DNEC

COMPANY

PROFILE

CLIENT ORIENTED COMMITMENT ›

Share with us your objectives, your vision, time table and budget and we will asses the feasibility of your project and come back to you with the most efficient design and construction solutions available.

From the initial feasibility studies, through planning and development, through project design and tender stage we will help you deliver a quality solution on time and on budget.

DNEC prides itself in listening to the client's objectives and project goals and then recommending the most efficient construction path and solution oriented assistance.

We are pleased to work with owner clients directly, large government agencies, contractors or in support of other architectural/engineering firms.

Our inherited experience in the GCC region over the last 20 years speaks to the true value that DNEC brings to the project design and construction team. Innovative designs utilizing proven technologies all delivered in a safe fashion, on schedule, on budget, every time.

THE COMPANY ›

DNEC is an international engineering consultancy founded in 2005 as a partnership between two experienced structural engineers, Darko Popovic and Nenad Jovanovic. With over 20 years of experience in the Middle East, working on unique and complex design and construction projects, both partners have built a strong portfolio for their company. Their dedication, ethical standards and high quality of service have attracted a growing clientele.

DNEC works with all major construction companies, governmental agencies and private development firms and has developed key partners and cooperative working arrangements with manufacturers, specialty and general contractors and large A/E firms.

Today DNEC operates throughout the Middle East and South East Europe and delivers solutions for projects all over the world. It has offices in the UAE and Serbia.

DNEC is dedicated to building lasting relationships based on trust and mutual respect with its clients and business partners. Innovation, quality design, flexibility and experience are DNEC's sources of strength.

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SERVICES ›

□ 1. Structural Design of Buildings

- Concept, preliminary and "for construction" design and detailing.
- Structural analysis, design and detailing of super high-rise buildings.
- Design and detailing of all types of structures - concrete, steel, pre-stressed, post-tensioned, composite etc.
- Expertise in the field of seismic and wind engineering, building movement and structural vibrations induced by wind or human pace.

□ 2. Structural Design of Infrastructure

- Design of bridges.
- Design of reservoirs, water-tanks and water-towers.

□ 3. Engineering Consultancy Services

- Review and Peer-review services.
- Value engineering, re-design and provision of alternative construction solutions using precast pre-stressed structural elements, post-tensioned elements and composite steel/concrete elements.

□ 4. Construction Support

- Design & Build – Complete engineering services.
- Design of bridge bearings.
- Temporary works design and design verification of temporary structures such as scaffolding assemblies, wall shutters and temporary props and bracings.
- Expertise in heavy-lift engineering, strand-jacking and design of associated temporary works.
- Complete engineering solutions including sequence of construction, planning and positioning of cranes and construction scheduling.

□ 5. Evaluation, Rehabilitation and Strengthening of Structures

- External pre stressing solutions.
- Jacketing and design of CFRP (carbon fiber reinforced polymers) applications for strengthening of reinforced concrete elements.
- Advanced procedures for state-of-art seismic resistance structural evaluation including static and dynamic non-linear analysis.

□ 6. Modelling and Detailing

- 3D structural modelling in Tekla and Revit.
- Preparation of structural steel workshop and fabrication drawings and concrete detailing.

A | DNEC SELECTED REFERENCES

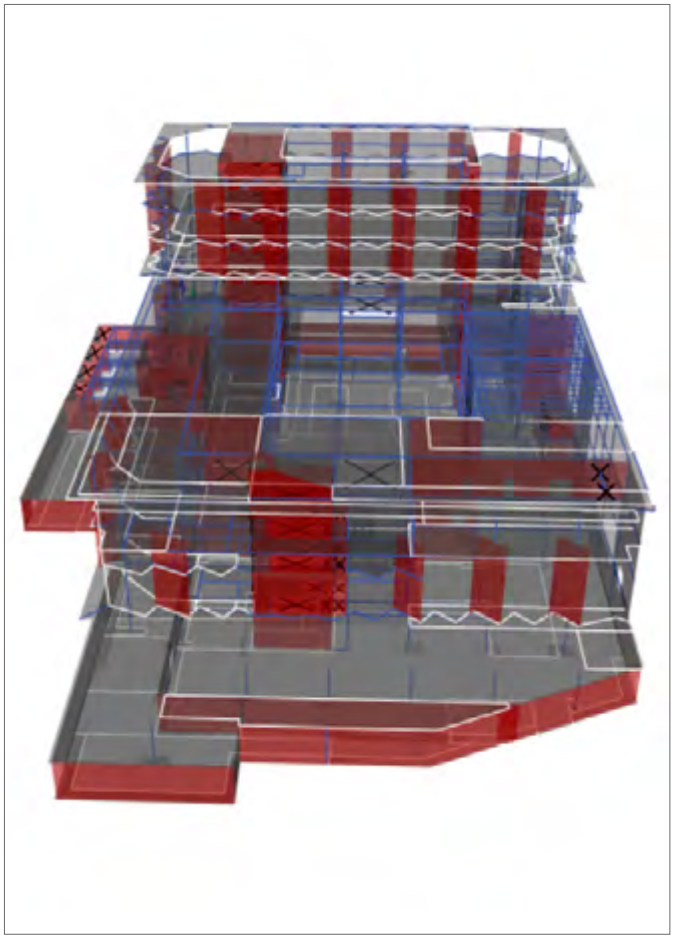
01 | BUILDINGS

The St. Regis Belgrade and the Residences at the St. Regis Belgrade

Client:	Belgrade Waterfront (BW Kula d.o.o. Beograd)
Location:	Belgrade, Serbia
Architect:	SOM
Lead Consultant:	AECOM
Contractor:	Pizzarotti Millennium Team
DNEC role:	Engineer of Record (JV with EPAiU) FIDIC Engineer and Site Supervision Consultant

Landmark tower located in the heart of Belgrade Waterfront development.

3D images courtesy of Belgrade Waterfront



□ EPIC GAMES

Client: 3 Lateral and Epic Games
Location: Novi Sad, Serbia
Author: Norman Foster's bureau
Architect: A3 Belgrade
Contractor: KOTO

DNEC role: Structural Consultant and Design Supervision

Epic Games campus is an office building with BUA of approximately 25000 m^2 with hi-tech equipment including head and body scanners and a powerful data center. Structurally it consists of cast in situ concrete, local steel structures as well as parts with prefabricated concrete.

DNEC role - Structural Designer from Concept Design stage, up to IFC stage, including the production of reinforcement shop drawings which were done in Tekla. During the Construction stage DNEC role was Design Supervision.

□ Western Metro Station

Client: Higher Commission for the Development of Arriyadh

Location: Riyadh, Kingdom of Saudi Arabia

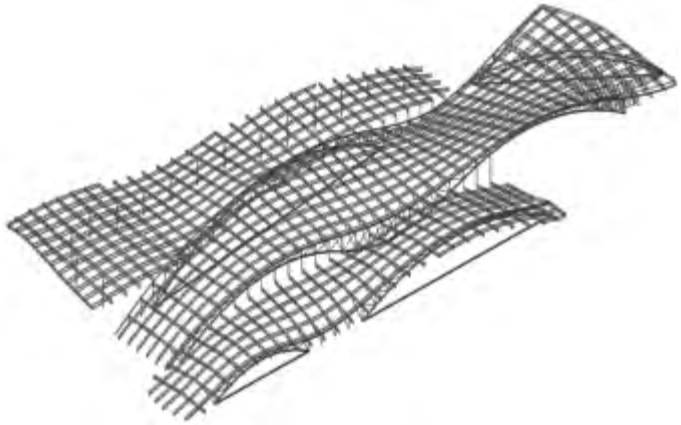
Lead Consultant: Omrania & Associates

DNEC role: Structural Consultant

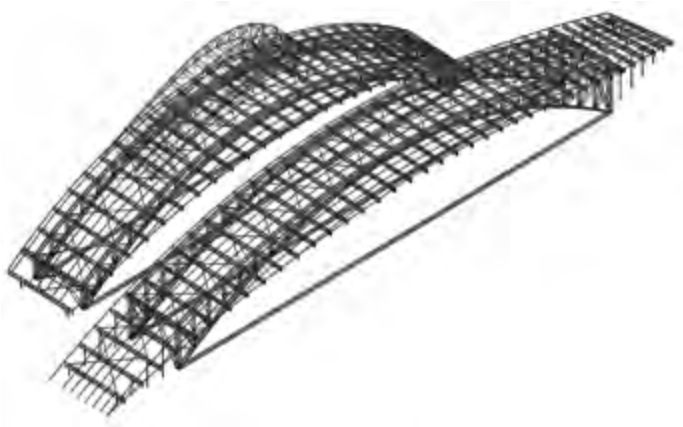
Western Metro station is a landmark project designed to become an integral part of the local neighbourhood. In addition to the Metro station, the development comprises bus station (BRT), food and vegetable Market, underground car park, mosque and large public areas that include parks, plazas and passages.

The basement and podium structure is 360 m x 250 m in plan and consists of cast-in-place concrete foundations, columns, retaining walls and podium slab. Metro station and Market roofs are designed as free-formed structural steel trusses. Post-tensioned box girders are used for Metro and BRT viaducts having spans of approximately 40 m - 50 m.

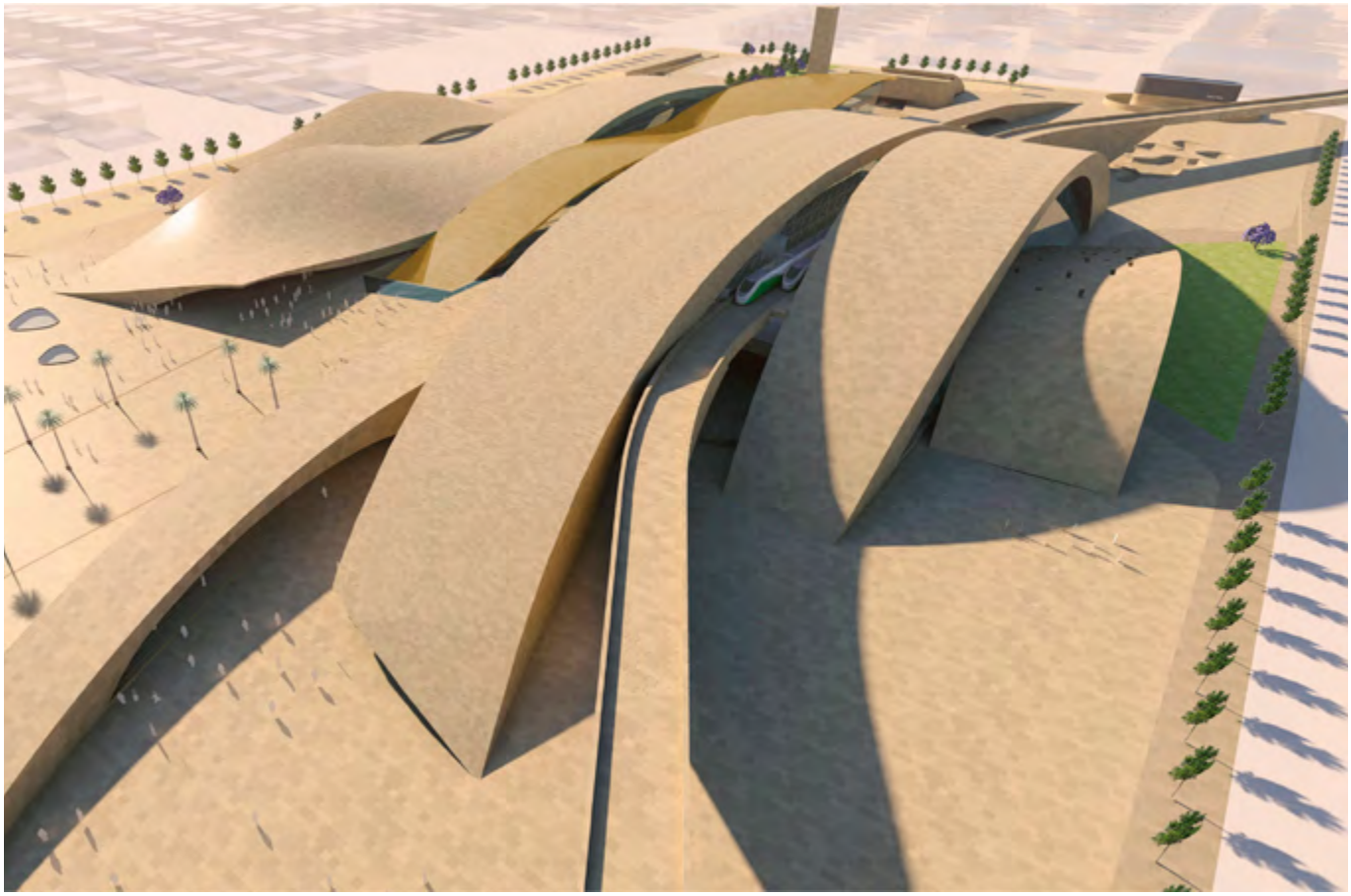
Market roof



Metro and BRT roof



3D image courtesy of Omrania & Associates



□ Centre for promotion of science - CFPOS

Client: PUI
government of Serbia
Location: Belgrade

DNEC role: Structural Consultant

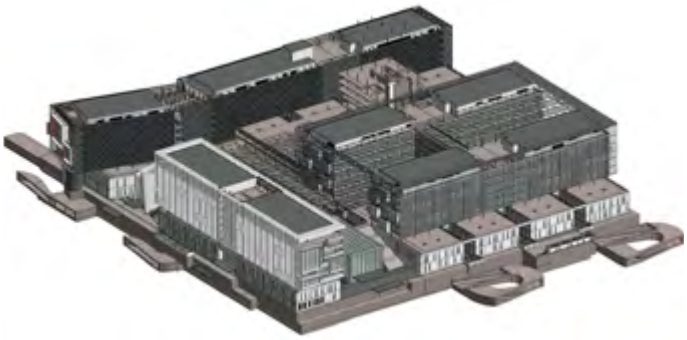
DNEC were engaged by the award winning Austrian architect Wolfgang Tchapeller to join his team as lead structural designer. This futuristicly shaped project comprises a 15,000 m^2 elevated exhibition space and an underground facility of similar size.

