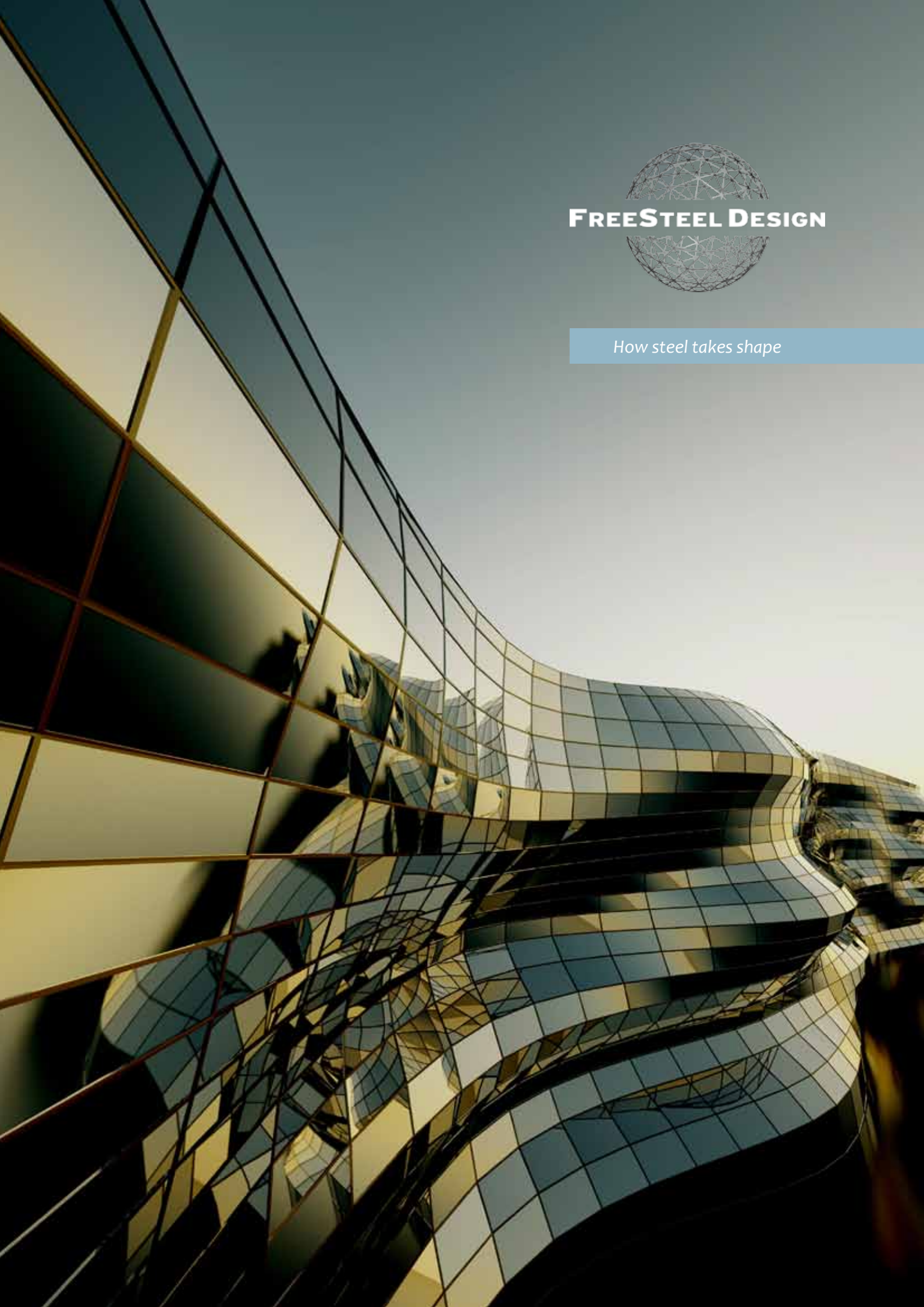
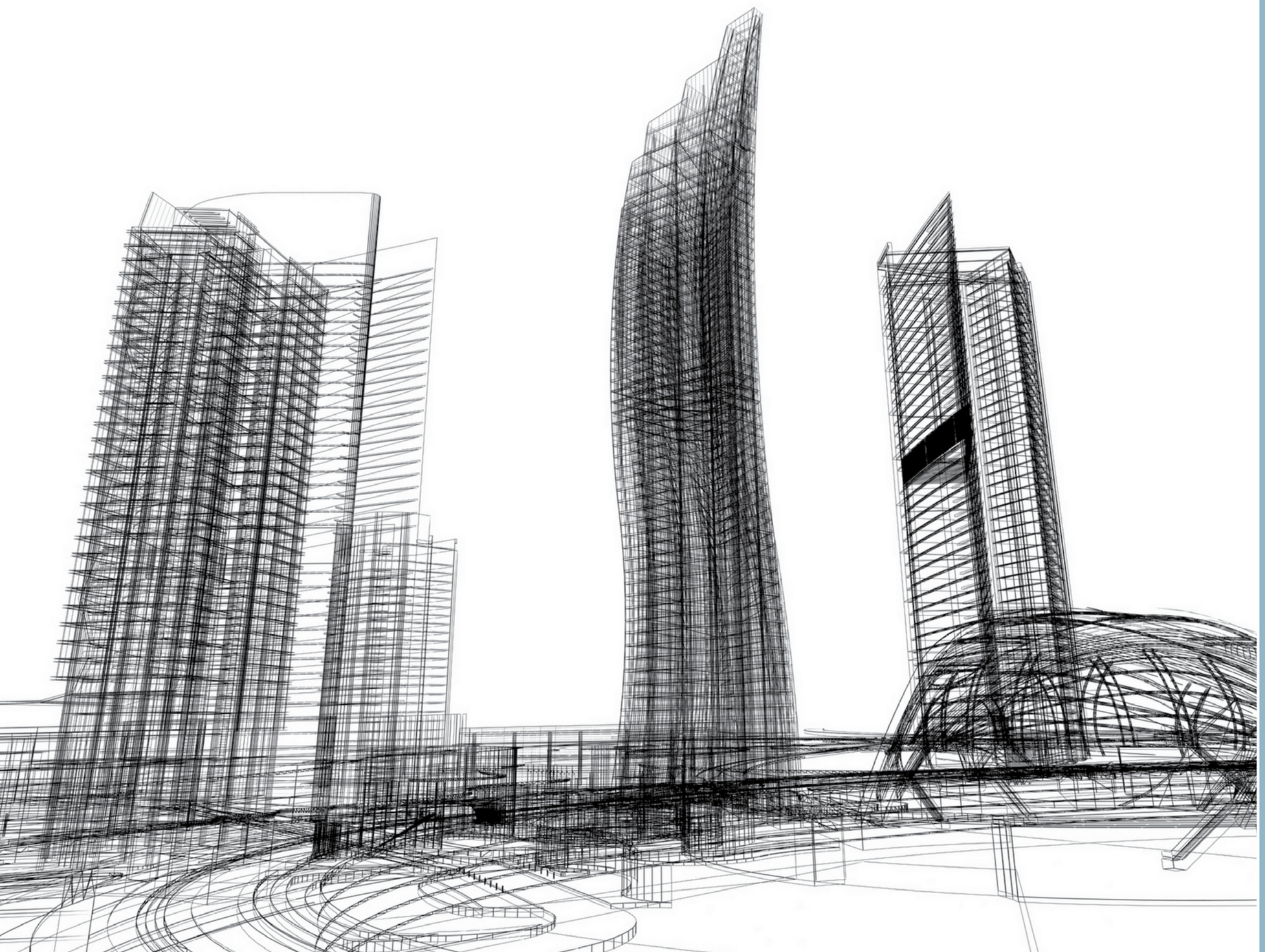


FreeSteel Design

How steel takes shape

FREESTEEL DESIGN

How steel takes shape



The construction sector is developing day by day, highlighting the capabilities of materials together with the projects where visual diversities are being used with functional purposes.

According to today's necessities, all architectural projects are being actualized by using high-tech materials and advanced technology together with the common materials which are re-interpreted within the context of functionality.

In this regard, steel is the most versatile and important construction material which enhances architecture and enables architects to create some of the most challenging buildings they have designed in their minds. Thus, key factors for the choice of steel structural system by DESIGNERS and INVESTORS are:

- The possibility of enabling multiple functions with one unit
- The contribution of steel structural system to visual richness
- Necessity of flexible and workable secondary steel structures depending on the variable interpretation of shell structures

FREESTEEL DESIGN

Within the frame of proper / perfect engineering acceptances, the effort to attain the objectives with the proper engineering might be pointless with many construction materials in terms of aesthetical point of view.

Proper engineering should be taken into consideration as an essential requirement even if not sufficient for proper architecture. In this context, steel gives an opportunity to actualize many architectural expressions together with being a versatile and applicable construction material.

In terms of general constructional aspects, high quality detailing is very important as it affects structural performance, costs, constructibility and above all, the visual appearance of construction. At this point, structural steel system enables to actualize intended achitectural expressions at maximum level with the help of proper engineering.

FreeSteel Design

The evolution of **STEEL**

According to a classical archaelogical theory, the very first processing of iron ore occurred spontaneously when the soil got very hot during a forest fire at Kaz Mountains, Turkey that caused to shape the iron in the soil.

