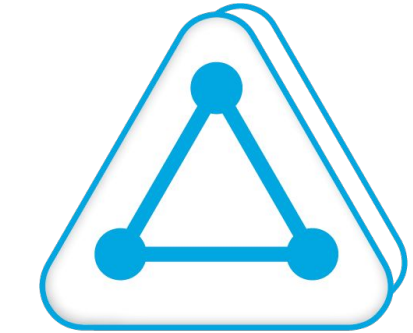


POLARKON

CORPORATE PRESENTATION

Table of Contents

Overview

Established in **1995**

Headquartered in **Düsseldorf, Germany**

Engineering and **fabrication** by **POLARKON AS**

“Design-Build” type operating engineering and steel fabrication company

Two fabrication facilities with

- Total of **34.000 m^2**,
- **14.000 m^2** of closed area for fabrication

Completed more than **600 unique “design-build” projects** internationally

Offers **turnkey “design-build”** engineering services such as **structural modelling, architectural design** and **connection detailing**

Corporate Structure

POLARKON

POLARKON's **main company** in Türkiye

Headquarters
Fabrication Facilities
Structural Design & Engineering
Business Development

ARER GROUP OF COMPANIES

ARER

Former **General Contracting Company**

Infrastructure Works
Highways
Bridges
Reinforced Concrete Buildings

argesis PROJE DANIŞMANLIK

ARGESIS

Research and Development (R&D) Company

Structural Health Monitoring
Software Development
Engineering & Design Studies

POLARKON

Polarkon GmbH

POLARKON's **Europe-based affiliate**

Business Development
Project Management
Site Management
Sales

POLARKON

Polarkon Middle East

POLARKON's **Gulf-based affiliate**

Business Development
Project Management
Site Management
Sales

Business Scope

Products

Structural Design & Detailing

Structural Health Monitoring (PYSIS)

Solar Carports

Services

Space Frame & Conventional Steel Structures

Production Halls

Logistics Centers

Sports Facilities

Airports

Energy Plants

General Contracting Works

Warehouses & Offices

Industrial Buildings

Sports Facilities

Shopping Malls

Convention Centers

Turnkey Solutions for Industrial Buildings

Warehouses

Industrial Buildings

Sports Facilities

Shopping Malls

Convention Centers

Steel Platforms

Steel Mezzanine Platforms

Steel Handrails

Steel Ladders & Cages

Steel Casterdeck Systems

Sustainable Corporate Growth

POLARKON is capable of undertaking projects valued **up to 25 million Euros** both domestically and internationally

For projects ranging **from 25 million to 100 million Euros**, POLARKON leverages its expertise **by forming joint ventures** with trusted associate companies to deliver exceptional construction services.

Fabrication Facilities

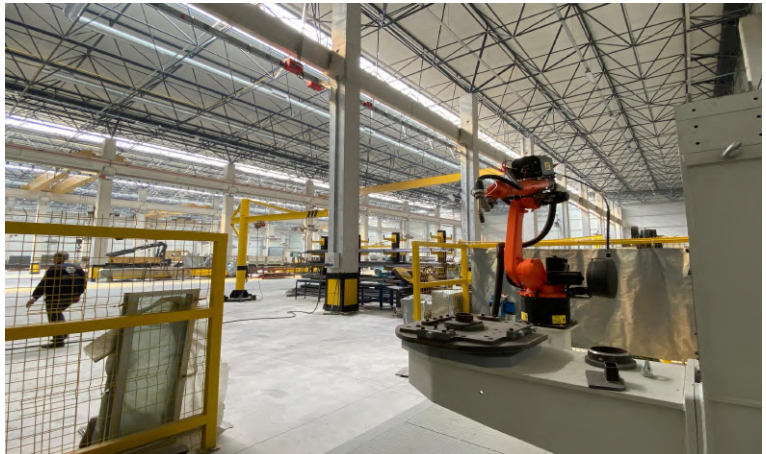
Located in **Polatlı Industrial Zone, Ankara, Türkiye**

Total area of **34.000 m² with 14.000 m² of closed area** for fabrication

16.000 tons of annual capacity

Up to EXC3 class steelworks conforming **EN, BS** and **ASTM** standards

Powered by 640 kWp of On-Grid PV System



Quality Certificates

ISO 9001:2015 Quality Management System

ISO 45001:2018 Occupational Health and Safety Management System

ISO 14001:2015 Environmental Management System

EN 1090-1:2009 CE Marking for Steel Structures

EN ISO 3834-2 Quality Requirements for Fusion Welding of Metallic Materials

TSEK Certificate of Conformance to Turkish Standards

Quality Control

POLARKON

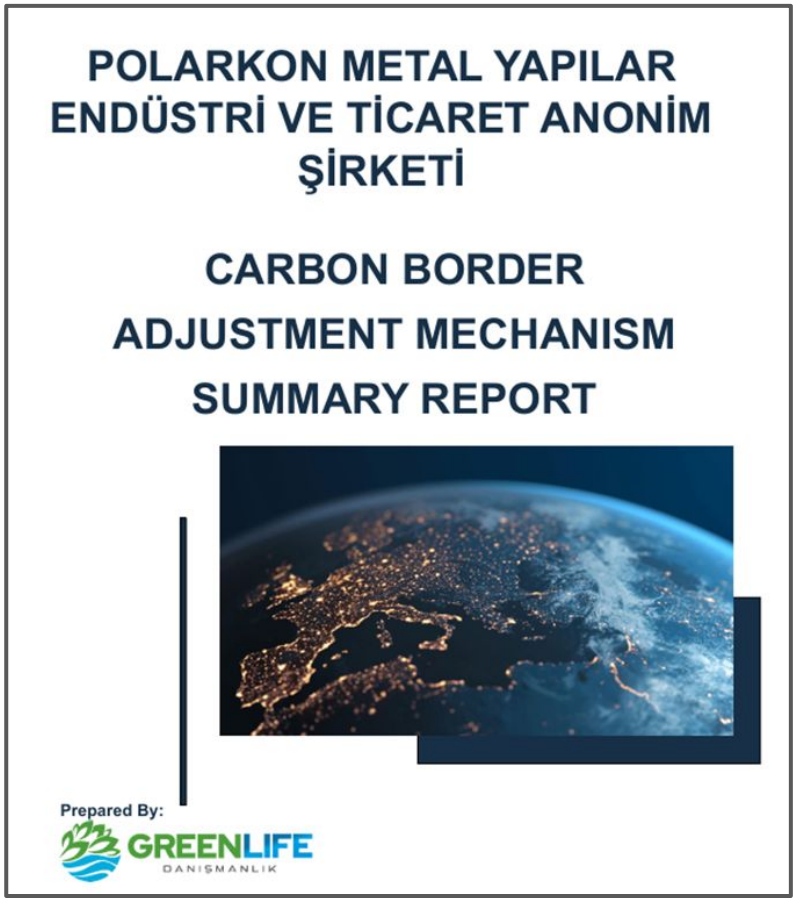
Documentation	Material Check	Preparation for Fabrication	Fabrication	Tests	Protection
Method Statement ITP Shop Drawings Material Lists Preparation of Inspection Forms	Material Acceptance (Physical observation) Chemical and Mechanical Tests Material Compliance for Technical Specifications	Thickness Checks Lamination Controls Traceability Strategy Welder's Certificate	Weldlog PQR (Procedure Qualification Record) WPS (Welding Procedure Specification) Final Checks (Quantity controls)	Destructive & Non-Destructive Tests VT (100%), MT, PT, RT Tensile Strength Tests	Sand Blasting Check Thickness Checks for Corrosion Protection Coating Paint Repair Reworks (if required)

Project Locations

POLARKON has completed **more than 600 unique design-build projects** worldwide, including the following countries;

- Azerbaijan
- Ethiopia
- Germany
- Italy
- Kazakhstan
- Kuwait
- Liberia
- Nigeria
- Qatar
- Rwanda
- Saudi Arabia
- Tunisia
- Turkmenistan
- Türkiye
- United Arab Emirates
- Uzbekistan

Our Way to Green Steel



Increasing energy costs and the reduction of operational carbon emissions become increasingly important over time

In the future, it is likely that planning permissions will be easier to be obtained with sustainable and environmentally friendly solutions.

Steel can be recycled any number of times without loss of quality or strength.

Components are **fabricated under factory-controlled conditions with minimal waste.**

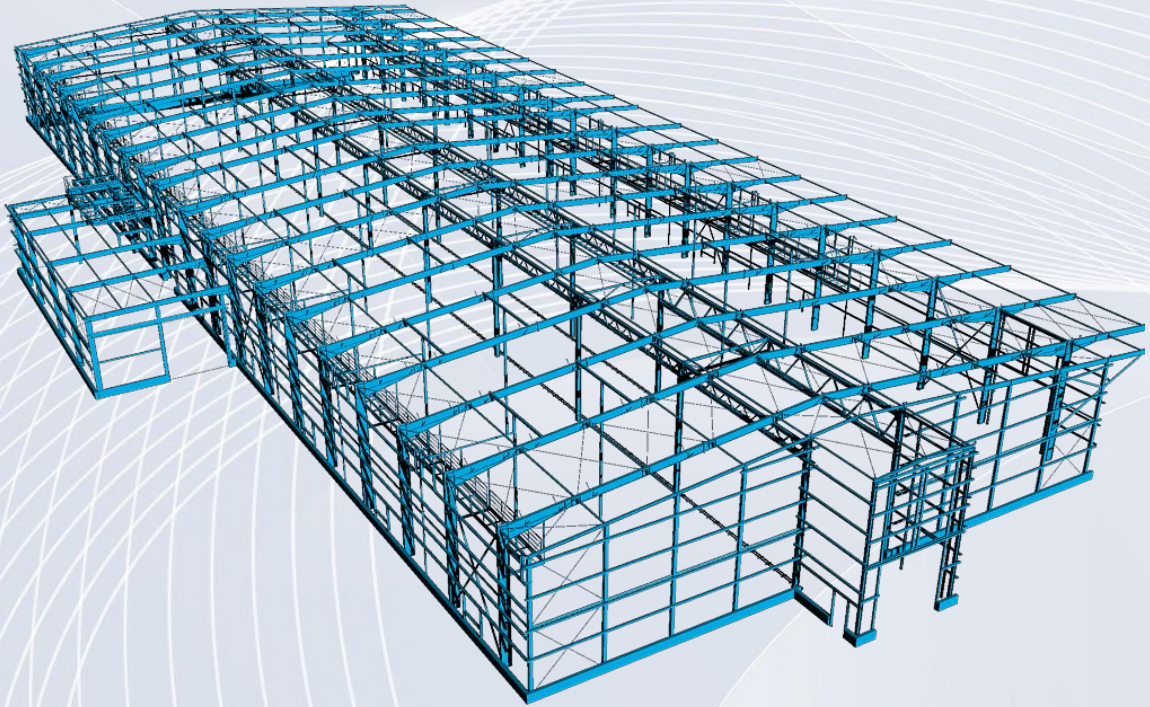
- Cuts are recycled as scrap
- Rarely any waste on site

Steel structures **can be easily disassembled.**

- Recycling and reuse

Structural Design & Detailing

POLARKON



SAP2000

ETABS®

Tekla Structures

N MAN

Structural Design & Detailing

POLARKON is capable of using **Eurocodes** and **American codes** for structural design and detailing.

Main Design codes used in POLARKON's projects are listed as follows;

EN 1993-1-1:2005: "Eurocode 3: Design of Steel Structures Part 1-1: General Rules and Rules for Buildings"

EN 1990:2002: "Eurocode - Basis of Structural Design"

EN 1991-1-4:2005: "Eurocode 1: Actions on Structures - Part 1-4: General Actions - Wind Actions"

UBC 97: "Uniform Building Code"

IBC 2012: "International Building Code 2012"

ASCE/SEI 7-05: "Minimum Design Loads for Buildings and Other Structures"

ANSI/AISC 360-05: "Specification for Structural Steel Buildings"

AWS D1.1:2000: Structural Welding Code

Wireframe Modeling
(Rhino, Grasshopper, AUTOCAD)

⇩

Structural Analysis
(Ideastatica, ETABS, FrameCAD, SAP2000)

⇩

3D/BIM Modeling
(TEKLA, Navisworks)

⇩

Connection Design
(TEKLA, Ideastatica)

⇩

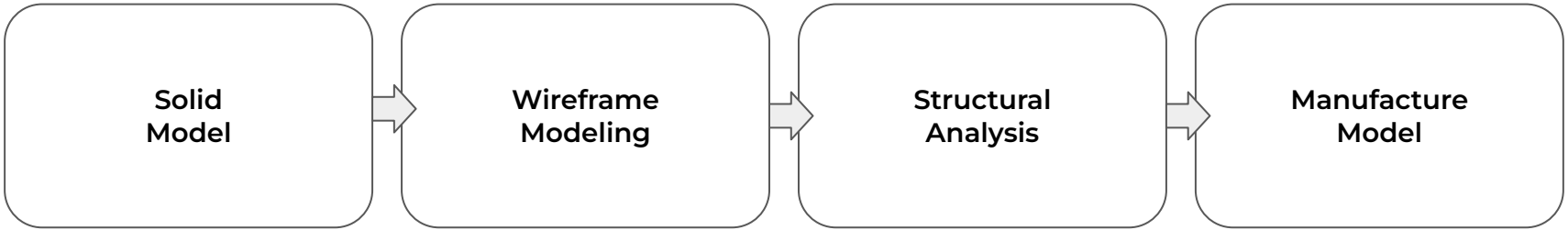
TEKLA Fabrication Modeling

⇩

Calculation Reports
(SAP2000)

Structural Design & Detailing

POLARKON



Roof Surface Geometry
(Provided by the Client)

REVIT

Space Frame Wireframe Model

(Created by RHINO-GRASSHOPPER software)

AUTOCAD

Wireframe model imported into structural analysis software

SAP2000 v.25 is used for structural analysis

Ideastatica v22

FrameCAD

3D Assembled Model for the whole structure

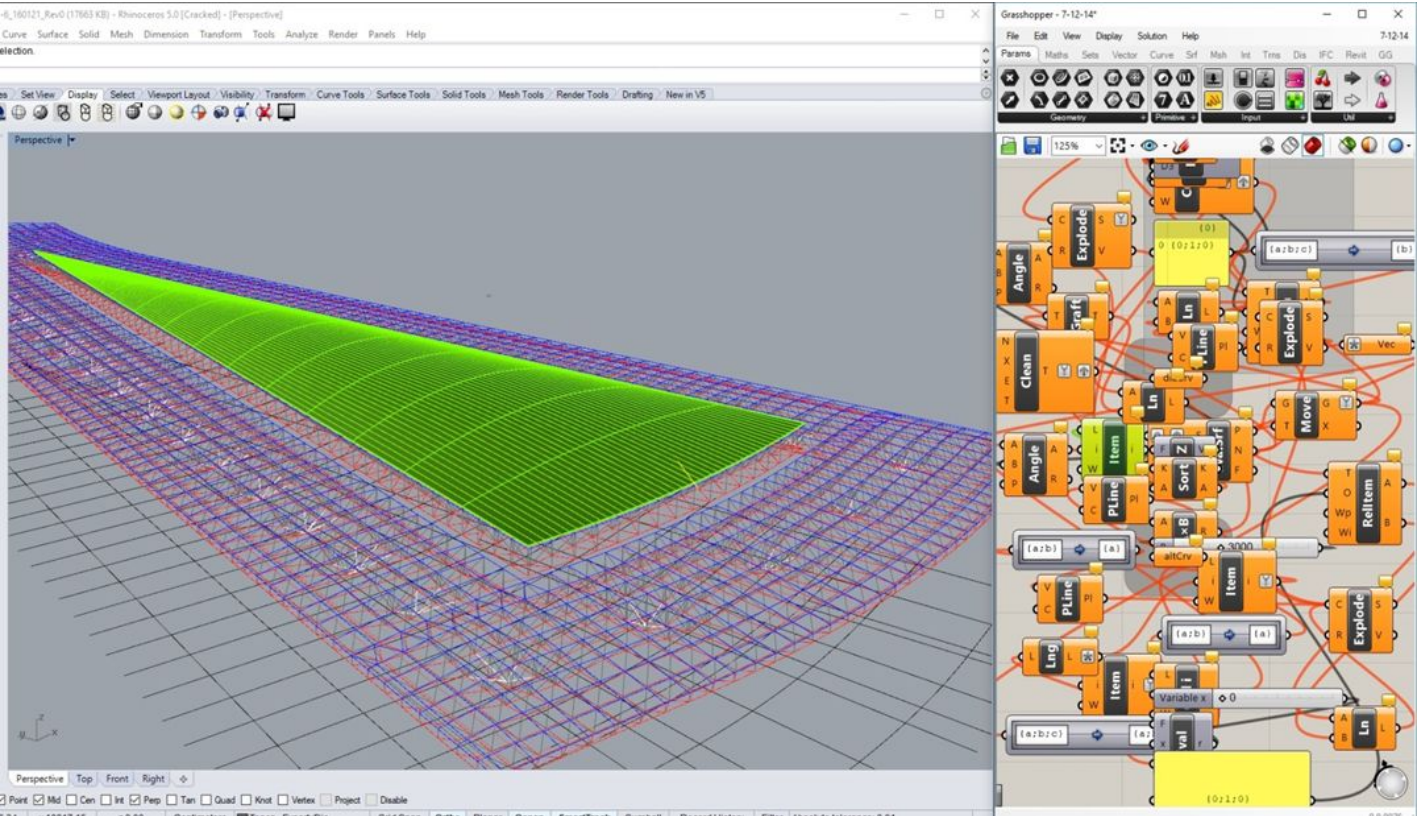
Shop drawings for the main members and components

Detailed drawings of connections and stuffers

TEKLA STRUCTURES

Structural Design & Detailing

Wireframe Modeling



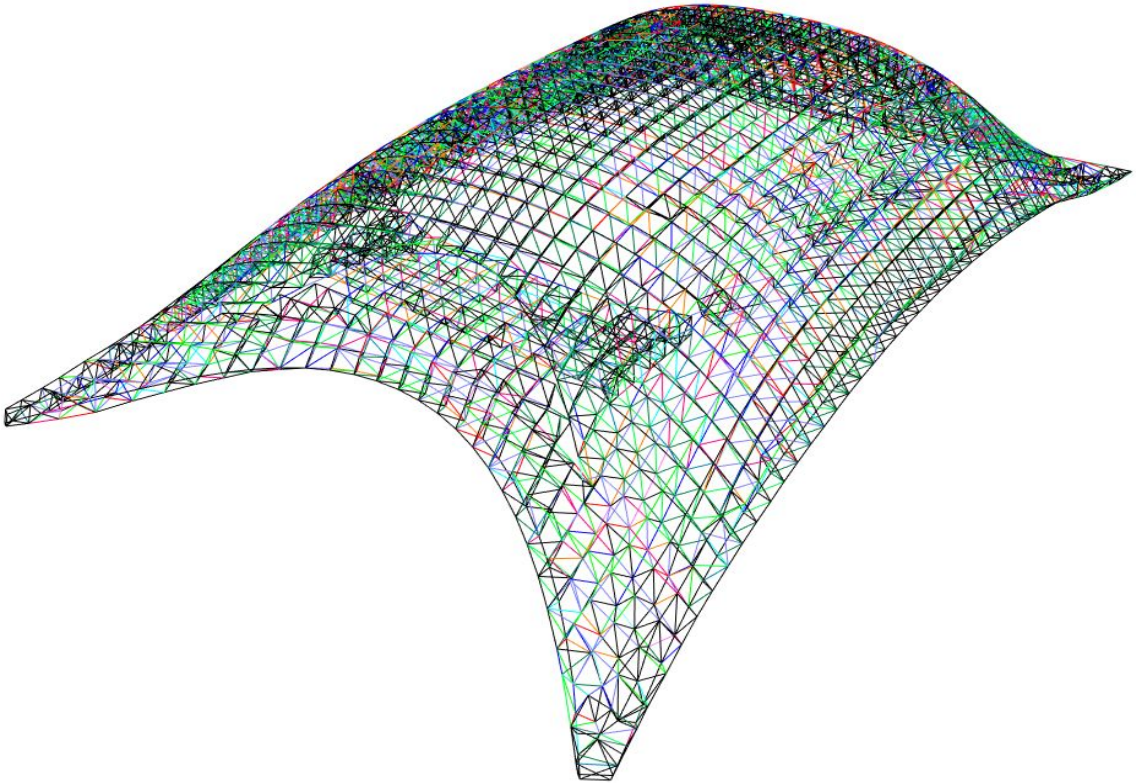
- **AUTOCAD**
- **RHINO**
- **GRASSHOPPER**

softwares are used for generating wireframe models for the projects.