▫ Sheikh Khalifa Medical City

Client: SEHA
Consultant: ITS (ICME, Tilke & SOM)
Location: Abu Dhabi

DNEC role: Sub-consultant - Structure

Sheikh Khalifa Medical City (SKMC) consists of the Main Building, the Car Park Building and Service Buildings. The Main Building has a footprint of 207 m x 225 m comprising foundation slab, one underground slab, ground floor, the plinth up to L2, five separate buildings rising from L3 to L7 and the Royal Tower L8 to L10. The Car Park is a 4-storey building located north of the Main Building. The total area is approximately 360,000 m².



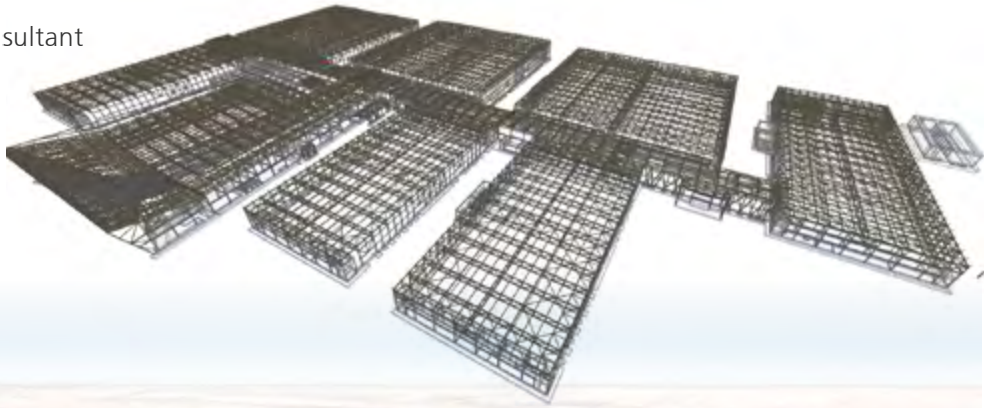
3D image courtesy of ITS

▫ The New Exhibition & Convention Centre

Client: Ministry of Works, Kingdom of Bahrain
Location: Bahrain
Lead Consultant: Tilke

DNEC role: Structural Consultant

Structural design for approximately 130,000 m² GFA, comprising ten Exhibition Halls covered by roof trusses spanning 70m, Convention Centre featuring large cantilevered roof over main entrance and Concourse.



3D image courtesy of Tilke

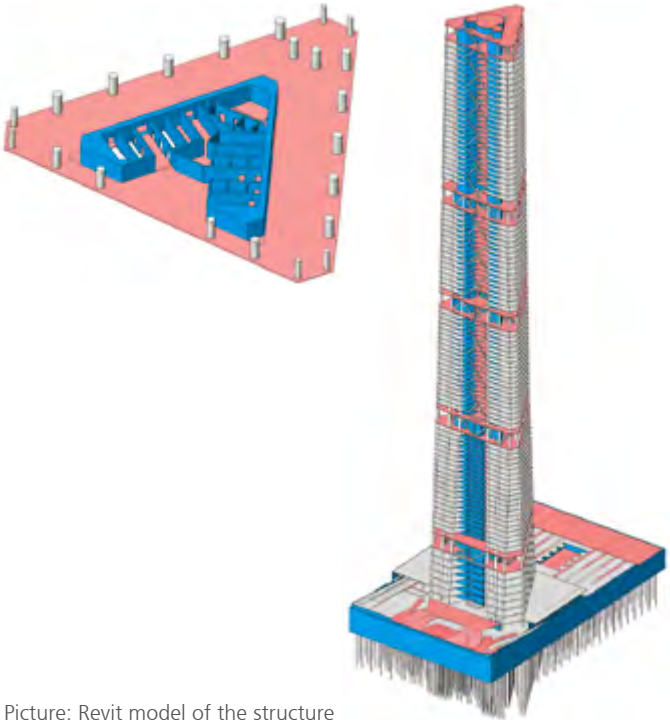
▫ Burj Al Fattan Tower

Client: All Fattan Properties
Architect: LWD Architects
Consultant: Hyder Consulting Middle East Ltd
Location: Dubai, UAE

DNEC role: Engaged by Hyder Consulting Middle East Ltd to prepare Concept and Preliminary design.

Duration: June 2008 – December 2008
DNEC – Belgrade, Serbia
Status: Tender stage

Composite Steel/Reinforced concrete tower structure. Mixed use high-rise development of 97 storeys. Total height 463 m. Four underground parking levels. High strength concrete up to 100 MPa cylinder strength utilized.



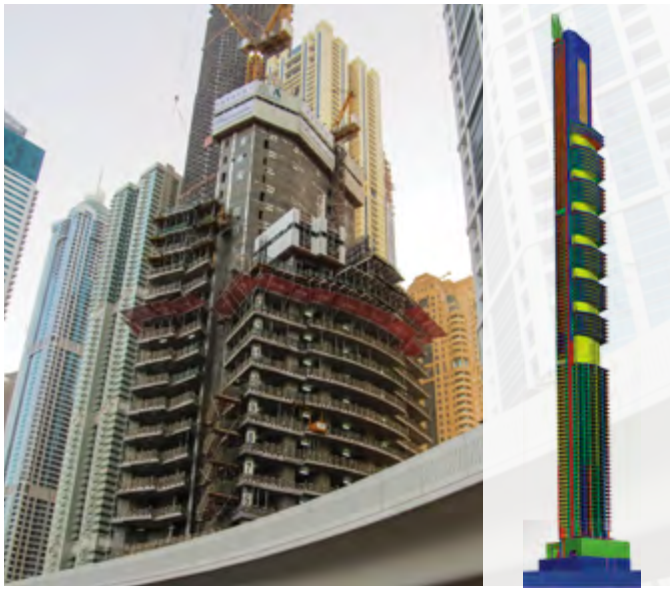
Picture: Revit model of the structure

▫ The Pentominium

Client: Trident International Holdings
Architect: Aedas Architects
Consultant: Hyder Consulting Middle East Ltd
Location: Dubai, UAE

DNEC role: Engaged by Hyder Consulting Middle East Ltd to prepare "for construction" design.

Reinforced concrete, 120 storey, 518 m in height. Residential high-rise development. Six underground parking levels. High strength concrete up to 100 MPa cylinder strength utilized.



Al Habtoor Theatre

Client: Al Habtoor
Location: Dubai

Engineer: Khatib & Alami
Contractor: Al Habtoor Leighton Group

DNEC role: Structural Steel Designer

Structural steel design for Roof trusses, Podium and Theatre Dome.

02 | BRIDGES

□ Omo River Bridge Recovery, Repair and Strengthening Works

Client: Ethiopian Roads Authority
Location: Omorate, Ethiopia
Main Contractor: Pan-Africa Construction Engineers PLC
Specialist Subcontractor: VSL Middle East

DNEC Role: Engineering Consultant

Recovery of 128 m long structural steel truss that collapsed during bridge launching operation in early 2011.

The scope covered design and engineering of recovery operation including preparation of recovery procedures, method statements and site supervision, as well as design and engineering of temporary works for bridge repair and replacement of damaged members.

The bridge was recovered, repaired and launched in its final position from May until July 2013.

□ KAFD Skywalk Bridges - Contract C17

Client: Riyadh Investment Company
Consultant: BuroHappold
Contractor: Al Ghurair Construction (Design-and-Build Contract)
Location: Riyadh, KSA

DNEC role: Employed by the Contractor to prepare structural design, fabrication drawings, erection methodology and provide site supervision

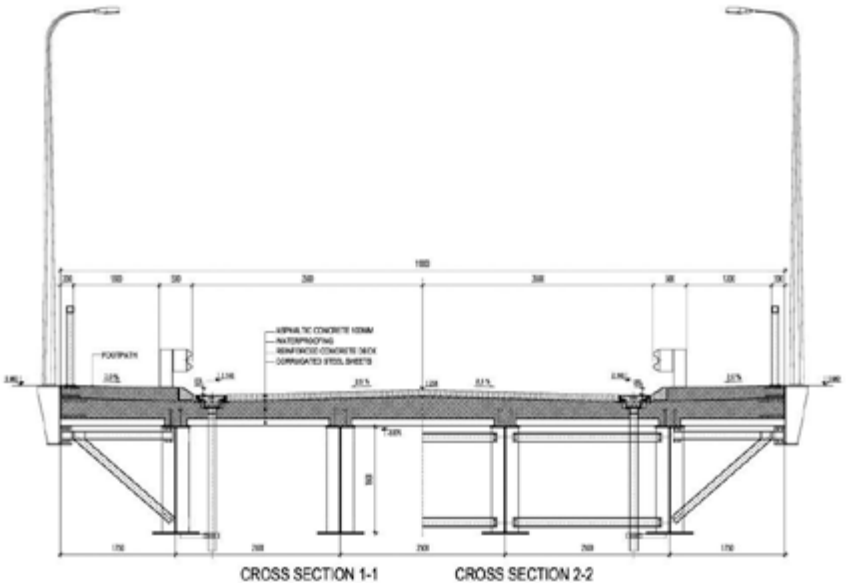
Tubular type Skywalk link bridges are designed to interconnect all buildings at the KAFD development in Riyadh. The 57 out of 90 bridges were scheduled for construction during the project's 1st phase. Complex logistics situation at KAFD site required a detailed construction methodology to be considered at the early stage of the bridge design process. DNEC has undertaken all engineering design services starting from bridge design followed by the preparation of fabrication drawings, construction method statement, planning and erection supervision.

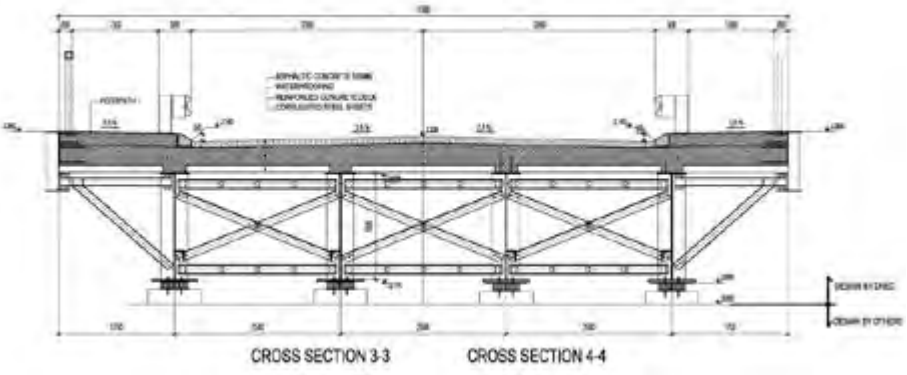
□ Al Gharraf Bridge

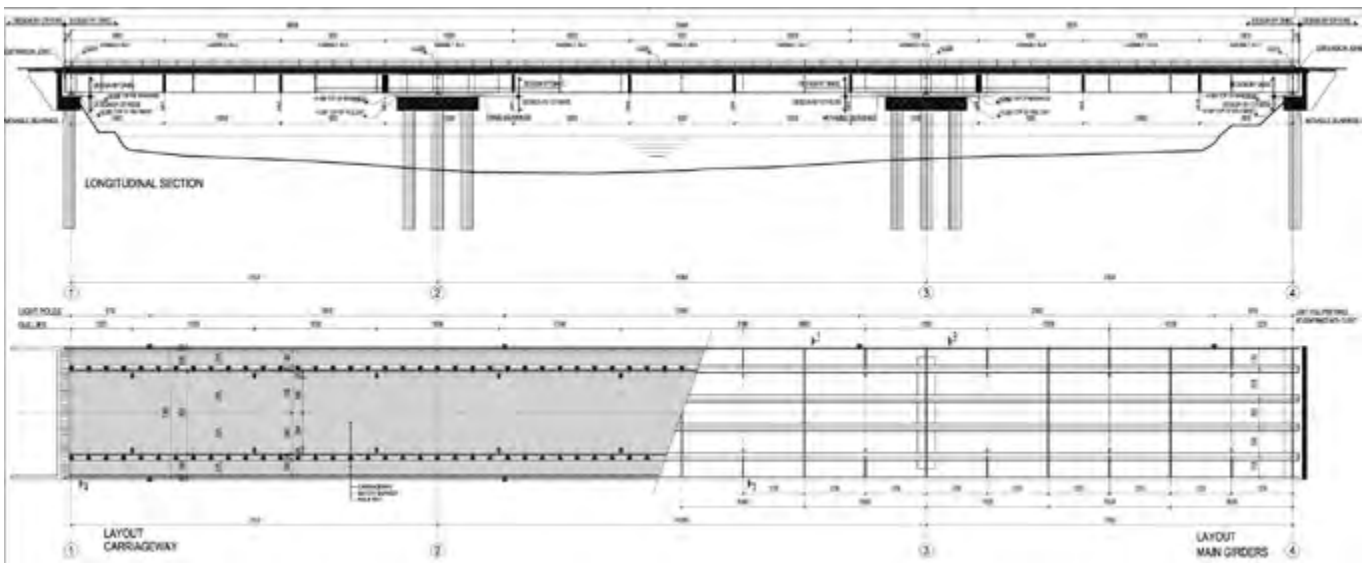
Client: Petronas
Contractor: ICCB
Location: Al Gharraf, Iraq

