode: *Basis of structural design*.

Structural steel material shall be as per EN-10025, type S275 J0 or type S355 J0; only for stairs, railing, ladders shall be type S235 JR.

Execution class of steel structures shall be defined in relation to the following table:

Execution Classes EXC

Consequence classes		CC1		CC2		CC3	
Service categories		SC1	SC2	SC1	SC2	SC1	SC2
Production categories	PC1	EXC1	EXC2	EXC2	EXC3	EXC3 [a]	EXC3 [a]
	PC2	EXC2	EXC2	EXC2	EXC3	EXC3 [a]	EXC4

[a] EXC4 should be applied to special structures or structures with extreme consequences of a structural failure as required by national provisions.

Execution Class of steel structures shall be EXC3 according to NEN-EN 1090.

Steel structures are prefabricated and pre-assembled at workshop to the maximum extent that allows installation at site performed by bolted connections, avoiding field welding as much as possible.

Painting shall be applied according to EN ISO 12944, NESTE Specification L-103 and *Painting Specification* 082755C-000-JSD-2300-0001.

All structural steel shall be hot dip galvanized: galvanizing shall be in accordance with EN ISO 14713 and EN ISO 1461.

Steel structural elements subject to jet and pool fire scenario shall be fireproofed according to EN1993-1-2. The primary method to apply fireproofing in the process units is epoxy intumescent coating carried out during prefabrication works at workshop, in order to minimize the need of fireproofing field application. Fireproofing application on the connections of structural elements shall be applied at site on erected structures. Fireproofing application on steel structures shall be in accordance with project Specification 082755C-000-JSD-2400-0001.

Fireproofing extension is based on hazardous area classification.

For RDCG Project, the steel structures shall be foreseen for MNA Area and for Existing Refinery:

