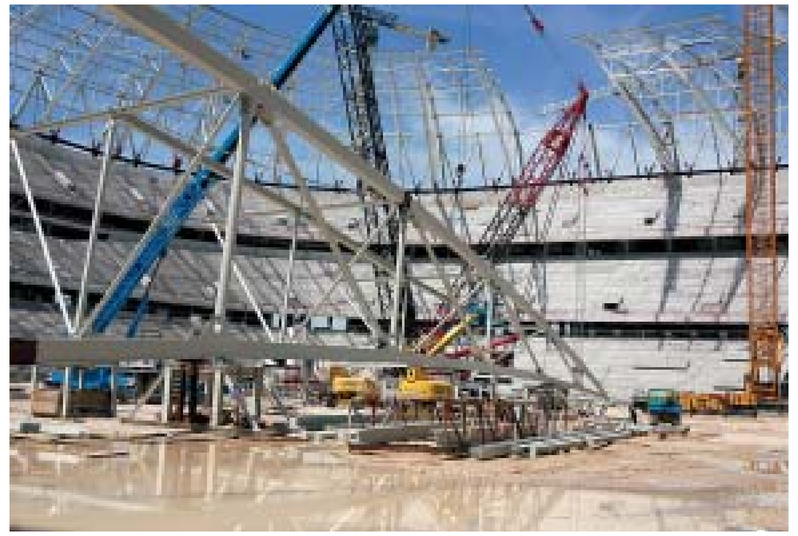
Allianz Arena Munich

Source: Allianz-Arena München Stadion GmbH

Since summer 2005, the two German football clubs Bayern München and 1860 München have found their new football home in front of up to 66,000 visitors in the newly constructed Allianz Arena of Munich. The Swiss architects, Herzog and de Meuron, designed a stadium with an energetically striking round form surrounded by a cushion cover that can be lit up in different colours depending on the event.
The stadium bowl with its three terraces consists of 96 concrete steel frames, which are located concentrically around the field. The roof construction is composed of 9,000 t of steel, 60 % of which was used for the primary structure. The primary structure consists of lattice trusses designed as cantilevers, which are up to 62 m long and 10 m high.

Because of weight reasons and out of aesthetic considerations, the upper and lower chord are designed as caissons with an infill in hollow sections. The connector construction is horizontally stiffened with 12 joints each. The 48 main cantilever connectors were delivered in single parts from the workshops and welded together on a moulding within the stadium. Two cantilever connectors with the secondary beams and the lattice stiffeners (weight up to 106 t) were lifted to their assembled height of 50 mm by a 450 t lattice boom crawler. Dillinger Hütte GTS supplied 2,000 t of heavy plates of S355J2G3 and S355K2G3 in the thickness range of up to 100 mm for this steel construction.

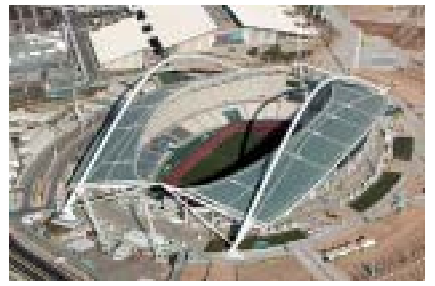
The shoulder area of the construction is carried out in steel composite construction. The secondary structure consisting of rectangular tubes was assembled onto the primary structure. These tubes serve as bracket for the 2,800 membrane pillows filled with air that form the roof and front wrapping and give the stadium an distinctive appearance. With this stadium, the capital of Bavaria can call another very special attraction its own.



Source: Allianz-Arena München Stadion GmbH

Olympic Stadium "Spyridon Louis" Athens

Design:	Santiago Calatrava Valls
Planning of the steel-plate structure: (roof)	SKM Sinclair Knight Merz Studio Gorgio Romaro
Static testing, Project management:	Bung Ingenieure AG
Construction:	Aktor S.A. (roof) Archirodon Construction (Overseas) Co. S.A.
Constructional steelwork:	Costruzioni Cimolai Armando spa (roof)
Sub-contractor (Hydraulic):	Enerpac
Heavy plate deliveries:	Dillinger Hütte GTS



Source: Costruzioni Cimolai Armando spa

LTU Arena Dusseldorf

Owner:	Multifunktionsarena Immobiliengesellschaft mbH & Co. KG
Constructional consortium:	Walter Bau-AG (together with Dywidag) and ABB Gebäudetechnik AG
Architect:	JSK Architekten
Operations:	Rheinarena Düsseldorf GmbH
Constructional steelwork:	Lubbers Hollandia, Bailey
Heavy plate deliveries:	Dillinger Hütte GTS

