


Amendments to Code of Practice for the Structural Use of Steel 2011 (2023 Edition)

(April 2026)

Legends:

 New/Amended

 Deleted

(Rev. 4/2026)

Amendments to the Code of Practice for the Structural Use of Steel 2011 (2023 Edition) in April 2026 included:

- (a) Clause 3.1.3 – clarification of the definitions of Ys and Us;
- (b) Clause 3.1.5 - deletion of the duplicated paragraph;
- (c) Clause 3.4 - clarification of the welding requirements for welding different grades of steel;
- (d) Clause 5.3.4 – revision of the requirements for building acceleration limits;
- (e) Equation 9.9 – amendment of the typo relating to lap joints;
- (f) Equation 9.10 – clarification of the definition of net cross sectional area;
- (g) Clause 10.1.2 and Table 10.1 – addition of information on the short-term elastic modulus of concrete;
- (h) Figure 10.17 – classification of composite columns;
- (i) Clause 10.5.1(3) – revision of allowable concrete and steel grades in composite columns;
- (j) Clause 10.5.2(5) – addition of requirements for quality control of concrete in composite columns composed of concrete filled steel hollow sections;
- (k) Table 10.11 – update of maximum values on geometric ratios;
- (l) Clause 10.5.3.2 – amendment to the design strengths of concrete and steel in composite columns;
- (m) Table 10.13 – update of buckling curves and member imperfections for composite columns;
- (n) clause 10.5.3.3 – update of the requirements for checking buckling strength of composite columns;
- (o) Clause 13.6.4 – addition of requirements for vibration response of footbridges;
- (p) Clauses 14.3.2 and 14.3.3 – addition of the requirements for mechanised and automatic welding;
- (q) Table 14.2b – revision of the definition for carbon equivalent value;
- (r) Annex A1.4.2.2 – addition of the acceptable standards for mechanised and automatic welding; and
- (s) Annex A2.5 – addition of general reference for vibrations of steel-framed structural systems.

Amendments to Code of Practice for the Structural Use of Steel 2011 (2023 Edition) (April 2026)

Item	Current version	Amendments
(a) Clause 3.1.3 ¹	<p>3.1.3 Design strength for ultra high strength steels</p> <p>For ultra high strength steels with a design strength greater than 690 N/mm² produced in accordance with the basic requirements in Annex D1.1, the design strength p_y may be taken as Y_s/γ_{m1} but not greater than U_s/γ_{m2}, where Y_s and U_s are respectively the minimum yield strength (R_{eH}) and minimum tensile strength (R_m) specified in the relevant reference material standard or derived by the manufacturer using an acceptable Quality Assurance system, while γ_{m1} and γ_{m2} are the material factors according to manufacturer's recommendations.</p>	<p>3.1.3 Design strength for ultra high strength steels</p> <p>For ultra high strength steels with a design strength greater than 690 N/mm² produced in accordance with the basic requirements in Annex D1.1, the design strength p_y may be taken as Y_s/γ_{m1} but not greater than U_s/γ_{m2}, where Y_s and U_s are determined according to clause 3.1.2, and they are specified in the relevant reference material standards or derived by the manufacturer using an acceptable Quality Assurance system, while γ_{m1} and γ_{m2} are the material factors according to manufacturer's recommendations.</p>

¹ Clarification of the definitions of Y_s and U_s .

Item	Current version	Amendments
(b) Clause 3.1.5 ²	<p>3.1.5 Through thickness properties</p> <p>The essential requirement is an adequate deformation capacity perpendicular to the plate surface to provide ductility and toughness against fracture under tension</p> <p>The design strengths given in most material specifications refer to the longitudinal and transverse directions. Where there are through thickness tensile stresses greater than 90% of the design strength, through thickness properties as defined in acceptable references in Annex A1.1 should be specified to ensure structural adequacy. For thick T butt welds or for heavy double fillet welded joints, consideration should be given to specifying steel with guaranteed through thickness tensile properties to reduce the risk of lamellar tearing (see also clause 9.2.1).</p> <p>The essential requirement is an adequate deformation capacity perpendicular to the surface to provide ductility and toughness against fracture.</p>	<p>3.1.5 Through thickness properties</p> <p>The essential requirement is an adequate deformation capacity perpendicular to the plate surface to provide ductility and toughness against fracture under tension.</p> <p>The design strengths given in most material specifications refer to the longitudinal and transverse directions. Where there are through thickness tensile stresses greater than 90% of the design strength, through thickness properties as defined in acceptable references in Annex A1.1 should be specified to ensure structural adequacy. For thick T butt welds or for heavy double fillet welded joints, consideration should be given to specifying steel with guaranteed through thickness tensile properties to reduce the risk of lamellar tearing (see also clause 9.2.1).</p> <p style="text-align: center;">↓</p>

² Deletion of the duplicated paragraph.

Item	Current version	Amendments
(c) Clause 3.4 ³	<p>3.4 Welding Consumables</p> <p>All welding consumables shall conform to the requirements of the reference standards given in Annex A1.4. For steel with design strength not exceeding 690 N/mm² the specified yield strength, ultimate tensile strength, elongation at failure and Charpy impact value of the welding consumables shall be equal to or better than the corresponding values specified for the grade of steel being welded. The most onerous grade shall govern if dissimilar grades are welded together. For ultra-high strength steel, the welding consumables may, if necessary to produce a suitable joint, be of a lower strength; the elongation to failure and Charpy impact value should still match those of the parent material. In that case, the design strength of the weld must be based on the weld material.</p>	<p>3.4 Welding Consumables</p> <p>All welding consumables shall conform to the requirements of the reference standards given in Annex A1.4. For steel with design strength not exceeding 690 N/mm² the specified yield strength, ultimate tensile strength, elongation at failure and Charpy impact value of the welding consumables shall be equal to or better than the corresponding values specified for the grade of steel being welded. ↓ If different grades of steel are welded together, the requirements of welding consumables shall be specified according to those of the steel of lower grades. For ultra-high strength steel, the welding consumables may, if necessary to produce a suitable joint, be of a lower strength; the elongation to failure and Charpy impact value should still match those of the parent material. In that case, the design strength of the weld must be based on the weld material.</p>

³ Clarification of the welding requirements for welding different grades of steel.