It's also possible to generate wireframe models even for complex architectural geometries.

Structural Design & Detailing

Structural Analysis



Geometry developed in Rhino or AutoCAD is imported into the Structural Design Software by **SAP2000, ETABS** and **FRAMECAD**.

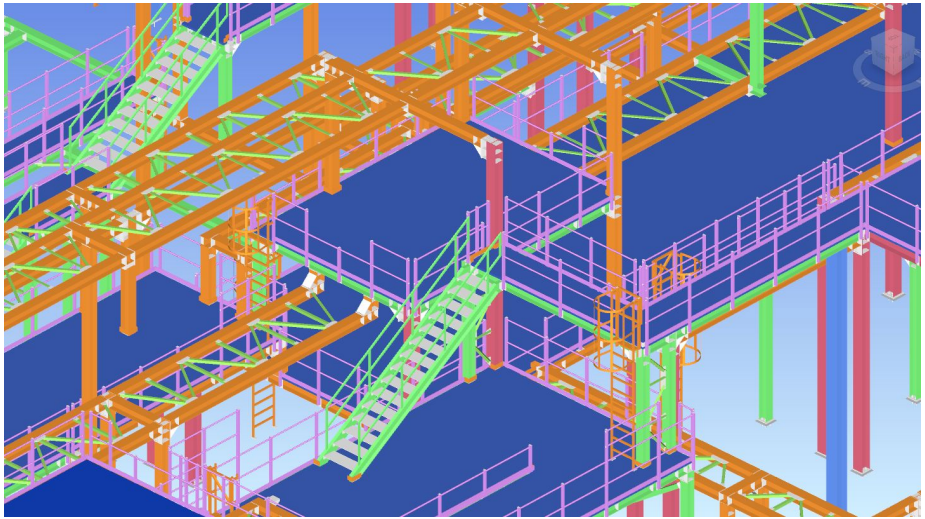
Structural designs conforming International Codes such as;

- **Eurocodes**
- **American Codes**
- **British Codes**
- **SNIP**

Structural Design & Detailing

3D/BIM Modeling

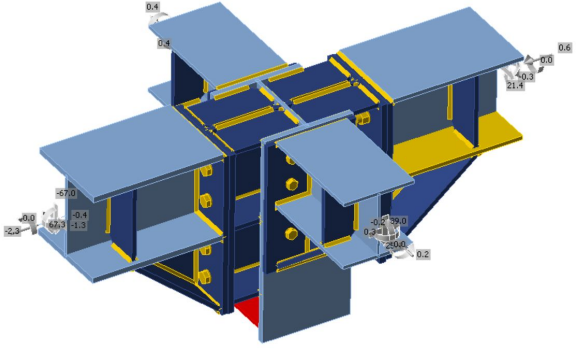
POLARKON



- Developing 3D model in coordination with other disciplines
- BIM Methodology is used to generate full model
- Real time and online design development
- Detailed clash checks in Navisworks

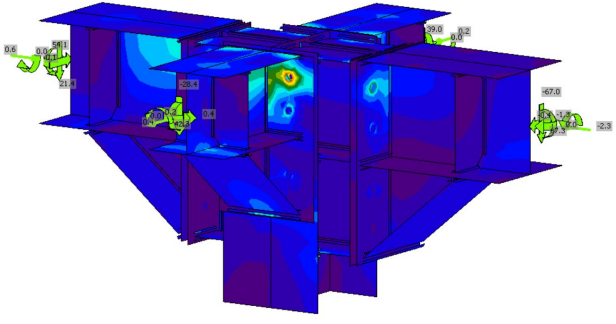
Structural Design & Detailing

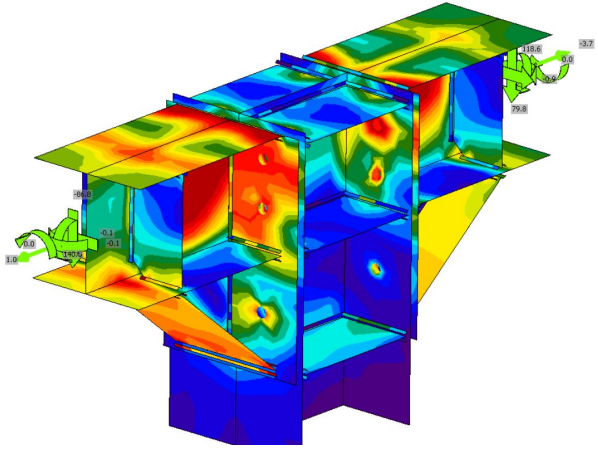
Connection Design



TEKLA Structures

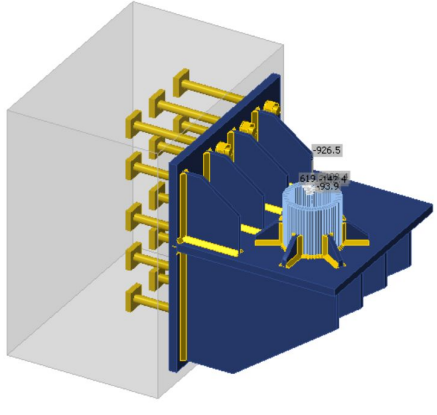
To pre-design and modeling connection details





IDEASTATICA

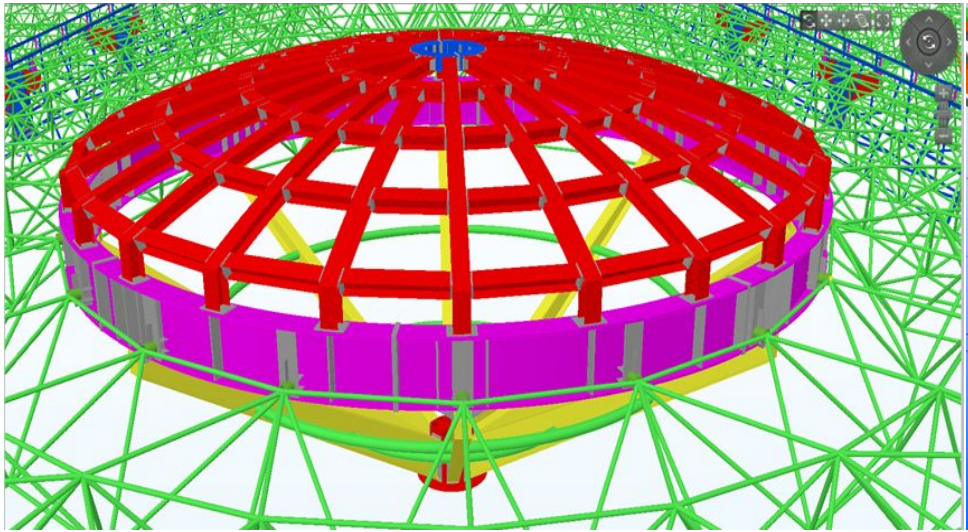
To perform connection structural design

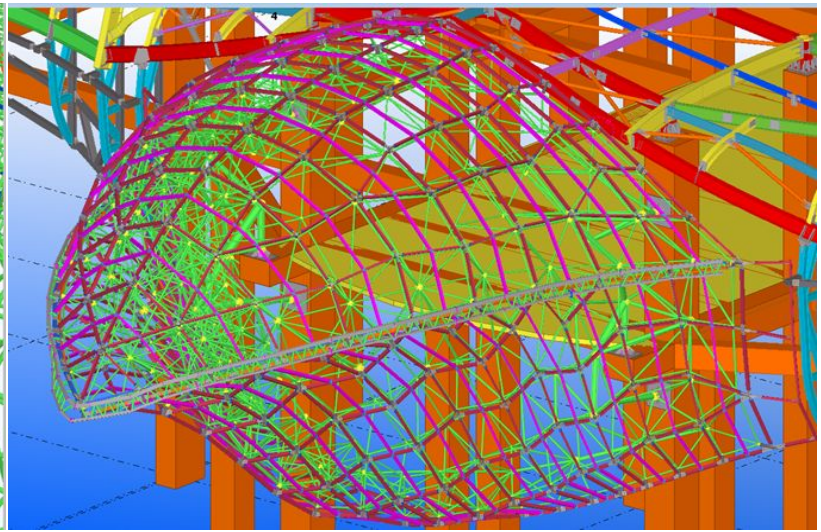


Structural Design & Detailing

TEKLA Fabrication Modeling

POLARKON





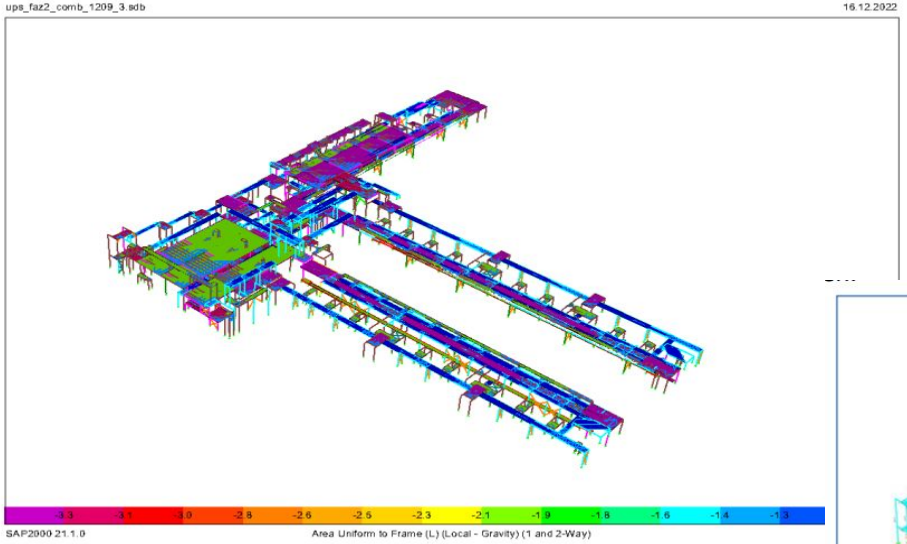
Tekla Structures software is used for:

- Detailing of steelworks
- Obtaining shop drawings
- Layout drawings of the installation

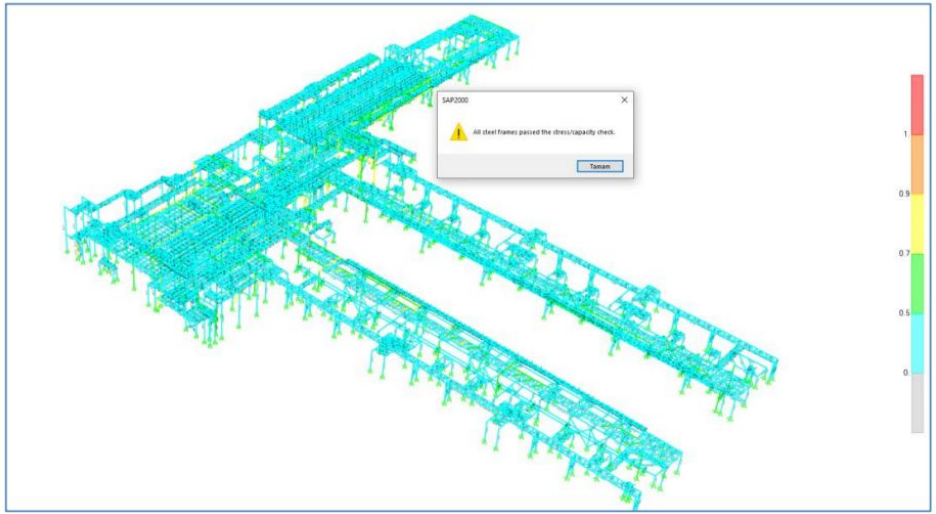
The 3D model can be exported in AutoCAD and IFC formats which are compatible with most of the software.

Structural Design & Detailing

Calculation Report



POLARKON prepares and submits the Structural Design Report for approval by the authorities, including material definitions, geometry input of the model, load cases and combinations, stress checks, deflection checks and etc.



Conventional Steel Structures

POLARKON

Conventional Steel Structures

Izmir Airport, **2.460 tons**

POLARKON is able to execute **all types of steel constructions** as “Design and Build”

Saves time by effective use of design, fabrication and installation schedules

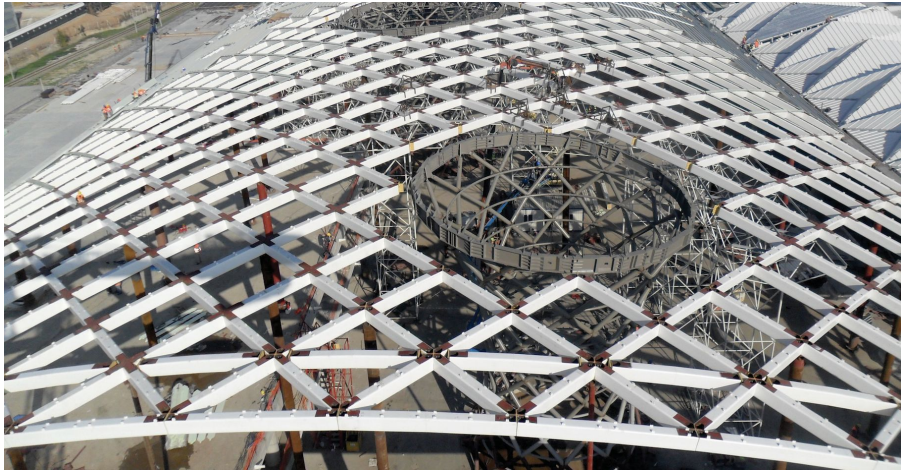
Generates savings due to less cost for design and coordination and less time needed for projects,

Complies with **all international standards**

Erzincan Airport, **2.600 tons**

Istanbul Airport, **10.000 tons** with **145.000 m²**

Conventional Steel Structures



Space Frame Structures

POLARKON

Space Frame Structures

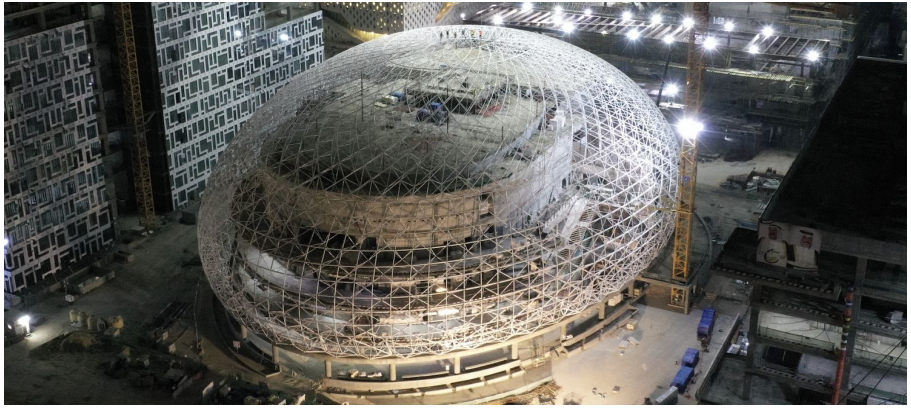
A **rigid, lightweight, truss-like structure** constructed from interlocking tubular members in a geometric pattern

Can be used to **cover large span areas with no or minimum interior supports**

Like the truss, a space frame is **strong due to the inherent rigidity of the triangle structure**

The economy of the system comes from transmitting bending moments as tension and compression loads along the length of each tubular member

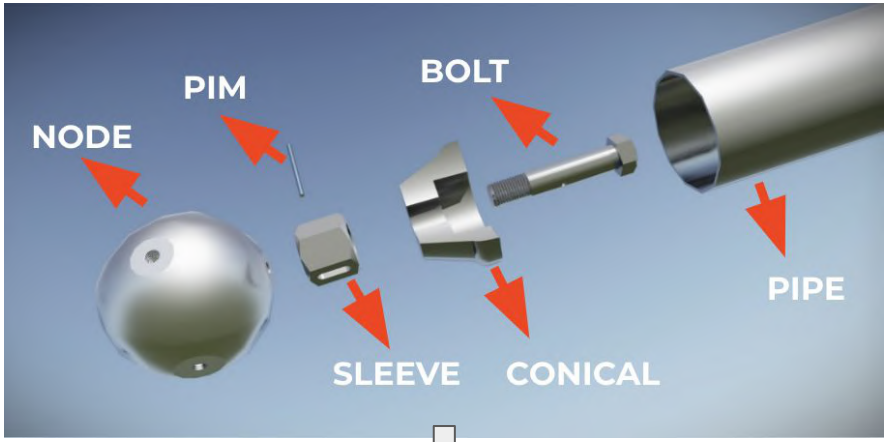
Thermal Power Plant in **Soma, Türkiye,** **16.000 m²**

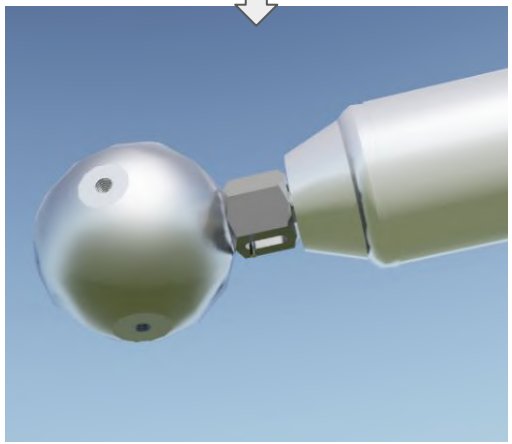


University Convention Hall in **Kuwait City, Kuwait,** **11.000 m²**

Al Shaheed Park III in **Kuwait City, Kuwait,** **15.400 m²**

Space Frame Structures





External loads acting on space frame structures are transferred into three dimensional axials tubular members through spherical nodes

Tubular Members

Main part of the space frame to transfer tension and compression loads.

Nodes (Spheres)

Connects tubular members to each other.

Bolts

Members transferring tension loads.

Nuts

Members transferring compression loads.

Conicals

Connection part of tubular members to bolts and nodes.