Allianz Arena Munich

Owner:	Allianz Arena München Stadion GmbH
General contractor:	Alpine Bau Deutschland GmbH
Architect:	Herzog & de Meuron Architekten
General planner:	HVB Immobilien AG
Planning of the primary construction:	Sailer Stephan und Partner (Arge SSP / Arup)
Constructional steelwork: (consortial leader)	Max Bögl GmbH
Heavy plate deliveries:	Dillinger Hütte GTS

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STEELS FOR CONSTRUCTIONAL STEELWORK

STADIUMS

DILLINGER HÜTTE GTS

The “Spyridon Louis” Olympic Stadium in Athens

In 1896 Athens was already host for the first Olympic Games of the modern age.
In 2004 the eyes of the world turned again to Greece’s capital where the XXVIIIth Olympic Games took place.

An architectural masterpiece made of steel

At the centre of the games was the stadium which had already been built previously for the application for the 1996 Olympic Games and was redesigned for the 2004 Games.
The arena’s roof is itself “ready for the Games”. The impressive, but still gracious construction can notch up several records at once. It is not only considered to be the world’s largest stadium roof, but also the largest roof shift of any time.
The celebrated Spanish architect Santiago Calatrava received the order to enlarge the existing arena, holding 74,000 spectators, with this roof for the Olympic Games. The arch construction with a span of 304 m is a masterpiece of architecture. It is unique in its own way world-wide, especially with regard to the complexity of the technical solutions used, the manner of assembly and the total size of the two arch elements. The construction weighs in total approximately 17,000 t and covers a total area of 21,000 m^2.

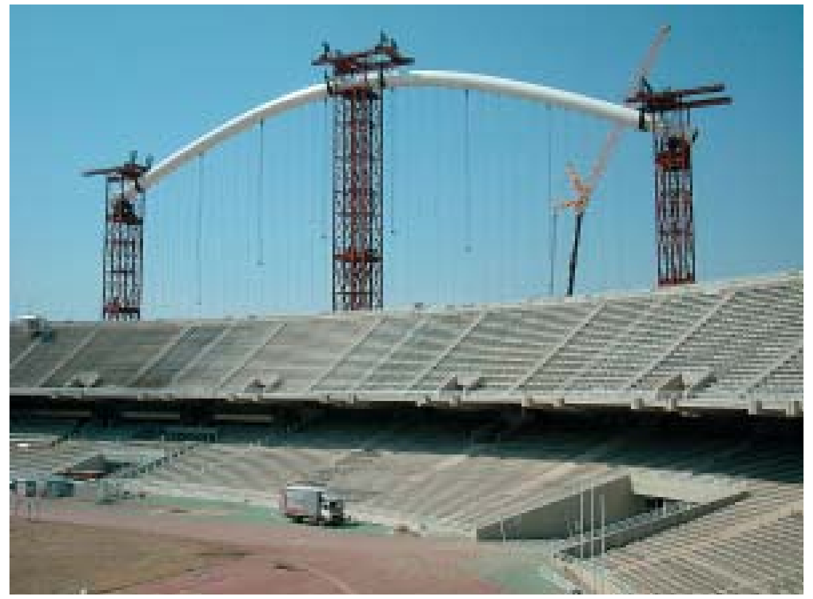
A roof made of steel from Dillingen

The two main arches, welded together from 260 tubes, with each tube being 5 m long, span to a maximum height of 80 m. These central arches constitute, together with the rim arches, the main load-carrying element of the new futuristic roofing construction made of steel and glass. The roof floats on 248 stay cables in a maximum height of 40 m.

Dillinger Hütte GTS supplied 6,150 t of heavy plates in the steel quality S355J2G3 for this construction. The plates were used in a thickness range of up to 100 mm for, among others, the arch beams which have a circular cross-section diameter of 3.25 m for the lower arch and 3.60 m for the upper arch. For this construction plates with a width of up to 5,050 mm were used. They were first bent with a press, having a capacity of 6,000 t, to semi-shells and then welded together with longitudinal welds at the steel processing company. It is obvious that the use of such wide plates made sense in order to reduce labour and save on potential cost-intensive longitudinal welds on the thick-walled tubes.

