

Structural I-Beams & H-Beams — Classification, Types & Global Standards

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Executive Summary

The I-beam (also referred to as H-beam, wide-flange beam, or universal beam) is the backbone of modern structural steel frameworks. Its distinctive "I" or "H" cross-section delivers an exceptional strength-to-weight ratio, making it the preferred choice for load-bearing applications across commercial construction, heavy industry, and infrastructure projects worldwide.

Why I-Beams dominate global construction:

- 7× stronger** than rectangular steel bars of equivalent weight
- 30× stiffer** under bending loads
- Engineered for predictable, calculable performance under ISO, ASTM, and GB standards
- Cost-optimized for large-scale procurement through direct mill sourcing

Metal Asia specializes in [direct-mill procurement of structural I-beams and H-beams](#) manufactured to Chinese GB/T standards, with full compliance documentation for global export. Our clients include distributors, EPC contractors, and steel traders across Europe, North America, Southeast Asia, the Middle East, and Africa.

1. Classification by Flange Geometry

The fundamental classification of I-beams is based on the geometry of the inner flange surfaces — whether they run **parallel** or **tapered (sloped)**. This parameter directly determines load-bearing capacity, connection methodology, and applicable design standards. [Our engineering team](#) assists buyers in selecting the optimal beam profile based on project-specific load calculations and regional building codes.

1.1. Parallel Flange Beams

Primary Standards: GOST 26020-83 (legacy), GOST 35087-2024 (current), EN 10365, ASTM A6, GB/T 11263-2017

Parallel flange beams represent the modern industry standard. The uniform flange thickness simplifies connections, improves predictability in finite element analysis, and ensures compatibility with bolted and welded joint configurations.

Type	Code	Profile Characteristics	Typical Applications
Normal Beam	B (Б)	Height significantly exceeds flange width. Flange width $\approx 0.5\times$ height. Optimized for bending loads.	Commercial building frames, floor systems, bridge decks, railway infrastructure
Wide-Flange Beam	Sh (Ш)	Flange width nearly equals web height. Handles 40% higher loads than normal beams without additional bracing.	Roof trusses, foundation tie-beams, trailer and railcar frames
Column Beam	K (К)	Massive flanges and web. Width-to-height ratio approaches 1:1 . Maximum vertical compression resistance.	Multi-story building columns, bridge piers, seismic-resistant structures
Additional Beam	D (Д)	Intermediate flange dimensions between normal and wide-flange profiles	Custom structural solutions, transitional load zones
Narrow-Flange Beam	U (У)	Reduced flange width for light-load applications	Secondary bracing, lightly loaded support structures
Pile Beam	S (С)	Uniform web and flange thickness	Foundation piles, heavy-duty support columns

Standard dimensional range (per GOST 26020-83 / GB/T 11263-2017):

- Profile height: **100 – 1,000 mm**
- Flange width: **55 – 400 mm**
- Mass per meter: **8.1 – 254.8 kg/m**

1.2. Tapered Flange Beams

Primary Standards: GOST 8239-89, GOST 19425-74, GB/T 706-2016, EN 10034

Tapered flange beams feature an inner slope of **6% to 12%** (up to 16% for specialized variants). These profiles are historically significant and remain in demand for specific industrial applications where the tapered surface offers advantages in riveted connections and certain compression scenarios.

Type	Code	Inner Slope	Applications
Standard Tapered	O	6 – 12%	General building construction, retrofits, heritage structures
Monorail Beam	M	$\leq 12\%$, reinforced flanges	Overhead crane runways, gantry cranes, hoists, trolley systems
Special / Mine Beam	S	Up to 16%	Mine shaft reinforcement, tunnel linings, heavy-duty underground structures

1.3. Manufacturing Precision Classes

Class	Code	Tolerance Level
High Precision	A	Specialized orders, tight-tolerance applications
Standard Precision	B	General hot-rolled production
Enhanced Precision	V	Improved dimensional tolerances

2. Classification by Manufacturing Method

The manufacturing process directly impacts structural integrity, dimensional flexibility, and unit economics.

Method	Description	Key Characteristics
Hot-Rolled	Monolithic profile rolled from heated steel billets through sequential mill stands	No weld seams, maximum structural integrity, limited to standard sizes, mill scale present
Welded (Built-Up)	Three steel plates (two flanges + web) assembled and automatically welded (SAW)	Fully customizable dimensions, web perforation possible, hybrid steel grades, requires UT inspection
Extruded (Aluminum)	Aluminum alloy pressed through H-section die	Ultra-lightweight, corrosion-resistant, limited to non-structural/light-duty applications
Glued Laminated (Timber)	LVL lumber flanges + OSB web bonded with PUR adhesive	Residential construction only, lightweight, crane-free assembly

For global procurement, **hot-rolled beams** offer the best balance of proven performance, availability, and cost efficiency. **Welded beams** are optimal for projects requiring non-standard dimensions or weight optimization. [NDT quality verification](#) is recommended for all welded beam orders.

