

Choosing Your Steel Hollow Section: Square vs. Rectangular vs. Circular (SHS, RHS, CHS)

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Look up at almost any modern building, bridge, or industrial facility. If it looks clean, sharp, and lightweight, chances are it is using steel hollow sections.

These profiles—the squares, rectangles, and circles—are the silent stars of contemporary construction. They are lightweight. They are incredibly strong. They are the go-to solution for everything from architectural columns to heavy-duty machinery frames.

But here is the deal. When you have a construction project, you cannot just pick one based on looks. Choosing the right steel hollow section is a strategic decision.

Do you need the equal strength of a square? The directional muscle of a rectangle? Or the sleek, twisting power of a circle?

Choosing the wrong option costs you money, wastes materials, and could compromise the integrity of your entire project.

This guide is not written by a robot reading out standards. It is written for the people who actually need to buy, specify, and build with these materials—the engineers, architects, and procurement managers who need the facts, explained simply. We are going to break down the differences and help you choose the right shape for the job.

Let's dive in and simplify this choice.

What Are These Hollow Sections, Anyway? (SHS in Structural Steel)

Before we talk about shapes, let's talk about what makes a steel hollow section superior in many modern designs.

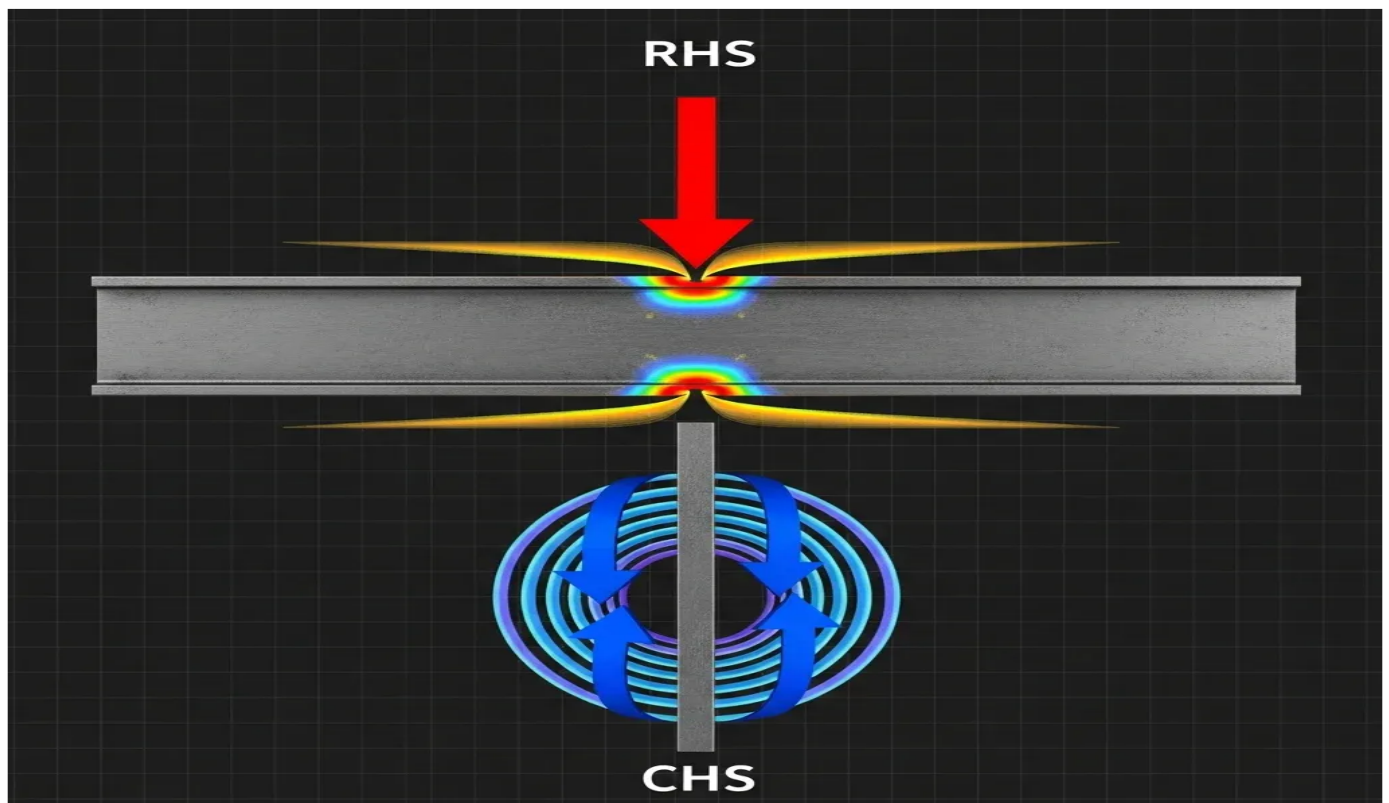
A hollow section, often called an HSS (Hollow Structural Section) in North America or commonly referred to simply as a structural tube, is a steel profile with a hollow core. Instead of being a solid bar, it is essentially a tube.