Another theory is that, human beings found out to process iron as a result of meteor hits. It is assumed that human beings found out to forge the meteoric iron. After processing of the iron they made primitive equipments and guns.

Although iron and steel are being used for about 5000 years, they were only used for producing guns and equipments until two centuries ago.

However, in the eighteenth century England, they began to use iron in the construction industry as a result of producing raw iron. Thus, the first structures were the bridges made of iron and the first material used was cast iron with a high compression strength and a low tensile strength.

Following years, the possibility of producing cast steel was developed as a result of refining liquefied raw iron by methods of Bessemer(1855), Siemens-Martin(1864), Thomas(1879).
Thus, cast steel became the most produced type of steel, dating from late eighteenth century.

Especially at the beginning of the twentieth century, there had been a fast improvement at construction techniques of steel structures with the use of electric furnaces at production phases. As a result of fast erection capability of steel structures, this system was preferred to be used commonly at construction sites after the First World War, as well as during and after the Second World War.

After the First World War, steel structures were commonly used in order to put together and restructure the scattered industry.

During the Second World War, German armies invaded all the lands of many states till Volga River and carried the outfits of industrial plants to those new lands. They aimed to start a rapid industrial production which was only possible by using steel structural system at constructions. Similarly, after the war, the necessity to build industrial facilities, social and sports centers, schools and housings promptly, could only be fulfilled by using the same system at constructions. Thus, design and calculation techniques of steel structural system developed rapidly.

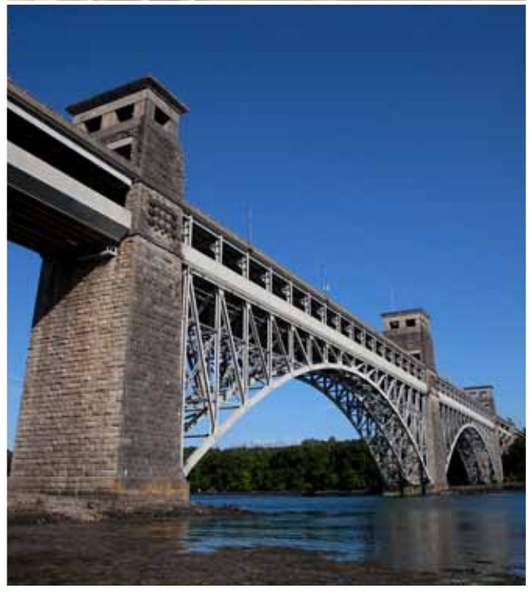
Siemens Martin oven

Within that period, welding techniques developed as well. The first bridge which was constructed by using cast iron in 1778 / England, was Coalbrookdale Bridge on Severn River.

Abraham Darby III

Coalbrookdale Bridge, 1778

It was constructed by Abraham Darby. He is the first who succeeded to produce coking coal by using hard coal and processed iron by using that coking coal.



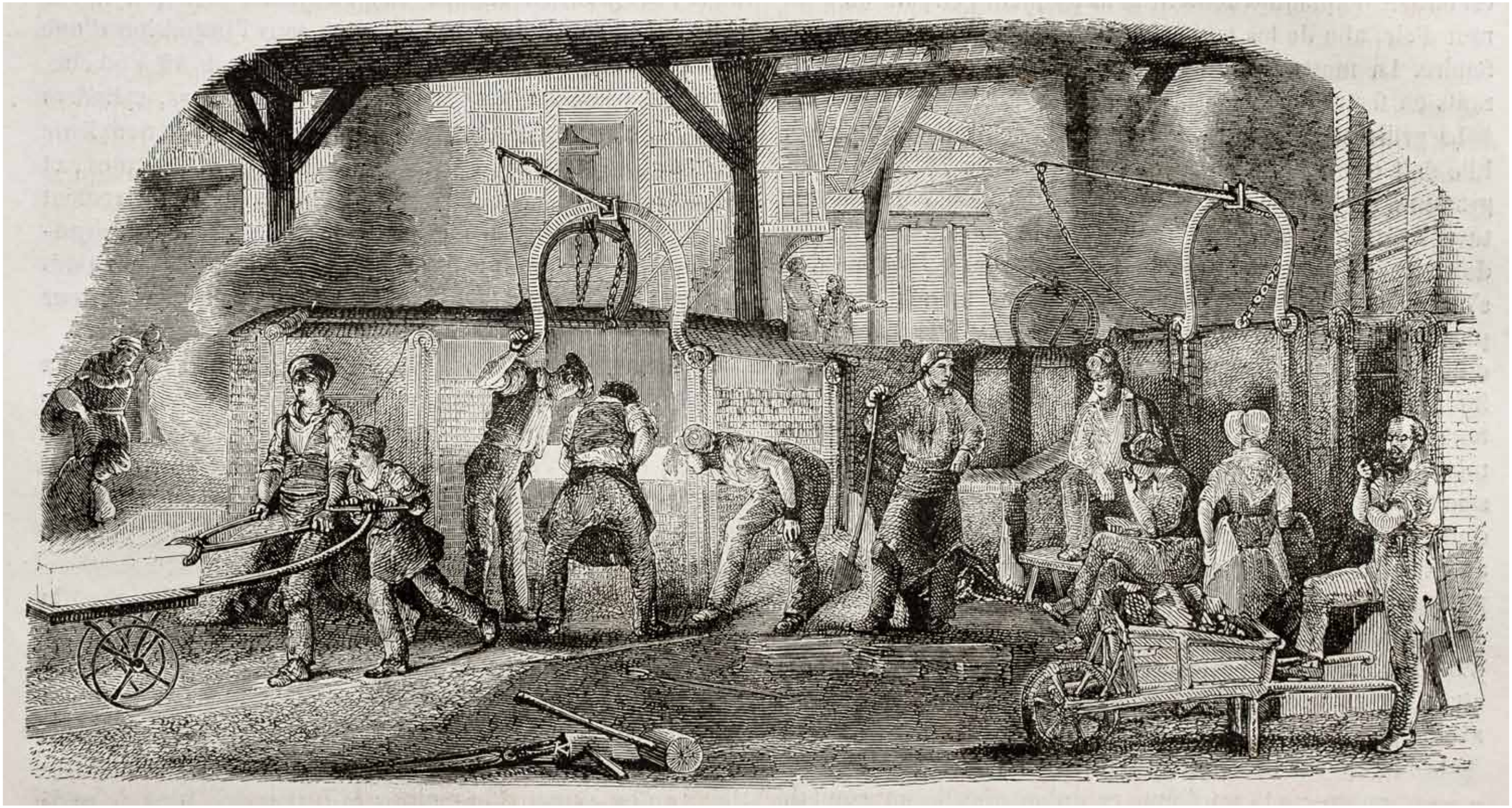
Britannia Bridge, 1846

Until eighteenth century, people used wood coal as it possesses a rich content of carbon, in order to process iron. However, the European Forests were on the point of exhausting in those years which made it difficult to use wood coal. At the same time there were plenty of hard coal in England in those years, but there was not enough carbon in it. Abraham Darby is the first who succeeded to produce coking coal by using hard coal and processed iron by using that coking coal. Thus, coking coal is considered to be a great invention which started The Steel Age. However, the quality of the iron which Darby was processing was not good. The processed iron was full of carbon pores and inadequate for elaborare such as clock and watch making. Moreover, tensile strength of cast iron was also not good enough.

Henry Cort who was British like Abraham Darby, achieved to produce good quality cast steel by discovering 'Method of Puddling' in 1784. Owing to that invention, a high quality steel was obtained sufficiently which was enough for industry. Thus, sole trade of Russia and Sweden who were processing iron by wood coal had been eliminated. In this way, England began to dominate the market and was accepted among all countries as the provider of the metal with its manufacturing technology.

In those years, England was in a preeminent position in the world at mining industry. Most of the countries invited and delegated British engineers in order to set up iron plants in their countries.

The first high furnaces in Germany and France were set up by British people (1787). During those years they started to construct bridges with solid main beams or lattice main beams made of cast steel. One of those is Britannia Bridge with a span of 140m. which was constructed in 1846 / England.



Old illustration of iron production: Foundry in La Houilles, France.
By unidentified author, published on Magasin Pittoresque, Paris, 1850.

Why **STEEL**

Building with structural steel is the obvious and **S A F E** *decision*

Sustainable

Appropriate

Fast

Economic

Why
STEEL

SAFE

Sustainable

Iron and Steel are the materials which are used in every field of life. Iron is the core material and the most common natural resource of the earth as well as available at anywhere on earth. Moreover, steel structure can be easily adapted to the changing needs of the user and provides a long lifespan of a structure.

Steel enables structures or buildings to be renewed, changed or to be able to adapt to the new areas of usage.

It is a 100% recyclable material, as well as increasing the quality of the product unlike other materials. Thus, steel is among the most important sustainable material of the future.

In Europe, most of the buildings are constructed by steel structures which are 96% recyclable and they can be re-used in a considerable amount while the other materials cannot.

The consumed energy and the results of decreasing CO_2 output per each ton of produced steel are in conformity with the targets of sustainability of the European Commission.

Steel provides safe working conditions and also improves the quality of employee training.

It is the most convenient material for pure, strong buildings and fast constructions. It also provides sustainable construction solutions.

