HOLLOW STRUCTURAL SECTIONS

CSA G40.21 50W or Metric 350W Class H

SUBMITTAL DATA SHEET

CSA G40.21-98

Description: General requirements for rolled or welded structural quality steel/structural quality steel.

Intended use: General specification for plates, shapes, hollow sections, sheet, sheet piling, cold-formed channels and bars used in construction.

Specification:	**G40.21**
Strength Levels:	**50W/350W**
Yield Strength	**50,000 PSI (350 MPa)Minimum**
Tensile Strength	**65,000 – 90,000 PSI (450–620 MPa)**
Elongation % in 2"	**22 Minimum**
Chemistry Levels:	**50W/350W**
Carbon	**.23 Maximum**
Manganese	**.50—1.50**
Phosphorous	**.040 Maximum**
Sulphur	**.050 Maximum**
Silicon	**.40 Maximum**
Grain Refining Elements	**.10 Maximum**

What is CSA G40.21 50W/350W Class H?

According to the Canadian Standards Association (CSA), Hollow sections – welded or seamless round, square, rectangular or special profile structural tubing is available in two classes:

Class C — hollow sections that are cold-formed from a section produced either by a seamless process or by an automatic electric-welding process producing a continuous weld.

Class H — hollow sections made by a seamless

(i) or furnace-butt welding (continuous welding) or automatic electric-welding process, and hot-formed to final shape; or

(ii) automatic electric-welding process producing a continuous weld, and cold-formed to final shape; subsequently stress relieved by heating to a temperature of 450°C (850°F) or higher; followed by cooling in air.

Why do we produce material to a Class H Specification?

In cold-formed HSS, we induce residual stresses in the finished product due to the rolling process on our tube mills. We begin with flat strip, form to a round, weld and subsequently shape to a square or rectangular section.

The residual stresses we induce are concentrated in the four corners and the weld line (as shown in the attached diagram for a rectangular section). In general terms, when we stress relieve the product by heating in the furnace, we relax the tube, thus reducing the residual stresses present. The chemical properties of the material are not altered in any way and the physical properties might see a slight decline in the yield and tensile strength and an increase in the elongation but all changes would be minimal. As can be seen in the table at the beginning of this article, the properties required by the specification for Class H are identical with our normal Class C.

It is important to note that Class H is part of the Canadian specification only and has not been approved for ASTM A500 in the United States. However, Class H material could be substituted for CSA G40.21

Class C and ASTM A500 providing the size and gauge are identical.

Project: _____ Contractor: _____ Date: _____

Engineer: _____ Specification Reference: _____ System Type: _____

Locations: _____ Comments: _____

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Winnipeg
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Rev. 10/25/11

What are the Benefits of Class H

- Savings in mass up to 20%
- Provides equivalent or higher compression resistance than Class C sections
- Made every 2 weeks in our Harrow Plant
- Atlas is the leading producer of HSS in Canada

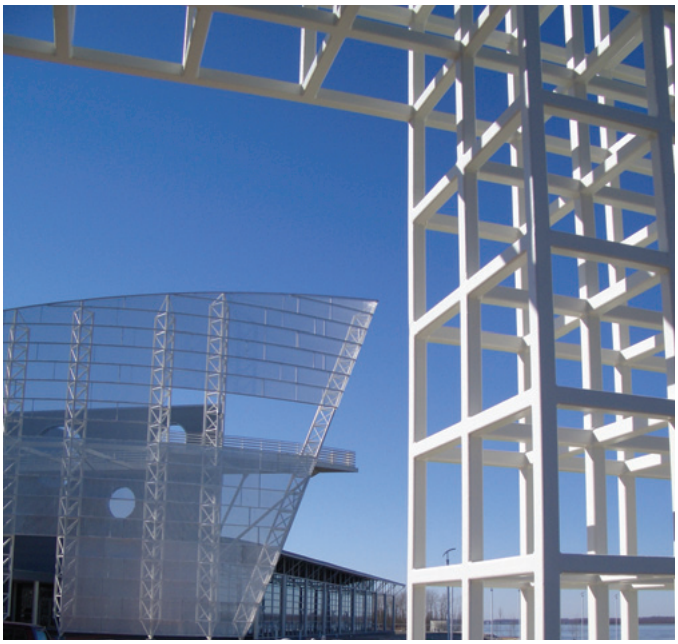
Savings in mass of almost 20% are possible.

An article produced by Stelpipe in 1989 details the potential cost savings with Class H as follows.

"An increase in the axial compressive resistance of up to 27% is potentially available to a structural designer with the use of Class H. This increased resistance translates into cost savings in the design when a smaller section or thinner wall thickness in Class H gives an equivalent or higher compressive resistance than the Class C section. Actual mass reductions will of course depend on the axial resistance required, effective length and availability of a section to meet that exact requirement. Depending on the specific parameters for each design situation, savings in mass of almost 20% are possible. Due to the extra processing required to stress relieve Class H, a premium is applied to the selling price. When included in the total fabricated cost of an HSS structure, this premium is minimal and, as has been shown, can often result in a material mass and cost saving due to the increased axial compressive resistance of Class H HSS."

How do we produce Class H material?

Material produced for CSA G40.21 50W/350 W Class H is run just as we would run CSA G40.21 50W/350W Class C. This material is then moved to the furnace staging area. Once we have accumulated approximately 140,000# or 64,000kg (a furnace load) the rail car used to feed the furnace is loaded. This car is 70' (21m) long, 10' (3m) wide and can be loaded to a maximum height of 10' (3m). The furnace operator records the position of each bundle or piece on a row and removes the mill tags writing the tag number on the surface or inside of the tubes with a temperature resistant marker. Each row is separated by 6"x6" (152mm x 152mm) spacers to allow the free movement of furnaces gases within the load. Once complete, the operator places nine thermocouples throughout the load. Each thermocouple monitors the temperature of the product at that point throughout the furnace cycle. All of the information from the thermocouples is sent to a controller which monitors and records the data. The completed load is moved into the furnace, the door is closed and the thermocouples connected to the recorder. The furnace cycle begins by heating the material from the ambient temperature of the warehouse at a rate of 125°F (52°C) per hour to the maximum temperature of 890°F (476°C). Once stable at 890°F (476°C), the temperature is held for 30 minutes. The load is then allowed to cool at a rate of 200°F (93°C) per hour from 890°F (476°C) back to ambient temperature. The door is opened, the load removed, bundles are retagged and moved to the



shipping area for direct shipment to our customers. Tensile samples, heat-treated with the load, are pulled and the results recorded for each heat number, tube size and gauge. The material is checked for straightness and surface condition. Due to the elevated temperature, some surface scaling or oxide is present.