- New MNA Area Structures

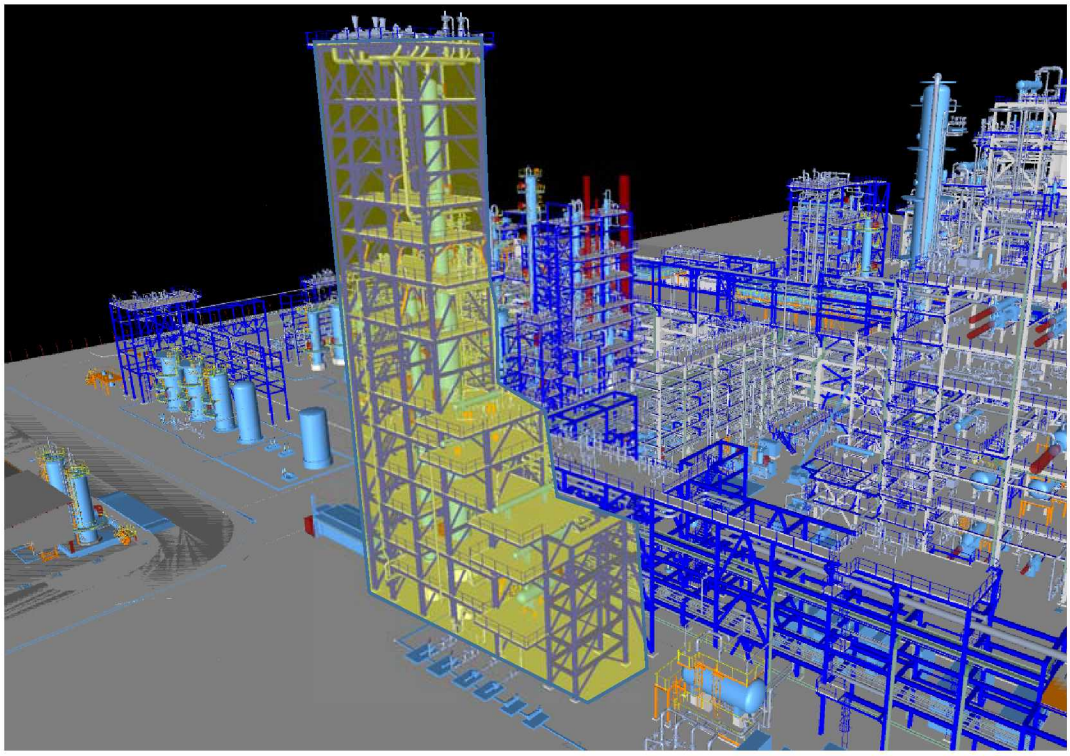

Figure 18: Steel Structures 021-STR-1200

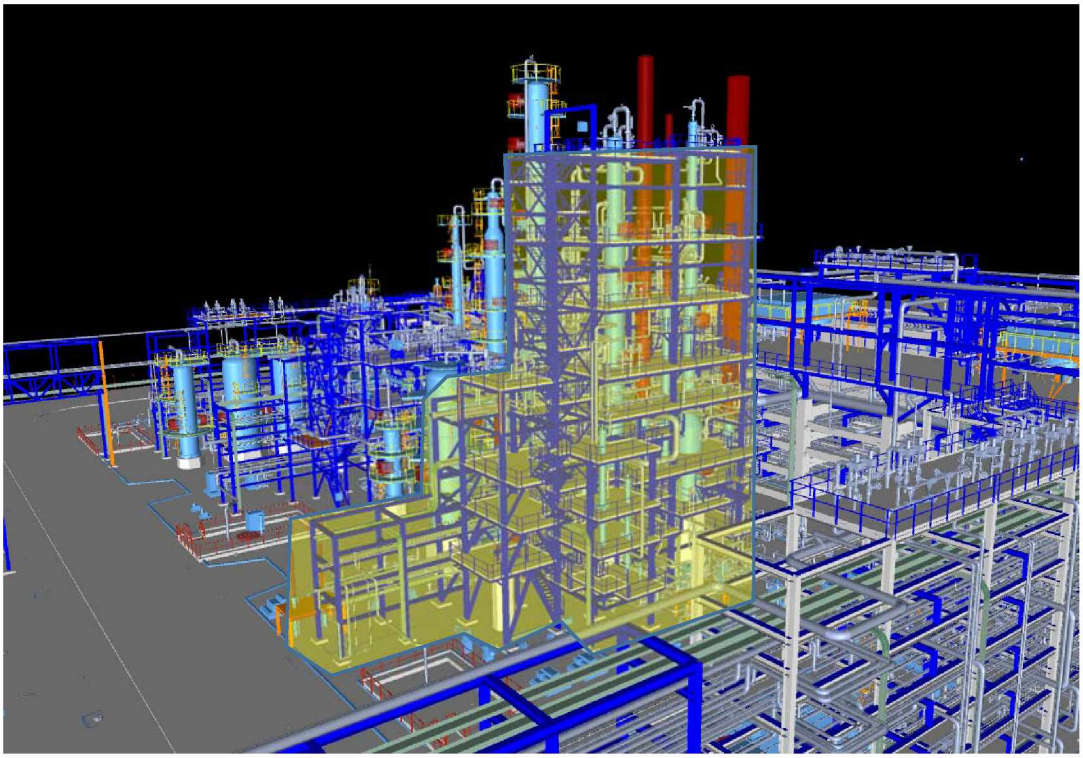

Figure 19: Steel Structures 021-STR-300

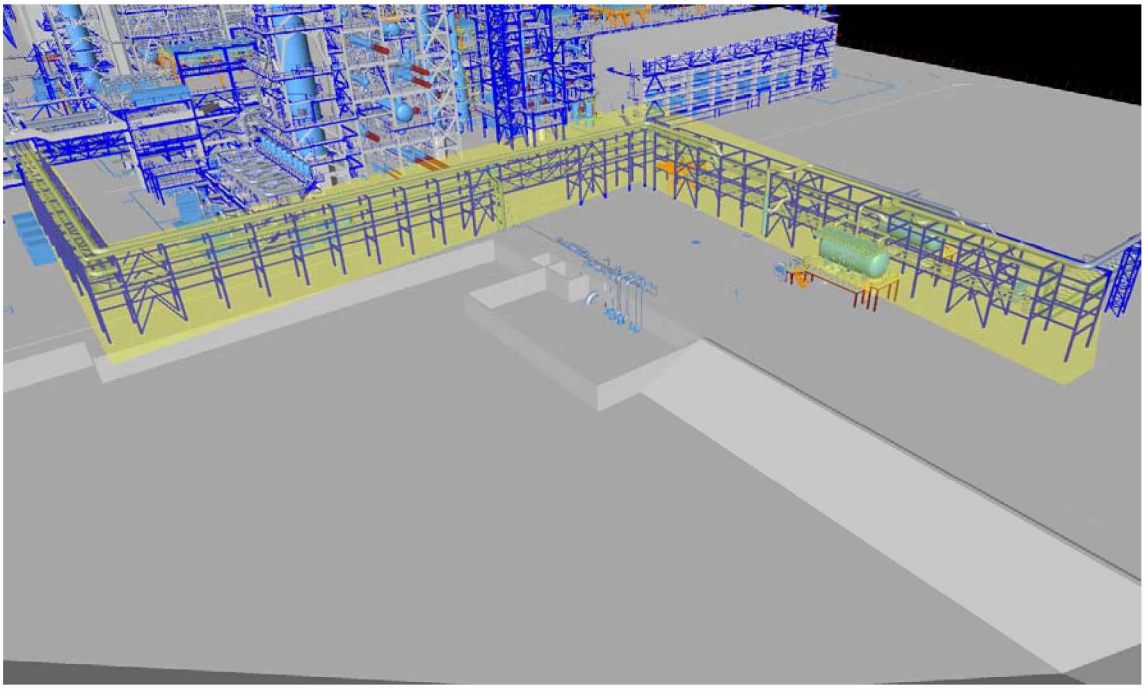

