



VIVA ENGINEERING

**REDSTONE CSP PROJECT 100MW
CENTRAL TOWER STAIRCASE & PLATFORMS**

THE PROJECT BRIEF

CLIENT: SEPCO 3

STRUCTURAL ENGINEER: POWER CONSULTING

MAIN CONTRACTOR: VIVA ENGINEERING

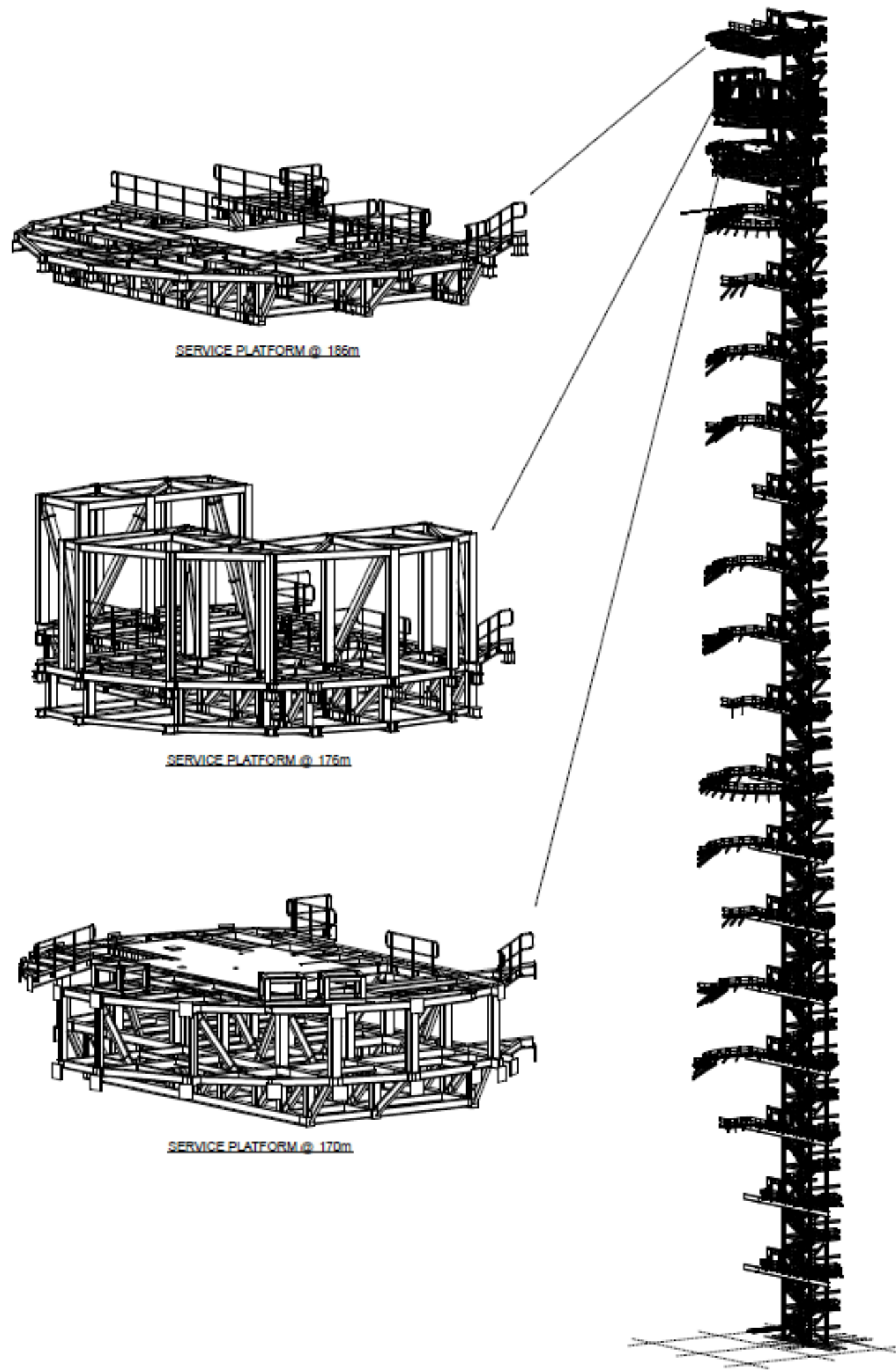
ENGINEERS MODELS / RENDERING

PROJECT OBJECTIVE & REQUIREMENTS

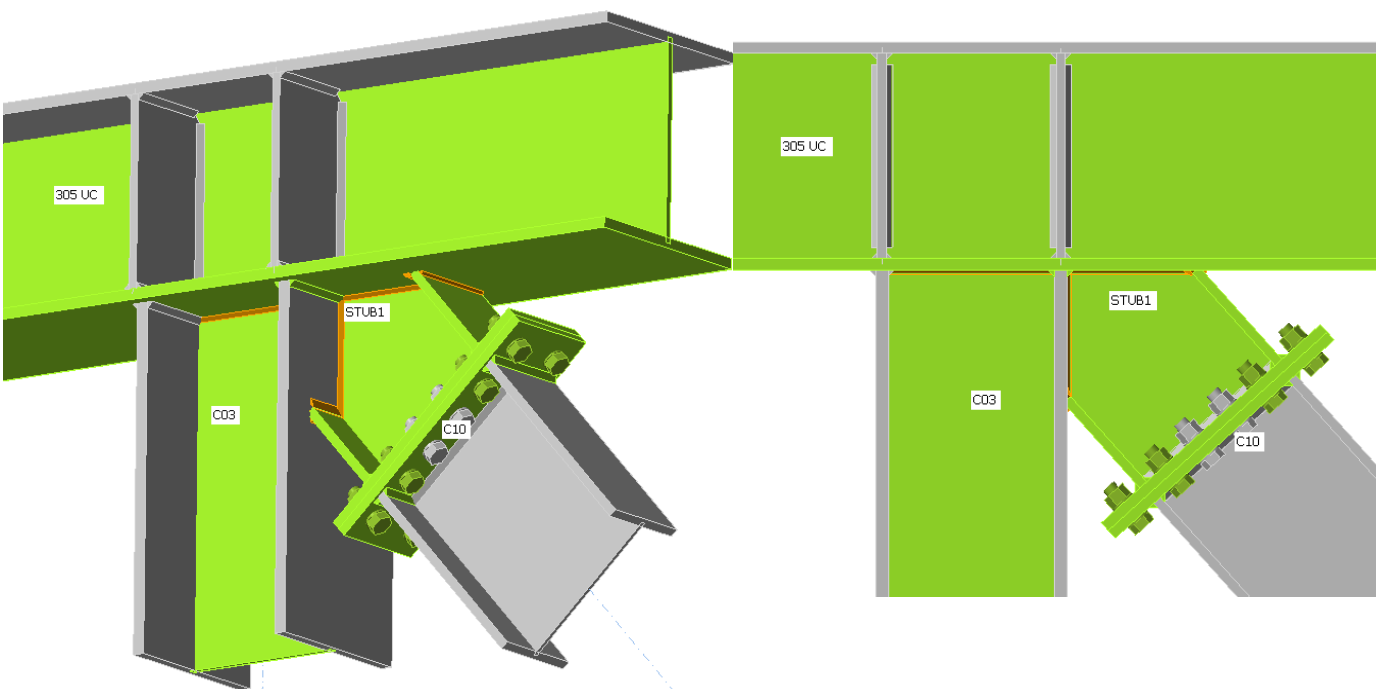
Viva's scope was part of a larger CSP Project in Kathu, Northern Cape

CSP is an acronym for Concentrating Solar Power

Viva Engineering were responsible for the central tower staircase and service platforms, from ground to 188,5m



ENGINEERS MODELS / RENDERING

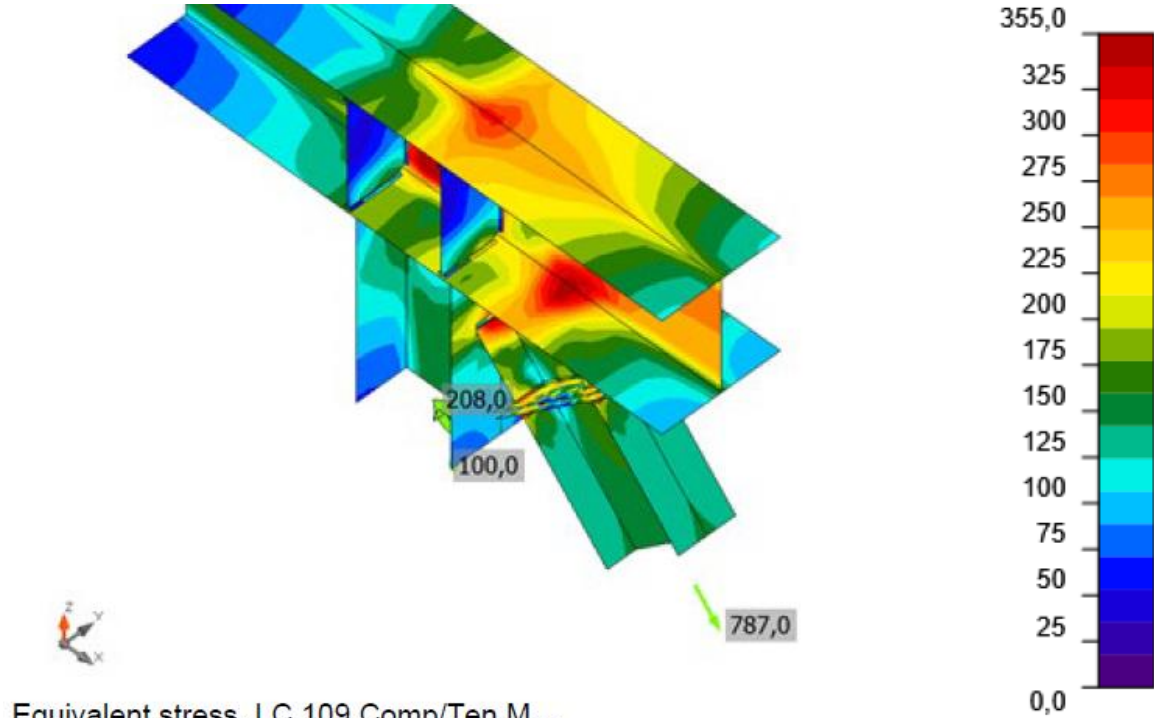


Joint design resistance

Summary

Loads	Resistance [%]
LC 109 Ten/Comp	169,8
LC 109 Comp/Ten	184,4
LC 109 Ten/ Comp ...	104,4
LC 109 Comp/Ten M...	102,1

Name	Value	Status
Plates	0,5 < 5,0%	OK
Bolts	80,0 < 100%	OK
Welds	99,7 < 100%	OK



PROJECT OBJECTIVE & REQUIREMENTS

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ENGINEERING

Power Consulting, was responsible for the connection design. All design work was done in accordance with EC 3 / BS 5950, we were aided by a connection design packaged created by IDEA StatiCa.

