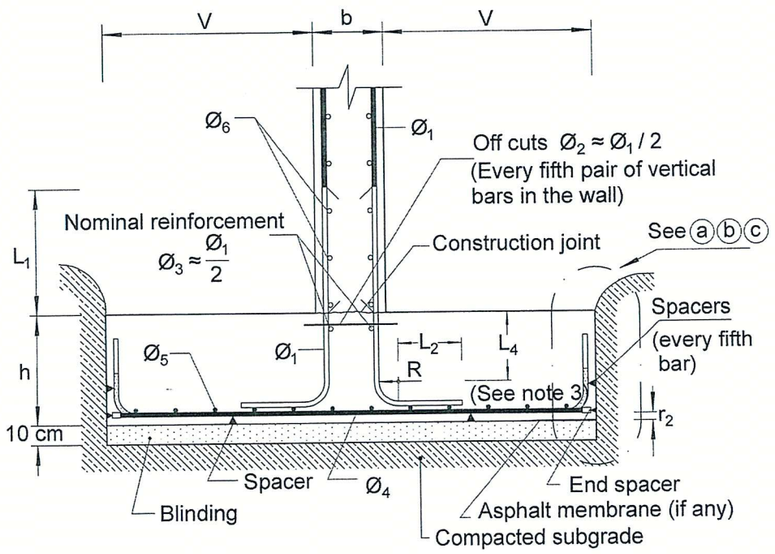
Group 01

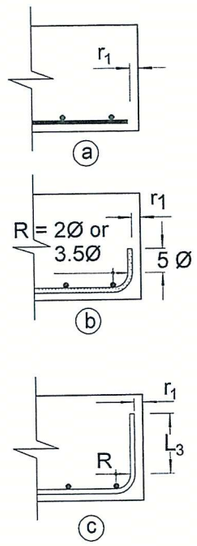
Foundations

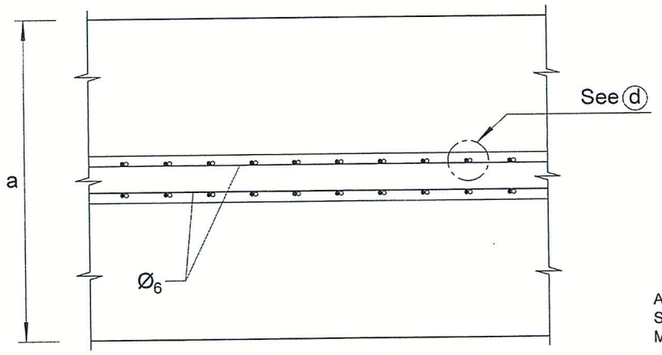
CD – 01.01

WALL FOOTING SUPPORTING A REINFORCED CONCRETE WALL

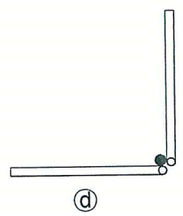


CROSS-SECTION

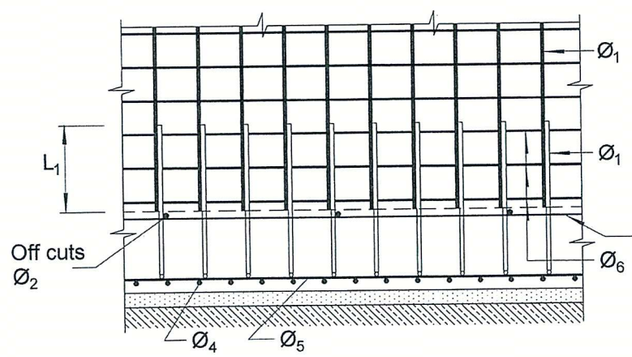




PLAN



ARRANGEMENT WHEN TWO STARTER BARS ARE USED PER MAIN BAR IN THE COLUMN



ELEVATION

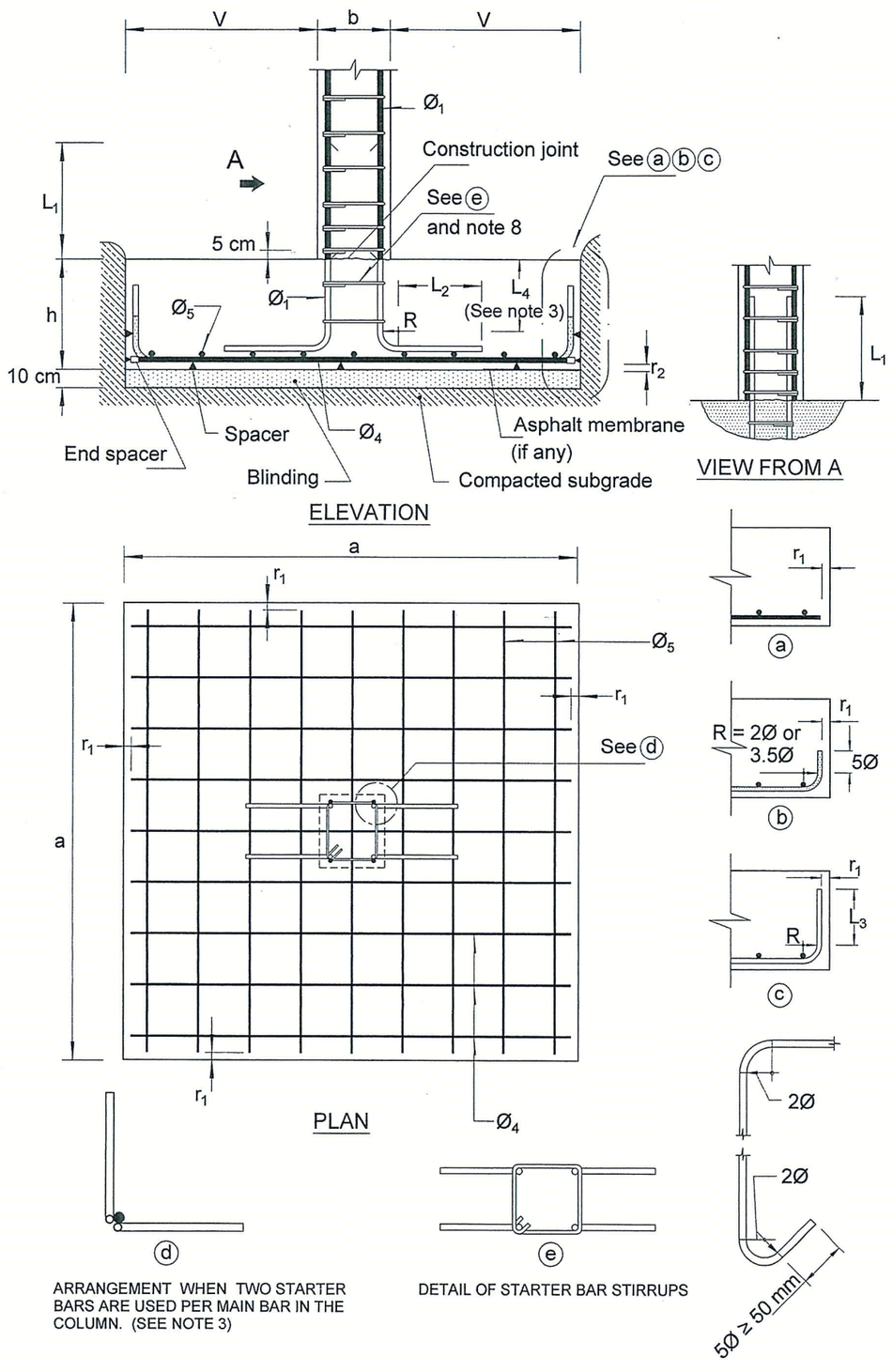
CD – 01.01

NOTES

1. RECOMMENDATIONS

1. The ϕ_1 bars rest directly on the top of the footing, with no hooks needed.
2. L_1 is the ϕ_1 bar lap length.
3. **AR.** The starter bars are diameter ϕ_1 bars. L_4 should be $\geq \ell_{bd}$, but length ℓ_{bd} is defined in EC2 for the least favourable case. In this case the side covers for the ϕ_1 bars are very large. See (12), p. 69. A safe value would be $\ell'_{bd} = \frac{2}{3}\ell_{bd}$. If $L_4 < \frac{2}{3}\ell_{bd}$, often a more suitable solution than increasing the depth of the footing is to use two starter bars for every ϕ_1 bar in the wall. The sum of the cross-sections of these two bars should not be less than the ϕ_1 bar cross-section, but their diameter should be such that $\frac{2}{3}\ell_{bd} < L_4$, where ℓ_{bd} is the anchorage length. The arrangement detail is as in alternative (d). This rule can be applied wherever the bar cover is $\geq 10\ \phi$ but not under 10 cm.
4. $r_1 = 7.5$ cm if the concrete for the footing is poured directly against the soil.
5. $r_2 = 2.5$ cm but not less than ϕ_4.
6. See 1.5 to determine when to use anchor type a, b or c at the end of the ϕ_4 reinforcing bar.
7. Length L_2 shall suffice to tie the ϕ_1 starter bars securely to two ϕ_5 transverse bars. (It may not be less than 2s, where s is the space between ϕ_5 bars.)
8. The bars with diameters ϕ_2 and ϕ_3 are supports whose sole purpose is to keep the starter bar assembly firmly in place while the concrete is cast in the foundations. The starter bar assembly is to be tied at all cross points. Depending on the case, these ties may be supplemented or replaced by positioning reinforcement ϕ_6 in lapping length L_1 before pouring the concrete in the footing.
9. The top of the footing is smoothed with floats or a power float except in the contact area with the future wall, where a rough surface such as is generated by the vibrator is needed.
10. In soft soils, the 25 cm over the level of the future blinding should not be excavated until shortly before pouring the concrete to ensure that the soil is not softened by rainfall immediately before placement.
11. The foundation subgrade must be compacted before the blinding is poured.
12. The blinding under the footing is floated or smoothed with a power float. Its standard 10-cm thickness may be varied to absorb tolerances in foundation subgrade levelling.
13. Where the footing is to be poured on soils that constitute an aggressive medium, it should be protected by an asphalt membrane as specified.
14. Before pouring the concrete to form the wall, the joint surface should be cleaned and pressure hosed. The concrete should not be cast until the surface dries.
15. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

SPREAD FOOTING



ARRANGEMENT WHEN TWO STARTER BARS ARE USED PER MAIN BAR IN THE COLUMN. (SEE NOTE 3)

