VALLOUREC & MANNESMANN TUBES

PREON – The key component for hall construction

Innovative products from
VALLOUREC & MANNESMANN TUBES

Origins of the PREON load-bearing element

For some time now, VALLOUREC & MANNESMANN TUBES, Joachim Stahlbau and Ingenieurbüro DITTMANN + POLLMANN VBI have been developing application-tailored, high-quality and economically sustainable components capable of industrial fabrication for heavy-duty steel construction.

The unique feature of these products is the range of options. The end customer has the opportunity to order a complete package, e.g. a partially prefabricated system building, crane runway etc.

But he can also order "just" the steel, the design, fabrication of a single component or the assembly of an entire system. Any combination is basically possible.

PREON is the first offspring of this fertile "marriage" and is an extremely versatile and high load-bearing roof frame system. PREON has been patented internationally and has meanwhile demonstrated its distinctive advantages in numerous projects. In the development of the load-bearing system, special importance was attached to the optimization of **cost**, **timing** and **quality**.

The task involved exploiting the technical and qualitative advantages of hot-rolled MSH sections in the design, keeping the degree of design difficulty within acceptable bounds and minimizing and simplifying production, transport and later assembly effort as far as possible.

Thanks to PREON, we are able to reconcile the needs of everyone involved in the project. This means that everyone benefits from the value-generating features. This is essential for the success of PREON as a cost-effective and high-quality structural element.

PREON applications

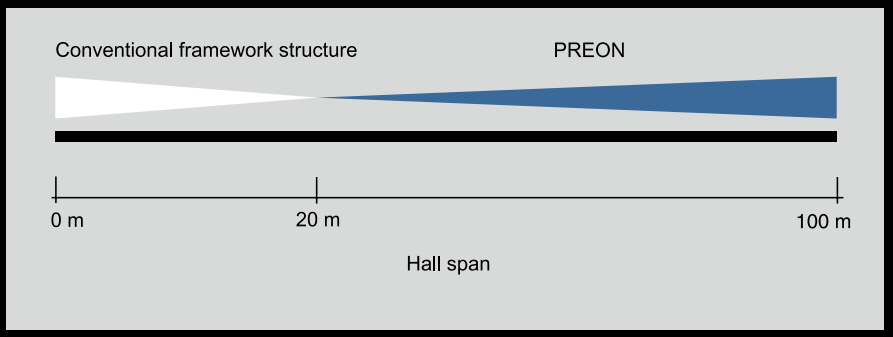
PREON is at home in all areas of traditional industrial building construction. The load-bearing element exploits its advantages particularly in areas calling for large spans, high loads and large distances between supports.

The design-related, economic and aesthetic advantages come into full play from spans of 20 m upwards. An unsupported distance of 60 m can be comfortably spanned. Spans of 100 m or more are possible.

The system is preferably used in production, warehouse and workshop buildings, although its use in hangars, shopping centres and exhibition or leisure buildings is also certainly conceivable.

Each customer is given his individual complete PREON package, optimized to suit his needs and requirements.

It goes without saying that we can also handle the planning, design and assembly of the entire industrial building on your behalf.



What is PREON?

The patented PREON module system consists of...

… prefabricated end sections made from 10 m long traditional roof trusses, and

… a frame-type middle section of any desired length.

