

# REINFORCING DETAILS

(REBAR)

# REINFORCING DETAILS

BAR LAPS

(REBAR-BL)

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-5"	1'-9"	1'-5"
#5	3'-0"	2'-2"	1'-9"
#6	3'-10"	2'-9"	2'-2"
#7	5'-2"	3'-9"	3'-0"
#8	6'-10"	4'-11"	3'-11"
#9	8'-8"	6'-2"	4'-11"
#10	10'-11"	7'-10"	6'-3"
#11	13'-5"	9'-7"	7'-8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

Note:

1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 3000$  psi.

APPROVAL	
<i>L.S. Freedom</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 5/10/11	
REVISIONS	
SHA	FHWA
FHWA APPROVAL	
DATE:	

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES  
BAR LAP DIMENSIONS FOR  
GRADE 60 REINFORCING STEEL  
IN MIX NO.3 (3500 P.S.I.) CONCRETE  
NON-EPOXY COATED REINFORCING



STANDARD NO. REBAR-BL-101

SHEET 1 OF 3

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1 1/2"	3"	3 1/2"
#5	3'-8"	3'-3"	2'-7"	1 7/8"	3 3/4"	4 3/8"
#6	4'-8"	4'-1"	3'-3"	2 1/4"	4 1/2"	5 1/4"
#7	6'-4"	5'-7"	4'-6"	2 5/8"	5 1/4"	6 1/8"
#8	8'-3"	7'-4"	5'-10"	3"	6"	7"
#9	10'-6"	9'-3"	7'-5"	3 3/8"	6 3/4"	7 7/8"
#10	13'-3"	11'-9"	9'-5"	3 3/4"	7 5/8"	8 7/8"
#11	16'-4"	14'-5"	11'-6"	4 1/4"	8 1/2"	9 7/8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

Note:

1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 3000$  psi.

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

<b>APPROVAL</b> <i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11		STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1							
<b>REVISIONS</b> <table border="1"> <tr> <th>SHA</th> <th>FHWA</th> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> </tr> </table>				SHA	FHWA				
SHA	FHWA								
FHWA APPROVAL DATE:	STANDARD NO. REBAR-BL-101	SHEET <u>2</u> OF <u>3</u>							

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-11"	2'-1"	1'-8"
#5	3'-7"	2'-7"	2'-1"
#6	4'-7"	3'-3"	2'-8"
#7	6'-3"	Does Not Exist	3'-7"
#8	8'-2"		4'-8"
#9	10'-4"		5'-11"
#10	13'-2"		7'-6"
#11	16'-1"		9'-3"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

Note:

1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 3000$  psi.

CASE NO.2 - For bars coated with epoxy not in Case No.1.

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><th colspan="2">APPROVAL</th></tr> <tr><td colspan="2" style="text-align: center;"><i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES</td></tr> <tr><td colspan="2" style="text-align: center;">DATE: 5/10/11</td></tr> <tr><th colspan="2">REVISIONS</th></tr> <tr><th>SHA</th><th>FHWA</th></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>	APPROVAL		<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES		DATE: 5/10/11		REVISIONS		SHA	FHWA									<p><b>STATE OF MARYLAND</b>  <b>DEPARTMENT OF TRANSPORTATION</b>  <b>STATE HIGHWAY ADMINISTRATION</b>  <b>OFFICE OF STRUCTURES</b></p> <p>BAR LAP DIMENSIONS FOR          GRADE 60 REINFORCING STEEL          IN MIX NO.3 (3500 P.S.I.) CONCRETE          EPOXY COATED REINFORCING CASE NO.2</p> <p><b>STANDARD NO. REBAR-BL-101</b></p>	
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<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES																				
DATE: 5/10/11																				
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FHWA APPROVAL																				
DATE:																				

REBAR - BAR LAP

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-2"	2'-3"	1'-10"
#5	3'-11"	2'-10"	2'-3"
#6	4'-8"	3'-4"	2'-8"
#7	5'-10"	4'-2"	3'-4"
#8	7'-8"	5'-6"	4'-5"
#9	9'-9"	6'-11"	5'-7"
#10	12'-4"	8'-10"	7'-1"
#11	15'-1"	10'-10"	8'-8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

Note:

1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 4000$  psi.

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<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING	
STANDARD NO. REBAR-BL-102	SHEET <u>1</u> OF <u>3</u>

REBAR - BAR LAP

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing
	A	B	C		
#4	3'-10"	3'-4"	2'-8"	1 1/2"	3"
#5	4'-9"	4'-2"	3'-4"	1 7/8"	3 3/4"
#6	5'-8"	5'-0"	4'-0"	2 1/4"	4 1/2"
#7	7'-1"	6'-3"	5'-0"	2 5/8"	5 1/4"
#8	9'-4"	8'-3"	6'-7"	3"	6"
#9	11'-9"	10'-5"	8'-7"	3 3/8"	6 3/4"
#10	14'-11"	13'-2"	10'-7"	3 3/4"	7 5/8"
#11	18'-4"	16'-2"	13'-0"	4 1/4"	8 1/2"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

Note:

1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 4000$  psi.