Figure 20: Steel Pipe Rack 081-PR-400 & 067-PR-100

- New Civil "Building" structures in MNA Area

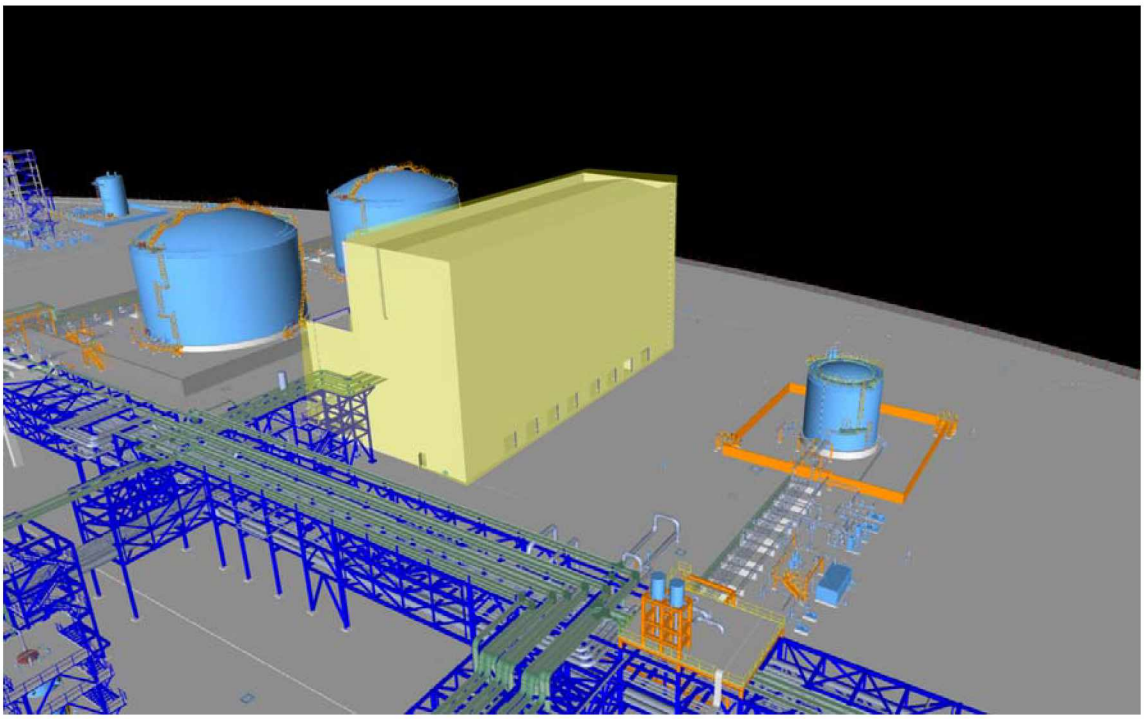

Figure 21: 012-STR-100 – New PTU Building

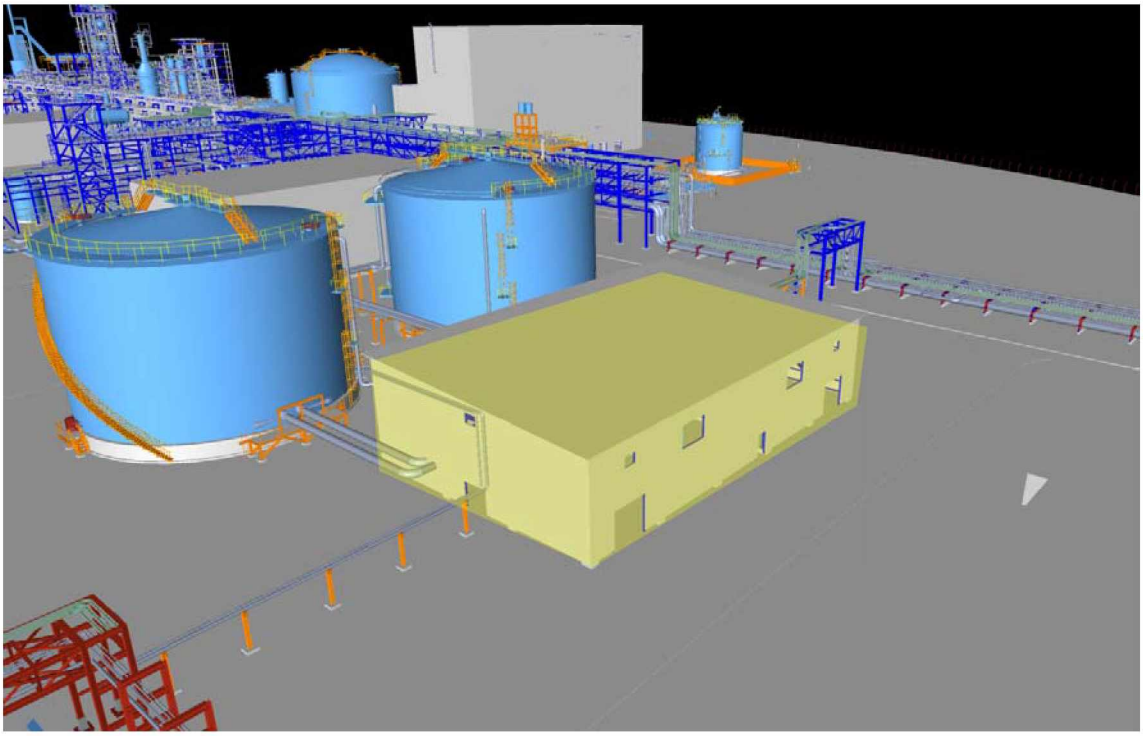

Figure 22: 086-SHT-100 – New Firewater Shelter