DNEC role: Structural Consultant

Design of tri-span (31.5 m + 42 m + 31.5 m), 105 m long, two-lane bridge. The deck is designed using 1,600 mm deep structural steel girders and 250 mm in-situ concrete slab to BS EN Standards.







▫ Exit Ramp ADNEC Car Park A

Client: Hilalco
Location: Dubai, UAE

DNEC role: Design of ramp-bridge

Exit ramp for Abu Dhabi National Exhibition Company. Bridge design to Abu Dhabi Municipality/AASHTO requirements includes design of bridge box girder, piers, abutments, pile caps and approach slab. The bridge is designed as three span (30 m – 35 m – 17 m) continuous post-tensioned box girder.

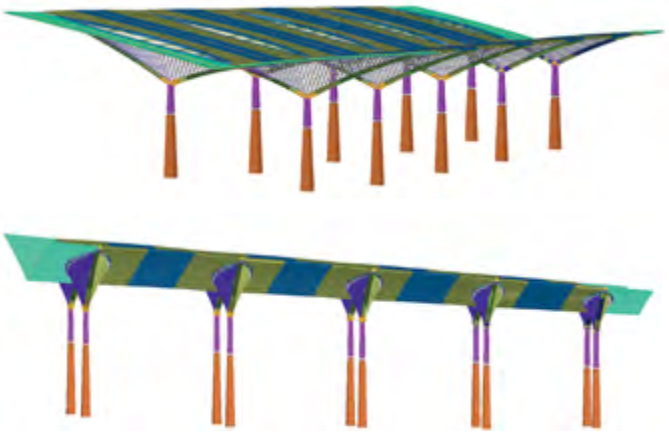
Picture: ADNEC Ramp (Courtesy of Hilalco)

03 | CONSTRUCTION SUPPORT

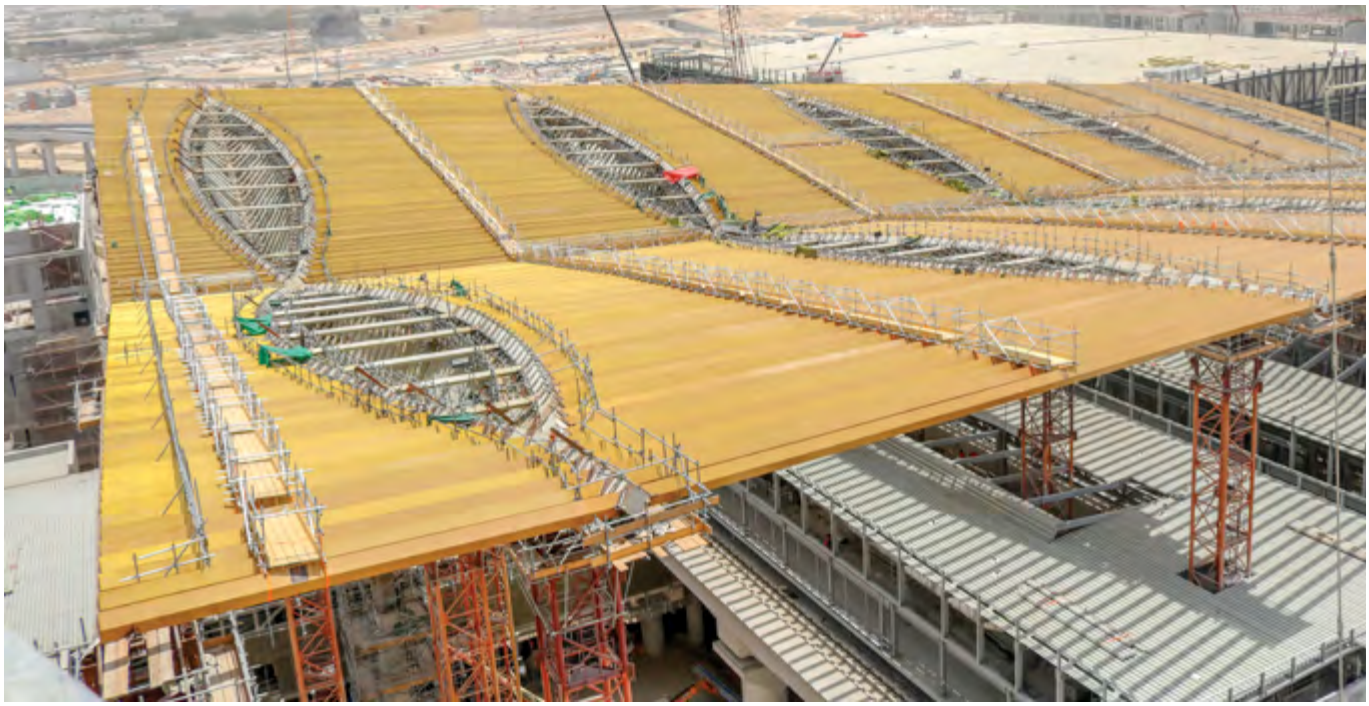
▫ EXPO 2020 Metro Station Canopy

Client: RTA Dubai
Location: Dubai, United Arab Emirates
Contractor: EXPOLINK Consortium
Steelworks Contractor: CSCEC
Steel Construction Company LLC

DNEC role: Structural Steel Engineering Consultant



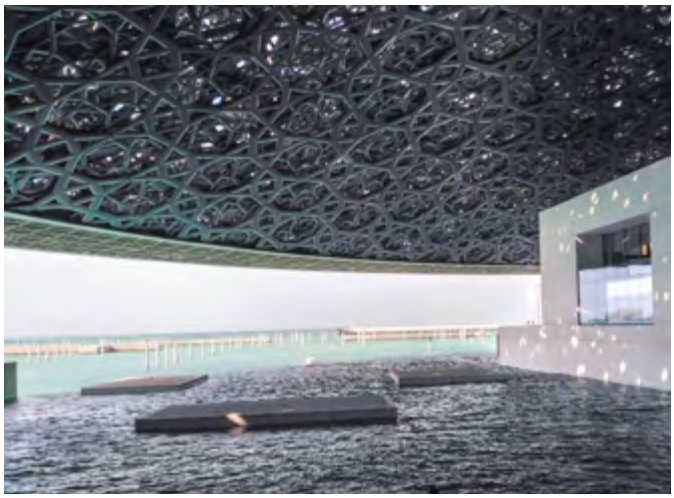
Structural steel connection design, erection stress analysis, preparation of Tekla model and temporary works design.

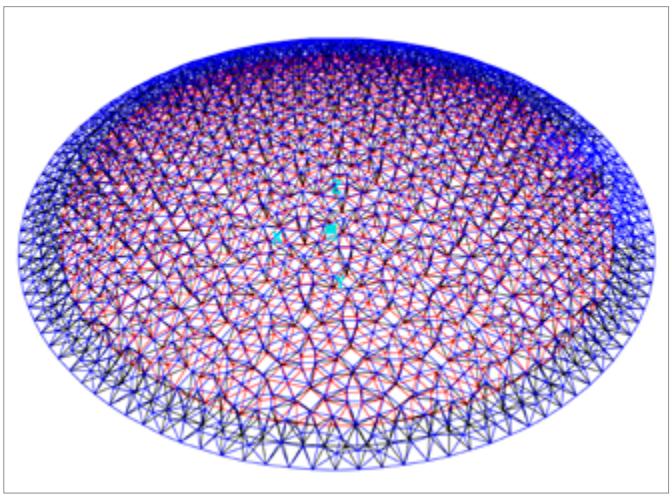


□ Louvre Abu Dhabi

Client: TDIC
Architect: Jean Nouvel
Consultant: Buro Happold
Contractor: Arabtec – San Jose – Oger International JV

DNEC role: Engaged by the Contractor to provide third party design review of temporary works as required for Dome installation including construction staging and Dome de-propping.





▫ Yas Arena

Client: Miral
Location: Yas Island, United Arab Emirates
Consultant: WSP
Contractor: BAM International Abu Dhabi LLC

DNEC role: Structural Steel Engineering Consultant

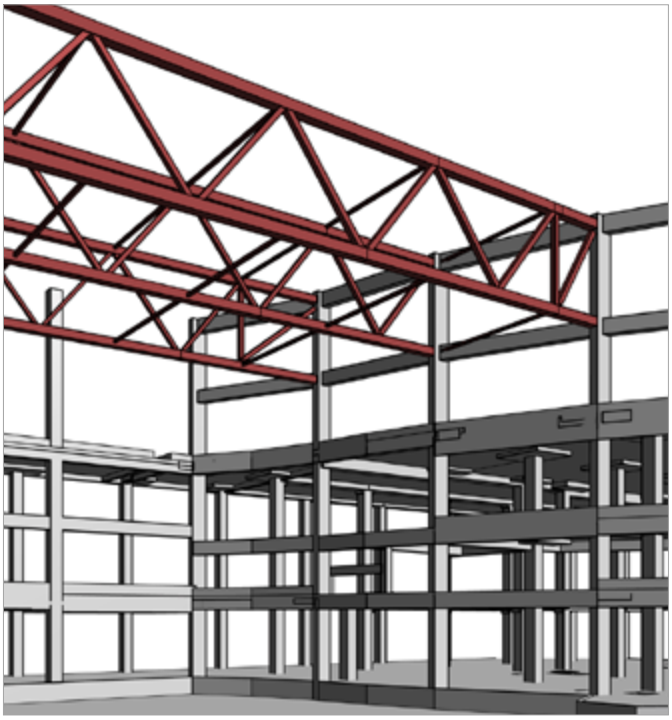
Structural steel connection design, erection stress analysis and temporary works design for the Arena roof trusses.

▫ EXIT 15 Shopping mall

Client: SEVEN (Saudi Entertainment Ventures)
Location: Riyadh, KSA
Architect and Lead Consultant: AECOM
Contractor: ZAMIL STEEL

DNEC role: Steel Connection Design and Structural review

The Exit 15 Al Nahda Entertainment Complex in Riyadh, developed by Saudi Entertainment Ventures (SEVEN), is poised to become a leading leisure destination. Covering 100,000 m^2 it will include a range of attractions such as cinemas, dining venues, retail outlets, and notably, an indoor ski slope that will provide a year-round snow experience in Riyadh. DNEC was engaged by Zamil Steel to provide Steel connection design and Design review. Total steel tonnage was 9000 t.