Thus, education of qualified professionals who are familiar with steel structures is very important for sustainable development.

Searching and dissemination of information about the possibilities for optimizing the construction by using steel structures, is the key factor for success at steel supply chain. In this aspect, Europe undertakes this responsibility for sharing its knowledge and abilities with the rest of the world.

Culture and sustainability cooperate for the environment, and using steel structures is the most sustainable way for the future.

Why
STEEL

S A F E

Appropriate

Dynamic forms

Today, architectural object becomes a continously disfigured and reformed, luminous and electronic material.

The form which is deformed, elasticised and digitised gives a new meaning to structures and buildings.

Being digitised can be characterised by following concepts of 'unification, fusion, contraction and mutation' which enables steel to be used in a new design language.

Steel is the load bearing structure or the coater of these digitised forms and it can be reshaped or bended in order to achieve such forms. Any requested steel structural profiles or steel coating elements can be easily produced by special production techniques. This elasticised feature enables steel to be named as a plastic and formable material.

Transparency

In architectural terminology, transparency can be described with the idea of designing the building without disconnecting it from the environment.

The ability to design steel structures with small sections enables to design the building without disconnecting it from the surrounding.

Today, many architectural works which unite pure steel structures with transparency of glass are considered as icons of the era. This feature of steel is also very important within the context of engineering.

Steel structures are designed in such a way that they can be traced throughout the life of buildings; the sections are open, ready to be controlled anytime or to be replaced if needed.

Slightness and flexibility in design

Buildings constructed with steel structure are much lighter than other construction materials.

When you compare the weight of a building constructed by steel with the same building constructed by reinforced concrete, steel structures are lighter than other at a rate of 1/3 approximately. This feature of steel enables the structures to be more flexible and makes it an unrivalled construction material.

Steel provides also flexibility in design as well as at construction. Building owners often are faced with the challenge of modifying an existing space to meet changing needs.

In this context, steel is the only material that allows the strength of a structure to be increased economically once it is built.

Longer spans

Steel structure gives way to designers to create spaces with longer spans. Its high strength-to-weight ratio enables to span large distances gracefully and economically - more so than any other building material.

The long spanning capability of steel also enables the creation of large areas of unobstructed space in buildings.

Fewer columns make it easier to subdivide and customize living space for current and future tenants. Open space is also more attractive to designers as well as investors.

Thus, steel is the most convenient construction material where flexible and free spaces are required.

High quality production and traceability

Steel structure requires high level of engineering. Both the nature of the material and the production requisites generate a control mechanism by itself.

It is not possible to build any steel structural system with standard experiences and it requires engineering. Besides, steel structures are produced under the controlled factory conditions.

The material is not affected by site conditions.

Providing convenience to other disciplines of construction

Steel structural system provides many advantages as a result of pre-production phase by virtue of delicate project requirements. Moreover, it creates appropriate spaces for electric and mechanical works, provides high technological and safe detailing for bracing members as a result of appropriate engineering which are very essential features of steel structures for constructions.

Why
STEEL

S A F E

Fast

Steel structure is produced under the controlled factory conditions and does not get affected from site circumstances. Besides, it enables to produce the cladding material simultaneously, which covers the structure as it is designed and produced with precise project dimensions.

Every cladding structure or the interior material can be manufactured in parallel with steel projects without taking any dimensional check at site.

Thus, steel enables the most efficient site/installation planning, when the coordination of the site works is considered.

Why
STEEL

SAFE

Economic

One of the main factors that enables cost-saving in construction is that steel structures are produced under the controlled factory conditions. Besides the primary costs of the building, it is assumed to be the most economic construction material in terms of total cost. Steel provides an economic building identity by means of:

- Shortening the construction period
- Enabling the building to enter into service in a short time
- Decreasing the foundation and excavation costs in parallel with having lighter weight
- Having a longer-lasting/more sustainable lifespan than other alternative construction materials

The cost saving feature of steel structures by means of shortening the construction period and its positive effect to the total investment as well as its reliability are the main factors for contractors' and investors' choice of these systems as building structure.

Utopia to
REALITY

How steel contributes to architecture

The transparency concept beginning in the second half of nineteenth century, displays an attractive effect over architectural design.

Later on, versatility of the glass material provides new and better potentials to designers. The placement of the openings is not just a practical solution for getting light, providing exterior&interior visibility and enabling natural ventilation but also provides therapeutic quality by catching and framing the light which is essential for changing gloomy spaces.

Designing glazed and semi-transparent roofs or facades which are generally perceived as weightless, enables spaces as if they are reaching to the sky and it develops the relationship with the nature.

The curved forms of modern atriums inside or in between the buildings can be easily constructed with steel structures which provide desired effect of the designer.

Thus, steel enables minimal and smart solutions without spoiling the building's desired visual and functional features.

Who we are

Who
WE ARE

When the development of construction sector is considered, there are two options for us

To do what has been done so far and keep on doing the usual,
or
To make a contribution to progress of architecture being aware that designers are leading this field
and
To do what is not standard, not easy and carry designers through success with the help of high engineering solutions

In this regard, FreeSteel Design prefers to do what cannot be easily done and puts into practice the advanced solutions with the help of necessary and appropriate engineering management.

This journey began 17 years ago and the accumulated knowledge with experience is embodied in FSD.

The creation of the company is the incorporation of its team's ongoing experiences which is parallel to the evolution of steel, described within this 'FSD Book'.

Similarly, the evolving reliance and the advantages of steel philosophy enables the company to be an important contractor/manufacturer in construction sector.

FSD's creative engineering capabilities are the services that are put forward to this sector.

Every experienced employee of FSD aims and follows the idea that the appropriate engineering makes a maximum contribution to architecture.

In this respect, the creative engineering is recognized and adopted by each and every member of FSD.

Besides, it is difficult and hard to manage the whole process of transmission of innovation to accurate engineering, manufacturability of engineer's design, and also reliability of the final product.

The definition of analytic process at project management should be determined within this context and the reliable process, which means the manageable product and services in all, should be described in detail.

In this sense, the reliance of steel which is blended with advance engineering capabilities and experiences of FSD team, forms the philosophy and route of the company.

RITZ CARLTON HOTEL / CUPOLA

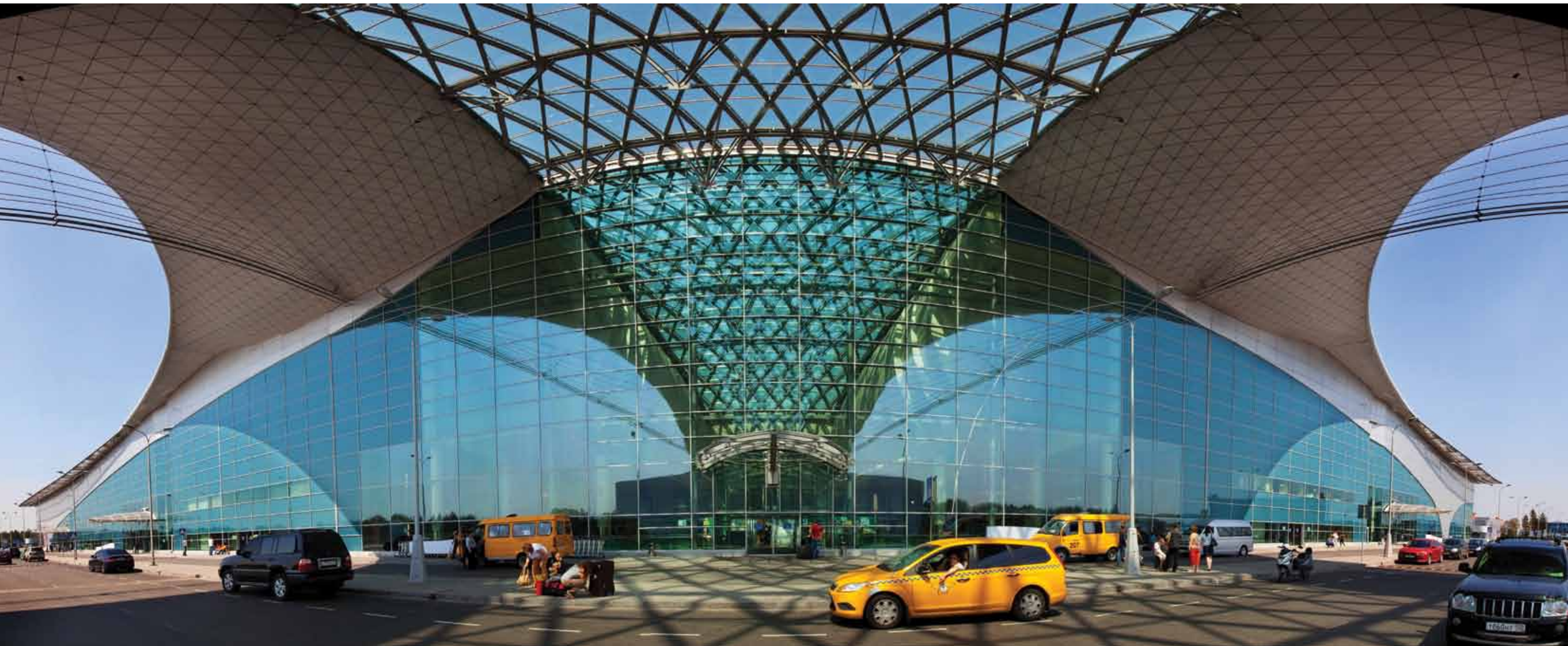
Who
WE ARE

The objectives of FreeSteel Design can be described as follows

Structural Engineering, Detail Designing, Planning, Manufacturing and Erection of

- *Architectural steel structures*
- *Primary steel structures*
- *Secondary steel structures*

SHEREMETYEVO AIRPORT / MAIN ARCH



Architectural steel structures

RITZ CARLTON HOTEL / CUPOLA

Architectural steel structures

One of the most important milestones in architecture was the development of construction methods in iron and steel.

