

《混凝土結構作業守則 2013 年》

屋宇署已成立技術委員會，其工作包括向建築業界收集有關使用《混凝土結構作業守則 2013 年》（《混凝土守則 2013》）的意見及回應，並加以考慮。於 2017 年 6 月 13 日和 2020 年 11 月 24 日透過通告函件頒布的修訂，已納入現行的《混凝土守則 2013》（2020 年修訂版）。屋宇署因應技術委員會的建議，公布以下對《混凝土守則 2013》（2020 年修訂版）的修訂，並已上載於屋宇署網站（www.bd.gov.hk）：

- (a) 附錄 A¹— 2022 年 2 月；及
- (b) 附錄 B¹— 2023 年 6 月。



建築事務監督 余寶美

檔 號：BD GR/1-50/76

本作業備考前稱《認可人士及註冊結構工程師作業備考》296
初 版：2007年6月
本 修 訂 版：2023年6月（助理署長／拓展(2)）
（一般修訂）

¹ 暫只提供英文版本

Amendments to the Code of Practice for Structural Use of Concrete 2013 (2020 Edition)
(February 2022)

Legends:

 Amended
 Deleted

(6/2023)

Amendments to the Code of Practice for Structural Use of Concrete 2013 (2020 Edition) in February 2022 included:

- (a) clause 6.2.3 and Figure 6.18b – addition of design requirements for plain concrete linings;
- (b) clause 10.3.4.2 and Table 10.2 – revision of the requirements on the use of 100 mm and 150 mm concrete cubes;
- (c) clause 11.7.5.4 and Table 11.2 – addition of general guidelines on monitoring early compressive strength of insitu concrete by maturity method; and
- (d) Annex A – addition of ASTM C1074-19^{e1} corresponding to the new clause 11.7.5.4.

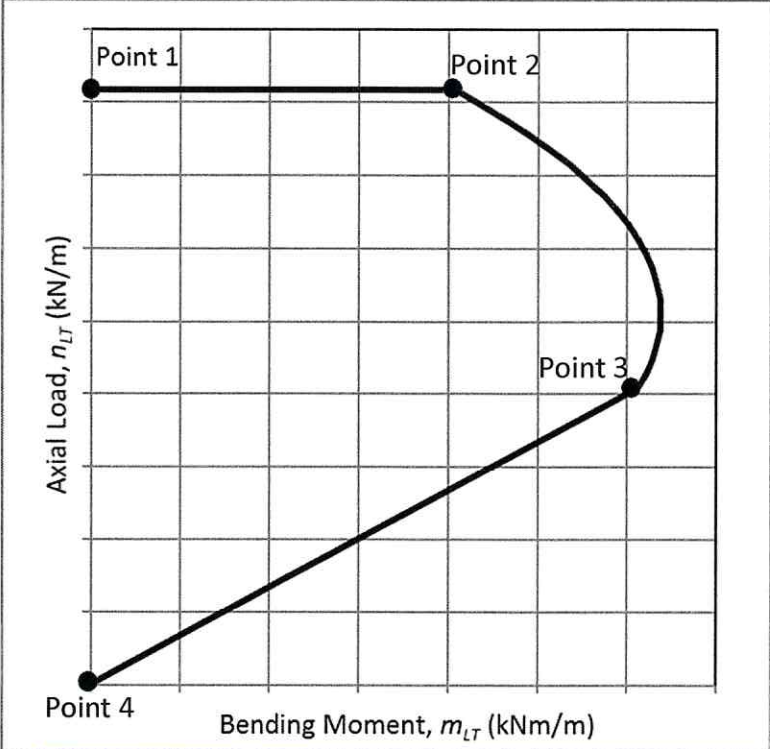
Amendments to the Code of Practice for Structural Use of Concrete 2013 (2020 Edition)

