

ArcelorMittal Tubular Products



TitanThermic™

ArcelorMittal

The Hot Finished Tube Solution

Don't worry,
build happy!



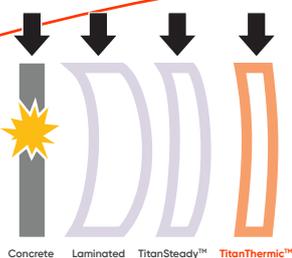
A product that puts you at ease

Security is a key factor for deciding which tube to use in your project. The ideal product has to be more resistant, with less weaknesses, and would warn when close to breaking. Our TitanThermic™, with its Hot Finished process, fulfills perfectly these requirements. Compared to cold formed equivalent sections:

- 1. TitanThermic™** will resist better to compression and multidirectional loads
- 2. TitanThermic™** will stand longer in case of fire
- 3. TitanThermic™** will provide a higher reserve of resistance after gross deformation

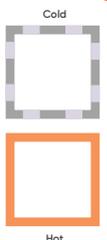


Why to use TitanThermic™?



1. Resistance

The internal structure of TitanThermic™ is the same in all directions, giving the product high, regular and uniform mechanical properties, whatever the direction of load (no loss of resistance in a specific direction). Consequently, it will keep the risk in the safe zone, and the energy absorption resulting of load variation will be better for the global structure. For compression calculation, TitanThermic™ is 22% more resistant: Eurocode-3 will allow to use a better buckling curve "a" (instead of "c" for cold formed tubes). This homogeneous property removes the discontinuity and mechanical weaknesses in corners and welding zone, which increase the security in complex structures when assembling the tubes (all the perimeter is eligible to be welded/assembled with other parts)



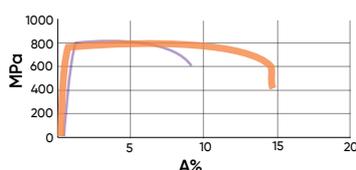
2. Fire resistance

Comparing two identical profiles with different forming process, the utilization rate and shape factor (A_s/V) of TitanThermic™ will be lower (as it would support higher loads), which is essential for proper fire resistance as it gives time to evacuate. Also, the risk of sudden and unexpected yield loss is far lower than for cold sections.

PROFILES	$A_s/V(m^{-1})$		μ_0		$\theta_{CR}(^{\circ}C)$		Fire stability (minutes)	
	C	Titan	C	Titan	C	Titan	C	Titan
RHS 120x20x5	207	205,5	0,47	0,43	554	557	9	10
RHS 120x20x10	107,7	105,8	0,47	0,40	638	648	16	17

COLD S600	Rp0.2	Rm	A%	A% Manu	Fm (kN)
788	826	8,9	17,8	317,05	

TitanThermic™ S600	Rp0.2	Rm	A%	A% Manu	Fm (kN)
768	814	14,8	21,6	295,84	



3. Ductility

The hardness distribution of TitanThermic™ is perfect to maintain the yield strength over the nominal value while earning ductility. The range where plastic deformation occurs is wider, which provides higher security, both on the breaking point limit and warning side.

Fulfill your dreams with elegance

Modern design, especially in construction but not only, often requires exceptional tubular products to elaborate any original and complex architectures without constraints. Our TitanThermic™ hollow section, by its high mechanical properties, is the ideal solution to realize bold designs.

4. TitanThermic™ will allow full freedom on design as it can be used with no risk or constraints in complex structures that solicitate the metal in all directions: construction, agriculture machines, mining equipment, transporation equipment, lattice girders/cranes...

5. TitanThermic™ will extend geometrical assembling possibilities on these structures as there is no constraint on the welding zones.

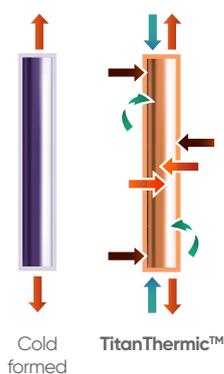
6. TitanThermic™ will come with sharper corner radius, improving the aspect of tubes and allowing more elegant designs.



Why to use TitanThermic™?

4. Homogeneity

TitanThermic™ hollow sections, with their regular internal grain structure, are optimal for many different purposes. They are perfectly adapted in many physical situations: tension, compression, bending, or a mix of these. Compared to TitanThermic™, cold formed section are more vulnerable in case of buckling (bending + compression for example).



