NOTATIONS

Preparation of Teaching Resource Material
Sponsored by: Ministry of Steel, Government of India
Workshops for University Faculty

\(A\)  
Area or Gross area of a cross section

\(A_e\)  
Effective area of a section

\(A_{eff}\)  
Effective area

\(A_n\)  
Net area of a section

\(A_{st}\)  
Area of an intermediate stiffener

\(A_t\)  
Tensile stress area of a bolt

\(a\)  
Effective throat size of a fillet weld

\(a_1\)  
Net sectional area of connected elements

\(a_2\)  
Gross sectional area of connected

\(B\)  
Overall width of an element

\(b\)  
Flat width of an element

\(b_{eff}\)  
Effective width of a compression element

\(b_{re}\)  
Reduced effective width of a sub-element

\(b_{su}\)  
Effective width of an unstiffened compression element

\(C_d\)  
Coefficient defining the variation of moments on a beam

\(C_T\)  
Constant depending on the geometry of a T-section

\(C_W\)  
Warping constant of a section

\(c\)  
Distance from the end of a beam to the load or the reaction

\(D\)  
Overall web depth

\(D_e\)  
Equivalent depth of an intermediately stiffened web

\(D_{2}\)  
Distance between the centre line of an intermediate web stiffener and the tension element

\(d\)  
Diameter of a bolt or Diameter of a spot weld

\(d_0\)  
Distance from the centre of a bolt to the end of an element

\(d_{eff}\)  
Effective diameter of a circular plug or elongated plug weld

\(d_r\)  
Recommended tip diameter of an electrode

\(d_v\)  
Visible diameter of a circular plug or elongated plug weld.

\(E\)  
Modulus of elasticity of steel

\(e\)  
Distance between a load and a reaction

\(e_s\)  
Distance between the geometric neutral axis and the effective neutral axis of a section

\(F_c\)  
Applied axial compressive load

\(F_s\)  
Shear force (bolts)

\(F_t\)  
Applied tensile load

\(F_v\)  
Shear force

\(F_w\)  
Concentrated load on a web

\(f_a\)  
Average stress in a flange

\(f_c\)  
Applied compressive stress

\(G\)  
Shear modulus of steel

\(g\)  
Gauge, i.e. distance measured at right angles to the direction of stress in a member, centre-to-centre of holes in consecutive lines

\(h\)  
Vertical distance between two rows of connections in channel sections

\(I\)  
Second moment of area of a cross section about its critical axis

\(I_{min}\)  
Minimum required second moment of area of a stiffener

\(I_s\)  
Second moment of area of a multiple stiffened element

\(I_x, I_y\)  
Second moment of area of a cross section about the x and y axes respectively

\(J\)  
St Venant torsion constant of a section
\( K \) Buckling coefficient of an element
\( l \) Length of a member between support points
\( l_e \) Effective length of a member
\( L_w \) Length of a weld
\( M \) Applied moment on a beam
\( M_b \) Buckling resistance moment
\( M_c \) Moment capacity of a cross section
\( M_{cr} \) Critical bending moment to cause local buckling in a beam
\( M_{cx} \) Moment capacity in bending about the \( x \) axis in the absence of \( F_c \) and \( M_y \)
\( M_{cy} \) Moment capacity in bending about the \( y \) axis in the absence of \( F_c \) and \( M_x \)
\( M_{E} \) Elastic lateral buckling moment of a beam
\( M_p \) Plastic moment capacity of a section
\( M_x, M_y \) Moment about \( x \) and \( y \) axes respectively
\( M_y \) Yield moment of a section
\( N \) Number of 90 degree bends in a section
\( P_{bs} \) Bearing capacity of a bolt
\( P_c \) Buckling resistance under axial load
\( P_{cs} \) Short strut capacity
\( P_{e} \) Elastic flexural buckling load (Euler load) for a column
\( P_{ex}, P_{ey} \) Elastic flexural buckling load (Euler load) for a column about \( x \) and \( y \) axes respectively
\( P_{fs} \) Shear capacity of a fastener
\( P_{ft} \) Tensile capacity of a fastener
\( P_s \) Shear capacity of a bolt or Shear capacity of a spot weld
\( P_{T} \) Torsional buckling load of a column
\( P_{T} \) Tensile capacity of a member or connection
\( P_{TF} \) Torsional flexural buckling load of a column
\( P_v \) Shear capacity or shear buckling resistance
\( P_{w} \) Concentrated load resistance of a single web
\( P_{c} \) Compressive strength
\( P_{cr} \) Local buckling stress of an element
\( P_{o} \) Limiting compressive stress in a flat web
\( P_{v} \) Shear strength
\( P_{y} \) Design strength of steel
\( P_{w} \) Design strength of weld
\( Q \) Factor defining the effective cross-sectional area of a section
\( q_{cr} \) Shear buckling strength of a web
\( r \) Inside bend radius or Radius of gyration
\( r_{cy} \) Radius of gyration of a channel about its centroidal axis parallel to the web
\( r_i \) Radius of gyration of an I section
\( r_o \) Polar radius of gyration of a section about the shear centre
\( r_x, r_y \) Radii of gyration of a section about the \( x \) and \( y \) axes respectively
\( Z_p \) Plastic modulus of a section
\( S \) Distance between the centres of bolts normal to the line of applied force or, where there is only a single line of bolts, the width of the sheet or Leg length of a fillet weld or Standard deviation
\( S_p \) Staggered pitch, i.e. the distance, measured parallel to the direction of stress in a member, centre-to-centre of holes in consecutive lines
\( t \) Net material thickness
\( t_{s} \) Equivalent thickness of a flat element to replace a multiple stiffened element for calculation purposes
\( t_1, t_2 \) Thickness of thinner and thicker materials connected by spot welding
\( U_{s} \) Ultimate tensile strength of steel
\( u \) Deflection of a flange towards the neutral axis due to flange curling
\( W \) Total distributed load on a purlin
\( W_d \) Weight of cladding acting on a sheeting rail
\( W_{w} \) Wind load acting on a sheeting rail
\( w \) Flat width of a sub-element or Intensity of load on a beam
\( w_s \) Equivalent width of a flat element to replace a multiple stiffened element for calculation purposes
\( x_0 \) Distance from the shear centre to the centroid of a section measured along the \( x \) axis of symmetry
\( f_y \)  
Yield strength of steel

\( Y_{sa} \)  
Average yield strength of a cold formed section

\( Y_{sac} \)  
Modified average yield strength in the presence of local buckling

\( \gamma \)  
Distance of a flange from the neutral axis

\( Z_c \)  
Compression modulus of a section in bending