Item	Current version	Amendments
1. Contents	6.2.2 Walls	6.2.2 Walls 6.2.3 Plain concrete linings
2. LIST OF TABLES ¹	Table 11.1 – Objects of production and construction control Table 12.1 – Design flexural tensile stresses for class 2 members: serviceability limit state: cracking	Table 11.1 – Objects of production and construction control Table 11.2 – Correction factor applied to the estimated insitu concrete compressive strength Table 12.1 – Design flexural tensile stresses for class 2 members: serviceability limit state: cracking
3. LIST OF FIGURES ²	Figure 6.18a - Geometry of the Circular Section Figure 6.19 - Critical section for shear check in a pile cap	Figure 6.18a - Geometry of the Circular Section Figure 6.18b - Interaction Curve for Design of Plain Concrete Lining Figure 6.19 - Critical section for shear check in a pile cap
4. Clause 6.2.3 and Figure 6.18b	-	6.2.3 Plain concrete linings 6.2.3.1 General Plain concrete is suitable for use in structural members with high axial loads and relatively low bending moments. The following criteria can generally be applied to the use of plain concrete lining in tunnels or caverns: (a) the lining curvature is adequate to accommodate axial distribution of external loads; (b) the plain concrete lining is constructed in relatively good rock geology and is always in compression under all load combinations; (c) the effect of imperfection of the concrete lining has been considered by means of rigorous structural analysis of the plain concrete lining; and

¹ Addition of Table 11.2 corresponding to the new clause 11.7.5.4.

² Addition of Figure 6.18b corresponding to the new clause 6.2.3.

Item	Current version	Amendments
		<p>(d) an arch section can be formed by plain concrete in conjunction with a reinforced concrete invert provided the junction between the plain and reinforced concrete satisfies the design requirements specified in clause 6.2.3.2.</p> <p>6.2.3.2 <i>Design of plain concrete lining</i></p> <p>(a) Maximum axial load for plain concrete lining The design ultimate capacity of axial load per unit length, n_{LT} and design maximum ultimate bending moment per unit length, m_{LT} ($=n_{LT} e_x$) shall be evaluated using the interaction curve as shown in Figure 6.18b.</p> <p>(i) The first section (Point 1 to Point 2) of the interaction curve as shown in Figure 6.18b, the highest axial force, is applicable when the eccentricity of the thrust force is less than or equal to $0.1h$. The ultimate capacity is calculated using a rectangular stress block over the whole section; For $e_x \leq 0.1h$ $n_{LT} \leq 0.32h f_{cu} \quad 6.63a$</p> <p>(ii) The second section (Point 2 to Point 3) of the interaction diagram is based on a rectangular stress block approach and is applicable for eccentricity between $0.1h$ and $0.3h$. The stress block is acting over part of the section, and reduces as the eccentricity increases. For $0.1h < e_x \leq 0.3h$ $n_{LT} \leq 0.4 (h - 2 e_x) f_{cu} \quad 6.63b$ where:</p>

Item	Current version	Amendments
		<p>e_x is the resultant eccentricity of load at right angles to the plan of the lining.</p> <p>(iii) Cracking restriction limits the use of the strength design method to a maximum eccentricity of $0.3h$. The third section (Point 3 to Point 4) of the interaction curve is a straight line down to the point $n_{LT} = 0$, $m_{LT} = 0$, as shown in Figure 6.18b.</p> <div>  <p>The figure shows a graph with a grid. The vertical axis is labeled 'Axial Load, n_{LT} (kN/m)' and the horizontal axis is labeled 'Bending Moment, m_{LT} (kNm/m)'. The curve consists of four points: Point 1 is at the top left; Point 2 is at the top right; Point 3 is on the right side, lower than Point 2; Point 4 is at the bottom left. The curve is horizontal from Point 1 to Point 2, curved from Point 2 to Point 3, and straight from Point 3 to Point 4.</p> </div> <p>Figure 6.18b – Interaction Curve for Design of Plain Concrete Lining</p>