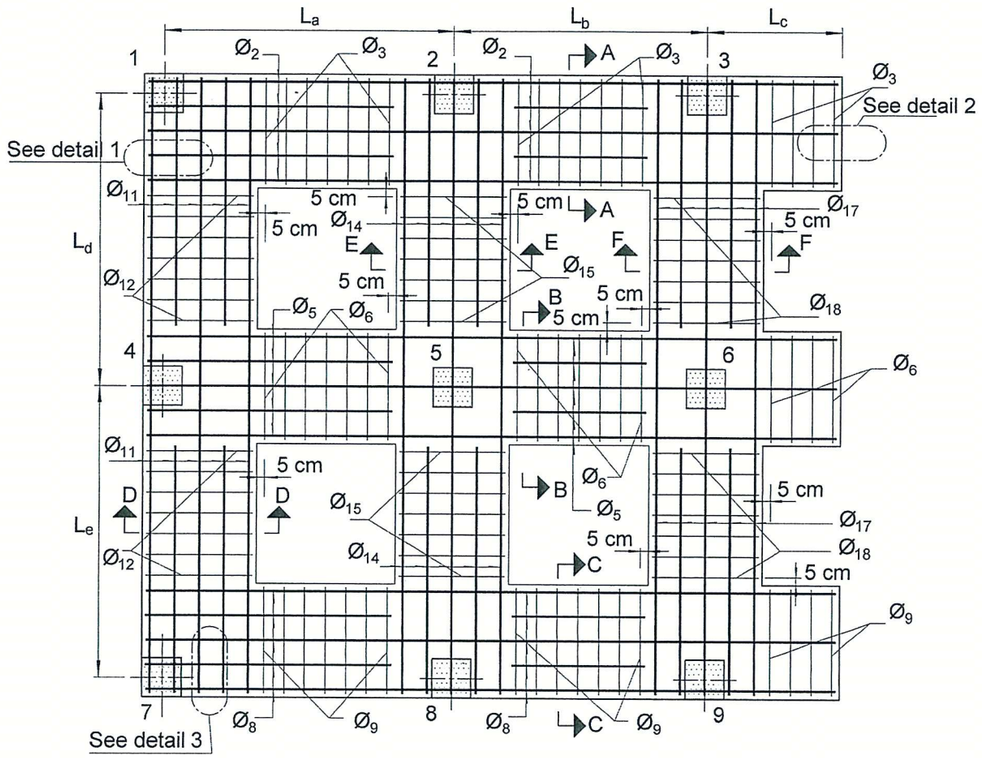
DETAIL OF STARTER BAR STIRRUPS

NOTES

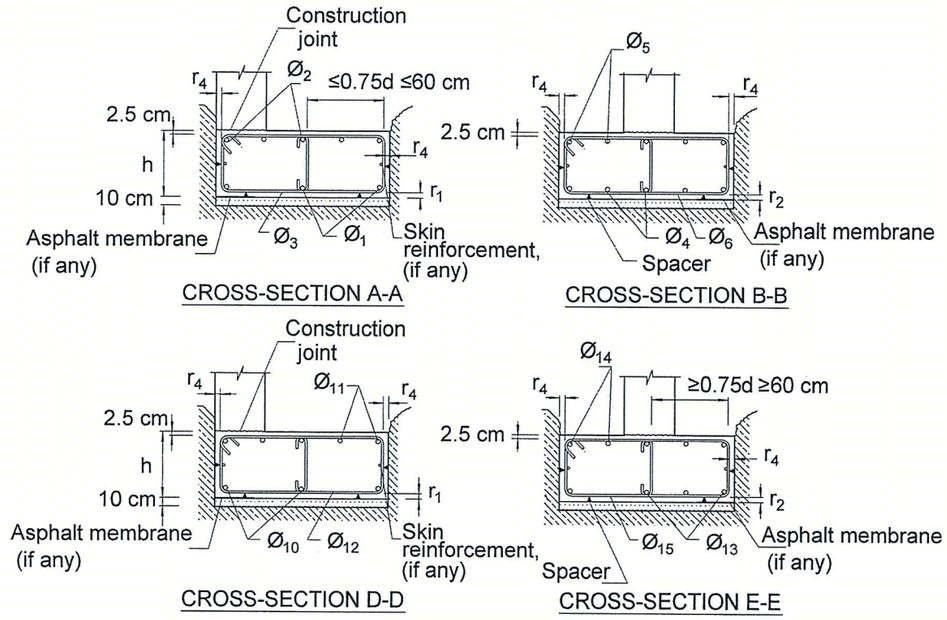
1. RECOMMENDATIONS

1. The ϕ_1 bars rest directly on the top of the footing, with no hooks needed.
2. L_1 is the ϕ_1 bar lap length.
3. **AR.** The starter bars are diameter ϕ_1 bars. L_4 should be $\geq \ell_{bd}$, but length ℓ_{bd} is defined in EC2 for the least favourable case. In this case the side covers for the ϕ_1 bars are very large. See (12), p. 69. A safe value would be $\ell'_{bd} = \frac{2}{3}\ell_{bd}$. If $L_4 < \frac{2}{3}\ell_{bd}$, often a more suitable solution than increasing the depth of the footing is to use two starter bars for every ϕ_1 bar in the wall. The sum of the cross-sections of these two bars should not be less than the ϕ_1 bar cross-section, but their diameter should be such that $\frac{2}{3}\ell_{bd} < L_4$, where ℓ_{bd} is the anchorage length. The arrangement detail is as in alternative (d). This rule can be applied wherever the bar cover is $\geq 10\ \phi$ but not under 10 cm.
4. $r_1 = 7.5$ cm if the concrete for the footing is poured directly against the soil.
5. $r_2 = 2.5$ cm but not less than ϕ_4.
6. See 1.5 to determine when to use anchor type a, b or c at the end of the ϕ_4 reinforcing bar.
7. Length L_2 shall suffice to tie the ϕ_1 starter bars securely to two ϕ_5 transverse bars. (It may not be less than 2s, where s is the space between the ϕ_5 bars.)
8. The starter bar ties are supports whose sole purpose is to keep the starter bar assembly firmly in place while the concrete is cast in the foundations. The starter bar assembly is to be tied at all cross points. These are not the same ties as in the column.
9. The top of the footing is smoothed with a float or power float except in the contact area with the future column, where a rough surface such as is generated by the vibrator is needed.
10. In soft soils, the 25 cm over the level of the future blinding should not be excavated until shortly before pouring the concrete to ensure that the soil is not softened by rainfall immediately before placement.
11. The foundation subgrade must be compacted before the blinding is poured.
12. The blinding under the footing is floated or smoothed with a power float. Its standard 10-cm thickness may be varied to absorb tolerances in foundation subgrade levelling.
13. Where the footing is to be poured on soils that constitute an aggressive medium, it should be protected by an asphalt membrane as specified.
14. Before pouring the column concrete, the joint surface should be cleaned and pressure hosed. The concrete should not be cast until the surface dries.
15. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.
16. Where calculations are very tight, the mid plane in pairs of lapped bars should be perpendicular to the direction of the greatest bending moment acting on the column springing.
17. Rectangular footings can be set out in exactly the same way, although the resulting grid is logically not symmetrical.

GRID FOUNDATION (VARIATION 1) (1 of 2)



PLAN - TOP REINFORCEMENT



NOTES

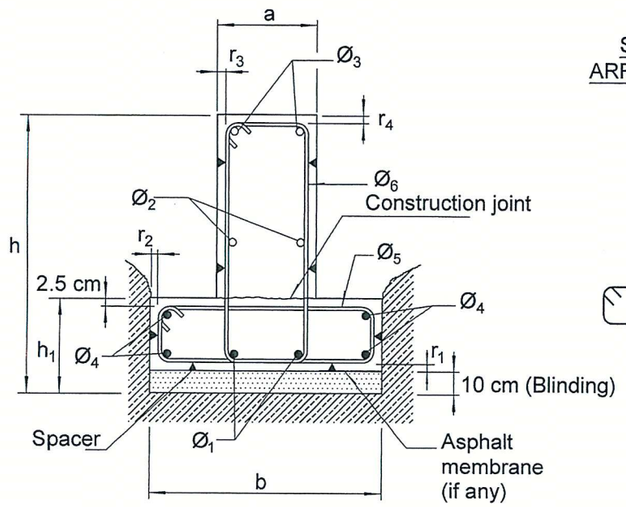
1. RECOMMENDATIONS

1. $r_1 = 2.5\ cm \geq \phi_1 - \phi_3$.
2. $r_2 = 2.5$ cm.
3. r_4 and r_5 are equal to 7.5 cm if the concrete for the footing is poured directly against the soil.
4. The ϕ_{10}, ϕ_{13} and ϕ_{16} bars lie on the ϕ_1, ϕ_4 and ϕ_7 bars, respectively.
5. The ϕ_{11}, ϕ_{14} and ϕ_{17} bars lie on the ϕ_2, ϕ_5 and ϕ_8 bars, respectively.
6. If the shear stress cannot be entirely absorbed by the concrete, the stirrups must be arranged in such a way that their vertical legs are not separated by more than 60 cm or 0.75d. Cross-ties, as shown, or multiple stirrups (see CD – 01.17) may be used.
7. If multiple stirrups are used, the horizontal legs must be lapped along a distance of at least L_b, where L_b is the stirrup anchorage length. (This is required for the horizontal arm of the stirrup to act as transverse bending reinforcement; see CD – 01.17.)
8. The corner column starter bars need ties of the same diameter and maximum spacing as in the column. Two stirrups suffice for the inner column starter bars (see CD – 01.03).
9. The top of the footing is smoothed with a float or power float except in the contact area with the future column, where a rough surface such as is generated by the vibrator is needed.
10. In soft soils, the 25 cm over the level of the future blinding should not be excavated until shortly before pouring the concrete to ensure that the soil is not softened by rainfall immediately before placement.
11. The subgrade is compacted before pouring the blinding.
12. The blinding is floated or smoothed with a power float. Its standard 10-cm thickness may be varied to absorb tolerances in foundation subgrade levelling.
13. Where the footing is to be poured on soils that constitute an aggressive medium, it should be protected by an asphalt membrane as specified.
14. Before pouring the column concrete, the joint surface should be cleaned and pressure hosed. The concrete should not be cast until the surface dries.
15. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

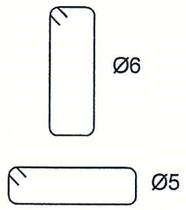
This type of footing is not addressed in EC2 (5).

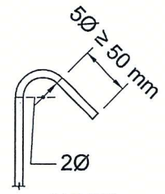
CD – 01.23 WALL FOOTING



CROSS-SECTION

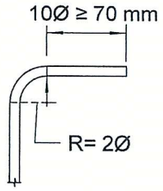
STIRRUP ARRANGEMENT



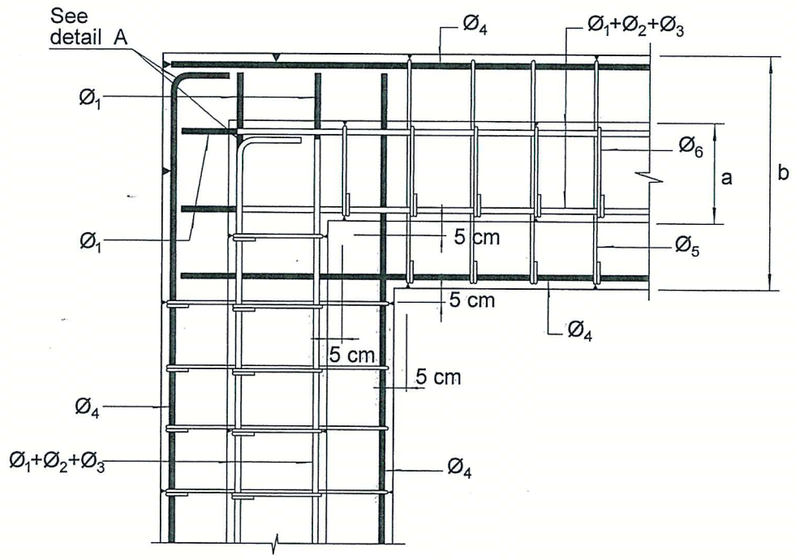


HOOK

90º BEND



DETAIL A



CORNER DETAIL - PLAN

CD – 01.23 NOTES

1. RECOMMENDATIONS

1. r_1 = 2.5 cm.
2. r_2 = 7.5 cm if the concrete for the footing is poured directly against the soil.
3. r_3 = 2.5 cm.
4. r_4 = 2.5 cm.
5. The top of the stem and base are smoothed with a float or power float except at the joint, where a rough surface such as is generated by the vibrator is needed.
6. In soft soils, the 25 cm over the level of the future blinding should not be excavated until shortly before pouring the concrete to ensure that the soil is not softened by rainfall immediately before placement.
7. The foundation subgrade must be compacted before the blinding is poured.
8. The blinding is floated or smoothed with a power float. Its standard 10-cm thickness may be varied to absorb tolerances in foundation subgrade levelling.
9. Where the footing is to be poured on soils that constitute an aggressive medium, it should be protected by an asphalt membrane as specified.
10. Before casting the concrete, the joint surface should be cleaned and pressure hosed. The concrete should not be cast until the surface dries.
11. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

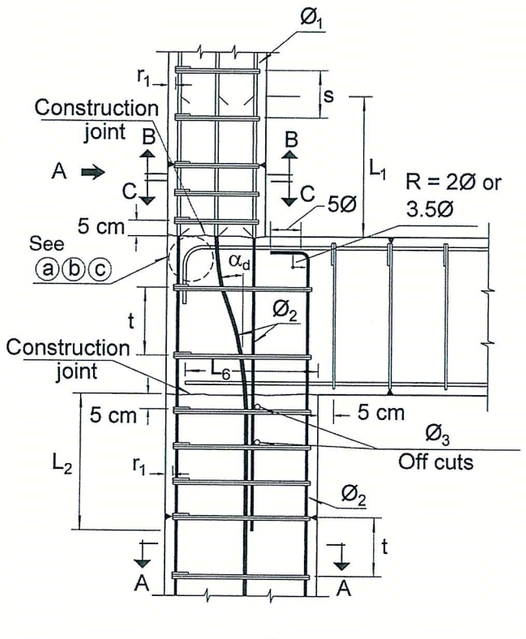
None in place.