The familiar post and beam metal frames of modern architecture became possible with the mass production of steel. However, it goes beyond the standards and eliminates the borders of architecture in a short time. Thus, every type of steel is the most favoured material for architectural design.

Steel presents a new design opportunity to architects with its different features from the traditional materials.

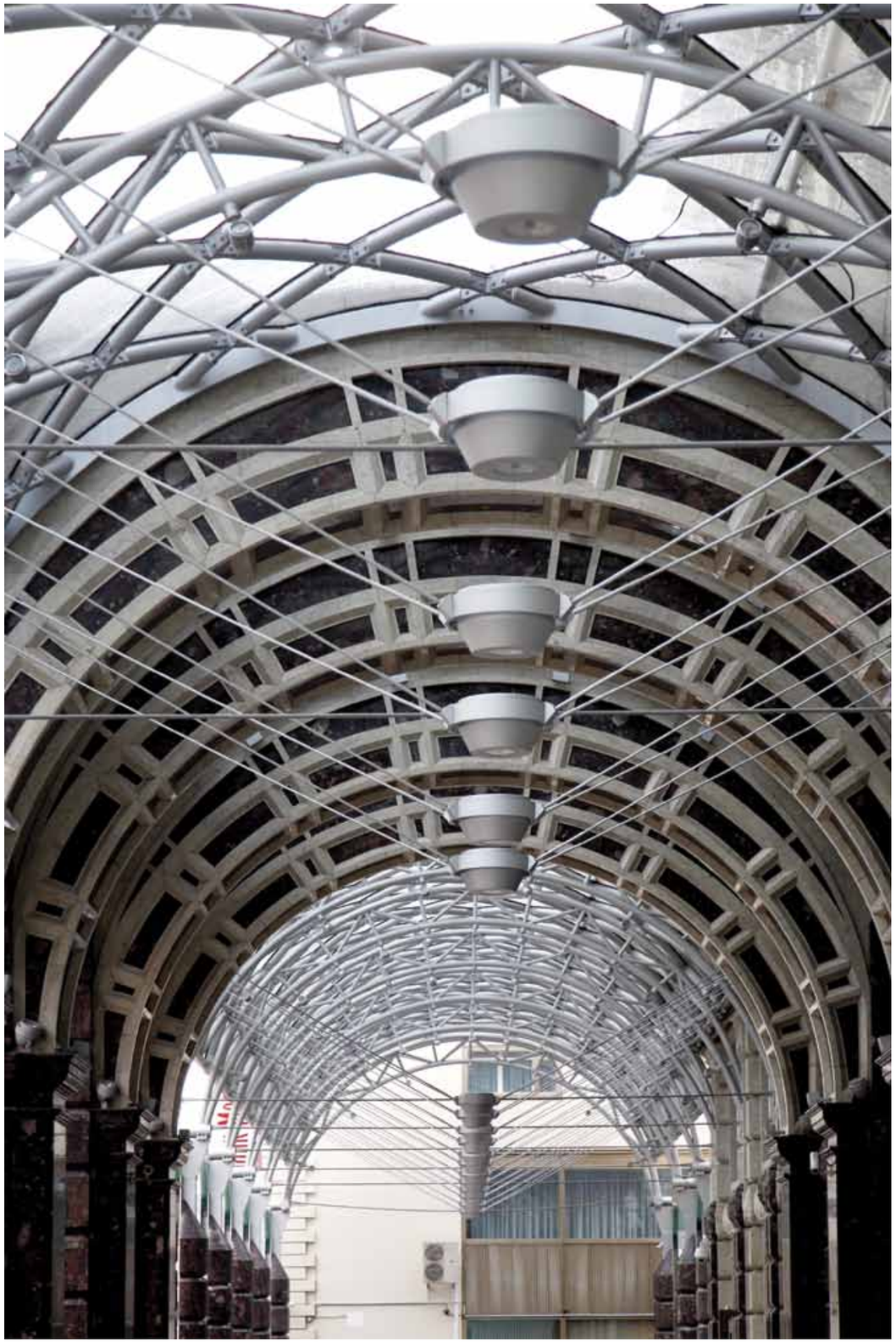
The steel is intensively used in contemporary architecture to provide a different expression. Just because structure is essential for the architecture of the building, providing necessary stability, strength and stiffness, it does not have to be architecturally mute, unless the designer makes that choice.

Thus, steel structure no longer remains silent in terms of today's architectural concepts.

It contributes architectural meaning and richness, sometimes becoming the most significant of all architectural elements within a building.

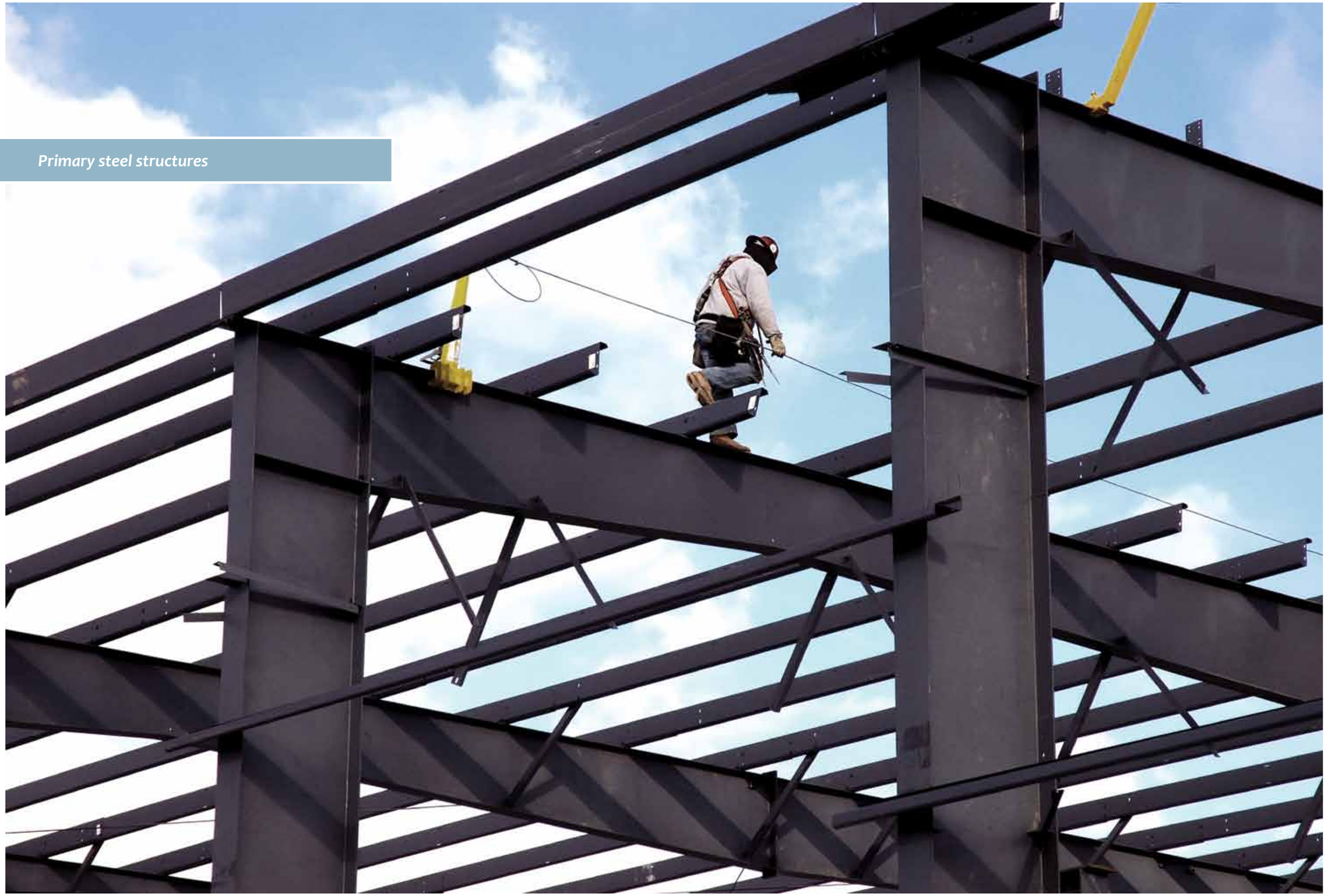
In this context, FSD aims to be the solution partner for the architects in order to achieve the most complicated structures with using the capabilities of steel systems.

In the light of the expression ***'There is always a solution in Steel'***, FSD team has completed many complicated projects with its advanced design & engineering capability, strict planning and project management discipline.