Item	Current version	Amendments
		<p>(b) Shear strength The design shear stress in the plain concrete lining subjected to shear and axial compression without shear reinforcement can be calculated in accordance with clause 6.1.2.5(k).</p> <p>The design shear resistance of plain concrete lining can be checked in accordance with clause 6.2.2.3(r).</p>
<p>5. Clause 10.3.4.2(a)</p>	<p>10.3.4.2 Concrete Cube Tests During Construction</p> <p>(a) Concrete Cubes</p> <p>The compressive strength of concrete shall be determined by testing 100 mm or 150 mm cubes 28 days after mixing. A representative sample shall be taken from fresh concrete to make test cubes and each sample shall be taken from a single batch. The rate of sampling shall be at least that specified in Table 10.1 and at least one sample shall be taken from each grade of concrete produced on any one day.</p>	<p>10.3.4.2 Concrete Cube Tests During Construction</p> <p>(a) Concrete Cubes</p> <p>The compressive strength of concrete shall be determined by testing 100 mm cubes, or 150 mm cubes if the maximum aggregate size of concrete exceeds 20 mm, 28 days after mixing. A representative sample shall be taken from fresh concrete to make test cubes and each sample shall be taken from a single batch. The rate of sampling shall be at least that specified in Table 10.1 and at least one sample shall be taken from each grade of concrete produced on any one day.</p>