The load combinations included thermal expansion, seismic, human access and self-weight. Sliding connection were also employed throughout the height of the 250m tower to compensate for horizontal movement and potential misalignment in the construction process.

The package outputs included summaries of joint efficiency (plates, bolts and welds) as well equivalent FEA equivalent stress for the “worst case” load combinations.

THE PROJECT OVERVIEW



PROJECT OVERVIEW

STRUCTURAL STEELWORK

Project Completed: In Progress

Steelwork Completed: November 2022

Tonnage: 750T

The final height of the absorber tower is **250m**

The Overall height of Staircase is **188.50m**



PROJECT OVERVIEW

STRUCTURAL STEELWORK

Structural Engineer: Power Consulting
Steelwork Contractor: Viva Engineering
Steel Detailer: Viva Engineering
Steel Merchant/s: Various

This once-in-a-lifetime project was part of round four of the IPPP (Independent Power Producer Program) in South Africa



Led Zeppelin's 70's classic
Stairway to Heaven starts
with the lyrics

... "All that glitters is gold
And she's buying a stairway
to heaven"

In this case, the glittering is
not gold, it's a super
concentration of sunlight
by a large field of mirrors
that track the sun to a
receiver on the tower.
Liquid salt from a "cold" salt
tank ('only' 288 °C) is
pumped up the tower and
through the receiver,
where it is heated to 566 °C

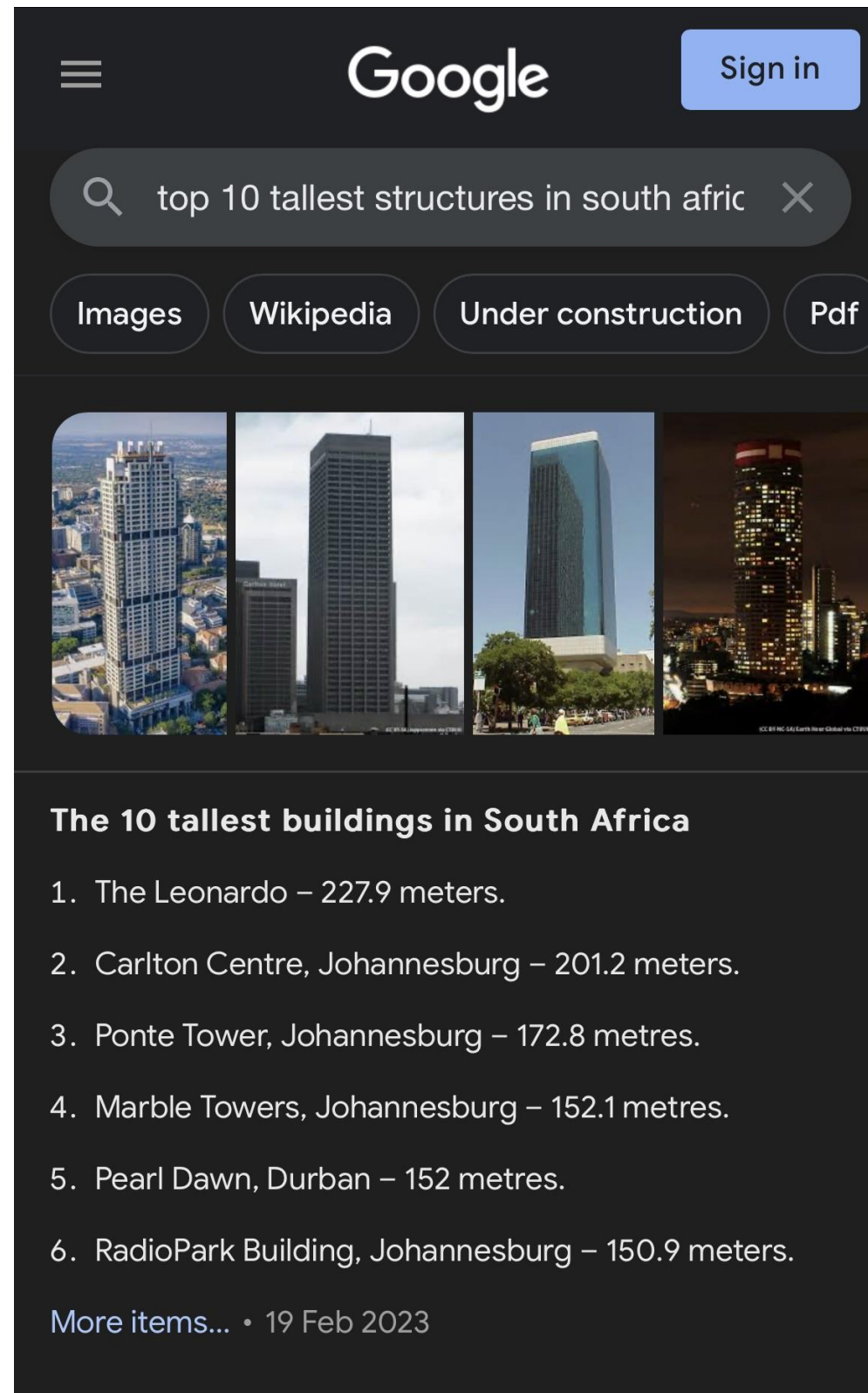


The final height of the absorber tower is **250m**, which, when complete will make it the tallest structure in South Africa! (Ref Google)

Viva Engineering's scope included the

- connection design
- shop detailing
- manufacturing,
- corrosion protection
- and delivery to site

of the Central Absorber Tower staircase and Service Platforms



A screenshot of a Google search results page. The search bar contains the text "top 10 tallest structures in south africa". Below the search bar are tabs for "Images", "Wikipedia", "Under construction", and "Pdf". A row of four images shows various tall buildings. Below the images is a section titled "The 10 tallest buildings in South Africa" with a list of six buildings and their heights. At the bottom, it says "More items... • 19 Feb 2023".

The 10 tallest buildings in South Africa

1. The Leonardo – 227.9 meters.
2. Carlton Centre, Johannesburg – 201.2 meters.
3. Ponte Tower, Johannesburg – 172.8 metres.
4. Marble Towers, Johannesburg – 152.1 metres.
5. Pearl Dawn, Durban – 152 metres.
6. RadioPark Building, Johannesburg – 150.9 meters.

More items... • 19 Feb 2023



A screenshot of a Twitter post from the official account of the Presidency of South Africa (@PresidencyZA). The post text states: "TODAY: President @CyrilRamaphosa conducts oversight visit to the Redstone Concentrated Solar Power Thermal Plant in Postmasburg, Northern Cape". It includes the hashtags #JustTransition and #LeaveNoOneBehind. Below the text is a large image of President Cyril Ramaphosa wearing a white hard hat and a green safety vest, speaking into a microphone. The image has a caption: "Redstone Thermal Power Plant Visit. President Cyril Ramaphosa conducts an oversight visit to the newly built Redstone Thermal Power Plant." Below the image, it says "THURSDAY, 20 OCTOBER 2022" and "POSTMANSBURG, NORTHERN CAPE". At the bottom of the image are the hashtags #JustTransition and #LeaveNoOneBehind, and the "LEAVE NO ONE BEHIND" logo. The bottom of the tweet shows the South African coat of arms and the text "THE PRESIDENCY REPUBLIC OF SOUTH AFRICA".

Presidency | South Africa
@PresidencyZA · Follow

TODAY: President @CyrilRamaphosa conducts oversight visit to the Redstone Concentrated Solar Power Thermal Plant in Postmasburg, Northern Cape

#JustTransition
#LeaveNoOneBehind

Redstone Thermal Power Plant Visit
President Cyril Ramaphosa conducts an oversight visit to the newly built Redstone Thermal Power Plant.