Cold formed

TitanThermic™

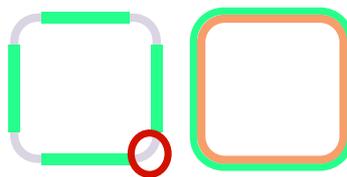


5. Weldability

TitanThermic™ can be welded around the whole perimeter, and therefore is not subject to the welding limitations of cold formed sections. For cold formed sections, it is only allowed to weld with a distance $5t$ from each corner of the section, unless the below conditions a)b)c) are met. This is constraining and very risky for lattice girders as they have a lot of joints ("weak points" for cold sections) where the structure could fail.

Conditions:

- a) r_i/t is lower than the minimum value provided in table 4.2 EN 1993-1-8,
- b) Steel sub-grades are limited to J2H, K2H, MH, MLH, NH, NLH, and
- c) if chemical composition is $C \leq 18\%$, $P \leq 0.020\%$ and $S \leq 0.012\%$.

Cold formed :
limited welding zoneTitanThermic™:
no restrictions

6. Corner radius

TitanThermic™ has tighter corner radius, which allows not only better properties on the surfaces, but also gives a better finishing aspect to the tube. Two possibilities are offered here, for choosing the shape that fits perfectly to the project: the Hot Finished (HF: semi-compact profile to avoid any local buckling risk, 40% larger corner radius) and the Hot Stretched Reduced (HSR: sharper corners and 48% larger flat area).

TYPE	Corner radius (R)	Flat length of faces c(*)	Mass	Section class (c/T)(**)
H.F.	12,5mm (2,5T)	195mm	33,1kg/m	Class 3
H.S.R.	7,5mm (1,5T)	205mm	33,4kg/m	Class 4



Cold formed

TitanThermic™

Designed to last

Nothing lasts forever. Nevertheless, choosing the best quality to slow down the deterioration is a key factor of durability and respect of the environment. In ArcelorMittal Europe Tubular Products, this notion is important and valued. **TitanThermic™** corresponds to a more environmentally-friendly approach and is designed to endure over time.



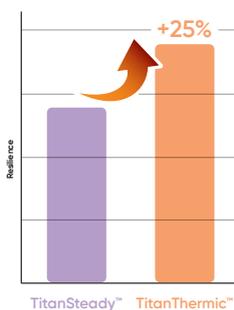
- 7. TitanThermic™** will be adapted to a wider range of temperatures, especially for low temperatures conditions.
- 8. TitanThermic™** will have a longer life-span when submitted to fatigue and alternate loads, especially in moving or vibrating machines.
- 9. TitanThermic™** will increase efficiency, which means a limited impact on the environment.



Why to use TitanThermic™?

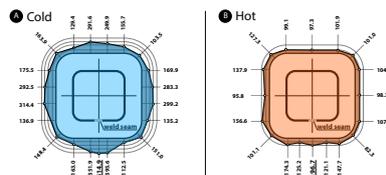
7. Resilience

Compared to the equivalent cold formed section, the **TitanThermic™** has 25%-50% more resilience at -20°C. Cold forming and welding can reduce the low-temperature ductility of EN 10219 hollow sections. The Charpy-V toughness in the corner after welding may not always fulfill the requirement of 27 J at -20°C.



8. Reliability

The **TitanThermic™** internal body shows minimal residual stress. The fine-grain structure is uniform and gives higher performance in case of variable loads. The resistance to fatigue (induced by vibrations resulting of moving parts or high frequency cyclic loads) is improved with better energy absorption and prevention of internal fractures, and makes it adapted to moving machines.



XCarb®
Towards carbon neutral steel

9. Sustainability

By performing better than the equivalent cold formed section (30% more capacity), **TitanThermic™** is lighter and helps to limit the environmental impact. In line with ArcelorMittal's XCarb® initiative, the transport will be eased and with less CO2 impact, the execution of the structure will also be improved in the same way

