



Tass Engineering (Pty) Ltd

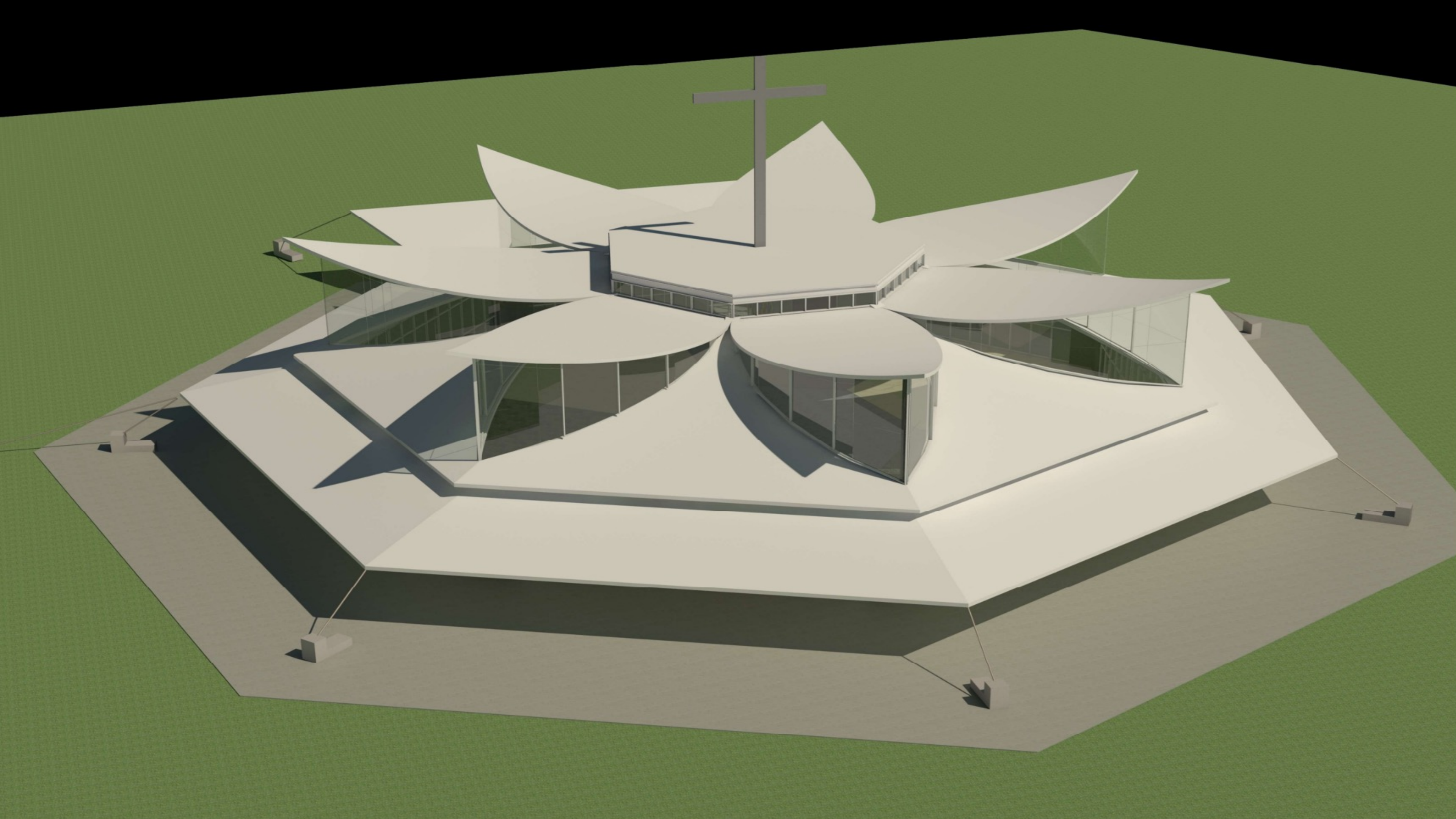
MOTHER OF MERCY SHRINE

THE PROJECT BRIEF

CLIENT: CATHOLIC ARCHDIOCESE OF JOHANNESBURG

ARCHITECTS: PERCEPTION ARCHITECTS (PTY) LTD

MAIN CONTRACTOR: GAUDI CONSTRUCTION (PTY) LTD





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27 June 2024

Overview by Perception Architects re Mother of Mercy Shrine project
 in support of Steel Award presentation by Tass Engineering Pty Ltd

Mother Of Mercy Shrine, Cradle Of Humankind, Kruitfontein

The Shrine of the Mother of Mercy is to be a sacred place for the Catholic Church in South Africa and a place of pilgrimage and meditation for its patrons. The design includes a chapel and multi-purpose hall. It is positioned on a natural, mountainous site in the Magaliesberg which invites a special style of architecture using Biophilic design principles (where nature becomes part of the building) to allow the building to blend in with and respect the surrounding environment.

The concept

The multi-purpose hall design was in truth a heavenly inspiration. However, the challenge and complexity of the design of the building was to achieve a large open interior space housing approximately 1500 people which could embrace the surrounding natural environment.

The spacious open plan interior therefore needed to be column free which necessitated a bold engineering approach.

Perception Architects (Jocelyne and Jason Mazaham) and THS and Associates (Late Keith Trowbridge) Structural and Façade Engineers worked together to create a structure consistent with the design conceptualised by the architects. The roof design is composed of 3 layers:

1. centre roof ;
2. glazing window petals; and
3. the lower roof of the main heptagon structure.

In order that the structure should conform to the column free design conceived by the architects, Keith Trowbridge boldly accepted the daunting engineering challenge of providing a steel roof structure with a massive concrete ring beam along the perimeter of the walls

The architects and the façade engineers worked harmoniously together to achieve the final product.

The number Seven is dominant in the Catholic Liturgy, symbolising the Seven Gifts of the Holy Spirit and the Seven Sorrows and Joys of Mary. This symbolic number is the driving aspect behind the design of the multi-purpose hall with its floor plan, designed in the shape of a heptagon, a seven-sided polygon and roof, creating a flower with seven petals (a Symbol of our Mother Mary). Each of the seven walls has large sliding folding doors with ventilated glass panels above. The roof is made of lightweight material with seven large clerestory windows beneath each leaf and is structured to rest on a large ring beam holding the Seven Petals. The petals are linked to a central smaller heptagon rooftop with additional smaller clerestory windows.

While in the hall one will experience the presence and effect of the Magaliesburg Mountains all around the building from all angles.

Natural light illuminates the building through the glazing on the leaves which is strategically designed such that the light subtly enters the building and creates only minimal areas of harsh direct sunlight.

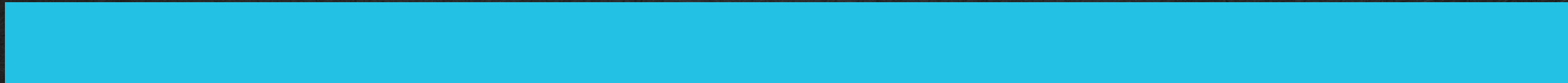
Around the perimeter of the building is a large tensile covered patio with a circular Porte Cohere at the entrance

The Mother of Mercy Shrine is a beautiful tribute to Our Lady and it is most admirable that the Catholic Diocese, under the inspirational leadership of His Grace, Archbishop Buti Tlhagale .O.M.I, had the vision and courage to undertake such a noble project which embodies and reflects the proud and time honoured characteristics of the Catholic Church and its people.