THURSDAY, 20 OCTOBER 2022
POSTMANSBURG, NORTHERN CAPE

#JustTransition • #LeaveNoOneBehind •

LEAVE NO ONE BEHIND

THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

DETAILING

STEELWORK DETAILING: VIVA ENGINEERING

ENGINEERS MODELS / RENDERING

ENGINEERING

Staircase Columns UC305*118
Staircase Bracing UC203*60
Staircase main Beams UB305*165*46
Stair stringers PC260*75

Service platforms had some Plate Girders 700*250*16w*20F

3 Main service platforms members:

Columns-- UC305*305*118
UC305*305*97
UC254*254*89

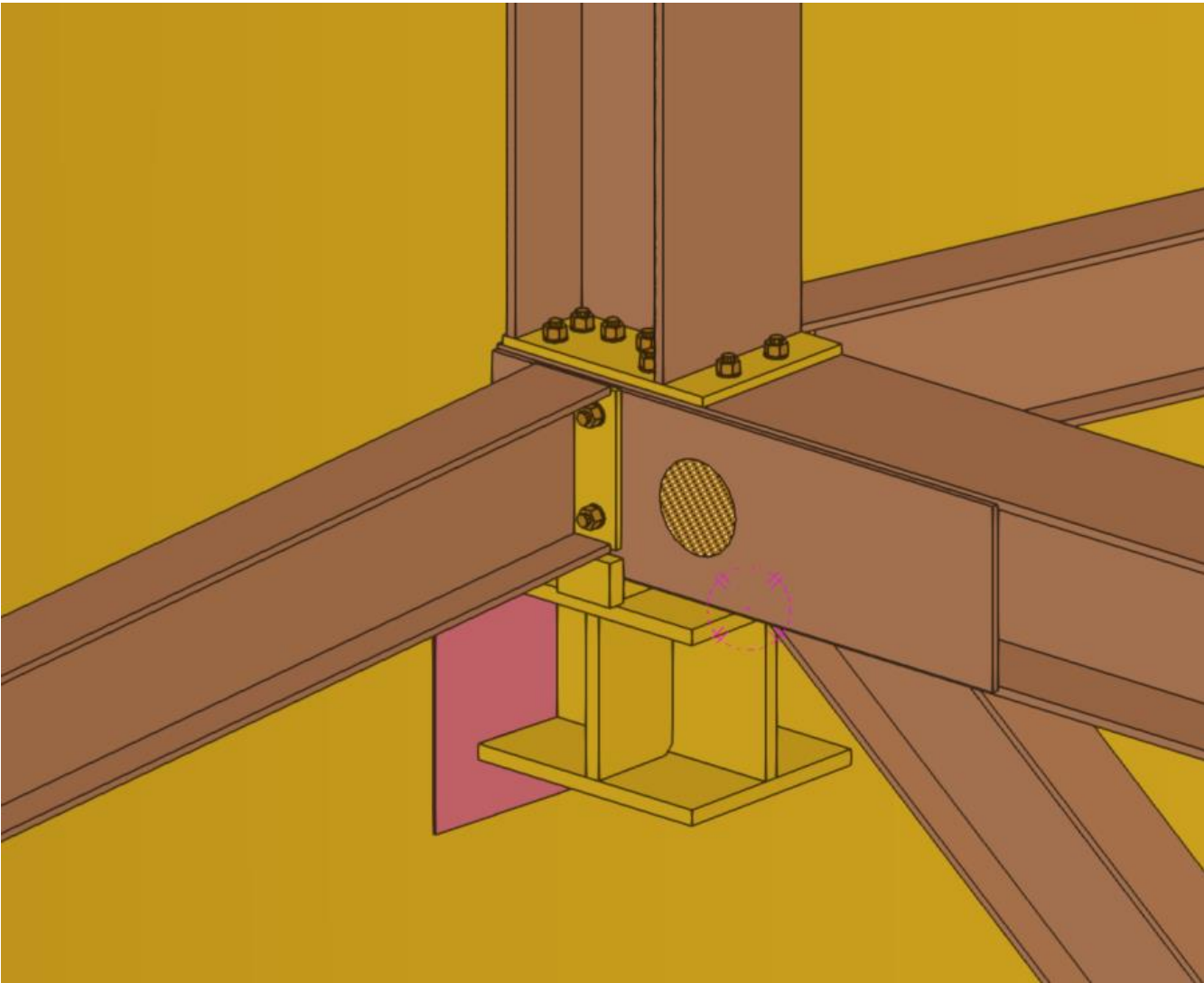
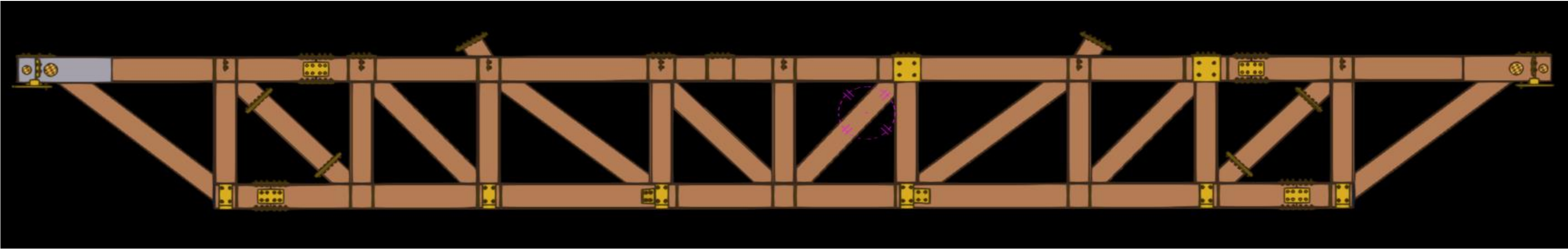
Beams -- UC305*305*118
UB254*146*43
UC305*305*97

Bracing --- UB254*146*43
UB203*133*25

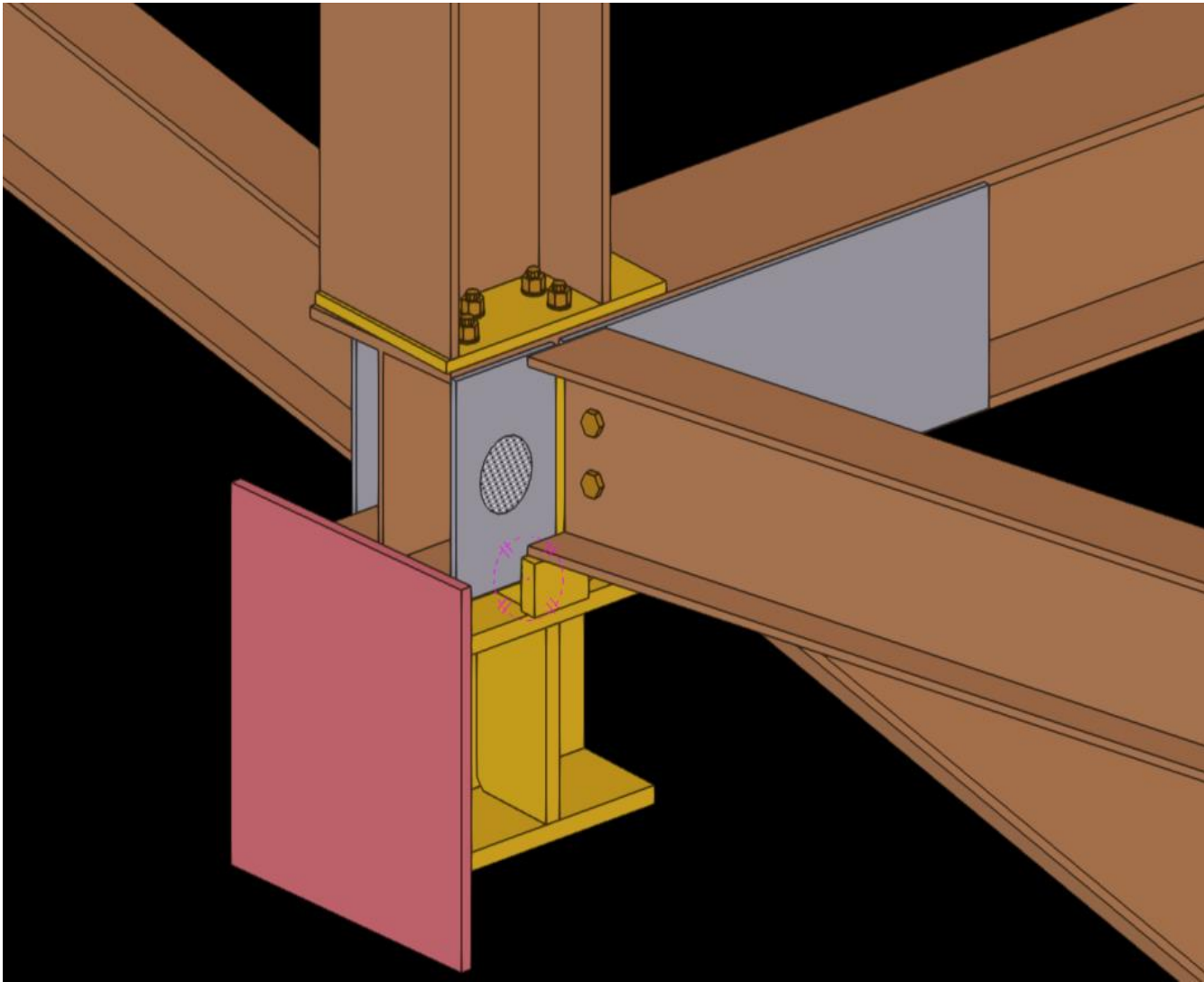
Service Platforms are Ø 16.9m in diameter