Space Frame Structures

Space Frame Structures

Conventional Steel vs. Space Frame Structures

Key Concepts

POLARKON

Conventional Steel Structures

Despite using powerful tools CAD Softwares like TEKLA, structural modeling is;

- ❏ Complicated and takes too much time
- ❏ Very costly in terms of engineering efforts
- ❏ Skilled experienced technicians are mandatory to have
- ❏ Any possible mistake may result in crucial time and money loss

Space Frame Structures

Creating structural models in space frame is;

- ❏ Very simple and fast automatic modeling
- ❏ Highly accurate in terms of modelling
- ❏ Cost effective and bears minimum costs

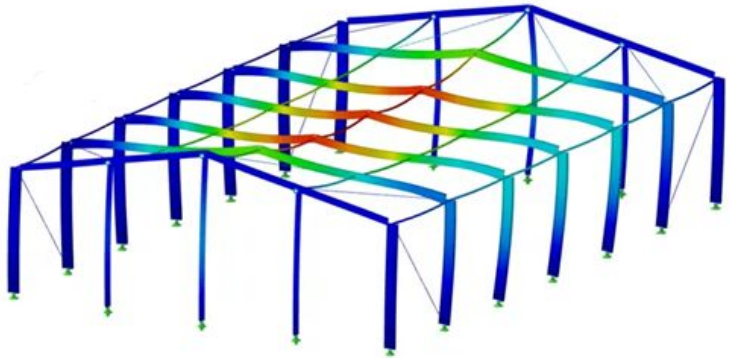
Conventional Steel vs. Space Frame Structures

Design: Structural Analysis

POLARKON

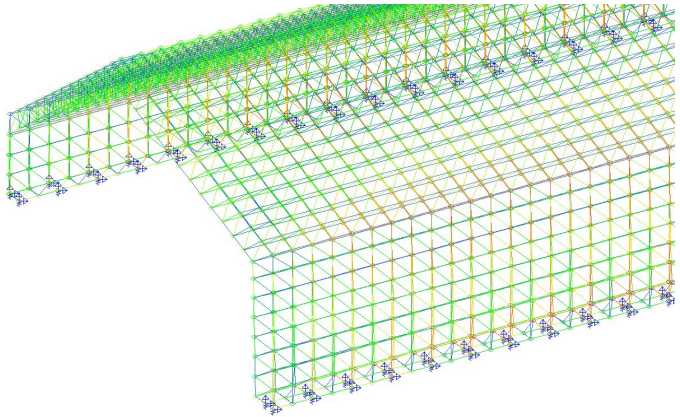
Conventional Steel Structures

- Structural analysis needs special attention to reach correct results, takes long time due to complexity of models
- Global optimization is not possible, only basic manual improvements can be done



Space Frame Structures

- Very fast and efficient analysis
- Highly optimized
- Verification with universal structural analysis software (such as SAP 2000) is possible



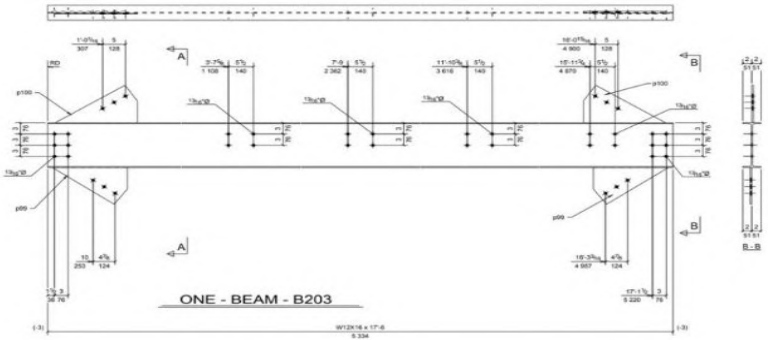
Conventional Steel vs. Space Frame Structures

Design: Shop Drawings & Revisions

POLARKON

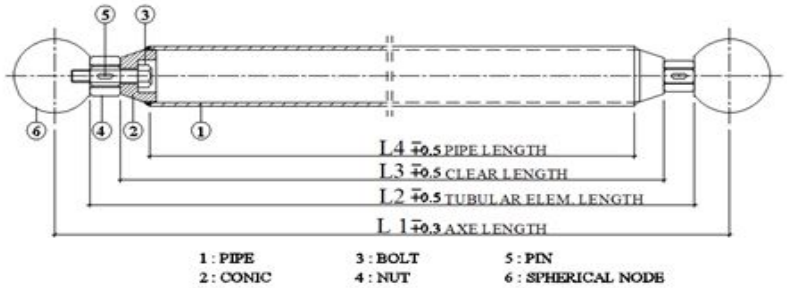
Conventional Steel Structures

- ❏ Besides structural design, connection design + shop drawings are costly
- ❏ takes long time
- ❏ Shop drawings may include mistakes which may result in extra costs
- ❏ Any revision also takes time and cost effort



Space Frame Structures

- ❏ Shop drawings by fully automatic post-processing
- ❏ Fully Digital output, suitable for CAM
- ❏ Due to Automatic generation, No possibility for mistakes in shop drawings
- ❏ Revisions have no cost, very easy and quick.



Conventional Steel vs. Space Frame Structures

Design: Connection Detailing

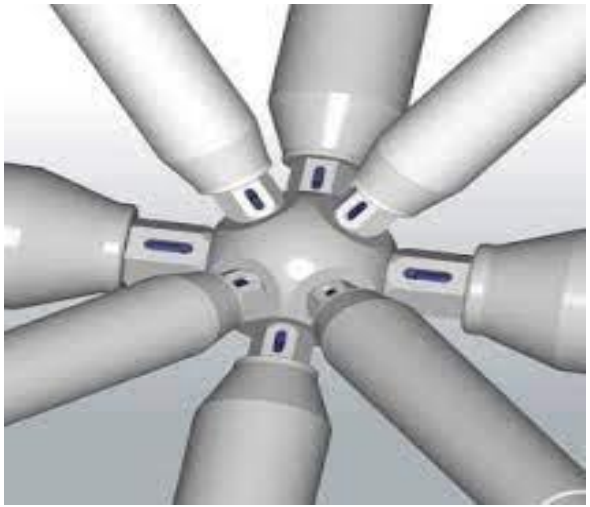
POLARKON

Conventional Steel Structures

- Takes long time to prepare various connections, connection members, structural members and general optimization.

Space Frame Structures

- Simple and quick system with frame and sphere members. Easy to prepare the architectural and structural models.



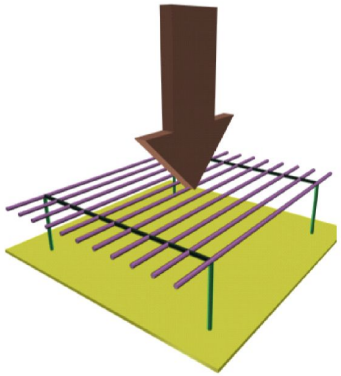
Conventional Steel vs. Space Frame Structures

Structural Behavior: Stability & Optimization

POLARKON

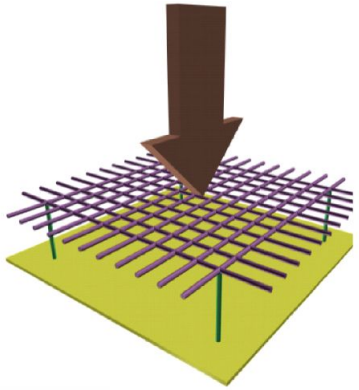
Conventional Steel Structures

- Heavy solutions with limited optimisation
- Requires additional members for lateral stability
- More expensive due to heavy structure



Space Frame Structures

- Lightweight solutions with highly optimized structures
- High stability due to the 3 dimensional load distribution structure
- The most economic solution due to its lightweight structure



Conventional Steel vs. Space Frame Structures

Fabrication: Cost & Time

POLARKON

Conventional Steel Structures

- Large areas with heavy/expensive equipments are necessary
- CAMs are applicable in limited operations
- Manuel fabrication methods are used
- Difficult and costly to handle and store the material
- High fabrication costs in overall unit prices

Space Frame Structures

- Compact factory and economic machinery are enough for high volume of production
- Suitable for mass production
- Easy to handle and store the material
- Fully/semi automatic production operations
- Very economic, lightweight and optimum solutions especially for span lengths more than 20 m
- Low Fabrication cost in overall unit prices

Conventional Steel vs. Space Frame Structures

Fabrication: Quality Control

POLARKON

Conventional Steel Structures

- Every project needs a special ITP as per project requirements.
- High costs for non-destructive test
- Lower sensitive fabrication with manuel fabrication with much more human error

Space Frame Structures

- A typical standardized ITP is applicable for all projects, Very efficient and fast, quality control process by an efficient and simple ITP
- Limited non-destructive evaluation requirements, quality and control costs are low
- Easy and cheap to apply the typical quality plan and assuring in high level

Conventional Steel vs. Space Frame Structures

Fabrication: Painting

POLARKON

Conventional Steel Structures

- ❏ wet paint layers take much more time due to drying stages
- ❏ slow progress
- ❏ needs big areas and heavy equipments
- ❏ generally %30-%40 paint material wasted
- ❏ Expensive and time taking methodology

Space Frame Structures

electrostatic powder paint;

- ❏ Fast painting with robotic system
- ❏ Uniform and reliable surface finishing
- ❏ No waste of material
- ❏ Cheap and clean technology

Conventional Steel vs. Space Frame Structures

Transportation: Cost & Efficiency

POLARKON

Conventional Steel Structures

- ❏ High transportation cost due to bulky structure
- ❏ Difficulty in loading and unloading
- ❏ Often inefficient transportation
- ❏ Often requires special transportation alternatives

Space Frame Structures

- ❏ Low transportation cost due to light and compact material
- ❏ Always efficient loading
- ❏ Never requires special transportation

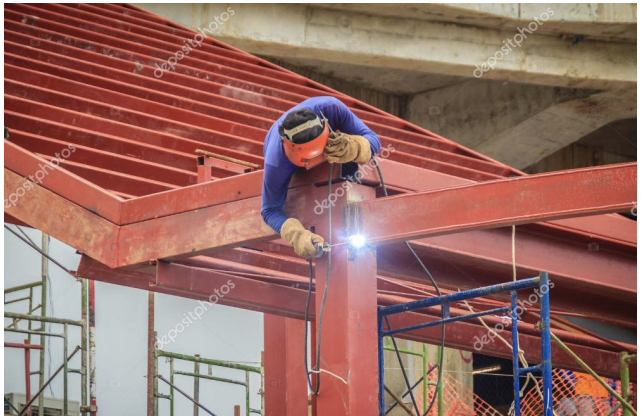
Conventional Steel vs. Space Frame Structures

Installation: Site Welding & Torquing

POLARKON

Conventional Steel Structures

- ❏ Often needs welding at site
- ❏ Need torquing which takes time and effort
- ❏ Hard to install at narrow site conditions due to comprising of big and heavy parts



Space Frame Structures

- ❏ Does not need welding at site
- ❏ Space frame bolts are never torqued
- ❏ Can be installed even at narrow site conditions due to comprising of smaller and light parts

Conventional Steel vs. Space Frame Structures

Installation: Cost & Schedule

POLARKON

Conventional Steel Structures

- ❏ Takes much more time for installation and cost
- ❏ Need more quantity and capacity of cranes due to bulky and heavy material
- ❏ Higher installation costs

Space Frame Structures

- ❏ Fast installation (Up to **750 m²/day**)
- ❏ Less quantity and capacity of cranes
- ❏ Lower installation costs

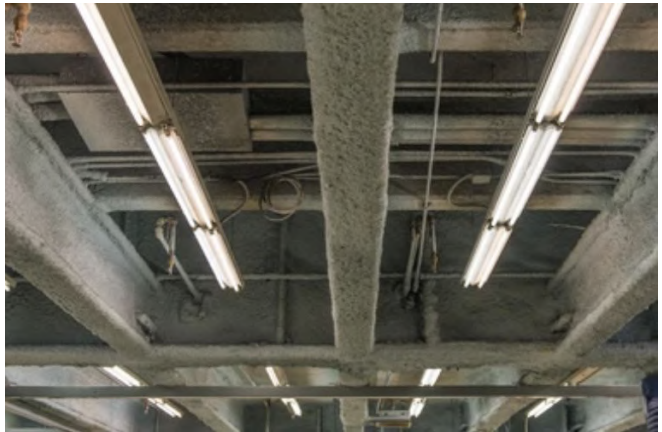
Conventional Steel vs. Space Frame Structures

Installation: Service Load Application

POLARKON

Conventional Steel Structures

- Has limited locations on roof to hang service equipments due to long distances between trusses
- Needs to have heavy secondary structure to create fixation locations between main trusses



Space Frame Structures

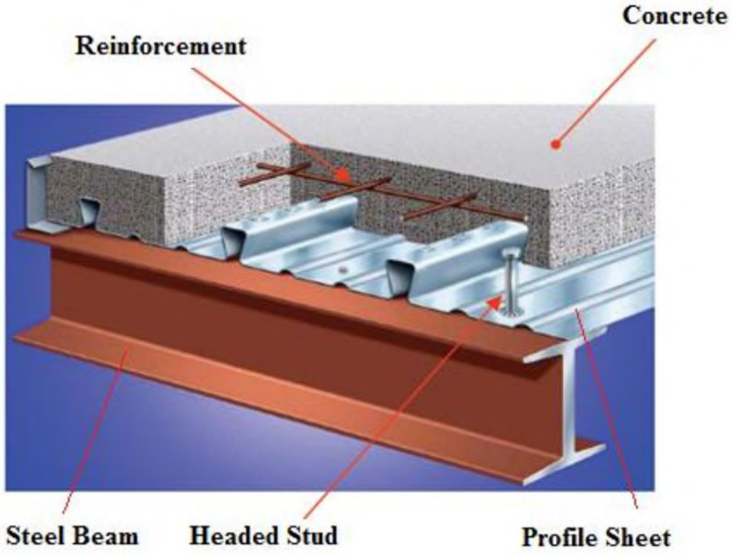
- Allows to hang all kind of service equipment practically anywhere on the roof
- Doesn't need heavy secondary structure for fixations

Conventional Steel vs. Space Frame Structures

Load Capacity

Conventional Steel Structures

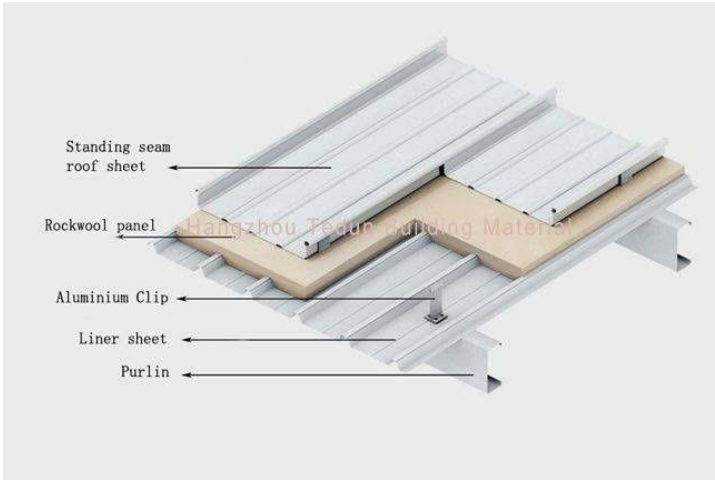
- Should be preferred under very heavy loads such as floors. (>500 kg/m²) as well as (<500 Kg/m²)



Space Frame Structures

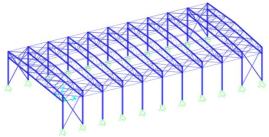
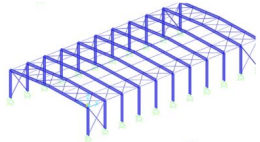
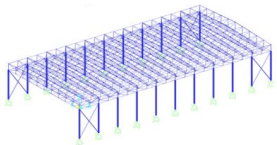
- Not suitable for dead loads>500 kg/m² due to connection detail and capacity

(This is POLARKON's design rule, there is no such strict scientific evidence)



Conventional Steel vs. Space Frame Structures

Carbon Footprint

Construction System		Total CO2 Emission (t)		
Name	***3D Model***	***t CO2 e/t***	***t***	***CO2***
Truss Structure		845	110	**92.950**
Hot Rolled Steel		845	144	**121.680**
Space Frame		1055	76	**80.180**

No	Product Name	CN Codes	SE (direct) tCO2e/t	SEE (direct) tCO2e/t	SE (indirect) tCO2e/t	SEE (indirect) tCO2e/t	SEE Total Emission tCO2e/t
1	SPACE FRAME	73089098	0,135	0,652	0,100	0,403	1,055
2	STEEL CONS.	73089098	0,135	0,436	0,100	0,409	0,845

POLARKON METAL YAPILAR ENDÜSTRİ VE TİCARET ANONİM ŞİRKETİ

CARBON BORDER ADJUSTMENT MECHANISM SUMMARY REPORT

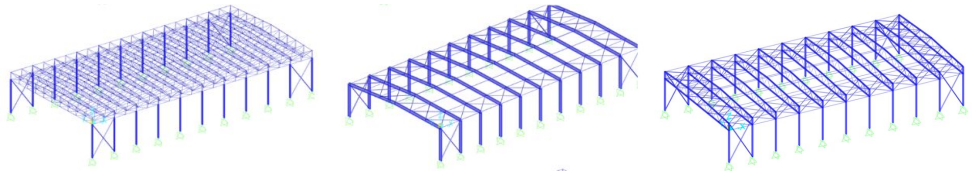
Prepared By:

GREENLIFE DANIŞMANLIK

Conventional Steel vs. Space Frame Structures

Comparison Study

Comparison Table			
Component	**Space Frame**	**Steel Structure**	**Truss Structure**
Roof	51 t	82 t	69 t
Columns	17 t	42 t	21 t
Purlin	8 t	20 t	20 t
Total	**76 t**	**144 t**	**110 t**
Deflection	L/520	L/320	L/660
Column Section	HEA280	HEA700	HEA280
Purlin Spacing	3m	3m	3m



Conventional Steel vs. Space Frame Structures

Results & Conclusions

POLARKON

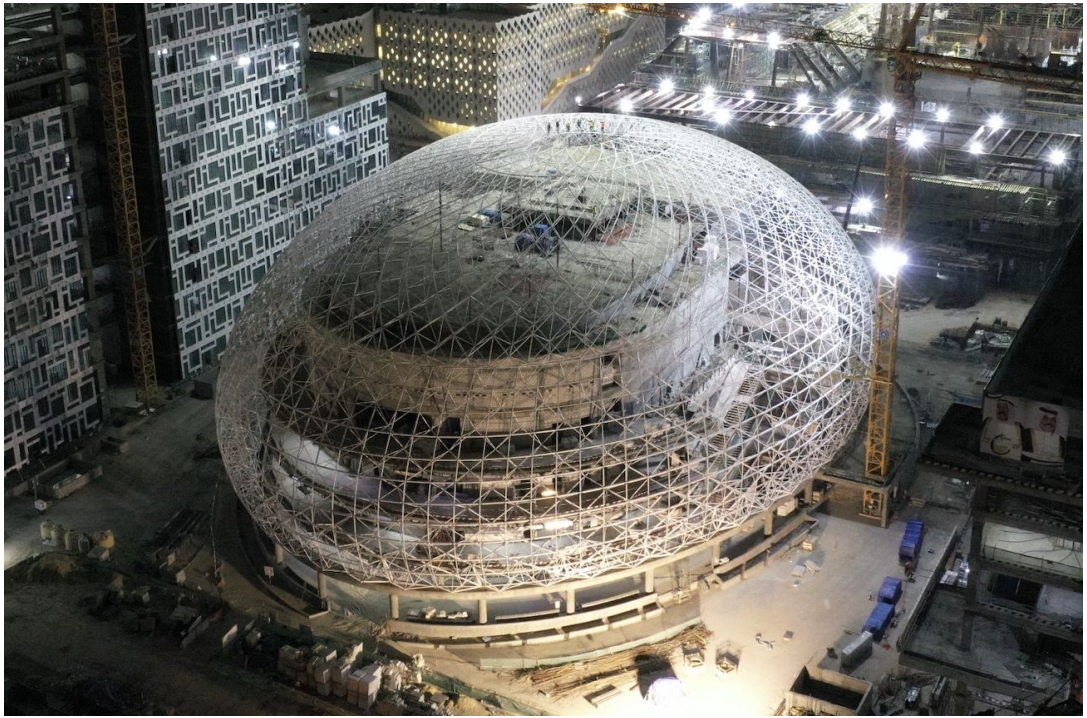
Space frame structures **provide overall substantial time and cost savings** in;

- *Material*
- *Fabrication*
- *Transportation*
- *Installation*

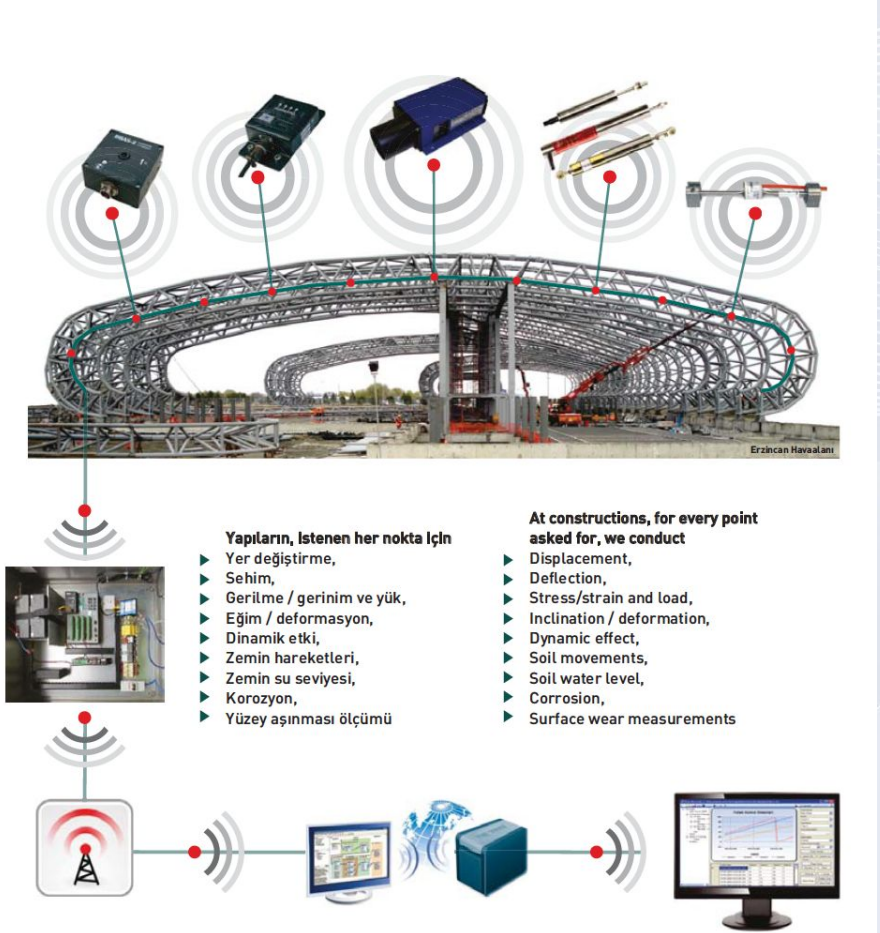
Space frame structures **cause less CO2 emission than conventional steel** and;

% 16 less than **truss system**

% 49 less than **hot rolled steel structures**



Structural Health Monitoring (PYSIS)



POLARKON **designs and provides a monitoring system for critical structures**

To follow up critical values according to **risk analysis of structures**

Provide and setup data collection equipped with sensors, data loggers, data transmission to main computer

To record online, real time data

Evaluate data comparison in between theoretical and actual values

Possible to define structural constraints/thresholds

User defined automatic reporting system

Including online and instant warnings

General Contracting Works

POLARKON

General Contracting Works

With it's 30 years of experience in construction and contracting works, POLARKON can carry out **all the services** from start to finish for any type of building or structure.