Group 03

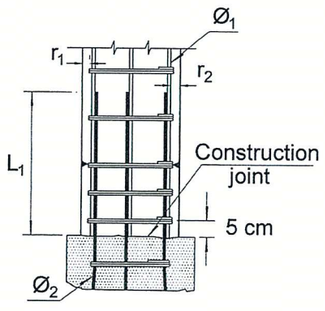
Columns and joints

CD – 03.05

INTERMEDIATE JOINT IN EDGE COLUMNS (VARIATION 2)

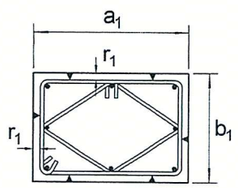


Ø1

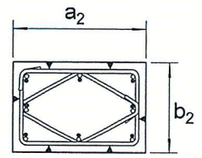


VIEW FROM A

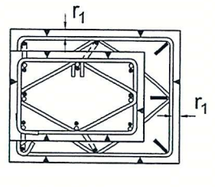
AR. { This CD is used when in CD-03.04
tan α > 1/6
If tan α > 1/6 use CD-03.06



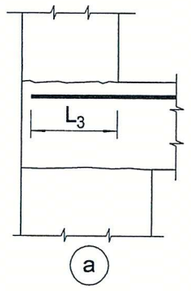
SECTION A-A

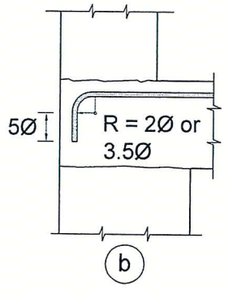


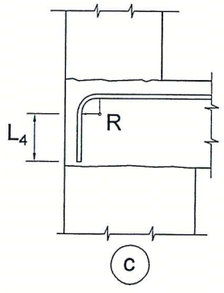
SECTION B-B

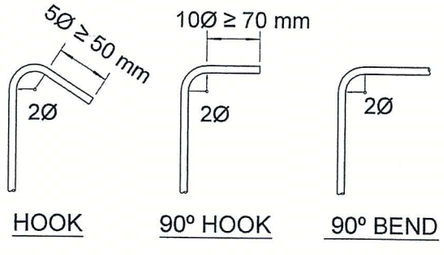


SECTION C-C

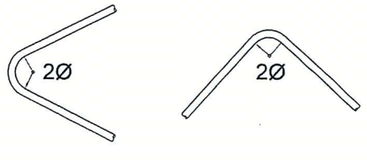








HOOK 90° HOOK 90° BEND



$s \leq$ { $20\ Ø_1$; 40 cm ; THE SMALLER OF a_2 OR b_2

$t \leq$ { $20\ Ø_2$; 40 cm ; THE SMALLER OF a_1 OR b_1

NOTES:
s AND t SHOULD BE REDUCED BY A FACTOR OF 0.6 IN TRANSVERSE SECTIONS AT A DISTANCE FROM THE COLUMN OF LESS THAN THE LARGEST TRANSVERSE DIMENSION COUNTING FROM THE BEAM OR SLAB. IN LAP AREAS IF Ø≥16 mm, A MINIMUM OF THREE TIES IS REQUIRED.

$Ø_1$ AND $Ø_2$ ARE THE DIAMETERS OF THE THINNEST LONGITUDINAL BARS.

CD – 03.05

NOTES

1. RECOMMENDATIONS

1. L_1 is the ϕ_1 bar lap length. L_2 is the ϕ_2 bar lap length.
2. See Tables T-1.1 and T-1.2 for bend radii.
3. Cover r_1 = 2.5 cm.
4. Cover $r_2 \geq \phi_2$.
5. To calculate lengths L_3 and L_4, see EC2, anchorage lengths.
6. The tie bars are bent in the starter bars and hooked in all others.
7. For tie bars in the joint, see the respective details.
8. See CD – 03.16 for tie bar shapes and bar layouts.
9. See 1.2 for bar tying procedures and 1.3 for spacer placement.
10. Angle α is understood to be the actual measured magnitude.

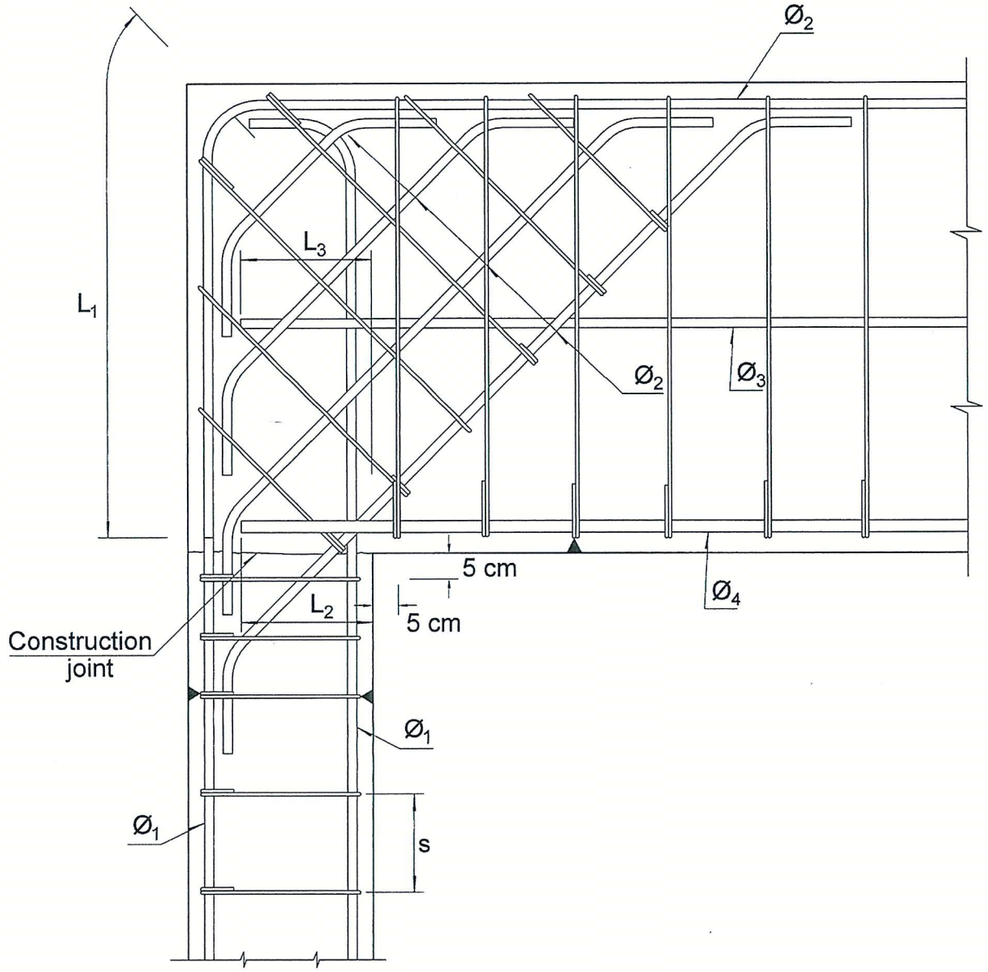
2. STATUTORY LEGISLATION

See EC2 (5).

3. RECOMMENDED ALTERNATIVE CODES

See ACI 318-08 (22) and (15).

CD – 03.15	CORNER JOINT IN LARGE SPAN PORTAL FRAMES



CD – 03.15	NOTES

1. RECOMMENDATIONS

1. To calculate length L_2, see EC2, anchorage lengths.
2. L_1 is the lap length of the thicker of the ϕ_1 or ϕ_2 bars.
3. Bar ϕ_3 reinforces the web. It has a conventional anchorage (L_3). An arrangement calling for 20 $\phi_3 \geq$ 15 cm is suggested.

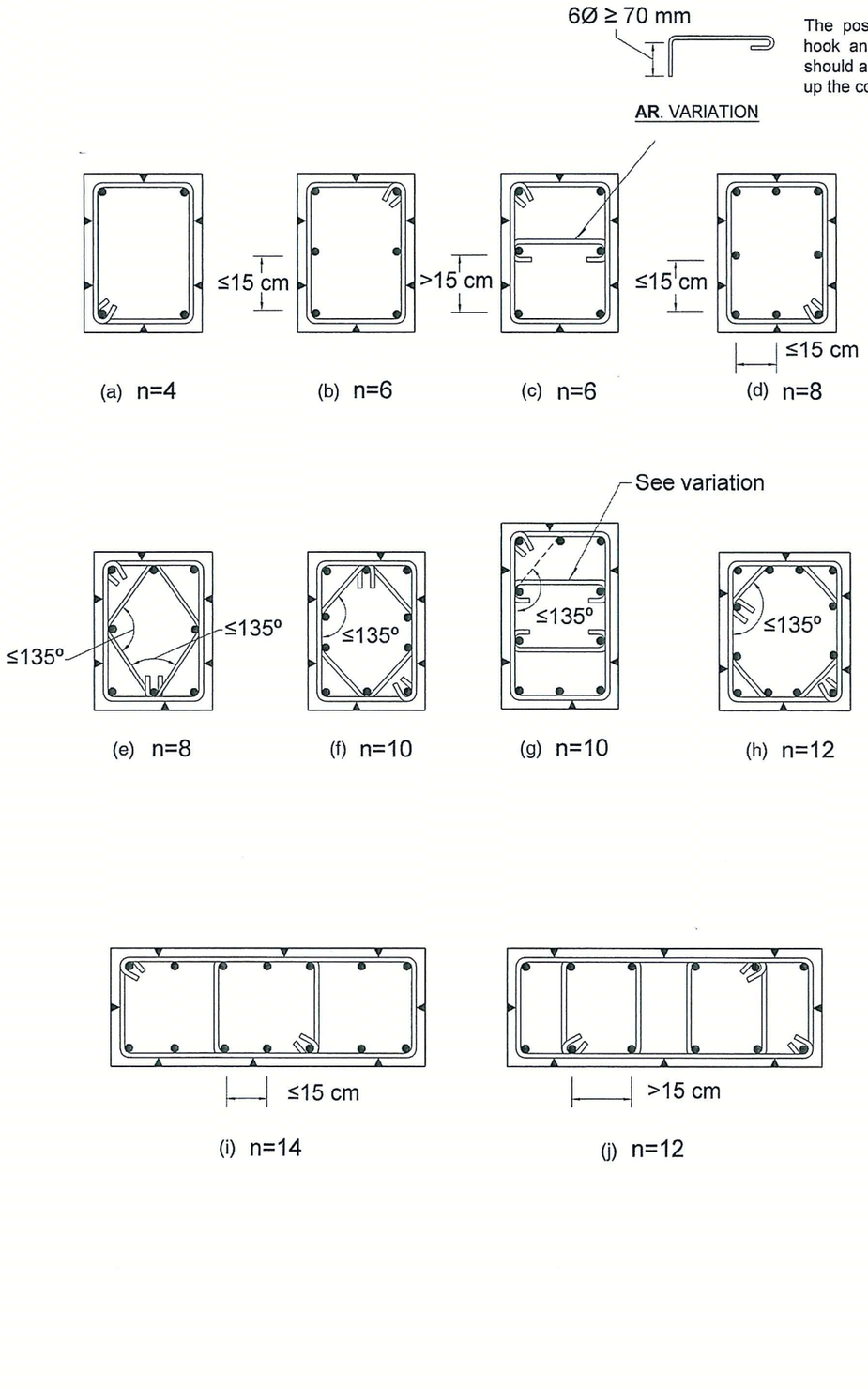
2. STATUTORY LEGISLATION

None in place.