RITZ CARLTON HOTEL / ARCADE

Primary steel structures



Primary steel structures

INDUSTRIAL BUILDINGS

Architectural needs of constructing industrial buildings are also fulfilled properly with steel structures.

Longer spans, sectional-variable load descriptions, changeable dimensions are the main reasons for choosing steel structures in design of industrial buildings.

The advanced design capability of FreeSteel Design with the advantage of providing light weight at weak soil conditions, plays an important role at customer's choice.

Steel structures are produced and installed faster than other construction materials. The building starts functioning just in time as planned before.

Steel structure is more resistant to eartquake. This positive feature of steel in terms of weight, combining with the design capability of FreeSteel Design, provides a major advantage when it is compared to other construction methods.

'Quality and Reliable Total Service Perception' of FreeSteel Design is the key value of constructing industrial buildings throughout all the processes: project designing, planning, manufacturing and erection.

INDUSTRIAL BUILDING EXAMPLES

Primary steel structures

MULTISTOREY BUILDINGS

Multistorey Steel Buildings are used in parallel with architectural & social needs and provide reliability and architectural flexibility by changing the habits.

Longer spans with using minimum post and beam structures means more open and comfortable spaces.

The other advantages of using steel structure at multistorey buildings are being lighter in terms of weight, decreasing costs in terms of foundation expenditures and being more secure in terms of earthquake in parallel with its weight.

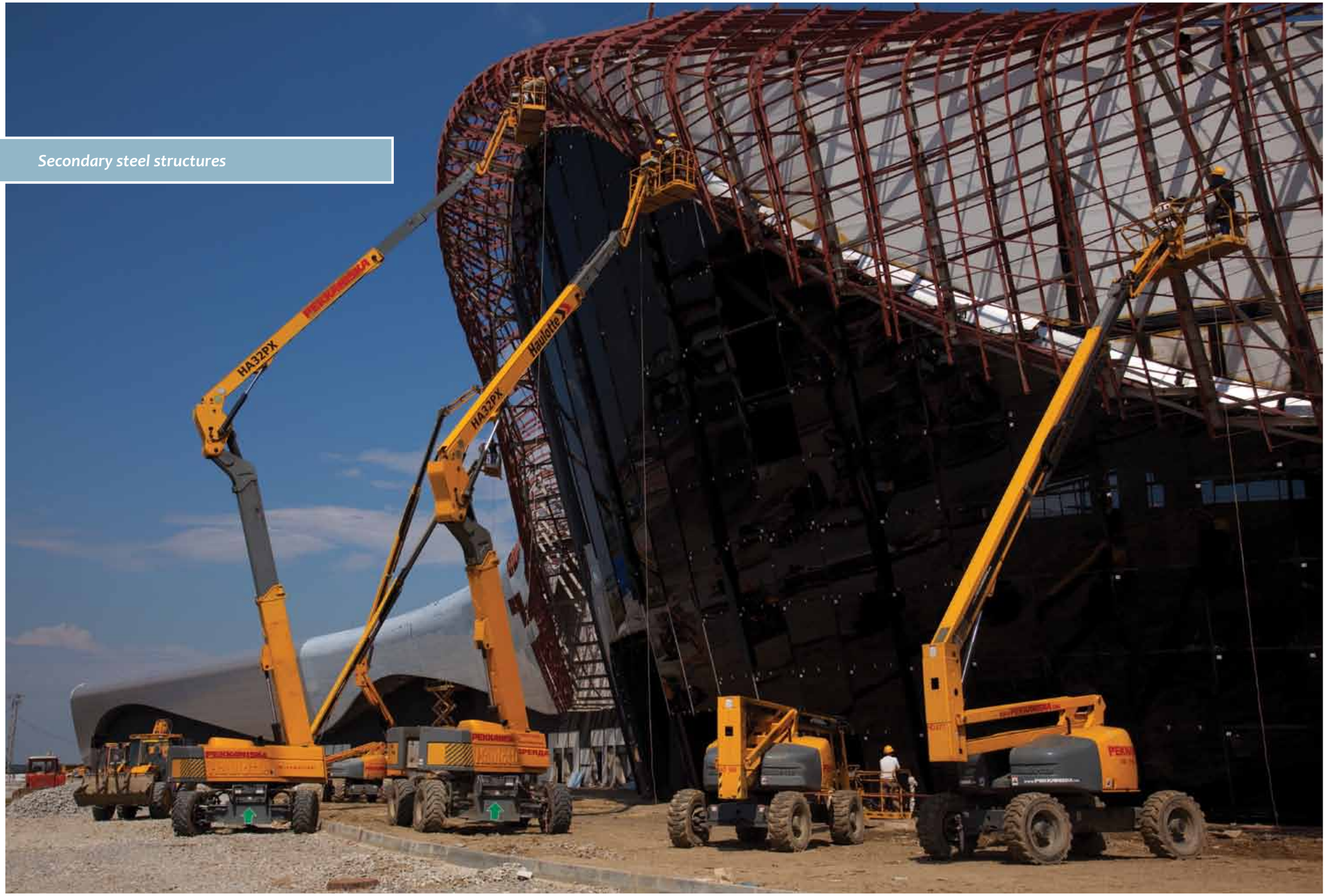
Using formwork at other construction methods is not essential for multistorey steel buildings.

At this point, using steel structure is faster than other construction methods and enables reliable construction conditions.

'Quality and Reliable Total Service Perception' of FreeSteel Design is the key value of constructing multistorey buildings throughout all the processes: project designing, planning, manufacturing and erection.

MULTISTOREY BUILDING EXAMPLES

Secondary steel structures



OZ MALL / WING STRUCTURE

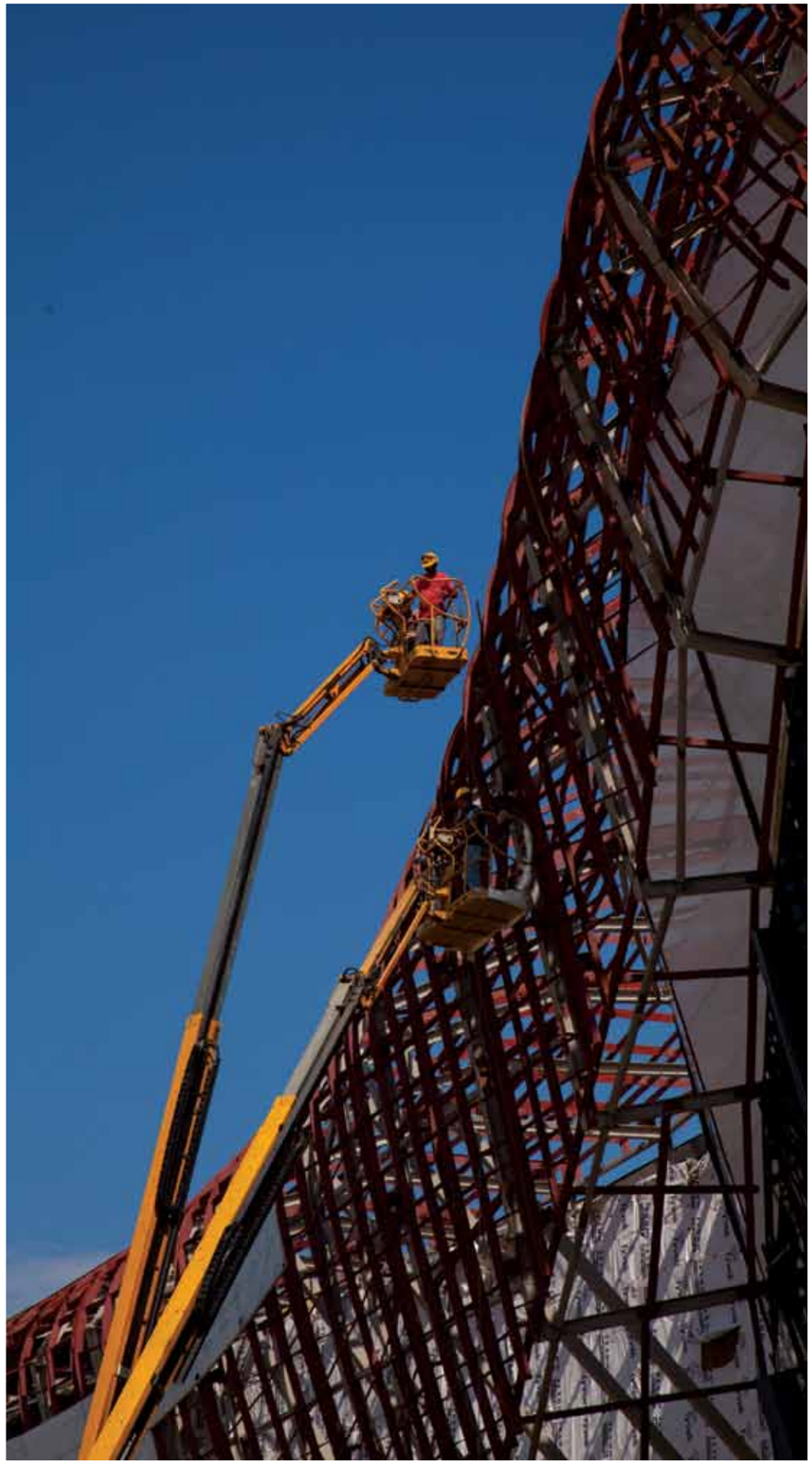
Secondary steel structures

Secondary steel structures can be considered as building elements which are not load-bearing but play an important role especially in architectural design of shell systems.