Why go hollow? Because of physics. When you push or pull on a structural column, the center of the column does very little work. Most of the heavy lifting—the resistance to force—is done by the material far away from the center, which is the "skin" or the wall of the tube.

By removing the material in the center, you get massive strength for much less weight. This saves steel, saves costs, and makes installation easier.

These tubes come in three main flavors, which are how we get the shorthand names:

All these sections are fantastic for jobs that require excellent strength under compression (like vertical columns) or where you need a clean, flat surface for connections. They offer a much cleaner aesthetic than the traditional H-beams or I-beams, which often look bulky.



The Core Difference: How Shapes Handle Stress (What is the difference between SHS and CHS?)

To choose the right section, you need to think about how your structure is going to be attacked by forces. There are three main ways a force tries to break steel, and each shape handles them differently.

1. Compression and Tension (Pushing and Pulling)

This is the most straightforward force. When you stand a column vertically and put a load on top, that is compression (pushing). When you hang something from a ceiling, that is tension (pulling).

2. Bending (Side Loads)

This happens when a horizontal load—like wind hitting a wall or heavy shelves bending a floor beam—is applied.

3. Torsion (Twisting)

This is the hidden killer. Torsion is the twisting force—like wringing out a wet cloth. This is a common problem in things like crane jibs, long bridge sections, or any structure where the load is off-center.

The Workhorse: Square Hollow Section (SHS)

The Square Hollow Section is the most balanced and versatile shape in the structural world. You see it everywhere, and for good reason.

It gives you the best of both worlds: structural muscle and easy fabrication.

In terms of pure strength, the SHS is superb at resisting compression. When you look at an SHS column, you know it can handle the load of a building sitting on top of it. Its material is evenly spread, giving it a high degree of symmetrical strength.

But the real superpower of the SHS is its flat surfaces.

Let's be real: structures are not built with one continuous piece of steel. They are built by connecting pieces. And connecting an SHS is simple. You can easily clamp another beam onto a flat face, drill straight through it, or weld a plate onto it cleanly. This speeds up construction time and keeps fabrication costs down. When you need a clean, visible column that also serves as a strong beam

connection point, the SHS is the go-to. Its clean lines also lend themselves to a contemporary, industrial aesthetic that architects love.

The Versatile Player: Rectangular Hollow Section (RHS) (SHS vs RHS)

This is where the direct comparison to the SHS gets interesting. The Rectangular Hollow Section—the stretched square—is essentially the same product, but optimized for situations where the force is known and directional.

RHS is the Master of Directional Strength

When you choose an RHS, you are making a deliberate decision. You are saying, "I know the force is mostly coming from this direction." You orient the longer, taller side of the rectangle to face the load. This taller side provides a much greater resistance to bending (higher moment of inertia) than a square of the same weight would offer.

Rectangular Hollow Section Standard Size Explained

When you order RHS, the sizing is critical. It is always listed as three numbers: Height $\times$ Width $\times$ Wall Thickness.