Item	Current version	Amendments						
(d) Clause 5.3.4 ⁴	<p>5.3.4 Serviceability criteria for tall buildings</p> <p>b) A dynamic analysis to study building motion, frequency of vibration and acceleration should be carried out. Acceptable levels of occupant comfort will be considered to have been achieved in compliance with the Code if the following building acceleration limits during the worst 10 consecutive minutes of an extreme wind event with a return period of 10 years are met:</p> <table border="1" data-bbox="539 580 1238 721"> <thead> <tr> <th>Type of Use of Building</th> <th>Peak acceleration (milli-g)</th> </tr> </thead> <tbody> <tr> <td>Residential</td> <td>15</td> </tr> <tr> <td>Office building, Hotel</td> <td>25</td> </tr> </tbody> </table> <p>The 10-year return period of 10-minute wind speed may be determined from suitable analysis of Hong Kong wind climate data, numerical typhoon modelling or derived from the wind speed used for strength design.</p> <p>It should be noted that for some buildings, a higher degree of occupant comfort may be desirable. The above only represents an acceptable minimum standard for most buildings. Local researchers and published standards, e.g. ISO 6897 indicates that peak acceleration as comfort criteria is frequency dependent.</p>	Type of Use of Building	Peak acceleration (milli-g)	Residential	15	Office building, Hotel	25	<p>5.3.4 Serviceability criteria for tall buildings</p> <p>b) A dynamic analysis to study building motion, frequency of vibration and acceleration should be carried out. ↓ The occupant comfort will be considered acceptable if the 1-year and the 10-year peak accelerations are less than the limits stipulated in the HKWC.</p> <p>↓</p>
Type of Use of Building	Peak acceleration (milli-g)							
Residential	15							
Office building, Hotel	25							

⁴ Revision of the requirements for building acceleration limits.

Item	Current version	Amendments
(e) Equation 9.9 ⁵	$\beta_{LW} = 1.2 - 0.002 \left(\frac{a}{L_j} \right) \leq 1.0 \quad (9.9)$ <p> a = fillet weld leg size L_j = actual length of weld </p>	$\beta_{LW} = 1.2 - 0.002 \left(\frac{L_j}{a} \right) \leq 1.0 \quad (9.9)$ <p> a = fillet weld leg size L_j = actual length of weld </p>
(f) Equation 9.10 ⁶	$a_e = K_e a_n \leq a_g \quad (9.10)$ <p> where the effective net area coefficient K_e is given by $K_e = 1.2$ for steel of grade S275 $= 1.1$ for steel of grade S355 $= 1.0$ for steel of grade S460 $= 0.84$ for steel of grade S550 $= 0.80$ for steel of grade S690 a_n is the net cross sectional area of the leg deduced for hole openings. a_g is the gross sectional area without reduction for openings. </p>	$a_e = K_e a_n \leq a_g \quad (9.10)$ <p> where the effective net area coefficient K_e is given by $K_e = 1.2$ for steel of grade S275 $= 1.1$ for steel of grade S355 $= 1.0$ for steel of grade S460 $= 0.84$ for steel of grade S550 $= 0.80$ for steel of grade S690 a_n is the net cross sectional area with reduction for openings. a_g is the gross sectional area without reduction for openings. </p>
(g) Clause 10.1.2 and Table 10.1 ⁷	<p>10.1.2 Concrete</p> <p>Normal weight concrete shall comply with the recommendations given in HKCC. The nominal maximum size of aggregate shall not exceed 20 mm. In the absence of other information, the wet and the dry densities of reinforced concrete shall be taken as 2450 kg/m³ and 2350 kg/m³ respectively, and the grade specified shall be in the range of C25 to C60. For concrete grades above C60, a performance-based</p>	<p>10.1.2 Concrete</p> <p>Normal weight concrete shall comply with the recommendations given in HKCC. The nominal maximum size of aggregate shall not exceed 20 mm. In the absence of other information, the wet and the dry densities of reinforced concrete shall be taken as 2450 kg/m³ and 2350 kg/m³ respectively, and the grade specified shall be in the range of C25 to C80. The use of concrete grades for composite beams,</p>

⁵ Amendment of the typo relating to lap joints.

⁶ Clarification of the definition of net cross sectional area.

⁷ Addition of information on the short-term elastic modulus of concrete.