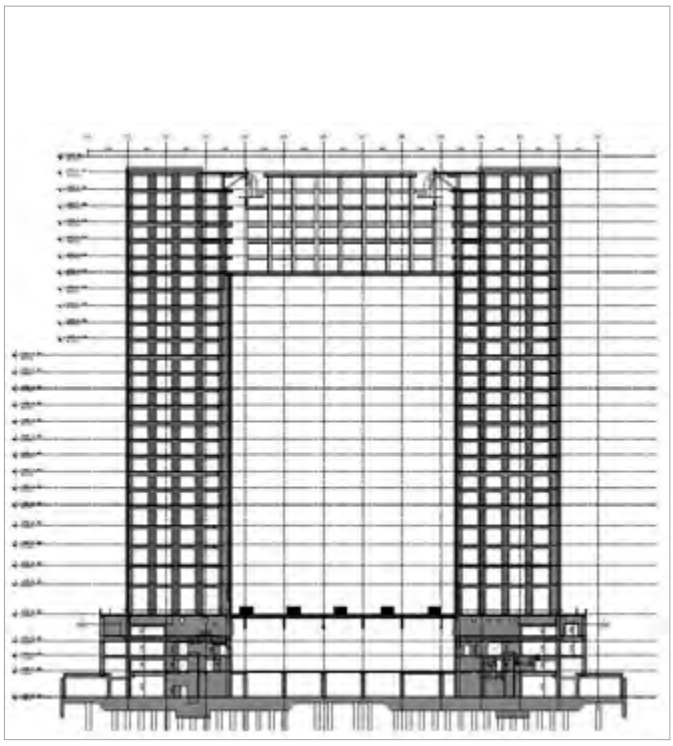


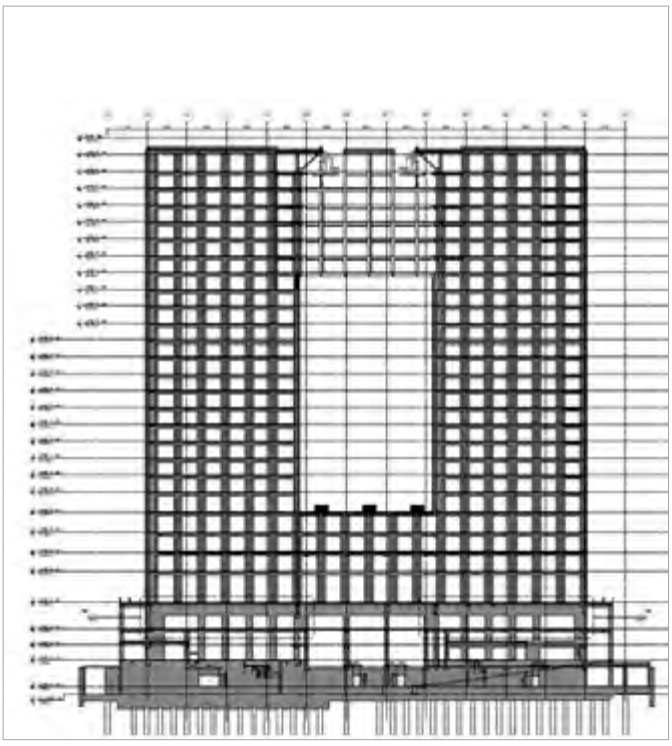
□ Four seasons hotel

Client: Midad Real estate
Location: Jeddah, KSA
Author: WME
Architect: DSA Architects International
Specialist
Sub-Contractor: VSL (Middle East) LLC

DNEC role: Heavy Lifting Frames Design

DNEC was engaged by VSL to provide engineering solution for lifting of North and South bridges that connect two wings of Jeddah hotel on 26th floor at the elevation of 110 m above ground. Bridges were almost 50 m long each. Lifting jacks capacity of 330 and 580 tons were used at each lifting point to Strand jack the bridges.analysis and temporary works design for the Arena roof trusses.





▫ Fairmont Hotel, Abu Dhabi

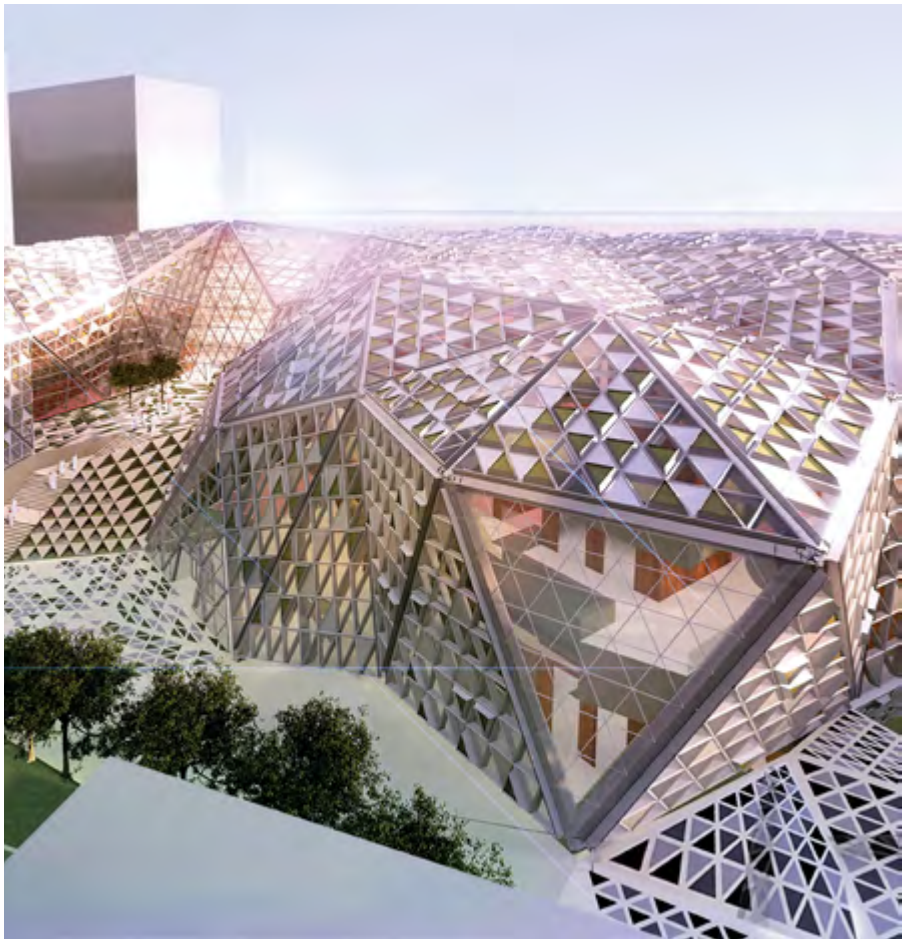
Client: NIC
Contractor: Arabtec
Specialist Heavy-Lift Sub-Contractor: VSL

DNEC role: Employed by VSL to prepare structural design and engineering details for temporary works for strand-jacking of 400t bridge and 70 t arch located between two hotel towers.

KAFD Conference Centre

Client: Riyadh Investment Company
Consultant: SOM
Contractor: Parmasteelisa Gartner / Al Reyami Construction
Location: Riyadh, KSA

DNEC role: Construction engineering and design of temporary structures



Conference center is the masterpiece of the KAFD development. Its steel roof with irregular geometry presented a significant construction challenge. Construction methodology and detailing of temporary supporting frame proposed by DNEC allowed independent erection of the structure nodes weighing up to 23 t prior to erection of members. Detailed sequential and de-propping procedure is analyzed, detailed and supervised.

▫ CMA Tower

Client: Central Market Authority
Consultant: HOK - Omrania & Associates JV
Contractor: Saudi Binladin Group (SBG) Architecture and Building Construction Division
Location: KAFD Development in Riyadh, Kingdom of Saudi Arabia

DNEC role: Employed by SBG as Specialist Engineering Consultant

Preparation of construction method statement, vertical transportation study, building shortening study and building shortening compensation method statement for 385 m tall Tower. Assistance to SBG in review of method statements and workshop drawings prepared by subcontractors. Design of temporary structures and permanent structure check at temporary construction conditions.

Development of engineering details and participation in discussions with SBG and the engineer on implementation of engineering details. Coordination with SBG and its subcontractors to ensure incorporation of engineering details into workshop drawings.

▫ Shams Gate Building

Client: Sorouh
Consultant: Khatib&Alami/Arup
Contractor: ACC / Eversendai
Location: Al Reem Island – Abu Dhabi

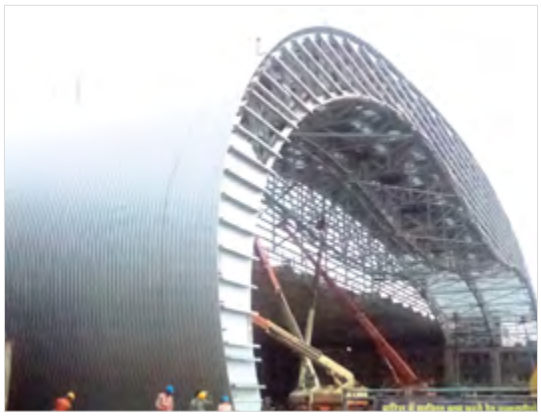
DNEC role: Independent review and certification Engineer

- Permanent connection design review and certification
- Structure stability check at temporary construction condition review and endorsement
- Heavy lifting methodology review and certification
- Temporary structure design review and certification
- Site inspection and compliance certification

Dubai Frame

Client: Dubai Municipality
Location: Zabeel Park, Dubai
Engineer: Hyder Consulting
Contractor: Al Rostamani – Pegel LLC

Preparation of building movement prediction study and movement compensation measures. Review of as-built survey reports as part of building movement monitoring and control programme.



Mumbai Airport Hangar Peer Review

Client: Eversendai Construction Private Limited
Location: Mumbai, India

DNEC role: Structural design peer review

Peer review of structural design documents (drawings and calculations) for 145 m long trusses that support the hangar's roof and walls.

▫ Balanced Cantilever Construction method for Dubai Metro Bridges

Client: VSL – Freyssinet – Rizzani de Eccher JV

Location: Dubai, UAE

DNEC role: Engineering solution for temporary propping

Structural design and detailing of temporary prop structural elements for Dubai Metro bridges constructed using Balanced Cantilever construction method. Each BC Prop assembly comprises 1,2 m wide, 2,6 m high heavy-duty post-tensioned precast spreader beam, two numbers precast columns and top-mounted structural steel bracing together with all provisions necessary for installation of hydraulic jacks and temporary bearings. Maximum working load on BC Prop - 17,000 kN. All connections designed and detailed to allow easy installation and dismantling for re-use at various Dubai Metro Project's locations.

▫ Ice Skating, Aquarium and Carnival Walk Roof Trusses, Dubai Mall

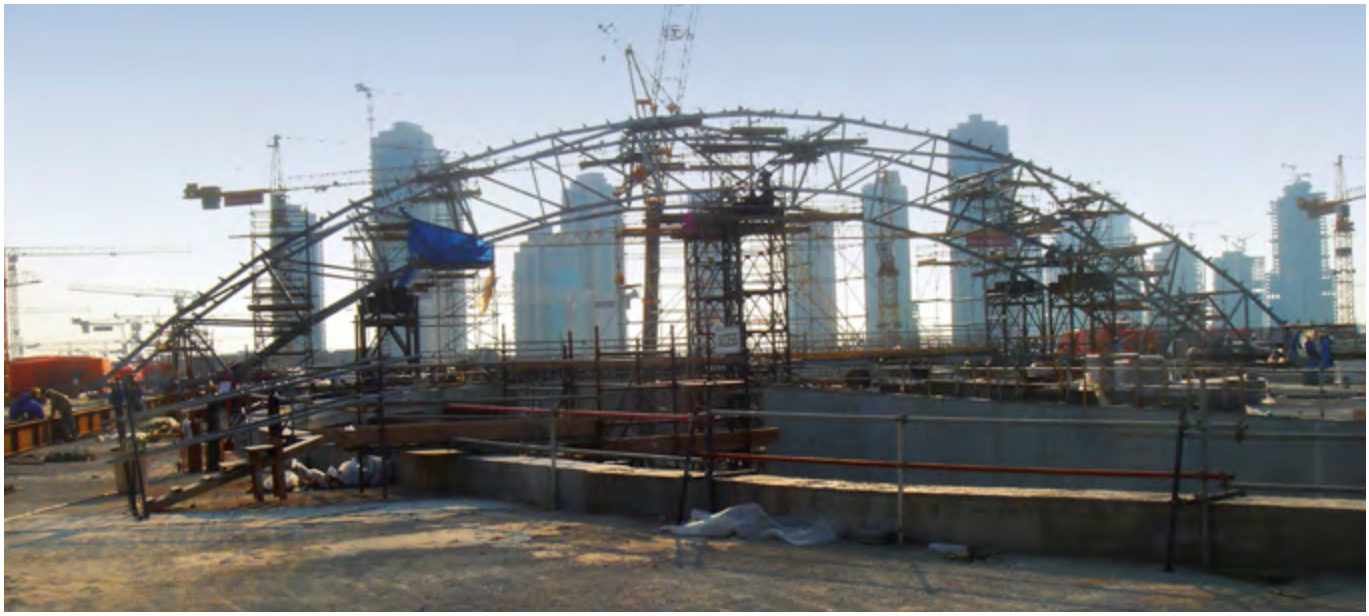
Client: Eversendai LLC
Location: Dubai, UAE