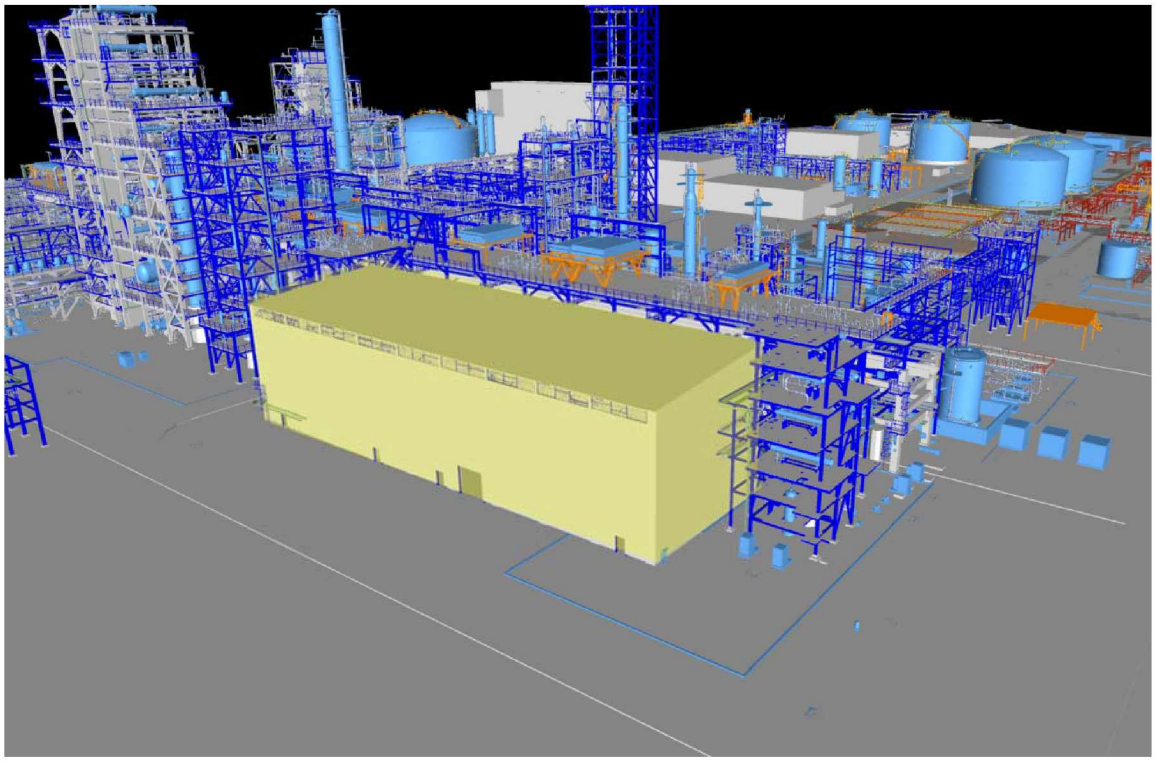

Figure 23: 021-SHT-100 – New Compressor Shelter

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- Revamping of existing Interconnecting Pipe Rack and Sleeper Way in Refinery Area