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	<p>approach based on test and analytical methods should be used to justify the composite behaviour. According to the HKCC, the short-term elastic modulus, E_{cm} (kN/mm²), of the normal weight concrete is given by:</p> $E_{cm} = 3.46 \sqrt{f_{cu}} + 3.21 \quad (10.1)$ <p>where f_{cu} is the cube compressive strength of concrete (N/mm²).</p> <p>Table 10.1 - Compressive strength and short-term elastic modulus for various concrete grades</p> <table border="1" data-bbox="474 624 1223 852"> <thead> <tr> <th>Concrete Grade</th> <th>Cube compressive strength, f_{cu} (N/mm²)</th> <th>Elastic modulus, E_{cm} (kN/mm²)</th> </tr> </thead> <tbody> <tr><td>C25</td><td>25</td><td>20.5</td></tr> <tr><td>C30</td><td>30</td><td>22.2</td></tr> <tr><td>C35</td><td>35</td><td>23.7</td></tr> <tr><td>C40</td><td>40</td><td>25.1</td></tr> <tr><td>C45</td><td>45</td><td>26.4</td></tr> <tr><td>C50</td><td>50</td><td>27.7</td></tr> <tr><td>C55</td><td>55</td><td>28.9</td></tr> <tr><td>C60</td><td>60</td><td>30.0</td></tr> </tbody> </table> <p>For design data on creep coefficient, shrinkage coefficient and coefficient of thermal expansion for concrete, refer to HKCC.</p>	Concrete Grade	Cube compressive strength, f_{cu} (N/mm ²)	Elastic modulus, E_{cm} (kN/mm ²)	C25	25	20.5	C30	30	22.2	C35	35	23.7	C40	40	25.1	C45	45	26.4	C50	50	27.7	C55	55	28.9	C60	60	30.0	<p>composite slabs with profiled steel sheet or composite columns should refer to clause 10.2.1 (2), 10.4.1(2), and 10.5.1(3) respectively. ↓ Otherwise, a performance-based approach based on test and analytical methods should be used to justify the composite behaviour. According to the HKCC, the short-term elastic modulus, E_{cm} (kN/mm²), of the normal weight concrete is given by:</p> $E_{cm} = 3.46 \sqrt{f_{cu}} + 3.21 \quad (10.1)$ <p>where f_{cu} is the cube compressive strength of concrete (N/mm²).</p> <p>Table 10.1 - Compressive strength and short-term elastic modulus for various concrete grades</p> <table border="1" data-bbox="1267 818 2040 1331"> <thead> <tr> <th>Concrete Grade</th> <th>Cube compressive strength, f_{cu} (N/mm²)</th> <th>Elastic modulus, E_{cm} (kN/mm²)</th> </tr> </thead> <tbody> <tr><td>C25</td><td>25</td><td>20.5</td></tr> <tr><td>C30</td><td>30</td><td>22.2</td></tr> <tr><td>C35</td><td>35</td><td>23.7</td></tr> <tr><td>C40</td><td>40</td><td>25.1</td></tr> <tr><td>C45</td><td>45</td><td>26.4</td></tr> <tr><td>C50</td><td>50</td><td>27.7</td></tr> <tr><td>C55</td><td>55</td><td>28.9</td></tr> <tr><td>C60</td><td>60</td><td>30.0</td></tr> <tr><td>C65</td><td>65</td><td>31.1</td></tr> <tr><td>C70</td><td>70</td><td>32.2</td></tr> <tr><td>C75</td><td>75</td><td>33.2</td></tr> <tr><td>C80</td><td>80</td><td>34.2</td></tr> </tbody> </table> <p>For design data on creep coefficient, shrinkage coefficient and coefficient of thermal expansion for concrete, refer to HKCC.</p>	Concrete Grade	Cube compressive strength, f_{cu} (N/mm ²)	Elastic modulus, E_{cm} (kN/mm ²)	C25	25	20.5	C30	30	22.2	C35	35	23.7	C40	40	25.1	C45	45	26.4	C50	50	27.7	C55	55	28.9	C60	60	30.0	C65	65	31.1	C70	70	32.2	C75	75	33.2	C80	80	34.2
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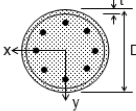
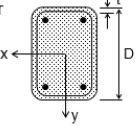
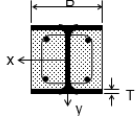
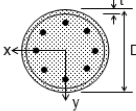
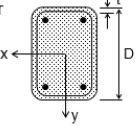
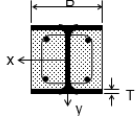
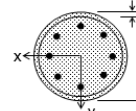
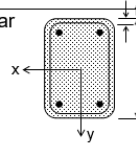
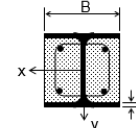
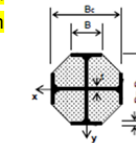
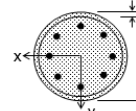
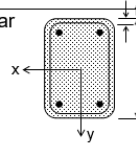
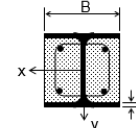
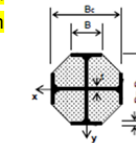
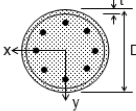
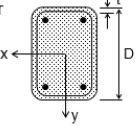
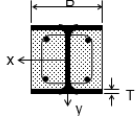
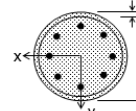
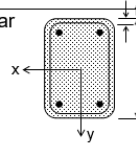
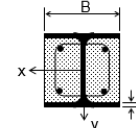
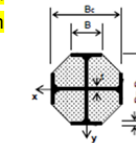
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(h) Figure 10.17 ⁸		<p>a) Concrete encased steel sections</p> <p>b) Concrete filled steel hollow sections</p>
(i) Clause 10.5.1(3) ⁹	(3) This clause applies to columns and compression members using steel sections with yield strengths between 235 and 460 N/mm ² , and normal weight concrete of strength classes C25 to C60.	(3) This clause applies to columns and compression members shown in Figure 10.17 using steel sections of yield strengths and normal weight concrete of strength classes as follows: (i) For concrete encased steel sections, steel sections with yield strengths between 235 and 460 N/mm ² and normal weight concrete of strength classes C25 to C60; and

⁸ Classification of composite columns.

⁹ Revision of allowable concrete and steel grades in composite columns.

Item	Current version	Amendments
		(ii) For concrete filled steel hollow sections, steel sections with yield strengths between 235 and 690 N/mm ² and normal weight concrete of strength classes C25 to C80.
(j) Clause 10.5.2(5) ¹⁰	<p>(5) Shrinkage and creep effects shall be considered if they are likely to reduce the structural stability significantly.</p> <p>For simplification, creep and shrinkage effects may be ignored if the increase in the first-order bending moments due to creep deformations and longitudinal force resulting from permanent loads is not greater than 10%.</p> <p>(6) For composite compression members subjected to bending moments and normal forces resulting from independent actions, the partial safety factor g_f for those internal forces that lead to an increase of resistance should be reduced to 80%.</p>	<p>(5) Special attention should be paid to the quality assurance, temperature control and concrete curing for the use of normal weight concrete of strength classes above C60 for composite columns composed of concrete filled steel hollow sections.</p> <p>(6) Shrinkage and creep effects shall be considered if they are likely to reduce the structural stability significantly.</p> <p>For simplification, creep and shrinkage effects may be ignored if the increase in the first-order bending moments due to creep deformations and longitudinal force resulting from permanent loads is not greater than 10%.</p> <p>(7) For composite compression members subjected to bending moments and normal forces resulting from independent actions, the partial safety factor g_f for those internal forces that lead to an increase of resistance should be reduced to 80%.</p>

¹⁰ Addition of requirements for quality control of concrete in composite columns composed of concrete filled steel hollow sections.