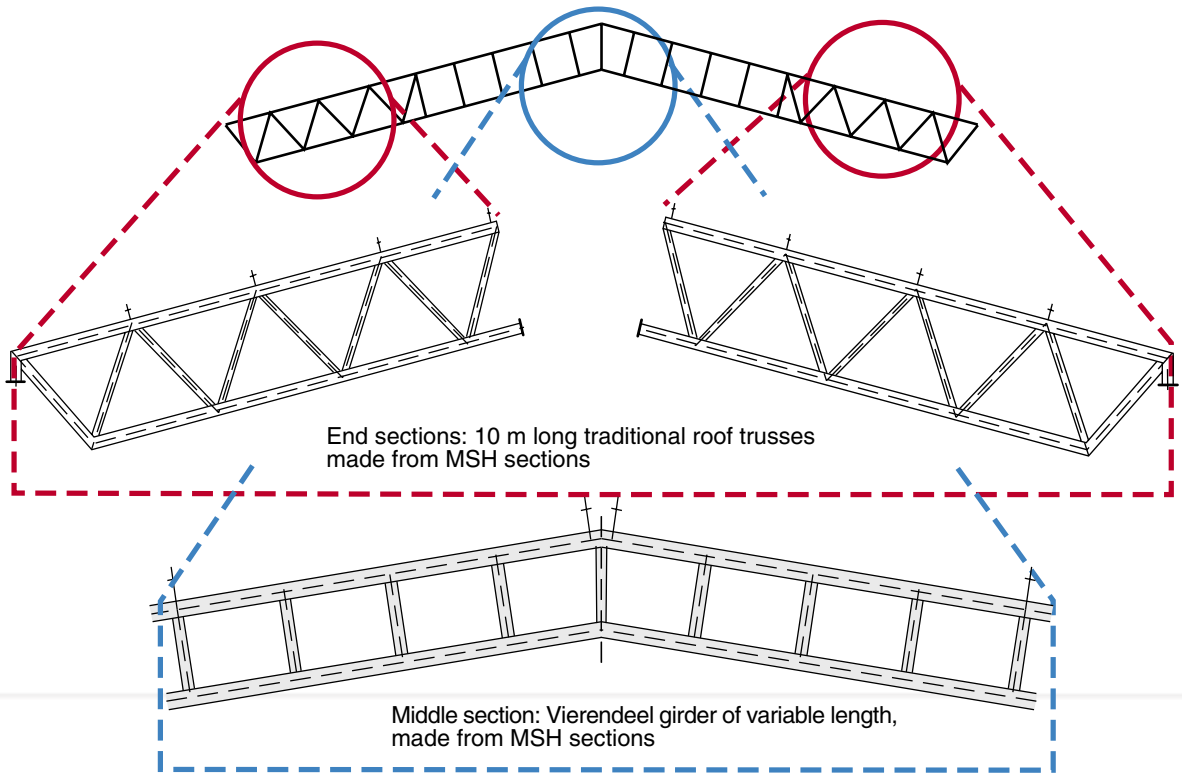
The top and bottom chords of the end and middle sections are rectangular, while the web members can be round if desired.

The various components, each of which terminates in a headplate, are assembled on site with simple threaded joints.

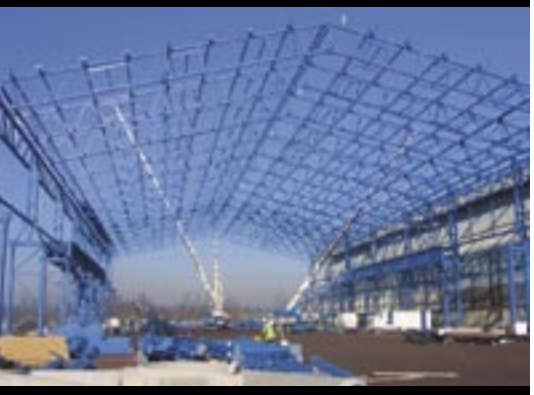
The surface can be supplied with a variety of finishes. Along with conventional coatings, PREON is following the current trend as it is highly amenable to powder coating. Any RAL colour can be chosen.

MSH sections:

PREON makes use of hot-rolled seamless MSH sections whose long-term quality is acknowledged around the globe. Mannesmann structural hollow sections (MSH sections) are distinguished among other things by their high load-bearing capacity, ease of processing, trouble-free corrosion protection and aesthetic appearance. Steel grade S355J2H conforming to EN 10210 ensures maximum dependability.



Halle construction with PREON



Expert commentary

Roof trusses are girders subject to bending that have to take up transverse forces and moments resulting from their own weight and roof loads. With increasing spans, plane lattice girders capable of transmitting the loads via a system of tension and compression bars are therefore mainly used. In addition to their static load advantages, trusses are superior to all other structures in terms of weight, production costs and aesthetics.

By comparison, Vierendeel girders have the advantage of a greater range of spans and simpler production. For Vierendeel girders, just straight sections and lower dimensional accuracy are sufficient.

However, Vierendeel girders are less capable of transmitting shear forces. For this reason, on the PREON girder the Vierendeel section is only used in the middle area exposed to lower shear forces (Fig. 1).

Fig. 1: Transverse force distribution across a single-span girder

Another advantage of the Vierendeel girder is that the distances between the posts can be adapted to the actual load, which has a particularly positive effect on moment transfer. Consequently, the version with varied post distances in Figure 2 shows a lower moment Y < X than the version with a constant distance between posts in Fig. 3.

Fig. 2: Moment distribution in 06/06 with a variable distance between posts

Fig. 3: Moment distribution in 06/06 with a constant distance between posts

Using a Vierendeel girder with a variable post distance in the middle section of the girder and using a plane lattice at both ends of the girder, the PREON girder combines the advantages of both systems. This yields a structure which is cost-effective thanks to its adaptation to the distribution of forces and thanks to its large range of spans.

PREON represents an extremely cost-effective and versatile solution for industrial building construction.

Dr. Stefan Herion, TU Karlsruhe

Advantages of PREON

PREON reveals its unique strengths in the design and execution of virtually any building project. Standardization, individuality and versatility are by no means mutually exclusive properties. PREON represents the optimum combination..

