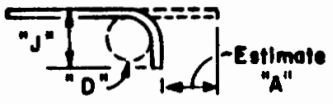
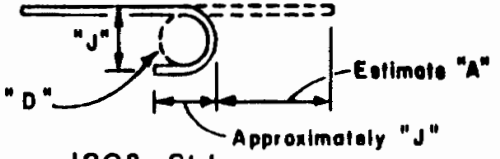
REINFORCING BAR DATA - GRADE 60 (ACI 318-83)

SIZE #	PHYSICAL PROPERTIES					HOOK DIMENSIONS									
						STANDARD					STIRRUPS AND TIES				
						90°		180°			90°		135° SEISMIC		
	Weight Lbs/Ft.	Nominal Diam. Inches	† Approx. Dia. Outside Deformation Inches	Area Sq.in.	Perim Inches	"J"	"A"	"J"	"A"	"D"	"J"	"A"	"A"	Ext.*	"D"
3	0.376	0.375	0.44	0.11	1.178	6"	5"	3"	5"	2 1/4"	4"	3"	7 1/4"	6"	1 1/2"
4	0.668	0.500	0.56	0.20	1.571	8"	7"	4"	6"	3"	4 1/2"	3 1/2"	7 1/2"	6"	2"
5	1.043	0.625	0.69	0.31	1.963	10"	9"	5"	7"	3 3/4"	6"	4 1/2"	8"	6 1/4"	2 1/2"
6	1.502	0.750	0.88	0.44	2.356	1'-0"	10"	6"	8"	4 1/2"	1'-0"	10 1/2"	10 3/4"	7 1/2"	4 1/2"
7	2.044	0.875	1.00	0.60	2.749	1'-2"	1'-0"	7"	10"	5 1/4"	1'-2"	1'-0 1/4"	1'-0 1/2"	8 3/4"	5 1/4"
8	2.670	1.000	1.13	0.79	3.142	1'-4"	1'-2"	8"	11"	6"	1'-4"	1'-2"	1'-2 1/4"	10"	6"
9	3.400	1.128	1.25	1.00	3.544	1'-7"	1'-4"	11 1/4"	1'-3"	9"					
10	4.303	1.270	1.44	1.27	3.99	1'-10"	1'-6"	1'-0 3/4"	1'-5"	10 1/4"					
11	5.313	1.410	1.63	1.56	4.43	2'-0"	1'-8"	1'-2 1/4"	1'-7"	11 1/4"					
14	7.65	1.693	1.88	2.25	5.32	2'-7"	2'-1"	1'-8 1/2"	2'-2"	1'-5"					
18	13.60	2.257	2.50	4.00	7.09	3'-5"	2'-9"	2'-3"	2'-11"	1'-10 1/2"					

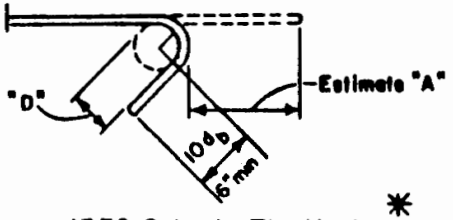
* Dimension hooks on plans because the standard is less than the seismic requirement.
† USE DEFORMATION DIAMETER WHEN CALCULATING CLEARANCES.



90° Std.
90° Stirrup/Tie

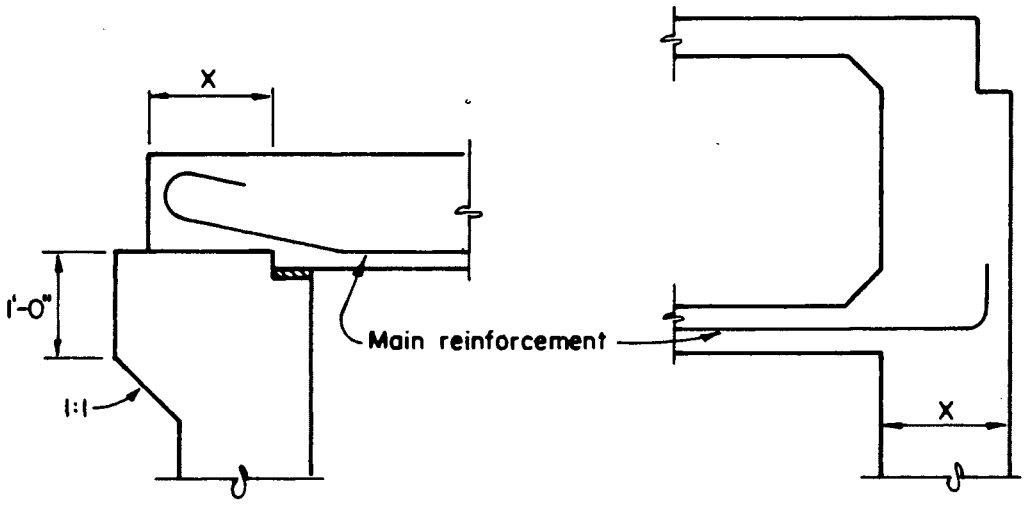


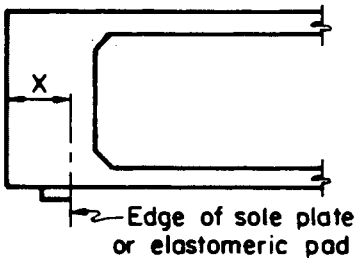
180° Std.