Item	Current version	Amendments																																																														
6. Table 10.2	<table border="1"> <thead> <tr> <th rowspan="3">Specified Grade Strength</th> <th rowspan="3">Compliance Criteria</th> <th colspan="2">Column A</th> <th colspan="2">Column B</th> </tr> <tr> <th colspan="2">Average of 4 consecutive test results shall exceed the specified grade strength by at least</th> <th colspan="2">Any individual test result shall not be less than the specified grade strength minus</th> </tr> <tr> <th>150 mm Cubes</th> <th>100 mm Cubes</th> <th>150 mm Cubes</th> <th>100 mm Cubes</th> </tr> </thead> <tbody> <tr> <td rowspan="2">C20 and above</td> <td>C1</td> <td>5 MPa</td> <td>7 MPa</td> <td>3 MPa</td> <td>2 MPa</td> </tr> <tr> <td>C2</td> <td>3 MPa</td> <td>5 MPa</td> <td>3 MPa</td> <td>2 MPa</td> </tr> <tr> <td>Below C20</td> <td>C1 or C2</td> <td>2 MPa</td> <td>3 MPa</td> <td>2 MPa</td> <td>2 MPa</td> </tr> </tbody> </table> <p>Table 10.2 - Compressive Strength Compliance Criteria</p>	Specified Grade Strength	Compliance Criteria	Column A		Column B		Average of 4 consecutive test results shall exceed the specified grade strength by at least		Any individual test result shall not be less than the specified grade strength minus		150 mm Cubes	100 mm Cubes	150 mm Cubes	100 mm Cubes	C20 and above	C1	5 MPa	7 MPa	3 MPa	2 MPa	C2	3 MPa	5 MPa	3 MPa	2 MPa	Below C20	C1 or C2	2 MPa	3 MPa	2 MPa	2 MPa	<table border="1"> <thead> <tr> <th rowspan="3">Specified Grade Strength</th> <th rowspan="3">Compliance Criteria</th> <th colspan="2">Column A</th> <th colspan="2">Column B</th> </tr> <tr> <th colspan="2">Average of 4 consecutive test results shall exceed the specified grade strength by at least</th> <th colspan="2">Any individual test result shall not be less than the specified grade strength minus</th> </tr> <tr> <th colspan="2">100 mm Cubes (150 mm Cubes)</th> <th colspan="2">100 mm Cubes (150 mm Cubes)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">C20 and above</td> <td>C1</td> <td colspan="2">7 MPa (5 MPa)</td> <td colspan="2">2 MPa (3 MPa)</td> </tr> <tr> <td>C2</td> <td colspan="2">5 MPa (3 MPa)</td> <td colspan="2">2 MPa (3 MPa)</td> </tr> <tr> <td>Below C20</td> <td>C1 or C2</td> <td colspan="2">3 MPa (2 MPa)</td> <td colspan="2">2 MPa (2 MPa)</td> </tr> </tbody> </table> <p>Table 10.2 - Compressive Strength Compliance Criteria</p>	Specified Grade Strength	Compliance Criteria	Column A		Column B		Average of 4 consecutive test results shall exceed the specified grade strength by at least		Any individual test result shall not be less than the specified grade strength minus		100 mm Cubes (150 mm Cubes)		100 mm Cubes (150 mm Cubes)		C20 and above	C1	7 MPa (5 MPa)		2 MPa (3 MPa)		C2	5 MPa (3 MPa)		2 MPa (3 MPa)		Below C20	C1 or C2	3 MPa (2 MPa)		2 MPa (2 MPa)	
Specified Grade Strength	Compliance Criteria			Column A		Column B																																																										
				Average of 4 consecutive test results shall exceed the specified grade strength by at least		Any individual test result shall not be less than the specified grade strength minus																																																										
		150 mm Cubes	100 mm Cubes	150 mm Cubes	100 mm Cubes																																																											
C20 and above	C1	5 MPa	7 MPa	3 MPa	2 MPa																																																											
	C2	3 MPa	5 MPa	3 MPa	2 MPa																																																											
Below C20	C1 or C2	2 MPa	3 MPa	2 MPa	2 MPa																																																											
Specified Grade Strength	Compliance Criteria	Column A		Column B																																																												
		Average of 4 consecutive test results shall exceed the specified grade strength by at least		Any individual test result shall not be less than the specified grade strength minus																																																												
		100 mm Cubes (150 mm Cubes)		100 mm Cubes (150 mm Cubes)																																																												
C20 and above	C1	7 MPa (5 MPa)		2 MPa (3 MPa)																																																												
	C2	5 MPa (3 MPa)		2 MPa (3 MPa)																																																												
Below C20	C1 or C2	3 MPa (2 MPa)		2 MPa (2 MPa)																																																												
7. Clause 10.3.4.2(b) (i)	<p>(i) Before 40 test results are available, where there is sufficient previous production data using similar materials from the same plant under similar supervision to establish that the standard deviation of 40 test results is less than 5 MPa for 150 mm test cubes or 5.5 MPa for 100 mm test cubes, compliance requirement C2 may be adopted; otherwise compliance requirement C1 shall be adopted.</p>	<p>(i) Before 40 test results are available, where there is sufficient previous production data using similar materials from the same plant under similar supervision to establish that the standard deviation of 40 test results is less than 5.5 MPa (5 MPa for 150 mm cubes), compliance requirement C2 may be adopted; otherwise compliance requirement C1 shall be adopted.</p>																																																														
8. Clause 10.3.4.2(b) (ii)	<p>(ii) Where the calculated standard deviation of a set of 40 consecutive test results of concrete judged by compliance requirement C2 of Table 10.2 exceeds 5 MPa for 150 mm test cubes or 5.5 MPa for 100 mm test cubes, compliance requirement for checking the test results shall be changed from C2 to C1 on the 35th day after making the last pair of test cubes in the set of 40.</p>	<p>(ii) Where the calculated standard deviation of a set of 40 consecutive test results of concrete judged by compliance requirement C2 of Table 10.2 exceeds 5.5 MPa (5 MPa for 150 mm cubes), compliance requirement for checking the test results shall be changed from C2 to C1 on the 35th day after making the last pair of test cubes in the set of 40.</p>																																																														