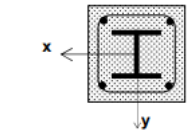
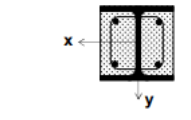
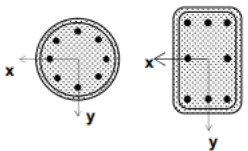
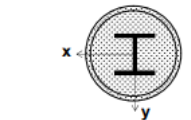
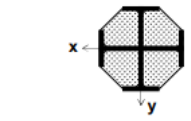
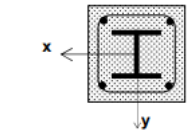
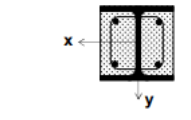
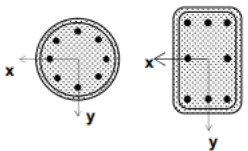
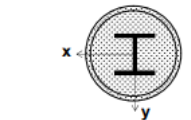
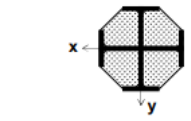
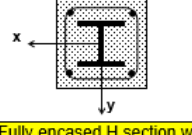
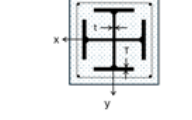
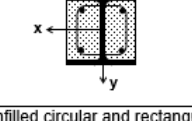
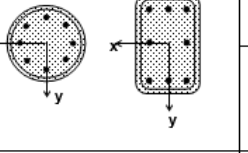
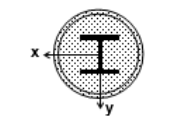
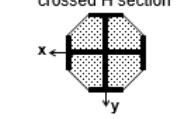
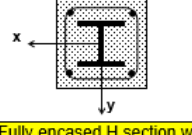
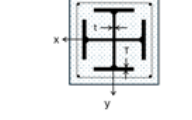
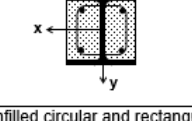
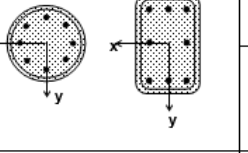
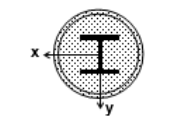
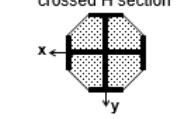
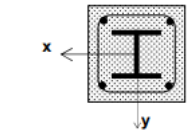
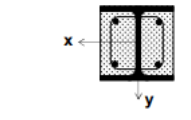
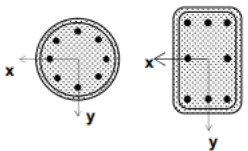
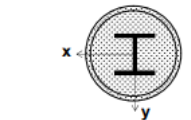
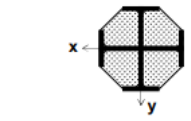
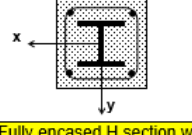
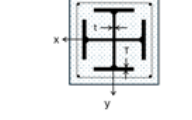
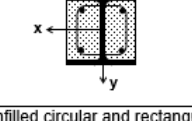
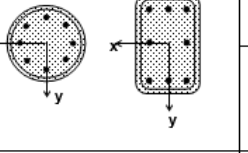
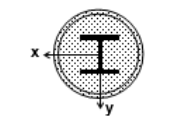
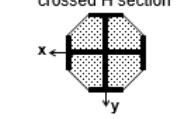
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(k) Table 10.11 ¹¹	<p>Table 10.11 - Maximum values on geometric ratios</p> <table border="1"> <thead> <tr> <th data-bbox="481 264 831 288">Cross-section</th> <th data-bbox="831 264 1205 288">Max (D/t) and max (B/T)</th> </tr> </thead> <tbody> <tr> <td data-bbox="481 288 831 432"> Infilled circular hollow sections  </td> <td data-bbox="831 288 1205 432"> $\text{Max} \left(\frac{D}{t} \right) = 77 \times \left(\frac{275}{p_y} \right)$ </td> </tr> <tr> <td data-bbox="481 432 831 576"> Infilled rectangular hollow sections  </td> <td data-bbox="831 432 1205 576"> $\text{Max} \left(\frac{D}{t} \right) = 48 \times \left(\sqrt{\frac{275}{p_y}} \right)$ </td> </tr> <tr> <td data-bbox="481 576 831 735"> Partially encased H-sections  </td> <td data-bbox="831 576 1205 735"> $\text{Max} \left(\frac{B}{T} \right) = 41 \times \left(\sqrt{\frac{275}{p_y}} \right)$ </td> </tr> </tbody> </table> <p data-bbox="481 746 750 786">Note: p_y in N/mm².</p>	Cross-section	Max (D/t) and max (B/T)	Infilled circular hollow sections 	$\text{Max} \left(\frac{D}{t} \right) = 77 \times \left(\frac{275}{p_y} \right)$	Infilled rectangular hollow sections 	$\text{Max} \left(\frac{D}{t} \right) = 48 \times \left(\sqrt{\frac{275}{p_y}} \right)$	Partially encased H-sections 	$\text{Max} \left(\frac{B}{T} \right) = 41 \times \left(\sqrt{\frac{275}{p_y}} \right)$	<p>Table 10.11 - Maximum values on geometric ratios</p> <table border="1"> <thead> <tr> <th data-bbox="1420 264 1769 288">Cross-section</th> <th data-bbox="1769 264 2067 288">Max (D/t) and max (B/T)</th> </tr> </thead> <tbody> <tr> <td data-bbox="1420 288 1769 432"> Infilled circular hollow sections  </td> <td data-bbox="1769 288 2067 432"> $\text{Max} \left(\frac{D}{t} \right) = 77 \times \left(\frac{275}{p_y} \right)$ </td> </tr> <tr> <td data-bbox="1420 432 1769 592"> Infilled rectangular hollow sections  </td> <td data-bbox="1769 432 2067 592"> $\text{Max} \left(\frac{D}{t} \right) = 48 \times \left(\sqrt{\frac{275}{p_y}} \right)$ </td> </tr> <tr> <td data-bbox="1420 592 1769 767"> Partially encased H-sections  </td> <td data-bbox="1769 592 2067 767"> $\text{Max} \left(\frac{B}{T} \right) = 41 \times \left(\sqrt{\frac{275}{p_y}} \right)$ </td> </tr> <tr> <td data-bbox="1420 767 1769 959"> Partially encased H-sections with crossed H-sections  </td> <td data-bbox="1769 767 2067 959"> $\text{Max} \left(\frac{B}{T} \right) = 41 \times \left(\sqrt{\frac{275}{p_y}} \right)$ </td> </tr> </tbody> </table> <p data-bbox="1272 970 1541 1010">Note: p_y in N/mm².</p>	Cross-section	Max (D/t) and max (B/T)	Infilled circular hollow sections 	$\text{Max} \left(\frac{D}{t} \right) = 77 \times \left(\frac{275}{p_y} \right)$	Infilled rectangular hollow sections 	$\text{Max} \left(\frac{D}{t} \right) = 48 \times \left(\sqrt{\frac{275}{p_y}} \right)$	Partially encased H-sections 	$\text{Max} \left(\frac{B}{T} \right) = 41 \times \left(\sqrt{\frac{275}{p_y}} \right)$	Partially encased H-sections with crossed H-sections 	$\text{Max} \left(\frac{B}{T} \right) = 41 \times \left(\sqrt{\frac{275}{p_y}} \right)$
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¹¹ Update of maximum values on geometric ratios.

