Steel *the* Show

In the year of our establishment - 2006, we were commissioned to provide Structural Engineering consultancy services for what will be our then flagship project, the ***Leadway Assurance Headquarters***, Iganmu (read more- www.bomasso.com/projects/commercial).

14 years post occupancy, the client's desire to make use of over 250 sqm on the 2nd floor terrace for all year-round events prompted our being a part of the project once more.

The Challenge: Conceptualize a ***Sturdy***, ***Ridiculously Cheap*** yet ***Eye-Catching*** canopy with danpalon covering.

The peculiarity of the project site, i.e. actively used office spaces, likewise dictated that the canopy components be very light to promote easy and quick installation

We responded having in mind a not so famous quote by William F. Baker (Lead Structural Engineer of the Burj Khalifa)- "An Engineer should design a structure in a way that an architect would be ashamed to cover up" i.e. take it away and "***Steel" the Show***.

Concept

A simple topology of Structural Steel *Warren trusses* with each Warren truss supported by 2 stanchions (firmly anchored into the existing concrete elements) and well interlaced with other roof members.

Figure 1 shows the interlace of members- Stanchions, trusses, fly braces, diagonal braces, purlins, turnbuckles and eave ties.

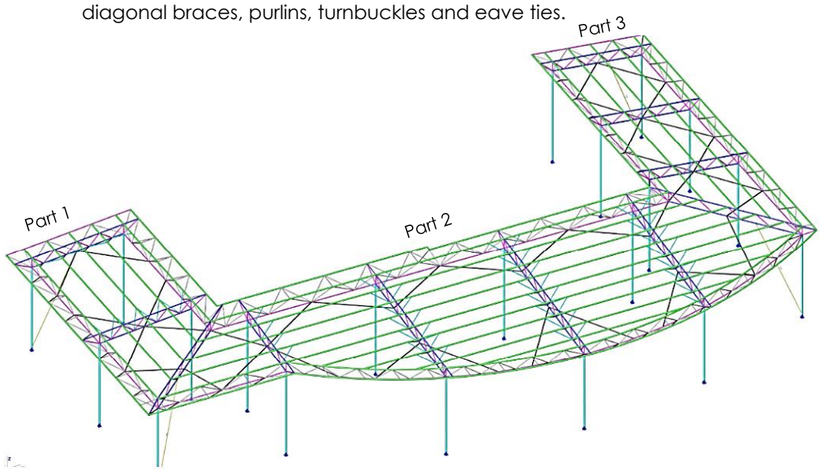

Figure 1: Overview of the canopy structure

Multiple Iterative analytical models were run in a bid to obtain an ***Optimal*** Frame, free from underutilized/redundant members thus promoting Cost Efficiency.

Due to the exposure condition of the canopy, different wind and gravity load scenarios were intricately investigated. All required axial, flexural and buckling checks were carried out working towards the range of Minimum and Maximum Utilization ratio of 0.65 and 0.90 respectively.

Link to Animation of Structure under most Onerous Wind Load Case- https://shorturl.at/Pkv2j

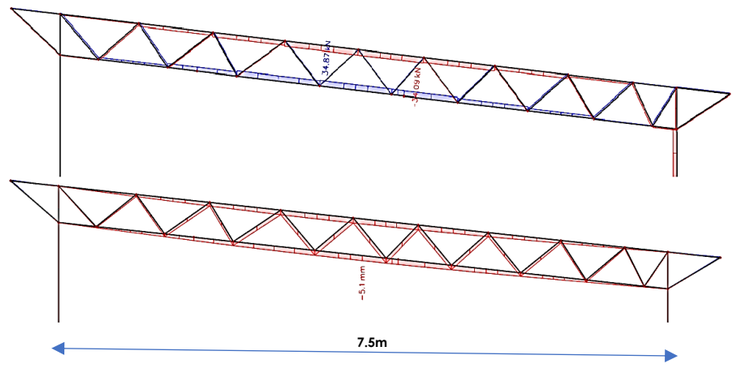

Figure 2a & b: Typical Truss Axial Force (+/-35kN) & Displacement (5.1mm)

Total tonnage of the canopy was ***6.7 tons*** and deployed sizes were:

- Stanchions- ø76.1 x 4mm thick
- Truss Top & Bottom chords- ø48.3 x 5mm thick
- Truss Web members- ø42.4 x 4mm thick
- Purlins- ø60.3 x 5mm thick
- Fly Braces -ø33.7 x 3.2mm thick
- Eaves tie- ø42.4 x 4mm thick

Steel - S275, Bolts- Grade 8.8, Welds- Minimum 6mm Fillet E35 Electrode with S275.

Connections at nodes were designed to match the axial forces (tension & compression) in the members and subsequently planned to ensure seamless fabrication and installation. Welded connections were limited to workshop fabrication while bolted connections for on-site activities.

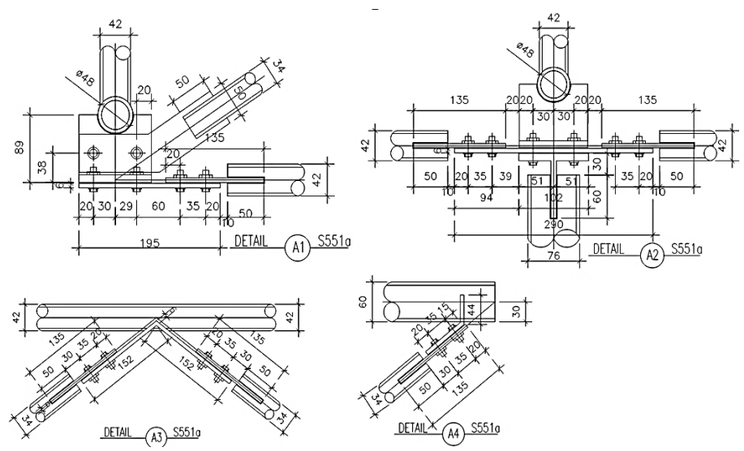

Figure 3: Typical Connection Details

To mitigate corrosion long-term, Marine paint was applied (in at least 2 coats) to all members while fasteners were Hot-Dipped Galvanized.

Execution team

Architect: **GYB Consults**
MEP Engineer: **OJ&T Consulting**
Contractor: **Global E-D Nigeria Limited**

Site Photographs

Picture 1: Within the Canopy Structure

Picture 2: Drone Image at 100% completion. (Courtesy Global E-D)

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