For example, an RHS might be specified as $150 \times 100 \times 6 \text{ mm}$.

The key takeaway here is the ratio. That 150 mm height is where most of the bending strength comes from. Standard sizes are dictated by market demand and manufacturing capabilities, but generally, you will find a huge range of sizes that have a $2:1$ or $3:2$ height-to-width ratio, allowing engineers to pick the exact directional strength they need.

Like SHS, the RHS also benefits from flat surfaces, making connections and welding straightforward and relatively inexpensive.



The Torsion Champion: Circular Hollow Section (CHS)

The Circular Hollow Section, often just called structural tube, is the shape you choose when uniformity and twisting resistance are your absolute top priorities.

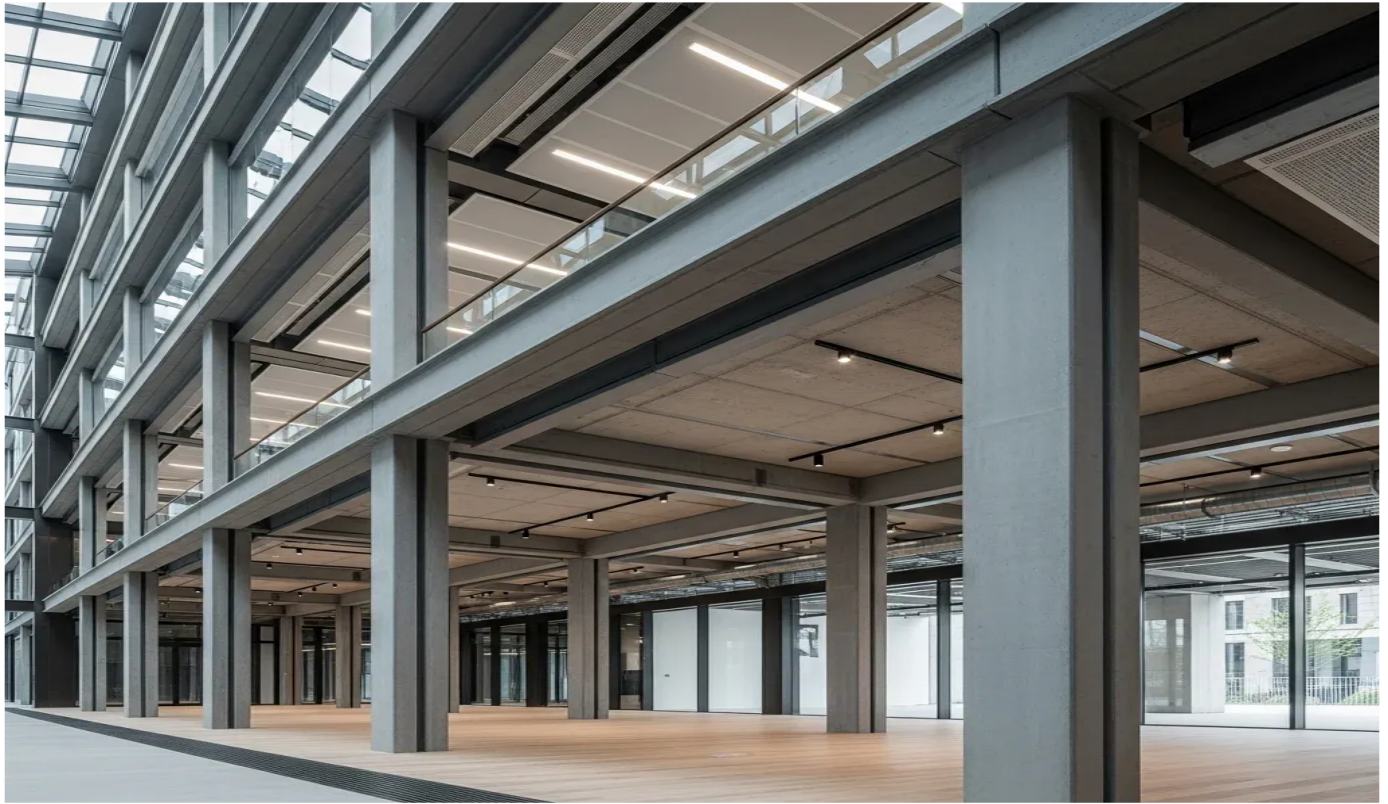
As we discussed, the perfect 360-degree geometry of the CHS means it handles loads equally from every side. This is vital for structures exposed to high wind loads, like masts, towers, or columns in exposed areas. When the wind hits a corner of an SHS, that corner receives the brunt of the force. When the wind hits a CHS, the force is distributed evenly around the entire curve.