Perception Architects [Jocelyne and Jason Mazaham PR- Arch (MIA)



THE PROJECT OVERVIEW



PROJECT OVERVIEW

STRUCTURAL STEELWORK

Project Completed: June 2024

Steelwork Completed: July 2023

Tonnage: 72.8 tons

Profiles used: UB, UC, CHANNELS, ANGLES,
CHS, RHS & PLATE



PROJECT OVERVIEW

STRUCTURAL STEELWORK

Structural Engineer: THS CONSULTING ENGINEERS (PTY) LTD

BSM BAKER CONSULTING ENGINEERS (PTY) LTD

Steelwork Contractor: TASS ENGINEERING (PTY) LTD

Steel Detailer: 3D CON STEEL DETAILING (PTY) LTD

Steel Merchant/s: BSI STEEL (PTY) LTD, TUBECON (PTY) LTD

CLOTAN STEEL (PTY) LTD, STEEL BANK (PTY) LTD

ALLIED STEELRODE (PTY) LTD

GK STEEL (PTY) LTD, MACSTEEL TUBING (PTY) LTD

STEWARTS & LLOYDS (PTY) LTD



PROLOK 700

PROJECT OVERVIEW

METAL CLADDING AND ROOFING

Project Completed: JUNE 2024

Cladding Completed: JUNE 2024

Cladding Material Used: 0,50 ARCELORMITTAL CHROMADEK FISH EAGLE
WHITE

Cladding Profile: PROLOK 700=1246,81m² + ULTRALOK=871,38m²

Cladding Area Coverage: 2118,19m² (ROOFING SQUARES)

Cladding Tonnage: 11,249tONS



PROLOK 700



STRUCTURAL FRAMING

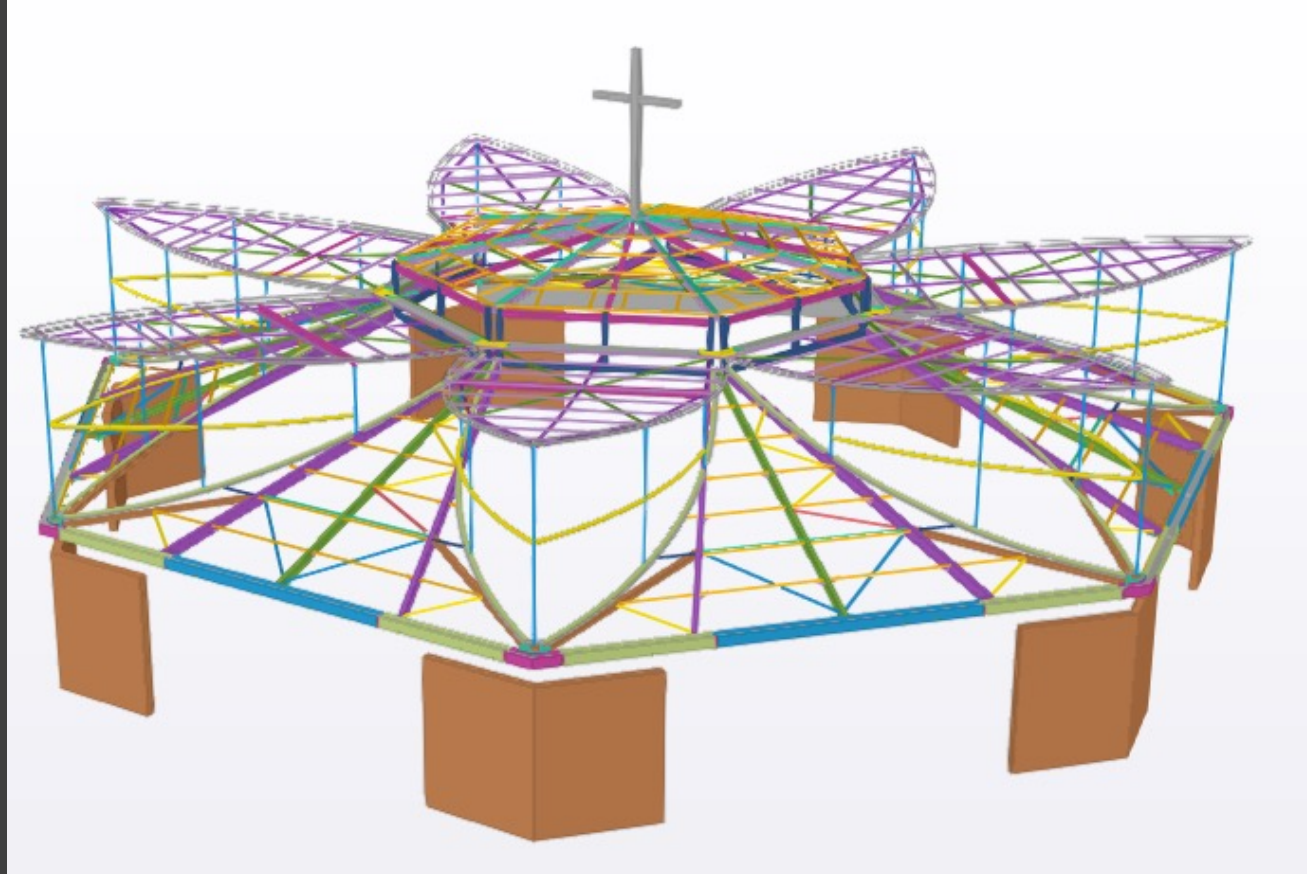
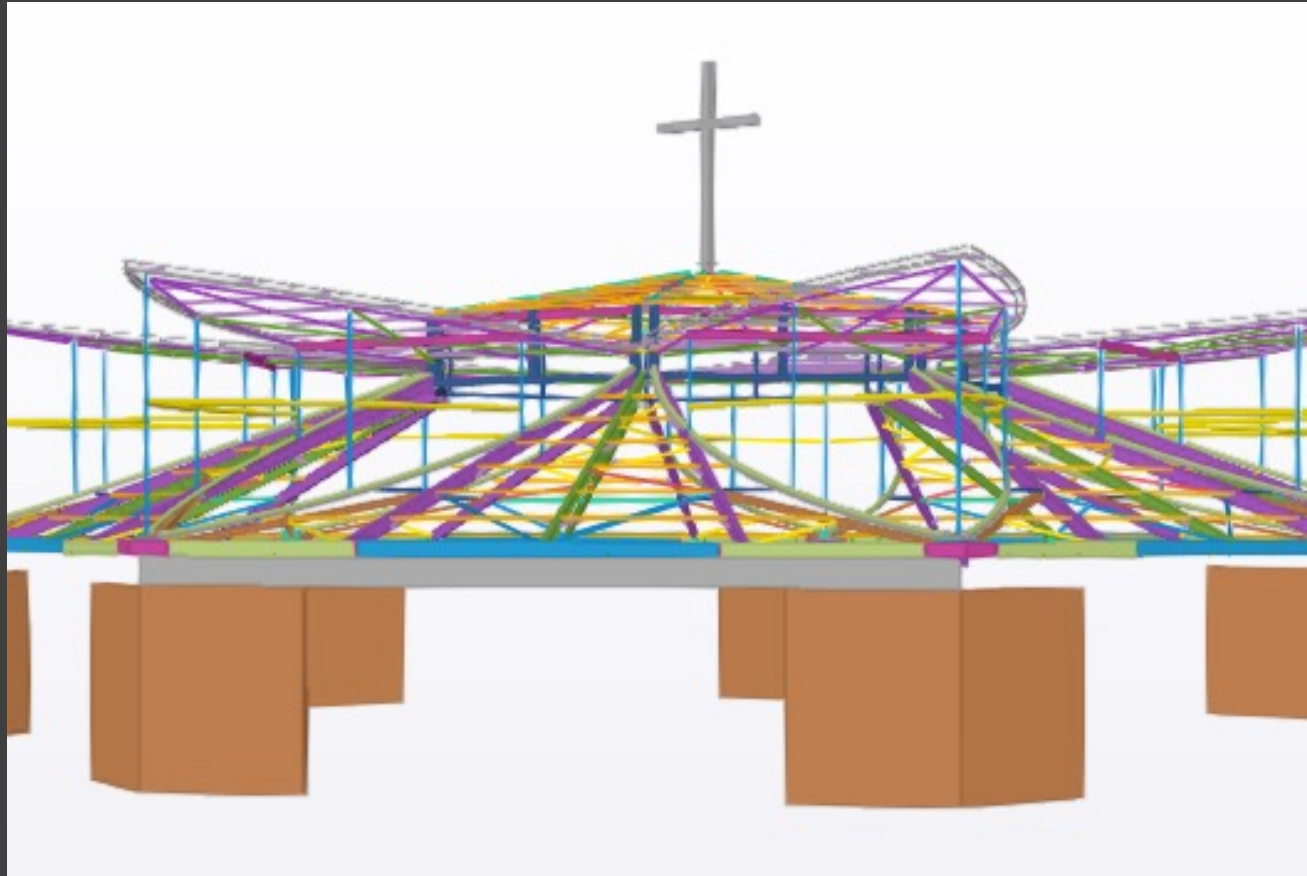
1st STRUCTURAL ENGINEER: THS & Associates (Pty) Ltd

