

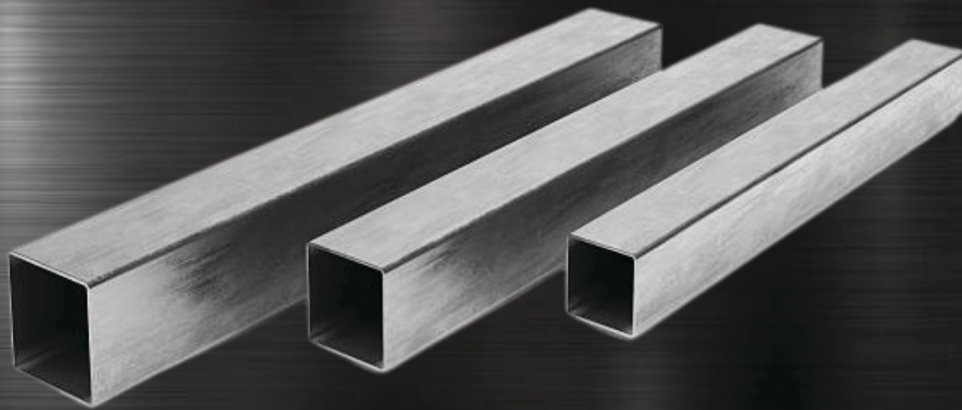


الريان للأعمال المتميزة

**Al Rayyan**  
Business Excellence

## **Al Rayyan Business Excellence**

**FLAT PRODUCTS  
2023**





# Flat Products

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## HRC, CRC, Tinplate, GI & PPGI Products

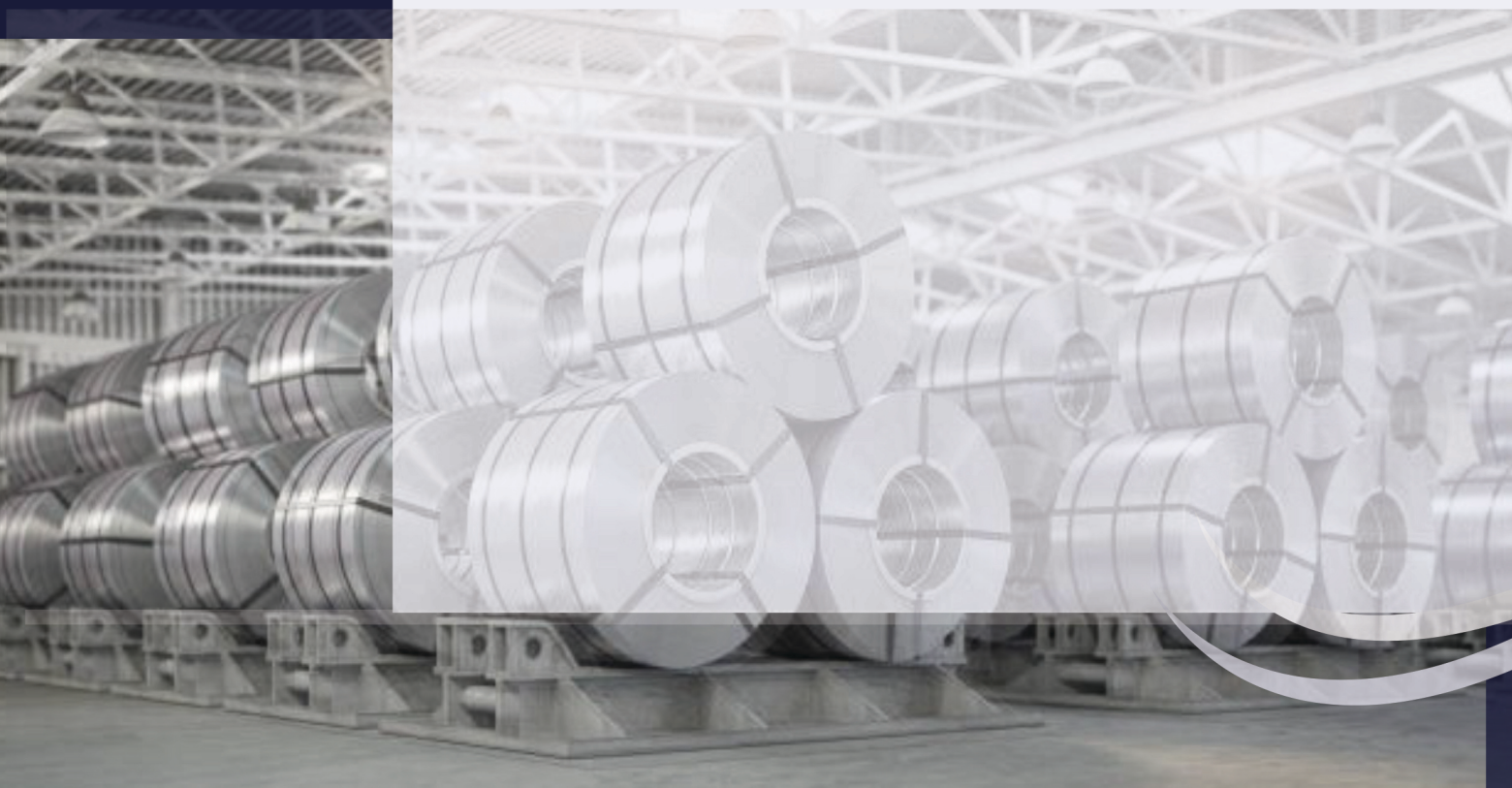
### Dimensions & Weight of Products

#### Coil

| Product            | Inter Dia (mm) | Thickness (mm) | Width (mm) | Weight (Mt) |
|--------------------|----------------|----------------|------------|-------------|
| HRC                | 850/760        | 1.2-16         | 600-2000   | 10-29       |
| Pickled Coil       | 760/610        | 1.5-5.3        | 600-2000   | 6-28        |
| CRC                | 610/508        | 0.20-3         | 600-2000   | 6-25        |
| Tinplate Coil      | 420            | 0.18-0.4       | 600-1050   | 4-8         |
| Galvanized Coil    | 610/508        | 0.25-2         | 750-1500   | 6-24        |
| Pre - Painted Coil | 610/508        | 0.25-1.5       | 750-1500   | 4-12        |