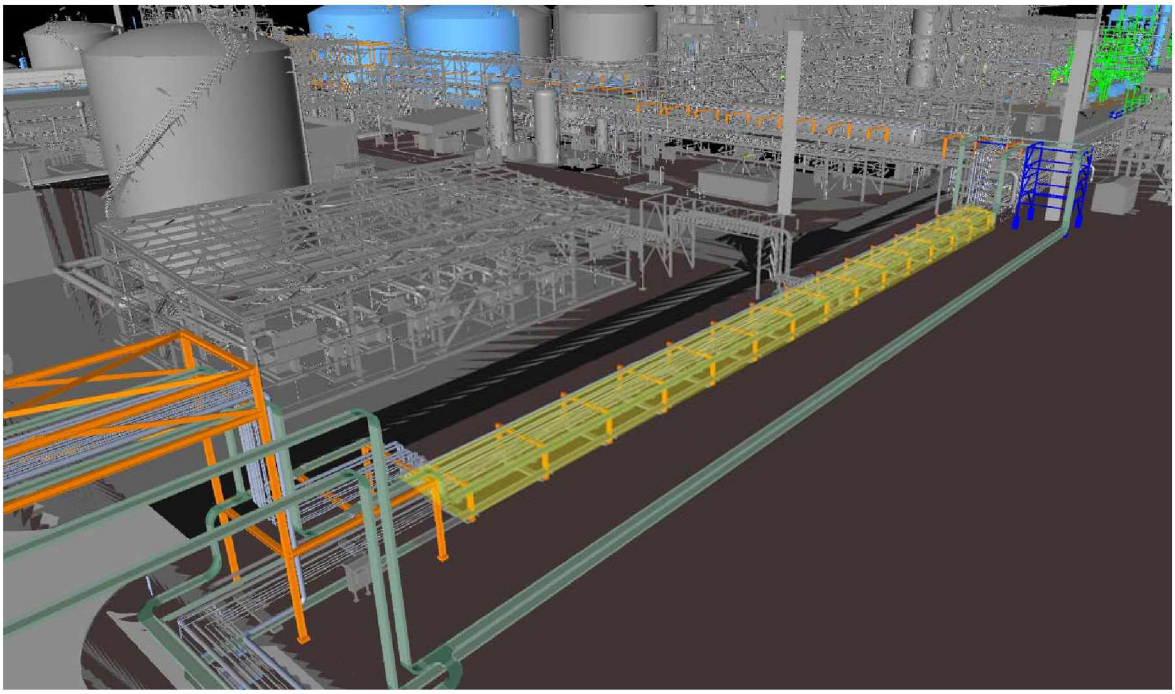

Figure 24: M80-PR-200 - Revamping of existing sleeper way

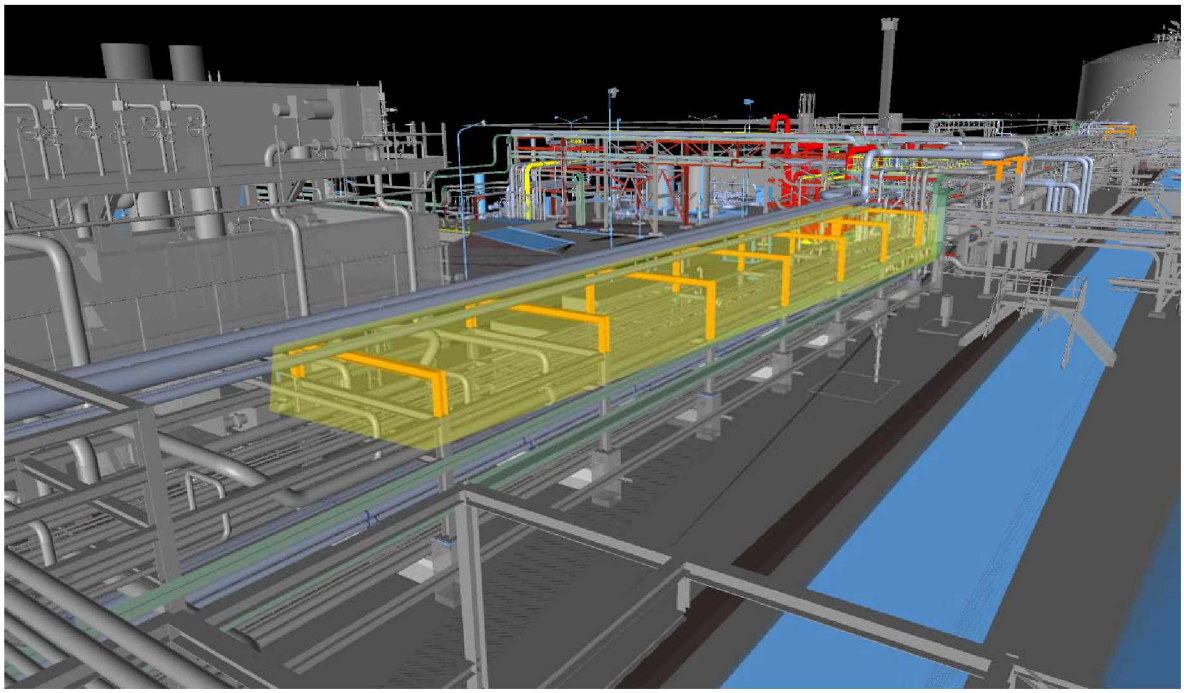

Figure 25: D80-PR-100 - Revamping of existing sleeper way

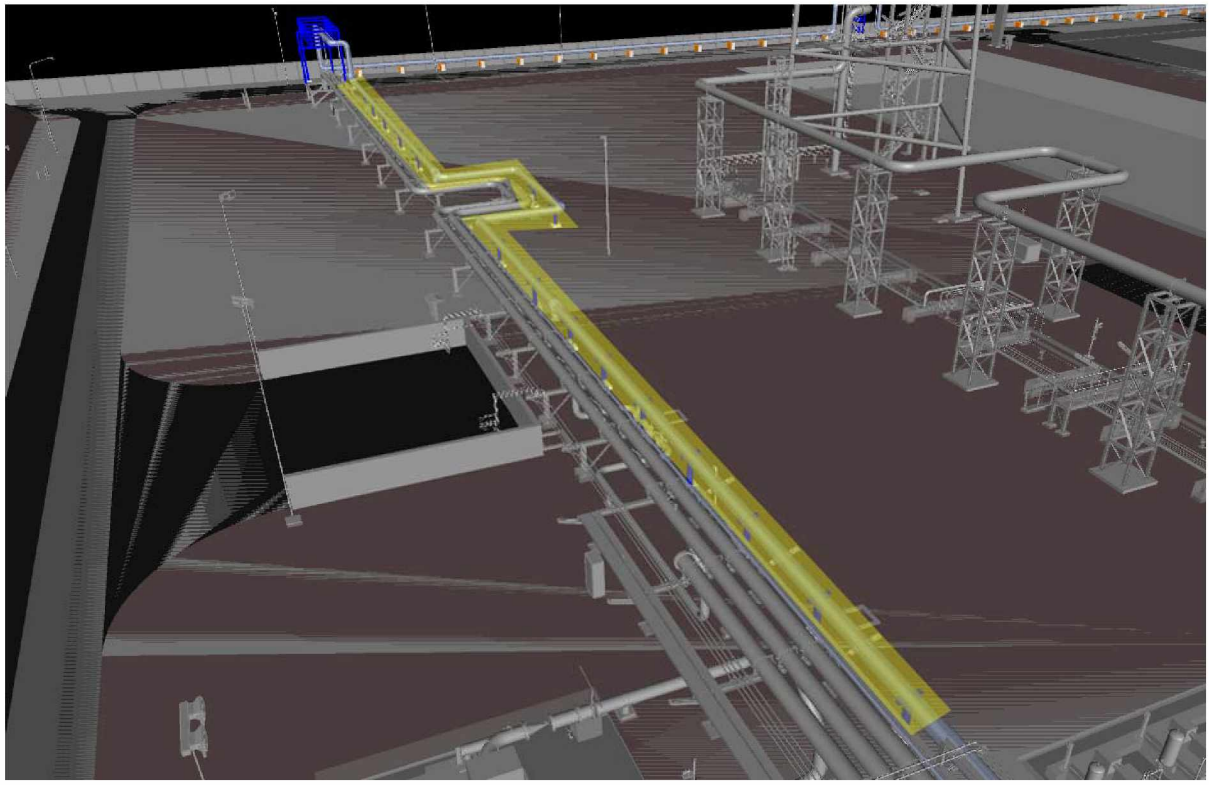

Figure 26: 080-PR-100 – New Pipeline supports in existing area (the blue ones)

5.3. Soil preparation and Earthworks

A soil investigation campaign, an UG mapping and a topographic survey have been performed during feasibility phase of *Rotterdam Site Development Project.* An additional soil investigation campaign has been carried out during the Definition Phase in order optimize the Geotechnical recommendations.