3. RECOMMENDED ALTERNATIVE CODES

None in place.

CD – 03.16 BAR ARRANGEMENT AND SHAPES OF TIES IN COLUMNS



CD – 03.16 NOTES

1. RECOMMENDATIONS

1. See CD – 03.01, CD – 03.02 and CD – 03.03 for the distribution of tie bars along the column, cover and spacers, respectively.
2. The maximum spacing between longitudinal reinforcing bars is 35 cm (not specified in EC2).
3. The tie bars should brace the longitudinal reinforcement at an angle of ≤ 135º (details (e), (f), (g) and (h)) (not specified in EC2).
4. **AR.** Only every other bar need be braced if they are spaced at more than 15 cm (details (c), (j)). This provision is laid down in ACI-318-08 (22).
5. The general principle is that the smallest possible number of bars should be used (see CD – 03.17 on possible bundling).
6. In long columns, the use of thick bars is advisable, with preference given to detail (i) over detail (j) arrangements.
7. Rather than very thick tie bars, the use of bundled ties is recommended.
8. When two or more ties are used, different shapes may be jointed or staggered at 10 ϕ, provided ties of the same type are spaced within the maximum allowable distance. This second solution is preferable when, following the preceding recommendation, double ties are used rather than four-ties.
9. Complex tie bar arrangements lead to segregation during concrete pouring and consequently to lower concrete strength.

2. STATUTORY LEGISLATION

This subject is scantly dealt with in EC2 (5).

3. RECOMMENDED ALTERNATIVE CODES

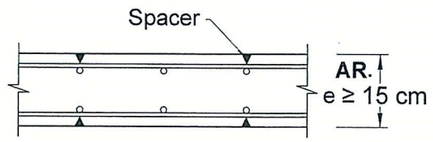
See ACI 318-08 (22) and (15).

Group 04

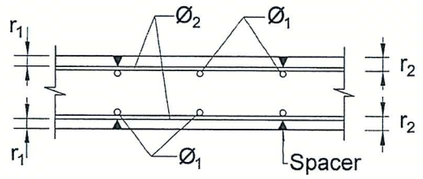
Walls subjected to axial loads

CD – 04.01

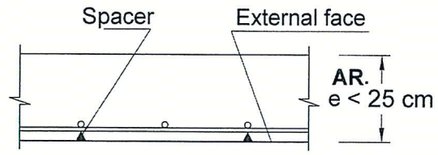
WALLS, SHEAR WALLS AND CORES. GENERAL ARRANGEMENTS



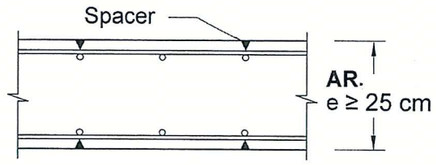
HORIZONTAL SECTION
ⓐ MINIMUM THICKNESS



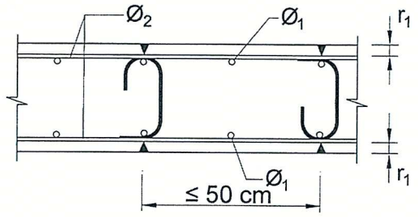
HORIZONTAL SECTION
ⓑ COVER



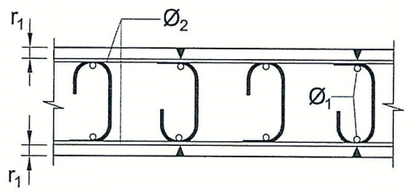
HORIZONTAL SECTION
ⓒ WALLS REINFORCED ON ONE SIDE ONLY



HORIZONTAL SECTION
ⓓ WALLS WITH e ≥ 25 cm
(REINFORCEMENT MANDATORY ON BOTH SIDES)

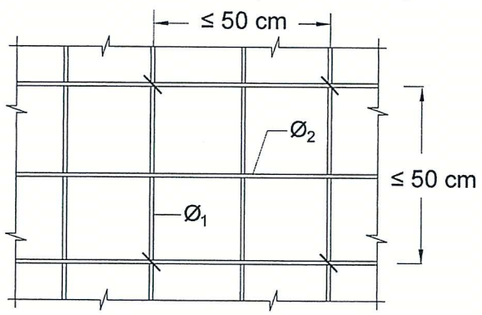


HORIZONTAL SECTION

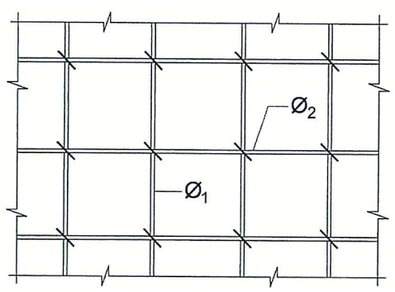


HORIZONTAL SECTION

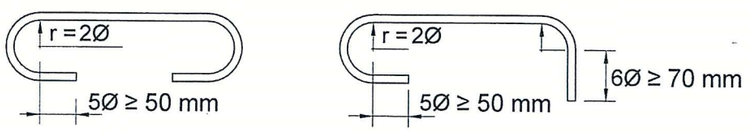
a) On the horizontal plane the cross-ties should be placed alternately on each side with the 90º hooks.
b) The 90º hooks should be placed alternately in the vertical direction.



ⓔ ELEVATION



ⓕ ELEVATION



TIE DETAIL

CD – 04.01

NOTES

1. RECOMMENDATIONS

1. For ease of pouring and to prevent segregation, the minimum recommended thickness is 15 cm. Nonetheless, particular care is required when pouring walls with e < 25 cm.
2. $r_1 = 2.5$ cm; $r_2 \geq \phi_2$.
3. **AR.** Structural calculations permitting, where e < 25 cm the reinforcement may be placed on one side only (the outer side if the wall is a facade). Where e ≥ 25 cm, reinforcement is needed on both sides. The required drying shrinkage and thermal contraction ratios must be observed. See details (c) and (d).
4. If the geometric ratio of the ϕ_1 vertical reinforcement is ≤ 2 per cent, $\phi \leq 16$ mm, or if welded-wire mesh reinforcement is used with a cover of 2 ϕ, no tie bars are required. Otherwise, four ties per m² are required.
5. **AR.** If the conditions specified in recommendation 4 are not met, and:
   (a) $\phi_1 \leq 12$ mm, tie bars must be spaced, horizontally and vertically, at no more than 50 cm; or
   (b) $\phi > 12$ mm, and in all cases where vertical compression reinforcement is needed, tie bars must be placed at all intersections and spaced vertically at no more than 20 ϕ_1.
6. See CD – 02.08 for horizontal construction joints in exposed concrete.
7. If vertical contraction joints are required, see CD – 02.09 and in particular, CD – 02.21.
8. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.
9. Recommendations 3 and 5 are taken from ACI 318-08 (22).

2. STATUTORY LEGISLATION

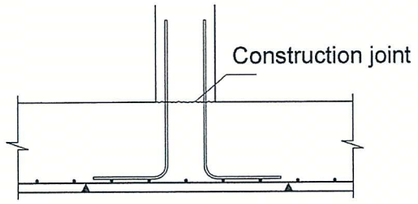
See EC2 (5).

3. RECOMMENDED ALTERNATIVE CODES

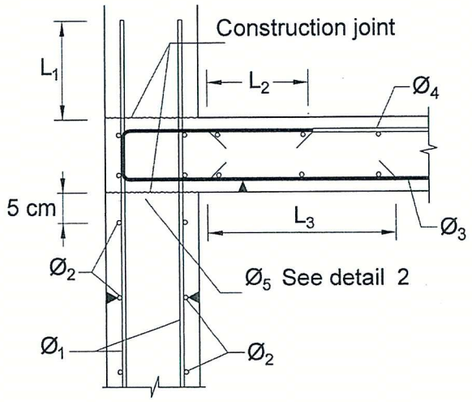
See ACI 318-08 (22), which deals with the subject more extensively than EC2 (5).

CD – 04.02

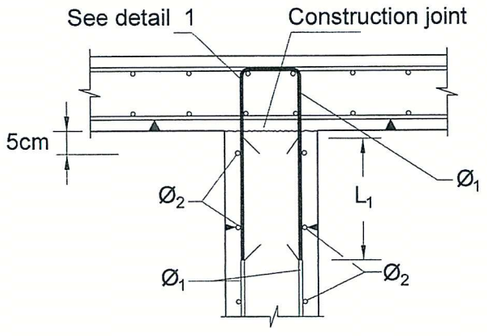
WALLS, SHEAR WALLS AND CORES. JOINT DETAIL



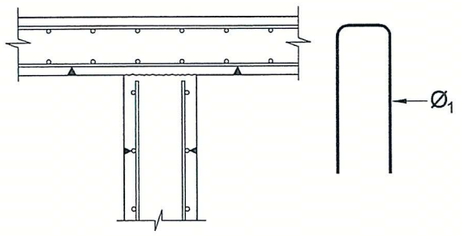
ⓐ FOOTING SPRINGLINE



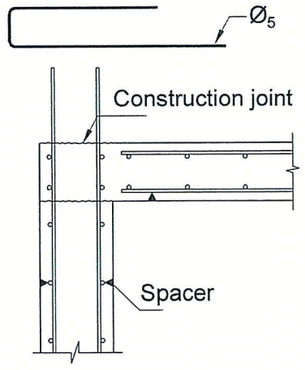
ⓑ HORIZONTAL JOINT ON STOREY



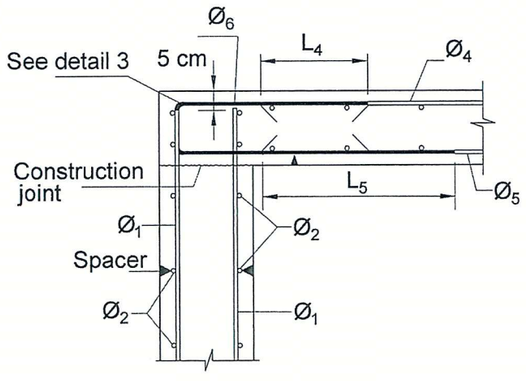
ⓒ BOND TO ROOF SLAB



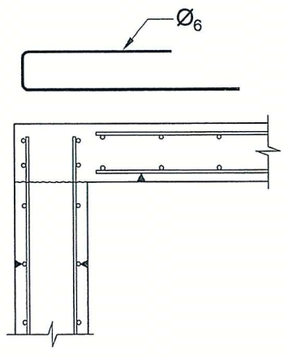
DETAIL 1



DETAIL 2



ⓓ ROOF JOINT



DETAIL 3

CD – 04.02

NOTES

1. RECOMMENDATIONS

1. For cover, minimum thickness and the need for and placement of ties, see CD – 04.01.
2. Foundation springing a) is built exactly as described in CD – 01.01. See the recommendations included therein as well.
3. L_1 is the ϕ_1 bar lap length.
4. L_2 is the lap length in the thicker of the ϕ_4 or ϕ_5 reinforcing bars; is the lap length L_3 in the thicker of ϕ_3 or ϕ_5 bars; ϕ_5 is equal to the thicker of the ϕ_3 or ϕ_4 bars.
5. L_4 is the lap length in the thicker of the ϕ_4 or ϕ_5 bars; L_5 is the lap length L_5 in the thicker of the ϕ_5 or ϕ_6 bars; ϕ_6 is equal to the thicker of the ϕ_4 or ϕ_5 bars.
6. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