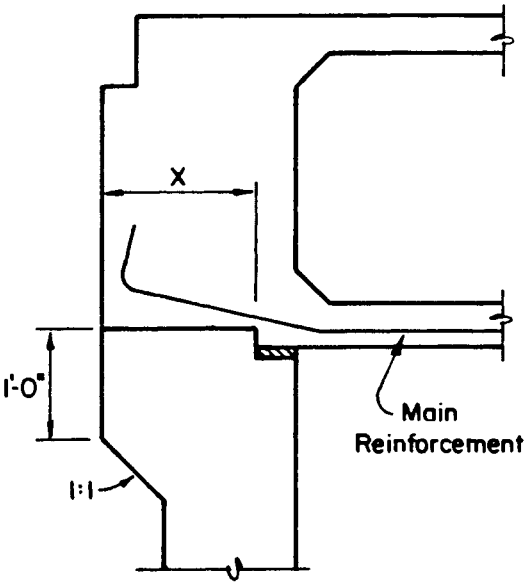
135° Seismic Tie Hooks *

ANCHORAGE OF MAIN REINFORCEMENT





Main Reinf	Min. X (3)	
	with hook (1)	without hook (2)
*6	0'-8"	1'-2"
*7	0'-10"	1'-2"
*8	0'-11"	1'-2"
*9	1'-0"	1'-4"
*10	1'-1"	1'-8"
*11	1'-2"	2'-0"
*14	1'-3"	2'-8"
*18	1'-6"	3'-6"



(1) These dimensions based on experience.

(2) One half the working strength of bar developed by bond. Minimum length 1'-0" + 2" cover. f'_c = 3250 psi.

(3) Not less than length required by AASHTO Article 1.5.13.

Note: Special consideration should be given to abutment details in order to provide adequate anchorage of main reinforcement. The standard Strutted Abutment sheet may require alterations.

Development Length of Deformed Bars

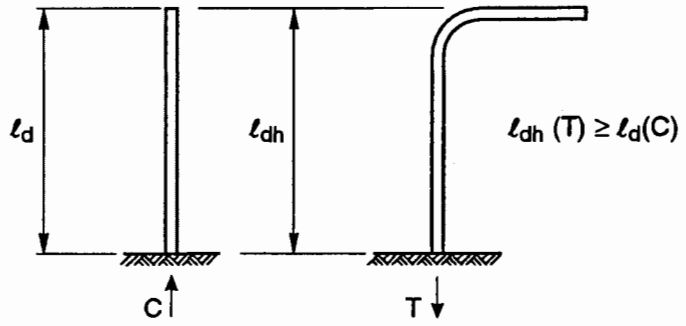
A. Column Bar Development

Bridge columns are designed by Ultimate Strength Design methods. The anchorage of column reinforcement in footings and caps should comply with the following minimum requirements in order to be consistent with the design assumptions:

1. The tables are established for Grade 60 reinforcement and f'_c = 3,250, f'_c = 4,000 and f'_c = 5,000 psi concrete. For other strengths, apply the appropriate reduction factor from below to the basic straight bar development length for f'_c = 3,250 psi, before applying spacing or confinement factors.*

f'_c = 3,500 psi (0.964)	f'_c = 5,000 psi (0.806)
4,000 psi (0.901)	5,500 psi (0.769)
4,500 psi (0.850)	6,000 psi (0.736)

2. Hooks are not considered effective in developing reinforcement in compression. Therefore, the tension hook cannot be less than the basic development length of compression bars. As a result, compression controls for all bar sizes in the chart for hooked bars.**



Column Bars in Compression

3. If hooked bars are used, care should be taken to make sure that the hooks will fit into the cap. Hooks are required in footings. When concentric bundled bars are used for column reinforcement, *the footing hooks of the inner pattern of bars may be omitted*, provided the footing is thick enough to develop straight bars. If all bars of a bundle are hooked, the hooked shall be separated a minimum of 6 inches vertically. See illustrations.

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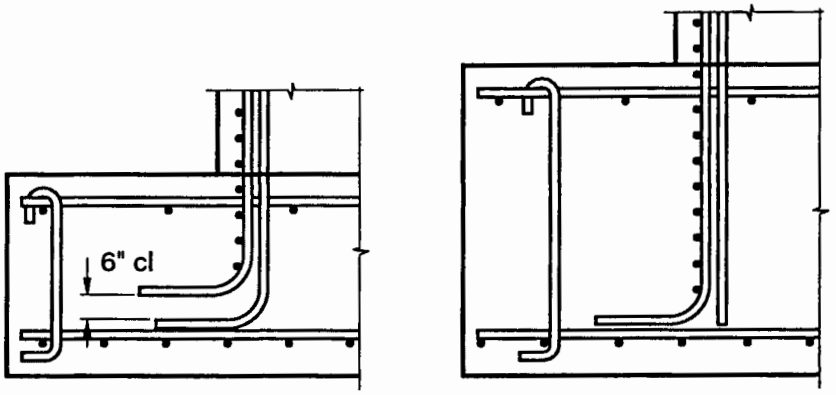
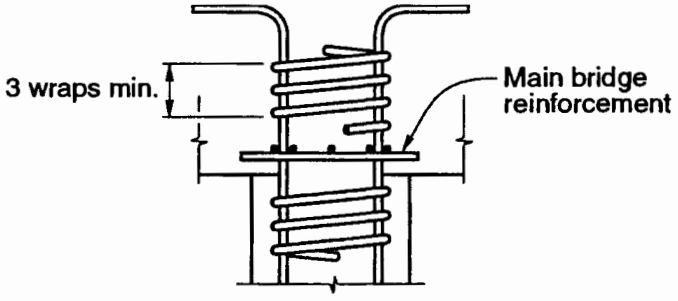
* Some spacing or confinement reduction factors are not applicable to #14 and #18 bars. See Table 1.