CHS: Strongest in the Twist, Hardest to Connect

The drawback of the CHS is the fabrication challenge.

Connecting two CHS members, or connecting an SHS/RHS to a CHS, is difficult. You cannot just clamp a plate onto a round surface. You need a process called "coping" or "profiling." This involves cutting the end of the tube into a complex saddle shape so it perfectly matches the curve of the member it is being welded to.

This coping requires specialized plasma or laser cutting equipment and highly skilled welders. That complexity adds significant time and cost to the fabrication process.



The Big Decision: When to Choose Which

The choice between SHS, RHS, and CHS usually comes down to three factors: Engineering, Cost, and Look.

Engineering: Efficiency of Design For vertical column loads (axial) ' CHS is best because it offers pure symmetrical strength and handles load from any angle perfectly. For horizontal beam loads (known direction) ' RHS is ideal since it maximizes resistance to bending by placing steel far from the neutral axis (the 150 mm side faces the load). For twisting or torsional loads ' CHS performs best, providing unmatched 360-degree resistance to twisting forces. For general-purpose framing or bracing ' SHS offers a good balance of compression,

**bending strength,
and easy connection.****Cost: Fabrication and Materials**

Look: Architectural Aesthetic

Buying Smart: Grades, Standards, and Coatings

It is not enough to pick the shape. You need to make sure the steel hollow section you get has the right "recipe" (grade) and preparation (coating).

The Recipe: Understanding Standards

Most of these profiles are made from common structural steel grades. When you buy, you will encounter two main standards:

Always check your engineering drawings and never substitute a grade without professional sign-off. The difference between 275 MPa and 355 MPa of yield strength can make or break a high-load column.

Coatings: Protection is Key

Just like structural beams, hollow sections are prone to corrosion. If your structure is going to be outside—exposed to rain, sun, or the harsh coastal air of places like the GCC—it must be protected.

The interior of the tube is hard to protect, so this is usually done by Hot-Dip Galvanizing (HDG) the entire profile after fabrication. This involves dipping the finished structure into molten zinc. The zinc forms a highly durable, sacrificial layer that protects the steel from rust. When you see a light gray, slightly textured finish on outdoor structural steel, that is usually HDG.

For clean architectural applications where coating is not feasible, specialized stainless steel hollow sections (often Grade 304 or 316) are available, but they carry a much higher price tag. This choice is often governed by the same severe corrosion risks that dictate the use of stainless steel rebar for Saudi Projects.

Quick Summary: The Cheat Sheet

Final Thoughts and Next Steps

Choosing your steel hollow section is a decision where efficiency meets engineering. There is no single "best" shape; there is only the right shape for the job.

If your project requires simple, balanced framing, the SHS is likely your answer. If you have known, heavy, directional forces, the RHS is the smart, optimized choice. And if your design calls for superior torsional resistance or a unique curved aesthetic, the CHS is worth the added fabrication cost.

The key takeaway is this: Do not guess. Understand the forces, review the technical specifications, and then make your purchase. Why Smart Importers Choose Strategic Steel Partners.

We specialize in supplying high-quality, certified steel hollow sections—SHS, RHS, and CHS—in all major grades (A500, S355, etc.). Our technical team can review your project's load requirements to ensure you are not overspending on material you do not need, or underspecifying a profile that will compromise safety.

Contact our experts today for a consultation or quote. Let us help you get the right profile for your next structure.