Item	Current version	Amendments
(1) Clause 10.5.3.2 ¹²	<p><i>Compression capacity</i></p> <p>(1) The compression capacity P_{cp} of a composite cross-section shall be calculated by adding the compression capacities of its components: For fully encased and partially encased H sections: $P_{cp} = A p_y + 0.45 A_c f_{cu} + A_s f_{sd} \quad (10.58a)$</p> <p>For infilled rectangular hollow sections: $P_{cp} = A p_y + 0.53 A_c f_{cu} + A_s f_{sd} \quad (10.58b)$ where A, A_c, A_s are the areas of the steel section, the concrete and the reinforcements respectively.</p> <p>(2) The steel contribution ratio δ is defined as: $\delta = \frac{A p_y}{P_{cp}} \quad (10.59)$ where P_{cp} is the compression capacity of the composite cross-section defined in clause 10.5.3.2(1).</p>	<p><i>Compression capacity</i></p> <p>(1) The compression capacity P_{cp} of a composite cross-section shall be calculated by adding the compression capacities of its components: For fully encased and partially encased H sections: $P_{cp} = A p_y + 0.45 A_c f_{cu} + A_s f_{sd} \quad (10.58a)$</p> <p>where p_y is the design strength of the structural steel section in N/mm² not more than 460 N/mm²; f_{cu} is the cube compressive strength of the concrete in N/mm² not more than 60 N/mm²</p> <p>A, A_c, A_s are the areas of the steel section, the concrete and the reinforcements respectively.</p> <p>For infilled rectangular hollow sections: $P_{cp} = A p_y + 0.53 A_c f_{cu} + A_s f_{sd} \quad (10.58b)$ where p_y is the design strength of the structural steel section in N/mm² not more than 690 N/mm²; f_{cu} is the cube compressive strength of the concrete in N/mm² not more than 80 N/mm²</p> <p>A, A_c, A_s are the areas of the steel section, the concrete and the reinforcements respectively.</p> <p>(2) The steel contribution ratio δ is defined as: $\delta = \frac{A p_y}{P_{cp}} \quad (10.59)$</p>

¹² Amendment to the design strengths of concrete and steel in composite columns.

Item	Current version	Amendments
	<p>(3) For infilled circular hollow sections, account may be taken of increase in strength of concrete caused by confinement provided that the relative slenderness $\bar{\lambda}$ defined in clause 10.5.3.3(3) does not exceed 0.5 and $e / d < 0.1$, where e is the eccentricity of loading given by M / P and d is the external diameter of the column. The compression capacity for infilled circular hollow sections shall be calculated as follows:</p> $P_{cp} = \eta_a A p_y + 0.53 A_c f_{cu} \left[1 + \eta_c \frac{t}{d} \frac{p_y}{0.8 f_{cu}} \right] + A_s f_{sd} \quad (10.60)$ <p>where t is the wall thickness of the steel tube.</p> <p>For members in combined compression and bending with $0 < \frac{e}{d} < 0.1$, the values η_a and η_c are given as follows:</p> $\eta_a = \eta_{ao} + (1 - \eta_{ao}) \left(10 \frac{e}{d} \right) \quad (\text{but} < 1.0) \quad (10.61)$ $\eta_c = \eta_{co} \left(1 - 10 \frac{e}{d} \right) \quad (\text{but} < 1.0) \quad (10.62)$ <p>where</p> $\eta_{ao} = 0.25 (3 + 2 \bar{\lambda}) \quad (\text{but} < 1.0) \quad (10.63)$ $\eta_{co} = 4.9 - 18.5 \bar{\lambda} + 17 \bar{\lambda}^2 \quad (\text{but} \geq 0) \quad (10.64)$	<p>where P_{cp} is the compression capacity of the composite cross-section defined in clause 10.5.3.2(1).</p> <p>(3) For infilled circular hollow sections, account may be taken of increase in strength of concrete caused by confinement provided that the relative slenderness $\bar{\lambda}$ defined in clause 10.5.3.3(3) does not exceed 0.5 and $e / d < 0.1$, where e is the eccentricity of loading given by M / P and d is the external diameter of the column. The compression capacity for infilled circular hollow sections shall be calculated as follows:</p> $P_{cp} = \eta_a A p_y + 0.53 A_c f_{cu} \left[1 + \eta_c \frac{t}{d} \frac{p_y}{0.8 f_{cu}} \right] + A_s f_{sd} \quad (10.60)$ <p>where p_y is the design strength of the structural steel section in N/mm^2 not more than 690 N/mm^2; f_{cu} is the cube compressive strength of the concrete in N/mm^2 not more than 80 N/mm^2 t is the wall thickness of the steel tube.</p> <p>For members in combined compression and bending with $0 < \frac{e}{d} < 0.1$, the values η_a and η_c are given as follows:</p> $\eta_a = \eta_{ao} + (1 - \eta_{ao}) \left(10 \frac{e}{d} \right) \quad (\text{but} < 1.0) \quad (10.61)$ $\eta_c = \eta_{co} \left(1 - 10 \frac{e}{d} \right) \quad (\text{but} < 1.0) \quad (10.62)$ <p>where</p> $\eta_{ao} = 0.25 (3 + 2 \bar{\lambda}) \quad (\text{but} < 1.0) \quad (10.63)$ $\eta_{co} = 4.9 - 18.5 \bar{\lambda} + 17 \bar{\lambda}^2 \quad (\text{but} \geq 0) \quad (10.64)$