DNEC role: Engineering solution for installation

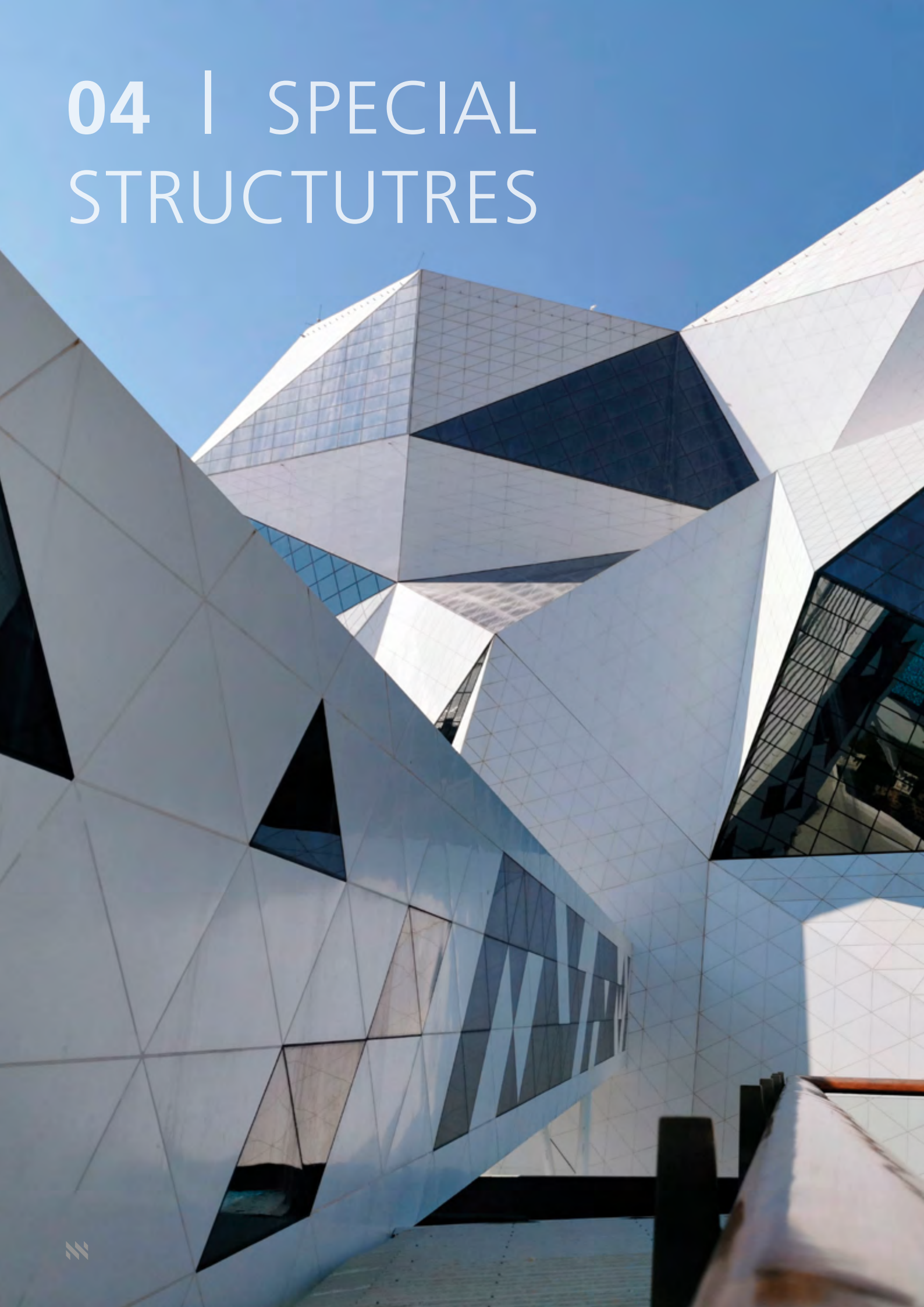
Complete engineering solution for installation of Dubai Mall roof trusses. Structural design and analysis of different installation stages/conditions. Preparation of method statements and installation manuals, as well as construction drawings.

Aquarium and Ice Skating roof trusses (22 Nos. trusses in total, span approx. 50 m each) launched into position by sliding over the distance of 60 m using strand jacks and temporary sliding rails.

Carnival Walk triangular shape trusses (20 m in length) installed using segmental erection over the temporary shoring trusses. Site supervision and inspection provided for the above launching and installation operations.



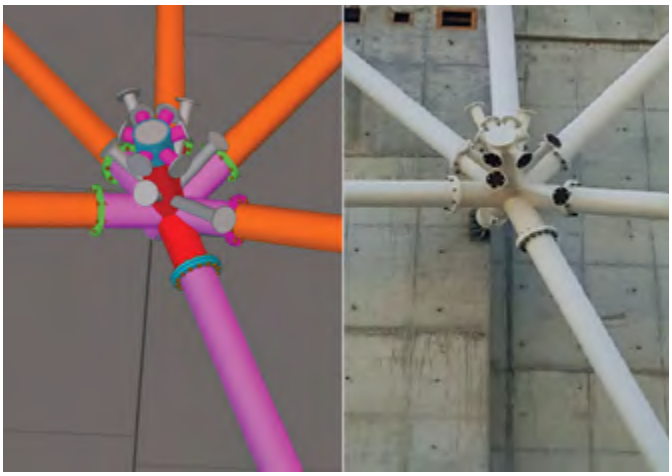
04 | SPECIAL STRUCTUTRES



▫ Indoor Flight Chamber and Climbing Centre

Client: Miral
Location: Abu Dhabi, United Arab Emirates
Lead Consultant: AECOM
Façade Design & Build Contractor: Zublin Construction LLC

DNEC role: Façade Frame
Structural Steel Designer



Design and detailing of structural steel façade supporting frame made up of triangular panels. The structural frame is supported on foundation pads at ground level and laterally restrained by concrete core walls. Each panel has a unique geometric shape and none of the panels are repeated. Each panel is on a different plane. The structural framing consists of primary triangular frames made up of tubular steel members. Secondary trusses are connected to primary frame members. Finally, the triangular cladding panels are fixed to the structural frame. Detailing completed using Tekla software with API developed in-house.

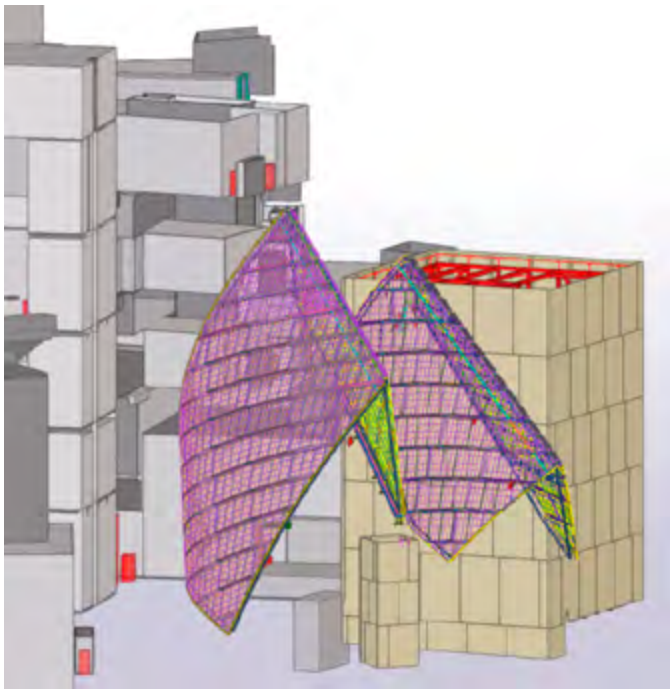
▫ Guggenheim Abu Dhabi

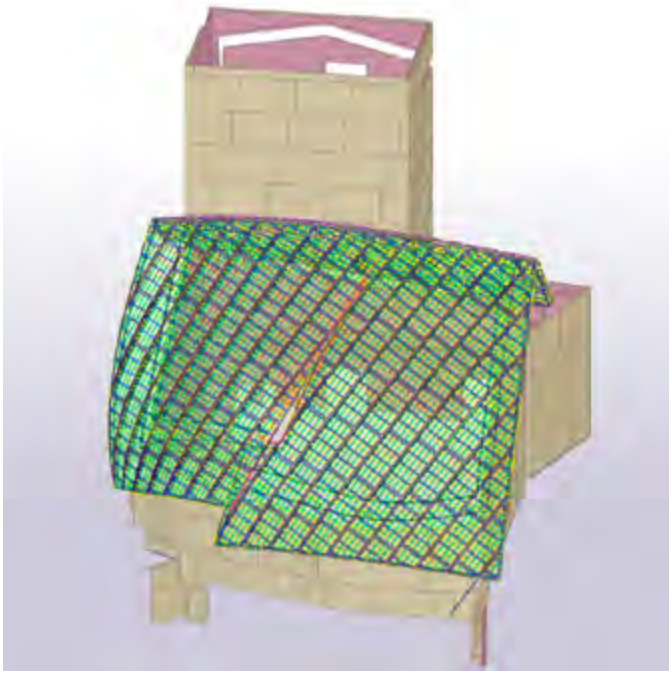
Client:	UAE Department of Culture and Tourism
Location:	Saadiyat Island, Abu Dhabi, UAE
Architect:	Gehry Partners, LLP.
Consultant:	Arup Gulf LTD
Contractor:	BESIX Group, and Trojan
DNEC role:	Tekla Modelling and shop drawings for Shards

Guggenheim Museum of global modern and contemporary art, an iconic project located on Saadiyat Cultural District in Abu Dhabi. Author of this project is Pritzker-prize winning architect Frank Gehry.

It is designed to cover 30,000 m^2 and accommodate approximately 130,000 square feet (12,000 m^2) of exhibition space, which makes it the largest Guggenheim foundation's facility.

DNEC was employed to provide Tekla model, workshop and fabrication drawings for Shards. Super complex warped geometry required exceptional coordination, use of parametric design tools and API programming in Tekla.





▫ New Abu Dhabi Airport

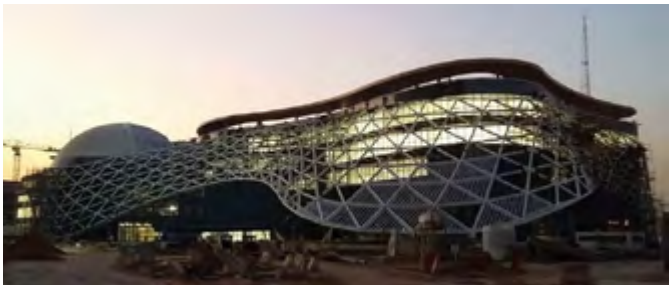
Location: Abu Dhabi, United Arab Emirates
Client/Contractor
Sub-contractors: ADAC, TAV-CCC-Arabtec JV, Eversendai, CSCEC
Engineer: Arup
Brief Description of Commissions: Part 1 – Independent Checking Engineer for structural steel works, Package 3 & 4
Part 2 – Midfield Terminal Building Connection Design

Professional Services Delivered: ICE for structural steel works for the Piers.

Preparation of connection design documents for MTB Central Processor Roof secondary girders.

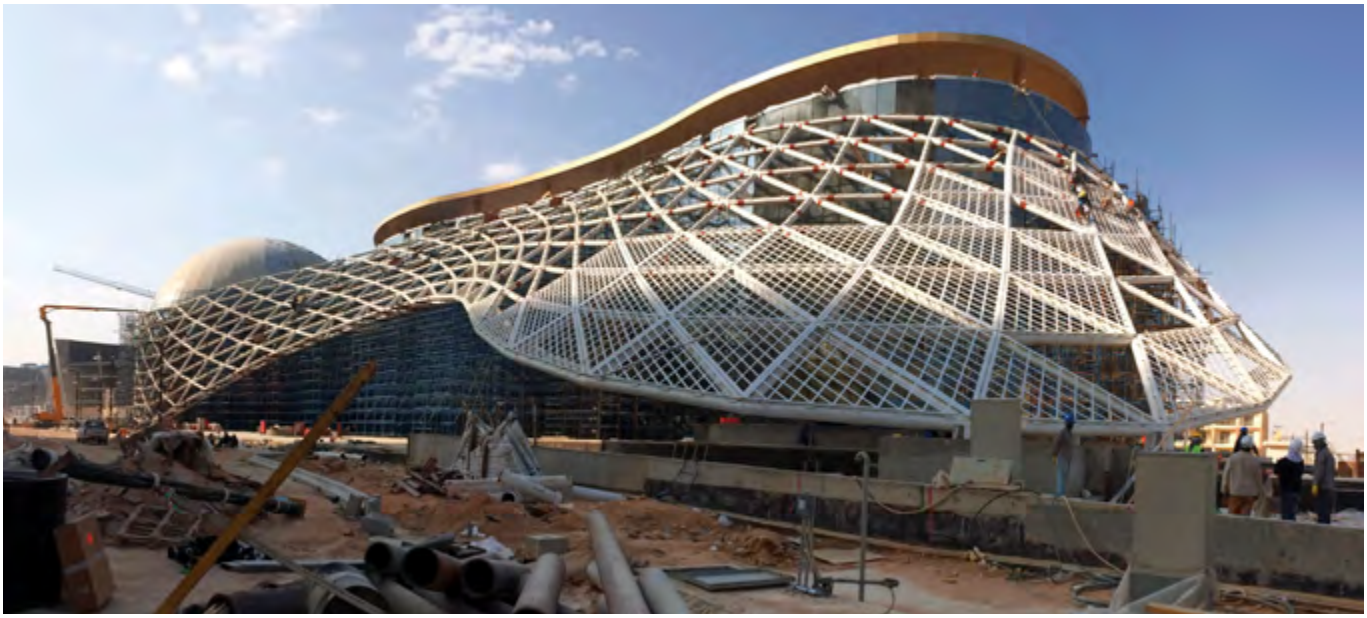
▫ Information Technology and Communication Complex, 17 Parcels

Client: Riyadh Investment Company
Location: Riyadh, Kingdom of Saudi Arabia Facade and Structural Steel
Contractor: Al Ghurair Construction & Arabian Aluminium LLC



Design and detailing of structural steel frame that supports architectural screen feature covered by perforated aluminium panels.