The Late Keith Trowbridge as the structural steel roof façade designer.

2nd STRUCTURAL ENGINEER: BSM Baker Consulting Engineers(Pty) Ltd - Geoff Baker

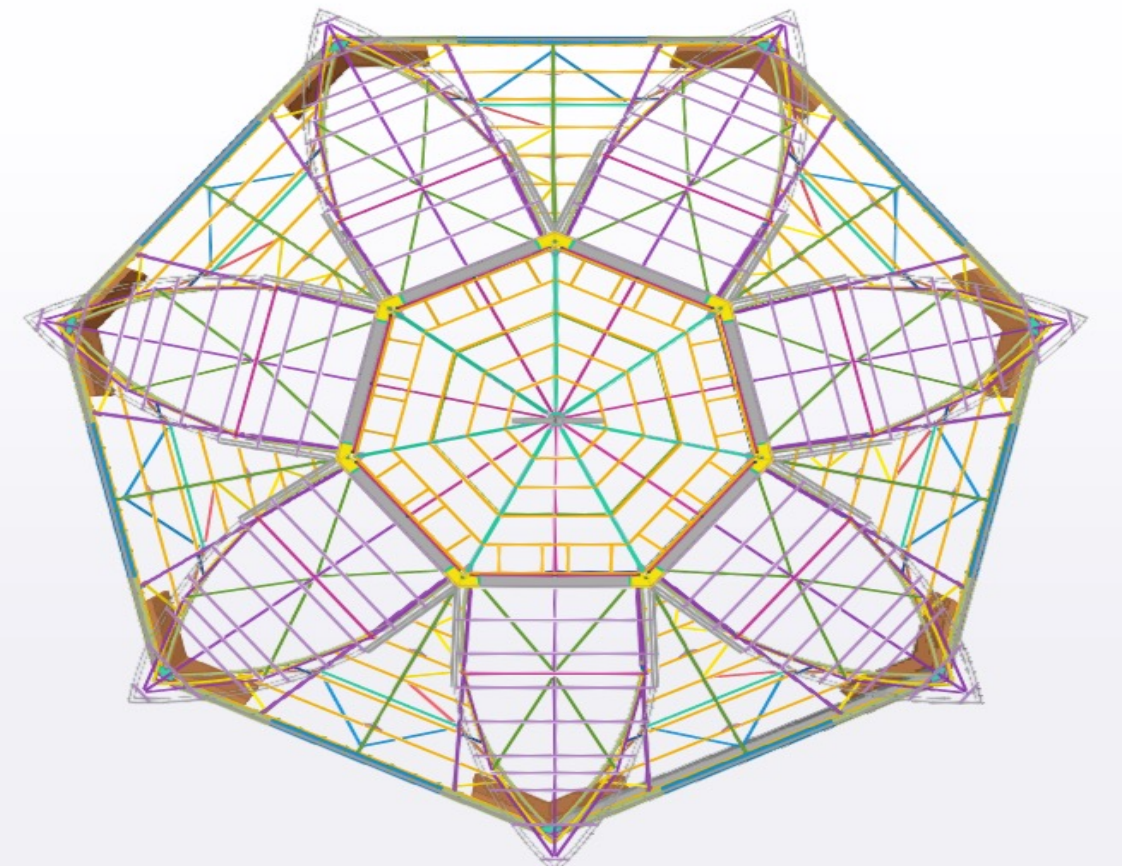
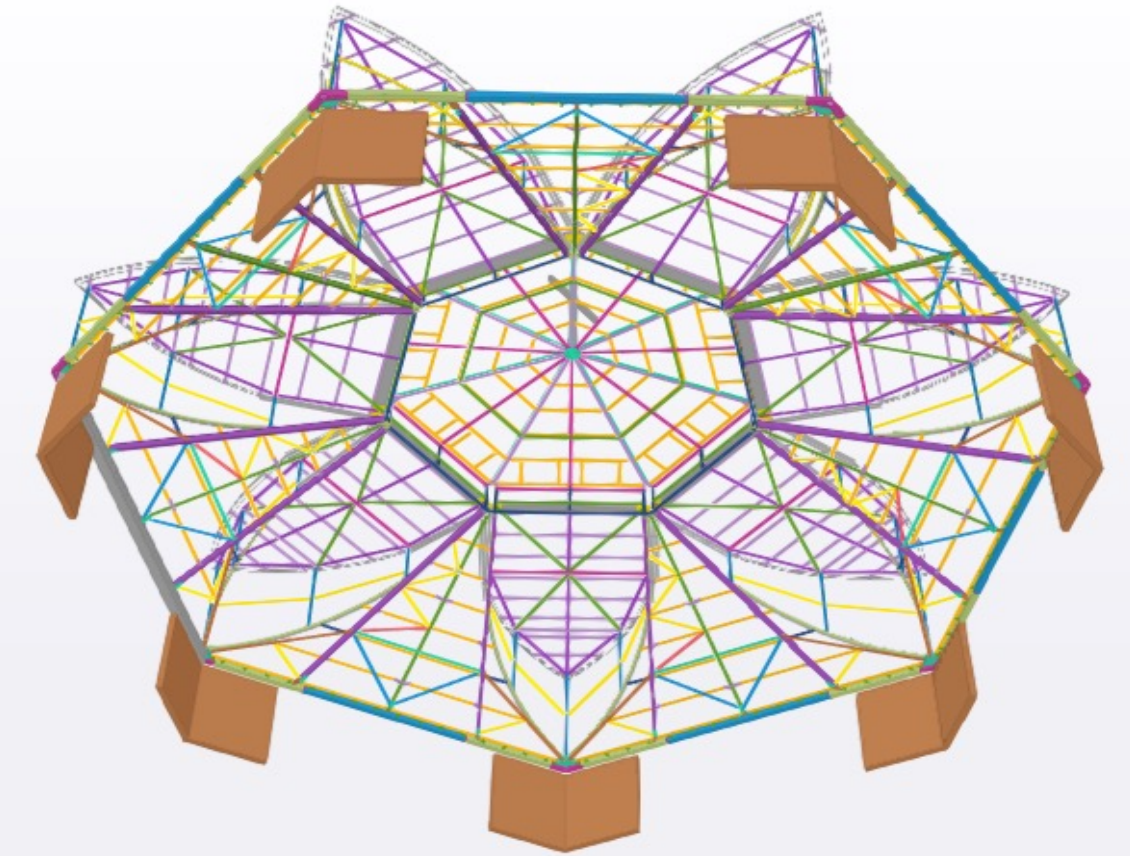
STEELWORK CONTRACTOR: Tass Engineering (Pty) Ltd

