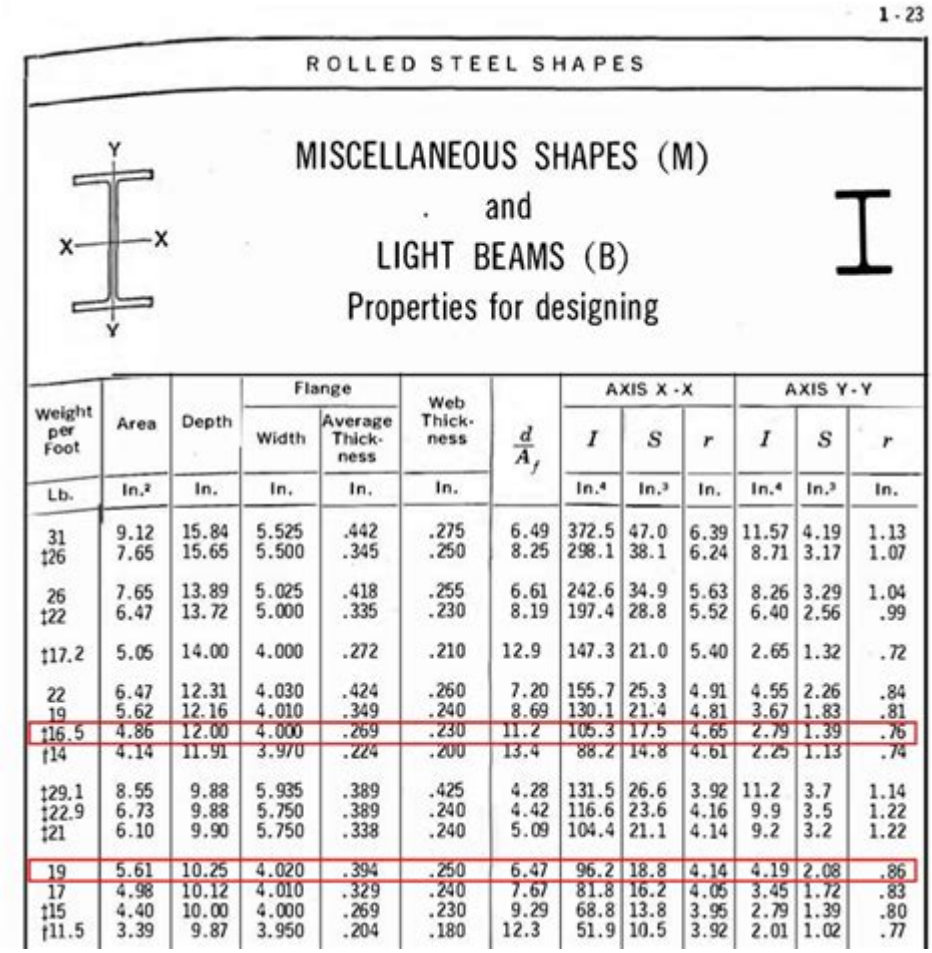
Structural Steel Sections Tables Of Dimensions And Properties