** Except as noted.



Concentric Bundled Bars Anchored in Footing

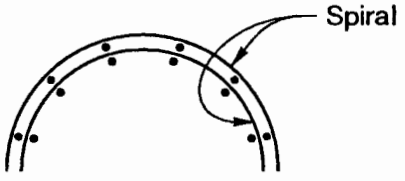
4. Seismic design criteria requires spirals to be extended into bent caps and footings. Sufficient embedment must be provided to develop the hooked bar and allow for a minimum of three complete wraps of spiral between point-of-tangency on hook and steel mat in connected member. See illustration.

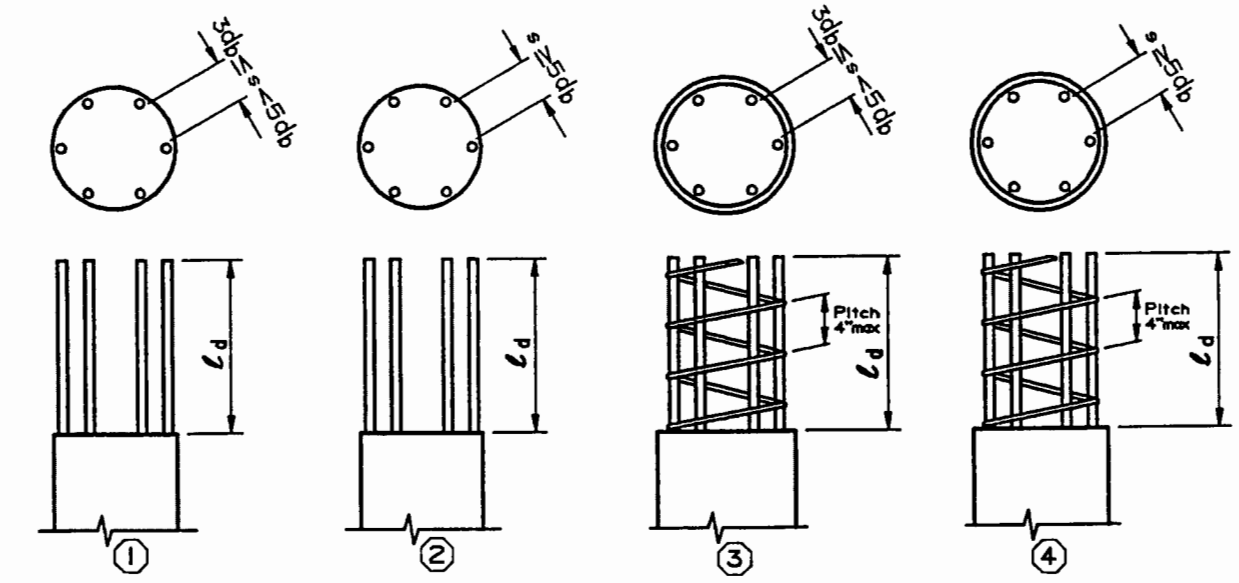


Spiral Extension in Bent Cap

Although spiral confinement is required around developed ends of column bars as an OSD Seismic Policy, *reduction in hook length for #14's and 18's in tension is not allowed by AASHTO.*

5. A concentric arrangement of main column reinforcement separated by a spiral is considered bundled bars. Use when confinement or shear is critical. This configuration is difficult to construct, therefore, other solutions (i.e. larger column section, higher strength concrete, etc.) should be investigated.



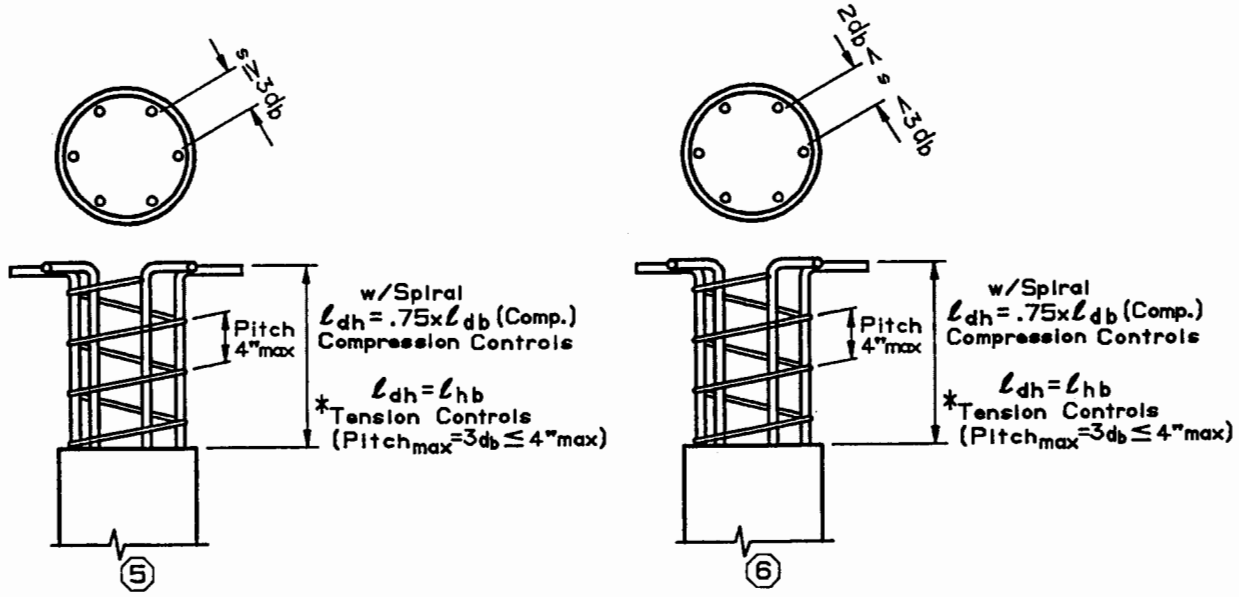


Basic Condition
No Spiral Confinement
$3d_b \leq$ Bar Spacing $< 5d_b$
$\ell_d = \ell_{db}$