Development of complete construction solution including design and detailing of all temporary works, preparation of production and installation method statements and supervision of works.



▫ Steel Cladding to Meydan Race Course VVIP Bridge

Client: Petrofab LLC
Location: Dubai, UAE

DNEC role: Design, detailing and supervision of bridge cladding

Complete design and engineering management of wave-shaped cladding steel works including structural design, method statements for production and installation, workshop drawings, production supervision and installation supervision.

▫ 120 m Flagpoles in Umm al Quwain and Fujairah

Owner: Ministry of Public Works
DNEC client and structural stee contractor: Trident Support, Dubai

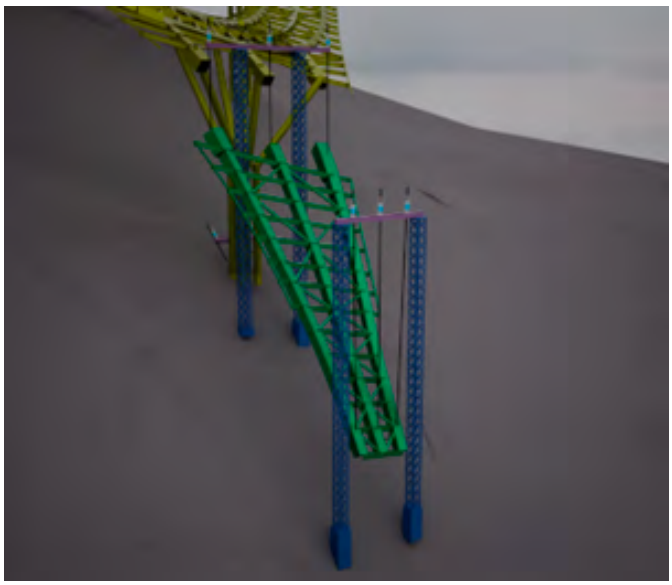
Project description and DNEC scope
Two flagpoles, each 120 m high, locations Umm al Quwain and Fujairah. Structural design of tapered structural steel poles including foundation design.

05 | EARLY CONTRACTORS INVOLVMENT – TENDER SUPPORT

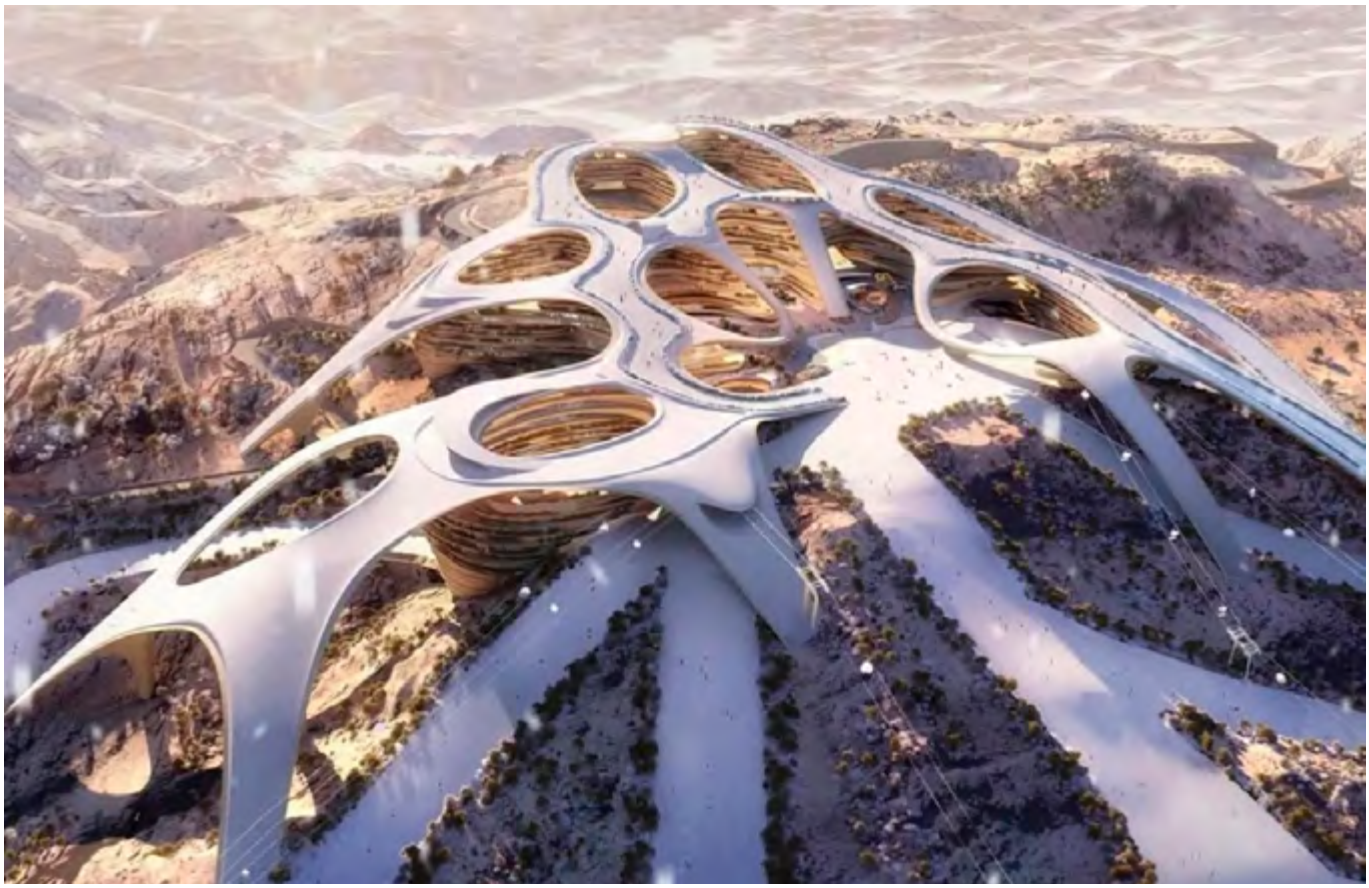
▫ Trojena Ski Village

Client: NEOM
Location: Trojena Mountain, KSA
Architect: Aedas
Consultants: Dar, Maffeis
Bidding Contractor: Zamil Steel

DNEC role: Technical support to Zamil Steel in ECI Phase



Trojena ski village is the Gulf Region's first ever outdoor ski resort. It is a massive complex envisaged to host 700,000 annual visitors and be home to as many as 7,000 residents, with GFA of 270,000m^2. DNEC were engaged by Zamil Steel in Early Contractor Involvement phase to provide technical support for preparation of Zamil's Tender Bid. DNEC provided Construction Methodology Proposal which included: risk assessment analysis, logistic plans, craneage and site management plans, constructability report, construction program, sequencing etc. for structure that comprises more than of 85,000 t of structural steel.



□ NEOM The Line

Client: NEOM
Location: NEOM, KSA
Delivery partners: Parsons, Jacobs and Atkins
Structural Consultant: Ramboll
DNEC role: Employed by Parsons to provide technical expertise on feasibility of design solutions

Futuristic linear project stretching across 170 kilometers, from Red Sea to the mountains of NEOM. A mirrored architectural masterpiece consisting of 135 modules, 800 m long, land-saving 200 meters wide, towering 500 meters above sea level. DNEC was engaged by Parsons to join the Delivery Partners team with a task to assure feasibility of design solutions provided by Structural Designers.

W Monolith

Client: Destinations Development Company
Location: Al ULA, KSA
Consultant: Buro Happold
Bidding Contractor: Al Bawani Construction Company

DNEC role: Technical support to Al Bawani in ECI Phase

Project W Monolith is a unique hospitality complex with 1000 keys, located on the cliff of Al-Ula Mountain plateau elevated from surrounding terrain. It consists of multiple towers arranged around the perimeter of the complex with common podium with overall plan dimensions of 300 m x 150 m.

DNEC were engaged by Al Bawani in Early Contractors's Involvment phase to provide technical support for Tender phase. DNEC defined the strategy and developed Construction methodology covering Construction phasing, Circulation plans, Cranes and Hoists layouts, arrangement of Concrete pumps, pipelines and stationary placing booms. Additionally, DNEC developed a solution for construction of Megabeams, which populate the entire plan of 300 m x 150 m, reach 10m in depth and transfer the loads between Towers to Podium, which have mutually independent and displaced column layouts.

06 | MARINE PROJECTS

□ Delma Mainland Jetty

Contractor: Hilalco
Location: Jebel Dhanna, Abu Dhabi, UAE
Consultant: Euroestudios

DNEC role: Marine Works Consultant

Jetty for ferry boats to Delma island, 250 m in length having five berthing places with Ro-Ro ramps.

Jetty retaining wall constructed with steel sheet piling tied into the backfill using dia 60 mm tie-rods and capped with precast coping units.

B | INHERITED EXPERIENCE OF KEY PERSONEL

Darko Popovic

Position: Managing Partner
Education: BSc. Civil/Structural Engineer
University of Belgrade, Serbia

▫ The Emirates Towers Dubai, UAE

Consultant: Hyder Consulting Middle East
Client: Besix, Multiplex, Murray & Roberts and Turner Int.

Designation: Engineering Manager,
Eversendai Engineering L.L.C.-Dubai

Developing erection studies, designing all temp. erection structures for construction of two towers (320 m and 367 m height) which includes 10,000 T of structural steel. Engineer in charge with full responsibility for special 100 T heavy lifting operations (strand jacking transfer trusses to its final position at 180 m height).


EMAAR

▫ Burj Khalifa – Dubai, UAE

Consultant: SOM, Chicago, USA
Client: Emaar
Designation: Burj Khalifa is with its 830 m height currently the tallest building in the world. Employed as a Principal Engineer at the Hyder Consulting high-rise design group participated in validation and adoption of the SOM design. Particular involvement in a 300 m tall steel apex structure including the inspection and supervision of the "heavy lifting - strand jacking" method for the spire construction.

▫ Burj Al Arab - Dubai, UAE

Consultant: Atkins, UK
Client: Shaikh Maktoum Engineers Office
Designation: Construction of this landmark in Dubai spiraled future development of Dubai luxury high-rise development. Employed as a Engineering manager with Eversendai Engineering LLC was involved in development of construction studies and execution for the 9000 T of steel structure which involved several complex "heavy lifting - strand jacking" activities and innovative construction methods.

▫ Kingdom Trade Centre Riyadh, KSA

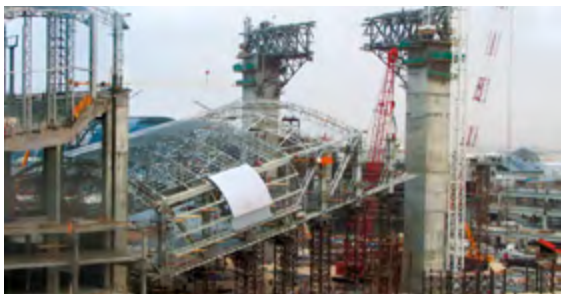
Consultant: Omrania associates
Client: Impregilo S.P.A. - Elseif
Designation: Engineering Manager,
Eversendai Engineering L.L.C.-Dubai

Managing fabrication and supervision. Developing erection studies, design all temp. erection structures for construction of 300 m tower sculpture that includes 4,000 T of structural steel. Engineer in charge with full responsibility for 200 T heavy lifting operation (strand jacking the bridge to its final position at 300 m height). Liaison with Consultants and site erection supervision.