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ROLLED STEEL SHAPES

MISCELLANEOUS SHAPES (M)
and
LIGHT BEAMS (B)
Properties for designing

Weight per Foot	Area	Depth	Flange		Web Thick-ness	$\frac{d}{A_f}$	AXIS X-X			AXIS Y-Y		
			Width	Average Thick-ness			I	S	r	I	S	r
Lb.	In.²	In.	In.	In.	In.		In.⁴	In.³	In.	In.⁴	In.³	In.
31	9.12	15.84	5.525	.442	.275	6.49	372.5	47.0	6.39	11.57	4.19	1.13
‡26	7.65	15.65	5.500	.345	.250	8.25	298.1	38.1	6.24	8.71	3.17	1.07
26	7.65	13.89	5.025	.418	.255	6.61	242.6	34.9	5.63	8.26	3.29	1.04
‡22	6.47	13.72	5.000	.335	.230	8.19	197.4	28.8	5.52	6.40	2.56	.99
‡17.2	5.05	14.00	4.000	.272	.210	12.9	147.3	21.0	5.40	2.65	1.32	.72
22	6.47	12.31	4.030	.424	.260	7.20	155.7	25.3	4.91	4.55	2.26	.84
19	5.62	12.16	4.010	.349	.240	8.69	130.1	21.4	4.81	3.67	1.83	.81
‡16.5	4.86	12.00	4.000	.269	.230	11.2	105.3	17.5	4.65	2.79	1.39	.76
‡14	4.14	11.91	3.970	.224	.200	13.4	88.2	14.8	4.61	2.25	1.13	.74
‡29.1	8.55	9.88	5.935	.389	.425	4.28	131.5	26.6	3.92	11.2	3.7	1.14
‡22.9	6.73	9.88	5.750	.389	.240	4.42	116.6	23.6	4.16	9.9	3.5	1.22
‡21	6.10	9.90	5.750	.338	.240	5.09	104.4	21.1	4.14	9.2	3.2	1.22
19	5.61	10.25	4.020	.394	.250	6.47	96.2	18.8	4.14	4.19	2.08	.86
17	4.98	10.12	4.010	.329	.240	7.67	81.8	16.2	4.05	3.45	1.72	.83
‡15	4.40	10.00	4.000	.269	.230	9.29	68.8	13.8	3.95	2.79	1.39	.80
‡11.5	3.39	9.87	3.950	.204	.180	12.3	51.9	10.5	3.92	2.01	1.02	.77

Structural steel sections tables of dimensions and properties play a critical role in the field of civil engineering and construction. These tables serve as a comprehensive reference for engineers and architects, providing essential information about various steel shapes and their characteristics. Understanding these tables is fundamental for the design and analysis of structures, ensuring that they are safe, efficient, and cost-effective. This article delves into the various types of structural steel sections, their dimensions, properties, and the importance of these tables in practical applications.

Understanding Structural Steel Sections

Structural steel is a category of steel used for making construction materials in a variety of shapes. These shapes are standardized into sections that are categorized based on their geometry and application. Common types of structural steel sections include:

- I-beams (also known as H-beams or wide-flange beams)
- C-channels (also referred to as U-sections)
- Angle sections
- T-sections

- Square and rectangular hollow sections
- Circular hollow sections

Each of these sections has distinct dimensions and properties, making them suitable for different structural applications.

Types of Structural Steel Sections

I-Beams

I-beams are one of the most commonly used structural steel sections, characterized by their "I" shape. They provide excellent strength-to-weight ratios and are typically used in beams, columns, and frames.

- Dimensions: The dimensions of I-beams are defined by their depth, flange width, and web thickness.
- Properties: The moment of inertia, section modulus, and weight per unit length are critical properties considered when selecting I-beams for a project.

C-Channels

C-channels, or U-sections, are used in various applications, including frames, supports, and brackets.

- Dimensions: C-channels are defined by their height, flange width, and thickness.
- Properties: Similar to I-beams, the section modulus and weight per unit length are important for assessing the load-bearing capacity.

Angle Sections

Angle sections are L-shaped and are often used for braces, frames, and structural connections.

- Dimensions: Defined by the length of the sides and thickness.
- Properties: Their strength is evaluated through the section modulus and tensile strength.

T-Sections

T-sections are similar to I-beams but with a single flange. They are used in situations where load needs to be distributed evenly.

- Dimensions: Defined by the width of the flange and the height of the web.
- Properties: The properties include section modulus and weight.

Hollow Sections

Hollow sections, which include square, rectangular, and circular shapes, are used in various applications due to their aesthetic appeal and structural efficiency.

- Dimensions: Defined by the outer dimensions and wall thickness.
- Properties: Hollow sections have excellent bending properties and are evaluated based on their moment of inertia and section modulus.