Spacing Condition
No Spiral Confinement
Bar Spacing $\geq 5d_b$
$\ell_d = .8\ell_{db}$

Confinement Condition
Spiral Confinement
$3d_b \leq$ Bar Spacing $< 5d_b$
$\ell_d = .75\ell_{db}$

Combination Condition
Spiral Confinement
Bar Spacing $\geq 5d_b$
$\ell_d = .75 \times .80 \times \ell_{db}$



NOTATIONS:

s	=	Minimum Clear Spacing
d_b	=	Nominal Diameter of Bar
ℓ_{db}	=	Basic Development Length, in. (ACI 12.2)
$\ell_{db(Comp)}$	=	Basic Development Length of Bars in Compression, in. (ACI 12.3)
ℓ_{hb}	=	Basic Development Length of Standard Hook in Tension, in. (ACI 12.5)
ℓ_{dh}	=	Development Length of Standard Hook in Tension

BAR SIZE	BASIC ℓ_{db}	DEVELOPMENT LENGTHS ℓ_d OF DEFORMED BARS IN TENSION — CONDITIONS: Basic ① $\ell_d = \ell_{db}$	Spacing ② $\ell_d = .8\ell_{db}$	Confinement ③ $\ell_d = .75\ell_{db}$	Combined ④ $\ell_d = .6\ell_{db}$	DEVELOPMENT LENGTHS ℓ_{dh} OF HOOKED BARS — CONDITIONS: Basic ℓ_{hb}	ℓ_{dh} ⑤ $s \geq 3d_b$	ℓ_{dh} ⑥ $2d_b < s < 3d_b$
#4	8.4	16②	16②	16②	16②	11	8	12
#5	13.1	20②	20②	20②	20②	14	10	15
#6	18.5	24②	24②	24②	24②	16	12	17
#7	25.3	28②	28②	28②	28②	19	14	20
#8	33.3	34	32②	32②	32②	21	16	23
#9	42.1	43	36②	36②	36②	24	18	26
#10	53.5	54	43	40②	40②	27	20	29
#11	65.7	66	53	50	45②	30	23	32
#14	89.5	90	90①	68	68①	-	48*	60
#18	131.6	132	132①	99	99①	-	60*	102

f'_c= 3,250 psi f_y= 60,000 psi

Table 1

BAR SIZE	BASIC ℓ_{db}	DEVELOPMENT LENGTHS ℓ_d OF DEFORMED BARS IN TENSION — CONDITIONS: Basic ① $\ell_d = \ell_{db}$	Spacing ② $\ell_d = .8\ell_{db}$	Confinement ③ $\ell_d = .75\ell_{db}$	Combined ④ $\ell_d = .6\ell_{db}$	DEVELOPMENT LENGTHS ℓ_{dh} OF HOOKED BARS — CONDITIONS: Basic ℓ_{hb}	ℓ_{dh} ⑤ $s \geq 3d_b$	ℓ_{dh} ⑥ $2d_b < s < 3d_b$
#4	7.6	15②	15②	15②	15②	10	8	12
#5	11.8	18②	18②	18②	18②	12	9	13
#6	16.7	22②	22②	22②	22②	15	12	17
#7	22.8	25②	25②	25②	25②	17	13	18
#8	30.0	30	29②	29②	29②	19	15	20
#9	37.9	38	33②	33②	33②	22	17	24
#10	48.2	49	40	37	36②	25	19	27
#11	59.2	60	48	45	41②	27	21	29
#14	80.6	81	81①	61	61①	-	48*	60
#18	118.6	120	120①	90	90①	-	60*	102

f'_c= 4,000 psi f_y= 60,000 psi

Table 2

BAR SIZE	BASIC ℓ_{db}	DEVELOPMENT LENGTHS ℓ_d OF DEFORMED BARS IN TENSION — CONDITIONS: Basic ① $\ell_d = \ell_{db}$	Spacing ② $\ell_d = .8\ell_{db}$	Confinement ③ $\ell_d = .75\ell_{db}$	Combined ④ $\ell_d = .6\ell_{db}$	DEVELOPMENT LENGTHS ℓ_{dh} OF HOOKED BARS — CONDITIONS: Basic ℓ_{hb}	ℓ_{dh} ⑤ $s \geq 3d_b$	ℓ_{dh} ⑥ $2d_b < s < 3d_b$
#4	6.8	13②	13②	13②	13②	9	8**	10
#5	10.5	16②	16②	16②	16②	12	9	13
#6	14.9	20②	20②	20②	20②	14	11	15
#7	20.4	23②	23②	23②	23②	16	12	17
#8	26.8	27	26②	26②	26②	18	14	19
#9	33.9	34	29②	29②	29②	21	16	22
#10	43.1	44	36	33②	33②	23	18	25
#11	52.9	53	43	40	36②	26	20	28
#14	72.1	73	73①	55	55①	-	48*	60
#18	106.1	107	107①	81	81①	-	60*	102

f'_c= 5,000 psi f_y= 60,000 psi

Table 3

*See Sheet 13-14.2

**8" minimum controls (ACI 12.3.1)

① Condition case not applicable to #14 or #18 (ACI 12.2.3.4.)