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

<b>APPROVAL</b> <i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11		STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1	
<b>REVISIONS</b>			
SHA	FHWA		
FHWA APPROVAL DATE:		<b>STANDARD NO. REBAR-BL-102</b>	<b>SHEET 2 OF 3</b>

REBAR - BAR LAP

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	3'-9"	2'-8"	2'-2"
#5	4'-8"	3'-4"	2'-8"
#6	5'-7"	4'-0"	3'-3"
#7	7'-0"	Does Not Exist	4'-0"
#8	9'-2"		5'-3"
#9	11'-8"		6'-8"
#10	14'-9"		8'-6"
#11	18'-2"		10'-5"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

CASE NO.2 - For bars coated with epoxy not in Case No.1.

Note:

1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps only apply to 4500 p.s.i. lightweight concrete.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 4000$  psi.

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APPROVAL										
<i>L.S. Hudson</i> DIRECTOR OFFICE OF STRUCTURES										
DATE: 5/10/11										
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FHWA APPROVAL										
DATE:										

REBAR - BAR LAP

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-5"	1'-9"	1'-5"
#5	3'-0"	2'-2"	1'-9"
#6	3'-7"	2'-7"	2'-1"
#7	4'-6"	3'-3"	2'-7"
#8	5'-11"	4'-3"	3'-5"
#9	7'-6"	5'-4"	4'-3"
#10	9'-6"	6'-9"	5'-5"
#11	11'-8"	8'-4"	6'-8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

Note:

1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 4000$  psi.

<b>APPROVAL</b>  DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11		STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING	
<b>REVISIONS</b>			
SHA	FHWA		
FHWA APPROVAL			
DATE:			
		STANDARD NO. REBAR-BL-103	SHEET <u>1</u> OF <u>3</u>

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing	
	A	B	C			
#4	2'-11"	2'-7"	2'-1"	1 1/2"	3"	3 1/2"
#5	3'-8"	3'-3"	2'-7"	1 7/8"	3 3/4"	4 3/8"
#6	4'-5"	3'-10"	3'-1"	2 1/4"	4 1/2"	5 1/4"
#7	5'-6"	4'-10"	3'-10"	2 5/8"	5 1/4"	6 1/8"
#8	7'-2"	6'-4"	5'-1"	3"	6"	7"
#9	9'-1"	8'-0"	6'-5"	3 3/8"	6 3/4"	7 7/8"
#10	11'-6"	10'-2"	8'-2"	3 3/4"	7 5/8"	8 7/8"
#11	14'-2"	12'-6"	10'-0"	4 1/4"	8 1/2"	9 7/8"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

Note:

1. When bar lap is not specified on the Plans, the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate "Reinforcing Steel Design, fy = 60 ksi. and Concrete Design, f'c = 4000 psi.

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 5/10/11	
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FHWA APPROVAL	
DATE:	

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1	
STANDARD NO. REBAR-BL-103	SHEET <u>2</u> OF <u>3</u>

REBAR - BAR LAP

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-11"	2'-1"	1'-8"
#5	3'-7"	2'-7"	2'-1"
#6	4'-4"	3'-1"	2'-6"
#7	5'-5"	Does Not Exist	3'-1"
#8	7'-1"		4'-1"
#9	9'-0"		5'-2"
#10	11'-5"		6'-6"
#11	14'-0"		8'-0"

\* LOCATION CATEGORY

- A - Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B - All bars not in Category A spaced less than 6" apart.
- C - All bars not in Category A spaced 6" or more apart.

Note:

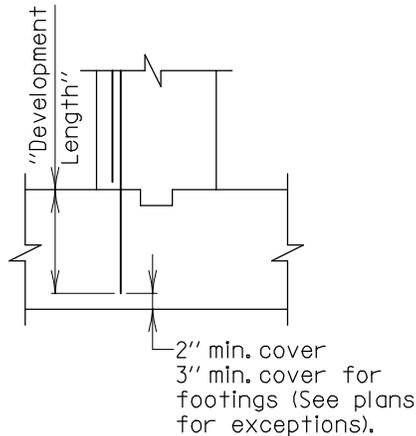
1. When bar lap is not specified on the Plans, CASE NO.2 - For bars coated with epoxy not in Case No.1. the above dimensions shall be used.
2. These bar laps do not apply when bar is in lightweight concrete. Greater lengths are required for this material.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 4000$  psi.