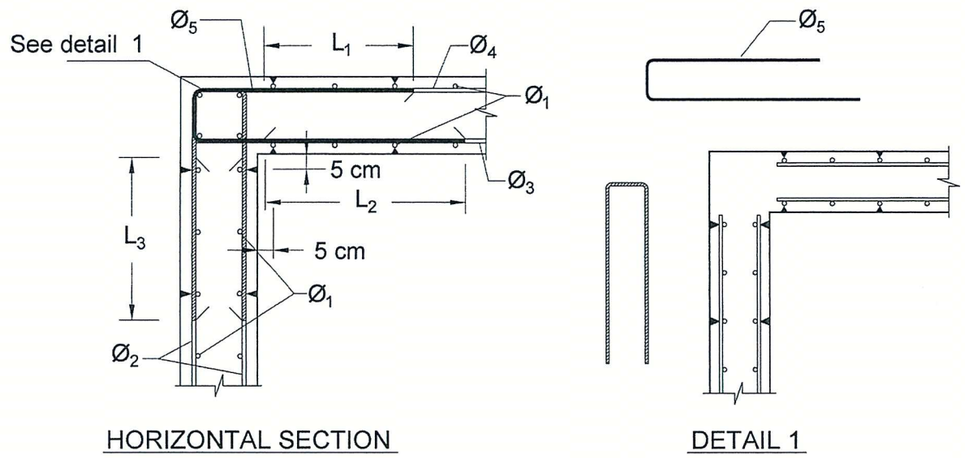
2. STATUTORY LEGISLATION

See EC2 (5).

3. RECOMMENDED ALTERNATIVE CODES

See ACI 318-08 (22), which deals with the subject more extensively than EC2 (5).

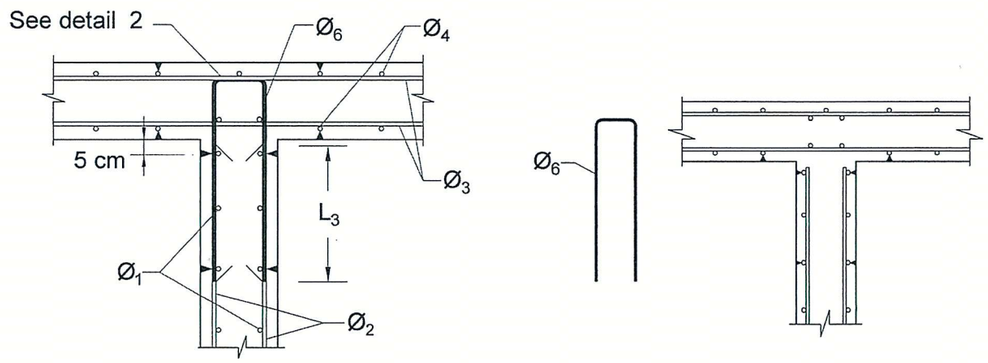
WALLS, SHEAR WALLS AND CORES. CORNERS, JOINTS AND EDGES



HORIZONTAL SECTION

DETAIL 1

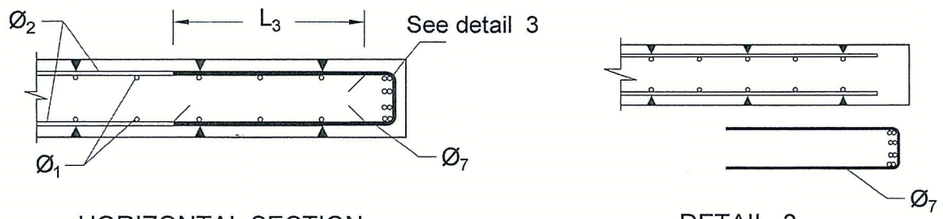
(a) CORNER DETAIL



HORIZONTAL SECTION

DETAIL 2

(b) JOINT DETAIL



HORIZONTAL SECTION

DETAIL 3

(c) EDGE DETAIL IN SHEAR WALLS

NOTES

1. RECOMMENDATIONS

1. For cover, minimum thickness and the need for and placement of tie bars, see CD – 04.01.
2. In detail (a), L_1 is the lap length in the thicker of the ϕ_4 or ϕ_5 bars; and L_2 is the lap length in the thicker of the bars. ϕ_3 or ϕ_5. The cross-ties are tied to the horizontal reinforcing bars. ϕ_5 is equal to the thicker of the ϕ_3 or ϕ_4 bars.
3. In details (a), (b) and (c), L_3 is the lap length in the horizontal reinforcement. The hairpins are tied to the intersecting horizontal reinforcing bars.
4. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

See EC2 (5).

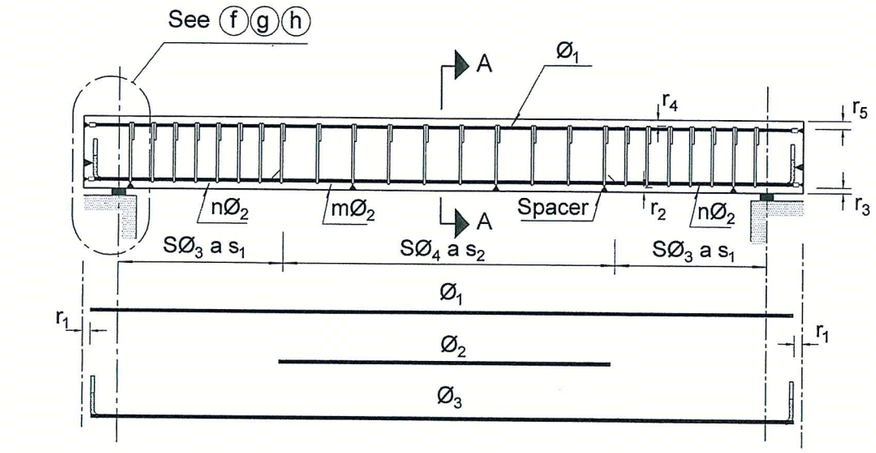
3. RECOMMENDED ALTERNATIVE CODES

See ACI 318-08 (22), which deals with the subject more extensively than EC2 (5).

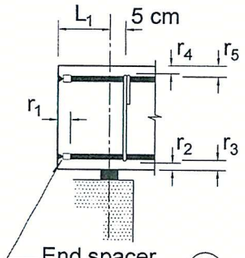
Group 05

Beams and lintels

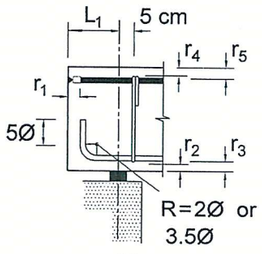
BEAMS.
SIMPLY SUPPORTED BEAMS



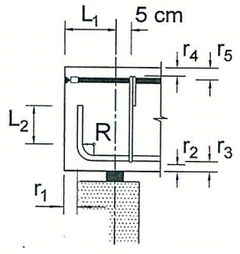
(A)



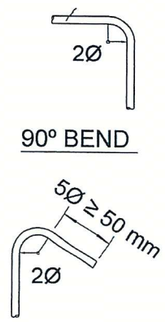
(f)



(g)

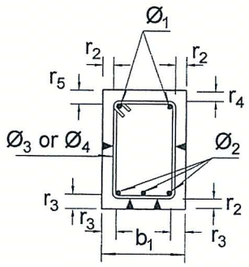


(h)



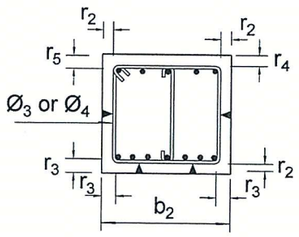
HOOK

(B)



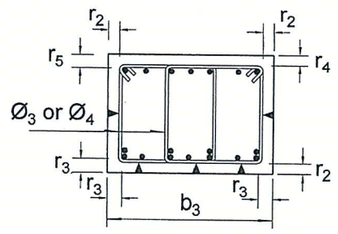
SECTION A-A

(C)



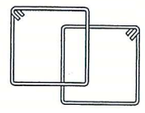
SECTION A-A

(D)



SECTION A-A

(E)



NOTES

1. RECOMMENDATIONS

1. See CD – 09 for information on support members.
2. $r_1 = 2.5$ cm $\geq \phi_2$.

   $r_2 = 2.5$ cm.

   $r_3 \geq \phi_2$.

   $r_4 = r_2$.

   AR. If the top of the beam is horizontal and exposed to rain or condensed water, $r_4 = 3$ cm.

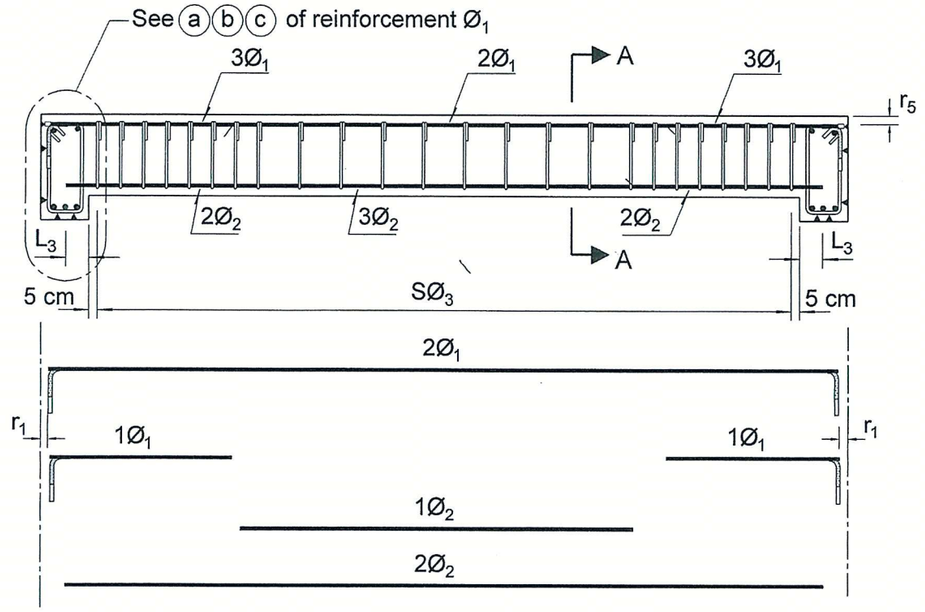
   $r_5 \geq \phi_1$.
3. See EC2, anchorage lengths, to determine when to use anchor type f, g or h at the end of the ϕ_2 reinforcing bar. (The length is measured from the centreline of the support.)
4. The double tie solution (C) is only valid where $b_1 \leq 65$ cm and ≤ 0.75 d. Where 65 cm $< b_2 \leq 125$ cm, use solution (D). Where 125 cm $< b_3 \leq 185$ cm, use solution (E).
5. Note that the web may need to be reinforced with skin reinforcement.
6. The top of the beam is smoothed with a float or power float.
7. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

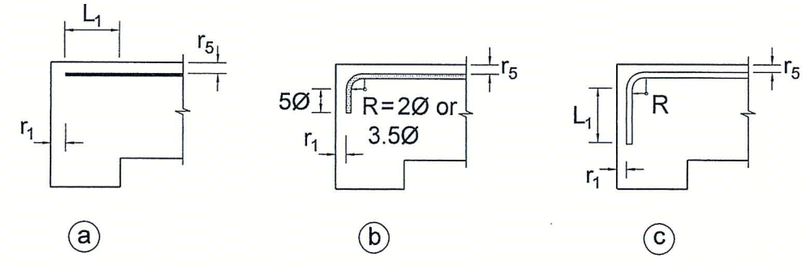
2. STATUTORY LEGISLATION

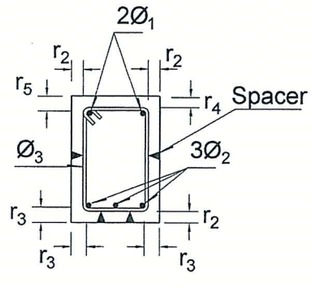
See EC2 (5).