② Minimum development length $.03 d_b \times f_y / \sqrt{f'_c}$ (ACI 12.2.3.6)

③ Minimum basic development Length $0.0004 d_b f_y$ (AASHTO 8.25.1)

Note:
For $f'_c \geq 4{,}444$ psi, minimum basic development length of $0.0003 d_b f_y$ governs; for Grade 60, $\ell_d = 18 d_b$ (ACI 12.3.2)

B. Notes on Development of Deformed Bars in Tension

Minimum Bar Spacing

Minimum clear spacing of deformed bars shall be 3 d_b. If a smaller spacing is used, the basic development length shall be factored by the appropriate factors of 2.0 or 1.4 in accordance with ACI 12.2.3.

Development of Bundled Bars (in tension or compression)

1. Development length of individual bars within a bundle shall be that for the individual bar multiplied by:

   1.0 .....for 2 bar bundle
   1.2 .....for 3 bar bundle
   1.33 .....for 4 bar bundle

2. The equivalent bar diameter shall be used in treating a unit of bundled bars when ACI Sections 12.2.3 and 12.2.4.3 are applied.

Modification Factors for Development Length in Tension

1. Top Reinforcement 1.3
2. Lightweight Aggregate Concrete 1.3
3. Epoxy-Coated Reinforcement
   For
   a. clear spacing .....$\geq 6\ d_b$ and
      cover .....$\geq 3\ d_b \ldots \ell_d = 1.2\ \ell_{db}$ (Note 1)
   b. clear spacing .....$< 6\ d_b$ or
      cover .....$< 3\ d_b \ldots \ell_d = 1.5\ \ell_{db}$ (Note 1 and 2)

4. Bar spacing, cover, and enclosing transverse reinforcement
   For bars satisfying ACI Section 12.2.3.1 .....1.0 (Note 3)
   For bars with clear spacing of $2d_b$ or less.....2.0
   For bars with clear spacing $2\ d_b < S < 3\ d_b$ 1.4

Note 1. In addition to other modifiers.
Note 2. For the combined effects of top reinforcement (ACI 12.2.4.1) and epoxy coating (ACI 12.2.4.3), the modification factor need not exceed 1.7.
Note 3. Charts on page 13-14.2 and 13-14.3 already satisfy ACI 12.2.3.1.

5. The basic development length may be reduced for certain bar spacing conditions, confinement within a spiral or excess reinforcement, where permissible. Refer to Table 4 for appropriate factors.

Table 4 – Summary of Modification Factors for Development Length in Tension

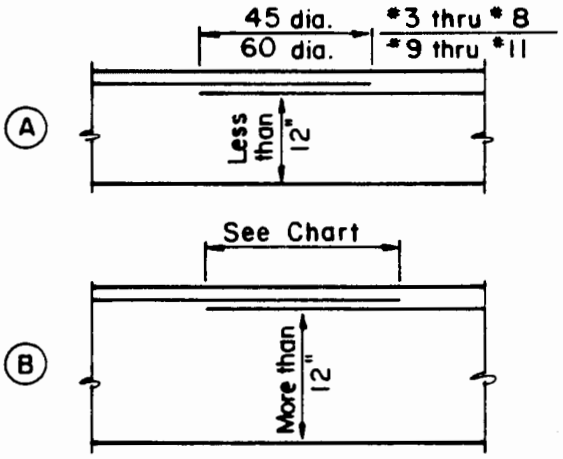
Item	Parameters	Modification Factor	ACI Code Section
1	Bar spacing, cover, and enclosing transverse reinforcement	1.0, 2.0, or 1.4	12.2.3.1 to 12.2.3.3
2	Bar spacing	0.8	12.2.3.4
3	Confinement	0.75	12.2.3.5
4	Top bar effect (1)	1.3	12.2.4.1
5	Lightweight aggregate concrete	1.3 or $6.7\sqrt{f'_c} / f_{ct} \not< 1$	12.2.4.2
6	Epoxy coated bars (1)	1.5 or 1.2	12.2.4.3
7	Excess reinforcement (2)	As required/As provided	12.2.5

(1) The product of items 4 (top bar effect) and 6 (epoxy coated bars) need not exceed 1.7.
(2) Not applicable to columns or plastic hinging zones.

REINFORCEMENT - SPLICING

1. SINGLE BAR SPLICES

LAP #3 THRU #11



SIZE	SPLICE LENGTH			
	(A)		(B)	
3	1'-5"	45 d laps	45 d laps	1'-5"
4	1'-11"			1'-11"
5	2'-4"			2'-4"
6	2'-10"			2'-10"
7	3'-3"		60 d laps	4'-5"
8	3'-9"			5'-0"
9	5'-8"	60 d laps	68 d	6'-5"
10	6'-4"		76 d	8'-1"
11	7'-1"		85 d	10'-0"

(A) Splice lengths are given in Section 52-1.08A of the Standard Specifications. Except as restricted by those specifications, a contractor can use these splices anywhere unless specifically noted otherwise on the plans.

Splice lengths for any condition other than (A) must be shown on the plans.

If more than 1/2 the bars in a given section are lap spliced within a required lap length, the splice length shall be calculated in accordance with Article 1.5.22(B) of AASHTO. If the calculated length exceeds that shown for Case (A), the splice length shall be shown on the plans.

#14 AND #18

Splice by welding or mechanical butt splices. Lap splices should not be permitted.

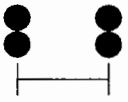
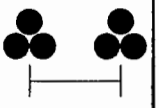
2. BUNDLED BAR SPLICE - LENGTHS

2 bar bundles - Same splice length as for single bars.
3 bar bundles - 1.2 times lap length single bar splice.
4 bar bundles - 1.33 " " " " " " .