Item	Current version	Amendments
9. Clause 10.3.4.2(b)(iii)	(iii) Where the calculated standard deviation of 40 previous consecutive test results is less than 5 MPa for 150 mm test cubes or 5.5 MPa for 100 mm test cubes, compliance requirement shall be changed from C1 to C2 on the 35 th day after making the last pair of test cubes in the set of 40.	(iii) Where the calculated standard deviation of 40 previous consecutive test results is less than 5.5 MPa (5 MPa for 150 mm cubes), compliance requirement shall be changed from C1 to C2 on the 35 th day after making the last pair of test cubes in the set of 40.
10. Clause 10.3.4.2(b)(iv)	(iv) For concrete grade not exceeding C60, the calculated standard deviation exceeds 8 MPa for 150 mm test cubes or 8.5 MPa for 100 mm test cubes; or	(iv) For concrete grade not exceeding C60, the calculated standard deviation exceeds 8.5 MPa (8 MPa for 150 mm cubes); or
11. Clause 10.3.4.2(b)(vi)	(vi) The average of the latest 40 cube test results exceeds the grade strength by at least 10 MPa for 150 mm test cubes or 12 MPa for 100 mm test cubes and all individual test results exceeds the grade strength by at least 4 MPa for 150 mm test cubes or 5 MPa for 100 mm test cubes; or	(vi) The average of the latest 40 cube test results exceeds the grade strength by at least 12 MPa (10 MPa for 150 mm cubes) and all individual test results exceeds the grade strength by at least 5 MPa (4 MPa for 150 mm cubes); or
12. Clause 11.7.5.4 and Table 11.2	-	<p><i>11.7.5.4 Monitoring early compressive strength of insitu concrete by maturity method</i></p> <p>After concrete casting, the development of insitu concrete compressive strength at early age can be monitored by the maturity method. The maturity method can be used for estimating insitu concrete compressive strength through measurement of the temperature-time history of concrete of ages up to 14 days after casting, for the purpose of determining the concrete strength for striking of formwork and falsework¹ in lieu of the minimum periods specified in clause 10.3.8.2. In formulating a proposal adopting the maturity method, reference should be made to the acceptable standard in Annex A. The proposal should cover the following:</p>

Item	Current version	Amendments									
		<p>(a) choice of an appropriate maturity function and determination of maturity function constants;</p> <p>(b) apparatuses and their calibration;</p> <p>(c) procedure for developing strength-maturity relationship;</p> <p>(d) procedure for estimating insitu concrete strength;</p> <p>(e) validation of insitu concrete strength;</p> <p>(f) re-calibration and re-validation; and</p> <p>(g) quality assurance and supervision.</p> <p>The concrete mix used in the structure should be the same as that used to derive the strength-maturity relationship.</p> <p>Taking into account the different conditions between cast insitu concrete and concrete cubes under various curing temperatures in the calibration process, a correction factor as shown in Table 11.2 should be applied to the estimated insitu concrete compressive strength.</p> <table border="1"> <thead> <tr> <th>Type of concrete mix</th> <th>≤ 48 hours after concrete casting</th> <th>> 48 hours after concrete casting</th> </tr> </thead> <tbody> <tr> <td>Concrete mix containing pfa or ggbs</td> <td>0.7</td> <td>0.8</td> </tr> <tr> <td>Other concrete mix</td> <td>0.8</td> <td>0.8</td> </tr> </tbody> </table> <p>Table 11.2 – Correction factor applied to the estimated insitu concrete compressive strength</p>	Type of concrete mix	≤ 48 hours after concrete casting	> 48 hours after concrete casting	Concrete mix containing pfa or ggbs	0.7	0.8	Other concrete mix	0.8	0.8
Type of concrete mix	≤ 48 hours after concrete casting	> 48 hours after concrete casting									
Concrete mix containing pfa or ggbs	0.7	0.8									
Other concrete mix	0.8	0.8									

Item	Current version	Amendments
		<p>1. Due to the rapid rate of concrete strength development within 24 hours after concrete casting, the maturity method is not suitable for use in justifying minimum periods before striking formwork and falsework of less than 24 hours.</p>
13. Annex A ³	BS EN 13263-1:2005 Silica fume for concrete. +A1:2009 Definitions, requirements and conformity criteria	<p>BS EN 13263-1:2005 Silica fume for concrete. Definitions, requirements and conformity criteria</p> <p>ASTM C1074-19^{e1} Standard Practice for Estimating Concrete Strength by the Maturity Method</p>

³ Addition of ASTM C1074-19^{e1} corresponding to the new clause 11.7.5.4.