▫ Ski Dome – Mall of the Emirates - Dubai, UAE

Client: Laing O'Rourke
Designation: Engineering Manager,
Eversendai Engineering L.L.C. - Dubai
Principal Engineer, Hyder Consulting ME

Development of construction studies, coordination with consultants regarding the finalization of overall design and build ability of the structure.



□ Khalifa Olympic Stadium - Doha, Qatar

Consultant: OA&P
Client: BESIX – MIDMAC JV
Designation: Engineering Manager,
Eversendai Engineering L.L.C. - Dubai

Development of construction studies and coordination with consultants regarding the finalization of overall design and construction of cable roof structure.

Temporary structure design, drawings and supervision of the whole operation.

Nenad Jovanovic

Position: Managing Partner
Education: BSc. Civil/Structural Engineer
University of Belgrade, Serbia

The Emirates Palace
Abu Dhabi, UAE

Client: Interbeton
Designation: Projects Manager,
Al Meraikhi Precast,
United Arab Emirates

Design, manufacture and installation of precast architectural units for the Hotel and Palace. Architect's requirement to install large precast units inside the completed buildings required engineering and production of purpose built devices for transport, handling and final positioning of different precast columns, arches and walls.

Marina Mall
Abu Dhabi, UAE

Client: Al Habtoor – M & R
Designation: Projects Manager,
Al Meraikhi Precast,
United Arab Emirates

Design and build project (to ACI-318), comprises cast-in-place walls and columns, precast floor structure and precast façade. Precast pre-stressed beams and HCS (up to 16 m long) used for floor structure. Precast pre-stressed I-girders used for pedestrian bridges and cinema roof. Precast polished concrete façade cladding.

Precast floor area 82,000 m^2.


Marina Mall
مركز المارينا

□ Four Seasons Hotel - Doha, Qatar

Client: CDC
Designation: Projects Manager,
Al Meraikhi Precast,
United Arab Emirates

Design and detailing of precast cladding for Apartment Towers, Hotel, Office Tower and Town Houses. White concrete exposed/sand-blasted, GRC-incorporated decorative panels designed to ACI-318/PCI requirements for façade cladding.

▫ Mall of the Emirates
Dubai, UAE

Client: Khansaheb
Designation: Projects Manager,
Al Meraikhi Precast,
United Arab Emirates

"Carrefour box", design and build project. Two-storey structure comprises in-situ columns; 16 m long patented Reduced Weight Precast Pre-stressed Beams and hollow core slabs (HCS) with structural topping. Total floor area 35,000 m².

▫ Pipe Protection Structures at Road to Ghanada Island, Abu Dhabi, UAE

Client: Bin Hafeez
Designation: Projects Manager,
Al Meraikhi Precast,
United Arab Emirates

Design, production and erection (to AASHTO requirements) of 22 m long I-girders and 9 m long Inverted Tee beams for three separate bridges over the existing utilities.

▫ Pipe Protection Bridge, Umm Al Nar Abu Dhabi, UAE

Client: Bin Hafeez
Designation: Senior Structural Engineer,
Al Meraikhi Precast,
United Arab Emirates

Design and build project, bridge over existing service corridor. The bridge comprises 24 m long pre-cast pre-stressed I-girders with precast slabs and in-situ concrete topping.

▫ Underground Car Parks for TRIP 983 & 984 Contracts, Abu Dhabi, UAE

Client: Abu Dhabi Municipality
Designation: Projects Manager,
Al Meraikhi Precast,
United Arab Emirates

All-precast structures comprising three-storey columns, pre-stressed I-girders and Double Tees.

▫ Zadco/Gasco New Headquarters Abu Dhabi, UAE

Client: ADNOC
Designation: Senior Structural Engineer,
Al Meraikhi Precast,
United Arab Emirates

Re-design of the cast-in-place floor structure for two twenty-storey towers to precast joists and slabs (to ACI-318).

▫ Zadco/Gasco Car Park Abu Dhabi, UAE

Client: ADNOC
Designation: Senior Structural Engineer,
Al Meraikhi Precast,
United Arab Emirates

Design and build project (to ACI-318), complete precast structure comprises single-unit three-storey columns, precast beams and precast pre-stressed hollow core slabs.

▫ Al Rahba General Hospital Abu Dhabi, UAE

Client: PWD
Designation: Senior Structural Engineer,
Al Meraikhi Precast,
United Arab Emirates

Re-design of the conventional in-situ floor structure into precast beams and hollow core slabs (to BS 8110). Precast panels used for façade cladding.

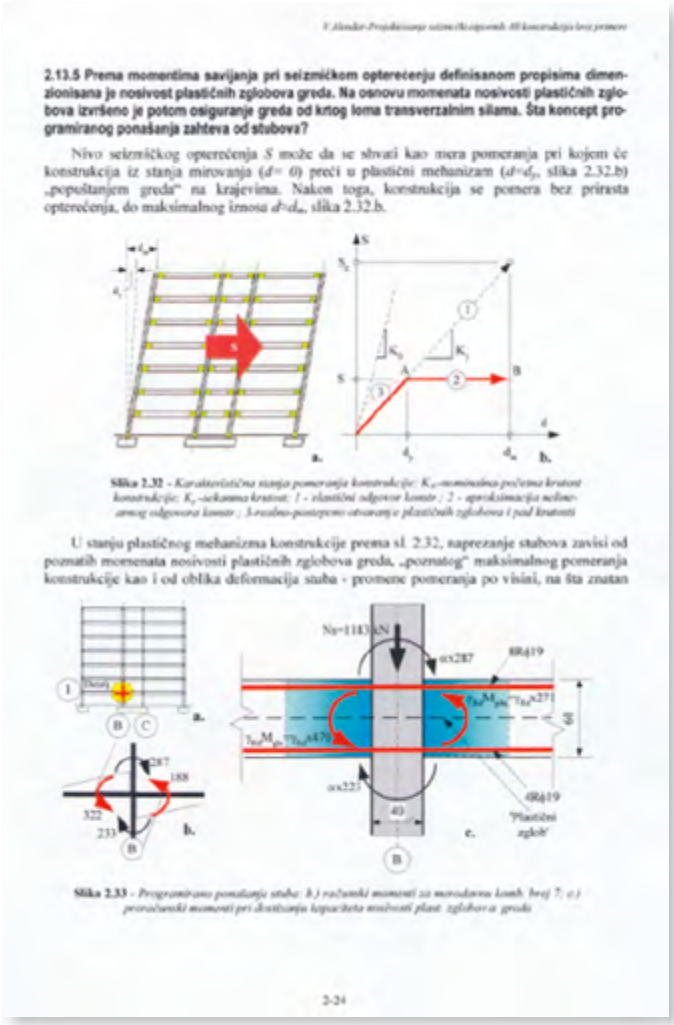
▫ Al Maria Cinema Abu Dhabi, UAE

Client: Al Faraa
Designation: Senior Structural Engineer,
Al Meraikhi Precast,
United Arab Emirates

Design and build project (to BS 8100), precast pre-stressed Inverted Tee beams and hollow core slabs.

Vanja Alendar

Position: Technical Director & Partner, DNEC-Serbia
Education: BSc. CEng.
University of Belgrade, Serbia
Awards: Lifetime Achievement Award
awarded by the Association of Structural Engineers Serbia in 2016



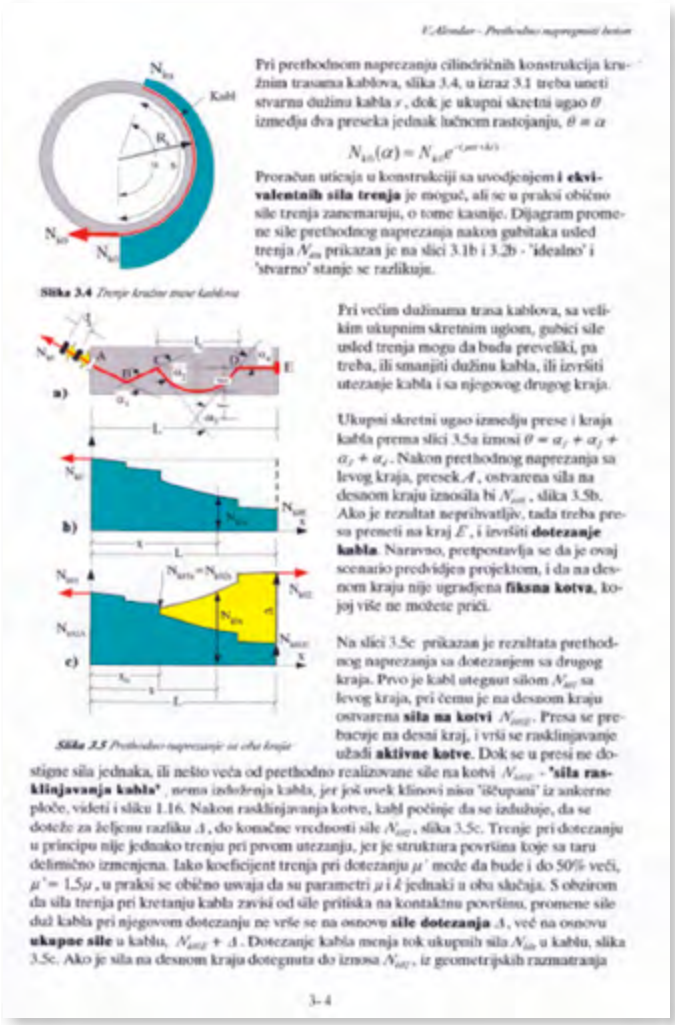
2.13.5 Prema momentima savijanja pri seizmičkom opterećenju definisanom propisima dimenzionisana je nosivost plastičnih zglobova greda. Na osnovu momenata nosivosti plastičnih zglobova izvršeno je potom osiguranje greda od krtog loma transverzalnim silama. Šta koncept programiranog ponašanja zahteva od stubova?

Nivo seizmičkog opterećenja S može da se shvati kao mera pomeranja pri kojem će konstrukcija iz stanja mirovanja ($d = 0$) preći u plastični mehanizam ($d = d_y$, slika 2.32.b) „popuštanjem greda" na krajevima. Nakon toga, konstrukcija se pomera bez prirasta opterećenja, do maksimalnog iznosa $d = d_u$, slika 2.32.b.

Slika 2.32 - *Karakteristična stanja pomeranja konstrukcije: K_o -početna (početna krutost konstrukcije; K_s -sekantna krutost: 1 - elastični odgovor konstr.; 2 - aproksimacija nelinearnog odgovora konstr.; 3-realno postepeno otvaranje plastičnih zglobova i pad krutosti*

U stanju plastičnog mehanizma konstrukcije prema sl. 2.32, naprezanje stubova zavisi od poznatih momenata nosivosti plastičnih zglobova greda, „poznatog" maksimalnog pomeranja konstrukcije kao i od oblika deformacija stuba - promene pomeranja po visini, na šta znatan

Slika 2.33 - *Programirano ponašanje stuba: b.) računski momenti za merodavnu komb. broj 7; c.) proračunski momenti pri dostizanju kapaciteta nosivosti plast. zglobova u gredi*



Pri prethodnom naprezanju cilindričnih konstrukcija kružnim trasama kablova, slika 3.4, u izraz 3.1 treba uneti stvarnu dužinu kabla s, dok je ukupni skretni ugao θ između dva preseka jednak lučnom rastojanju, $\theta = \alpha$

$$N_{k0}(\alpha) = N_{k0}e^{-(\mu\alpha+k\lambda)}$$

Proračun uticaja u konstrukciji sa uvođenjem **i ekvivalentnih sila trenja** je moguć, ali se u praksi obično sile trenja zanemaruju, o tome kasnije. Dijagram promene sile prethodnog naprezanja nakon gubitaka usled trenja $N_{k\alpha}$ prikazan je na slici 3.1b i 3.2b - 'idealno' i 'stvarno' stanje se razlikuje.

Slika 3.4 *Trenje kružne trase kablova*

Pri većim dužinama trasa kablova, sa velikim ukupnim skretnim uglom, gubici sile usled trenja mogu da budu preveliki, pa treba, ili smanjiti dužinu kabla, ili izvršiti utezanje kabla i sa njegovog drugog kraja.

Ukupni skretni ugao između prese i kraja kabla prema slici 3.5a iznosi $\theta = \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4$. Nakon prethodnog naprezanja sa levog kraja, presek A, ostvarena sila na desnom kraju iznosila bi N_{kA}, slika 3.5b. Ako je rezultat neprihvatljiv, tada treba presu preneti na kraj E, i izvršiti **dotezanje kabla**. Naravno, pretpostavlja se da je ovaj scenario predviđen projektom, i da na desnom kraju nije ugrađena **fiksna kotva**, kojoj više ne možete prići.