A General scrubbing of soil in green field areas, levelling and compaction up to elevation needed for piling execution (where required) and for shallow foundations is foreseen.

A soil improvement will be evaluated on the base of the outcomes of the Geotechnical Recommendations.

According to *JSD for Geotechnical Recommendations* 082755C-000-JSD-1410-01/2/3/4, the design shall take into account the recommendations defined in the following paragraph (5.3.1 & 5.3.2).

5.3.1. MNA Area

- **Direct Shallow foundations** may be adopted for light structures, isolated equipment and ancillary structures not sensitive to differential settlements.
  Shallow foundations could also be adopted for tanks constructed with usual annular concrete ring.
  The foundations depth should be limited to 2.5 ÷ 3.0 m below Final Ground Level.

- **Deep foundation** shall be adopted for heavy structures, structures subjected to uplift and/or overturning and structures sensitive to differential settlements.

  Structural piles shall be foreseen (but not limited to) for all the main structures in process units. In addition, piles will be foreseen for all structures, building and equipment not sensitive to differential settlements for which the design loads are not compatible with the recommended loads for shallow foundations.

  Considering the soil profile type at the site and the previous experience for the construction of the existing NESTE Plant, the **Drive cast in situ pile** type has been selected as suitable for the *Rotterdam Site Development Project* project:

  - Drive cast in situ piles

In MNA area, to improve foundation subgrade (bearing capacity) and reduce within acceptable limits the expected long term settlements of shallow isolated foundations, the total and differential settlements of large raft/slab or tanks in specific Plant areas characterized by local poor to medium properties of the natural materials, soil improvement interventions are taken into account as suitable solution.

Rigid inclusions are the solution most adequate to the scope (see figure 20). This solution has been already successfully adopted in the Existing Plant.

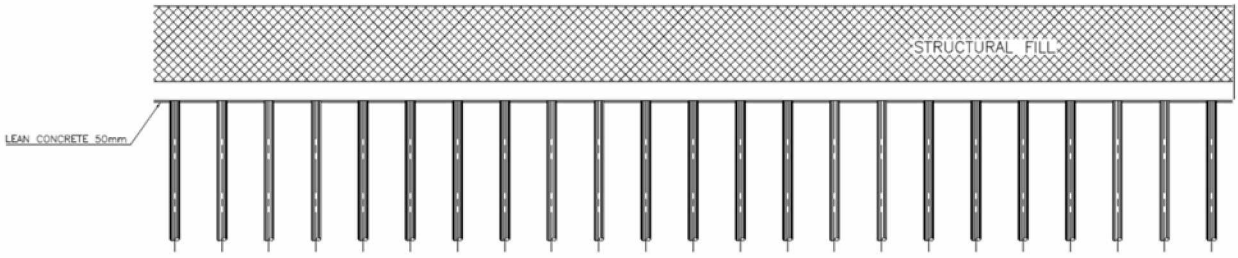

Figure 27 : Soil Improvement with concrete rigid inclusions and distribution concrete slabs

5.3.2. Existing Refinery Area

- **Direct Shallow foundations** may be adopted for light structures, isolated equipment and ancillary structures not sensitive to differential settlements.
  Shallow foundations could also be adopted for tanks constructed with usual annular concrete ring.
  The depth of foundations should be limited to 1.5 to 2.0 m below Final Ground Level.

Among ***early site civil works*** the following main general activities shall be fulfilled: dismantling and demolition works, installation of temporary drainage systems, scrubbing, levelling and soil preparation/improvement (if required).

5.4. Underground Networks

The UG system will include:

- *Reinforced concrete storm ditches*
- *Oily Water gravity lines (OW)*
- *Closed Drain*
- *Reinforced concrete trenches (for electrical cables)*
- *Duct banks*
- *Tie-Ins to existing UG lines/collectors*
- *Pits, Manholes, Catch basins*
- *Paved and curbed areas*