POLARKON performs **mechanical, electrical, plumbing** and **infrastructure works** upon request.

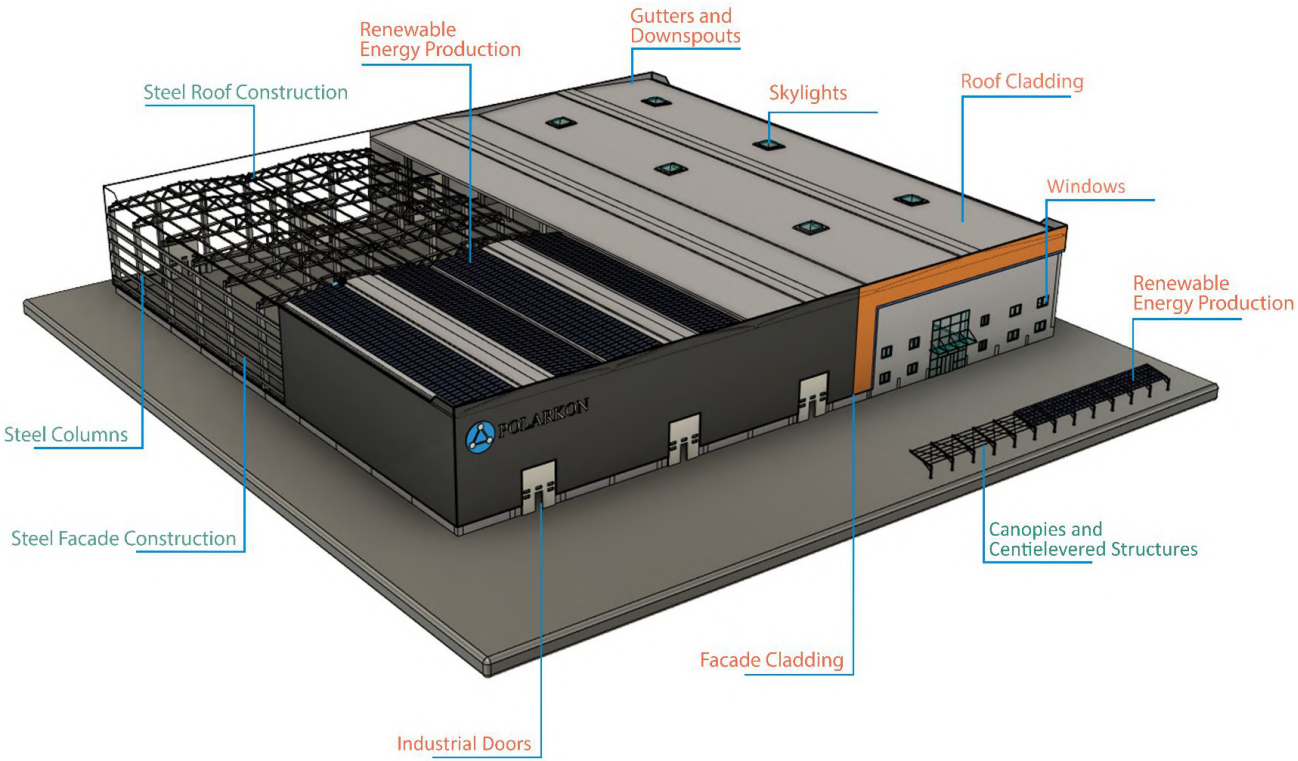
Projects implementation times are shortened with POLARKON's **in-house design** and **engineering** departments as well as **trusted suppliers** and **partners.**

UPS Gateway Center in **Istanbul, Türkiye**, **12.000 m²**

Turnkey Solutions for Industrial Buildings

POLARKON

Turnkey Solutions for Industrial Buildings



As a turnkey solutions provider for industrial buildings and commercial and logistics real estates, POLARKON offers;

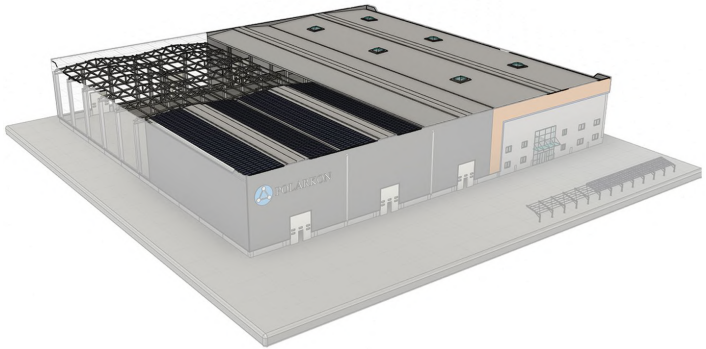
- Project-based design
- Engineering
- Steel roof construction fabrications
- Steel columns fabrications
- Steel façade constructions
- Canopies & cantilevered structures

Along with its exclusive and trustworthy suppliers in POLARKON provides the ultimate value and cost-effective solutions to its clients' while conforming high standards and international quality norms.

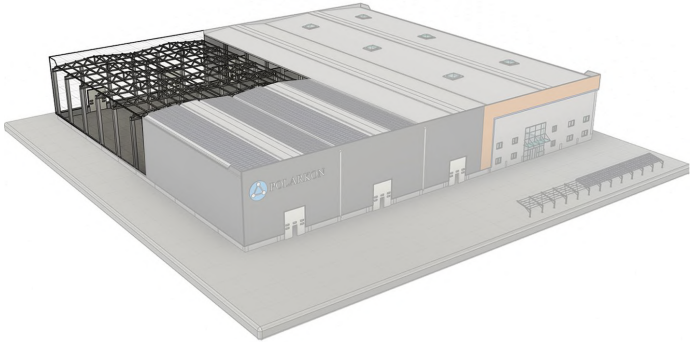
Turnkey Solutions for Industrial Buildings

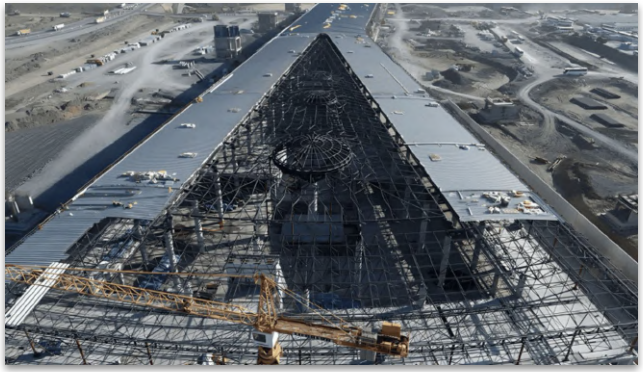
POLARKON

Steel Roof Constructions



Steel Facade Constructions

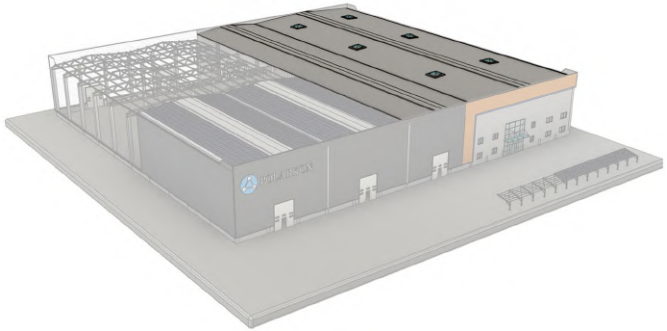




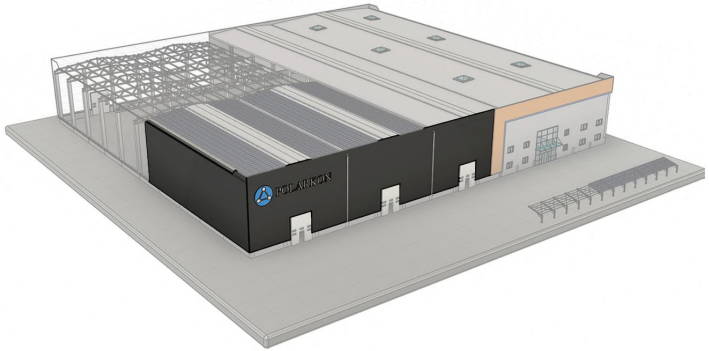
Turnkey Solutions for Industrial Buildings

POLARKON

Roof Claddings



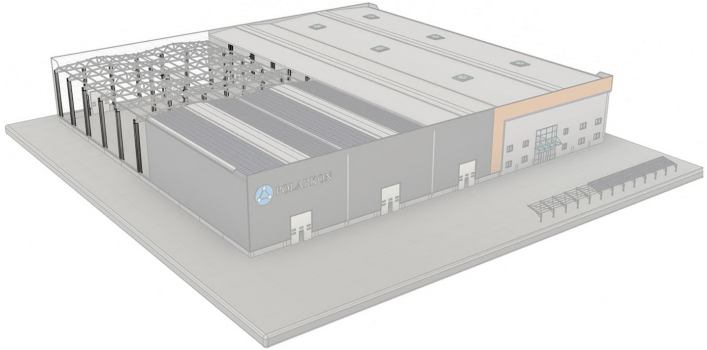
Facade Claddings



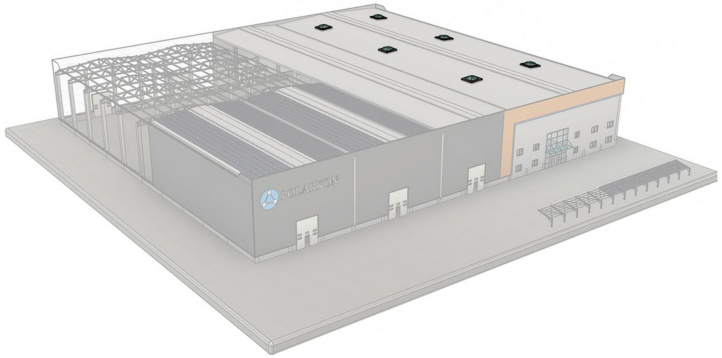
Turnkey Solutions for Industrial Buildings

POLARKON

Steel Columns



Skylights

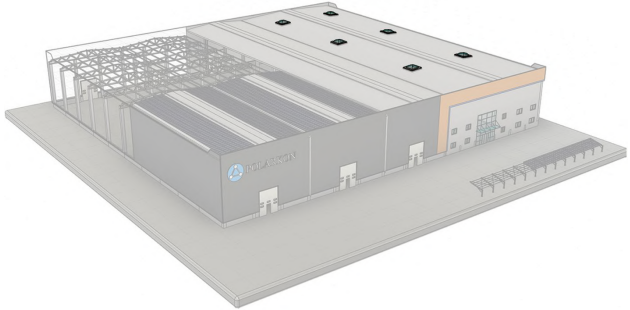


Turnkey Solutions for Industrial Buildings

POLARKON

Windows

Skylights

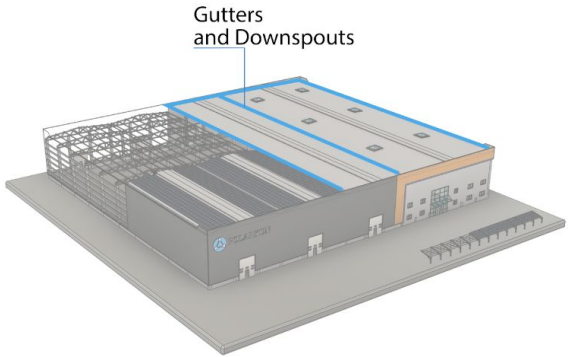


Industrial & Vehicle Access Doors

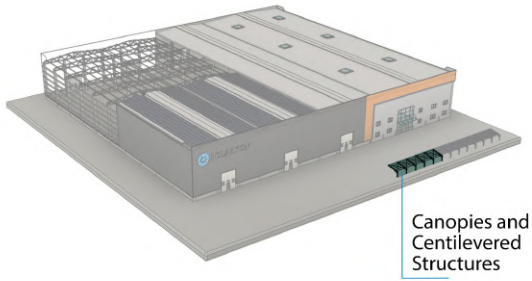
Turnkey Solutions for Industrial Buildings

POLARKON

Gutters & Downspouts



Canopies & Cantilevered Structures



Logistics Systems Steelworks

POLARKON

Logistics Systems Steelworks

POLARKON's Capabilities and Services

POLARKON

Experience

POLARKON has completed 600 unique projects worldwide which results in great experience on international projects

Turnkey Solutions

POLARKON is an Engineering company which provides solutions to steelwork projects including design, fabrication and installation

Flexibility

Due to having experience in working different regions and countries, Polarkon has flexibility to work with different design codes and standards

3D Modelling

POLARKON is very familiar with BIM / 3D modelling which is necessary for coordination with different parties

Logistics Systems Steelworks

POLARKON's Capabilities and Services

Material Handling Systems

POLARKON is very familiar with material handling systems and its design standards and requirements

Engineering Solutions

POLARKON can develop customized engineering solutions for specific project requirements

Market

Türkiye is a great supply market where high quality workmanship & products can be found with reasonable prices compared to Western countries

Outsourcing & Solution Partnership

The capacity can be increased depending on the project requirements by using extra capacity of our solution partners

Engineering Solutions

POLARKON can develop customized engineering solutions for specific project requirements

Logistics Systems Steelworks

Design, engineering, fabrication and installation of

- **steel platforms** equipped with steel/wooden floorings,
- **Stairs** and **handrails**,
- **Cage ladders**

UPS Langenhagen Logistics Center in **Hannover, Germany**

3.300 tons of design-build steelworks & 25.000 m² of steel gratings

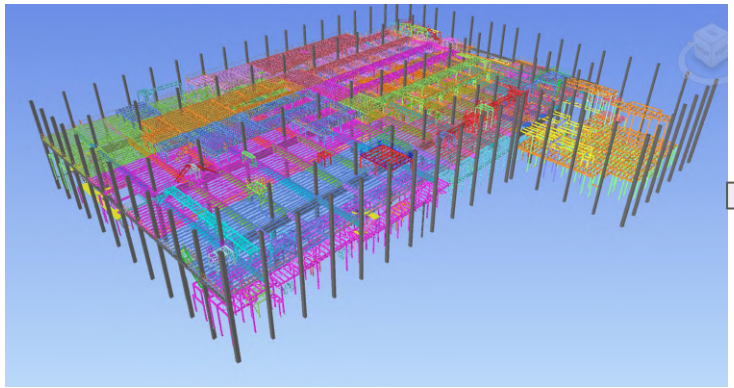
Design, engineering, fabrication and installation of

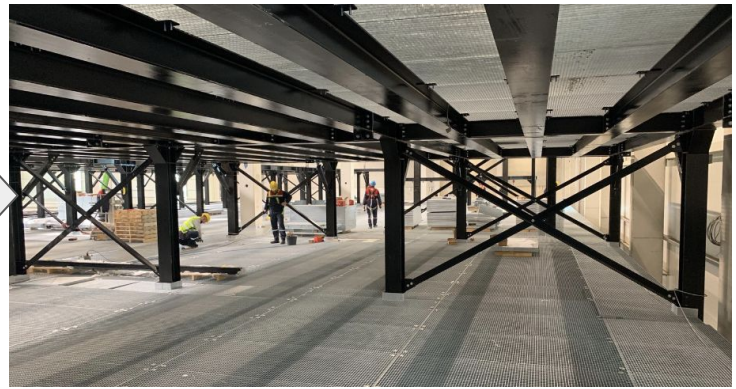
- Casterdecking structures with **ram protection**, **cam locks** and **static racks**

UPS Logistics Center at CGN Airport in **Cologne, Germany**

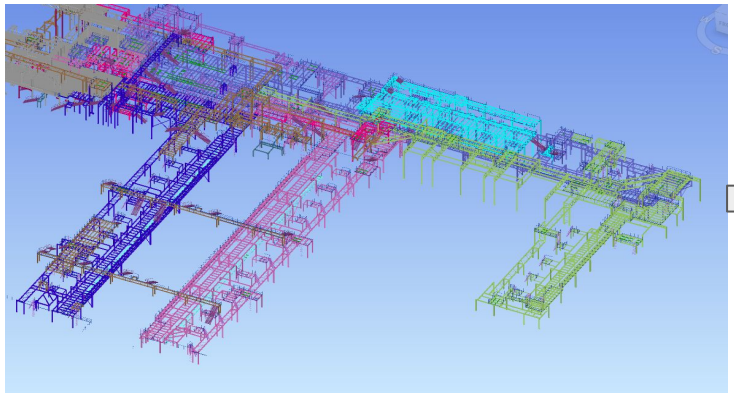
2.000 tons and 12.000 m² of Steel Caster Decks, Static Racks, Ram Protection and Cam Lock Systems

Logistics Systems Steelworks





Phase I of Langenhagen Logistics Center in Hannover



Phase II of Langenhagen Logistics Center in Hannover

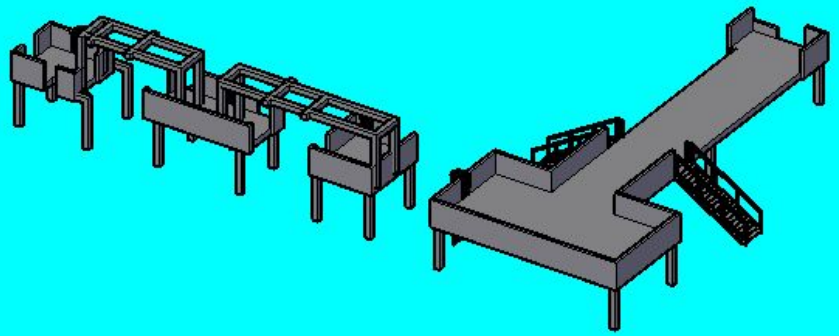
Logistics Systems Steelworks

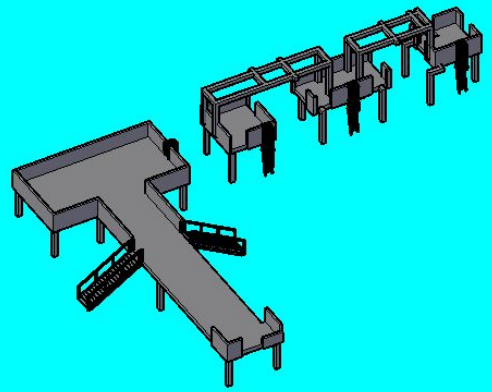
POLARKON

01	**INPUT DATA BY INTEGRATOR COMPANY**	3D modeling in “.dwg” and “Navis” formats
02	**STRUCTURAL ANALYSIS**	Steel sections are selected as per structural analysis results
03	**CLASH CHECKS**	Clash checks are performed in Navisworks
04	**CONNECTION DESIGN**	Steel connections are designed using “Ideastatica”
05	**STEEL DETAILING**	Shop drawings are prepared in Tekla Structures