Tables of Dimensions and Properties

The structural steel sections tables of dimensions and properties provide a detailed overview of the various types of steel sections available. These tables typically include several critical parameters:

- Section Type: The type of structural section (e.g., I-beam, C-channel, angle).
- Dimensions: The precise measurements of the section, including height, width, and thickness.
- Weight: The weight per unit length, which is crucial for transportation and installation considerations.
- Section Modulus (Z): A measure of the strength of the section, indicating its ability to resist bending.
- Moment of Inertia (I): This property measures the distribution of cross-sectional area, influencing the deflection of the beam under load.
- Yield Strength (Fy): The stress at which a material begins to deform plastically.
- Ultimate Strength (Fu): The maximum stress a material can withstand before failure.

Example Table Structure

Here’s a simplified example of what a structural steel section table might look like:

Section Type	Height (mm)	Flange Width (mm)	Web Thickness (mm)	Weight (kg/m)	Section Modulus (cm^3)	Moment of Inertia (cm^4)	Yield Strength (MPa)
IPE 100	100	55	5	13.7	16.4	60.6	235
UPN 80	80	45	5	9.2	9.2	26.5	235
L 50x50x5	50	50	5	4.1	2.7	6.8	235

Importance of Structural Steel Sections Tables

The importance of having access to comprehensive structural steel sections tables of dimensions and properties cannot be overstated. Here are several reasons why these tables are essential in engineering and construction:

1. Design Efficiency: Engineers can quickly select the appropriate steel sections based on load requirements and design constraints, saving time and improving efficiency.

2. Cost-Effectiveness: By accurately assessing the required steel sections, engineers can optimize material usage, reducing costs associated with over-specification or wastage.

3. Safety Assurance: Understanding the properties of structural sections allows engineers to ensure that structures can safely support loads and withstand environmental conditions.

4. Standardization: The availability of standardized tables helps maintain consistency in the industry, making it easier for contractors and suppliers to source materials.

5. Regulatory Compliance: Many building codes and regulations reference specific properties of structural steel sections. Tables provide the necessary information for compliance.

Conclusion

In conclusion, structural steel sections tables of dimensions and properties are invaluable resources in the field of structural engineering and construction. They provide essential information that facilitates design, ensures safety, and promotes cost-effectiveness. With the variety of steel sections available, understanding their dimensions and properties is vital for engineers and architects alike. As the construction industry continues to evolve, these tables will remain a cornerstone in the efficient design and execution of structural projects, helping to create safe and resilient infrastructure for the future.

Frequently Asked Questions

What are structural steel sections tables, and why are they important in construction?

Structural steel sections tables provide standardized dimensions and properties of various steel shapes, such as beams, columns, and angles. They are crucial in construction for ensuring the correct selection and use of steel materials, optimizing structural integrity and safety.

How do I read a structural steel section table?

To read a structural steel section table, identify the shape of the steel section (like I-beam, H-section, etc.), then locate the specific section's dimensions (width, height, thickness) and properties (weight per unit length, yield strength, etc.) listed in the table.

What properties are typically included in structural steel sections tables?

Typical properties in structural steel sections tables include dimensions (depth, flange width, web thickness), weight per unit length, moment of inertia, section modulus, yield strength, and tensile strength.

How do different steel grades affect the dimensions and properties in structural steel tables?

Different steel grades can affect the yield strength and tensile strength of the sections. Higher-grade steels can have thinner dimensions while maintaining strength, allowing for lighter structures without compromising safety.

What is the significance of the section modulus in structural steel tables?

The section modulus is a measure of the strength of a structural section. It indicates how well a shape can resist bending; higher section modulus values mean greater resistance to bending stresses, which is crucial for load-bearing applications.

Are there international standards for structural steel section dimensions?

Yes, there are international standards such as ASTM, AISC, and EN standards that govern the dimensions and properties of structural steel sections, ensuring consistency and safety in construction practices worldwide.

How can I determine the appropriate steel section for my construction project using the tables?

To determine the appropriate steel section, assess the loads and forces acting on the structure, consult the structural steel section tables for available shapes and their properties, and select a section that meets or exceeds the required strength and stability criteria.

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