SOME DETAILING INFORMATION



Typical Sliding Connection



Typical Fixed Connection

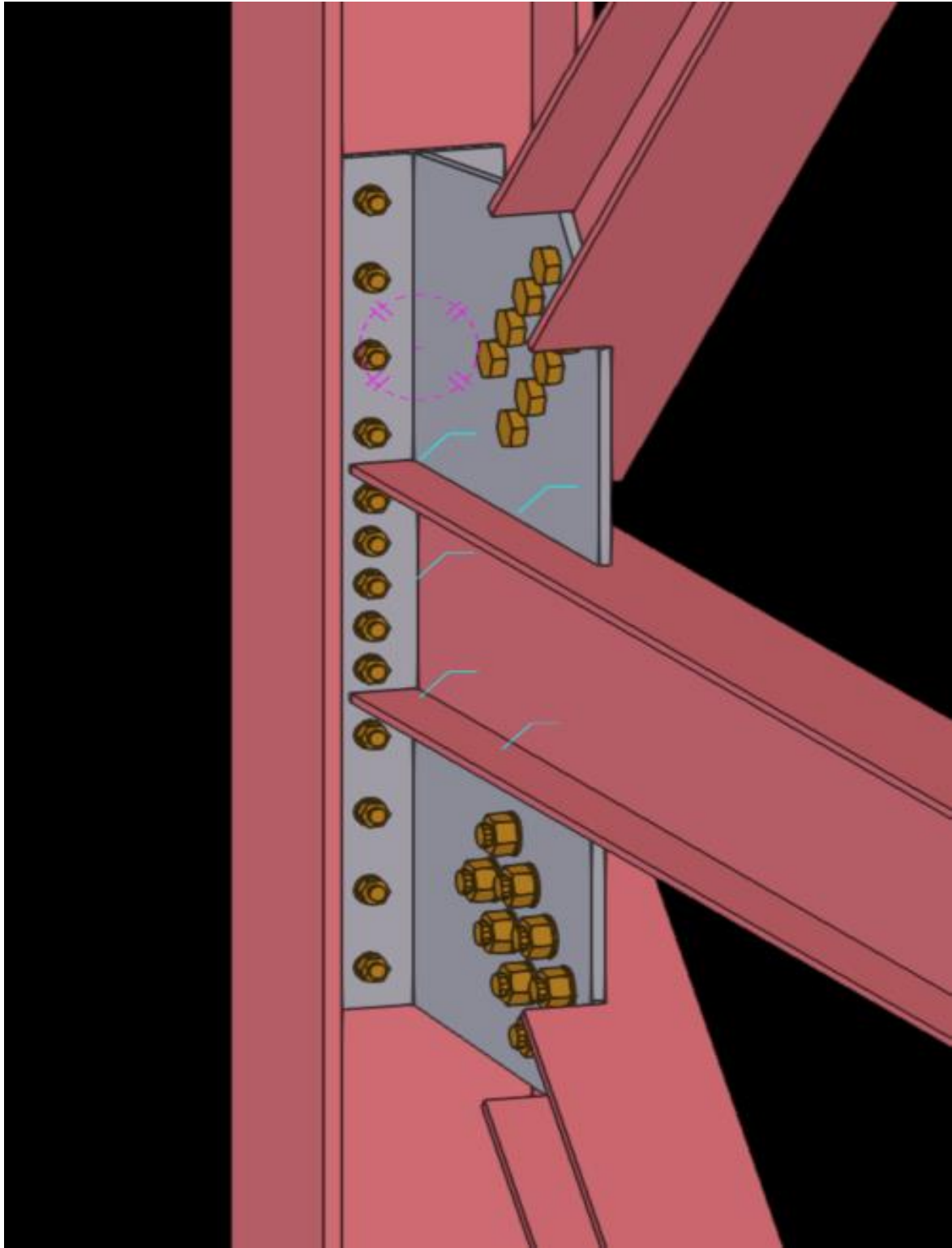
Typical Service
Platform Girder

Detailing

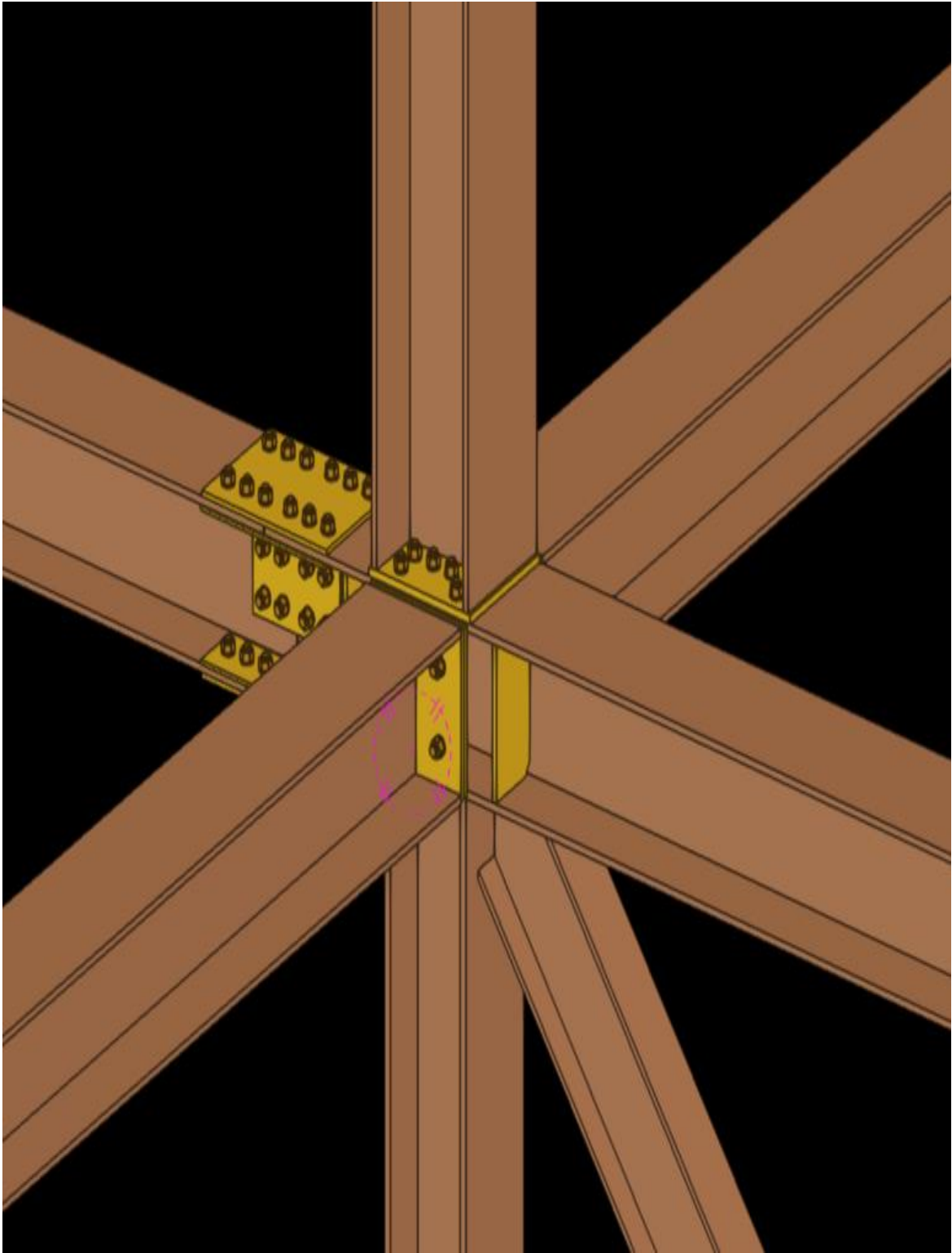
Number of
Installation GA's

140

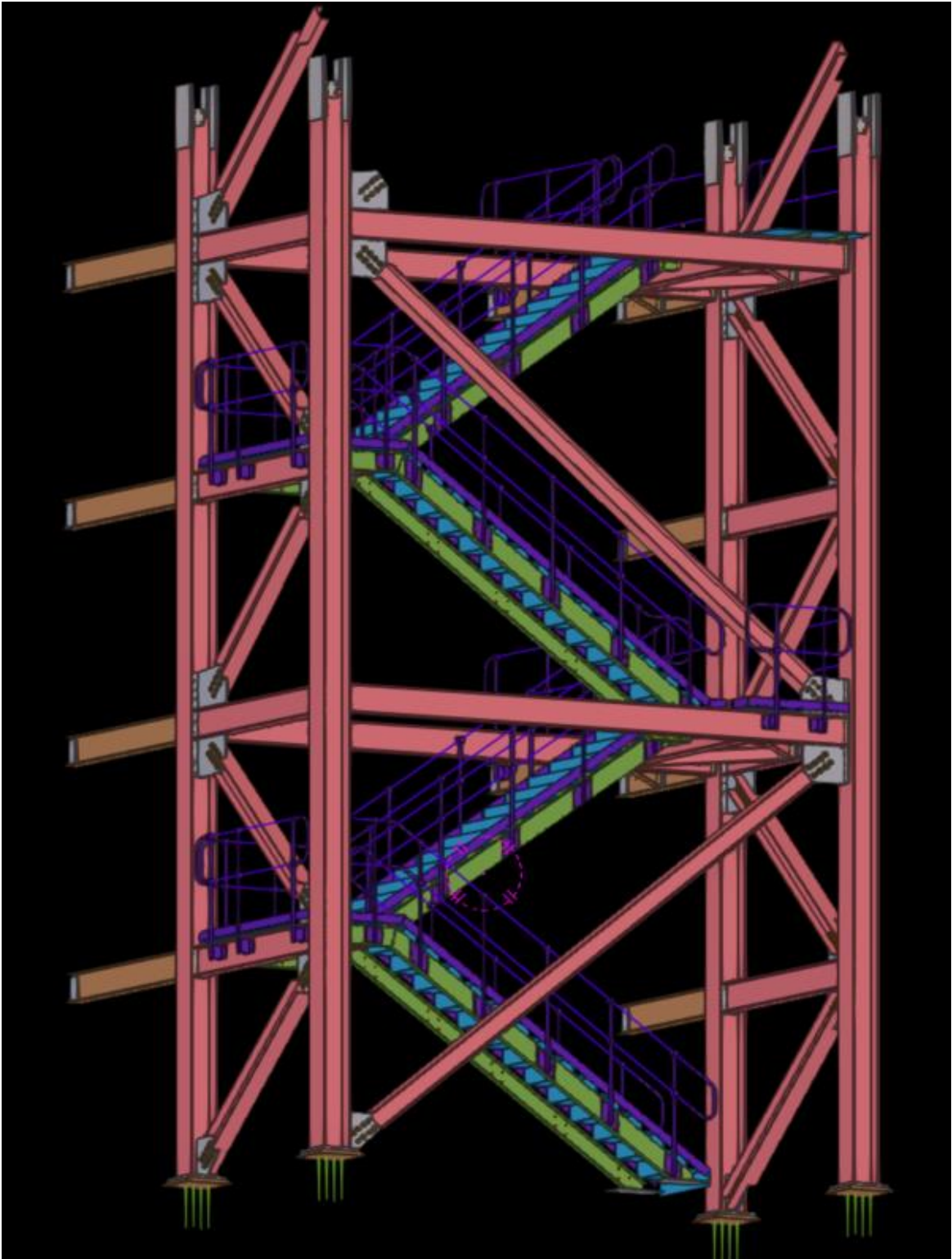
SOME DETAILING INFORMATION



Staircase Bracing Connection



Girder Connection



Staircase Module

FABRICATION

STEELWORK CONTRACTOR: VIVA ENGINEERING



Fabrication

Tonnage:

750T

Number of
assemblies

3 111

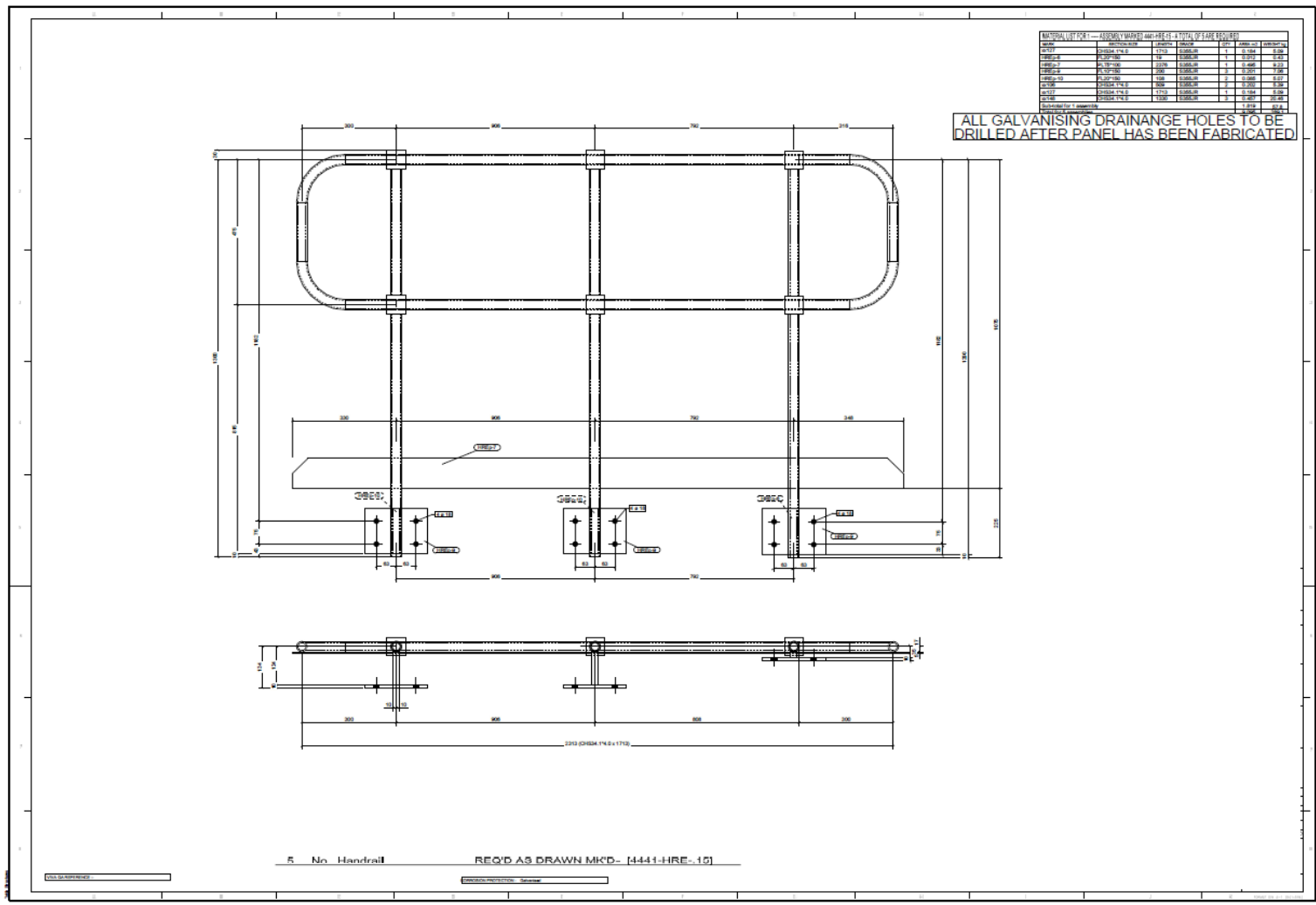
Number of
parts

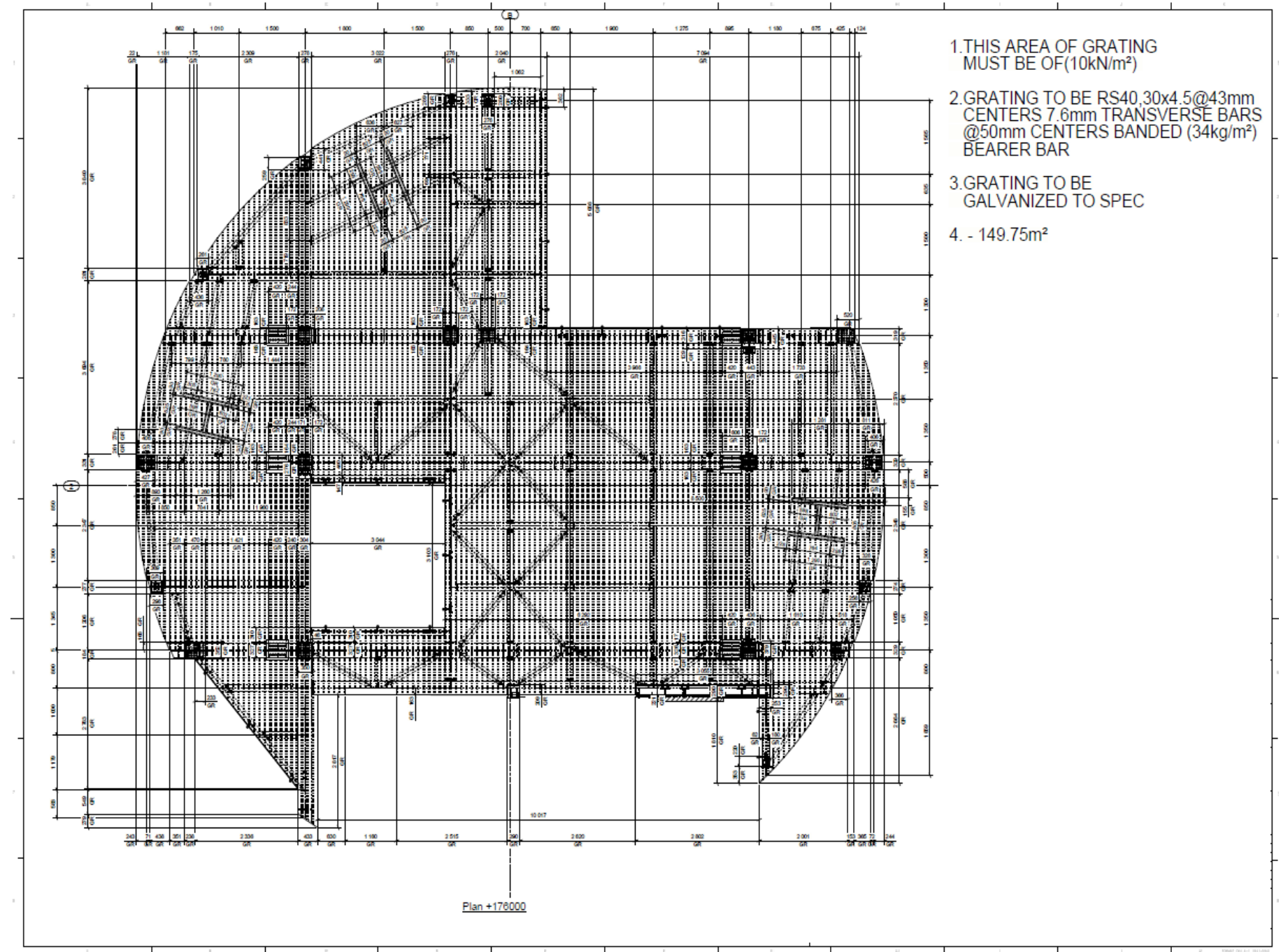
3 560

Fabricated Handrailing

The handrailing system was detailed into manageable panels for safe and speedy site installation

- Stanchions Ø43*4
- Hand & Knee Rail Ø34*4
- Tonnage of handrailing **39.5T**





FLOORING

The flooring was a combination of Vastrap and Open Grid flooring. Open Grid flooring was fitted with a secondary drop protection mesh. The flooring scope totalled 110T.