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¹³ Update of buckling curves and member imperfections for composite columns.

Item	Current version	Amendments
(n) Clause 10.5.3.3 ¹⁴	<p>(3) The reduction factor χ for column buckling is given by:</p> $\chi = \frac{1}{\phi + \sqrt{\phi^2 - \bar{\lambda}^2}} \quad \text{but} \quad \chi \leq 1.0 \quad (10.66)$ <p>where</p> $\phi = \frac{1}{2} \left[1 + \alpha (\bar{\lambda} - 0.2) + \bar{\lambda}^2 \right] \quad (10.67)$ <p>α is the imperfection factor which allows for different levels of imperfections in the columns</p> <ul style="list-style-type: none"> = 0.21 for buckling curve a = 0.34 for buckling curve b = 0.49 for buckling curve c <p>The relevant buckling curves for various cross-sections of composite columns are given in Table 10.13, and the buckling strength reduction factors of composite column are given in Table 10.14.</p>	<p>(3) The reduction factor χ for column buckling is given by:</p> $\chi = \frac{1}{\phi + \sqrt{\phi^2 - \bar{\lambda}^2}} \quad \text{but} \quad \chi \leq 1.0 \quad (10.66)$ <p>where</p> $\phi = \frac{1}{2} \left[1 + \alpha (\bar{\lambda} - 0.2) + \bar{\lambda}^2 \right] \quad (10.67)$ <p>α is the imperfection factor which allows for different levels of imperfections in the columns</p> <ul style="list-style-type: none"> = 0.21 for buckling curve a = 0.34 for buckling curve b = 0.49 for buckling curve c <p>The relevant buckling curves for various cross-sections of composite columns are given in Table 10.13, and the buckling strength reduction factors of composite column are given in Table 10.14.</p> <p style="background-color: yellow;">For composite columns composed of steel sections with yield strengths higher than 460 N/mm², and normal weight concrete of strength classes higher than C60, buckling curve b should be adopted.</p>

¹⁴ Update of the requirements for checking buckling strength of composite columns.

Item	Current version	Amendments
(o) Clause 13.6.4 ¹⁵	<p>13.6.4 Vibration</p> <p>Pedestrians can be adversely affected by the dynamic behaviour of footbridges. In addition to the criteria specified in section 5 on Human-Induced Vibration, the natural frequency of a footbridge shall not be less than 3 Hz. If the natural frequency of a footbridge is less than 3 Hz which may lead to unpleasant vibration, the maximum vertical acceleration, a_v, shall be limited to an appropriate value as given in recognized design guidelines in Annex A2.3 in order to avoid unpleasant vibration.</p>	<p>13.6.4 Vibration</p> <p>Pedestrians can be adversely affected by the dynamic behaviour of footbridges. In addition to the criteria specified in section 5 on Human-Induced Vibration, the vertical natural frequency of a footbridge shall not be less than 3 Hz. If the vertical natural frequency ↓ is below 3 Hz, which may lead to discomfort, the maximum vertical acceleration, a_v, shall be limited to an appropriate value as given in recognized design guidelines in Annex A2.5 in order to avoid discomfort.</p> <p>The lateral response of a footbridge due to crowd loading need not be considered if there are no significant lateral modes with frequencies below 1.5 Hz.</p>
(p) Clause 14.3.2 and Clause 14.3.3 ¹⁶	<p>14.3.2 Welder qualification</p> <p>14.3.2.1 <i>Certification of welder test</i></p> <p>Welder test shall be witnessed by a qualified welding inspector and certificates endorsed by an independent testing body. Welders shall be tested to meet the requirements as given in Annex A1.4.3.</p>	<p>14.3.2 Welder, welding operator and weld setter qualification</p> <p>14.3.2.1 <i>Certification of welder test</i></p> <p>Welder test shall be witnessed by a qualified welding inspector ↓. The welder test certificate shall be endorsed by an independent testing body. Welders shall be tested to meet the requirements as given in Annex A1.4.3.</p>

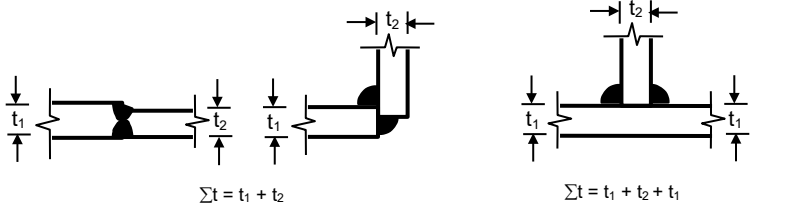
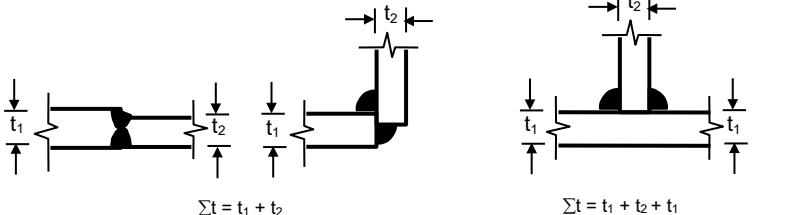
¹⁵ Addition of requirements for vibration response of footbridges.