CD – 05.02

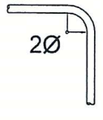
BEAMS.
HEADER JOIST



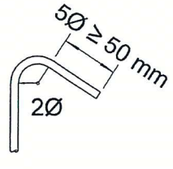




SECTION A-A



90º BEND



HOOK

CD – 05.02

NOTES

1. RECOMMENDATIONS

1. $r_1 = 2.5\ cm \geq \phi_1$.

   $r_2 = 2.5\ cm$.

   $r_3 \geq \phi_2$.

   $r_4 = r_2$.

   AR. If the top of the beam is horizontal and exposed to rain or condensed water, $r_4 = 3\ cm$.

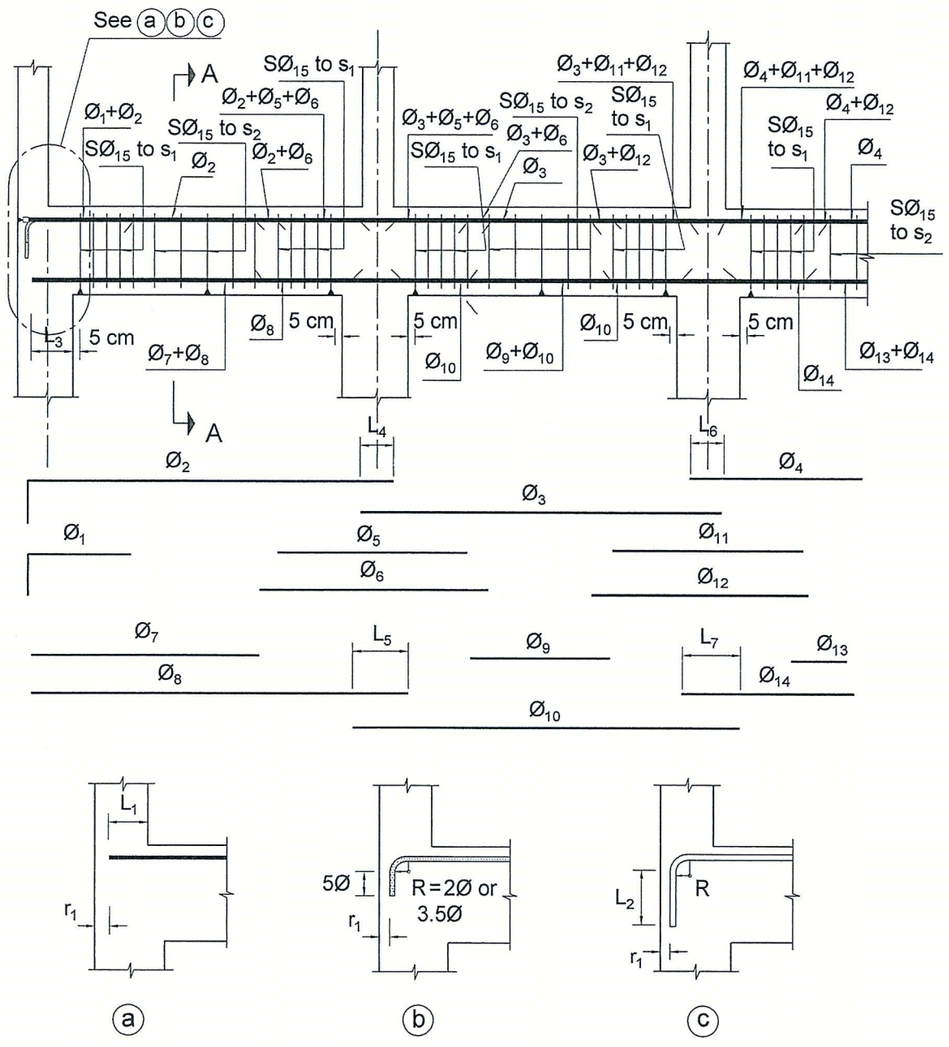
   $r_5 \geq \phi_1$

2. See EC2, anchorage lengths, to determine when to use anchor type a, b or c at the end of the ϕ_1 reinforcing bar.
3. See EC2 for information on calculating length L_3.
4. Note that the web may need to be reinforced with skin reinforcement.
5. The top of the beam is smoothed with a float or power float.
6. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

See EC2 (5).

BEAMS.
CONTINUOUS LINTELS WITH CONSTANT DEPTH



SECTION A-A

90º BEND

HOOK

NOTES

1. RECOMMENDATIONS

1. $r_1 = 2.5$ cm.

   $r_2 = 2.5$ cm.

   $r_3 \begin{cases} \geq \phi_7 \\ \geq \phi_8 \end{cases}$

   $r_4 = 2.5$ cm.

   If the top of the beam is horizontal and exposed to rain or condensed water, $r_4 = 3$ cm.

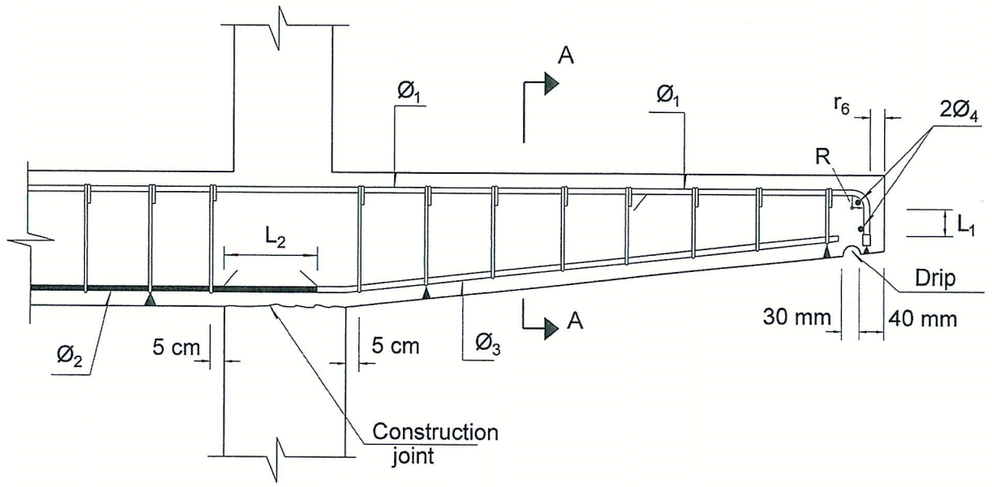
   $r_5 \geq \phi_2$.

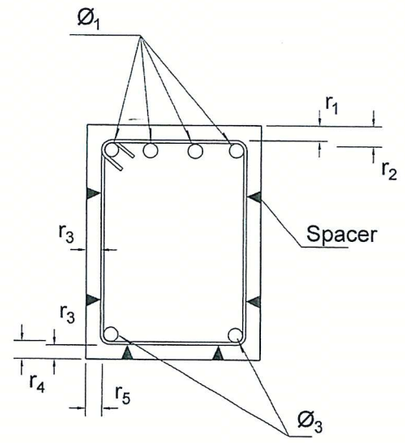
2. See EC2, anchorage lengths, to determine when to use anchor type a, b or c at the end of the ϕ_1 and ϕ_2 reinforcing bars.
3. See EC2 for information on calculating length L_3.
4. L_4 is the lap length in the thicker of the ϕ_2 or ϕ_3 bars, L_5 is the lap length in the thicker of the ϕ_8 or ϕ_{10} bars L_6 is the lap length in the thicker of ϕ_3 or ϕ_4 bars and L_7 is the lap length in the thicker of the ϕ_{10} or ϕ_{14} bars.
5. Note that the web may need to be reinforced with skin reinforcement.
6. The top of the beam is smoothed with a float or power float.
7. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

See EC2 (5).

BEAMS.
CANTILEVERED BEAMS





SECTION A-A

NOTES

1. RECOMMENDATIONS

1. See CD – 05.01 and CD – 05.03 for general considerations.
2. Members exposed to the elements should be fitted with a dripstone.
3. $r_1 = 2.5$ cm.

   If the top is horizontal and exposed to rain or condensed water, $r_1 = 3$ cm.

   $r_2 \geq \phi_1$.

   $r_3 = 2.5$ cm.

   $r_4 \geq \phi_3$

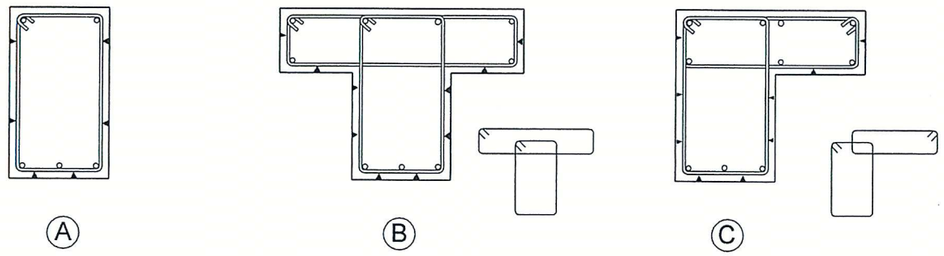
   $r_5 \begin{cases} \geq \phi_1 \\ \geq \phi_3 \end{cases}$

   $r_6 = 2.5$ cm $\geq \phi_1$.
4. If thick bars are used in short cantilevers, length L_1 must be verified.
5. L_2 is the lap length of the thicker of the ϕ_2 or ϕ_3 bars.
6. The top of the beam is smoothed with a float or power float.

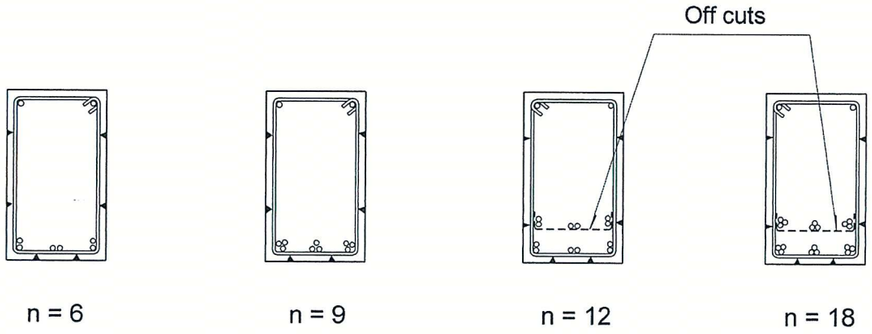
2. STATUTORY LEGISLATION

See EC2 (5).