3. Classification by Material Grade

Material selection is dictated by design loads, environmental exposure, and applicable building codes (Eurocode 3, AISC 360, SP 16.13330, etc.).

Material Family	Grades	Characteristics
Carbon Structural Steel	St3sp, St3ps (GOST); Q235B (GB); S235JR (EN); A36 (ASTM)	~80% of global beam production. Excellent weldability, cost-efficient, suitable for temperate climates
Low-Alloy High-Strength Steel	09G2S (GOST); Q355B/C/D (GB); S355J2 (EN); Gr.50 (ASTM)	Mn/Si alloyed. Operates down to -70°C . Dynamic load resistant. 30–50% higher strength than carbon steel
Bridge-Grade Steel	10HSND, 15HSND (GOST); Q345NH (GB); S355K2+N (EN)	Enhanced corrosion resistance, fatigue-resistant for cyclic loads
Special Structural Grades	C245 – C440 (GOST); S390 – S460 (EN)	Classified by yield strength. For heavy industrial and seismic applications

Climate-zone steel selection guide:

Climate Zone	Recommended Grade (GB)	Min Operating Temp
Temperate (Southern Europe, US South)	Q235B	-20°C
Cold (Northern Europe, Northern China)	Q355B	-20°C
Sub-Arctic (Canada, Scandinavia, Russia)	Q355C / Q355D	0°C / -20°C
Arctic (Alaska, Siberia)	Q355D / Q355E	-20°C / -40°C

4. Comparative Overview of Beam Types

Parameter	Normal (B)	Wide-Flange (Sh)	Column (K)	Monorail (M)	Special (S)
Width:Height	1:2	~1:1	~1:1	Tapered	Tapered ≤16%
Web/Flange Thickness	Standard	Increased	Massive	Reinforced	Standard
Load Capacity	Standard	+40% vs. B	Maximum	Elevated	Application-specific
Bending Performance	Excellent	Good	Not primary	Not primary	Good

Parameter	Normal (B)	Wide-Flange (Sh)	Column (K)	Monorail (M)	Special (S)
Compression Performance	Good	Good	Excellent	Good	Excellent
Bracing Required	Yes	No	No	Case-by-case	Yes
Primary Standard	GOST 26020 / GB/T 11263	GOST 26020	GOST 26020	GOST 19425	GOST 19425

5. Beam Designation & Marking System

Understanding the designation code ensures accurate procurement and eliminates costly specification errors.

Standard format (example: 26B2):

26 B 2

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Series number (within type)

Profile type (B/Sh/K/D/U)

Approximate profile height (cm)

Extended format per STO ASChM 20-93 (example: 20B1 C345 09G2S-12):

20 B1 C345 09G2S-12

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Grade category per GOST 19281

Steel grade

Strength class (C245–C440)

Subtype (B1/B2)

Profile number

6. Key Geometric Parameters

Parameter	Symbol	Description	Unit
Profile Height	H	Distance between outer flange faces	mm
Flange Width	B	Transverse flange dimension	mm
Web Thickness	S	Vertical web thickness	mm
Flange Thickness	t	Horizontal flange thickness	mm
Inner Fillet Radius	R	Web-to-flange transition radius	mm
Standard Length	L	4 – 15 meters (up to 24 m on request)	m
Mass per Meter	m	Weight per linear meter	kg/m

7. Primary Applications

Commercial & Industrial Construction

- Multi-story building frames and floor systems
- Bridge superstructures and approach spans
- Metro stations and underground passageways

- Industrial halls with wide clear spans
- Warehouses and logistics centers

Heavy Industry & Infrastructure

- Mine shaft reinforcement and tunnel linings
- Offshore platform substructures
- Crane runway beams and gantry systems
- Railway rolling stock underframes
- Power plant structural frameworks

Specialized Applications

- Seismic-resistant building systems
 - Heavy-duty foundations and pile caps
 - Stadium and arena roof structures
 - Wind turbine tower internals
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8. Advantages & Limitations

Advantages

-  Exceptional strength-to-weight ratio
-  Uniform load distribution to supports
-  Predictable, code-verified structural behavior
-  Cost-efficient for large-scale procurement
-  Globally standardized (GOST, GB, ASTM, EN)
-  Full recyclability

Limitations

-  Poor torsional resistance (avoid torsion-dominant applications)
 -  Hot-rolled surface has mill scale (requires surface preparation for coating)
 -  Standard hot-rolled sizes limited ($\leq$ ~600 mm height for most mills)
 -  Heavy units require mechanical handling (cranes, forklifts)
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9. Handling, Storage & Logistics

Proper handling ensures dimensional integrity from mill to construction site. [Metal Asia manages complete logistics chains](#) including [pre-shipment NDT inspection](#) at the mill.