Logistics Systems Steelworks

Input Data Modeling

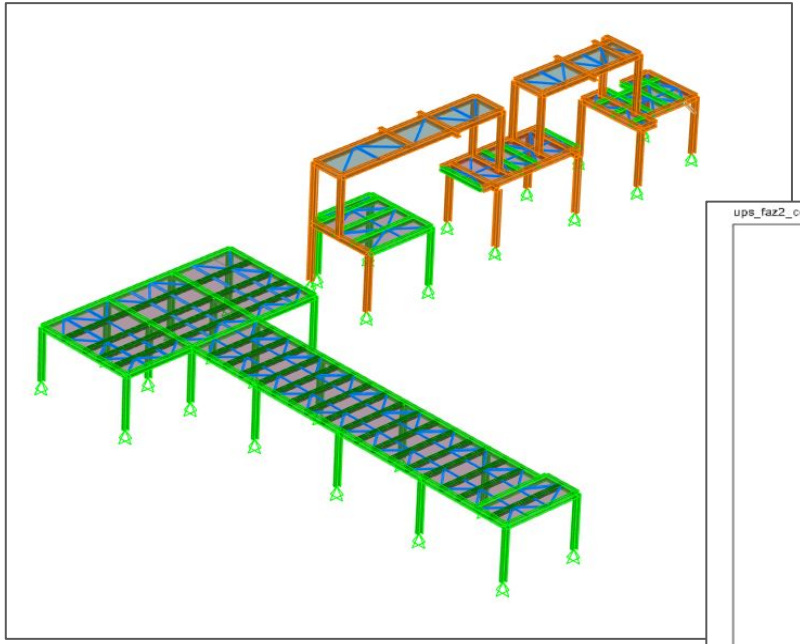


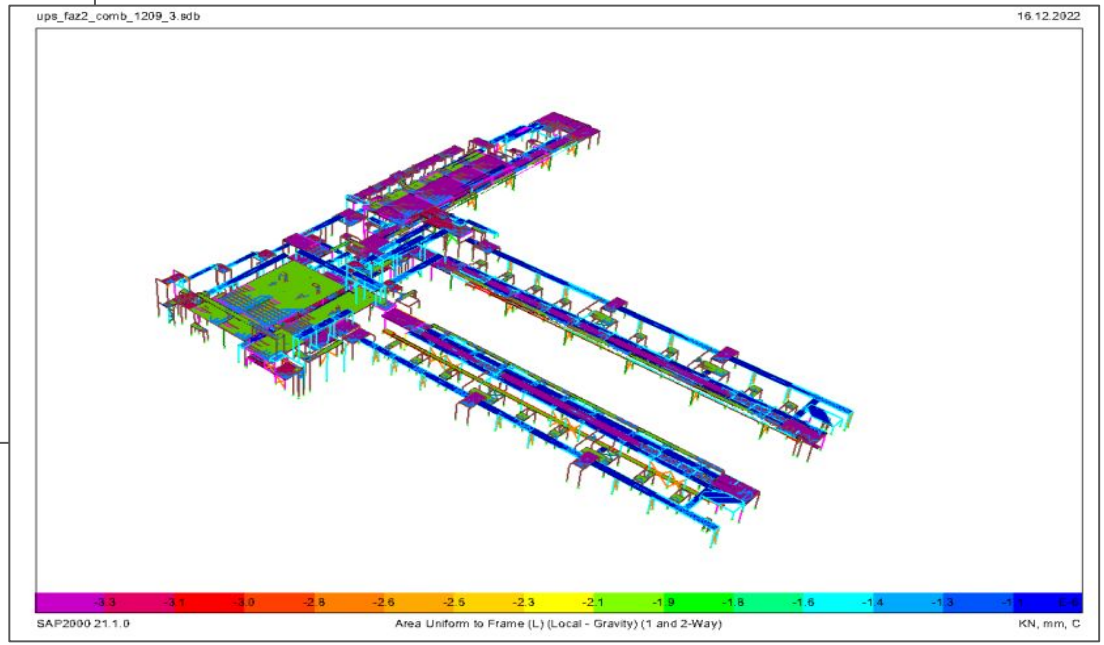


Simple platform models are received from integrator company **in 3D “.dwg” formats**

Logistics Systems Steelworks

Structural Analysis

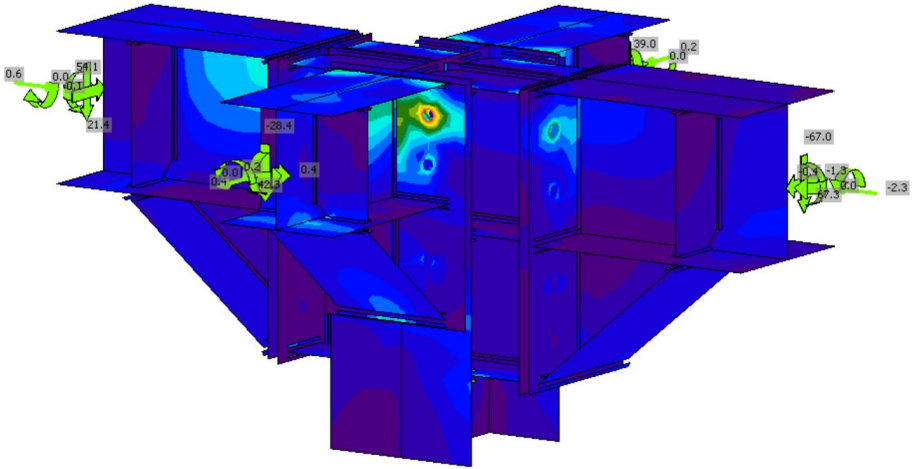


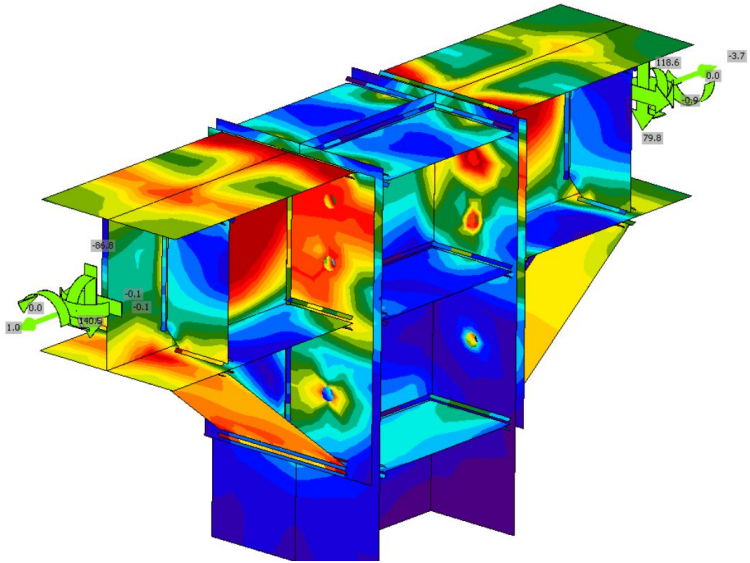


Structural analysis and design is carried out in structural analysis model in **SAP2000**

Logistics Systems Steelworks

Connection Designs & Clash Checks





Connections are analysed and designed using **“Ideastatica v25”**

Logistics Systems Steelworks

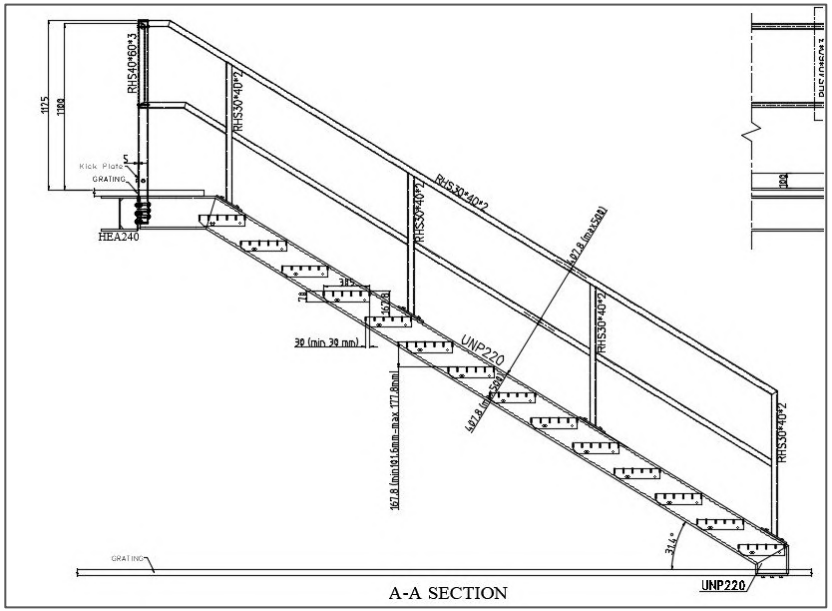
Steel Detailing

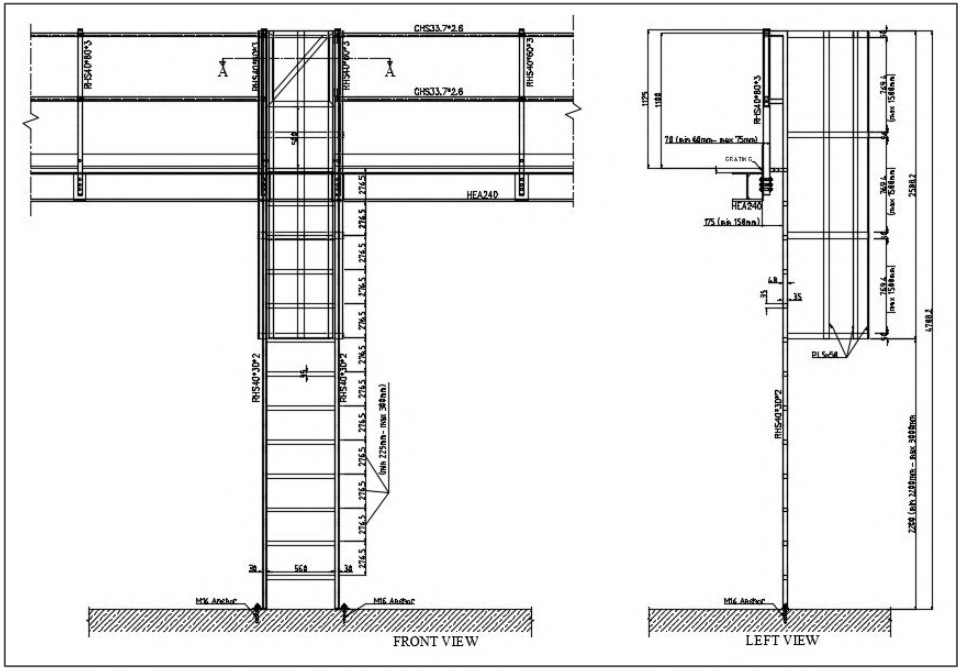
Steel detailing is performed in Tekla Structures including secondary steel such as ;

- Steel and/or polymer gratings,
- Wooden floors
- Handrails
- Stairs
- Crossovers

Logistics Systems Steelworks

Detail Implementation



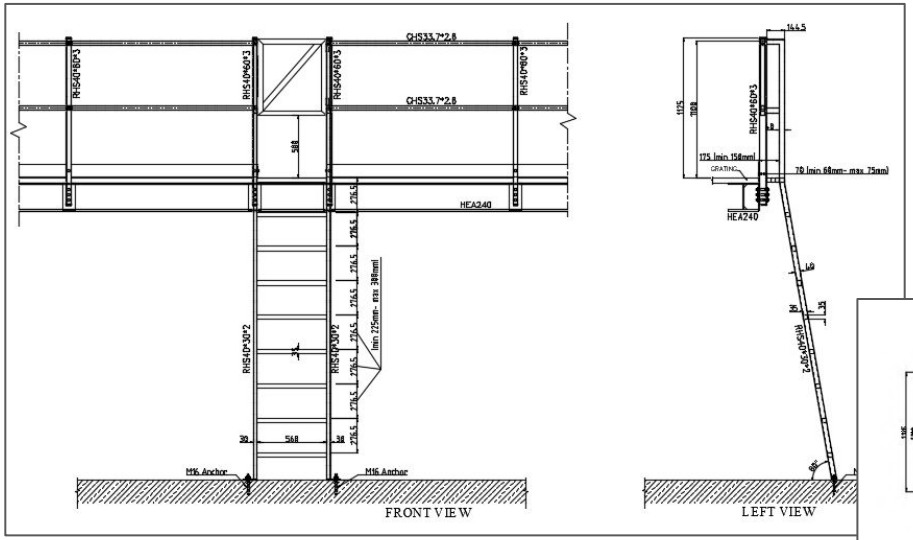


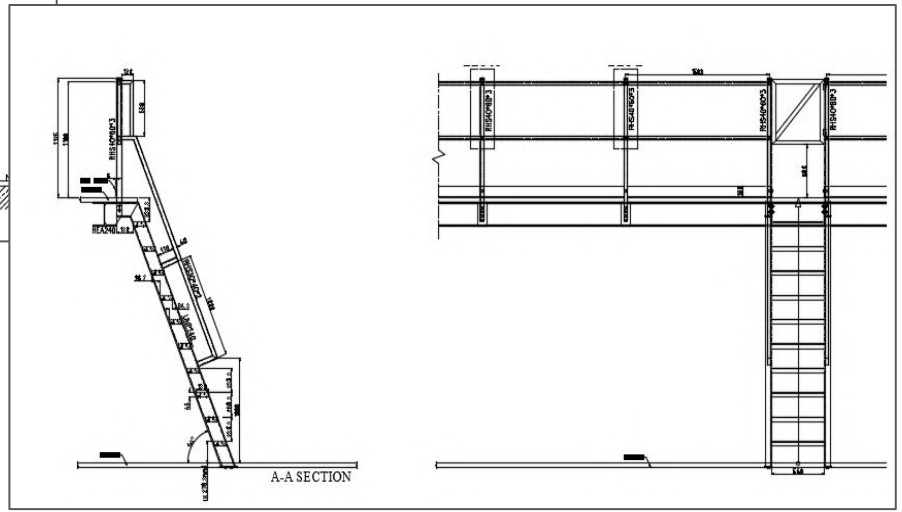
Typical POLARKON's details which are complying with the Integrator/Client and/or **EN ISO norms** are implemented in the models.

Logistics Systems Steelworks

Detail Implementation

POLARKON





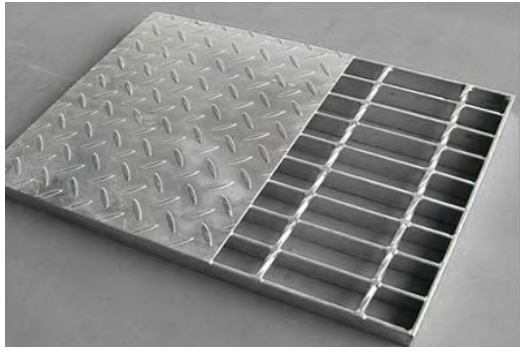
Logistics Systems Steelworks

Mezzanine Floor Types

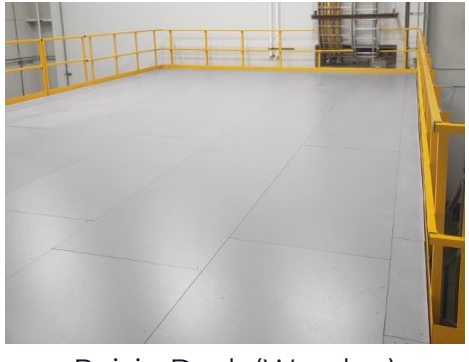
Resin Deck (Wooden), **Closed Deck (or Steel Gratings)** and **Concrete** are common materials which are designed and applied to mezzanine floors.

Each material has certain pros and cons to be used for the construction of mezzanine floors. Each material will be assessed basically in terms of cost-effectiveness, capacity, durability, fire resistance and safety.

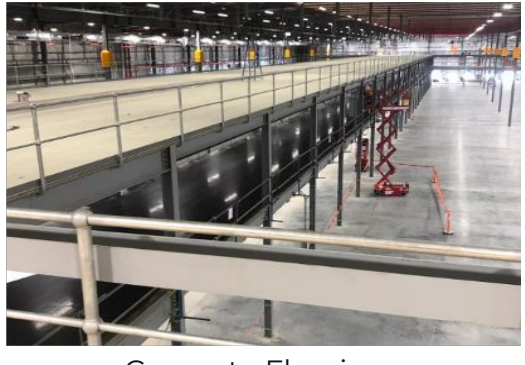
Steel Gratings



Gratings (Closed Deck)



Reisin Deck (Wooden)



Concrete Floorings

Logistics Systems Steelworks
Steel Gratings

PROS+

Type: Can be used in the form of open grating or closed decking or both can be used in the same platform system depending on operational requirements.

Weight: The total weight of the flooring system is relative less.

Ventilation: Open grating allows air flow, liquid drainage, reduce dirt accumulation. Closed decking prevent possible drop of material from upper platforms to lower platforms which creates operational safety risk.

Durability: Wear and tear resistance is relatively high which results in long life span.

Modification: Easy to modify the geometry when required. Opening extra access holes is also possible.

Earthquake: Earthquake induced loads by flooring system is less due to its low self weight.

Cost: Overall cost is not expensive compared to other alternatives.

Installation: Easy to install with simple connection details

CONS-

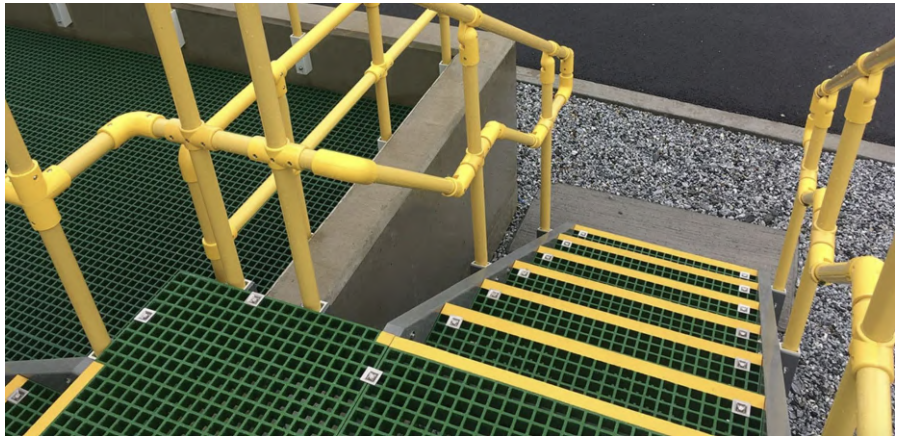
Noise: Walking on gratings might be noisy.

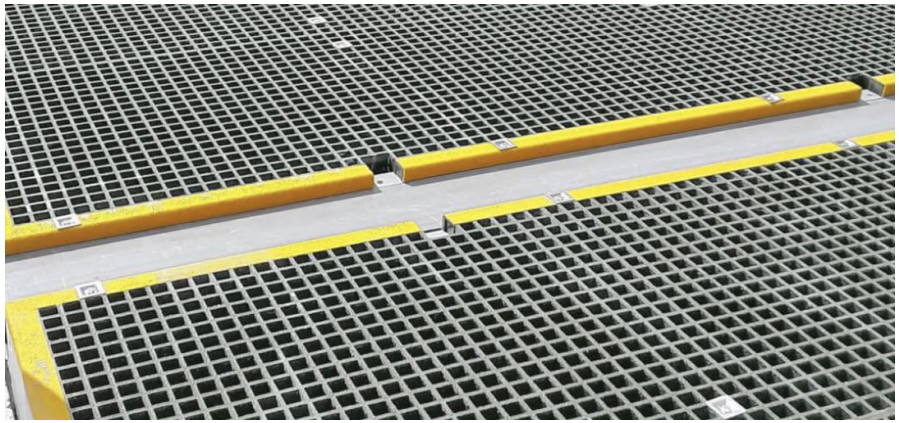
Comfort: Walking on grating might be uncomfortable due to its surface.