QUALITY ASSURANCE

Strict Quality Assurance at each stage of fabrication and supply to ensure that the final product delivered was to the highest of specifications



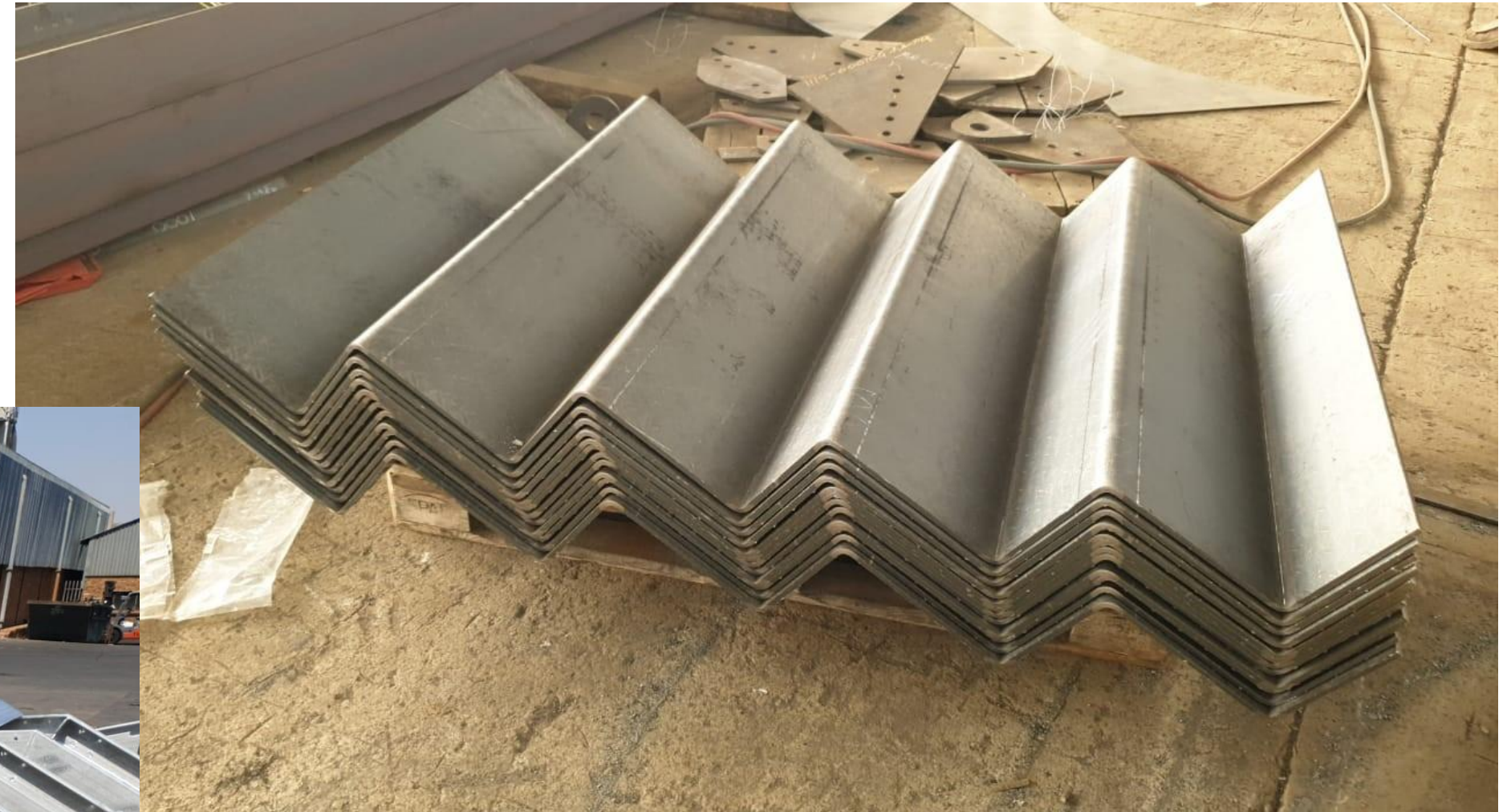
Bolts

Number of bolts

24 009



23 Sep 2022 11:00:31



STAIRCASES

Staircases were detailed as pre-fabricated units to reduce site installation time

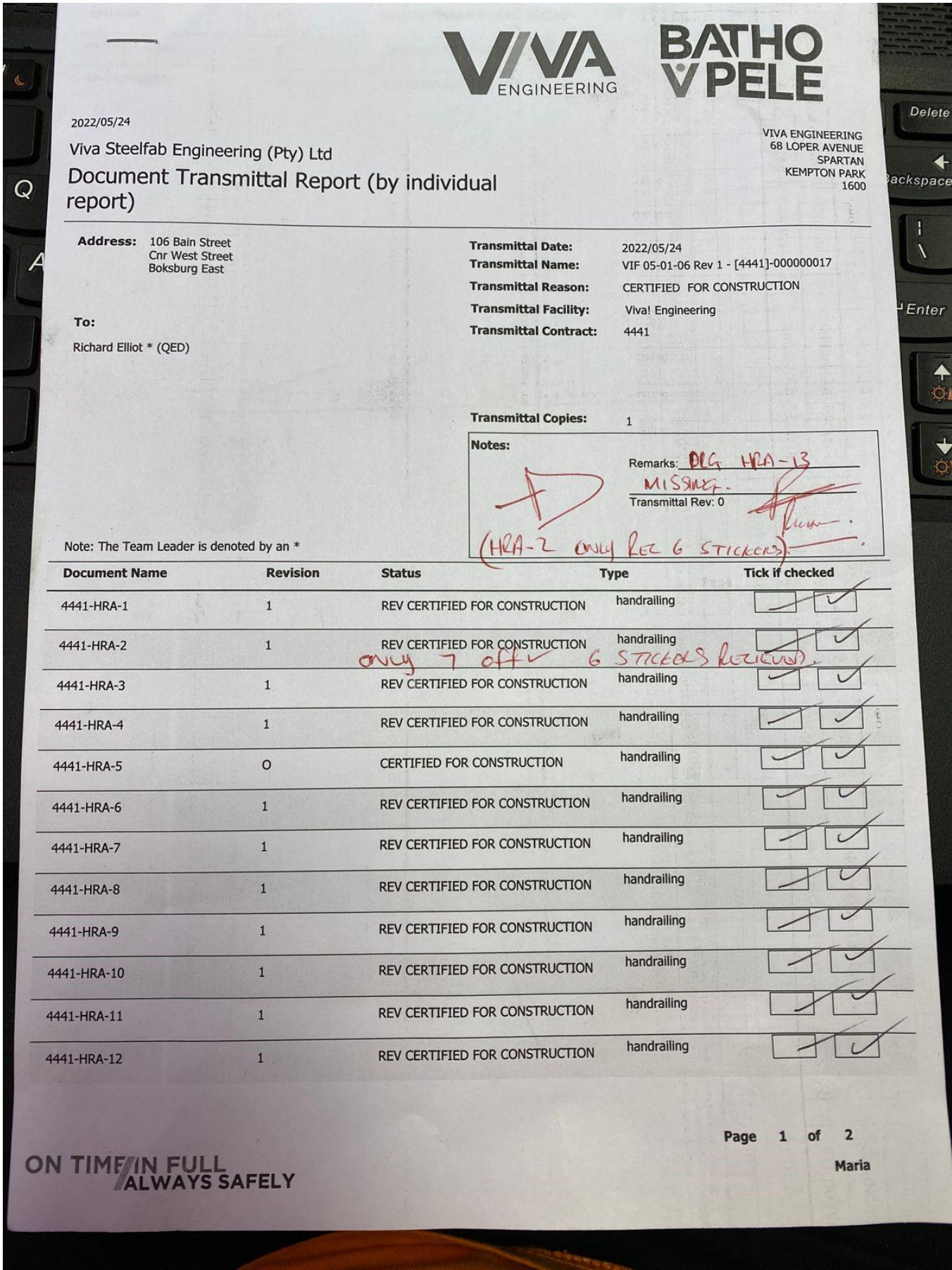
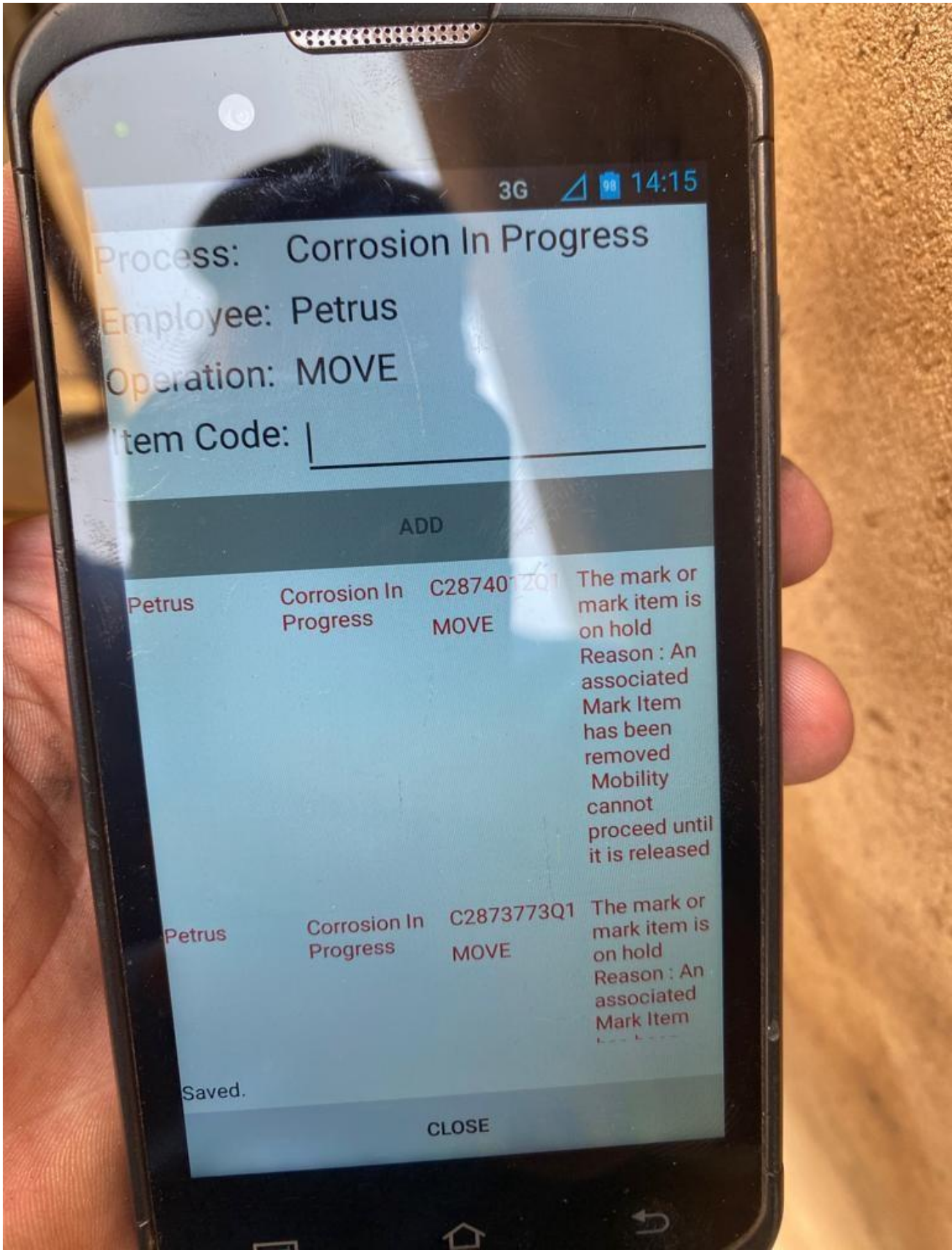