#### Sheet

| Product           | Length (mm) | Width (mm) | Thickness (mm) | Weight of Sheet Pack (tone) |
|-------------------|-------------|------------|----------------|-----------------------------|
| Hot-rolled sheet  | 1000-12000  | 600-2000   | 1.2-16         | 2-7.5                       |
| Cold-rolled sheet | 750-6000    | 600-2000   | 0.20-3         | 1-5                         |
| Tinplate sheet    | 450-1200    | 600-1050   | 0.18-0.4       | 1-2                         |



| STANDARD                       | DIN             | EN            | JIS                        | INSO        |
|--------------------------------|-----------------|---------------|----------------------------|-------------|
| COMMERCIAL QUALITY             | (1614-2) StW 22 | (10111) DD 11 | (3131) SPHC                | (3693)      |
|                                |                 |               |                            | INSO 3693-2 |
| DRAWING QUALITY                | (1614-2) StW 23 | (10111) DD 12 | (3131) SPHD                | (3693)      |
|                                |                 |               |                            | INSO 3693-3 |
| DEEP DRAWING<br>(FULLY KILLED) | (1614-2) StW 24 | (10111) DD 13 | (3131) SPHE<br>(3131) SPHF | (3693)      |
|                                |                 |               |                            | INSO 3693-4 |
| FOR COLD REDUCING              | (1614-1)        | -             | -                          | -           |
|                                | St 22           |               |                            |             |
|                                | St 23           |               |                            |             |
|                                | St 24           |               |                            |             |
| STRUCTURAL QUALITY             | (17100)         | (10025)       | (3131)<br>SPHC             | (3693)      |
|                                | St 33           | S185          |                            |             |
|                                | St 37(2-3)      | S235JR        |                            |             |
|                                | St 44(2-3)      | S275JR        |                            | INSO 3693-1 |
|                                | St 52           | S355JR        |                            |             |

**Standard Comparison Chart of Products**

|                 |                      | DIN        | JIS       | ASTM      | BS           |
|-----------------|----------------------|------------|-----------|-----------|--------------|
| Standard Number |                      | DIN 1623-1 | JIS G3141 | A 366,620 | EN 10130     |
| Quality Grade   | Commercial Quality   | St 12      | SPCC      | A 366,620 | Fe P01(DC01) |
|                 | Drawing Quality      | St 13      | SPCD      | A 619     | Fe P03(DC03) |
|                 | Deep Drawing Quality | St 14      | SPCE      | A 620     | Fe P04(DC04) |

**Standard DIN 1623-Part 1-1983 for Cold Roll**

| Grade   | Material No. | Tensile Strength<br>N/mm <sup>2</sup> (min) | Yield Strength<br>N/mm <sup>2</sup> (max) | Hardness (max) |        |     |
|---------|--------------|---|---|----------------|--------|-----|
|         |              |   |   | 0.6≤t≤1.1      | t<0.6  | HRF |
|         |              |   |   | HRBm           | HR 30t |     |
| St 12   | 1.0330       | 0.1   | 270-410                                   | 65             | 60     | 94  |
| Ust 13  | 1.0333       | 0.1   | 270-370                                   | 57             | 55     | 90  |
| RRSt 13 | 1.0347       | 0.1   | 270-370                                   | 55             | 53     | 88  |
| St 14   | 1.0348       | 0.08  | 270-350                                   | 50             | 50     | 86  |

**Symbols for characteristics of surface appearance and surface finish**

| Symbol of Quality | Tensile Strength<br>N/mm <sup>2</sup><br>(min) | Elongation % (min) |                |               |             |             |               | Composition % (max) |      |       |       |
|-------------------|--|--------------------|----------------|---------------|-------------|-------------|---------------|---------------------|------|-------|-------|
|                   |  | Thickness (mm)     |                |               |             |             |               | C                   | Mn   | P     | S     |
|                   |  | t ≥ 0.25           | 0.25 ≤ t < 0.4 | 0.4 ≤ t < 0.6 | 0.6 ≤ t < 1 | 1 ≤ t < 1.6 | 1.6 ≤ t < 2.5 |                     |      |       |       |
| SPCC (St 12)      | 270  | 32                 | 34             | 36            | 37          | 38          | 39            | 0.12                | 0.5  | 0.04  | 0.045 |
| SPCC (St 13)      | 270  | 34                 | 36             | 38            | 39          | 40          | 41            | 0.1                 | 0.45 | 0.035 | 0.35  |
| SPCC (St 14)      | 270  | 36                 | 38             | 40            | 41          | 42          | 43            | 0.08                | 0.4  | 0.03  | 0.03  |

## Continuous Hot Dip Galvanizing

### Technical Specification:

**Production Method:** Continuous Hot Dip Galvanizing

**Entry Coil:** Full Hard Coils (chemical composition and production technique refer to EN10142-10143)

**Coil Inside Diameter:** 610/ 508 mm

**Coil Outside Diameter:** 1000-2300mm Strip

**Thickness:** 0.25-2mm

**Strip width:** 750-1500mm

**Coating weight:** 60-350 g/m<sup>2</sup>

**Coating composition:** Zinc (99.8Zn-0.2Al)

**Coating Finish:** Normal Spangle, Minimized Spangle, Zero Spangle

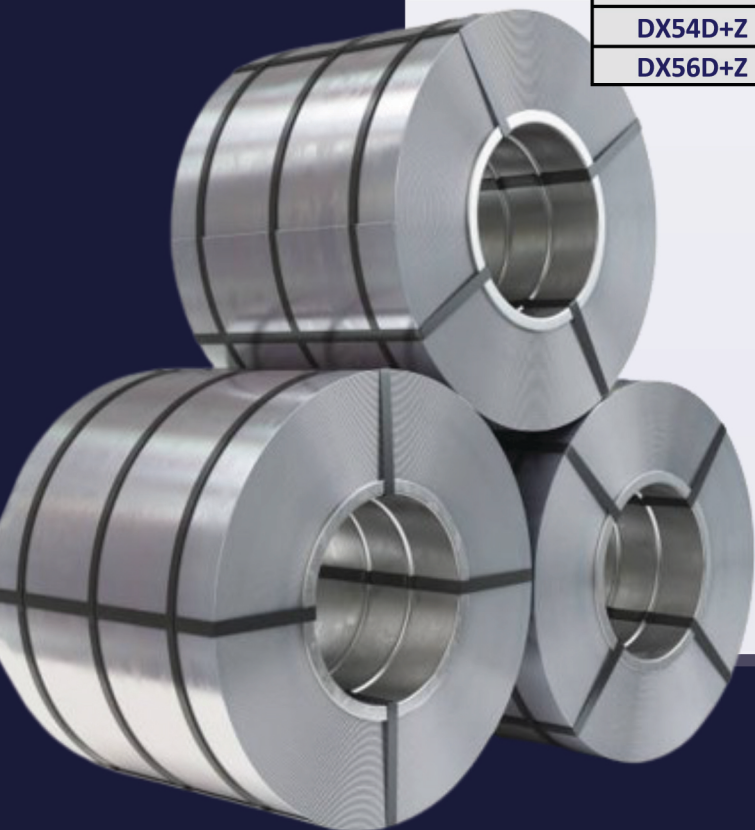
**Protective Coatings Oil:** As per request

**Passivation Method:** Chromated– Organic coating– Chrome free coating

### Physical Tolerance:

Product Quality (EN 10142)

| Steel Type | Quality | Rp<br>(N/mm <sup>2</sup> ) | Rm<br>(N/mm <sup>2</sup> ) | Elongation<br>(%) |
|------------|---------|----------------------------|----------------------------|-------------------|
| DX51D+Z    | CQ      | -                          | 270-500                    | 22                |
| DX52D+Z    | DQ      | 140-300                    | 270-420                    | 26                |
| DX53D+Z    | DQ2     | 140-260                    | 270-380                    | 30                |
| DX54D+Z    | DDQ     | 140-220                    | 270-350                    | 36                |
| DX56D+Z    | EDDQ    | 120-180                    | 270-350                    | 39                |