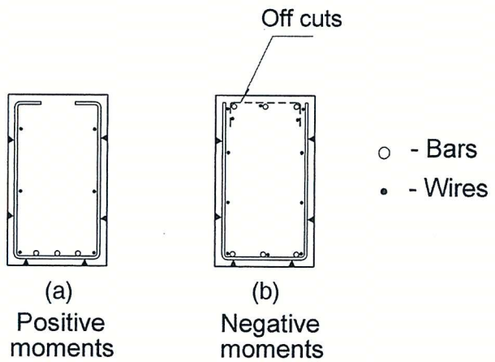
CD – 05.15	BEAMS. ARRANGEMENT OF REINFORCEMENT AT CROSS-SECTION



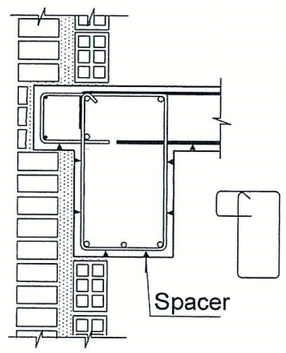
CROSS-SECTIONAL VARIATIONS



USE OF BUNDLES



USE OF WELDED-WIRE MESH IN PLACE OF STIRRUPS



BEAM SUPPORTING THE OUTER LAYER OF FACADE ENCLOSURES TO REDUCE THERMAL BRIDGES

CD – 05.15	NOTES

1. RECOMMENDATIONS

1. See CD – 05.01 to CD – 05.03 for cover dimensions and associated details.
2. Note that where bundles are used, while the cover dimension is determined in terms of the equivalent diameter, the cover must actually be measured from the outermost bar in the bundle.

2. STATUTORY LEGISLATION

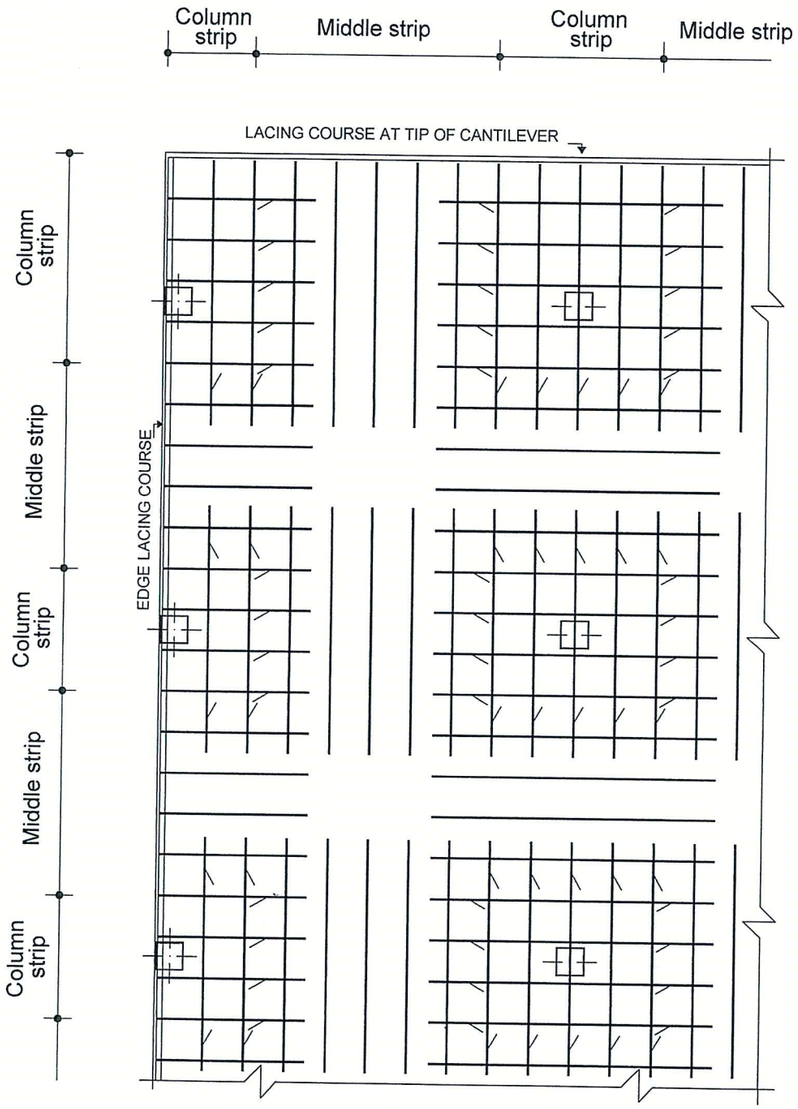
See EC2 (5).

Group 07

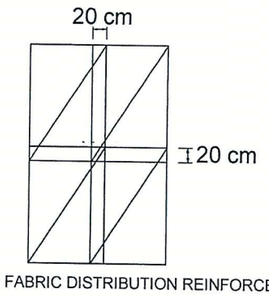
Flat slabs

CD – 07.01

FLAT SLABS. TOP REINFORCEMENT



WELDED-WIRE FABRIC IS LAID ON TOP AS DISTRIBUTION REINFORCEMENT $\neq \varnothing_1 \cdot \varnothing_1 \cdot s_1 \cdot s_1$



LAPPING IN WIRE FABRIC DISTRIBUTION REINFORCEMENT

CD – 07.01

NOTES

1. RECOMMENDATIONS

1. See CD – 07.04 for concrete cover and other details.
2. The top reinforcement runs in the direction of the larger span, on top of and in contact with the perpendicular reinforcement.
3. See CD – 07.05, CD – 07.06, CD – 07.07 and CD – 07.08 for possible punching shear reinforcement, which is not shown in this solution.
4. The general arrangement is valid for slabs with pockets and solid slabs, although in that case the parallel reinforcing bars should be spaced at no more than 25 cm.
5. The top is smoothed with floats or a power float.
6. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

See EC2 (5) (although the code contains scant information on the subject).

3. RECOMMENDED ALTERNATIVE CODES

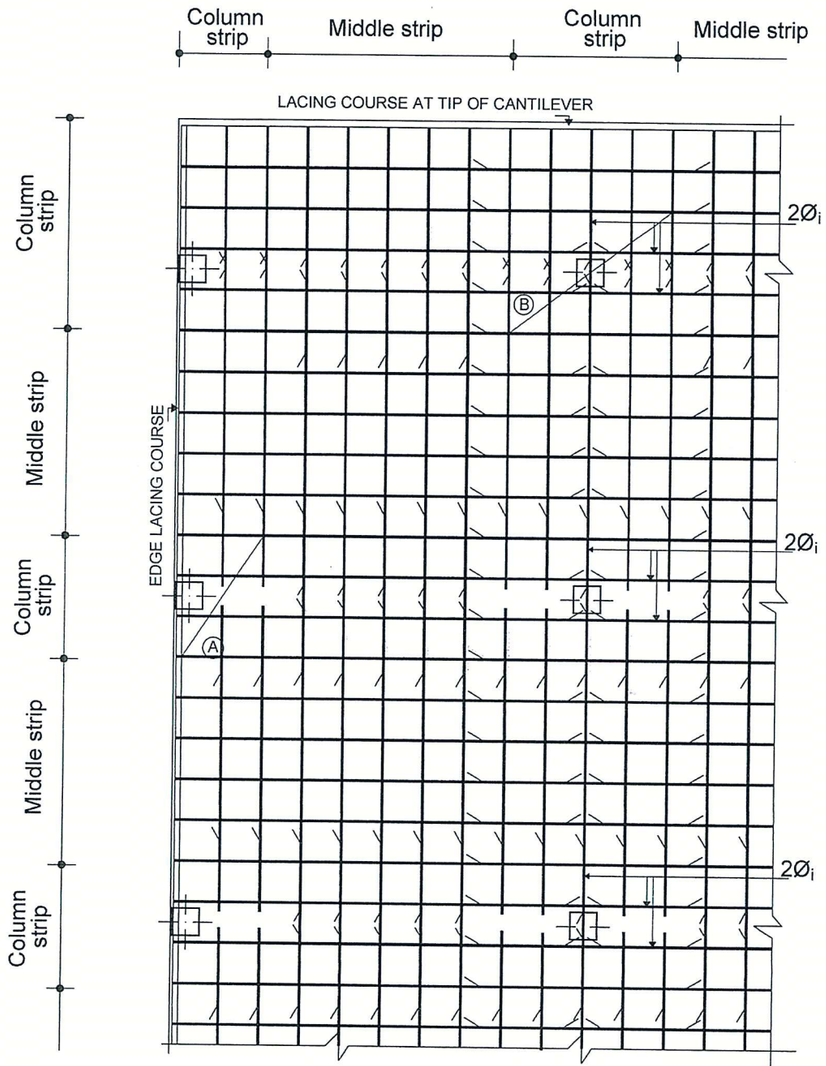
See ACI 318-08 (22).

4. SPECIFIC REFERENCES

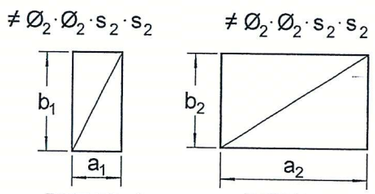
See (30).

CD – 07.02

FLAT SLABS. BOTTOM REINFORCEMENT

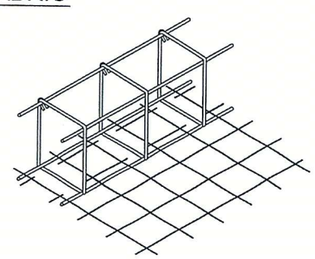


THE ENTIRE BOTTOM OF ABACUS SHOULD BE REINFORCED WITH WELDED-WIRE FABRIC



DETAIL A

DETAIL B



DETAIL OF LAPPING BETWEEN WELDED-WIRE FABRIC ON BOTTOM AND EDGE TIE BEAM

CD – 07.02

NOTES

1. RECOMMENDATIONS

1. See CD – 07.04 for concrete cover and other details.
2. The top reinforcement runs in the direction of the larger span, on top of and in contact with the perpendicular reinforcement.
3. See CD – 07.05, CD – 07.06, CD – 07.07 and CD – 07.08 for possible punching shear reinforcement, which is not shown in this solution.
4. The general arrangement is valid for slabs with pockets and solid slabs, although in that case the parallel reinforcing bars should be spaced at no more than 25 cm.
5. **AR.** The two ϕ_1 reinforcing bars (integrity reinforcement) overlap by their lap length in the area over the column (see (22)).
6. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

See EC2 (5) (although the code contains scant information on the subject).

3. RECOMMENDED ALTERNATIVE CODES

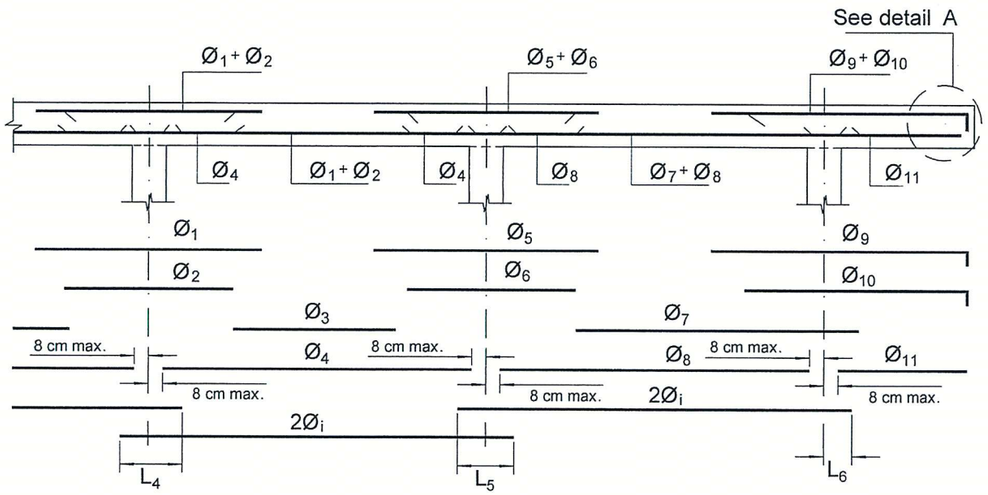
See ACI 318-08 (22).