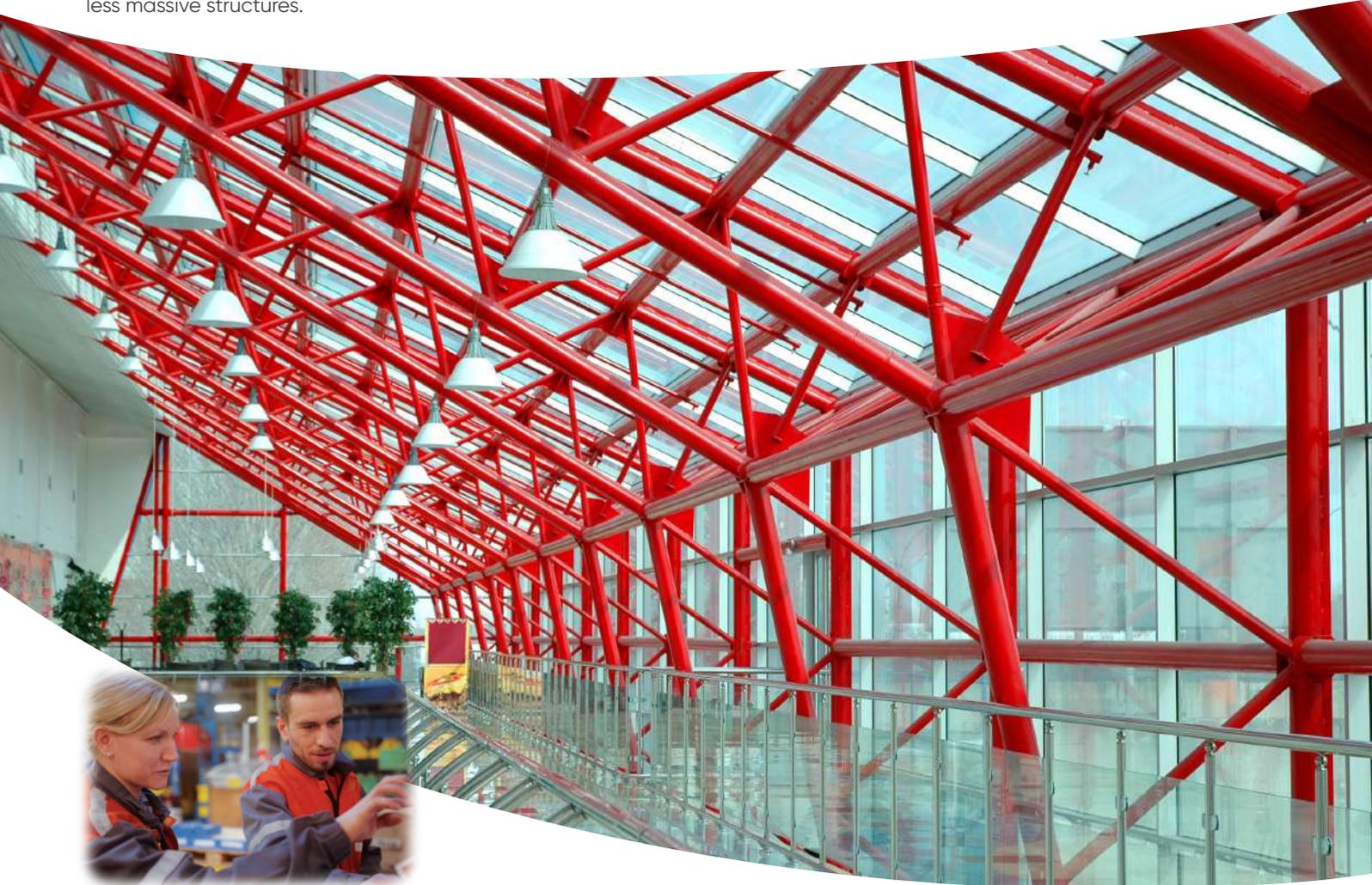


Full control on your project

Avoiding bad surprises in big and complex projects is important, as it prevents most of the unexpected additional costs. Choosing **TitanThermic™** will help controlling budgets and costs on your project.

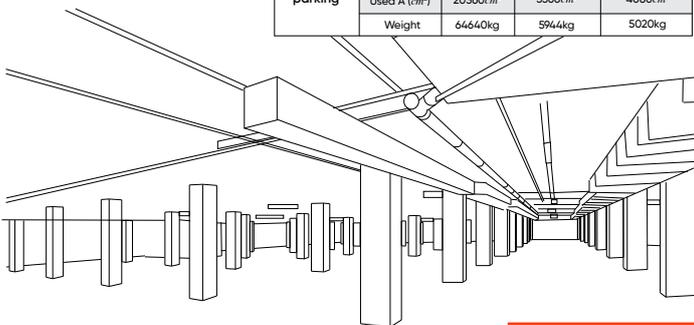
10. With its improved resistance, **TitanThermic™** is lighter and will facilitate the execution of the global structure. The product fits better in tight spaces, and this may even result in less massive structures.