# Long Products

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## Billet/ Bloom

| Physical tolerances | 130×130                        | 150×150                        | 200×200                        | 250×250    | 250×320    |
|---------------------|--------------------------------|--------------------------------|--------------------------------|------------|------------|
| Length              | ± 100 mm                       | ± 100 mm                       | ± 100 mm                       | ± 100 mm   | ± 100 mm   |
| Face Dimension      | ±4 mm                          | -2mm/ +6 mm                    | -4mm/ +8mm                     | -5,+10     | -5,+12     |
| Corner Radius       | 6-8 mm                         | 6-8 mm                         | 6-8 mm                         | 6-8 mm     | 6-8 mm     |
| Twist               | 1Deg.Per M                     | 1Deg.Per M                     | 1Deg.Per M                     | 1Deg.Per M | 1Deg.Per M |
| Rhomboidity         | 7 mm Max                       | 9 mm Max                       | 12 mm Max                      | 15 mm Max  | 15 mm Max  |
| Bend                | 7 mm / M<br>( Max 70 mm/ 12M ) | 7 mm / M<br>( Max 70 mm/ 12M ) | 7 mm / M<br>( Max 70 mm/ 12M ) | 7 mm / M   | 7 mm / M   |

## Chemical Composition

| Grade | C (PCT)   | Si (PCT)  | Mn (PCT)  | P (PCT MAX) | S (PCT MAX) | NI (PCT MAX) | CU (PCT MAX) | CR (PCT MAX) | N (PCT MAX) | Ni+Cr+Cu (PCT MAX) |
|-------|-----------|-----------|-----------|-------------|-------------|--------------|--------------|--------------|-------------|--------------------|
| 3SP   | 0.14-0.22 | 0.15-0.35 | 0.40-0.65 | 0.04        | 0.05        | 0.30         | 0.30         | 0.30         |             |                    |
| 4SP   | 0.20-0.27 | 0.15-0.35 | 0.60-0.80 | 0.05        | 0.05        | 0.3          | 0.3          | 0.3          | 0.012       | 0.65               |
| 5SP   | 0.28-0.37 | 0.35      | 0.50-0.80 | 0.04        | 0.05        | 0.3          | 0.3          | 0.3          |             |                    |

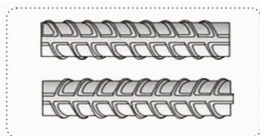
-Blooms and Billets are produced with length 4 to 12 meters.

-Physical and technical specifications of Blooms and Billets are according to international standards and agreements with customer

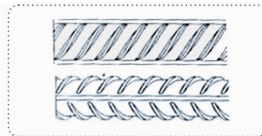




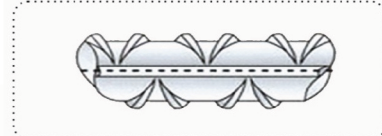
# Rebar



Rib Shape According to GOST Standard: (Uniform Rib)



Rib Shape According to DIN Standard: (Crescent Shaped Rib)



A Special Compound Rib:

| Standard Equivalence |                      |         |      |
|----------------------|----------------------|---------|------|
| Characteristics      | Equivalent Standards |         |      |
|                      | GOST                 | ASTM    | JIS  |
| 240 C                | A I                  | -       | SR24 |
| 340 AJ               | A II                 | A615G40 | SD35 |
| 400 AJ               | A III                | A615G60 | SD40 |
| 500 AJ               | -                    | A615G75 | SD50 |

| Nominal diameter (mm) | Diameter tolerance | Cross-sectional area (mm) <sup>2</sup> | Unit weight (kg/m) | Weight tolerance % | considerations  |
|-----------------------|--------------------|--|--------------------|--------------------|---|
| 8                     | 0.3<br>-0.5        | 50.3                                   | 0.395              | ±8                 | Density is equal to 7.85 gr/cm The differences between max & min diameter in the same cross-sectional plan must be Less than 70% of the tolerance range |
| 10                    |                    | 78.5                                   | 0.616              | ±5.5               |   |
| 12                    |                    | 113.1                                  | 0.888              |                    |   |
| 14                    |                    | 154                                    | 1.21               |                    |   |
| 16                    | 0.4<br>-0.5        | 201                                    | 1.58               | ±4.5               |   |
| 18                    |                    | 254                                    | 2                  |                    |   |
| 20                    |                    | 314                                    | 2.47               |                    |   |
| 22                    |                    | 380                                    | 2.98               |                    |   |
| 25                    | 0.4                | 491                                    | 3.85               |                    |   |
| 28                    | -0.6               | 616                                    | 4.83               |                    |   |
| 32                    | +0.4<br>-0.7       | 804                                    | 6.31               |                    |   |

Round bar sizes 8 – 10 & 12 – 32 are produced as coil & piece, respectively.



# Rebar

## Hot Rolled Round Steel Bars According to ASTM A 615/A 615 M (2015)

Table 1. Chemical composition & Mechanical Properties of Round Bars :

| Grade | Chemical Composition Based on Cast Analysis (Max %) |    |    |       |    | Mechanical Properties of Round Bars |                 |                   |
|-------|---|----|----|-------|----|-------------------------------------|-----------------|-------------------|
|       | C   | Si | Mn | P     | S  | Y.P (Mpa) min                       | U.T.S (Mpa) min | %El. (200 mm) min |
| G 40  | --  | -- | -- | 0.060 | -- | 280                                 | 420             | 11-12             |
| G 60  | --  | -- | -- | 0.060 | -- | 420                                 | 620             | 7-9               |
| G 75  | --  | -- | -- | 0.060 | -- | 520                                 | 690             | 6-7               |

## Hot Rolled Round Steel Bars According to BS 4449 (2005):

Table 1. Chemical composition of Round Bars :

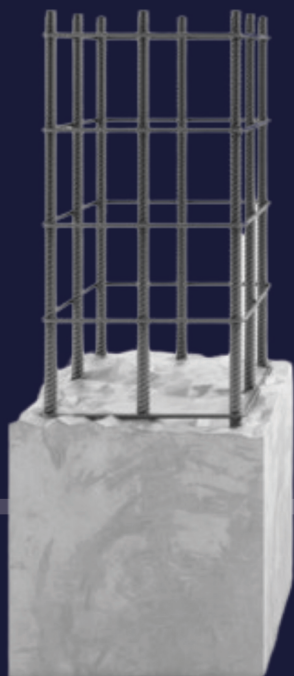
| Grade | Chemical Composition Based on Cast Analysis (Max %) |    |    |       |       |      |       |       |
|-------|---|----|----|-------|-------|------|-------|-------|
|       | C   | Si | Mn | P     | S     | Cu   | N     | Ceq   |
| B500A | 0.22  | -- | -- | 0.050 | 0.050 | 0.80 | 0.012 | 0.050 |
| B500B | 0.22  | -- | -- | 0.050 | 0.050 | 0.80 | 0.012 | 0.050 |
| B500C | 0.22  | -- | -- | 0.050 | 0.050 | 0.80 | 0.012 | 0.050 |