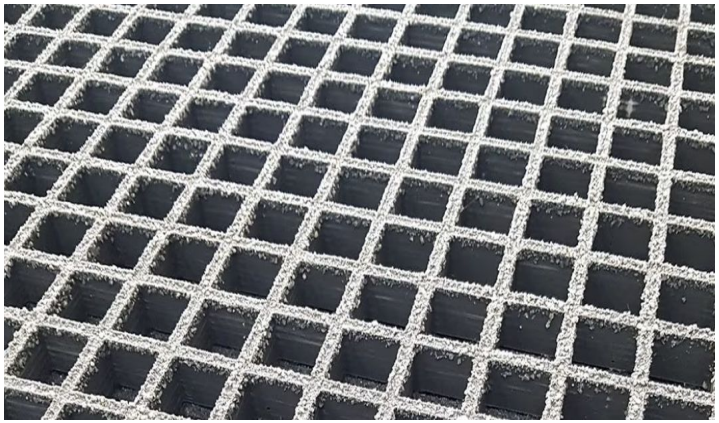
Logistics Systems Steelworks

GRP (Fiberglass Reinforced Plastic Grating)

POLARKON





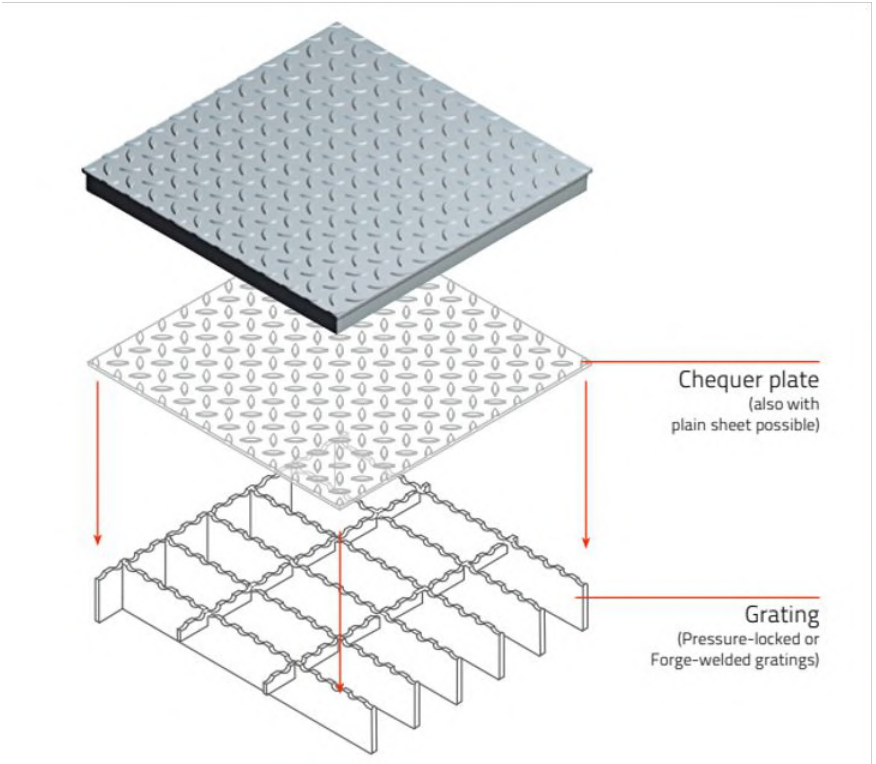


Logistics Systems Steelworks

Closed Deck vs Steel Gratings

POLARKON

Closed Deck



Steel Gratings

Logistics Systems Steelworks

Closed Deck vs Steel Gratings

POLARKON

	GRP	Steel
Corrosion Resistance	Excellent Corrosion Resistance Can be designed to suit most chemical environments.	Low Corrosion Resistance Subject to oxidation and corrosion. Requires painting or galvanizing.
Weight	Lightweight (Up to 80% lighter than steel & approx. 30% the weight of aluminium)	Extremely Heavy Requires heavy lifting gear to maneuver. And results in heavier sub construction and higher cost for sub construction.
Slip Resistance	Extremely High Slip Resistance Relinea's integral grit finish offers the highest degree of slip resistance ever measured for a walking surface, even in wet or oily conditions.	Little or No Slip Resistance A major health & safety risk for companies.
Fabrication	Easily Field Fabricated Can be easily field fabricated using simple carpenter tools with carbon or diamond tip blades. Lightweight for easier erection and installation.	Fabrication more Complex Often requires welding and cutting torches. Heavier material requires special handling equipment to erect and install.
Ergonomy	Good Ergonomic Properties The elasticity provides comfort as it has a “give” underfoot.	No Ergonomic Properties Steel does not provide comfort underfoot & causes back-ache.

Logistics Systems Steelworks

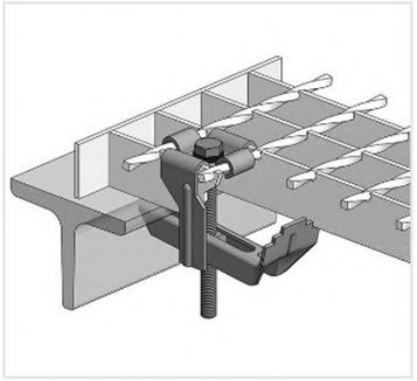
Closed Deck vs Steel Gratings

POLARKON

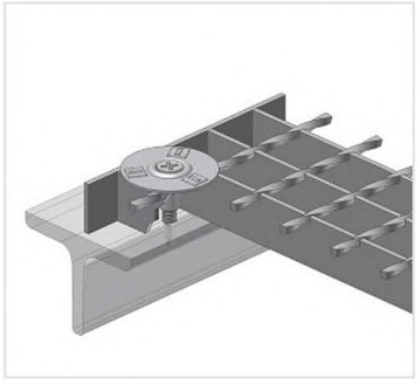
	GRP	Steel
Strength	High Strength-to-Weight Ratio Stronger than steel on a kg-for-kg basis.	High Strength Heavy in weight to achieve its high strength properties.
Impact Resistance	High Impact Resistance Will not permanently deform under impact.	Medium to Low Impact Resistance Can permanently deform under impact.
Fire Resistance	Bfl s1 Euroclasse B	Not applicable without additional precaution
Maintenance	Maintenance-Free GRP has a design life of 50 years.	Constant Maintenance Required Due to rust, damage, or re-painting. High cost implications.
Cost	Competitive prices / Long Term Cost Savings Lower operational and maintenance costs = low lifecycle cost/%10 cheaper unit prices compared to Steel Grating are available	Relatively expensive Higher Maintenance cost /Higher initial material cost + higher maintenance cost to maintain. High lifecycle costs.
Conductivity	Non-Conductive No earthing required.	Conducts Electricity Earthing required.

Logistics Systems Steelworks

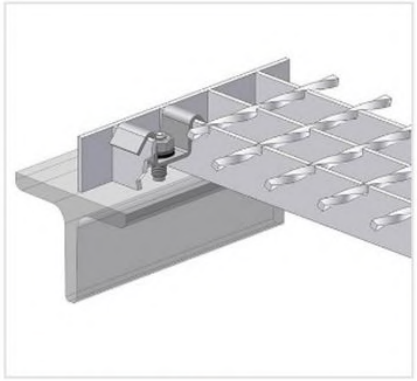
Steel Gratings



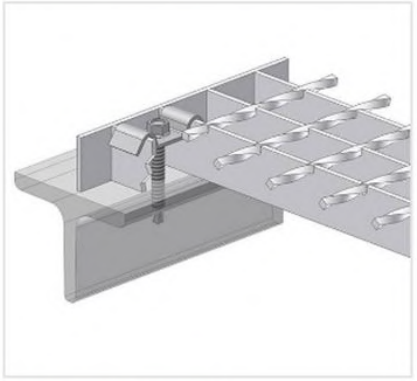
Fixing material B334 / B351K



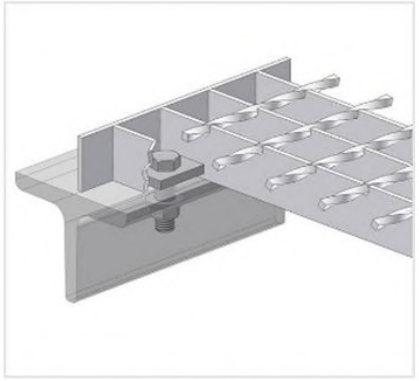
Threaded bolt fixing B433T



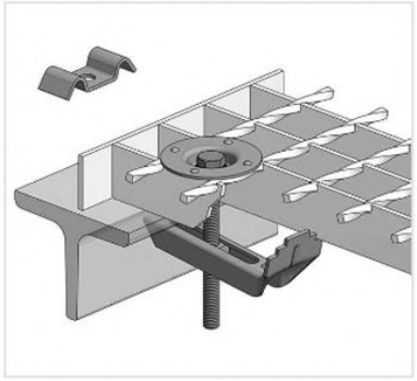
Welded bolt fixing B533K



Clamp upper part XOK133



Fixing with perforated plates B270



Standard fixing material B133T and B133K

Logistics Systems Steelworks
Concrete Flooring

PROS+

Strength: High load bearing capacity and suitable for heavy machinery use

Durability: High wear resistance, long-lasting service life

Maintenance: Low maintenance requirement

Fire Protection: High fire resistance

Noise & Comfort: Create less noise and comfort is high during walking

CONS-

Time: Walking on gratings might be noisy.

Weight: Walking on grating might be uncomfortable due to its surface.

Flexibility: Difficult to modify after completion of the work.

Concrete Design: Concrete floor increases the loads acting on ground slab and foundation due to its heavy self-weight

Logistics Systems Steelworks

Resin (Wooden) Deck Flooring

PROS+

Comfort: More comfortable for walking

Weight: Less weight which results in less earthquake induced loads.

Installation: Easy to install and implement.

Cost: Economical material compared to steel and concrete

Modification: Easy to modify at site if required

CONS-

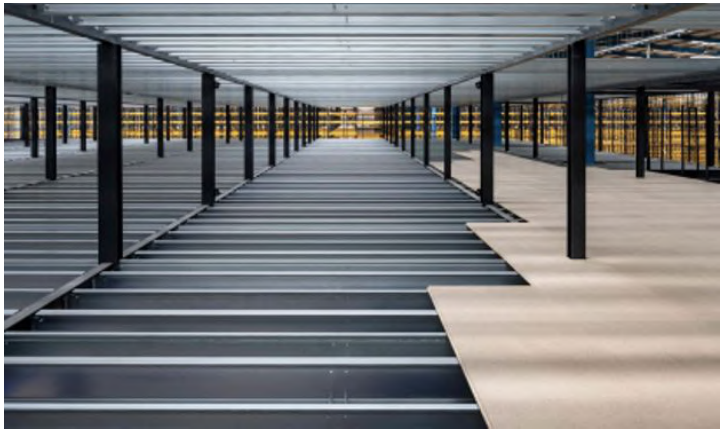
Durability: Limited or low durability against wearing under heavy loads

Fire: Wooden is flammable material.

Lifespan: Has a limited lifespan.

Capacity: Wooden decks has low or moderate load carrying capacity

Resistance: Easy to modify at site if required



Logistics Systems Steelworks

Langenhagen Logistics Center, Hannover, Germany

POLARKON

Facts & Figures

Phase I - Dec. 2020 - Jun. 2021
Phase II - May. 2023 - Oct. 2024

Client: FORTNA

POLARKON Scope: Design, Engineering, Fabrication and Installation of Steel Mezzanine Platforms, Handrails, Gratings, Ladders and Cages

Total Weight: **3.500** tons

Total Platforms: **27.000 m²**

Steel Gratings: **23.000 m²**

Total Closed Deck: **4.000 m²**

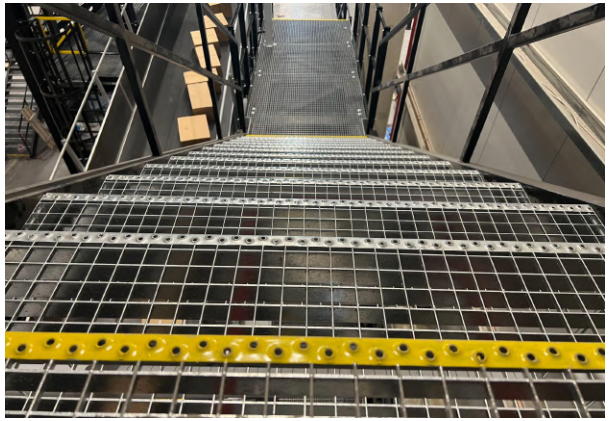
Steel Handrails: **7.000 meters**

Steel Ladders: **380 pcs**

Logistics Systems Steelworks

Langenhagen Logistics Center, Hannover, Germany

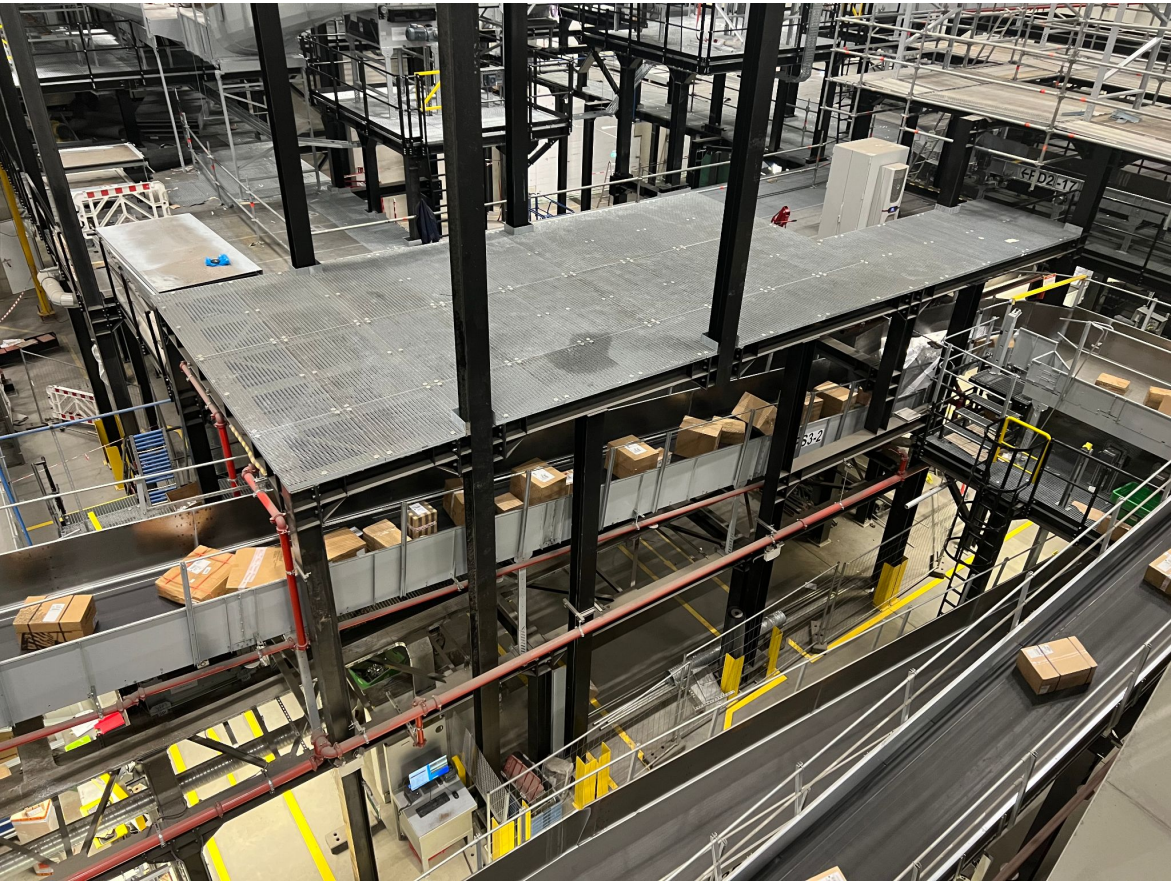
POLARKON



Logistics Systems Steelworks

Langenhagen Logistics Center, Hannover, Germany

POLARKON



Logistics Systems Steelworks

Langenhagen Logistics Center, Hannover, Germany

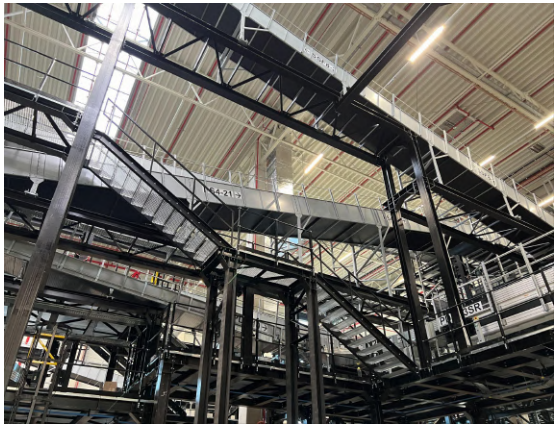
POLARKON

Logistics Systems Steelworks

Langenhagen Logistics Center, Hannover, Germany

POLARKON

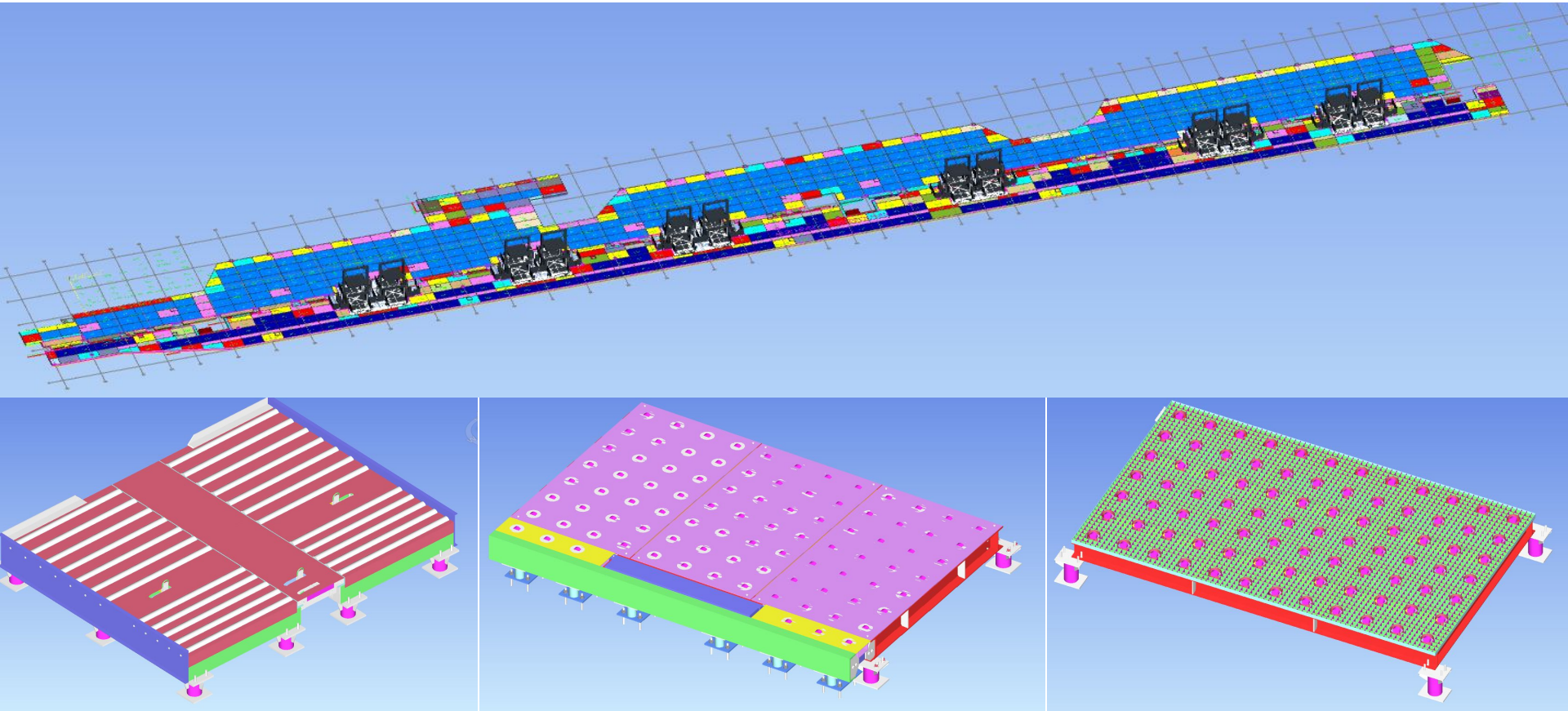




Logistics Systems Steelworks

Cologne-Bonn (CGN) Logistics Center, Cologne, Germany

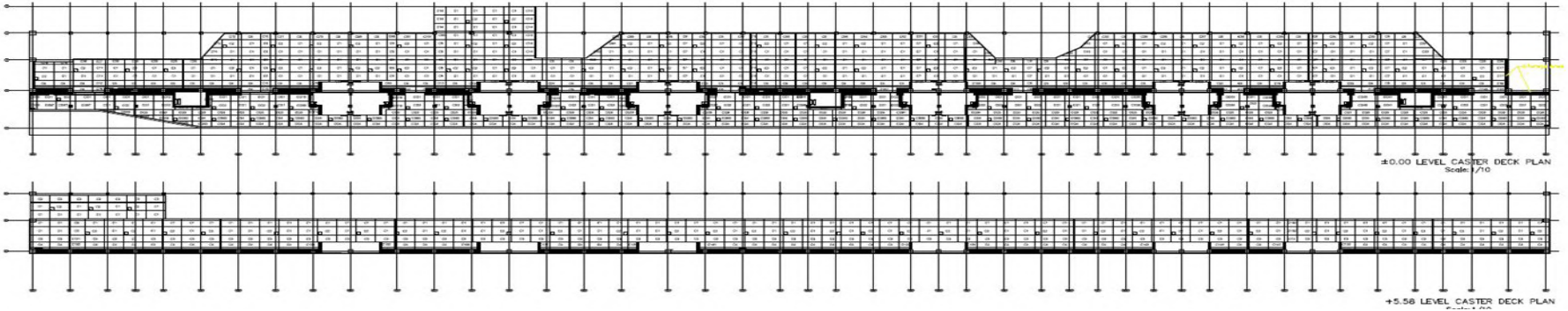
POLARKON

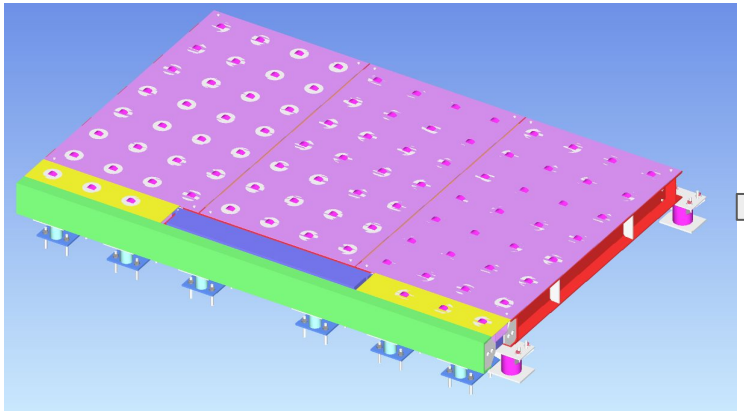


Logistics Systems Steelworks

Cologne-Bonn (CGN) Logistics Center, Cologne, Germany

POLARKON





Logistics Systems Steelworks

Cologne-Bonn (CGN) Logistics Center, Cologne, Germany

POLARKON

Logistics Systems Steelworks

Cologne-Bonn (CGN) Logistics Center, Cologne, Germany

POLARKON

Solar Carports

POLARKON

Why Solar Carports?