Minimum Clearance and Spacing

Spacing

Listed below are preferred minimum spacings. These should be maintained when practicable, but in no case should the minimum spacing be less than as specified in *Bridge Design Specifications.*

Bar Size	Perferred Minimum Spacing (inches)			
				
4	3 1/4	3 1/4	4	4
5	3 1/2	3 1/2	4 1/4	4 1/4
6	3 3/4	3 3/4	4 1/2	4 1/2
7	4	4	4 3/4	4 3/4
8	4 1/4	4 1/4	5	5 1/4
9	4 1/2	4 1/2	5 1/2	5 3/4
10	4 3/4	5	6	6 1/4
11	5	5 1/2	6 1/2	7
14	5 1/2	6	7 1/2	—
18	6	7 1/2	10	—

Where minimum spacing limitations are based on bar size, a unit of bundled bars shall be treated as single bar of diameter derived from the equivalent total area. For bundles having equal size bars the diameter for spacing shall be the diameter of a single bar multiplied by the following factors:

2 bar bundles = 1.414
3 bar bundles = 1.732

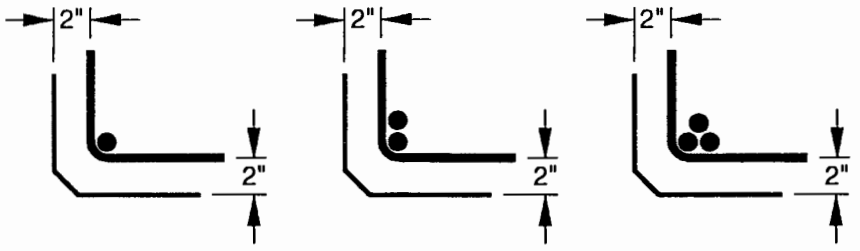
For minimum bar spacing for CIP concrete piles, see *Bridge Design Details,* page 13-22.

Bar Size Restrictions

Number 14 and number 18 bars which would require splicing should be specified only when it is impractical to use smaller bars.

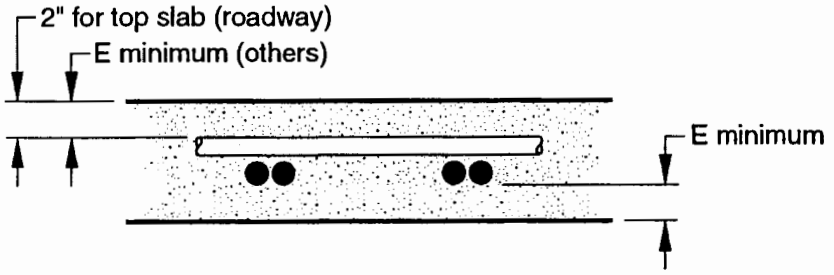
Covering

To any reinforcement exposed to weather:
a) Mass sections (caps, columns etc.,)



b) Slabs

Bar Size	E (inches)
4	1
5	1
6	1¼
7	1½
8	1½
9	1¾
10	2
11	2
14	2
18	2¼



Minimum Covering

Slabs: #4 thru #9 – 1½ nominal diameter or 1" minimum
#10 thru #18 – 1 nominal diameter or 2" minimum

T-Beams and Box Girder Stems:
1" minimum clear to stirrups

Note: Girder reinforcement which is attached to deck slab reinforcement shall be embedded as determined by the slab bars without other limitations.

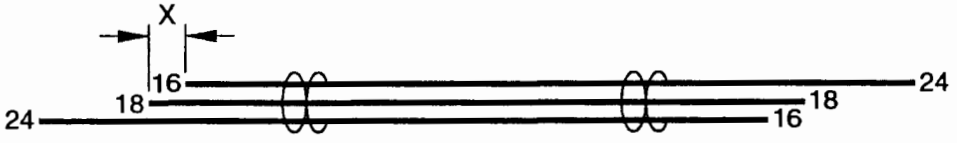
c) Use additional covering in marine environment. See *Bridge Design Specifications*, Article 8.22.

Bundle Bars

a) Size and Number:
Any size bars may be bundled in pairs. Bundles of three bars should preferably be used for #11 bars only. Consideration should be given to use of #14 and #18 bars when three #11 bar bundles are required.

b) Detailing:
Ties are schematic only, illustrate two per bundle in plan or elevation.

Indicate length or bars in bundles thus:

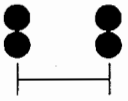
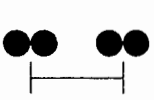
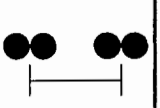


Plan or Elevation

Ordinarily, bundles or individual bars in a bundle will not be bent or hooked. The "X" dimension must not be less the forty bar diameters in a bundle.

Minimum Bar Spacing for CIP[1] Concrete Piles

Bar spacing for CIP piles is based on a clear spacing of at least five times the size of the maximum course aggregate (but not less than 5 inches clear) for CIP piling 24 inches and greater in diameter, and for CIP piling less than 24 inches in diameter 15 feet below the top of the pile.

Bar Size	Main Longitudinal Spacing			Spirals	Hoops	
						
4	6¼	6¼	6¾	6¼	—	—
5	6½	6½	7¼	6½	—	—
6	6¾	6¾	7¾	6¾	—	—
7	7	7	8	7	6	7
8	7¼	7¼	8½	—	6¼	7½
9	7½	7½	8¾	—	—	—
10	8	8	9½	—	—	—
11	8½	8½	10	—	—	—
14	7	7	9	—	—	—
18	7½	7½	10	—	—	—

NOTES: Spacings shown above are in inches.

Spacings shown for #4 through #11 (main reinforcement) and #4 through #7 (spirals) include lap splices.