Table 2. Mechanical properties of Round Bars:

| Mechanical Properties |               |                     |              |
|-----------------------|---------------|---------------------|--------------|
| Grade                 | Y.P (Mpa) min | U.T.S/Y.P Ratio min | %E (Agt) min |
| B500A                 | 500           | 1.05                | 2.5          |
| B500B                 | 500           | 1.08                | 5            |
| B500C                 | 500           | 1.15-1.35           | 7.5          |

## Hot Rolled Round Steel Bars According to GOST 5781 -82

| Grade         | Chemical Composition              | Y.P (Mpa) min | U.T.S/Y.P min | %E (A5) min |
|---------------|-----------------------------------|---------------|---------------|-------------|
| A- I (A240)   | According to GOST 5781-82 table 5 | 235           | 373           | 25          |
| A- II (A300)  |                                   | 295           | 490           | 19          |
| A- III (A400) |                                   | 390           | 590           | 14          |



### Grade B500B Standard

| characteristic relative rib area, mass and ranges for rib parameters |                   |                     |                  |                 |                  |
|--|-------------------|---------------------|------------------|-----------------|------------------|
| normal Diameter (d) (mm)   | Relative rib area | Mass per meter kg/m | Mass Tolerance % | Rib height (mm) | Rib spacing (mm) |
| 12   | 0.04              | 0.888               | ±4.5             | 0.03-0.15d      | 0.4-1.2d         |
| 14   | 0.056             | 1.21                |                  |                 |                  |
| 16   |                   | 1.58                |                  |                 |                  |
| 18   |                   | 2.00                |                  |                 |                  |
| 20   |                   | 2.47                |                  |                 |                  |
| 22   |                   | 2.98                |                  |                 |                  |
| 25   |                   | 3.85                |                  |                 |                  |
| 28   |                   | 4.83                |                  |                 |                  |
| 32   |                   | 6.31                |                  |                 |                  |

| Grade | Max. Product Chemical composition % |       |       |       |      |                 |
|-------|-------------------------------------|-------|-------|-------|------|-----------------|
|       | C                                   | S     | P     | N     | Cu   | C <sub>eq</sub> |
| B500B | 0.24                                | 0.055 | 0.055 | 0.014 | 0.85 | 0.52            |

| Grade | Characteristic mechanical properties        |               |                       |
|-------|---|---------------|-----------------------|
|       | Min. yield strength (Y.P) N/mm <sup>2</sup> | Min. UTS/Y.S. | Min A <sub>gt</sub> % |
| B500B | 500   | 1.08          | 5.0                   |



## Wire Rod

| Table 1 Physical Specifications of wire Rod |           |                       |                  |   |
|---|-----------|-----------------------|------------------|---|
| Diameter (mm)                               |           | Sectional Area A (mm) | Unit Weight (kg) | Deviation from Circularity              |
| Nominal Diameter                            | Tolerance |                       |                  |   |
| 5.5   | ± 4       | 23.76                 | 0.187            | Max. 80% of tolerance range of diameter |
| 6.5   |           | 33.18                 | 0.26             |   |
| 7   |           | 38.48                 | 0.302            |   |
| 8   |           | 50.26                 | 0.395            |   |
| 9   |           | 63.62                 | 0.499            |   |
| 10  |           | 78.54                 | 0.617            |   |
| 11  |           | 95.03                 | 0.746            |   |
| 12  |           | 113.1                 | 0.888            |   |
| 14  |           | 153.9                 | 1.21             |   |

**Table2. Chemical Composition of Wire Rod-Industrial Round Bars**

| Steel Grade | Weight of Elements(%) |           |           |        |        |                |
|-------------|-----------------------|-----------|-----------|--------|--------|----------------|
|             | C                     | Si        | Mn        | P(max) | S(max) | Other Elements |
| SAE1008     | ≤ 0.10                | ≤ 0.20    | 0.30-0.50 | 0.040  | 0.050  | -              |
| SAE1012     | 0.10-0.15             | 0.15-0.35 | 0.30-0.60 | 0.030  | 0.050  | -              |
| SAE1018     | 0.15-0.20             | ≤ 0.35    | 0.60-0.90 | 0.040  | 0.050  | -              |

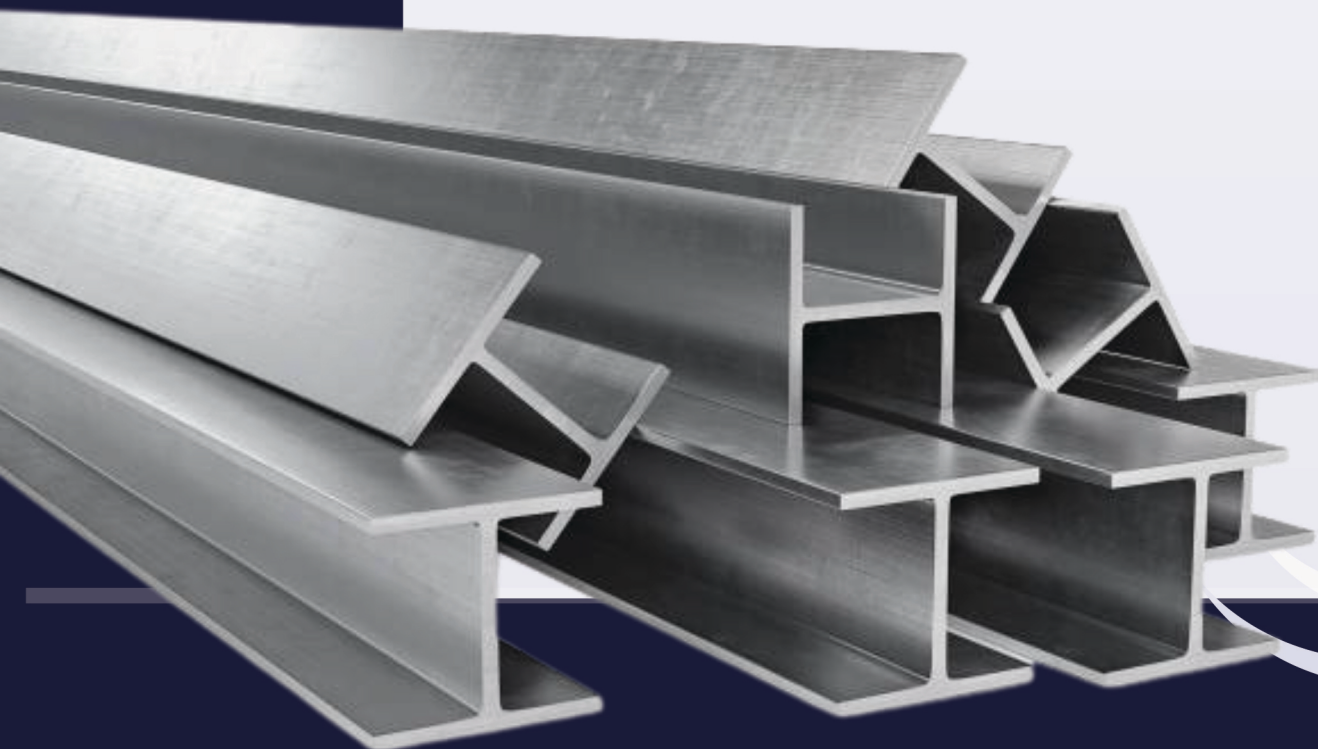
**Table3. Mechanical Composition of Wire Rod-Industrial Round Bars**

| Grade   | Elongation PCT Min | Yield Point N/mm <sup>2</sup> (min) | UTS. N/mm <sup>2</sup> (min) |
|---------|--------------------|-------------------------------------|------------------------------|
| SAE1008 | 30                 | 220                                 | 350                          |
| SAE1012 | 25                 | 275                                 | 450                          |
| SAE1018 | 27                 | 250                                 | 400                          |