CORROSION PROTECTION

There was a total of 13 567 m² painted by our Corrosion Protection partner Duplex Coatings

CONTROLS

This project was controlled with our barcode scanning system where every item can be traced from CNC through to delivery to site



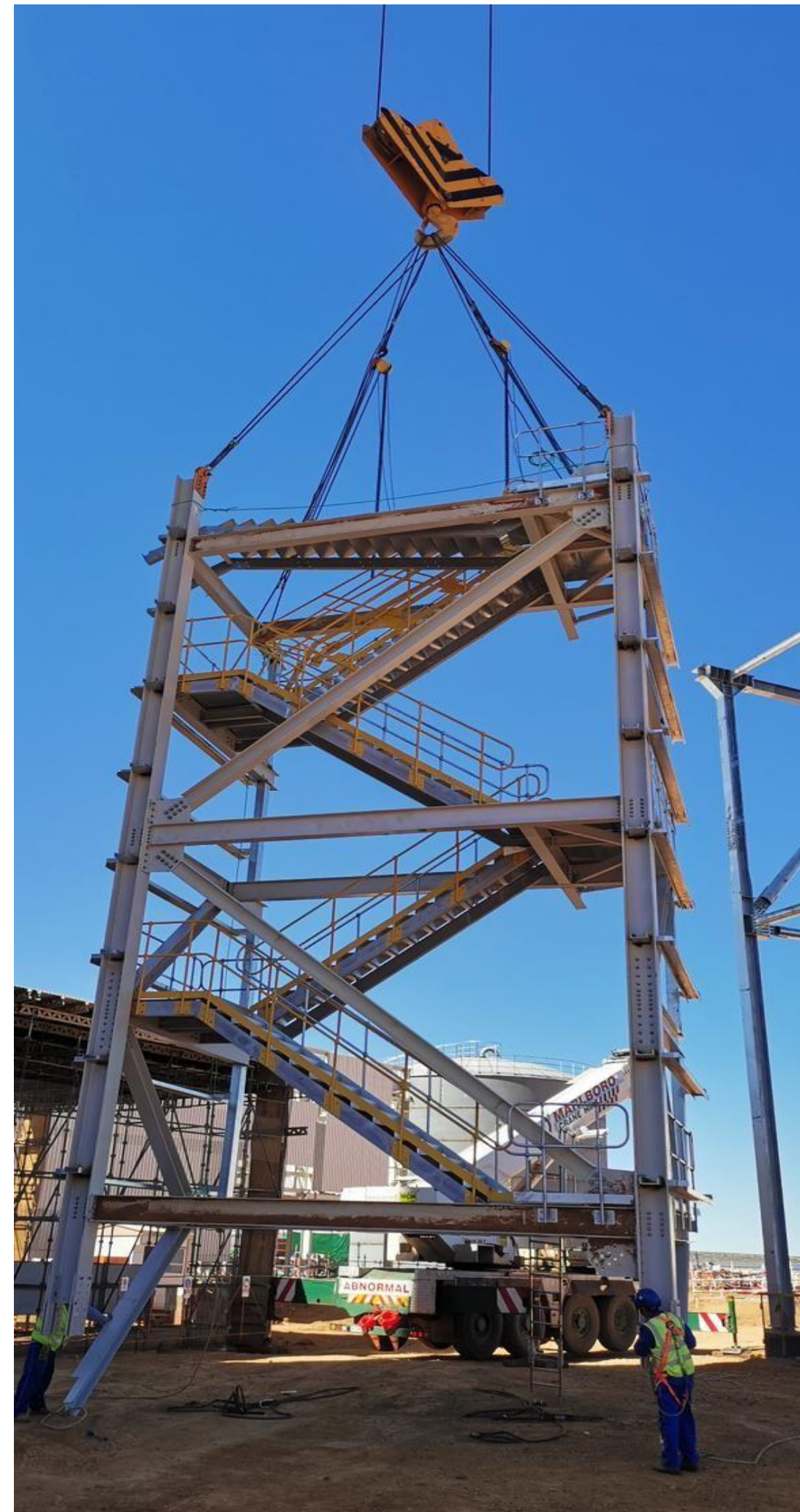


TRANSPORT

There were a total of 38 loads to site

ERECTION / CONSTRUCTION / INSTALLATION

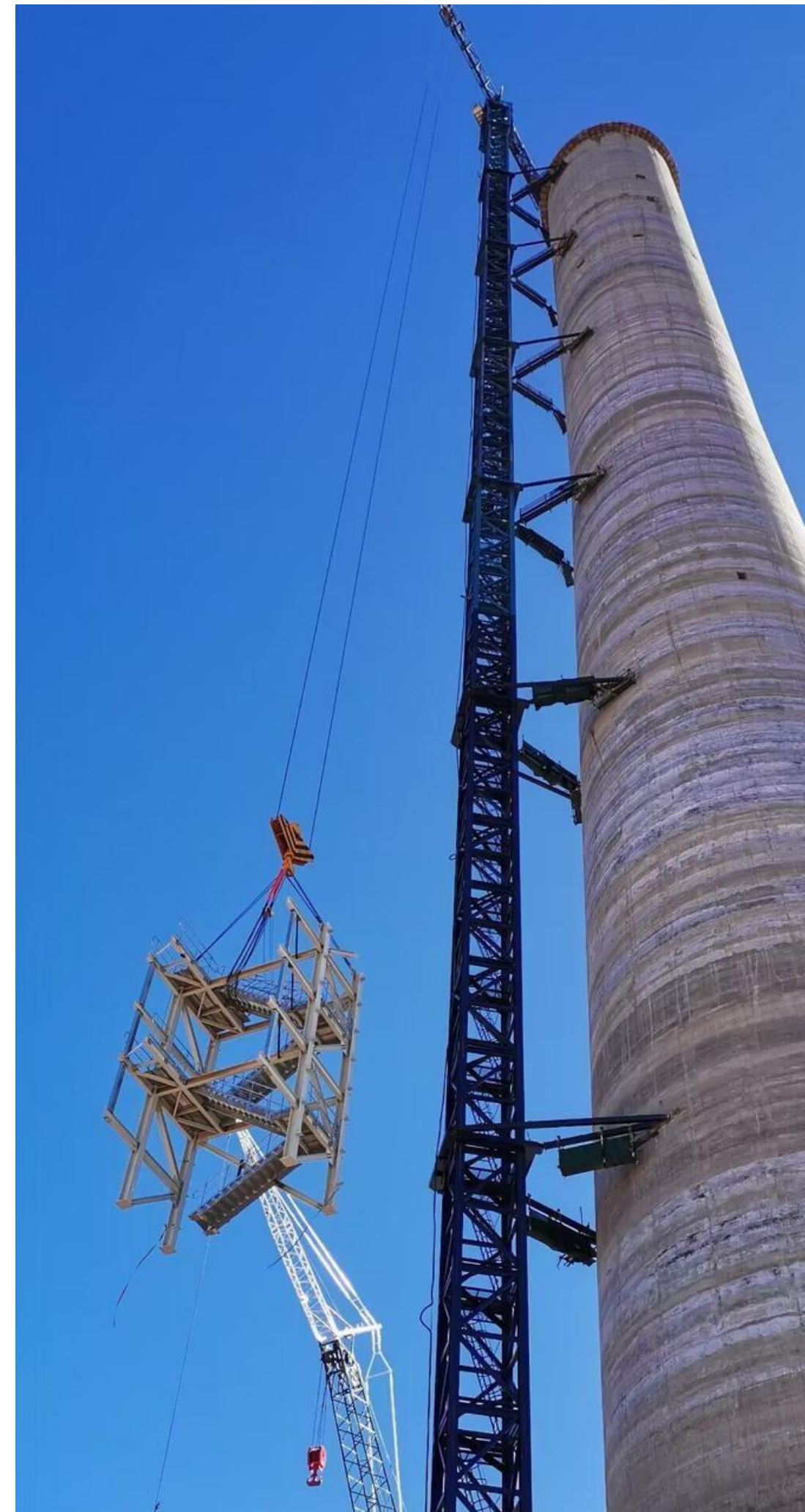
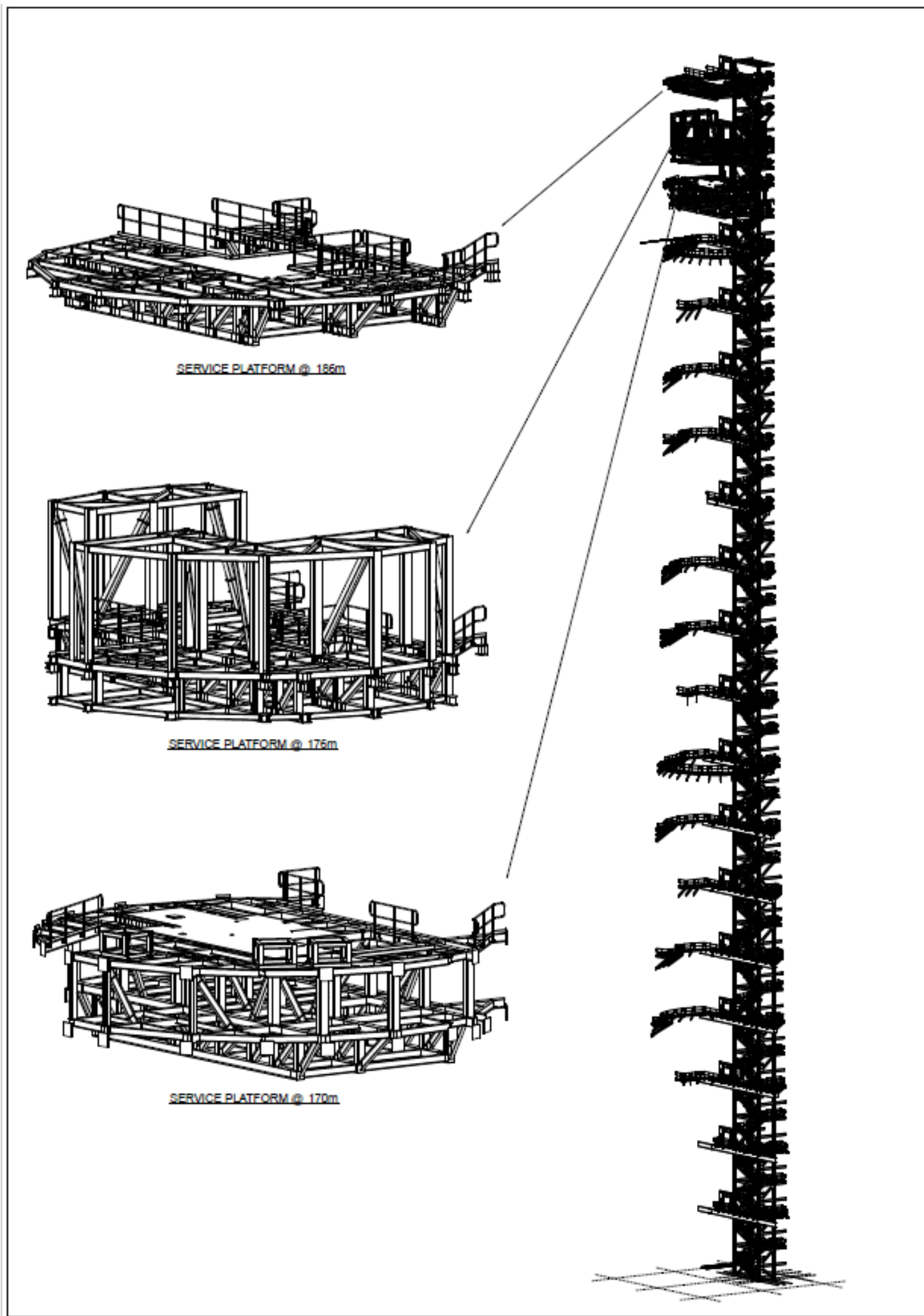
CONTRACTOR: SPECO 3