[1]Cast-In-Place

WELDED WIRE FABRIC STANDARD SIZES

The following table includes the standard sizes of welded wire fabric produced in the west, and either carried in the fabricator's inventory or readily available through local suppliers. Except as noted, sizes listed are available either in plain or galvanized finish.

It should be kept in mind that unless the quantity of welded wire fabric is greater than 5 tons, the fabric types should be confined to the common types shown in the STANDARD SIZES AND TECHNICAL DATA table. Where the quantity is greater than 5 tons, special orders can be made to the sizes indicated in the conversion table on page 13-31.

The welded wire fabric for sizes larger than the common sizes should be shown as an alternative by use of the following note:

"Welded wire fabric providing areas of steel equal to those shown may be used at the contractor's option; minimum spacing, 4".

STANDARD SIZES AND TECHNICAL DATA

Spacing of Wires in Inches		American Steel and Wire Gauge No.		Cross Section Areas, Sq. In. per Ft.		Lbs. per C sq. ft. (2)	Standard Rolls	
Long	Trans.	Long	Trans.	Long	Trans.		Length	Width
2	2	10	10	.086	.086	60	100'	60"
2	2	12	12	.052	.052	37	150'	60"
2	2	14	14	.030	.030	21	150'	60" (1)
2	2	16	16	.018	.018	13	150'	60" (1)
2	4	12	12	.052	.026	28	200'	60"
2	4	13	13	.039	.020	21	200'	60"
3	3	10	10	.057	.057	41	150'	60"
3	3	14	14	.020	.020	14	200'	60" (1)
3	3	12	12	.035	.032	25	200'	60" (1)
3	3	8	8	.082	.082	58	150'	60"
4	4	4	4	.120	.120	85	100'	84"
4	4	6	6	.087	.087	62	100'	84"
4	4	8	8	.062	.062	44	150'	84"
4	4	10	10	.043	.043	31	150'	84"
4	4	12	12	.026	.026	19	200'	60"
4	4	14	14	.015	.015	11	200'	60" (1)
4	8	10	12	.043	.013	20	200'	84"
4	8	12	14	.026	.008	12	200'	60" (1)
4	1	12	12	.026	.013	14	200'	60"
4	8	8	12	.062	.013	27	200'	60"
4	12	5	7	.101	.025	45	150'	84"
4	12	6	10	.087	.014	36	200'	60"
4	12	4	9	.120	.017	49	150'	60"
4	12	7	11	.074	.011	31	150'	84"
4	12	8	10	.062	.014	27	200'	84"
4	12	8	12	.062	.009	26	200'	84"
4	12	10	12	.043	.009	19	200'	84"
6	6	4	4	.080	.080	58	100'	84"
6	6	4	6	.080	.058	50	100'	84"
6	6	5	5	.067	.067	49	100'	84"
6	6	6	6	.058	.058	42	150'	84"
6	6	8	8	.041	.041	30	150'	84"
6	6	9	9	.035	.035	25	150'	84"
6	6	10	10	.029	.029	21	200'	84"
6	6	12	12	.017	.017	13	150'	84"
6	6	3	3	.093	.093	68	(3)	(3)
6	12	6	6	.058	.029	32	150'	84"
6	12	4	4	.080	.040	44	150'	84"

WELDED WIRE FABRIC CONVERSION TABLE

CONVERSION TABLE SHOWING WIRE SIZE AND SPACING EQUIVALENT TO DESIGNATED REBARS

Rebar Size and Spacing		Center to Center Spacing of Wires						
		2"	3"	4"	6"	8"	10"	12"
#3 Bars	@ 6"	4½ ga.	2 ga.	1/0 ga.	3/8"	5/0 ga.	7/0 ga.	
	@ 8"	6	3½	1½	2/0	3/8"	5/0	6/0
	@ 10"	7½	5	3½	1	2/0	3/8"	5/0½
	@ 12"	8½	6½	4½	2	1/0	3/0½	3/8
	@ 18"	10½	9	7	4½	1/4"	1	1/0
	@ 24"	11½	10	8½	6	4½	3	1½
#4 Bars	@ 6"	1/0½	3/0	5/0½	1/2"			
	@ 8"	1/4"	1/0	3/0	6/0½	1/2"		
	@ 10"	4	1	2/0½	4/0	6/0½	1/2"	
	@ 12"	5	1/4"	1/0½	3/0	5/0½	6/0	1/2"
	@ 18"	7½	5	3½	1/0½	3/0½	3/8"	5/0½
	@ 24"	9	7	5	2½	1/0½	2/0	3/0
#5 Bars	@ 6"	3/0	6/0½					
	@ 8"	2/0½	4/0	6/0½				
	@ 10"	1	3/0½	4/0	7/0			
	@ 12"	2	2/0½	3/0	6/0½			
	@ 18"	4½	2	1/0½	3/0	5/0	7/0½	
	@ 24"	6½	4	2	2/0½	3/0	5/0½	6/0½
#6 Bars	@ 8"	3/8"	6/0					
	@ 10"	3/0½	5/0½	7/0½				
	@ 12"	1/0	3/8"	5/0				
	@ 18"	1/4"	1/0	3/0	5/0	1/2"		
	@ 24"	4½	2	1/0	3/8"	5/0	7/0	

W-NUMBER WIRE SIZES

A new method of designating wire sizes for concrete reinforcement was adopted in 1970 by the American Society for Testing and Materials. The new system applies to ASTM Designation A 82, "Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement," and ASTM Designation A 185, "Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement." In this system the Steel Wire Gage numbers are replaced by W-Number size designations.