As it enables to form the building geometry according to architectural design, it needs to be detailed, manufactured and installed precisely.

In this context, structural detailing of secondary steel elements is very important.

Thus, endless opportunities exist in secondary steel structure in order to enhance architecture and thereby enrich people's architectural experience.



OZ MALL / WING STRUCTURE

Who
WE ARE

FreeSteel Design manages all phases successfully throughout

Conceptual design

Basic structure sizes&positions
Member material
Preliminary drawings

Architectural integration

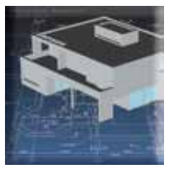
Structural engineering

Detailing

Shop drawings
Detailed connections

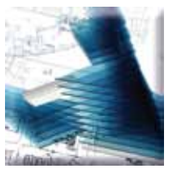
Procurement&purchasing

Bill of material (BOM)



Fabrication integration

Production automation
MIS information transfer
CNC downloads



Erection scheduling

Erection planning&follow up
Sequencing&lotting
Project management

Erection

FSD varies from others in steel construction sector with its following features:

1 *International contracting capability*

2 *Advanced design and engineering*
(International quality and design standards)

3 *Supplying high-quality steel products at its own production facility*

4 *Pre-assembling concept*
(Pre-assembling during fabrication stage at warehouse to eliminate any kind of erection faults and complications at site)

5 *Minimizing workmanship at site*

6 *Special structures*
(Advanced design and engineering software, qualified technical staff and fabrication power for design and engineering of complicated structures and forms)

Who
WE ARE

SHEREMETYEVO AIRPORT / MAIN ARCH

International Contracting Capability

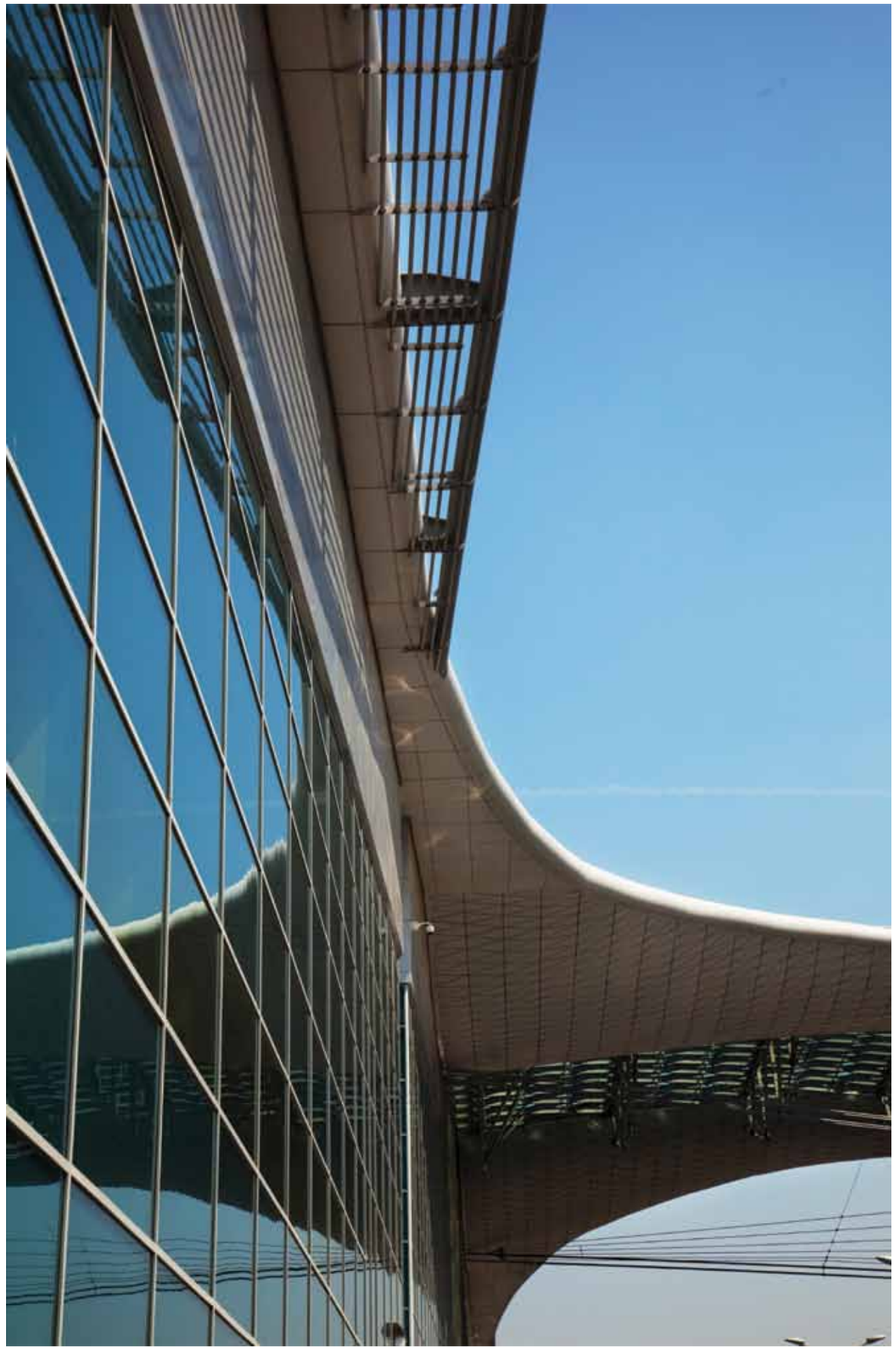
With its advanced design & engineering capability, strict planning and project management discipline, FSD gives its services at following range:

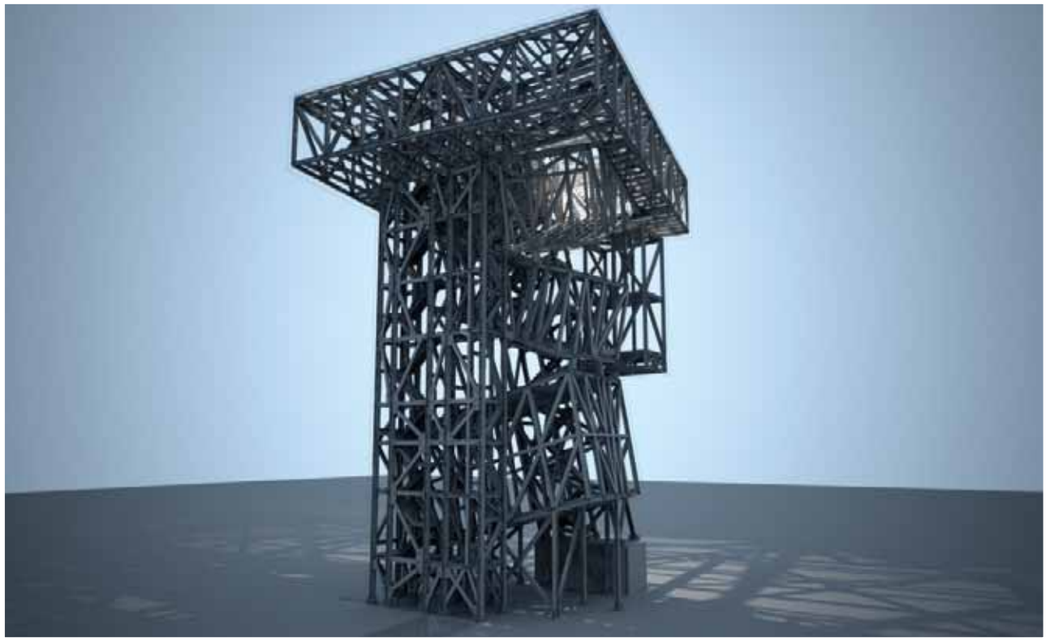
FSD is performing structural and architectural steel works beginning with the design development phases all the way to the successful completion which are supported with leading edge design and engineering solutions.

17 years of experience and know-how will be carried out within FSD, according to technical specifications, performance criterias and local norms of the territory where the project is located. Based on previous project experiences, FSD performs its work in line with Snip and GOST of Russia and CIS countries, BS of UK, EN of Europe, UBC and construction norms of USA and IBC/ ICC international building code.

Thus, having a capability and ability of performing construction works throughout Russian Federation, CIS Countries, Saudi Arabia, Africa, GCC Countries and Europe, FSD aims to strengthen its contracting ability all over the world and provide customer satisfaction in bulky & complex projects.