STEEL DETAILER: 3D Con Steel Detailing (Pty) Ltd

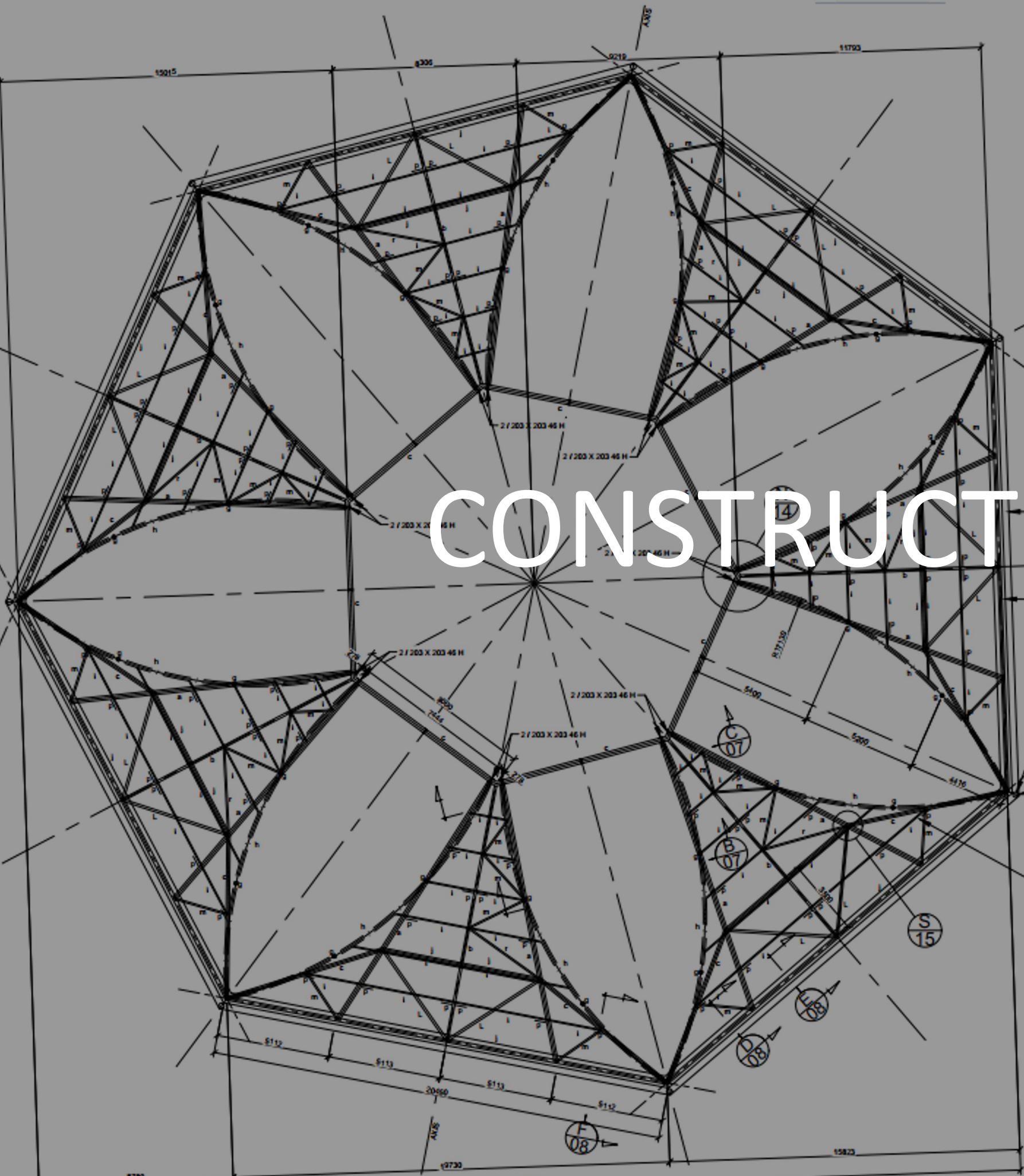


DESIGN HIGHLIGHTS

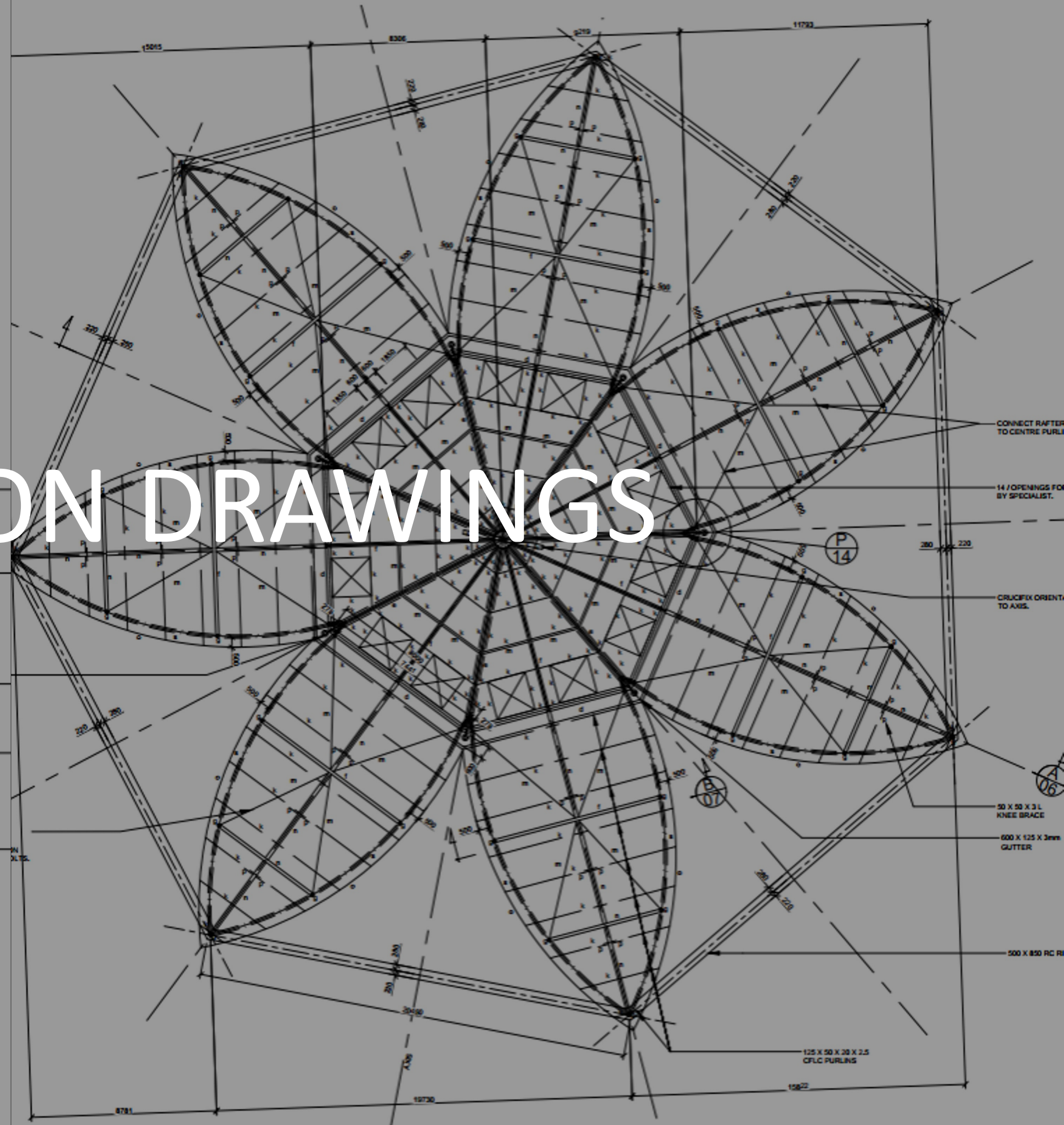
- **Unprecedented Spans:** The structure achieves a remarkable 44-meter span with no internal supports, a testament to the innovative use of steel and exceptional engineering expertise.
- **Dynamic Roof Design:** The multi-stepped roof adds a captivating visual element while also offering a practical solution.
- **Open to the Elements:** The design bravely embraces the wind load, creating a sense of openness and connection with the surrounding mountains.
- **Luminous Ambiance:** The uplighting on all seven sides of the structure not only illuminates the building but also highlights its unique geometry, creating a truly breathtaking spectacle.