# I-Beam

Table 1: physical Specification of parallel Flanges I-Beam

| size | Dimension  |           |                  |           |                   |           |                    |             |                       | Weight      |           |
|------|------------|-----------|------------------|-----------|-------------------|-----------|--------------------|-------------|-----------------------|-------------|-----------|
|      | Height (h) |           | Flange Width (b) |           | web thickness (s) |           | Flang thickness(t) |             |                       | Unit Weight | Tolerance |
|      | Nominal    | Tolerance | Nominal          | Tolerance | Nominal           | Tolerance | Nominal            | Tolerance   | Radius R of curvature | kg/m        | %         |
| 14   | 140        | 3+<br>2-  | 73               | 4<br>1-   | 4.7               | 0.7±      | 6.9                | 2+<br>1-    | 7                     | 12.9        | 6±        |
| 16   | 160        |           | 82               |           | 5                 |           | 7.4                |             | 9                     | 15.8        |           |
| 18   | 180        |           | 91               |           | 5.3               |           | 8                  |             | 9                     | 18.8        |           |
| 20   | 200        | 4+<br>2-  | 100              | 4+<br>2-  | 5.6               | 1±        | 8.5                | 2.5<br>1.5- | 12                    | 22.4        |           |
| 22   | 220        |           | 110              |           | 5.9               |           | 9.2                |             | 12                    | 26.2        |           |
| 24   | 240        |           | 120              |           | 6.2               |           | 9.8                |             | 15                    | 30.7        |           |
| 27   | 270        | 4+<br>2-  | 135              | 4+<br>2-  | 6.6               | 1±        | 10.2               | 2.5<br>1.5- | 15                    | 36.1        |           |
| 30   | 300        |           | 150              |           | 7.1               |           | 10.7               |             | 15                    | 42.2        |           |



# I-Beam

## I Beam equivalent to IPE

Table 1: Static Data of IPN

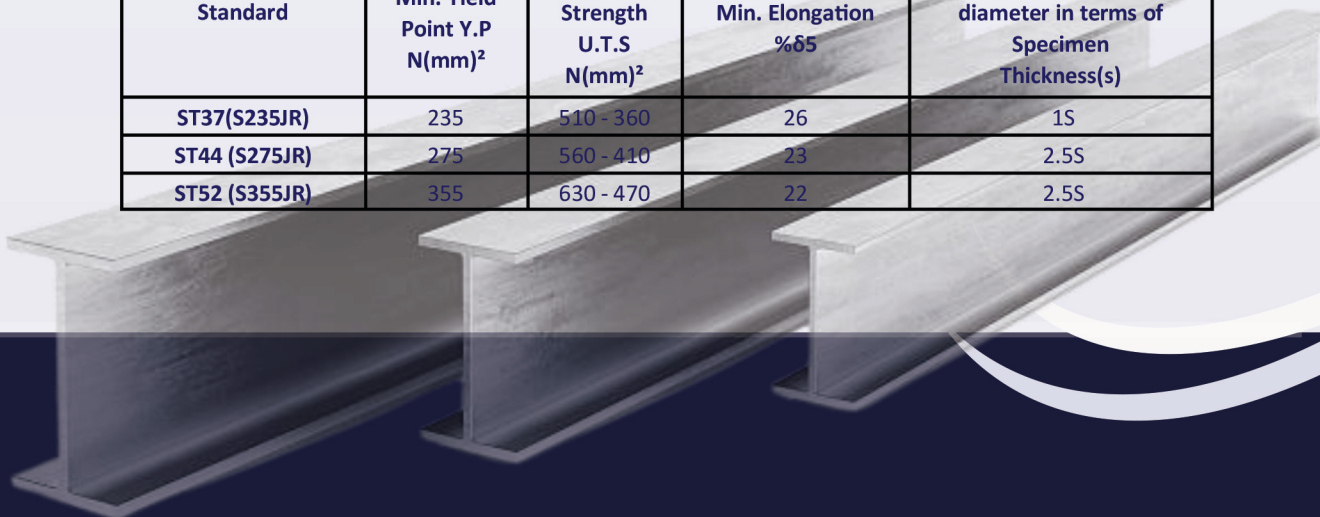
| Size | Sectional Area (A)<br>Cm <sup>2</sup> | Unit Surface Area(U)<br>m <sup>2</sup> /m | Moment of inertia relative to bending axis |                                      |                            |  |                                       |                            | Static Moment of half cross section<br>S×Cm <sup>3</sup> | Distance between comprehensive & tension axis<br>S×Cm <sup>3</sup> |
|------|---------------------------------------|---|--|--------------------------------------|----------------------------|--|---------------------------------------|----------------------------|--|--|
|      |                                       |   | X-X axis                                   |                                      |                            | Y-Y axis                               |                                       |                            |  |  |
|      |                                       |   | Moment of inertia<br>I×Cm <sup>4</sup>     | section modules<br>W×Cm <sup>3</sup> | Radius of gyration<br>I×Cm | Moment of inertia<br>I×Cm <sup>4</sup> | section modules<br>W×Cm <sup>34</sup> | Radius of gyration<br>I×Cm |  |  |
| 12   | 13.2                                  | 0.475                                     | 318  | 53                                   | 4.9                        | 27.7                                   | 8.65                                  | 1.45                       | 30.4   | 10.5   |
| 14   | 16.4                                  | 0.551                                     | 541  | 77.3                                 | 5.74                       | 44.9                                   | 12.3                                  | 1.65                       | 44.2   | 12.3   |
| 16   | 20.1                                  | 0.623                                     | 869  | 109                                  | 6.58                       | 68.3                                   | 16.7                                  | 1.84                       | 61.9   | 14   |
| 18   | 23.9                                  | 0.698                                     | 1320                                       | 146                                  | 7.42                       | 101                                    | 22.2                                  | 2.05                       | 83.2   | 15.8   |
| 20   | 28.5                                  | 0.768                                     | 1940                                       | 194                                  | 8.26                       | 142                                    | 28.5                                  | 2.24                       | 110  | 17.6   |
| 22   | 33.4                                  | 0.848                                     | 1770                                       | 252                                  | 9.11                       | 205                                    | 37.3                                  | 2.48                       | 143  | 19.4   |
| 24   | 39.1                                  | 0.922                                     | 3890                                       | 324                                  | 9.97                       | 284                                    | 47.3                                  | 2.69                       | 183  | 21.2   |
| 27   | 45.9                                  | 1.04                                      | 5790                                       | 429                                  | 11.2                       | 420                                    | 62.2                                  | 3.02                       | 242  | 23.9   |
| 30   | 53.8                                  | 1.16                                      | 8360                                       | 557                                  | 12.5                       | 604                                    | 80.5                                  | 3.35                       | 314  | 26.6   |