¹⁶ Addition of the requirements for mechanised and automatic welding.

Item	Current version	Amendments
		<p data-bbox="1263 226 2058 261">14.3.2.2 <i>Certification of welding operator and weld setter</i></p> <p data-bbox="1397 300 2058 592">Qualification tests for welding operator and weld setter for mechanised and automatic welding of metallic materials shall be witnessed by a qualified welding inspector. The qualification test certificates shall be endorsed by an independent testing body. Welding operator and weld setter shall be tested to meet the requirements given in Annex A1.4.3.</p>
	<p data-bbox="456 636 1043 671">14.3.3 Welding procedure specifications</p> <p data-bbox="456 710 1088 745">14.3.3.1 <i>Preparation of procedure specification</i></p> <p data-bbox="584 783 1245 1034">Welding procedure specification (WPS) shall be prepared in accordance with the requirements as given in Annex A1.4.2 and made available to the Responsible Engineer. They shall comply with the guidance to avoid hydrogen cracking and to provide adequate toughness in the heat affected zone.</p>	<p data-bbox="1263 636 1856 671">14.3.3 Welding procedure specifications</p> <p data-bbox="1263 710 1901 745">14.3.3.1 <i>Preparation of procedure specification</i></p> <p data-bbox="1397 783 2058 1075">Preliminary welding procedure specification (pWPS) and welding procedure specification (WPS) shall be prepared in accordance with the requirements as given in Annex A1.4.2 and made available to the Responsible Engineer. They shall comply with the guidance to avoid hydrogen cracking and to provide adequate toughness in the heat affected zone.</p>

Item	Current version	Amendments																																																												
(q) Table 14.2b ¹⁷	<p style="text-align: center;">Table 14.2b - Illustrative hold times</p> <table border="1" data-bbox="461 296 1205 858"> <thead> <tr> <th data-bbox="461 296 618 483">Nominal Carbon Equivalent Value (CEV)⁽²⁾</th> <th data-bbox="618 296 757 483">$\Sigma t^{(3)} < 30\text{mm}$</th> <th data-bbox="757 296 911 483">$\Sigma t^{(3)} \leq 60\text{mm}$</th> <th data-bbox="911 296 1055 483">$\Sigma t^{(3)} \leq 90\text{mm}$</th> <th data-bbox="1055 296 1205 483">$\Sigma t^{(3)} > 90\text{mm}$</th> </tr> </thead> <tbody> <tr> <td data-bbox="461 483 618 560">≤ 0.40</td> <td data-bbox="618 483 757 560">None</td> <td data-bbox="757 483 911 560">8 hours</td> <td data-bbox="911 483 1055 560">16 hours</td> <td data-bbox="1055 483 1205 560">40 hours⁽¹⁾</td> </tr> <tr> <td data-bbox="461 560 618 636">≤ 0.45</td> <td data-bbox="618 560 757 636">8 hours</td> <td data-bbox="757 560 911 636">16 hours</td> <td data-bbox="911 560 1055 636">40 hours⁽¹⁾</td> <td data-bbox="1055 560 1205 636">40 hours⁽¹⁾</td> </tr> <tr> <td data-bbox="461 636 618 713">≤ 0.48</td> <td data-bbox="618 636 757 713">16 hours</td> <td data-bbox="757 636 911 713">40 hours⁽¹⁾</td> <td data-bbox="911 636 1055 713">40 hours⁽¹⁾</td> <td data-bbox="1055 636 1205 713">40 hours⁽¹⁾</td> </tr> <tr> <td data-bbox="461 713 618 790">≤ 0.65</td> <td data-bbox="618 713 757 790">40 hours⁽¹⁾</td> <td data-bbox="757 713 911 790">40 hours⁽¹⁾</td> <td data-bbox="911 713 1055 790">40 hours⁽¹⁾</td> <td data-bbox="1055 713 1205 790">40 hours⁽¹⁾</td> </tr> <tr> <td data-bbox="461 790 618 858">> 0.65</td> <td data-bbox="618 790 757 858">48 hours⁽¹⁾</td> <td data-bbox="757 790 911 858">48 hours⁽¹⁾</td> <td data-bbox="911 790 1055 858">48 hours⁽¹⁾</td> <td data-bbox="1055 790 1205 858">48 hours⁽¹⁾</td> </tr> </tbody> </table> <p data-bbox="461 903 546 930">Notes:</p> <p data-bbox="461 938 1240 1043">(1) Where the figures are in bold, generally, the advice of a welding engineer or the supplier of the welding consumables should be sought.</p> <p data-bbox="461 1051 1240 1157">(2) The carbon equivalent value is that of the parent material to the International Institute of welding (IIW) formula and is calculated as follows:</p> $CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} \quad (T14.1)$	Nominal Carbon Equivalent Value (CEV) ⁽²⁾	$\Sigma t^{(3)} < 30\text{mm}$	$\Sigma t^{(3)} \leq 60\text{mm}$	$\Sigma t^{(3)} \leq 90\text{mm}$	$\Sigma t^{(3)} > 90\text{mm}$	≤ 0.40	None	8 hours	16 hours	40 hours ⁽¹⁾	≤ 0.45	8 hours	16 hours	40 hours ⁽¹⁾	40 hours ⁽¹⁾	≤ 0.48	16 hours	40 hours ⁽¹⁾	40 hours ⁽¹⁾	40 hours ⁽¹⁾	≤ 0.65	40 hours ⁽¹⁾	40 hours ⁽¹⁾	40 hours ⁽¹⁾	40 hours ⁽¹⁾	> 0.65	48 hours ⁽¹⁾	48 hours ⁽¹⁾	48 hours ⁽¹⁾	48 hours ⁽¹⁾	<p style="text-align: center;">Table 14.2b - Illustrative hold times</p> <table border="1" data-bbox="1265 296 2040 858"> <thead> <tr> <th data-bbox="1265 296 1422 483">↓ Carbon Equivalent Value (CEV)⁽²⁾</th> <th data-bbox="1422 296 1565 483">$\Sigma t^{(3)} < 30\text{mm}$</th> <th data-bbox="1565 296 1709 483">$\Sigma t^{(3)} \leq 60\text{mm}$</th> <th data-bbox="1709 296 1852 483">$\Sigma t^{(3)} \leq 90\text{mm}$</th> <th data-bbox="1852 296 2040 483">$\Sigma t^{(3)} > 90\text{mm}$</th> </tr> </thead> <tbody> <tr> <td data-bbox="1265 483 1422 560">≤ 0.40</td> <td data-bbox="1422 483 1565 560">None</td> <td data-bbox="1565 483 1709 560">8 hours</td> <td data-bbox="1709 483 1852 560">16 hours</td> <td data-bbox="1852 483 2040 560">40 hours⁽¹⁾</td> </tr> <tr> <td data-bbox="1265 560 1422 636">≤ 0.45</td> <td data-bbox="1422 560 1565 636">8 hours</td> <td data-bbox="1565 560 1709 636">16 hours</td> <td data-bbox="1709 560 1852 636">40 hours⁽¹⁾</td> <td data-bbox="1852 560 2040 636">40 hours⁽¹⁾</td> </tr> <tr> <td data-bbox="1265 636 1422 713">≤ 0.48</td> <td data-bbox="1422 636 1565 713">16 hours</td> <td data-bbox="1565 636 1709 713">40 hours⁽¹⁾</td> <td data-bbox="1709 636 1852 713">40 hours⁽¹⁾</td> <td data-bbox="1852 636 2040 713">40 hours⁽¹⁾</td> </tr> <tr> <td data-bbox="1265 713 1422 790">≤ 0.65</td> <td data-bbox="1422 713 1565 790">40 hours⁽¹⁾</td> <td data-bbox="1565 713 1709 790">40 hours⁽¹⁾</td> <td data-bbox="1709 713 1852 790">40 hours⁽¹⁾</td> <td data-bbox="1852 713 2040 790">40 hours⁽¹⁾</td> </tr> <tr> <td data-bbox="1265 790 1422 858">> 0.65</td> <td data-bbox="1422 790 1565 858">48 hours⁽¹⁾</td> <td data-bbox="1565 790 1709 858">48 hours⁽¹⁾</td> <td data-bbox="1709 790 1852 858">48 hours⁽¹⁾</td> <td data-bbox="1852 790 2040 858">48 hours⁽¹⁾</td> </tr> </tbody> </table> <p data-bbox="1265 903 1350 930">Notes:</p> <p data-bbox="1265 938 2045 1043">(1) Where the figures are in bold, generally, the advice of a welding engineer or the supplier of the welding consumables should be sought.</p> <p data-bbox="1265 1051 2045 1157">(2) The carbon equivalent value is that of the parent material to the International Institute of Welding (IIW) formula and is calculated as follows:</p> $CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15} \quad (T14.1)$	↓ Carbon Equivalent Value (CEV) ⁽²⁾	$\Sigma t^{(3)} < 30\text{mm}$	$\Sigma t^{(3)} \leq 60\text{mm}$	$\Sigma t^{(3)} \leq 90\text{mm}$	$\Sigma t^{(3)} > 90\text{mm}$	≤ 0.40	None	8 hours	16 hours	40 hours ⁽¹⁾	≤ 0.45	8 hours	16 hours	40 hours ⁽¹⁾	40 hours ⁽¹⁾	≤ 0.48	16 hours	40 hours ⁽¹⁾	40 hours ⁽¹⁾	40 hours ⁽¹⁾	≤ 0.65	40 hours ⁽¹⁾	40 hours ⁽¹⁾	40 hours ⁽¹⁾	40 hours ⁽¹⁾	> 0.65	48 hours ⁽¹⁾	48 hours ⁽¹⁾	48 hours ⁽¹⁾	48 hours ⁽¹⁾
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¹⁷ Revision of the definition for carbon equivalent value.