CONSTRUCTION DRAWINGS



LOWER ROOF STRUCTURE LAYOUT
SCALE 1:100

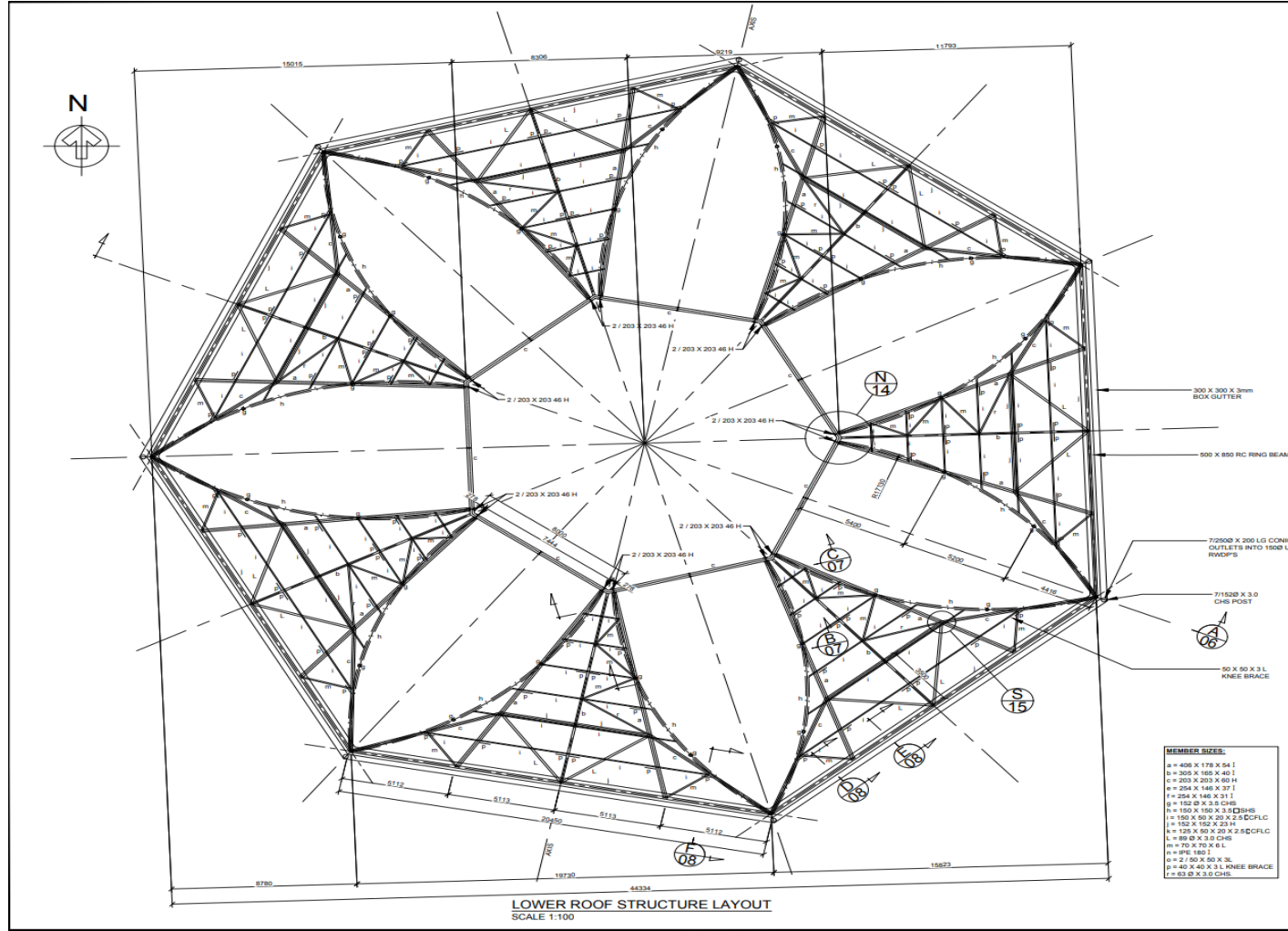


UPPER ROOF
STRUCTURE LAYOUT
SCALE 1:100

CONNECT RAFTER TO CENTRE PURLIN
14 / OPENINGS FOR BY SPECIALIST.
CRUCIFIX ORIENT TO AXIS.
50 X 50 X 3 L KNEE BRACE
600 X 125 X 3mm GUTTER
500 X 850 RC RL

SITE PROGRESS





STRUCTURAL STEELWORK NOTES

- 1) ALL STEELWORK TO COMPLY WITH SABS 1200 H WITH A DEGREE OF ACCURACY = II
- 2) STEEL TO BE GRADE S355JR IN ACCORDANCE WITH EN 10025-2.
- 3) NO FABRICATION IS TO COMMENCE PRIOR TO THE APPROVAL OF WORKSHOP DETAIL DRAWINGS BY THE ENGINEER.
- 4) ALL STEEL PRIMED WITH ZINC PHOSPHATE PRIMER. FINAL COATING TO ARCHITECT'S SPECIFICATION.
- 5) ALL WELDS TO BE 6mm CONTINUOUS FILLET UNLESS OTHERWISE INDICATED.
- 6) ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE PRIOR TO MANUFACTURE OF STRUCTURAL STEELWORK.
- 7) ADEQUATE TEMPORARY BRACING MUST BE PROVIDED TO STRUCTURAL STEELWORK DURING CONSTRUCTION
- 8) ALL BOLTED CONNECTIONS TO BE WITH MINIMUM M16 GRADE 4.8 UNLESS OTHERWISE SHOWN.
- 9) DETAIL AND SECTION LEDGEND:

DETAIL / SECTION NUMBER
DRAWING REFERENCE NUMBER

MEMBER SIZES

A	= 406 X 178 X 54 I
B	= 305 X 165 X 40 I
C	= 203 X 203 X 68 H
D	= 254 X 146 X 37 I
E	= 254 X 146 X 37 I
F	= 102 X 3.0 CHS
G	= 102 X 3.0 CHS
H	= 102 X 3.0 CHS
I	= 102 X 3.0 CHS
J	= 102 X 3.0 CHS
K	= 102 X 3.0 CHS
L	= 89 Ø X 3.0 CHS
M	= 76 Ø X 3.0 CHS
N	= 76 Ø X 3.0 CHS
O	= 76 Ø X 3.0 CHS
P	= 40 X 50 X 3 L KNEE BRACE
Q	= 50 X 50 X 3 L KNEE BRACE
R	= 50 X 50 X 3 L KNEE BRACE
S	= 50 X 50 X 3 L KNEE BRACE
T	= 50 X 50 X 3 L KNEE BRACE
U	= 50 X 50 X 3 L KNEE BRACE
V	= 50 X 50 X 3 L KNEE BRACE
W	= 50 X 50 X 3 L KNEE BRACE
X	= 50 X 50 X 3 L KNEE BRACE
Y	= 50 X 50 X 3 L KNEE BRACE
Z	= 50 X 50 X 3 L KNEE BRACE

1	STEEL MEMBERS REVISED	B.D	21/09/2021
2	ISSUED FOR CONSTRUCTION	B.D	03/08/2021
3	ISSUED FOR APPROVAL	B.D	01/09/2017
NO	AMENDMENTS	NAME	DATE

PROJECT: **MOTHER OF MERCY SHRINE, MAGALIESBURG.**

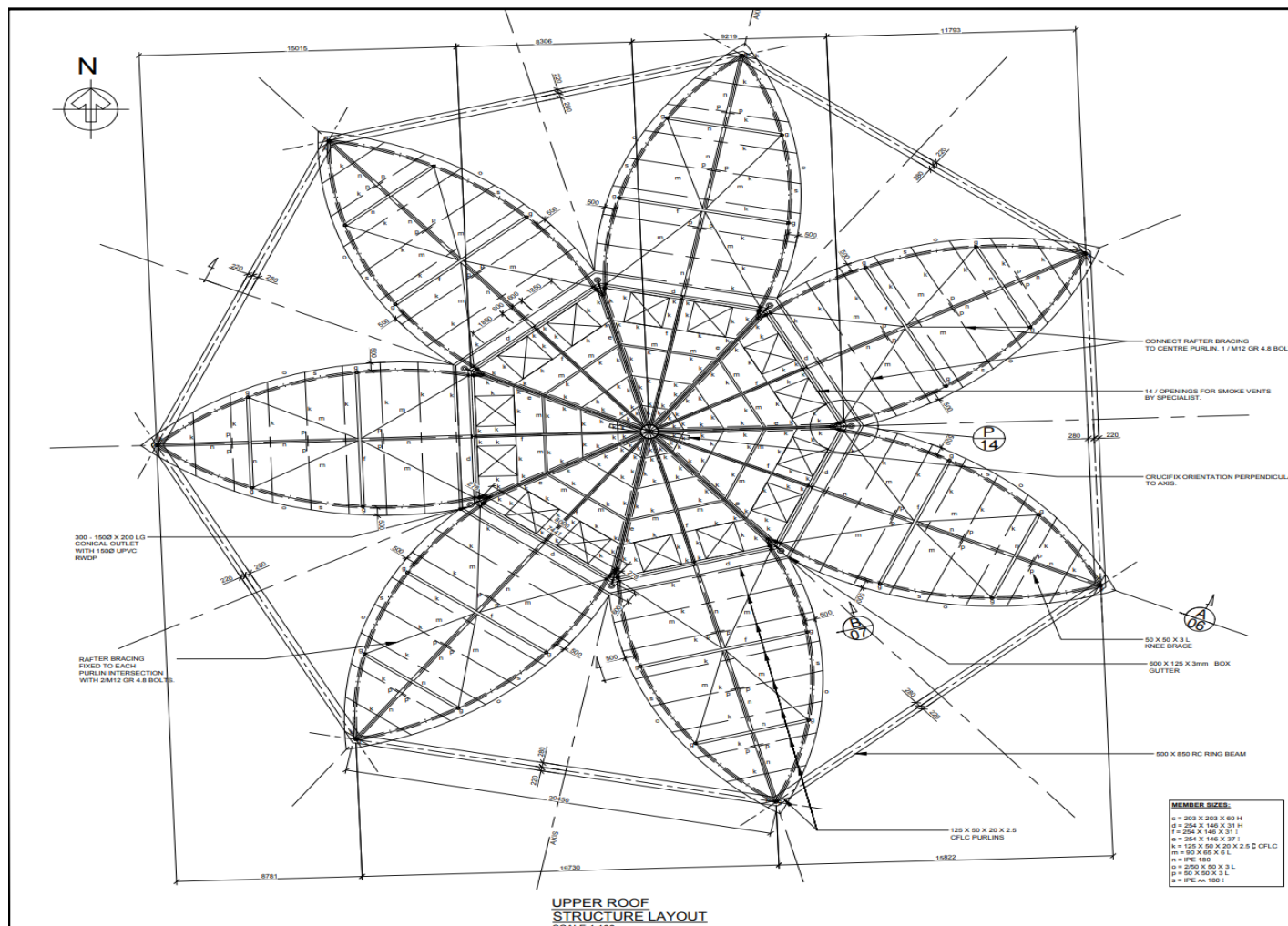
DRAWING TITLE: **MULTI - PURPOSE HALL, PLAN VIEW - LOWER ROOF STRUCTURE**

CLIENT: **CATHOLIC ARCH DIOCESE OF JOHANNESBURG PROPERTY.**

ARCHITECT: **PERCEPTION ARCHITECTS**

THS & Associates UNIT 4, GROUND FLOOR, THE WORKSHOP 70, SEVENTH AVE., PARKTOWN NORTH
PO BOX 52788, SANDHURST, 2153
TEL: 086 1 000 735 (847) FAX: 086 553 4455
E-MAIL: ADMIN@TRDWBIDGE.CO.ZA

SCALE	DESIGNED	K.T.	PROJECT NO.	T4586
AS SHOWN	DRAWN	B.D	DWG. NO.	04
AT A1	CHECKED		REVISION	1
DATE	TRACED			
01/09/17	CHECKED			



STRUCTURAL STEELWORK NOTES

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DETAIL / SECTION NUMBER
DRAWING REFERENCE NUMBER

MEMBER SIZES

A	= 203 X 203 X 68 H
B	= 254 X 146 X 37 I
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E	= 125 X 50 X 20 X 2.5 C/P L
F	= 102 X 3.0 CHS
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X	= 50 X 50 X 3 L KNEE BRACE
Y	= 50 X 50 X 3 L KNEE BRACE
Z	= 50 X 50 X 3 L KNEE BRACE

1	STEEL MEMBERS REVISED	B.D	21/09/2021
2	ISSUED FOR CONSTRUCTION	B.D	03/08/2021
3	ISSUED FOR APPROVAL	B.D	04/09/2017
NO	AMENDMENTS	NAME	DATE

PROJECT: **MOTHER OF MERCY SHRINE, MAGALIESBURG.**

DRAWING TITLE: **MULTI - PURPOSE HALL, PLAN VIEW - UPPER ROOF STRUCTURE**

CLIENT: **CATHOLIC ARCH DIOCESE OF JOHANNESBURG PROPERTY.**

ARCHITECT: **PERCEPTION ARCHITECTS**

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SCALE	DESIGNED	K.T.	PROJECT NO.	T4586
AS SHOWN	DRAWN	B.D	DWG. NO.	05
AT A1	CHECKED		REVISION	1
DATE	TRACED			
04/09/17	CHECKED			