11. **TitanThermic™** will prevent re-design process, as the sections chosen will "fit" from start to end of project, without changes due to execution.



Why to use TitanThermic™?

40 column parking	TYPE	Concrete	TitanSteady	TitanThermic
	Dim.	Ø256mm	Ø133x12,5mm	Ø114,3x12,5mm
Used A (cm ²)	20560cm ²	5560cm ²	4080cm ²	
Weight	64640kg	594kg	5020kg	

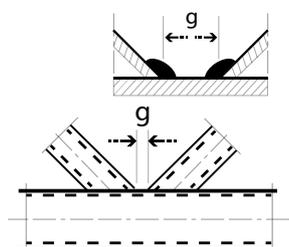


10. Execution

By having inherent better resistance than the equivalent cold formed section, **TitanThermic™** allows smaller profiles for the same load. On the contrary, keeping the same dimension allows longer spans and/or higher buildings. This weight control can be also beneficial not only to the very structure built with **TitanThermic™**, but extends to the foundations and transportation of all material. Furthermore, in case of special operation on the tube (cutting, bending, etc.), the **TitanThermic™**, due to its regular internal structure, keeps a dimensional stability. Consequently, the execution is eased, and in some cases, some time can be gained also.

11. Stable design

When designing a structure, the joints are calculated with the initial hollow sections already defined. The larger these are, the more limited the joint will be, which means that if a large section has been chosen as the filler bar of a truss, the chord must also be larger, otherwise the connection will fail. This may result in drastic changes in terms of design and budget. (Joints are a very limiting factor when designing a structure, which can produce significant variations in the profiles that were intended to be used, and could further increase the difference between the mass of cold-formed and hot structures). There are many limitant factors (by Eurocode-3) related to the size of hollow sections (Eccentricity, b_i/b_0 & d_i/b_0). In addition, limitations in welding can result in a high risk in punching shear in the joint.



Don't worry, build happy!

TitanThermic™ is the optimal tube solution to serve any market in full quality and safety: construction including long span structures (offices, houses, industrial buildings, bridges), agriculture (big greenhouses, warehouses), mining equipments, transportation equipments, cranes, lattice girders.

TitanThermic™ will bring you all the benefits of the hot process and free your mind from concerns:

- TitanThermic™ has high and uniform resistance in all directions.
- TitanThermic™ is adapted to safety philosophy with warning capacities
- TitanThermic™ brings unlimited freedom for architects and designers to create any structure according to their whims.
- TitanThermic™ offers an improved design with tight tolerances, and comes with two options (HSR, HF).
- TitanThermic™ has a long life span and high resistance to fatigue.
- TitanThermic™ is respectful of the environment and adapted to wide range of weather conditions (negative temperatures t°C).
- TitanThermic™ ensures an optimal control of projects in terms of cost, time, and space.

TitanThermic™ comes with technical consultancy (constructube@arcelormittal.com) that will help and support you to realize your specific projects.



Testimonials

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LEBAL

Our cooperation with ArcelorMittal Tubular Products Krakow Sp. z o.o. has been going on for many years. We have dealt with many cases where the quality of the product (mainly HSR Hollow Sections) was highly appreciated. We count them as one of our most valuable suppliers.

LEBAL

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Kverneland ploughs are often used in the toughest soil conditions worldwide. They are renowned for their unequalled robustness and longevity. This is explained by our consistency in buying the highest quality steels which will gain new important properties after Kverneland's unique steel heat treatments. This is why the hot formed tube from ArcelorMittal Tubular Products Lexy is optimal for us and delivers the required properties.