- Structural steel construction for industrial buildings
- Structural steel construction for multi-storey buildings
- Structural steel construction for pre-fabricated housings
- Structural steel construction for vehicle bridges
- Architectural steel structures for complex forms
- Architectural steel structures for special works such as: Canopy, Dome, Cupola Structures
- Steel structures for facade claddings and facade glazings, cladded roof structures, glazed skylights
- Modular steel shell systems

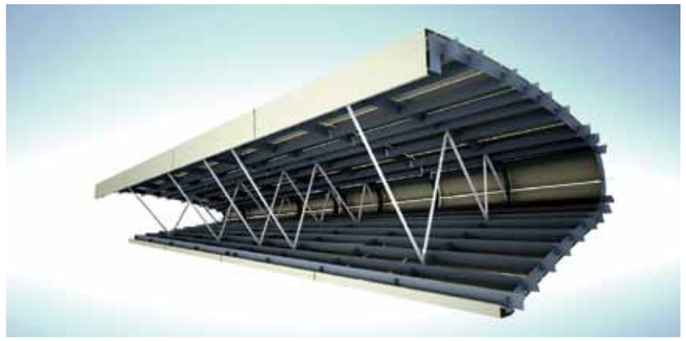


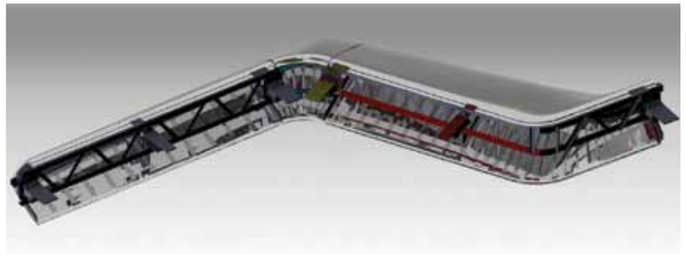


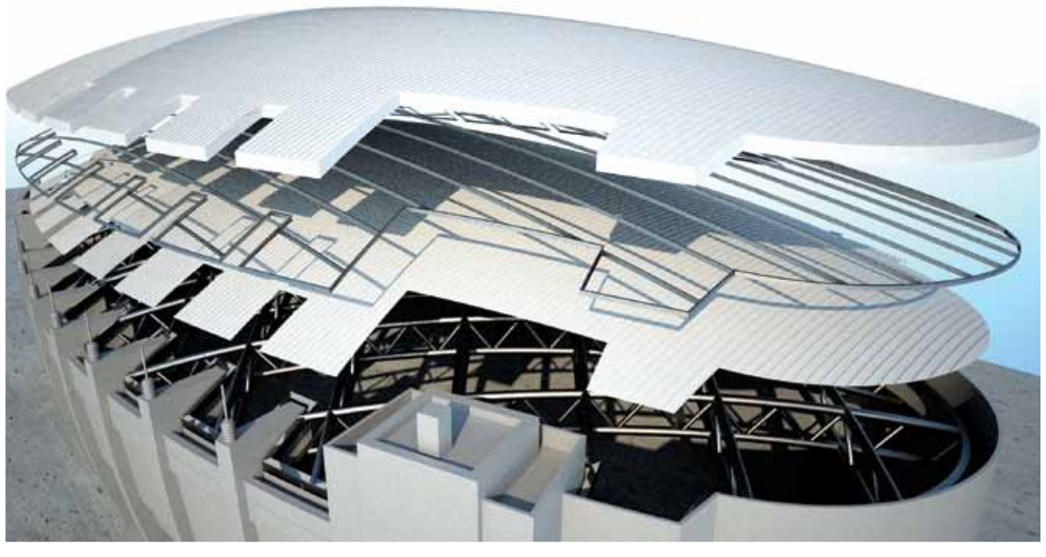
Advanced Design and Engineering

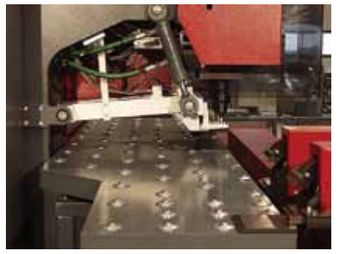
The advanced capability of FreeSteel Design's project designing ends up with successful manufacturing process.

Having embodied experienced manufacturing staff, FSD executes complex but producible forms/structures with its own high-tech machinery.









FSD manages all phases successfully throughout project designing, manufacturing and erection phases with its advanced experience.

FSD provides customers with its service not only with project designing, manufacturing and erection but also creating advanced solutions in details which need to be handled according to architectural precision.

Acting with this principle is the main target of FSD, which helps to prevent any complication that might occur before or after constructing the building.

Advanced detailing and generating appropriate solutions under the control of Architectural Project Supervisor, are the main obligations of FSD.

Having internalized the perception of total responsibility, FSD provides quality and reliable service to its customers with generating all the processes throughout structural engineering, detail designing, planning, manufacturing and erection.

Supplying high quality steel products at its own production facility

• To produce every piece of the structure under the controlled factory conditions

• To assemble the structure at site as described without any additional interpretation

Within the framework of this approach, each connection detail is designed as bolted at maximum rate as far as statical calculation permits.

By this means, the system gains a reliable process. Each piece which is produced under the controlled factory conditions, can be installed at anywhere in the world without having a problem.

Both the requirements of quality production and the capacity management correspond to ***'Quality and Reliable Total Service Perception'*** of FSD.

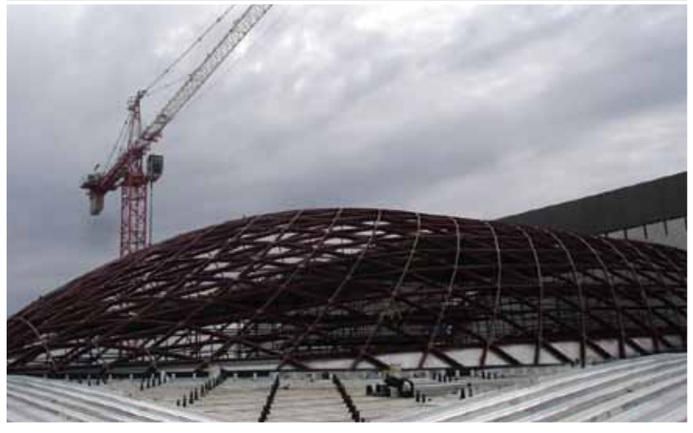
Demountability of these structures enables the sustainable exploitation of steel systems and becomes the integral piece of the whole process, within the context of FSD's philosophy.

Pre-assembly concept

Pre-assembling during fabrication stage to eliminate any kind of complications at site.

Minimizing workmanship at site

Structural Steel is lighter and assembled faster than other framing materials, thus minimizing the workmanship at site.



OZ MALL / CUPOLA

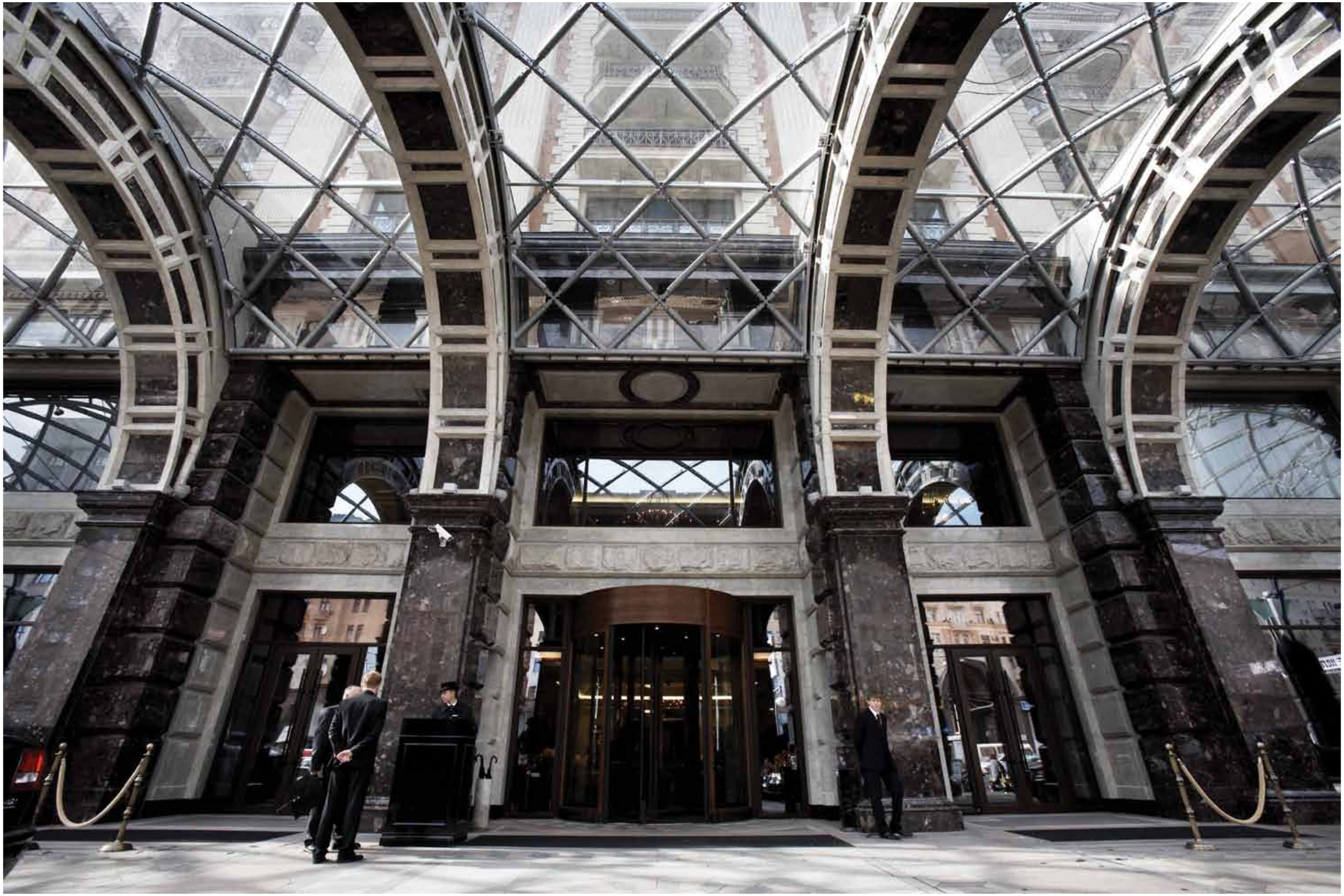
RITZ CARLTON HOTEL / ARCADE DETAIL

Special structures

Today, steel provides not only strength to buildings, but also enhances architecture and enables to construct special structures that are too costly to produce and construct with other materials.