Can be applied to large areas of commercial open-parking spaces, which can lead to **generating energy and income for the owner**

Energy can be stored in batteries and **even used at nights**

Excess/unused power **can be sold back to the grid**, generating income

Protects vehicles **against snow, rain, dirt** and **poor weather conditions**

Great investment with **little to no maintenance and repair** required

Charging of electric vehicles at EV-Charging Stations

Helps **reduce the carbon footprint**

Why POLARKON?

Offering **standardized** solar carport models

Also offering **client-specific** architectural designs

All standard models include;

Unique solutions for **50-250 kg/m^2 snow loads**

RAL-scale paint applications for every project

Hot-dip galvanization for surface protection

Fast deliveries from POLARKON stocks for each carport model

Rapid installations across Europe with POLARKON site teams

Competitive prices for design, engineering, fabrication and installation services

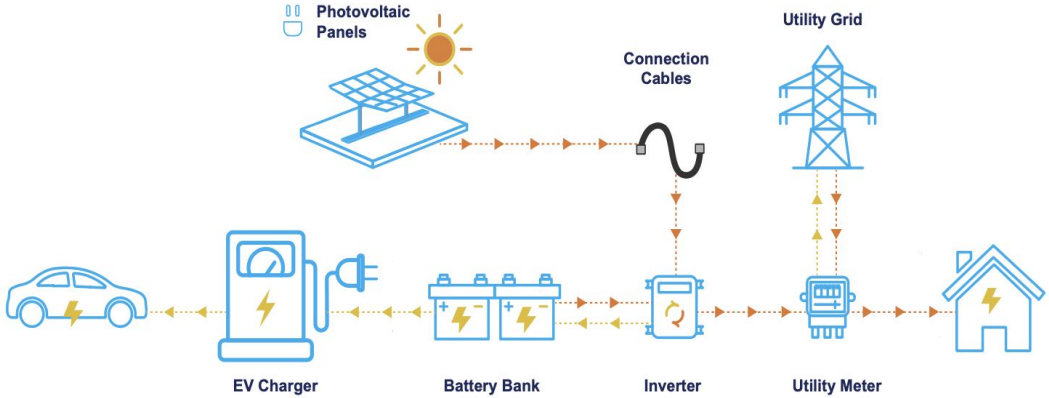
Offers & Services

Structural Steel Services

Structural design & engineering
Customer-specific designs
Obtaining construction permits & approvals
Foundation & base designs with applications
Rapid deliveries from shelf
System Installations

Photovoltaics Services

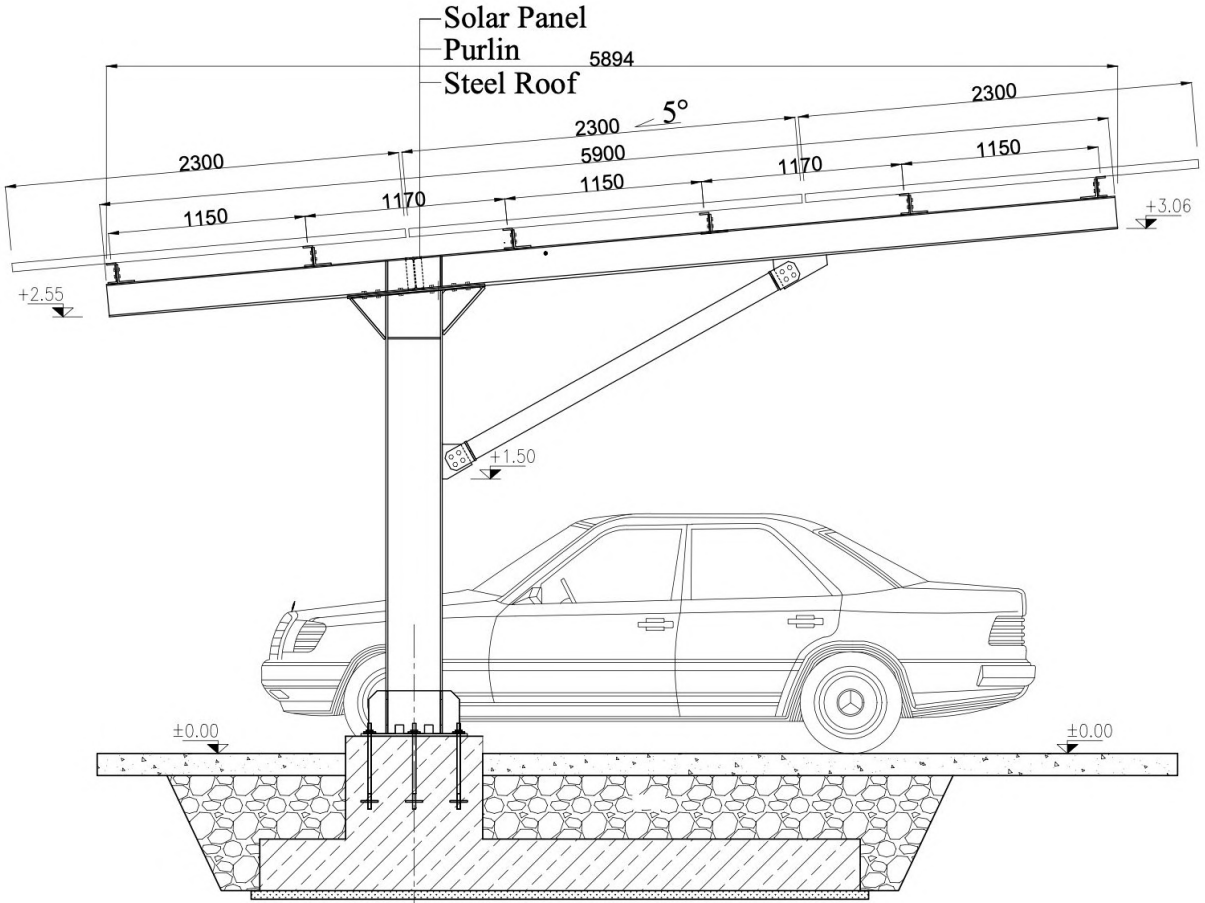
Electrical & photovoltaics projects design
Photovoltaics permits & approvals
Components supplies
Fast deliveries
System Installation
Tests & System commissioning



L TYPE *(single-row)*

POLARKON

L TYPE *(single-row)*



Technical Information

Row Type: **Single**

Column Heights: **2,55m to 3,06m**

Unit Area: **17,24 m²/parking bay**

Energy Generation/Parking Area: **3.60 – 3.90 kWp**

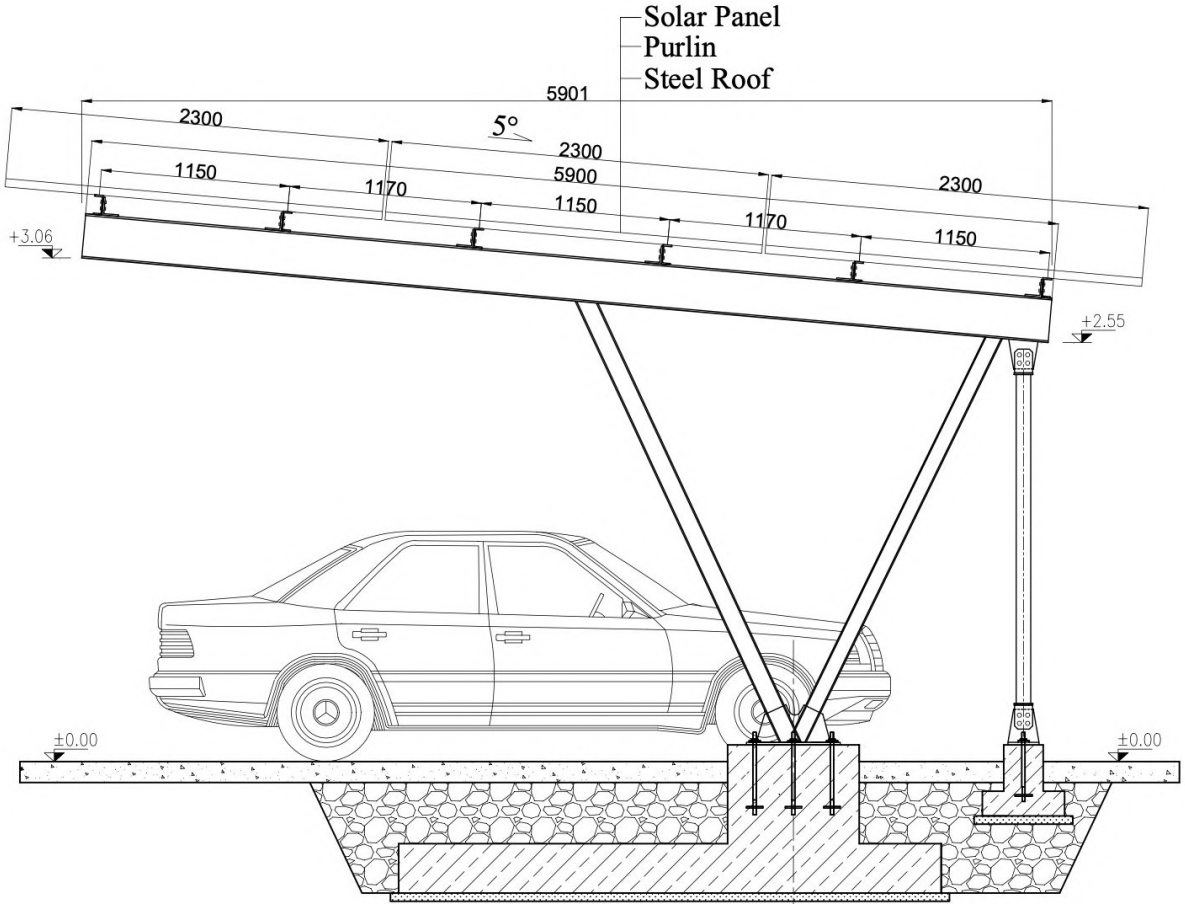
Suitable For: **All Weathers and Locations**

For snow loads **up to 200 kg/m²**, screw piling foundation alternative on L TYPE models provides better solution, faster implementation and reduced costs.

N TYPE *(single-row)*

POLARKON

N TYPE *(single-row)*



Technical Information

Row Type: **Single**

Column Heights: **2,55m to 3,06m**

Unit Area: **17,24 m²/parking bay**

Energy Generation/Parking Area: **3.60 – 3.90 kWp**

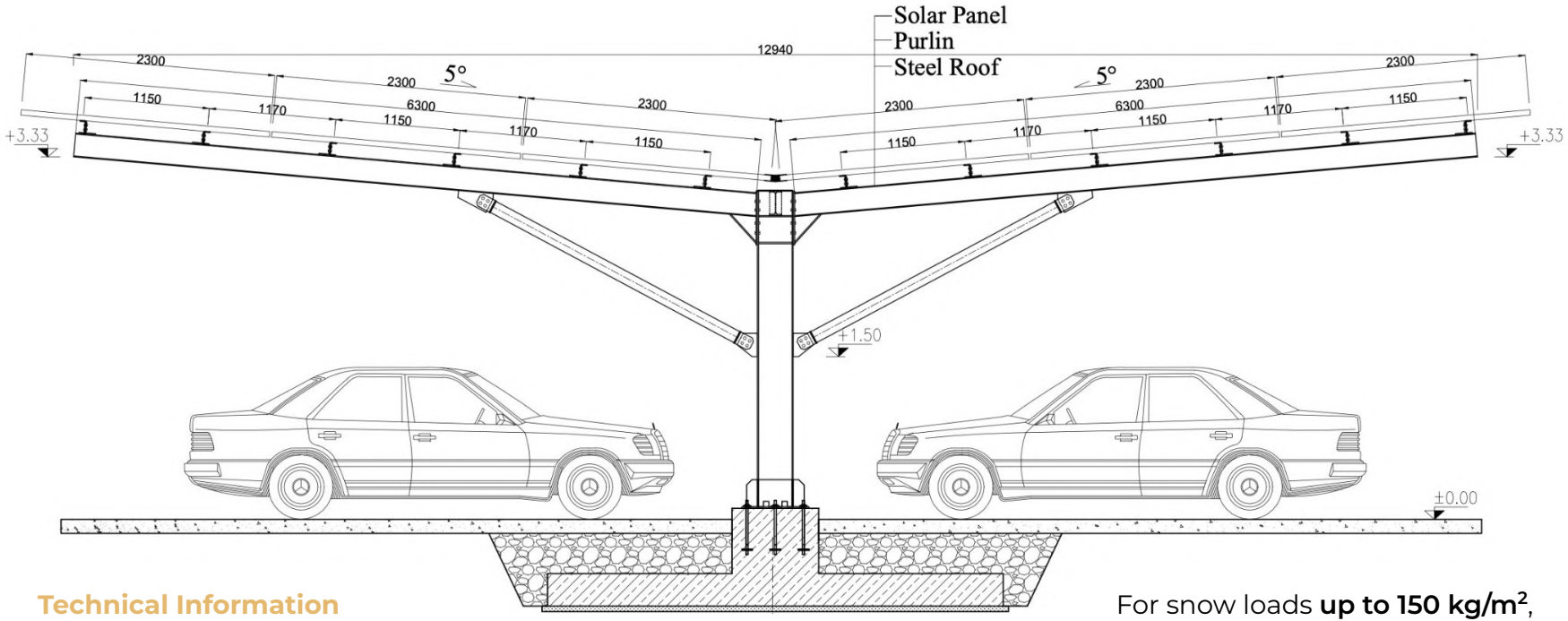
Suitable For: **All Weathers and Locations**

For snow loads **up to 50 kg/m²**, screw piling foundation alternative on N TYPE models provides better solution, faster implementation and reduced costs.

T TYPE *(double-row)*

POLARKON

T TYPE *(double-row)*



Technical Information

Row Type: **Double**
Column Heights: **3,33m**
Unit Area: **17,24 m²/parking bay**

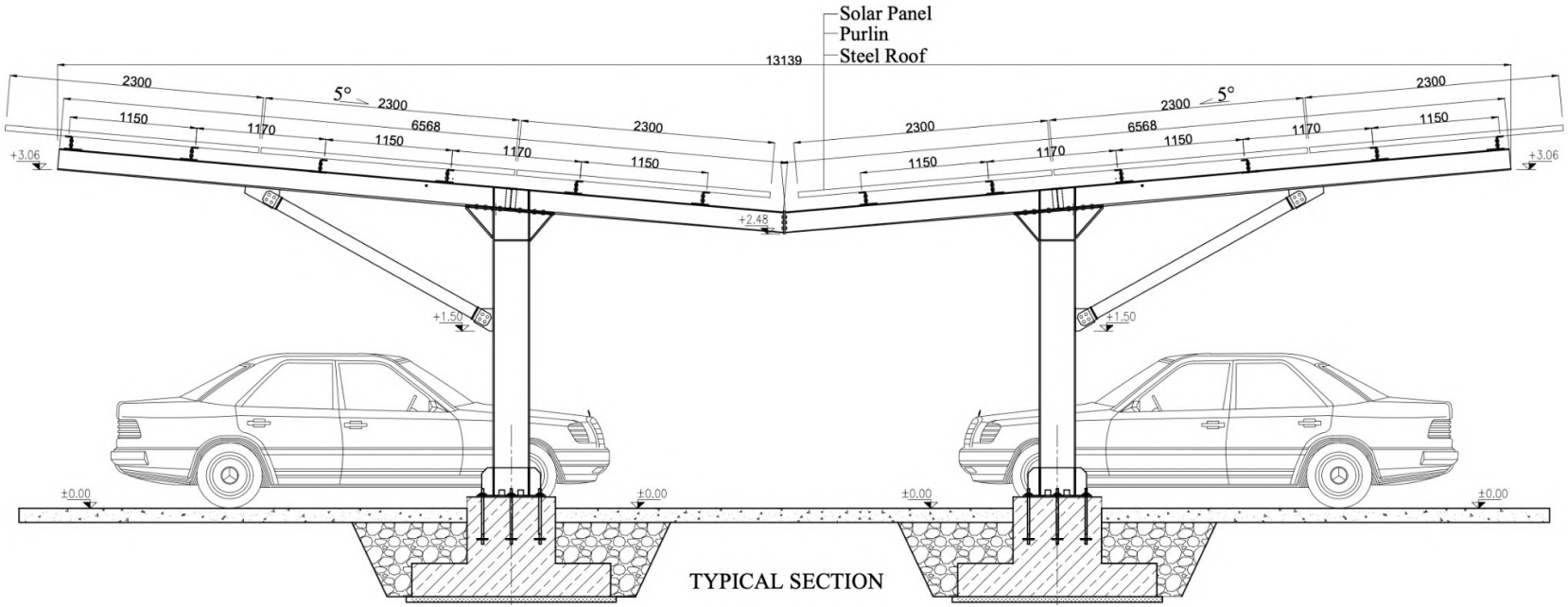
Energy Generation/Parking Area: **3,60 – 3,90 kWp**
Suitable For: **All Weathers and Locations**

For snow loads **up to 150 kg/m²**, screw piling foundation alternative on T TYPE models provides better solution, faster implementation and reduced costs.