KVERNELAND GROUP



**SHIPBUILDING
AND MACHINERY**

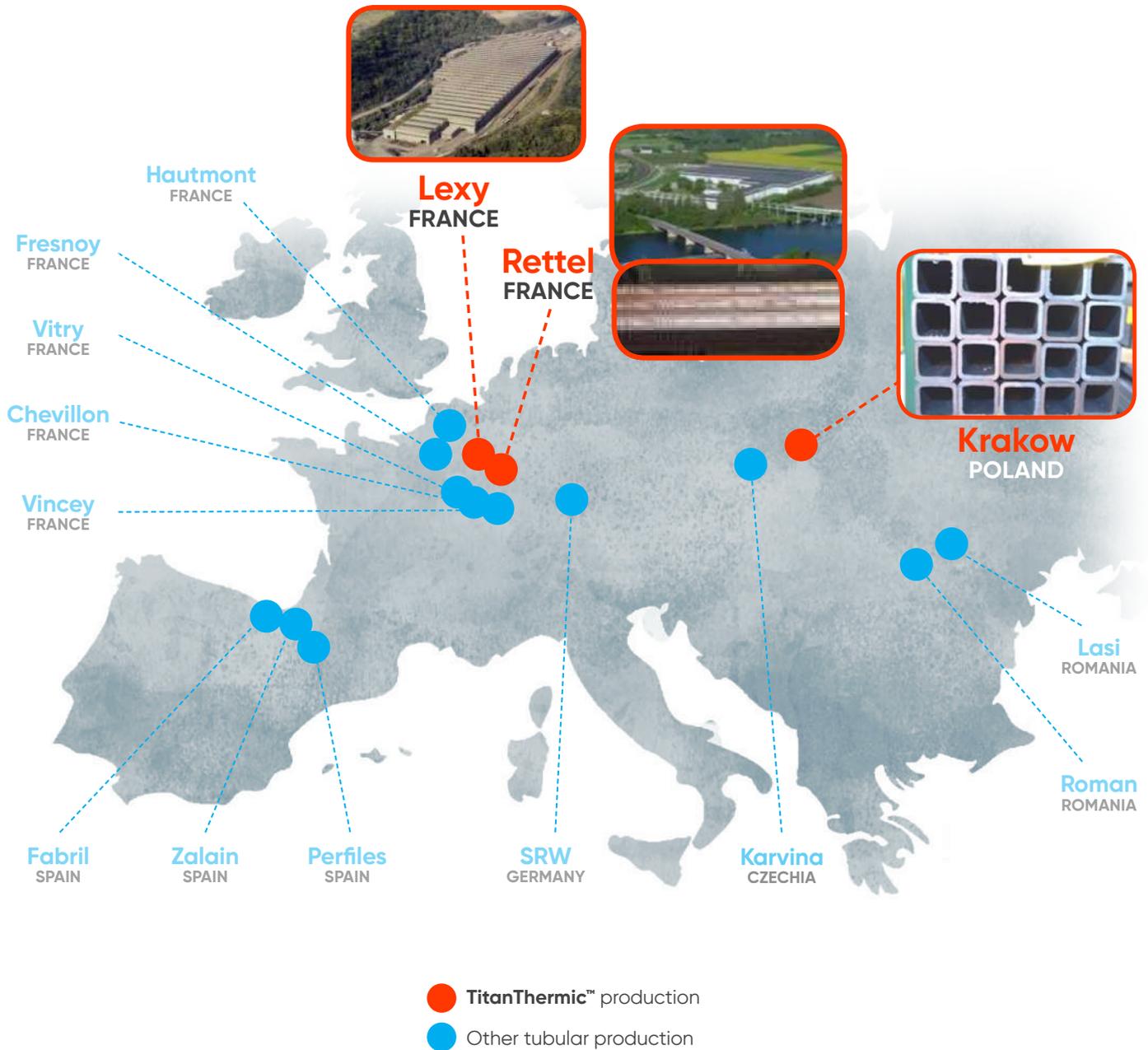
We have always looked for the best products quality from our suppliers. This is why we appreciate the Hot Formed from ArcelorMittal Tubular Products Lexy and Rettel. These mills provide high quality hot tubes with variable lengths that fit our needs, especially for machines in the agriculture sector.

SAM BUILDING MACHINERY

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Our vision. Our solution.

ArcelorMittal Tubular Products – European footprint



Our Vision

Safe and Sustainable steel sums up our main philosophy at ArcelorMittal. XCarb® has shown the way for our Group. We, at ArcelorMittal Europe Tubular Products, want our business to be sustainable in every sense of the word. We achieve this by keeping our people safe, acting responsibly and becoming more efficient at providing the steel tubes the world needs for construction, transport, manufacturing and all other aspects of everyday life.

Our Solution

More than fifty years of experience in Europe and other regions allows us to offer the best combination of raw material, manufacturing processes, and guaranteed properties: this is the **TitanThermic™**, for which we can propose different steel grades and shapes, including round, square, rectangular, and elliptical sections. Our expertise centers on Welded Hollow Sections in one of the largest size range, meeting all the requirements of the EN10210 standard. **TitanThermic™** can be produced in three plants, two in France and one in Poland, keeping the proximity to the European market.

Technical Hotline for
designers and planners:

constructube@arcelormittal.com

Do not hesitate to contact us for any question on
tubular construction.



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