Curving & bending is now possible in ways that were never thought possible before. Curves using steel beams bent to a certain radius or segmented curves or combinations of both can create members that follow the outlines of irregular facades, arches or domes.

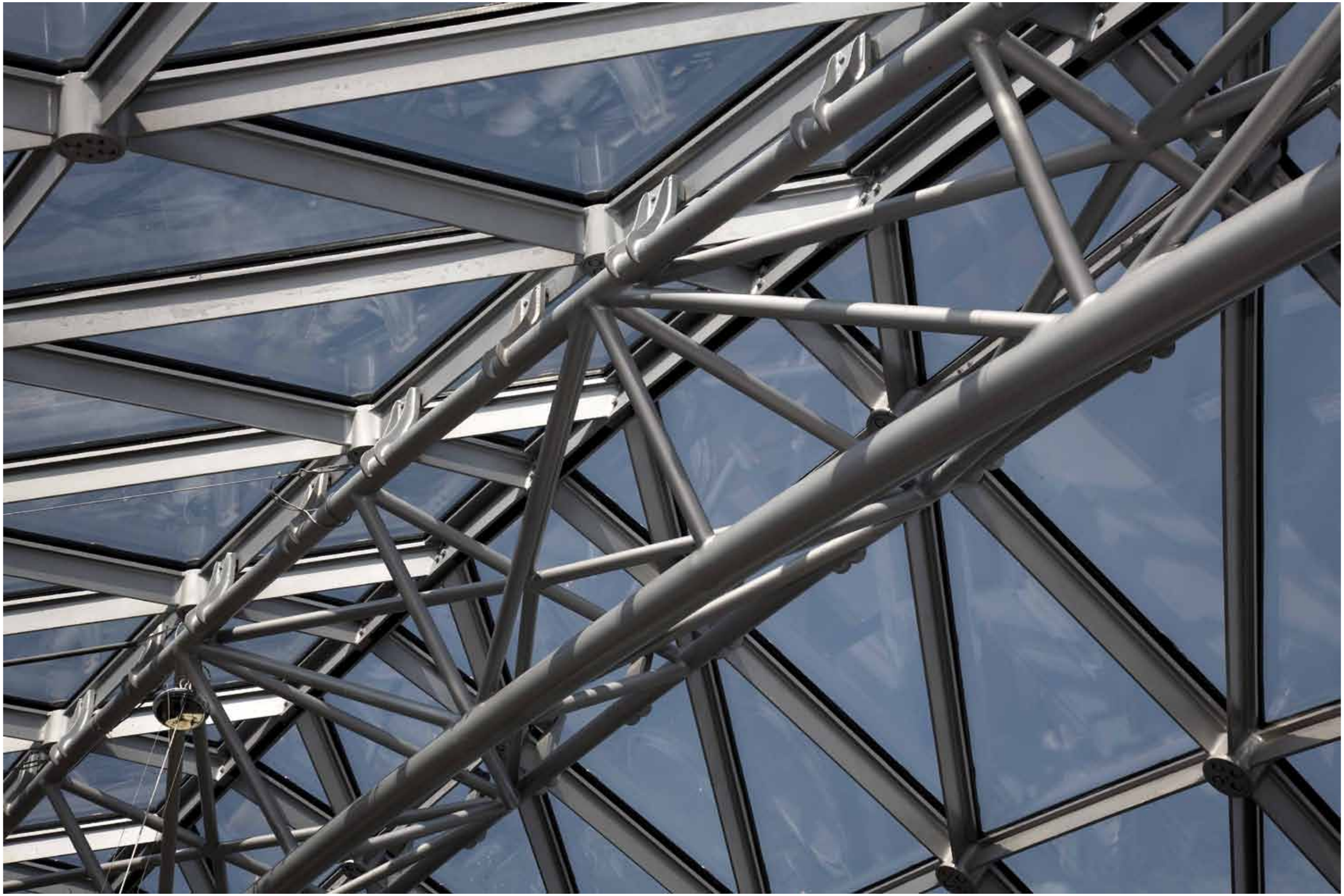
In this context, FreeSteel Design offers to produce and construct the most complicated and irregular structures with the help of its advanced design and engineering softwares, qualified technical team and high-tech manufacturing capability at its own production plant.



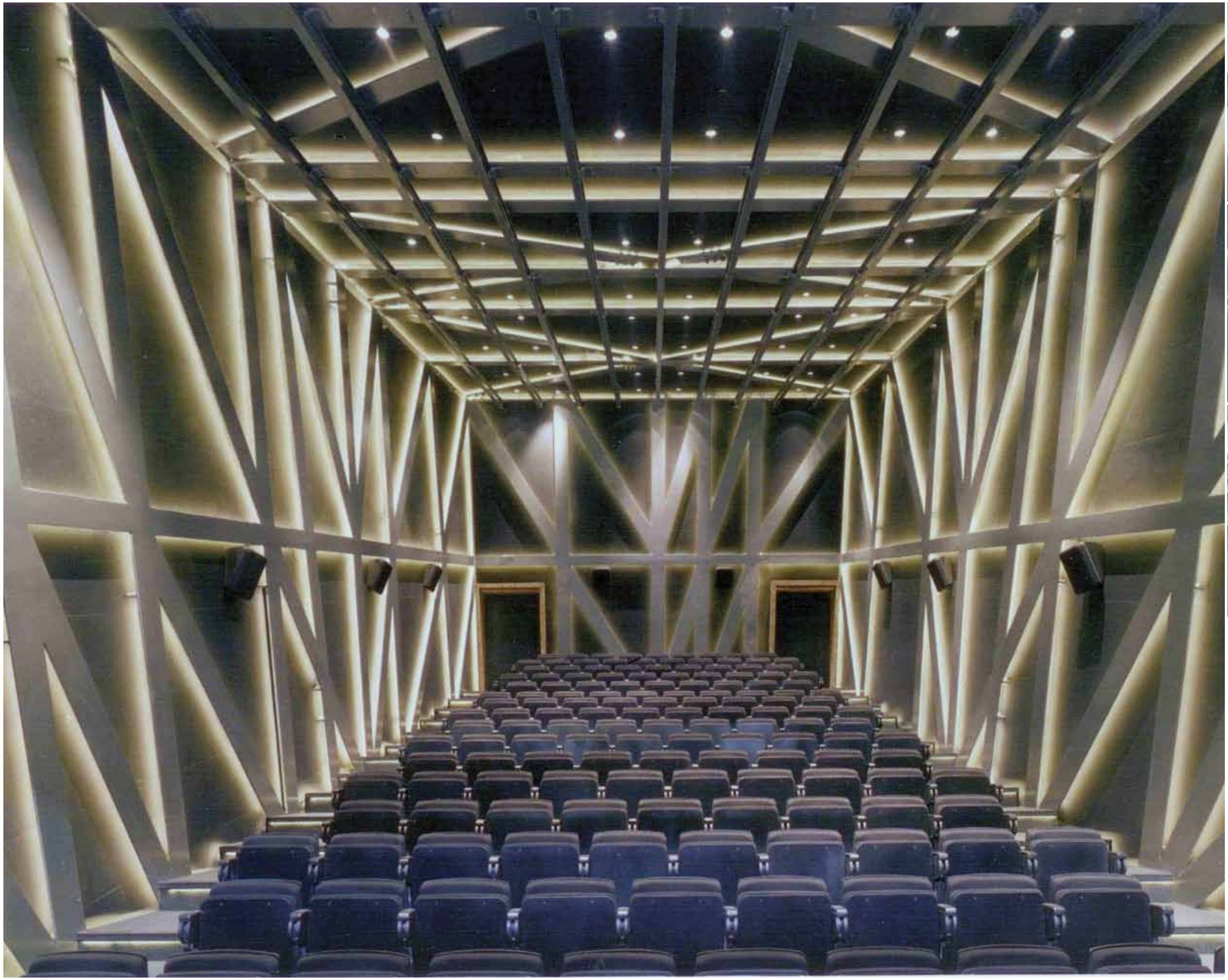
RITZ CARLTON HOTEL / ARCADE

OZ MALL / CUPOLA

RITZ CARLTON HOTEL / WINTER GARDEN



RITZ CARLTON HOTEL / CUPOLA



VAKKO HEAD OFFICE BUILDING

OZ MALL / CUPOLA

TURKMENBASHI AIRPORT

BALLOON STRUCTURE IN KADIKOY

FREESTEEL DESIGN

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