ASSEMBLEY

Staircase modules were fully assembled in a preassembly yard before being moved to the lifting area

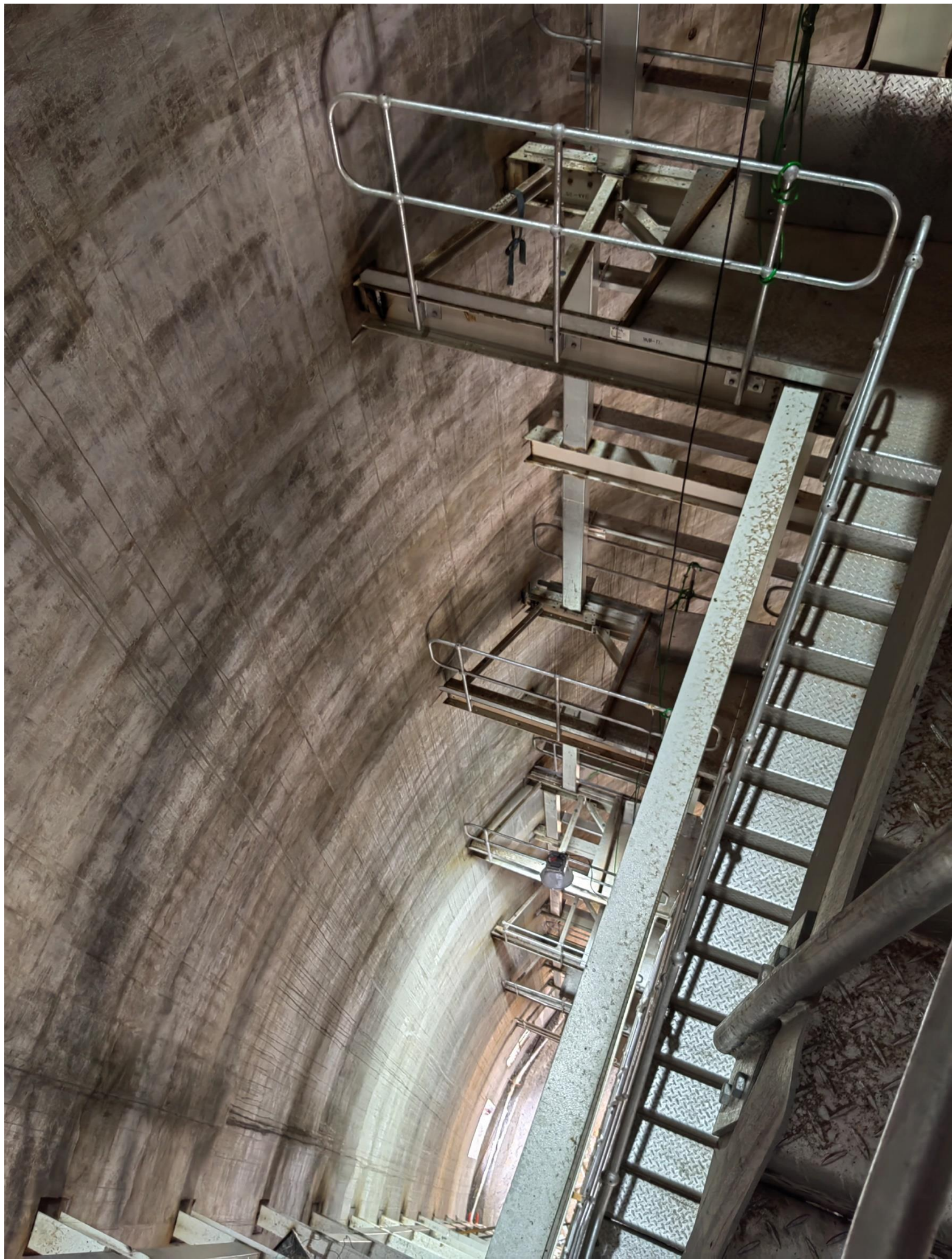
The area around the central tower was extremely congested so no assembly work could be done in this area.



Staircase modules were lifted over the top of the concrete silo before being lowered down the inside onto the awaiting concrete plinths ... and then the awaiting splice connections







CHALLENGES AND SOLUTIONS



Language Barrier

With broken English and non-existent Mandarin, weekly meetings progressed with difficulty. Slowly but surely everyone found the best ways to communicate and sure enough the expectations of the client were met.

Client 24/7 expectations

SEPCO had a number of Engineers assigned to each package. These Engineers would be rotated on a day and night shift as well as RR off time. So at any time Viva Team would be dealing with 3-4 different people on a 24/7 basis.

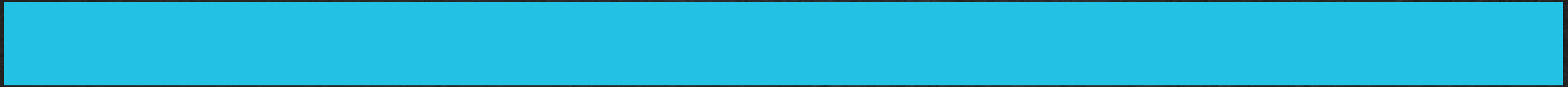
Project Timeframes

From the outset of the project, fabrication timeframes were unrealistically short and this added additional pressure on the Viva teams involved in the project

Viva Engineering – trusted to dizzying heights!!



WHAT WE'RE PROUD OF



We are proud of the quality of workmanship and design of this incredible structure.

With extremely tight project timelines, this project illustrates the substantial benefits of off site fabrication concurrently while a substantial amount of civil work is being completed concurrently.

The excellent working relationship which was developed with the Chinese Contractor SEPCO3.

Whilst the language barrier has been extremely challenging throughout the project, with broken English and non existent Mandarin, weekly meetings progressed and the expectations of the client were met.

(Sometimes it did feel like we were on the construction site of the Tower of Babel!)

Viva Engineering – trusted to dizzying heights!!



THANK YOU

ANY QUESTIONS?

www.vivaeng.co.za