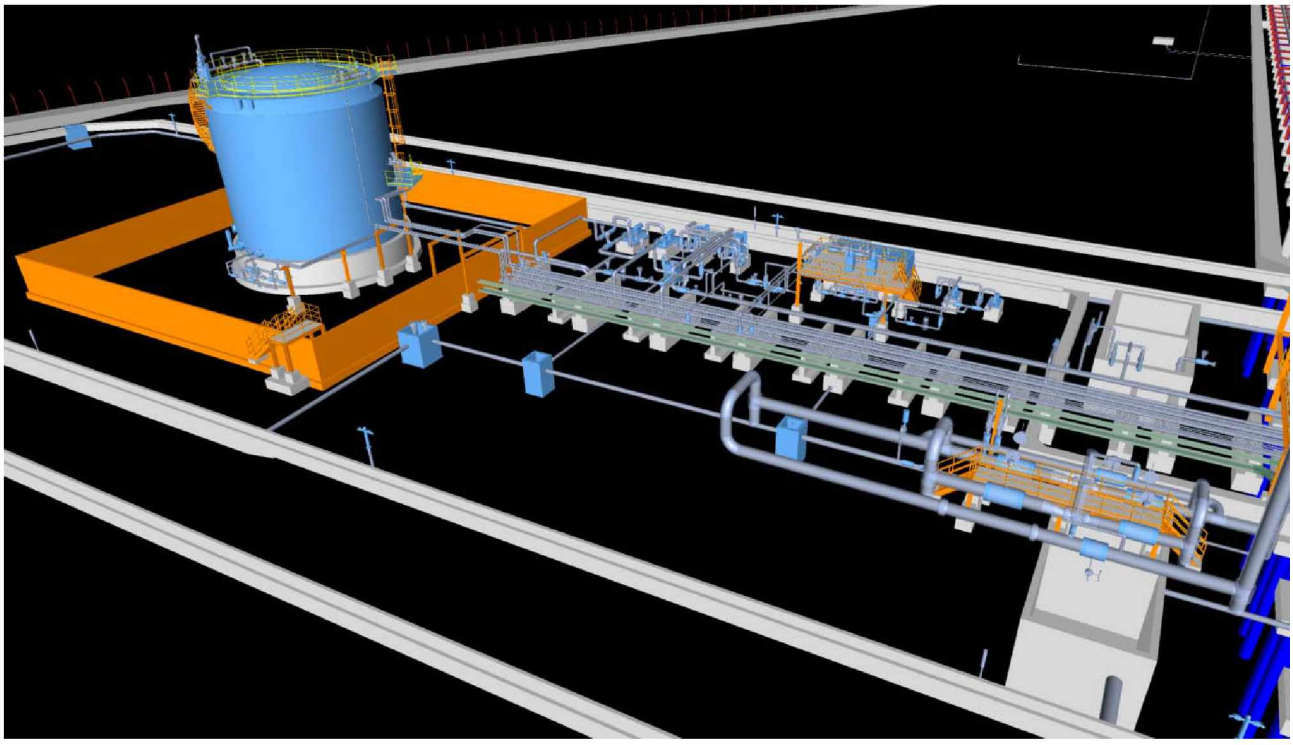

Figure 28: Waste Water Handling – U/G Networks model

5.5. Buildings

The following buildings shall be considered for the RDCG project:

- SS 12 – Main Substation (MNA)
- SS 13 – Main Substation (MNA)
- Operator Building and Laboratory (MNA)

RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE
NESTE

BUILDING	STOREY	Length m	Width m	Height m	Bldg AREA Sqm	Bldg VOLUME Cum	TRAFO AREA Sqm	Structures
SUBSTATION SS 12 + RIB	1st	76.10	23.10	4.10	1757.91	7207.43	344.40 177.51	Three storey, reinforced concrete framed structure / floors / roof / external CMU perimeter walls (lined with thermal insulation and gypsum board), CMU and/or gypmum internal partitions. .Above ground opened fenced cables room. External transformers bay.
	2nd	76.40	23.30	5.00	1780.12	8900.60		
	3rd	38.80	23.30	6.10	904.04	5514.64		
SUBSTATION SS 13 + RIB	1st	41.60	23.00	4.10	956.80	3922.88	231.26	Three storey, reinforced concrete framed structure / floors / roof / external CMU perimeter walls (lined with thermal insulation and gypsum board), CMU and/or gypmum internal partitions. .Above ground opened fenced cables room. External transformers bay.
	2nd	41.60	23.00	5.00	956.80	4784.00		
	3rd	41.60	23.00	6.10	956.80	5836.48		
OPERATOR CENTER BUILDING AND LABORATORY	1st	75.3	27.3	6	2206.89	13014.54	N.A.	Single storey cast in situ concrete structures with reinforced concrete floor and roof. Brick wall with cement plaster for external wall. Masonry internal partition walls.
	2nd	10.8	14	4.5				

5.5.1. SS 12 – Main Substation (MNA)

The building shall be an air-conditioned, three storeys framed structure with concrete floors and roof and with infill reinforced concrete masonry external walls, insulated internally and lined with gypsum board. The building shall be blast resilient for a value of psi to be checked on the QRA (will follow).

Ground floor houses cable room. The cable room shall be enclosed on almost all perimeter with demountable galvanized steel fence infill paneling within concrete frame with the provision of personnel access gates. Cable entrance shall be through sleeves into concrete channel system that provide cables distribution within cable room. After cable placement, cable channel shall be filled

with sand. The floor between adjacent cable channel will be finished with concrete slab on grade. Buried slab will support the entire cable channel system and cable room floor.

First floor houses electrical switchgear rooms (MV and LV), SCADA room, maintenance room and battery room.

Second floor houses instrument equipment (Configuration Room, instrumentation rack room, UPS room and telecom room for Instrument section and capacitors) and HVAC equipment (Ventilation machine room chillers will be placed on the ground floor).

The roof shall be finished with weathering membrane and rigid insulation with screed to falls and shall be supplied with R.C. parapet. For chillers area shall be foreseen a galvanized steel screen.

Internally the electrical equipment room, instrument plant room and battery room shall be separated by floor to roof concrete masonry wall to achieve 2 hours fire rating. The screeded concrete floor shall be finished with hardener and shall be lined with antistatic isolating light colored electrical safety mat with the battery room floor provided with acid-resistant tiling taken up to 1.20m above floor level to the walls or above the highest level of battery cap.

Access to the elevated floor level shall be via galvanized steel stairs and perimeter embossed steel walkway provided with galvanized and painted steel handrails. Stairs and walkways and its supporting structures shall be protected with fire rated panels to achieve the required 2 hours fire resistance.

All doors shall be insulated metal construction with additional demountable transom panels for equipment access and fire resistance where indicated.

Underground instrument cables will rise within a dedicated structure, cable shaft, that allow for their support and maintenance. Cable riser structures are closed with galvanized steel stretch sheet “Diamond Mesh” and provided of maintenance platform at each floor. Cable entrance is foreseen at false floor level located at second floor, through MCT barriers.

The building instrument section shall be provided with a proprietary raised full access tiled floor system (rooms housing the control equipment, workstations, racks, panels and consoles).