Na slici 3.5c prikazan je rezultata prethodnog naprezanja sa dotezanjem sa drugog kraja. Prvo je kabl utegnut silom N_{set} sa levog kraja, pri čemu je na desnom kraju ostvarena **sila na kotvi** N_{anch}. Presa se prebacuje na desni kraj, i vrši se rasklinjavanje uža **aktivne kotve**. Dok se u presi ne dostigne sila jednaka, ili nešto veća od prethodno realizovane sile na kotvi N_{anch} - **"sila rasklinjavanja kabla"**, nema izdužena kabla, jer još ovek klinovi nisu "ščupani" iz ankerne ploče, videti i sliku 1.16. Nakon rasklinjavanja kotve, kabl počinje da se izdužuje, da se dođe za željenu razliku Δ, do konačne vrednosti sile N_{anch}, slika 3.5c. Trenje pri dotezanju u principu nije jednako trenju pri prvom utezanju, jer je struktura površina koje se taru delimično izmenjena. Iako koeficijent trenja pri dotezanju μ' može da bude i do 50% veći, $\mu' = 1{,}5\mu$, u praksi se obično uvaja da su parametri μ i k jednaki u obu slučaja. S obzirom da sila trenja pri kretanju kabla zavisi od sile pritiska na kontaktnu površinu, promene sile duž kabla pri njegovom dotezanju ne vrše se na osnovu **sile dotezanja** Δ, već na osnovu **ukupne sile** u kablu, $N_{anch} + \Delta$. Dotezanje kabla menja tok ukupnih sila N_{sk} u kablu, slika 3.5c. Ako je sila na desnom kraju dotegnuta do iznosa N_{set}, iz geometrijskih razmatranja

Slika 3.5 *Prethodno naprezanje sa oba kraja*

For more than 30 years engaged as a teaching assistant and, later on as research associate at the Faculty of Civil Engineering in Belgrade, Serbia. Main research results published as contributions to five books, in more than sixty research-professional papers in national and foreign Journals or Symposia articles. Topics covered include the professional work as well as the problems of ultimate and serviceability limit states of concrete and prestressed structures, externally prestressed long-span concrete structures, slender concrete structures, the time-effects in statically undetermined concrete structures, computer-aided design, non-linear FEM analysis and seismic behavior of concrete structures. Two e-books: "Design of Prestressed Concrete Structures" and "Seismic Design of Concrete Structures". Member of Engineering Earthquake Research Institute - EERI, USA. (Reviewer for EERI World Housing Encyclopedia). Member of American Concrete Institute – ACI, USA

Engaged in design of more than seventy residential and office buildings, industrial and water supply plants, tanks and silos, sport's halls, water and communication towers and airplane hangars.

As an expert, took part in the evaluation, rehabilitation and strengthening of concrete bridges (by means of external post-tensioning and jacketing), buildings damaged by earthquake and buildings suffering from various deficiencies.

As a review engineer took part in the execution of many projects in Serbia and abroad. As a designer or consulting engineer worked in Russia, Iraq, Czech Republic, Uzbekistan and United Arab Emirates.

▫ Delta City Shopping Mall
Belgrade, Serbia

Client: DELTA M d.o.o.
and DELTA CITY d.o.o.

Architect: Moore Architects & Slavija Biro

Structural design: Faculty of Civil Engineering, Belgrade

First of the kind shopping mall in Serbia. Foot-print of 210x110 m, around 80,000 m^2 in area organized in four main levels.

Except between the mall and multi-storey garage, no other permanent movement joints designed. During construction, the building was temporarily divided in three blocks to compensate thermal and shrinkage movements.

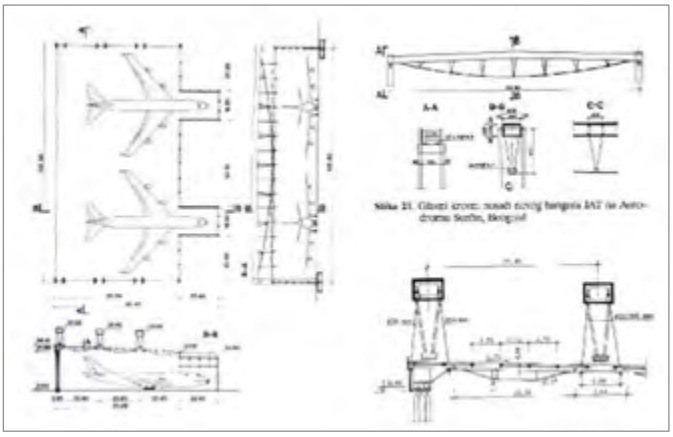
Hybrid structure, cast in place columns and precast beams and pre-tensioned hollow-core planks.

Designation: Preliminary and main design and "for construction" detailing of the structure. Support to Contractor in construction, and adjustments to Contractor's capabilities.

▫ Airplane Hangar JAT-Belgrade, Serbia

Client: JAT

Architect: I. Antic
Struct.design: Faculty of Civil Engineering, Belgrade
Author Prof. M. Ivkovic



Hangar for two Boeing 747 at Belgrade Airport. Hanging precast roof of about 10,000 m^2 carried by three externally post-tensioned RC main box-girders 136 m in span. Main girders casted on the ground level, post-tensioned and then lifted onto the top of the columns.

Designation: Main design and "for construction" detailing of externally post-tensioned girders. Proprietary softer developed for ultimate limit state and serviceability analysis, including time-dependent effects of creep, shrinkage and relaxation of internally statically indeterminate structure.

Design and for construction detailing of hanging precast roof structure – two chord girders with steel lower, and concrete upper chord. Design of roof plane acting as main horizontal diaphragm for seismic and wind actions.

▫ Reinforced concrete framed building strengthened by post-tensioning Belgrade, Serbia

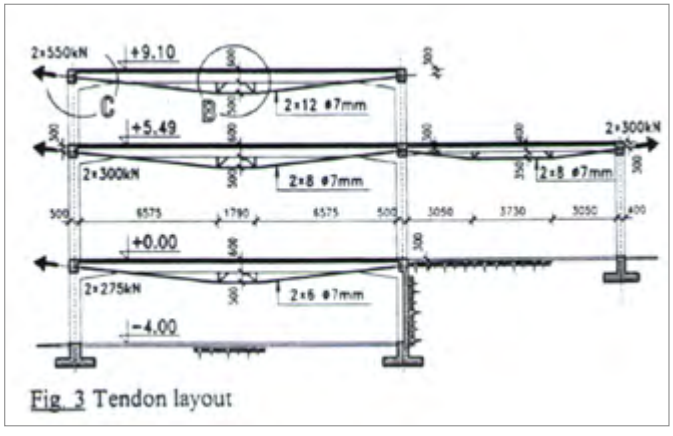


Fig. 3 Tendon layout

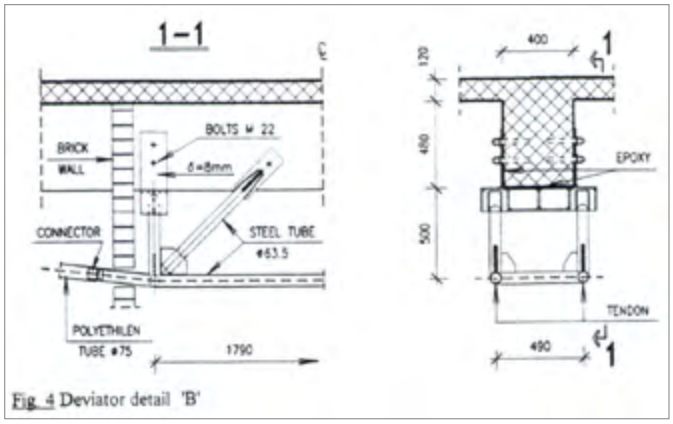


Fig. 4 Deviator detail 'B'

Building suffered serious cracking and deflection due to inadequate design.

To correct ultimate limit state capacity and to correct unacceptable deflections, "active" strengthening methodology is applied – external post-tensioning. Together with steel jacketing of damaged columns and beams, the function building is recovered.

Designation: Concept and main design and detailing for construction. Site supervision.

▫ Belgrade Arena - Belgrade, Serbia

Client: Limes

Architect: V. Slavica
Struct.design: Faculty of Civil Engineering, Belgrade
Author Prof M. Ivkovic

Multi-functional Hall with capacity up to 20,000 spectators. Roof structure 132x102 m in plan, supported by 14 columns 26 m in height. With a team of authors - The Yugoslav Structural Engineering Best Achievement award in 1999.

Externally post-tensioned main girders, four numbers along short span, and three numbers along longer span form a shallow two-way lens structure. Upper RC chord and lower tendons chord on maximum distance of 12 m are strutted apart by four-legs 'chairs' with RC tendon's deviators on lower and. Roof secondary structure made of RC beam elements.

Main roof structure assembled of precast RC elements at ground level, and prestressed. Lifting of the 3,400 tons mains structure onto the top of the main columns by means of Byging equipment. Final correction of tendon forces executed in final roof position.

Designation: Main design and for construction detailing of the roof structure, main columns and piles. Support to Contractor in construction, field measurement and adjustments to Contractor's capabilities.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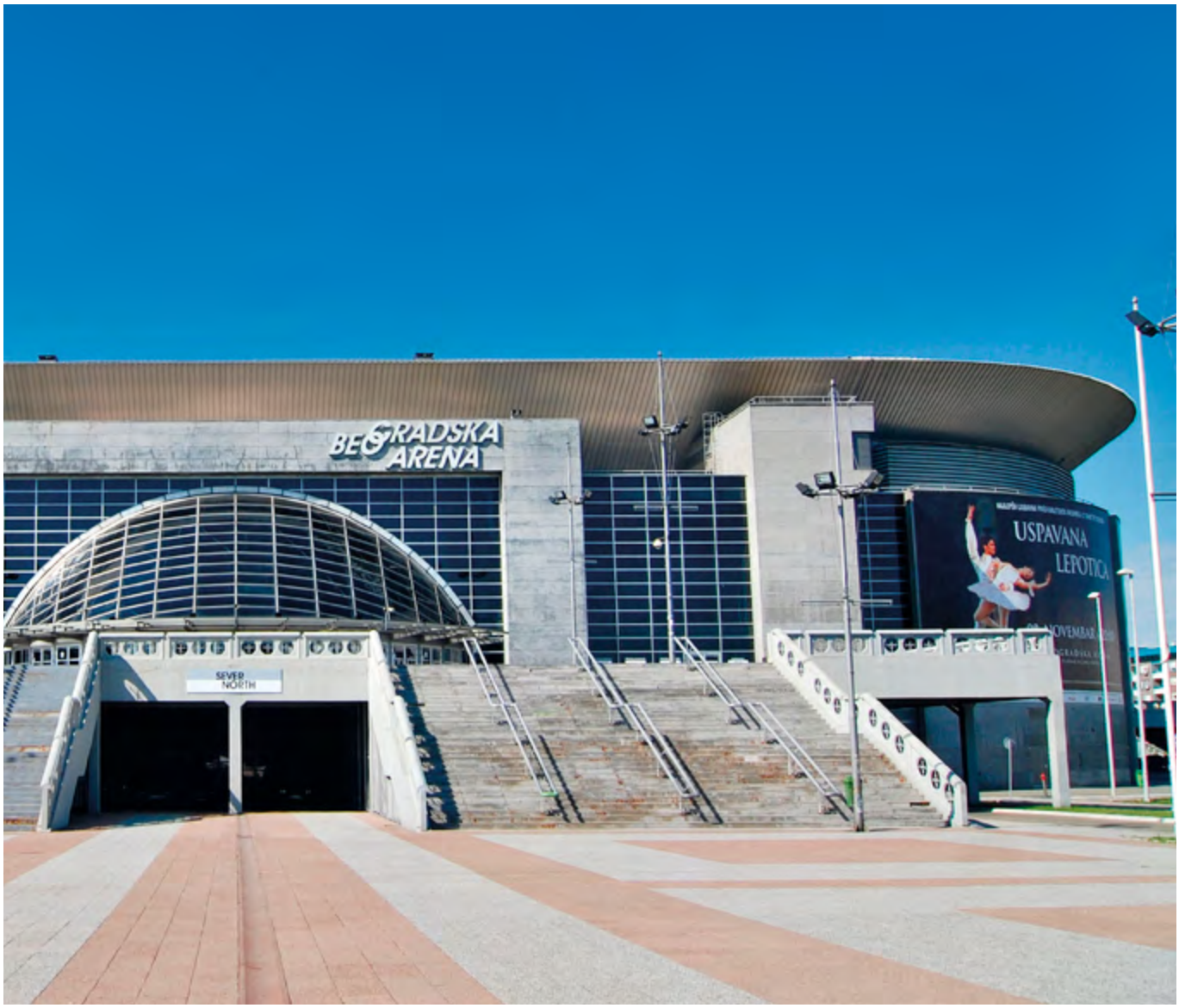
BEOGRADSKA ARENA
SEVER
NORTH
USPAVANA
LEPOTICA