Table 2: Chemical composition of Parallel Flanfs I-Beam

| Equivalent Standard | Weight of elements (%) |             |          |        |        |        |
|---------------------|------------------------|-------------|----------|--------|--------|--------|
|                     | C(Max)                 | Si          | Mn (Max) | P(Max) | S(Max) | N(Max) |
| S235JR              | 0.19                   | 0.35 - 0.12 | 1.5      | 0.045  | 0.045  | 0.014  |
| S275JR              | 0.24                   | 0.45 - 0.15 | 1.6      | 0.045  | 0.045  | 0.014  |
| S355JR              | 0.27                   | 0.60≥       | 1.7      | 0.045  | 0.045  | 0.014  |

Table 3: Mechanical Properties of Parallel Flanges I-Beam

| Steel Standard | Tensile test                               |  |                                 | Cold bend test at angle 180                             |
|----------------|--|--|---------------------------------|---|
|                | Min. Yield Point Y.P<br>N(mm) <sup>2</sup> | Tensile Strength U.T.S<br>N(mm) <sup>2</sup> | Min. Elongation % <sub>85</sub> | Bend mendral diameter in terms of Specimen Thickness(s) |
| ST37(S235JR)   | 235  | 510 - 360                                    | 26                              | 1S  |
| ST44 (S275JR)  | 275  | 560 - 410                                    | 23                              | 2.5S  |
| ST52 (S355JR)  | 355  | 630 - 470                                    | 22                              | 2.5S  |



## I Beam equivalent to IPN

IPN. Steel Grade S275 JR and/or S235 JR. chemical composition and mechanical properties acc to DIN EN10025-2/2005 and Dimensions As per DIN 1025-1/1995

**Table 112/7/2022 Physical Specification of IPN**

| Size | Height (h) |           | Flange Width (b) |           | Web thickness (s) |           | Flange thickness (t) |           | Radius of curvature |     | Unit Weight Kg/m |                   |
|------|------------|-----------|------------------|-----------|-------------------|-----------|----------------------|-----------|---------------------|-----|------------------|-------------------|
|      | Nominal    | Tolerance | Nominal          | Tolerance | Nominal           | Tolerance | Nominal              | Tolerance | r1                  | r2  | Nominal          | Wight tolerance % |
| 120  | 120        | ±2        | 58               | ±1.5      | 5.1               | 0.5 - 1   | 7.7                  | 1.5 - 0.5 | 5.1                 | 3.1 | 11.1             | ±%6               |
| 140  | 140        |           | 66               |           | 5.7               |           | 8.6                  |           | 5.7                 | 3.4 | 14.3             |                   |

**Table 2: Static Data of IPN**

| Size | Sectional Area (A) Cm <sup>2</sup> | Unit Surface Area (U) m <sup>2</sup> /m | Moment of inertia relative to bending axis |                                   |                         |                                     |                                   |                         | Static Moment of half cross section S×Cm <sup>3</sup> | Distance between comprehensive & tention axis S×Cm <sup>3</sup> |
|------|------------------------------------|---|--|-----------------------------------|-------------------------|-------------------------------------|-----------------------------------|-------------------------|---|---|
|      |                                    |   | X-X axis                                   |                                   |                         | Y-Y axis                            |                                   |                         |   |   |
|      |                                    |   | Moment of inertia I×Cm <sup>4</sup>        | section modulus W×Cm <sup>3</sup> | Radius of gyration I×Cm | Moment of inertia I×Cm <sup>4</sup> | section modulus W×Cm <sup>3</sup> | Radius of gyration I×Cm |   |   |
| 120  | 14.2                               | 0.439                                   | 328  | 54.7                              | 4.81                    | 21.5                                | 7.41                              | 1.23                    | 31.8  | 10.3  |
| 140  | 18.2                               | 0.502                                   | 573  | 81.9                              | 5.61                    | 35.2                                | 10.7                              | 1.4                     | 47.7  | 12  |

**Table 3: Chemical composition of IPN**

| Equivalent Standard | Weight of elements (%) |             |           |        |        |        |
|---------------------|------------------------|-------------|-----------|--------|--------|--------|
|                     | C(Max)                 | Si          | Mn (Max)  | P(Max) | S(Max) | N(Max) |
| S235JR              | 0.19                   | 0.12 - 0.35 | 0.25- 1.5 | 0.050  | 0.050  | 0.014  |
| S275JR              | 0.24                   | 0.15 - 0.45 | 0.40- 1.6 | 0.050  | 0.050  | 0.014  |
| S355JR              | 0.27                   | ≤0.60       | ≤1.7      | 0.050  | 0.050  | 0.014  |

**Table 4: Mechanical Properties of IPN Flanges**

| Steel Standard | Tensile test                            |  |                     | Cold bend test at angle 180                             |
|----------------|---|--|---------------------|---|
|                | Min. Yield Point Y.P N(mm) <sup>2</sup> | Tensile Strength U.T.S N (mm) <sup>2</sup> | Min. Elongation %65 | Bend mandrel diameter in terms of Specimen Thickness(s) |
| S235JR         | 235                                     | 360 - 510                                  | 26                  | 1 S   |
| S275JR         | 275                                     | 410 - 560                                  | 23                  | 2.5 S   |
| S355JR         | 355                                     | 470 - 630                                  | 22                  | 2.5 S   |

## Technical Specifications of (H-Beam)

**Table1. Physical Specifications of Medium H-Beam.**

| Size | Height (h) mm |           | Flange width (b) mm |           | Web thickness (s)mm |           | Flange thickness (t) mm |              | Radius of curvatures (r) | Cross section F cm <sup>2</sup> | Unit weight G (kg/m) |             |        | Unit surface area U m <sup>2</sup> /m |
|------|---------------|-----------|---------------------|-----------|---------------------|-----------|-------------------------|--------------|--------------------------|---------------------------------|----------------------|-------------|--------|---------------------------------------|
|      | Nominal       | Tolerance | Nominal             | Tolerance | Nominal             | Tolerance | Nominal                 | Tolerance    |                          |                                 | Nominal              | Tolerance % |        |                                       |
|      |               |           |                     |           |                     |           |                         |              |                          |                                 |                      | Bar         | Bundle |                                       |
| 14   | 140           | 3+<br>2-  | 140                 | 4+<br>2-  | 7                   | 1±        | 12                      | 2.5+<br>1.5- | 12                       | 43                              | 33.7                 | 6±          | 4±     | 0.805                                 |
| 16   | 160           |           | 160                 |           | 8                   |           | 13                      |              | 15                       | 54.3                            | 42.6                 |             |        | 0.918                                 |
| 18   | 180           |           | 180                 |           | 8.5                 |           | 14                      |              | 15                       | 65.3                            | 51.2                 |             |        | 1.04                                  |
| 20   | 200           | 4+<br>2-  | 200                 | 4±        | 9                   | 1/5±      | 15                      | 27           | 18                       | 78.1                            | 61.3                 | 117         |        | 1.15                                  |
| 30   | 300           |           | 300                 |           | 11                  |           | 19                      |              | 149                      | 117                             | 1.73                 |             |        |                                       |