Transition to exclusive use of the new specifications will not be immediate and may require some period of time. Welded wire fabric may be specified during this transition period in accordance with ASTM A 185 by using either the former Steel Wire Gages or by the new W-Numbers.

Cross-sectional area is the most important parameter for selection of concrete reinforcement and is the basic element in the W-Number system. Each wire size is identified by a number directly corresponding to the nominal wire area in hundredths of a square inch. A Size W4 has an area of 0.04 sq. in., a Size W6.5 has an area of 0.064 sq. in., etc. Those responsible for selecting concrete reinforcement to meet specified areas of steel may thus easily determine wire sizes and spacings required.

Identification of welded wire fabric is by the same method used when wires were classified by Steel Wire Gages. A 3x6-W5xW2.5 welded wire fabric by the new W-Number system means a 3 inch by 6 inch mesh having Size W5 longitudinal wires spaced at 3 inches and Size W2.5 transverse wires spaced at 6 inches. There are 4 longitudinal wires per linear foot and 2 transverse wires per linear foot so steel areas supplied are determined readily as being 0.20 sq. in. per linear foot in the longitudinal direction and 0.05 sq. in. per linear foot in the transverse direction.

Sectional Areas of Welded Wire Fabric From Wire Reinforcement Institute Manual of Standard Practice 1979

Customary Units

Wire Size Number Smooth	Wire Size Number Deformed	Nominal Diameter, Inches	Nominal Weight Lbs./Lin. Ft.	A,—Sq. In. Per Lin. Ft. Center to Center Spacing 2"	3"	4"	6"	8"	10"	12"
W20	D20	0.505	680	1.20	.80	.60	40	30	24	20
W18	D18	0.479	612	1.08	.72	.54	.36	.27	216	18
W16	D16	0 451	.544	.96	.64	48	.32	.24	.192	16
W14	D14	0.422	476	.84	.56	.42	.28	.21	168	14
W12	D12	0.391	.408	.72	48	.36	24	18	144	12
W11	D11	0.374	374	.66	.44	.33	22	165	132	11
W10 5		0.366	357	.63	.42	.315	.21	.157	.126	105
W10	D10	0.357	.340	.60	.40	.30	.20	.15	.12	10
W9.5		0.348	323	.57	.38	.285	.19	142	.114	095
W9	D9	0.338	306	.54	.36	.27	.18	.135	108	09
W8 5		0.329	.289	.51	.34	255	17	127	.102	085
W8	D8	0.319	.272	.48	.32	.24	.16	.12	.096	.08
W7 5		0.309	.255	.45	.30	.225	.15	112	.09	075
W7	D7	0.299	.238	.42	.28	.21	.14	105	.084	.07
W6 5		0 288	221	.39	.26	195	13	.097	078	.065
W6	D6	0 276	.204	.36	24	18	12	09	.072	.06
W5.5		0.265	187	.33	.22	165	.11	082	.066	055
W5	D5	0 252	170	.30	.20	15	.10	075	.06	05
W4 5		0 239	153	.27	18	.135	09	067	.054	045
W4	D4	0.226	136	.24	16	.12	.08	06	.048	04
W3 5		0 211	119	.21	14	.105	07	052	042	035
W3		0 195	102	.18	.12	09	06	.045	.036	03
W2 9		0.192	098	.174	.116	087	.058	043	035	.029
W2 5		0 178	.085	.15	.10	075	05	037	03	025
W2		0 160	.068	12	.08	06	.04	03	024	02
W1 4		0.134	.049	.084	.056	042	.028	021	017	014

Note: Wire sizes other than those listed above including larger sizes may be produced provided the quantity required is sufficient to justify manufacture

Common Stock Styles of Welded Wire Fabric

STYLE DESIGNATION New Designation (By W-Number)	STYLE DESIGNATION Old Designation (By Steel Wire Gage)	STEEL AREA sq. in. per ft. Longit.	STEEL AREA sq. in. per ft. Trans.	METRIC STYLE DESIGNATION
ROLLS				
6 x 6—W1.4 x W1 4	6 x 6—10 x 10	.028	.028	152 x 152 MW9.1 x MW9 1
6 x 6—W2.0 x W2.0	6 x 6— 8 x 8*	.040	040	152 x 152 MW13 3 x MW13 3
6 x 6—W2 9 x W2 9	6 x 6—6 x 6	.058	058	152 x 152 MW18 7 x MW18 7
6 x 6—W4 0 x W4.0	6 x 6—4 x 4	.080	.080	152 x 152 MW25.8 x MW25 8
4 x 4—W1 4 x W1 4	4 x 4—10 x 10	.042	.042	102 x 102 MW9 1 x MW9 1
4 x 4—W2 0 x W2 0	4 x 4—8 x 8*	060	060	102 x 102 MW13 3 x MW13 3
4 x 4—W2.9 x W2.9	4 x 4—6 x 6	.087	087	102 x 102 MW18 7 x MW18 7
4 x 4—W4.0 x W4.0	4 x 4—4 x 4	.120	120	102 x 102 MW25 8 x MW25 8
SHEETS				
6 x 6—W2.9 x W2.9	6 x 6—6 x 6	.058	.058	152 x 152 MW18 7 x MW18 7
6 x 6—W4 0 x W4 0	6 x 6—4 x 4	.080	080	152 x 152 MW25.8 x MW25 8
6 x 6—W5.5 x W5.5	6 x 6—2 x 2**	.110	110	152 x 152 MW34 9 x MW34 9
4 x 4—W4 0 x W4 0	4 x 4—4 x 4	120	120	102 x 102 MW25.8 x MW25 8

*Exact W-number size for 8 gage is W2 1
**Exact W-number size for 2 gage is W5 4