Steel Designations

U. S. Steel Hot Rolled Products are furnished in accordance with the latest ASTM material specifications. These latest ASTM specifications now include new product terminology, more definitive chemical composition limits and non-mandatory, typical mechanical properties. Previously, these specifications only required maximum limits on the chemical elements carbon, manganese, phosphorus and sulfur.

Selection of the proper steel designation must be based on the specific formability and mechanical property requirements of the final application. A general description, including chemical composition and typical mechanical property values, for each steel designation follows. For assistance in material selection, contact your local U. S. Steel Sales Office for customer technical service.

Commercial Steel Sheet (CS)

Commercial Steel Sheet is intended for applications that require only light draws or moderate forming and bending. Commercial Steels may be specified to ASTM A1011 CS Type B (0.02 to 0.15 percent carbon and typical mechanical properties), ASTM A659 CS (0.16 to 0.25 percent carbon), Chem Req (over 0.25 percent carbon) or ASTM A635 (up to 0.25 max C Heavy Thickness Coils).
CS is furnished only to the compositional limits of AISI Grades 1015 through 1023. Because the carbon level of these steels is over 0.15 to 0.25%, these steels are intended for applications that are flat or require limited bending or forming. For improved forming or bending at the expense of hardness and/or wear resistance, CS Type B steel should be specified.

**Chem. Req.**

U. S. Steel established the Chem Req steel designation to comprehend higher carbon steel grades such as AISI 1025 through 1080. Because the maximum carbon content of these steel grades exceed 0.25%, these steels are recommended for flat applications. Chem Req steels are furnished to compositional limits only.

CS Type B steel can be bent flat on itself in any direction at room temperature. However, this steel type is subject to stretcher strains, fluting and coil breaks (in heavier gauges) due to a metallurgical phenomenon called aging. To minimize the tendency for fluting or stretcher strains that recur after CS Type B steels age, it is necessary for the user to effectively roller level the product immediately before use. However, roller leveling will not restore softness and ductility. The effects of aging, including coil breaks, loss of ductility, and increased hardness, must be accepted by the customer beyond 45 days from the date of temper rolling.

To minimize the potential effects of aging, Drawing Steel DS Type B can be specified.

**Drawing Steel Sheet - DS TYPE B**

Drawing Steel Sheet is intended for applications that require stringent forming or drawing. It is used primarily for applications that exceed the forming capability of CS Type B sheet steels. Drawing Steel Sheet may be specified to ASTM A1011 DS Type B (0.02 to 0.08 percent carbon) or A635 (Heavy Thickness Coils).

DS Type B steel should be used when CS Type B steel will not provide a
sufficient degree of ductility for the fabrication of parts having stringent drawing requirements. Controlled metallurgical and processing parameters are used at all stages of manufacture, from steelmaking to finishing, in order to produce a product with uniform mechanical properties and substantially improved ductility compared with CS type B material.

In addition to the improved formability, DS Type B steel is essentially non-aging. It will not stretcher strain or exhibit fluting or suffer loss of ductility with elapsed time after it has been properly temper rolled. This steel designation should be specified when stretcher strains or fluting during fabrication are objectionable and the user wants to store the steel for an extended period of time without experiencing the adverse changes in ductility. DS Type B steel has its maximum ductility in the dead soft condition, but in this state, it is subject to stretcher straining or fluting during fabrication. The elimination of these 3 tendencies occurs only after temper rolling.

Drawing Steel with Boron (DS Type B with Boron) addition should be used with Hot Rolled Sheet when regular DS Type B will not provide a sufficient degree of ductility for the fabrication of parts having stringent drawing requirements. The addition of Boron is made to sheet steels to make them essentially non-aging and/or to improve formability.

**Structural Steel (SS)**

Structural Steel Sheet (SS) is intended for applications that require specific mechanical properties. This product is generally furnished to a broad chemistry requirement and to specific properties which may include yield strength tensile strength and elongation values. Since SS Sheet requirements cover mechanical properties ranging typically from 30 ksi to 55 ksi (210 MPa to 380 MPa) minimum yield strength, the compatibility of the mechanical properties ordered with the forming requirements of the specific application must be carefully considered.

Structural Steel Sheet (SS) is typically specified to either ASTM A1011 or ASTM A1018 (heavy thickness) which are a carbon/manganese based
specifications that preclude the addition of columbium or vanadium. ASTM A1011 SS is available in grades with a minimum yield strength through 40 ksi (275 MPa). Higher yield strength grades with minimum yield strengths ranging from 45 ksi (310 MPa) to 70ksi (480 MPa) are typically specified to ASTM A1011 HSLAS or A1018 HSLAS. (See the High Strength Sheet Section). Below is a summary of the mechanical property requirements of this specification.

**Structural Steel Sheet**

**Pressure Vessel Steel (PVS)**
Pressure Vessel steel sheet is intended for fusion welding or brazing into gas cylinders, boilers and similar end use high pressure applications. This product is ordered to mechanical property requirements ranging typically from 45 ksi to 75 ksi (310 MPa to 520 MPa) minimum tensile strength. More rigorous tensile testing is required on all Pressure Vessel sheet to assure uniform properties for these critical applications. Carbon Pressure Vessel Sheet may be specified to ASTM A414. Below is a summary of the mechanical property requirements of this specification.

**Carbon Pressure Vessel Sheet**

**High Strength Low Alloy Sheet**
High Strength Low Alloy Sheet is intended for applications where greater strength and reduced weight are important. Carbon Steel uses a combination of carbon, manganese, nitrogen and phosphorous to obtain the desired strength levels.
High Strength Low Alloy Steel (HSLAS and HSLAS-F) is a specific group of steels in which the various strength levels are achieved by the addition of moderate amounts of one or more alloying elements. The most common are columbium, vanadium or titanium. HSLAS offer improved formability and weldability when compared to the equivalent strength Structural Steel. ASTM A1011 or A1018 are commonly specified for HSLAS or HSLAS-F.

Weathering Steel (USS COR-TEN®) uses alloying elements such as copper, chromium, silicon and nickel to enhance the atmospheric corrosion resistance of the steel. The addition of these elements also results in a high strength steel that typically exhibits a 50 ksi minimum yield strength. ASTM A606 Type 4 is usually specified for this product.