Amendments to the Code of Practice for Structural Use of Concrete 2013 (2020 Edition)
(June 2023)

Legends:

 Amended
 Deleted

(6/2023)

Amendments to the Code of Practice for Structural Use of Concrete 2013 (2020 Edition) in June 2023 included:

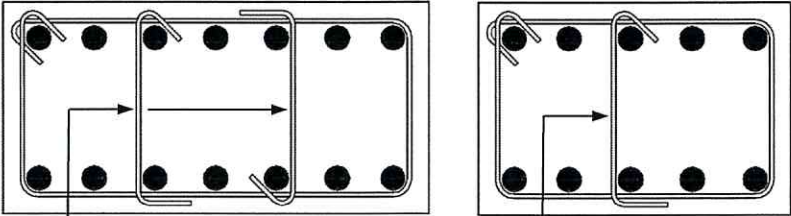
- (a) Clause 3.2.8.3 and Annex A – Addition of referenced standard ISO 15835-2 for the test method on mechanical coupler; and
- (b) Clause 9.9.1.3(b) and Figure 9.6a – Addition of alternative arrangement for links/ties for beam.

Amendments to the Code of Practice for Structural Use of Concrete 2013 (2020 Edition)

Item	Current version	Amendments
1. List of Figures	Figure 9.6 - Typical corbel detailing..... Figure 9.7 - Typical confinement in beam.....	Figure 9.6 - Typical corbel detailing..... Figure 9.6a - Alternative arrangement for links/ties for beam Figure 9.7 - Typical confinement in beam.....
2. Clause 3.2.8.3 ¹	3.2.8.3 Performance of type 1 mechanical couplers Type 1 mechanical coupler satisfying the following criteria may be used as an alternative to tension or compression laps: (a) when a representative gauge length assembly comprising reinforcement of the diameter, grade and profile to be used, and a coupler of the precise type to be used, is tested in tension the permanent elongation after loading to $0.6f_y$ should not exceed 0.1 mm; and	3.2.8.3 Performance of type 1 mechanical couplers Type 1 mechanical coupler satisfying the following criteria may be used as an alternative to tension or compression laps: (a) when a representative gauge length assembly comprising reinforcement of the diameter, grade and profile to be used, and a coupler of the precise type to be used, is tested in tension the permanent elongation after loading to $0.6f_y$ should not exceed 0.1 mm ¹ ; and
3. Clause 9.9.1.3(b) ²	(b) Anchorage Links should be adequately anchored by means of hooks with bend not less than 135° in accordance with clause 8.5. Anchorage by means of welded cross bars is not permitted. Where	(b) Anchorage Links should be adequately anchored by means of hooks with bend not less than 135° in accordance with clause 8.5. Alternatively, links/ties should be adequately anchored by means of hooks bent through an angle of not less than 135° at one end and 90° at the other end, and should be alternated end for end along the longitudinal bars (see Figure 9.6a). Anchorage by means of welded cross bars is not permitted. Where

¹ Addition of referenced standard ISO 15835-2 for the test method on mechanical coupler.

² Addition of alternative arrangement for links/ties for beam.

Item	Current version		Amendments	
4. Figure 9.6a			 <p>Links/ties with alternated end for end along the longitudinal bars</p> <p>Single link/tie</p> <p>Figure 9.6a - Alternative arrangement for links/ties for beam</p>	
5. Annex A	<p>AC 133:2008</p> <p>BS EN 197-1:2011</p>	<p>Acceptance Criteria for Mechanical Connector Systems for Steel Reinforcing Bars</p> <p>Cement. Composition, specifications and conformity criteria for common cements</p>	<p>AC 133:2008</p> <p>ISO 15835-2:2018</p> <p>BS EN 197-1:2011</p>	<p>Acceptance Criteria for Mechanical Connector Systems for Steel Reinforcing Bars</p> <p>Steels for the reinforcement of concrete – Reinforcement couplers for mechanical splices of bars – Part 2: Test methods</p> <p>Cement. Composition, specifications and conformity criteria for common cements</p>