Labour-intensive assembling technique

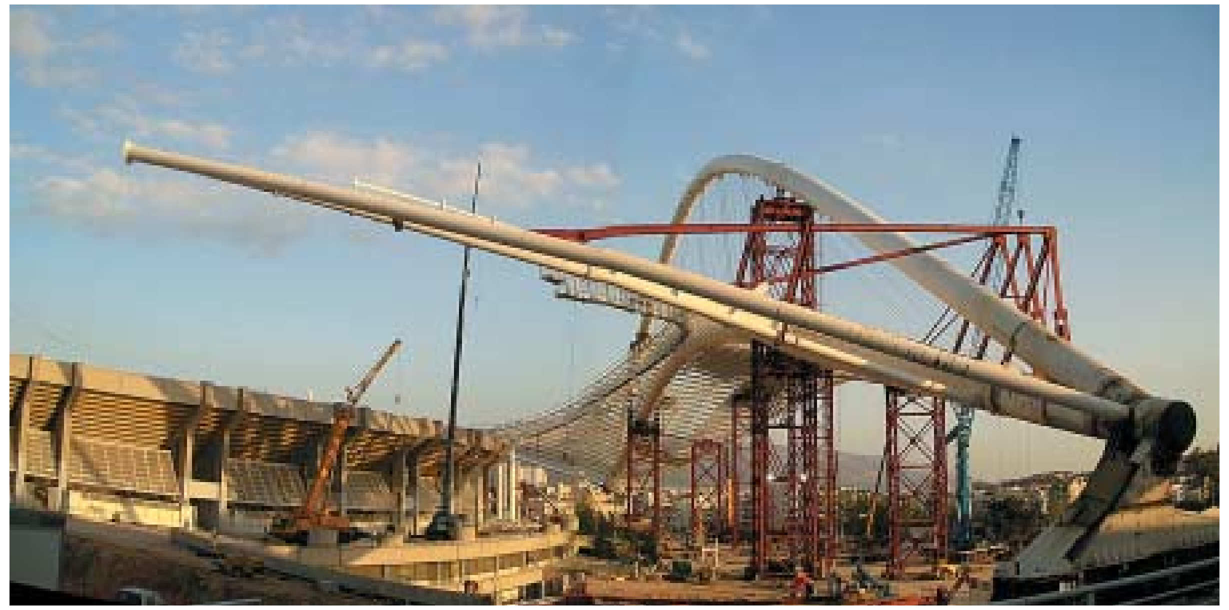
Five temporary piers per side were constructed for assembling and hanging the arches. The two roof elements were assembled separately outside the stadium because of the narrow time window and the redevelopment of the stadium that was simultaneously being carried out. After the essential works inside the stadium had been finished, the roof halves, weighing 8,500 t, were brought separately into their final position in 2 m thrusts and with a speed of 10 m per hour via hydraulic cylinders above the stadium. Finally the arches were linked on two symmetrically arranged main system points. The whole roof construction only touches the ground on four points: at the ends of the two arches.



Source: Costruzioni Cimolai Armando spa

Thus the stadium’s roof became the landmark of the Olympic Games in Athens and Greece’s capital got a lasting, formative new work of art well worth seeing in addition to its traditional sights.

Source: Costruzioni Cimolai Armando spa



LTU-Arena Dusseldorf

In the centre of the Rhine-Ruhr region a modern multi-functional arena was released for usage in January 2005. Thanks to the clever airing and roofing concept up to 51,000 visitors can witness and enjoy various events, be it sports or culture, in the rectangular arena with a markedly functional design. The heart of this multi-talent’s roof construction is composed of two 180 m long lattice girders with an impressive weight of approx. 1,600 t and a height of up to 18 m.

After preassembling the girders in the workshop and delivering each of them in 100 parts (among these were also parts up to 40 m long which were transported by water), the assembly was carried out on site. Within four days, such a main girder was lifted onto the stand construction in a height of 50 m. These main girders support the 235 m long and 201 m wide roof of the arena.

Between the main girders, the 110 m long and 395 t heavy compound girders were erected before the remaining girders carrying the roof sheeting were installed.

Steels with excellent weldability

The main girder of the construction is composed of a lower chord in a flange thickness up to 100 mm with lamellas set down vertically on the chord, a box-shaped upper chord in 1,500 x 2,500 mm (in 75 mm thick plates) as well as connecting hollow sections as a web. For this construction, Dillinger Hütte GTS supplied about 3,600 t of heavy plates, 2,400 t of which in thicknesses of 10 to 50 mm of S355J2G3 with improved carbon equivalents in order to optimise weldability. In the thickness range between 55 and 100 mm the special steel DI-MC 355 was used.

DI-MC 355 is produced with the thermomechanical rolling technique. The very low contents of alloying elements lead to such a good weldability that preheating is no longer needed even in these thickness ranges in the necessary butt joints. Moreover, a yield strength of 355 MPa was guaranteed for 100 mm thick plates whose utilisation made a slimming of the construction possible, compared to the values of the static calculation.

The arena not only sets new standards in the field of materials, but also its functionality is a prerequisite in setting new standards for events taking place in the arena.