Storage Requirements:

- Stack height: **maximum 2 meters**
- Separate layers with timber spacers
- Store under cover or with weather protection
- Avoid ground contact (use raised platforms)

Transportation Protocols:

- Loading/unloading: certified cranes or forklifts only
- Use protective slings (avoid chain direct contact)
- **Never drop** beams from transport bed
- Securing: chains + timber blocks for ocean/rail freight

Ocean Freight Considerations:

- Standard breakbulk or containerized (flat-rack for lengths > 12 m)

- Lashing requirements per IMO CSS Code
- Insurance coverage for full CIF/CFR terms

10. Chinese GB Standard Equivalents

For international buyers sourcing from Chinese mills, understanding GB/T equivalents to GOST, ASTM, and EN standards is essential for specification matching and regulatory compliance.

GB/T Standards for I-Beams & H-Beams

International Standard	Chinese GB/T Equivalent	Profile Designation
GOST 35087-2024 / GOST 26020-83 (Parallel Flange)	GB/T 11263-2017 Hot-rolled H-section steel	HW (wide-flange), HM (medium), HN (narrow)
GOST 8239-89 (Tapered Flange)	GB/T 706-2016 Hot-rolled section steel	I-beam designation (I20, I30, I40)
GOST 19425-74 (Special Beams)	YB/T 5055 / GB/T 706	Reinforced I-sections, industry special profiles
GOST R 58966-2020 (Welded Beams)	GB/T 33814-2017 Welded H-section steel	Custom fabricated H-sections
EN 10025-2 / ASTM A572	GB/T 1591-2018 High-strength low-alloy steel	Q355B, Q355C, Q355D, Q355E
ASTM A36 / EN S235	GB/T 700-2006 Carbon structural steel	Q235B, Q255

Profile Mapping: GOST → GB/T 11263

GOST Profile	GB/T Equivalent	Dimensions (H × B) mm
20B1	HN 200×100	200 × 100
30B1	HN 300×150	300 × 150
40B1	HN 400×200	400 × 200
30Sh1	HW 300×300	300 × 300 (note: significantly heavier)
40Sh1	HW 400×400	400 × 400
20K1	HW 200×200	200 × 200 (note: +48% mass)

Critical Procurement Notes

- Dimensional Variance:** Even when nominal height matches (e.g., GOST 20B1 vs. GB/T HN200×100), flange and web thickness may differ by **0.5 – 1.5 mm**. Always require engineering verification before substitution.
- Certification:** Chinese mills provide Mill Test Certificates (MTC) with mechanical properties translated to GOST 27772 strength classes (C255, C355) or ASTM/EN equivalents for international projects.
- Weight Discrepancy:** Chinese HW (wide-flange) profiles are typically **significantly heavier** than GOST Sh profiles of the same nominal height due to different width-to-height proportions. Budget for mass recalculation.

For additional guidance on international steel sourcing, visit our FAQ section or [explore our procurement insights blog](#).

11. Metal Asia Procurement Services

Metal Asia (www.metal-asia.pw) is a **direct-mill procurement partner** for structural steel buyers worldwide. We eliminate intermediary markups by connecting buyers directly with certified Chinese steel mills, ensuring **full supply chain transparency** from order placement to port delivery.

Core Procurement Services

Service	Description
Standard Matching	Cross-reference GOST/ASTM/EN specs to GB/T 11263 or GB/T 706 profiles
Mill Test Certificate Verification	Independent MTC audit and mechanical property validation
Dimensional Reconciliation	Load-recalculation support for GOST-to-GB substitutions
Pre-Shipment Quality Control	On-site NDT inspection at mill before release
End-to-End Logistics	Mill → Chinese port → customs → ocean/rail → destination port
Customs Documentation	HS code classification, CO, packing lists, commercial invoices
Cargo Insurance	Full-route coverage (warehouse-to-warehouse)
Steel Grade Consulting	Q235B vs. Q355B/C/D/E selection based on project climate zone

Our Commitment to Compliance & Transparency

- ✔ **Mill-direct pricing** — No hidden intermediary fees. Full cost breakdown on every quotation.
- ✔ **Pre-shipment inspection** — Every batch inspected at mill before release. No exceptions.
- ✔ **Complete documentation package** — MTC, Certificate of Origin, Commercial Invoice, Packing List, NDT reports (on request)
- ✔ **Supply chain risk management** — We handle customs clearance, freight booking, and insurance. You track every milestone.
- ✔ **Flexible payment terms** — Letter of Credit, T/T, and structured payment options for qualified buyers. [View payment options.](#)

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Specializes in mill audits across China's steel-producing provinces, cross-standard steel grade matching (GOST/ASTM/EN/GB), and oversized cargo logistics. **Core principle:** «Beam classification is not just codes and numbers — it is an engineering language. Choosing type B instead of Sh, or K instead of B1, can cost a project millions in remediation. We verify every specification before the PO is placed.»



REQUEST A MILL AUDIT

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