4. SPECIFIC REFERENCES

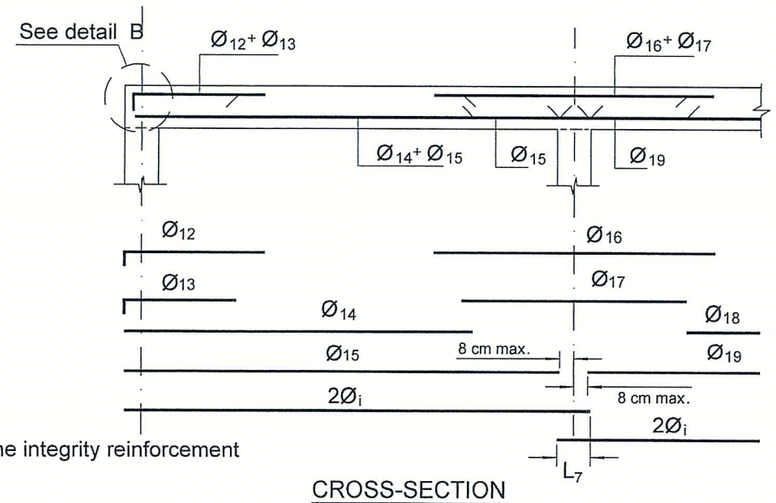
See (30).

CD – 07.03	FLAT SLABS. ARRANGEMENT OF FLEXURAL REINFORCEMENT (1 of 2)

(A) COLUMN STRIP

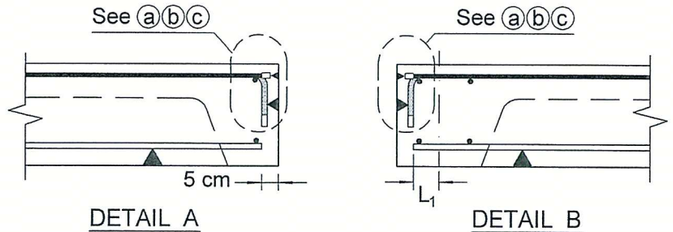


LONGITUDINAL SECTION



Øi is the integrity reinforcement

CROSS-SECTION



DETAIL A DETAIL B

(THE DETAIL FOR THE EDGE LACING COURSE SHOWN IN CD-07.04)

CD – 07.03	NOTES

1. RECOMMENDATIONS

1. See CD – 07.04 for concrete cover and other details.
2. The top reinforcement runs in the direction of the larger span, on top of and in contact with the perpendicular reinforcement.
3. See CD – 07.05, CD – 07.06, CD – 07.07 and CD – 07.08 for possible punching shear reinforcement, which is not shown in this detail.
4. The general arrangement is valid for slabs with pockets and solid slabs, although in that case the parallel reinforcing bars should be spaced at no more than 25 cm.
5. See 1.6 to determine when to use anchor type a, b or c in details A and B.
6. See EC2 (5) for the procedure to calculate L_1 (detail B).
7. The top is smoothed with floats or a power float.
8. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

See EC2 (5) (although the code contains scant information on the subject).

3. RECOMMENDED ALTERNATIVE CODES

See ACI 318-08 (22).

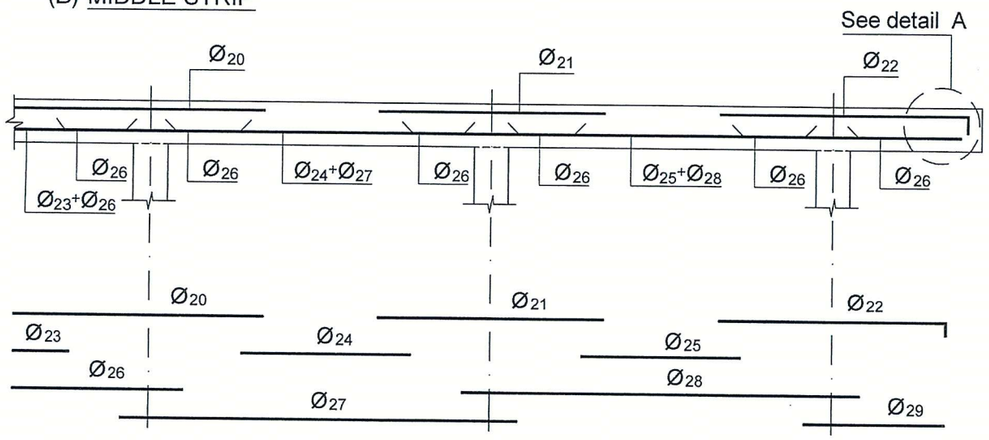
4. SPECIFIC REFERENCES

See (30).

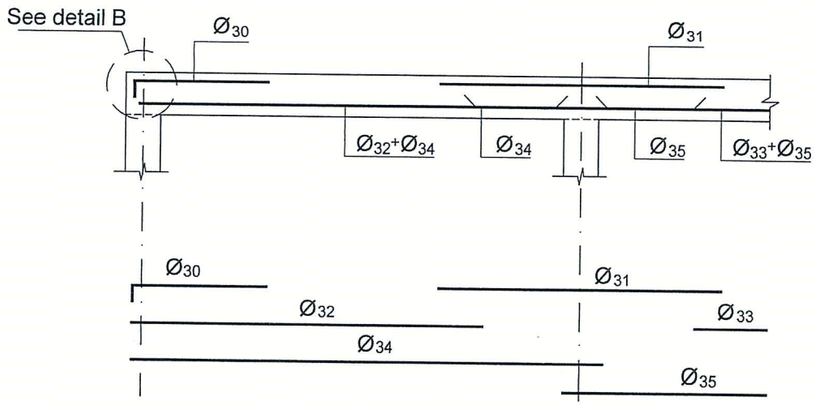
CD – 07.03

FLAT SLABS. ARRANGEMENT OF FLEXURAL REINFORCEMENT (2 of 2)

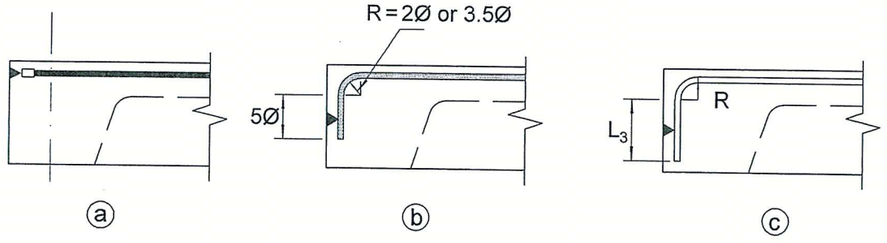
(B) MIDDLE STRIP



LONGITUDINAL SECTION



CROSS-SECTION



(THE DETAIL FOR THE EDGE LACING COURSE SHOWN IN CD-07.04)

CD – 07.03

NOTES

1. RECOMMENDATIONS

1. See CD – 07.04 for concrete cover and other details.
2. The top reinforcement runs in the direction of the larger span, on top of and in contact with the perpendicular reinforcement.
3. See CD – 07.05, CD – 07.06, CD – 07.07 and CD – 07.08 for possible punching shear reinforcement, which is not shown in this detail.
4. The general arrangement is valid for slabs with pockets and solid slabs, although in that case the parallel reinforcing bars should be spaced at no more than 25 cm.
5. See 1.6 to determine when to use anchor type a, b or c in details A and B.
6. See EC2 for the procedure to calculate L_1 (detail B).
7. The top is smoothed with floats or a power float.
8. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

See EC2 (5) (although the code contains scant information on the subject).

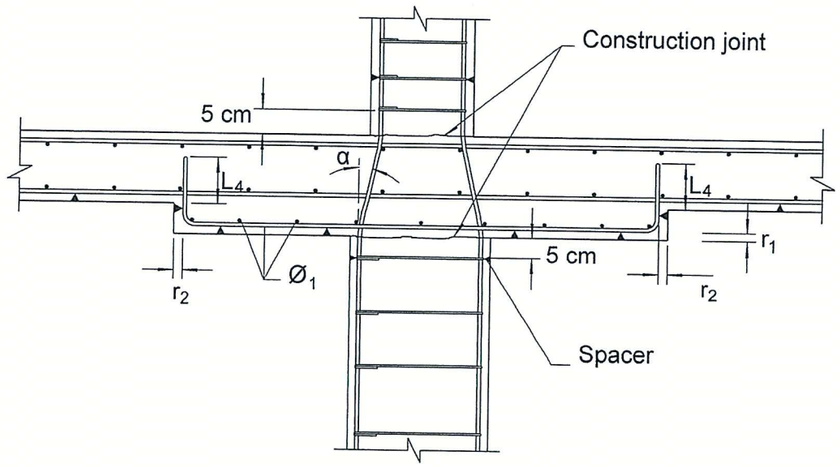
3. RECOMMENDED ALTERNATIVE CODES

See ACI 318-08 (22).

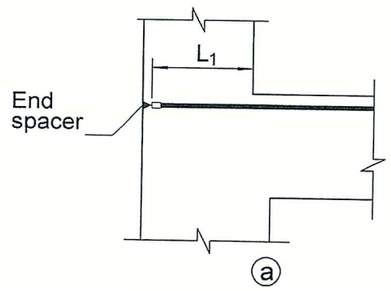
4. SPECIFIC REFERENCES

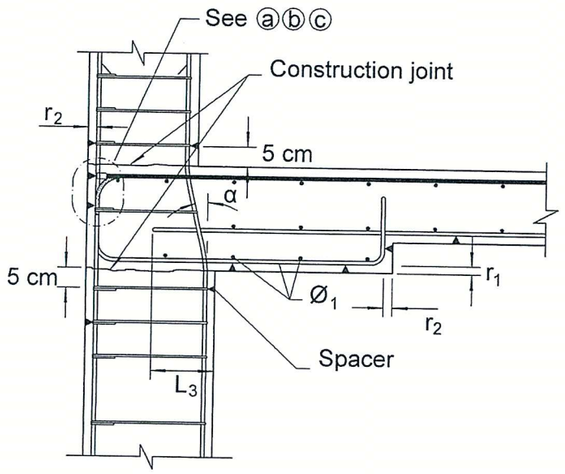
See (30).

FLAT SLABS.
DROP PANELS

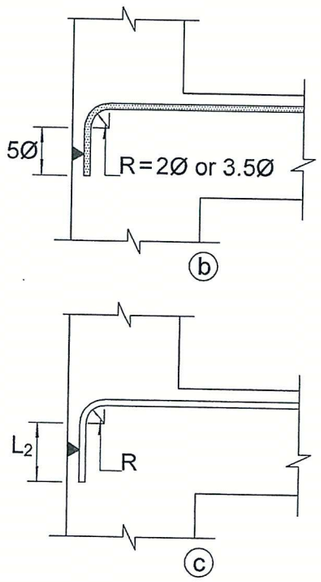


INTERNAL COLUMN





EDGE OR CORNER COLUMN



NOTES

1. RECOMMENDATIONS

1. $L_4 = 10\ \phi_1$.
2. $r_1 = 2.5\ cm \geq \phi_1$.

   $r_2 = 2.5\ cm \geq \phi_1$.
3. For column transition details, depending on whether tan α is smaller or greater than 1/6, see CD – 03.04 to CD – 03.14.
4. While column ties are not needed in the node or drop areas of inner columns, they are necessary in edge and corner columns.
5. See EC2, anchorage lengths, to calculate lengths L_1 and L_2 in details a, b and c.
6. See Recommendation 5 in CD – 06.02 for the procedure to calculate L_3.
7. See CD – 07.03 and CD – 07.04 for concrete cover and other details.
8. See 1.2 and 1.3 for descriptions of how to tie bars and place spacers.

2. STATUTORY LEGISLATION

See EC2 (5).

3. RECOMMENDED ALTERNATIVE CODES

See ACI 318-08 (22).

4. SPECIFIC REFERENCES

See (30).