**Table2. Section Data of Medium H-Beam**

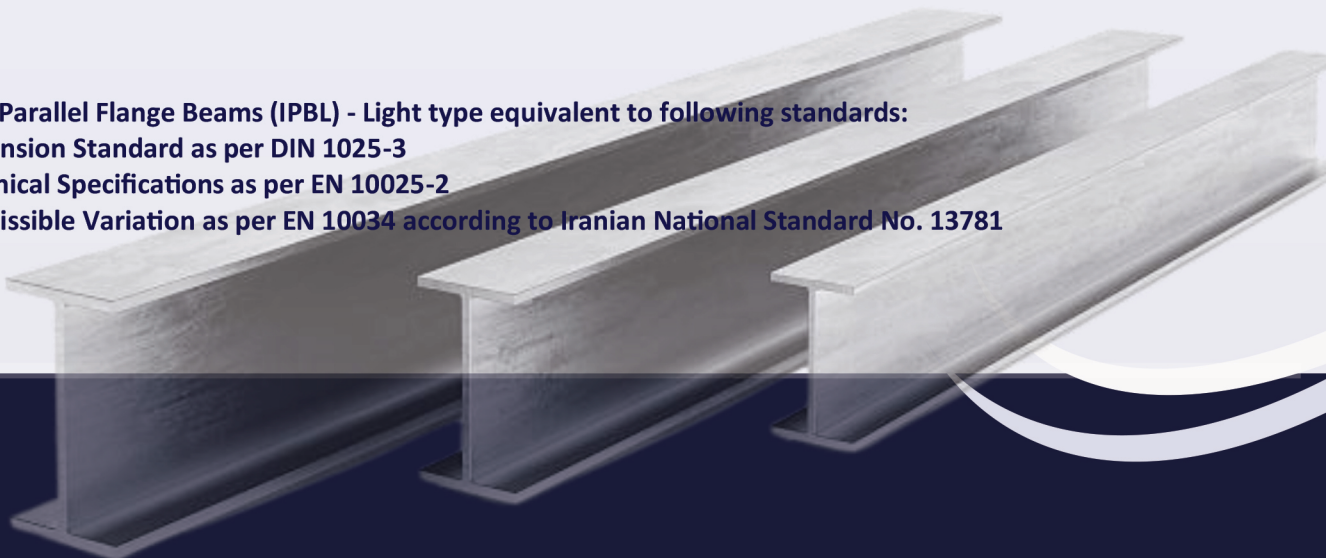
| Size | Static Value                                     |   |                                      |  |   |                                      | Static moment of half cross section S <sub>x</sub> cm <sup>3</sup> | Distance between center of compression & tension axis S <sub>y</sub> cm |
|------|--|---|--------------------------------------|--|---|--------------------------------------|--|---|
|      | X-X  |   |                                      | Y-Y  |   |                                      |  |   |
|      | Moment of inertia J <sub>x</sub> cm <sup>4</sup> | Section module W <sub>x</sub> cm <sup>3</sup> | Radius of gyration i <sub>x</sub> cm | Moment of inertia J <sub>y</sub> cm <sup>4</sup> | Section module W <sub>y</sub> cm <sup>3</sup> | Radius of gyration i <sub>y</sub> cm |  |   |
| 14   | 1510   | 216   | 5.93                                 | 550  | 78.5  | 3.58                                 | 123  | 12.03   |
| 16   | 2490   | 311   | 6.78                                 | 889  | 111   | 4.05                                 | 177  | 14.01   |
| 18   | 3830   | 426   | 7.66                                 | 1360   | 151   | 4.57                                 | 241  | 15.09   |
| 20   | 5700   | 570   | 8.54                                 | 2000   | 200   | 5.07                                 | 321  | 17.7  |
| 30   | 25170  | 1680  | 13                                   | 8560   | 571   | 7.58                                 | 934  | 26.9  |

Wide Parallel Flange Beams (IPBL) - Light type equivalent to following standards:

-Dimension Standard as per DIN 1025-3

-Technical Specifications as per EN 10025-2

-Permissible Variation as per EN 10034 according to Iranian National Standard No. 13781