Item	Current version	Amendments
	<p>(3) Σt is the combined thickness as shown in Figure 14.1.</p>  <p style="text-align: center;">Figure 14.1 - Combined thickness</p> <p>Whatever hold-time period is to be used shall be stated in the inspection records.</p>	<p>(3) Σt is the combined thickness as shown in Figure 14.1.</p>  <p style="text-align: center;">Figure 14.1 - Combined thickness</p> <p>Whatever hold-time period is to be used shall be stated in the inspection records.</p>
(r) Annex A1.4.2.2 ¹⁸	<p>BS EN ISO 15609-1:2019(E) Specification and qualification of welding procedures for metallic materials – Welding procedures specification – Part 1: Arc welding</p> <p>BS EN ISO 15614-1:2017 +A1: 2019 Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys</p>	<p>BS EN ISO 15609-1:2019(E) Specification and qualification of welding procedures for metallic materials – Welding procedures specification – Part 1: Arc welding</p> <p>BS EN ISO 15613:2004 Specification and qualification of welding procedures for metallic materials – Qualification based on pre-production welding test</p>

¹⁸ Addition of the acceptable standards for mechanised and automatic welding.

Item	Current version	Amendments
		BS EN ISO 15614-1:2017 Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys +A1: 2019
(s) Annex A2.5 ¹⁹	<p>A2.5 General references</p> <p>Steel Design Guide Series 11: Floor Vibrations due to Human Activity by Murray et al, with Revisions and Errata List included.</p>	<p>A2.5 General references</p> <p>Steel Design Guide Series 11: Floor Vibrations due to Human Activity by Murray et al, with Revisions and Errata List included.</p> <p>AISC Steel Design Guide 11: Vibrations of Steel-Framed Structural Systems Due to Human Activity (Second edition) by Murray et al (2016)</p>

¹⁹ Addition of general reference for vibrations of steel-framed structural systems.