PI TYPE *(double-row)*

POLARKON

PI TYPE *(double-row)*



Technical Information

Row Type: **Double**
Column Heights: **3.06m**
Unit Area: **19,02 m²/parking bay**

Energy Generation/Parking Area:
4.00 – 4.30 kWp
Suitable For: **All Weathers and Locations**

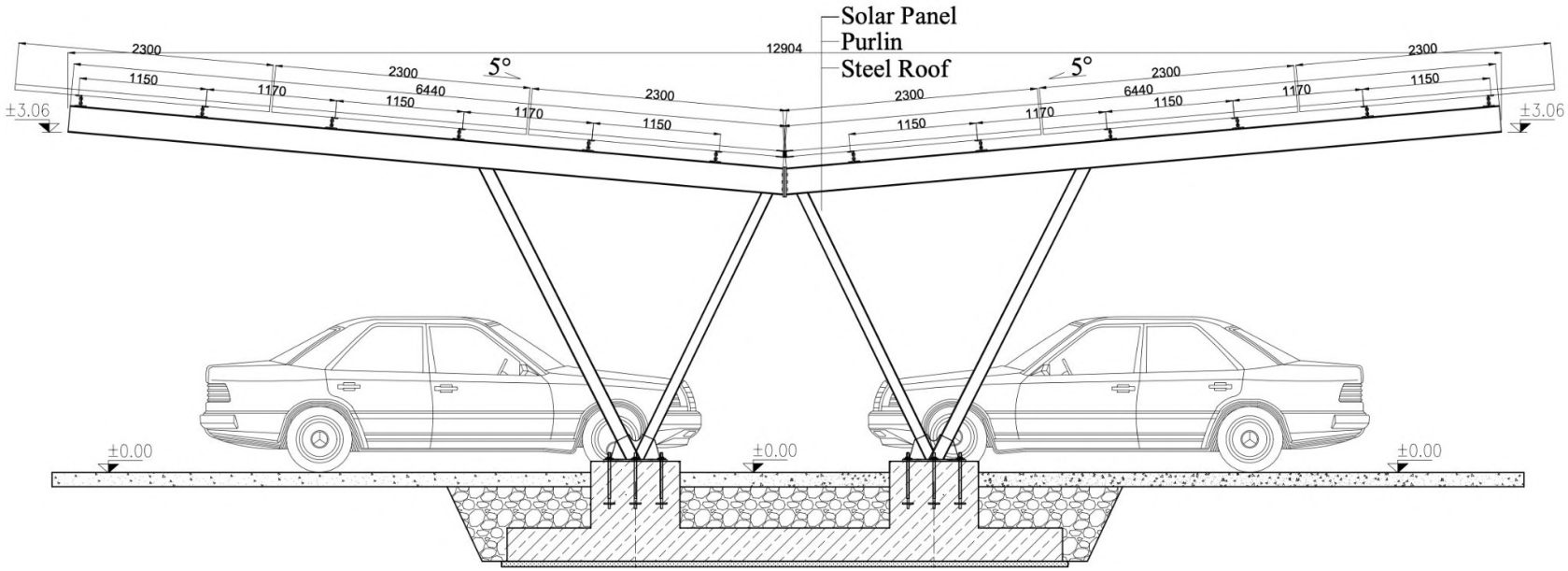
For snow loads **up to 100 kg/m²**, screw piling foundation alternative on PI TYPE models provides better solution, faster implementation and reduced costs.

W TYPE *(double-row)*

POLARKON

W TYPE *(double-row)*

POLARKON



Technical Information

Row Type: **Double**
Column Heights: **3.06m**
Unit Area: **19,02 m²/parking bay**

Energy Generation/Parking Area: **4.00 – 4.30 kWp**
Suitable For: **All Weathers and Locations**

For snow loads **up to 100 kg/m²**, screw piling foundation alternative on W TYPE models provides better solution, faster implementation and reduced costs.

PARKING STORAGE AREAS *(space frame)*

POLARKON

PARKING STORAGE AREAS
(Space Frame)

Lightweight solution for substantially greater parking areas, mostly used for vehicle storage

Optimum design for **larger distances in between columns**

Fast track project design with **computer-aided engineering**

Can also be implemented for LKWs, trucks, VANs and other tall vehicles with **adjustable minimum roof heights**

Reduced carbon footprint due to low material usage

Fast-track fabrication with **rapid installations** at the site

Adaptable for **reinforced concrete foundations**

Customized Design & Optional Features

POLARKON offers unique architectural design and customer-oriented solutions with respect to customers' requirements, space and uses.

With POLARKON's engineering, following components and/or options can be included;

- EV-Charging Stations
- Anti-Corrosion Protection
- Surface Coating (from RAL-scale)
- Rooftop LED Lighting

Foundation Design & Solutions

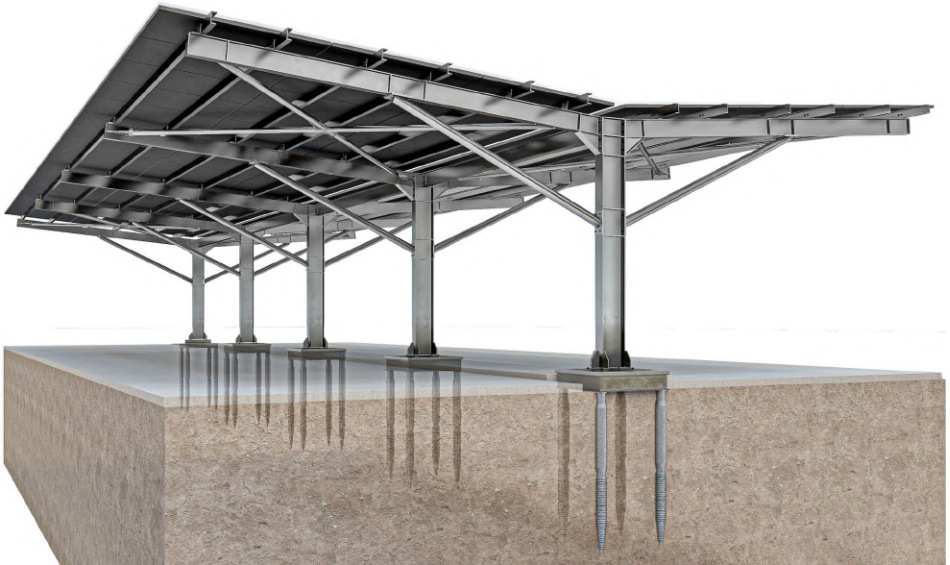
POLARKON

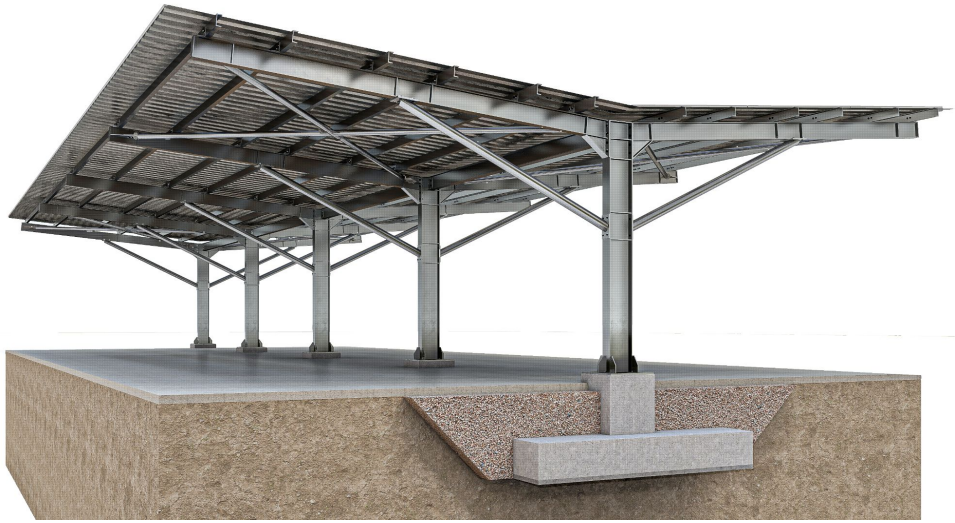
Reinforced Concrete (R/C) Alternative

Better option for **uncultivated lands** to be built for parking spaces

Useful for large spaces to be covered as carports having **less amount of columns**

Advantageous for **rocky or gravelly soils**





Screw Piling (FS) Alternative

Better option for **asphalt or paving stone grounds** to be built as carports

Advantageous for projects having **multiple spread-out/independent structures**

Fast-track implementation suitable for large projects

Highlighted Projects

POLARKON

Logistics Systems Steelworks

Langenhagen Logistics Center, Hannover, Germany

POLARKON

Facts & Figures

Phase I - Dec. 2020 - Jun. 2021
Phase II - May. 2023 - Oct. 2024

Client: FORTNA

POLARKON Scope: Design, Engineering, Fabrication and Installation of Steel Mezzanine Platforms, Handrails, Gratings, Ladders and Cages

Total Weight: **3.500** tons

Total Platforms: **27.000 m²**

Steel Gratings: **23.000 m²**

Total Closed Deck: **4.000 m²**

Steel Handrails: **7.000 meters**

Steel Ladders: **380 pcs**

Logistics Systems Steelworks

Cologne-Bonn (CGN) Logistics Center, Cologne, Germany

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Steel Casterdeck Systems***

Project Year: ***2021-2022***

Project Size: ***2.000 tons, 12.000 m²***

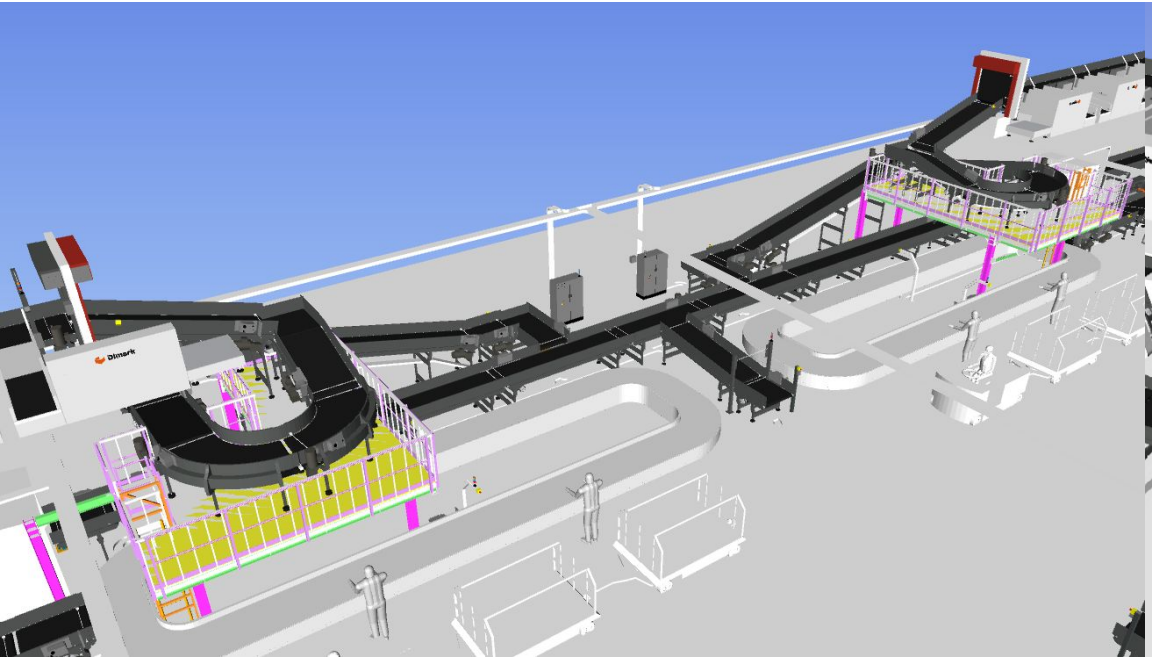
Logistics Systems Steelworks

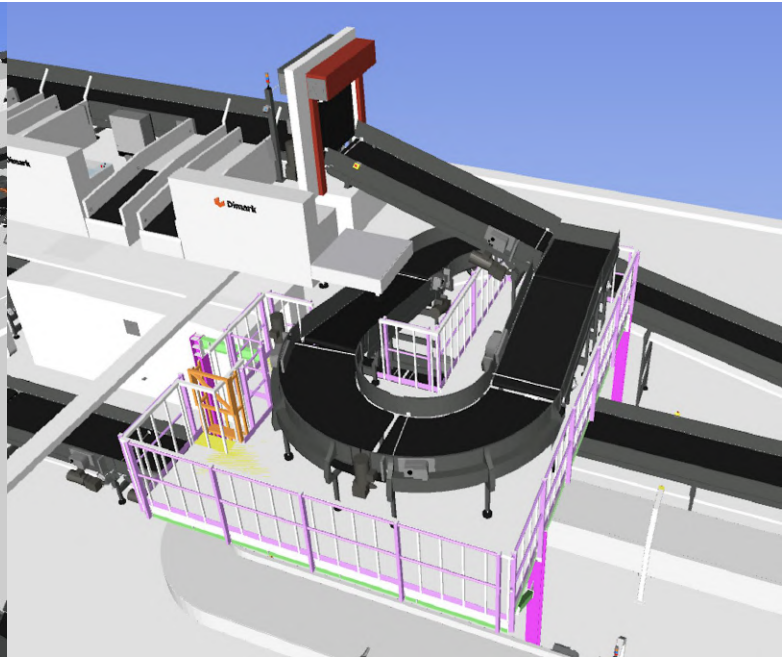
Trabzon International Airport (TZX), Trabzon, Türkiye

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Steel Casterdeck Systems***

Project Year: ***2025***

Project Size: ***2.500 m²***





Conventional Steel Structures

Istanbul Airport (IGA), Istanbul, Türkiye

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Pier Structures (conventional + space frame)***

Project Year: ***2016-2019***

Project Size: ***10.000 tons, 145.000 m²***

Conventional Steel Structures

Izmir Airport (ADB), Izmir, Türkiye

POLARKON's Scope: ***Engineering, Fabrication and Installation of Conventional Steel Structures with "hidden bolts"***

Project Year: ***2013-2014***

Project Size: ***2.460 tons***

Conventional Steel Structures

Erzincan Airport (ERC), Erzincan, Türkiye

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Conventional Structural Steel and Facade/Roof Claddings***

Project Year: ***2009-2010***

Project Size: ***2.600 tons***

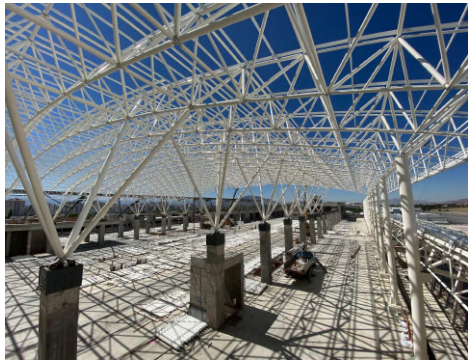
Space Frame Structures

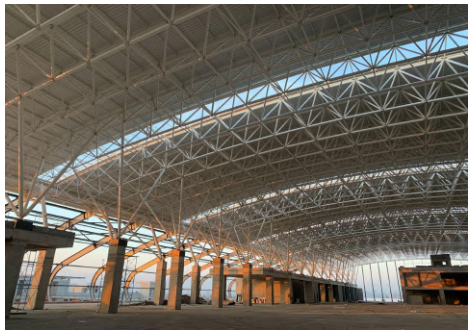
Kayseri Airport (ASR), Kayseri, Türkiye

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Space Frame Structures***

Project Year: ***2022***

Project Size: ***15.000 m²***





Space Frame Structures

Sabah Al Salem Uni. Convocation Hall, Kuwait City, Kuwait

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Space Frame Structures***

Project Year: ***2019-2020***

Project Size: ***11.000 m²***

Space Frame Structures

Al Shaheed Park III Theatre Building, Kuwait City, Kuwait

POLARKON's Scope: ***Engineering, Fabrication and Installation of Space Frame Structures***

Project Year: ***2021-2022***

Project Size: ***15.400 m²***

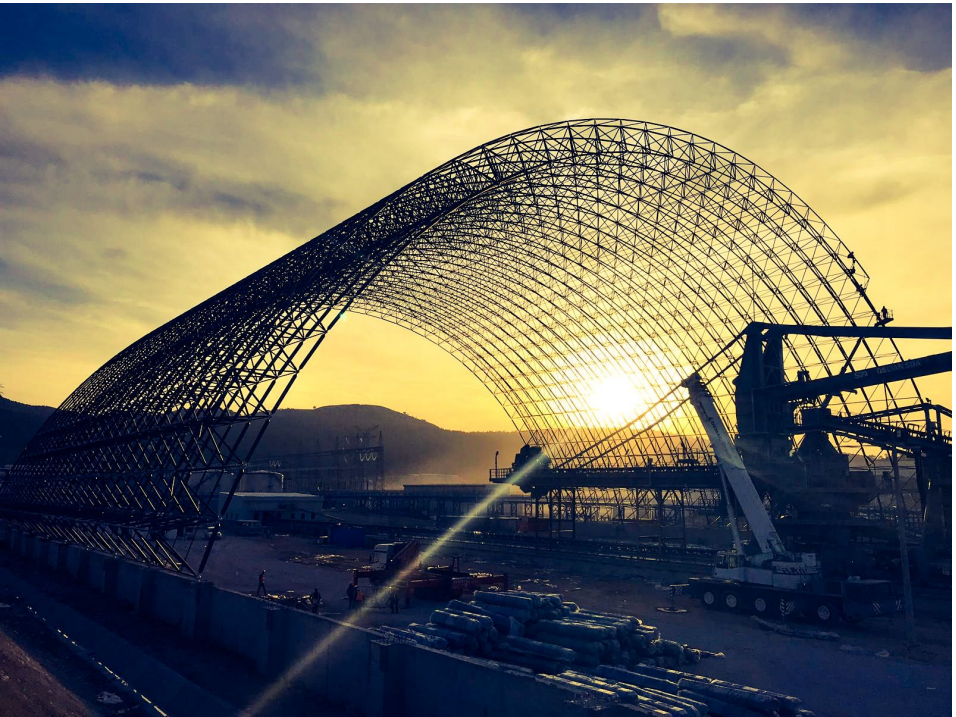
Space Frame Structures

Soma Thermal Power Plant, Manisa, Türkiye

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Space Frame Structures***

Project Year: ***2018-2019***

Project Size: ***16.000 m²***



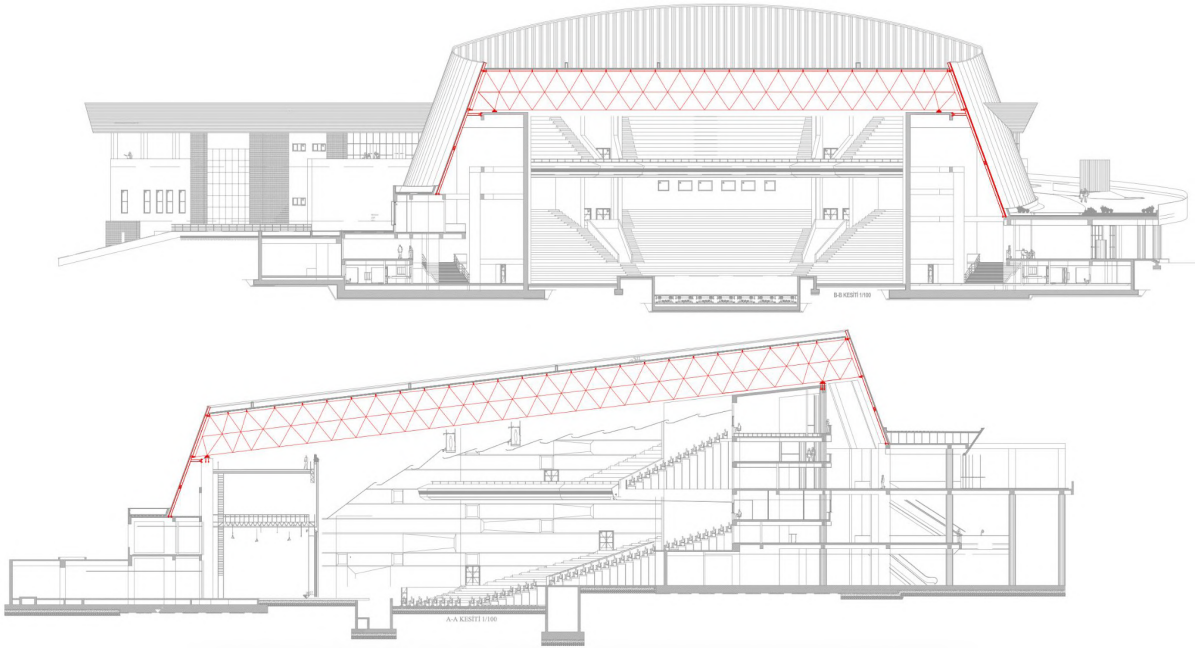
Space Frame Structures

Antalya EXPO Convention Center, Antalya, Türkiye

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Space Frame Structures***

Project Year: ***2018***

Project Size: ***12.000 m²***



Space Frame Structures

Cement Plant Storage Hall, Bursa, Türkiye

POLARKON's Scope: ***Design, Engineering, Fabrication and Installation of Space Frame Structures***

Project Year: ***2024***

Project Size: ***7.050 m²***

General Construction Works

UPS Gateway Building, Istanbul, Türkiye

POLARKON's Scope: ***General Contracting Works***

Project Year: ***2018***

Project Size: ***12.000 m²***

LEED-Certified

General Construction Works

JCB Service Station Building, Ankara, Türkiye

POLARKON's Scope: ***General Contracting Works***

LEED-Certified

Project Year: ***2013***

Project Size: ***7.500 m²***

Thank You!

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