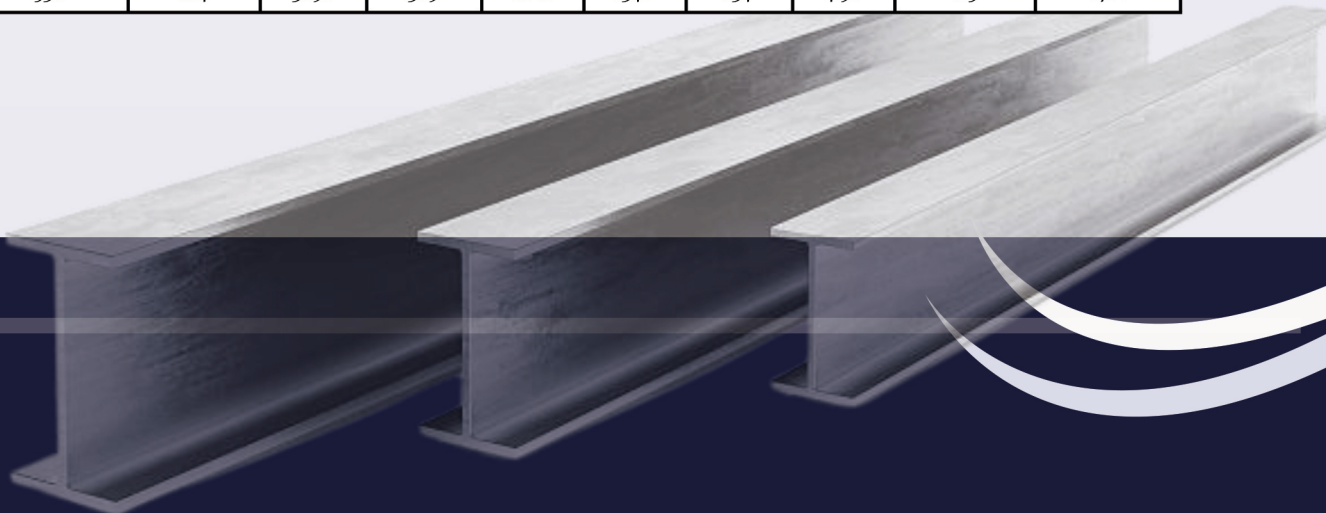
# H-Beam

## Technical Specifications of (H-Beam)

Table1. Physical Specification of Light H-Beam

| Size | Height (h) |           | Flange width (b) |           | Web thickness (s) |           | Flange thickness (t) |           | Radius of curvature (r) | Unit Weight W (kg/m) |               |        |
|------|------------|-----------|------------------|-----------|-------------------|-----------|----------------------|-----------|-------------------------|----------------------|---------------|--------|
|      | Nominal    | Tolerance | Nominal          | Tolerance | Nominal           | Tolerance | Nominal              | Tolerance |                         | Nominal              | Tolerance (%) |        |
|      |            |           |                  |           |                   |           |                      |           |                         |                      | Bar           | Bundle |
| 14   | 123        | 3+<br>2-  | 140              | 4+<br>2-  | 5.5               | 0.7±      | 8.5                  | 2+<br>1-  | 12                      | 24.7                 | 6±            | 4±     |
| 16   | 152        |           | 160              |           | 6.0               |           | 9.0                  |           | 15                      | 30.4                 |               |        |
| 18   | 171        |           | 180              |           | 6.0               |           | 9.5                  |           | 15                      | 35.5                 |               |        |
| 20   | 190        | 200       | 6.5              |           | 10.0              |           | 2.5+<br>1.5-         | 18        | 42.3                    |                      |               |        |

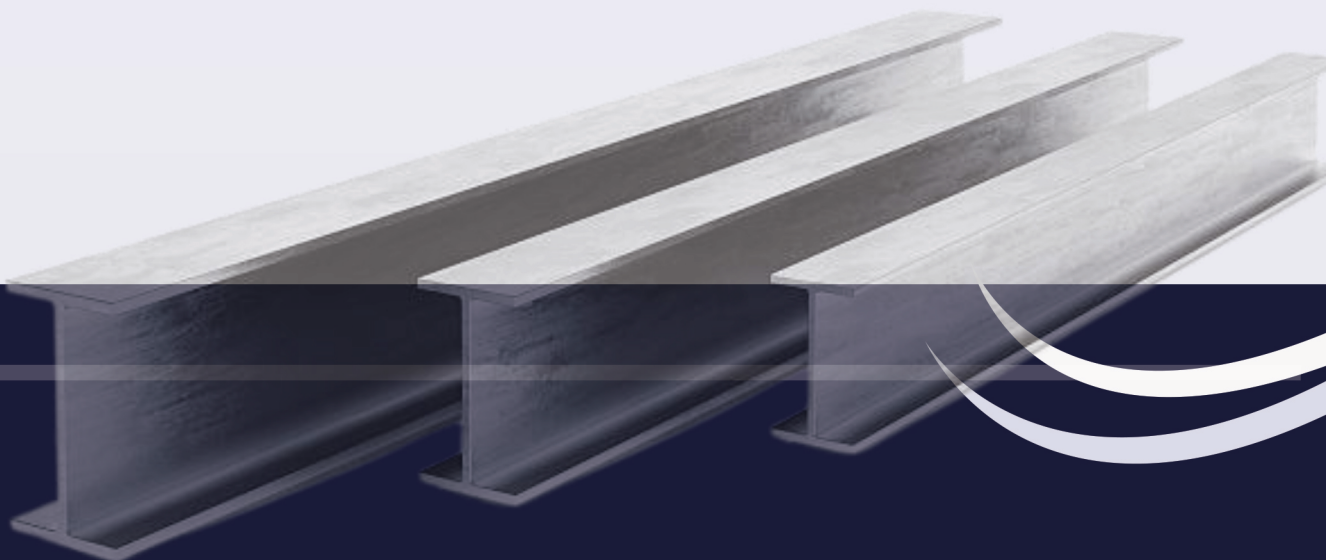
| Size | Sectional area (A) cm <sup>2</sup> | Unit surface area (U) m <sup>2</sup> /m | Static value                         |                                   |                          |                                      |                                   |                          | Static moment of half cross section Sx cm <sup>3</sup> | Distance between center of compression & tension axis Sx cm |
|------|------------------------------------|---|--------------------------------------|-----------------------------------|--------------------------|--------------------------------------|-----------------------------------|--------------------------|--|---|
|      |                                    |   | x - x                                |                                   |                          | y - y                                |                                   |                          |  |   |
|      |                                    |   | Moment of inertia Jx cm <sup>4</sup> | Section module Wx cm <sup>3</sup> | Radius of gyration ix cm | Moment of inertia Jy cm <sup>4</sup> | Section module Wy cm <sup>3</sup> | Radius of gyration iy cm |  |   |
| 14   | 31.4                               | 0.794                                   | 1030                                 | 155                               | 5.73                     | 389                                  | 55.6                              | 3.52                     | 86.7   | 11.9  |
| 16   | 38.8                               | 0.906                                   | 1670                                 | 220                               | 6.57                     | 616                                  | 76.9                              | 3.98                     | 123  | 13.6  |
| 18   | 45.3                               | 1.02                                    | 2510                                 | 294                               | 7.45                     | 925                                  | 103                               | 4.52                     | 162  | 15.5  |
| 20   | 53.8                               | 1.14                                    | 3690                                 | 389                               | 8.28                     | 1340                                 | 134                               | 4.98                     | 215  | 17.2  |



## Technical Specifications of (H-Beam)

| 3. Chemical analysis of H-Beams |                        |             |             |         |         |         |                            |
|---------------------------------|------------------------|-------------|-------------|---------|---------|---------|----------------------------|
| Steel grade                     | Weight of elements (%) |             |             |         |         |         | Max. carbon equivalent (%) |
|                                 | C (max)                | Si          | Mn          | S (max) | P (max) | N (max) |                            |
| ST37 (S235JR)                   | 0.19                   | 0.12 - 0.35 | 0.25 - 1.50 | 0.045   | 0.045   | 0.014   | 0.35                       |
| ST44 (S275JR)                   | 0.23                   | 0.15 - 0.45 | 0.40 - 1.60 | 0.045   | 0.045   | 0.014   | 0.40                       |
| ST52 (S355JR)                   | 0.26                   | ≤0.60       | ≤1.70       | 0.045   | 0.045   | 0.014   | 0.45                       |

| 4. Mechanical properties of H-Beams |   |   |   |   |
|-------------------------------------|---|---|---|---|
| Steel grade                         | Tensile test                            |   |   | cold bend test at angle of 180°                             |
|                                     | Min. yield point<br>N/(mm) <sup>2</sup> | Tensile strength<br>N/(mm) <sup>2</sup> | Min. Elongation<br>L <sub>0</sub> =5.65S <sub>0</sub> | Bend mandrel diameter<br>in terms of specimen thickness (t) |
| ST37 (S235JR)                       | 235                                     | 360 - 510                               | 26  | 1 †   |
| ST44 (S275JR)                       | 275                                     | 410 - 560                               | 23  | 2.5 †   |
| ST52 (S355JR)                       | 355                                     | 470 - 630                               | 22  | 2.5 †   |





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