PREON cuts costs
… by using MSH sections,
… by accelerating the price quotation process thanks to its straightforward pricing system,
… by simplifying design and assembly,
… thanks to fewer web members,
… thanks to reduced cutting and welding needs,
… thanks to tighter scheduling and
… thanks to its simple adaptation to local conditions.

The use of the modular PREON roof truss system is independent of the construction location, as the roof's span can be flexibly adapted. There is no fixed grid. Since the middle section of the structure has a frame-type design, there is no difficulty in realizing any desired size.

Thanks to the flexible span, you are free to design any ground plan. Weather-independent prefabrication at the factory, usually concurrently with the first building activities on the construction site, speeds up the construction process considerably.

With PREON the advantages of MSH sections are now inexpensively available for the construction of industrial roofs by offering maximum versatility and individuality combined with standardization.

At a glance:

- Unsupported spans of 20 m and greater can be inexpensively achieved.
- Vast design freedom.
- Quick and inexpensive execution thanks to standardization.
- Just-in-time delivery without delays or holdups in the steel supply – thanks to production at our own steel and tube mills.
- High quality and load-bearing capacity thanks to hot-rolled seamless MSH sections.
- Stylish aesthetics.
- Specialist consultation expertise.

PREON rests on five strong pillars

The development of an inexpensive design and rapid construction progress with constantly high quality are the result of a component strategy resting on five pillars of cost-effective and sustainable construction:

1. Meticulous planning

During the development of a PREON project from the first concept drawing through to the finished structure, experts from all the relevant disciplines (design and structural engineers, welding engineers, architects, project managers, etc.) are by your side with theoretical and practical advice.
Our specialists are available for consultations – if desired – during planning, execution and even after successful project completion. Or for static load calculations, project management, quality control, site controlling, acceptance and after-sales service.
We can also integrate other components, e.g. crane runways. During construction, each step is documented and swiftly reported to the customer.

2. Prefabrication

PREON stands for efficiency. All production steps take place in industrial conditions at our plants. For the remaining work on the construction site, optimum conditions are created in order to optimize cost, timing and quality.

3. Precision execution

Trouble-free production processes in the plant and during project execution on site are made possible by experienced and smooth-running teams. Our production and project managers and project supervisors all have the necessary experience to coordinate all processes and activities reliably and precisely. Our fitters have not only the technical skills, but also the required motivation and flexibility.

4. Comprehensive quality control

Both the production of PREON and the assembly of the girders and entire buildings are subject to strict quality standards. The comprehensive control of all processes ensures consistently high quality and compliance with completion deadlines.

5. Mature logistics

We also see ourselves as extremely reliable construction logistics experts, as the extremely fast-track production and construction schedules can only be complied with if every conceivable holdup, however minor, is avoided from the outset. We can proudly claim that all projects to date have been handed over ahead of the completion deadline.

PREON reduces construction time and costs while upholding the accustomed high standard of quality.

Quality and standards

Hot-rolled and cold-rolled sections have completely different structural characteristics, which are taken into account in the European standards. Compliance with the strict standards formulated to protect you, your customers and personnel, as well as materials and equipment, can only be achieved with hot-rolled sections. You can rely on V & M TUBES' quality management, and on the compliance of its products with all aspects of the relevant standards. All V & M TUBES sites are of course certified to ISO 9001.

PREON conforms to the following standards:

Welding:

Qualification certificate in accordance with DIN 18800-7

MSH sections:

– EN 10 210-1: Hot finished structural hollow sections of non-alloy and fine grain steels
– Part 1: Technical delivery conditions

– EN 10 210-2: Hot finished structural hollow sections of non-alloy and fine grain steels
– Part 2: Tolerances, dimensions and sectional properties

Design:

Eurocode 1 - Actions on structures
– Part 1-1: General actions; Densities, self-weight, imposed loads for buildings; German version EN 1991-1-1:2002

Eurocode 1 - Actions on structures
– Part 1-2: General actions; Actions on structures exposed to fire; German version EN 1991-1-2:2002

Eurocode 1 - Actions on structures
– Part 1-3: General actions - Snow loads; German version EN 1991-1-3: 2003

Eurocode 1: Actions on structures
– Part 1-4: General actions, Wind actions; German version EN 1991-1-4:2005

Eurocode 1: Actions on structures
– Part 1-5: General actions - Thermal actions; German version EN 1991-1-5:2003

Eurocode 1: Actions on structures
– Part 1-6: General actions, Actions during execution; German version EN 1991-1-6:2005

Eurocode 3: Design of steel structures
– Part 1-1: General rules and rules for buildings; German version EN 1993-1-1:2005

Eurocode 3: Design of steel structures
– Part 1-8: Design of joints; German version EN 1993-1-8:2005

Eurocode 8: Design of structures for earthquake resistance
– Part 1: General rules, seismic actions and rules for buildings; German version EN 1998-1:2004

Inclusive of national annexes in all cases.