METAL CLADDING/ ROOFING

CLADDING MANUFACTURER: ARCELORMITTAL CHROMADEK

CLADDING ROLL FORMER / PROFILER: PRO ROOF PRETORIA

CLADDING/ ROOFING SUPPLIER: PRO ROOF PRETORIA

CLADDING/ ROOFING CONTRACTOR: PA STEEL STRUCTURES













FABRICATION

STEELWORK CONTRACTOR: Tass Engineering (Pty) Ltd











ERECTION / CONSTRUCTION / INSTALLATION

CONTRACTOR: Gauteng Structural Erection



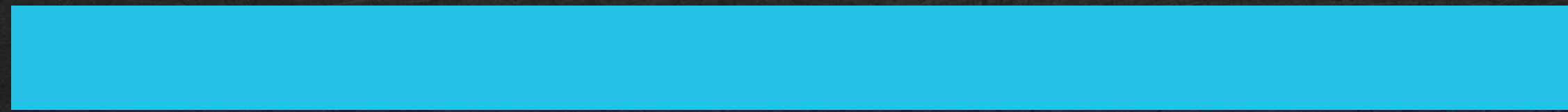






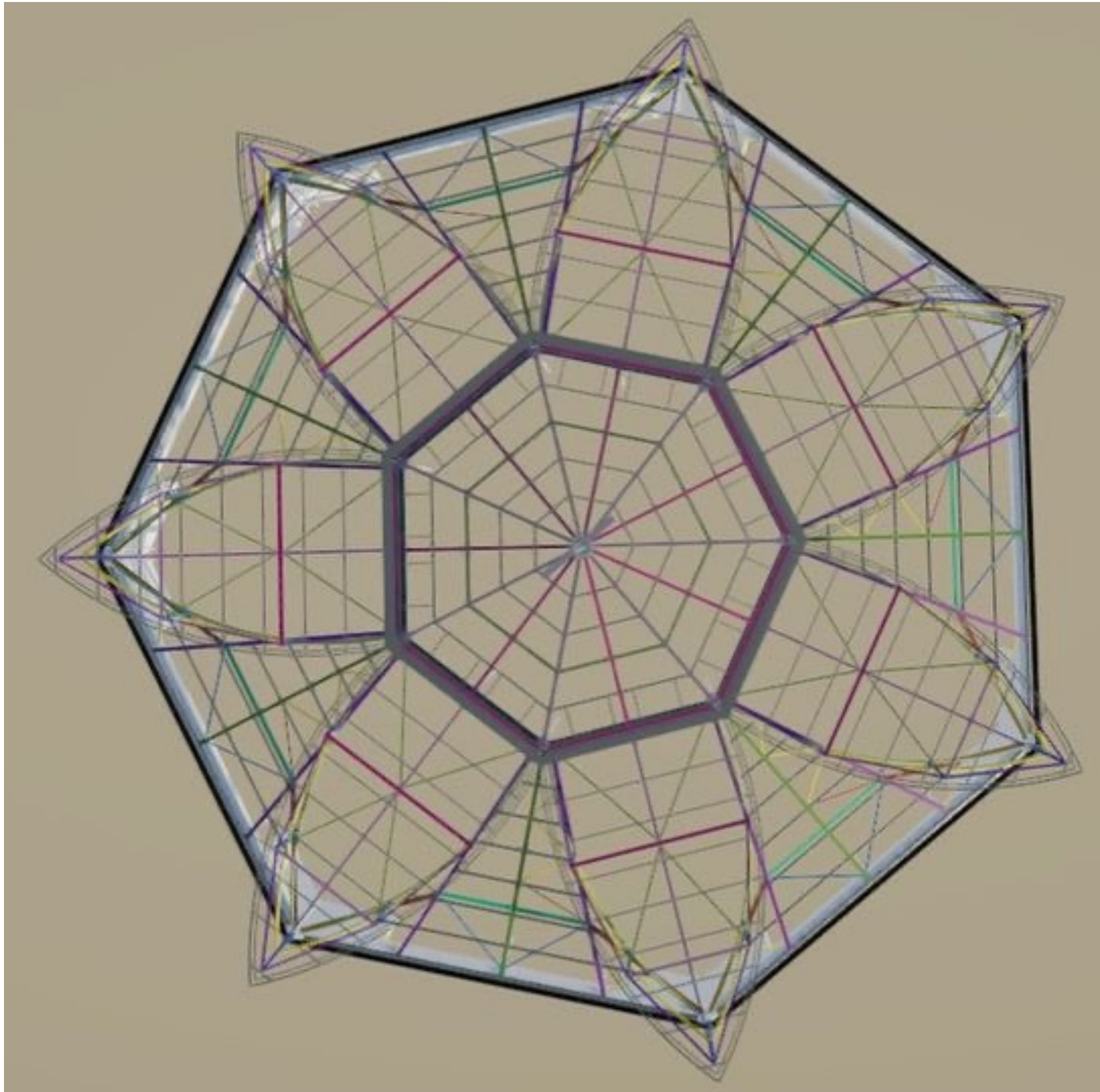


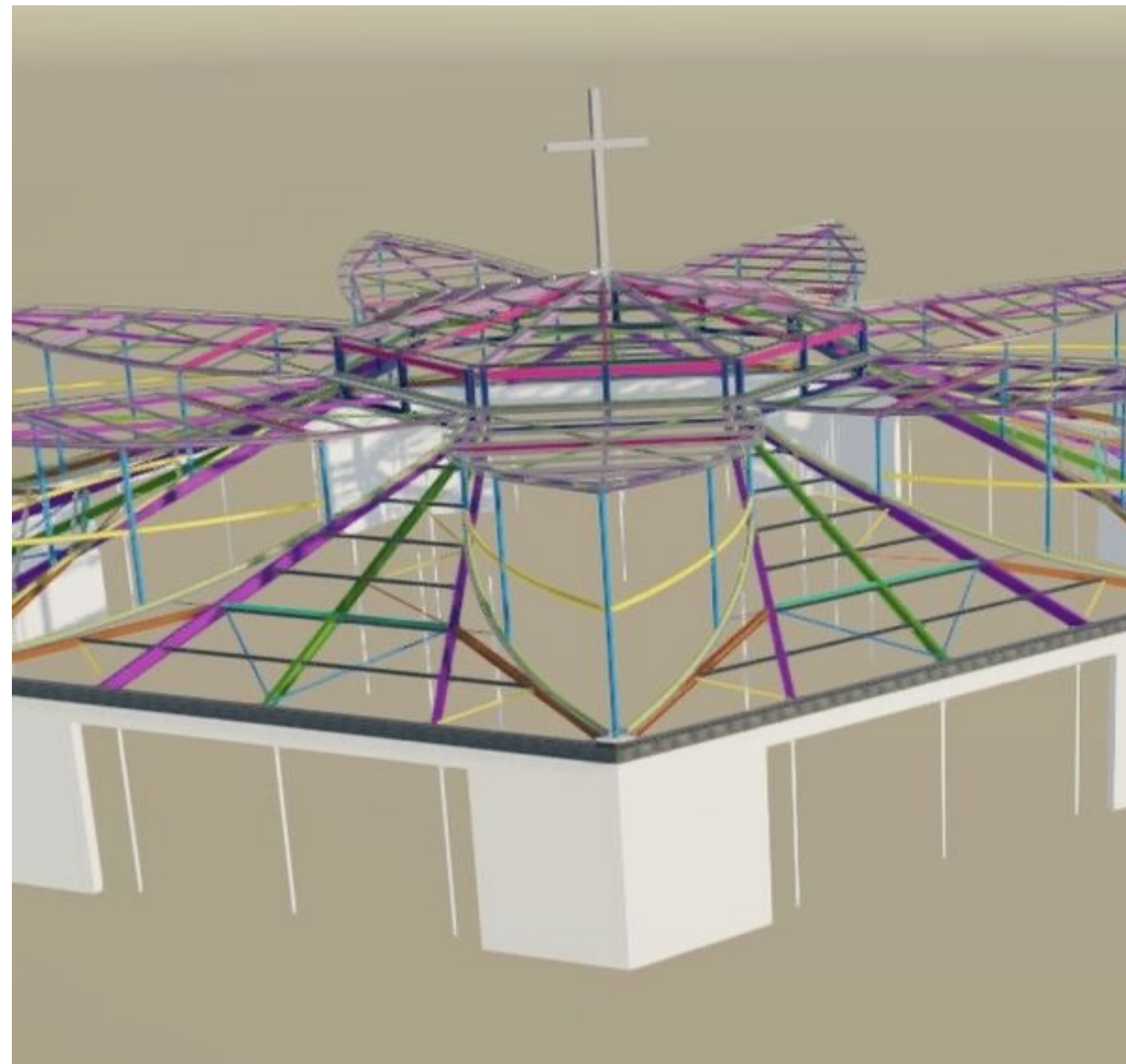
CHALLENGES AND SOLUTIONS



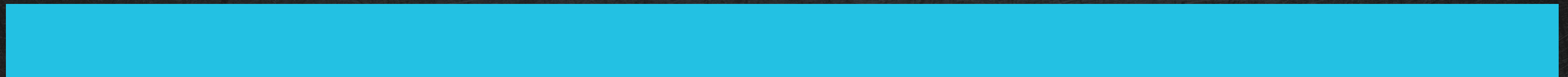
The structure presented a small challenge in terms of getting the spiral members to maintain a vertical plane for the façade. With the use of Tekla Structures and Trimble connect it allowed for an easier understanding of the complexity of the structure.

The connections of all the interconnecting members were “workshopped” with THS & Associates and 3D Con Detailing which resulted in details which were practical and efficient.





THE BENEFITS OF STEEL IN THIS APPLICATION



Benefits of Steel Usage:

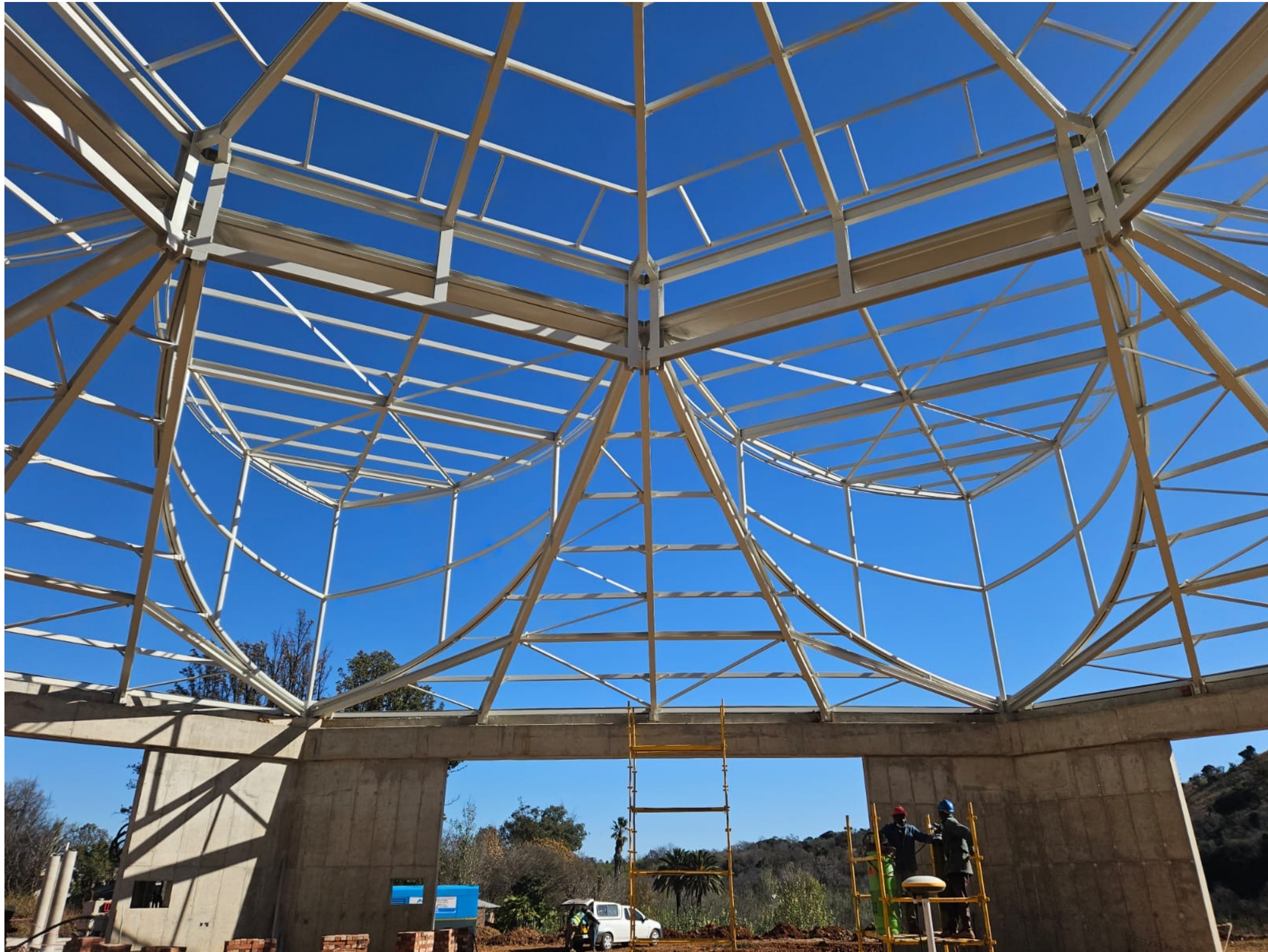
- **Structural Integrity:** Steel offers exceptional strength and load bearing capacity, allowing for creative and daring architecture.
- **Durability:** Steel is resistant to corrosion, weathering and pests, ensuring the buildings longevity and reduced maintenance costs.
- **Flexibility:** Steel's malleability facilitates intricate designs, enabling architects to experiment with complex shapes and forms.
- **Sustainability:** Steel is recyclable, promoting eco-friendly construction practices and reducing the building's environmental footprint.
- **Fast Construction:** Prefabricated steel components speed up the construction process, minimizing project timelines.
- **Fire Resistance:** Steel's non-combustible properties enhance the building's safety and compliance with fire codes.



WHAT WE'RE PROUD OF



- Aesthetics: Incorporation of the steel elements into the style and aesthetics.
- The Team: The team and all people involved to bring the vision to life.





We take great pride in Mother of Mercy Church, a testament to cutting edge engineering and design. The use of steel as the primary building material has not only ensured exceptional durability and structural integrity but has also granted us freedom to create expansive volumes within this building.

The versatility of steel allowed us to design soaring ceilings that foster a sense of grandeur. This achievement stands as a celebration of human ingenuity and showcases the remarkable possibilities that arise when technology and creativity converge in the realm of construction.