Access to the elevated floor levels shall be via concrete stairs provided with stainless steel handrails. Access to the roof shall be via galvanized steel ladder. Roof shall be provided with R.C. and steel parapet.

External personnel and equipment access doors for technical rooms shall be paint finished insulated galvanized steel complying with all necessary requirements for fire resistance, sound and thermal insulation, security and blast resistance. Interior doors shall be galvanized steel.

A 2 hours fire-rated reinforced concrete masonry infill wall shall be provided to separate the cable basement from the transformer bays and from one transformer bay to the others.

Each transformer containment bay shall be provided with an oil catchment’s basin.

The transformer area is covered by galvanized painted steel removable roofing.

Transformer yard (wall, transformer foundations, other minor equipment foundations, reinforced concrete trenches, cables, duct bank, cables trench, curbs, fence with removable panels, etc.) is part of building scope of works. Emergency diesel generator, container type, is foreseen at ground level. Openings on switchboard room slab for equipment cable entrance shall be provided with steel inserts and angular all-around holes. Sleeves for cables entrance shall be provided for wall and slab penetration.

The building structural design shall incorporate expansion joint where required, and as indicated on the drawings. Joint shall be filled and sealed with approved proprietary materials suitable for use in the local environmental conditions.

Internal finishing shall be provided according to schedule.

5.5.2. SS 13 – Main Substation (MNA)

The building shall be an air-conditioned, three storeys framed structure with concrete floors and roof and with infill reinforced concrete masonry external walls, insulated internally and lined with gypsum board. The building shall be blast resilient for a value of psi to be checked on the QRA (will follow).

Ground floor houses cable room. Cable room shall be enclosed on almost all perimeter with demountable galvanized steel fence infill paneling within concrete frame with the provision of personnel access gates. Cable entrance shall be through sleeves into concrete channel system that provide cables distribution within cable room. After cable placement, cable channel shall be filled with sand. The floor between adjacent cable channel will be finished with concrete slab on grade. Buried slab will support the entire cable channel system and cable room floor.

First floor houses electrical switchgear rooms (LV), SCADA room, maintenance room and battery room.

Second floor houses instrument equipment (Configuration Room, instrumentation rack room, UPS room and telecom room for Instrument section and capacitors) and HVAC equipment (Ventilation machine room and outdoor chiller area).

Personnel access to building will be through air lock.

The roof shall be finished with weathering membrane and rigid insulation with screed to falls and shall be supplied with R.C. parapet. For chillers area shall be foreseen a galvanized steel screen.

Internally the electrical equipment room, instrument plant room and battery room shall be separated by floor to roof concrete masonry wall to achieve 2 hours fire rating. The screeded concrete floor shall be finished with hardener and shall be lined with antistatic isolating light colored electrical safety mat with the battery room floor provided with acid-resistant tiling taken up to 1.20m above floor level to the walls or above the highest level of battery cap.

Access to the elevated floor level shall be via galvanized steel stairs and perimeter embossed steel walkway provided with galvanized and painted steel handrails. Stairs and walkways and its supporting structures shall be protected with fire rated panels to achieve the required 2 hours fire resistance.

All doors shall be insulated metal construction with additional demountable transom panels for equipment access and fire resistance where indicated.

Underground instrument cables will rise within a dedicated structure that allow for their support and maintenance. Cable riser structures are closed with galvanized steel stretch sheet “Diamond Mesh” and provided of maintenance platform at each floor. Cable entrance is foreseen at false floor level located at second floor, through MCT barriers.

The building instrument section shall be provided with a proprietary raised full access tiled floor system (rooms housing the control equipment, workstations, racks, panels and consoles).

Access to the elevated floor levels shall be via concrete stairs provided with stainless steel handrails.

Access to the roof shall be via galvanized steel ladder. Roof shall be provided with R.C. and steel parapet.

External personnel and equipment access doors for technical rooms shall be paint finished insulated galvanized steel complying with all necessary requirements for fire resistance, sound and thermal insulation, security and blast resistance. Interior doors shall be galvanized steel.

A 2 hours fire-rated reinforced concrete masonry infill wall shall be provided to separate the cable basement from the transformer bays and from one transformer bay to the others.

Each transformer containment bay shall be provided with an oil catchment's basin.

The transformer area is covered by galvanized painted steel removable roofing.

Transformer yard (wall, transformer foundations, other minor equipment foundations, reinforced concrete trenches, cables, duct bank, cables trench, curbs, fence with removable panels, etc.) is part of building scope of works. Emergency diesel generator, container type, is foreseen at ground level.

Openings on switchboard room slab for equipment cable entrance shall be provided with steel inserts and angular all-around holes. Sleeves for cables entrance shall be provided for wall and slab penetration.

The building structural design shall incorporate expansion joint where required, and as indicated on the drawings. Joint shall be filled and sealed with approved proprietary materials suitable for use in the local environmental conditions.

Internal finishing shall be provided according to schedule.

5.5.3. Operator Building and Laboratory (MNA)

This air-conditioned building shall provide support facilities for plant operators. The building consists of offices, rest room, lockers & showers, toilets.

The building shall be single storey with a reinforced concrete frame, R.C. floor and roof and concrete masonry walls, plastered and painted and insulated with mineral wool and gypsum boarding. Internal partition shall be concrete masonry unit. The building shall be blast resilient for a value of psi to be checked on the QRA (will follow).

The roof shall be furnished with weathering membranes on screed to falls. Access to the roof shall be via galvanized steel ladder.

The building shall be provided with insulated glazed steel doors and with solar tinted double-glazed steel framed windows. Internal finishing shall be provided according to schedule.