Fire safety:

With regard to fire safety, the industrial building guideline and Eurocode 1 apply.

Reference projects with PREON

Production shop, steel industry, St. Saulve, France	
Length:	154 m
Span:	39 m
Ground area:	6,000 m²
Ridge height:	25.6 m
Eaves height:	20.7 m
Hollow section tonnage:	564 t
Year of construction:	200

Production shop, steel industry, Düsseldorf, Germany	
Length:	171 m
Span:	47 m
Ground area:	8,000 m²
Ridge height:	19.8 m
Eaves height:	16.7 m
Hollow section tonnage:	604 t
Year of construction:	2006

Production shop, mechanical engineering industry, Duisburg, Germany	
Length:	120 m
Span:	24 m
Ground area:	2,900 m²
Ridge height:	15 m
Eaves height:	14.2 m
Hollow section tonnage:	260 t
Year of construction:	2006

Production shop, metalworking industry, Hohenlimburg, Germany	
Length:	200 m
Span:	35 m
Ground area:	7,000 m²
Ridge height:	17 m
Eaves height:	16 m
Hollow section tonnage:	160 t
Year of construction:	2006

Three-bay production shop, steel industry, Changhzou, China	
Length:	144 m / bay
Span:	30 m / bay
Ground area:	13,000 m²
Ridge height:	16.5 m
Eaves height:	15.5 m
Hollow section tonnage:	533 t
Year of construction:	2006

Warehouse, Witten, Germany	
Length:	48 m
Span:	23 m
Ground area:	1,100 m²
Ridge height:	17 m
Eaves height:	16 m
Hollow section tonnage:	57 t
Year of construction:	2007

Production shop, plant engineering, Mönchengladbach, Germany	
Length:	181 m
Span:	24 m
Ground area:	4,400 m²
Ridge height:	20 m
Eaves height:	19 m
Hollow section tonnage:	540 t
Year of construction:	2007

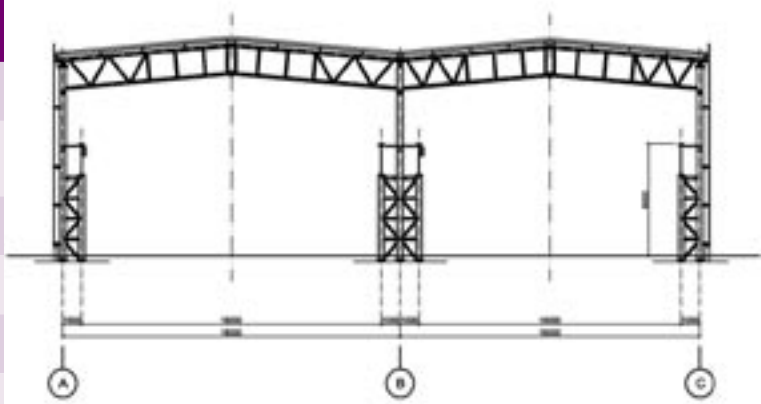
Two-bay production shop, steel industry, St. Saulve, France	
Length:	1 x 270 m / 1 x 189 m
Span:	1 x 45 m / 1 x 35 m
Ground area:	19,100 m²
Ridge height:	22.5 m
Eaves height:	17 m
Hollow section tonnage:	1,870 t
Year of construction:	2007

Seven-bay warehouse and logistics building, steel trade, Düsseldorf, Germany	
Length:	128 m / bay
Span:	32 m / bay
Ground area:	29,000 m²
Ridge height:	14 m
Eaves height:	13.7 m
Hollow section tonnage:	1,150 t
Year of construction:	2008

Production shop, aircraft construction, Saint-Nazaire, France	
Length:	200 m
Span:	60 m
Ground area:	12,000 m²
Ridge height:	28 m
Eaves height:	27.3 m
Hollow section tonnage:	1,400 t
Year of construction:	2009

Seven-bay production shop, steel industry, Jeceaba, Brazil	
Length:	700 m / bay
Span:	2 x 35 m / 5 x 50 m
Ground area:	130,000 m²
Ridge height:	33.5 m
Eaves height:	27 m
Hollow section tonnage:	~15,000 t
Year of construction:	Currently (2009) in planning, start of construction 2010

Ten-bay production shop, Changhzou, China	
Length:	327 m / 205 m / 60 m
Span:	5 x 24 m / 1x 40 m / 1 x 42 m 1 x 22 m / 1 x 18 m / 1 x 16 m
Ground area:	43,000 m²
Ridge height:	14 m / 28,5 m / 11,5 m
Eaves height:	13 m / 27 m / 10,5 m
Hollow section tonnage:	~ 3,400 t
Year of construction:	Currently (2008) in planning, start of construction 2009



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