<b>APPROVAL</b>		STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES BAR LAP DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2	
<i>L.S. Fisher</i> DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11			
<b>REVISIONS</b>			
SHA	FHWA		
FHWA APPROVAL	DATE:		
		<b>STANDARD NO. REBAR-BL-103</b>	<b>SHEET 3 OF 3</b>

# REINFORCING DETAILS

DEVELOPMENT LENGTH

(REBAR-DL)



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-3"	1'-6"	1'-4"
#7	3'-1"	2'-2"	1'-9"
#8	4'-0"	2'-11"	2'-4"
#9	5'-1"	3'-8"	2'-11"
#10	6'-5"	4'-7"	3'-8"
#11	7'-11"	5'-8"	4'-7"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 3000$  psi.
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. REBAR-DL-20I.

APPROVAL	
<i>L.S. Freedom</i> DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11	
REVISIONS	
SHA	FHWA

STATE OF MARYLAND  
 DEPARTMENT OF TRANSPORTATION  
 STATE HIGHWAY ADMINISTRATION  
 OFFICE OF STRUCTURES  
 DEVELOPMENT LENGTH DIMENSIONS FOR  
 GRADE 60 REINFORCING STEEL  
 IN MIX NO.3 (3500 P.S.I.) CONCRETE  
 NON-EPOXY COATED REINFORCING

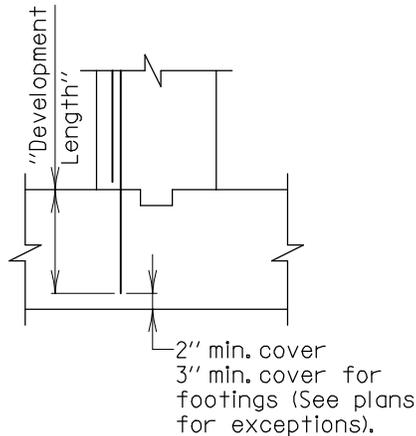


FHWA APPROVAL	
DATE:	

STANDARD NO. REBAR-DL-10I

SHEET 1 OF 3

REBAR - DEVELOPMENT LENGTH



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter = c/c Spacing
	A	B	C		
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"
#6	2'-9"	2'-5"	1'-11"	2 1/4"	4 1/2"
#7	3'-9"	3'-3"	2'-8"	2 5/8"	5 1/4"
#8	4'-11"	4'-4"	3'-6"	3"	6"
#9	6'-2"	5'-5"	4'-4"	3 3/8"	6 3/4"
#10	7'-10"	6'-11"	5'-6"	3 3/4"	7 5/8"
#11	9'-7"	8'-6"	6'-10"	4 1/4"	8 1/2"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
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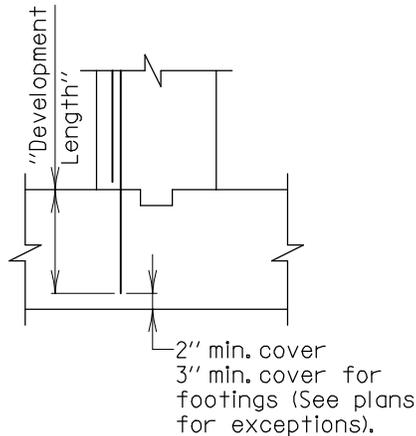
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CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

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<i>L.S. Fisher</i> DIRECTOR OFFICE OF STRUCTURES	
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<p>STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES</p> <p>DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.3 (3500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1</p> <p>STANDARD NO. REBAR-DL-101</p>	
SHEET 2 OF 3	



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-9"	1'-11"	1'-7"
#7	3'-8"	Does Not Exist	2'-1"
#8	4'-10"		2'-9"
#9	6'-1"		3'-6"
#10	7'-9"		4'-5"
#11	9'-6"		5'-5"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used. CASE NO.2 - For bars coated with epoxy not in Case No.1.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These bar laps only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Steel Concrete Design,  $f'_c = 3000$  psi.

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<i>L.S. Fisher</i> DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11	
REVISIONS	
SHA	FHWA
FHWA APPROVAL	
DATE:	

STATE OF MARYLAND  
 DEPARTMENT OF TRANSPORTATION  
 STATE HIGHWAY ADMINISTRATION  
 OFFICE OF STRUCTURES

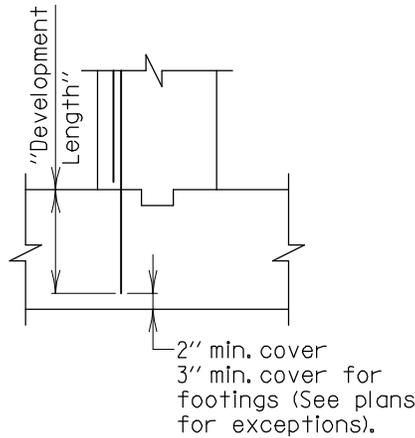
DEVELOPMENT LENGTH DIMENSIONS FOR  
 GRADE 60 REINFORCING STEEL  
 IN MIX NO.3 (3500 P.S.I.) CONCRETE  
 EPOXY COATED REINFORCING CASE NO.2

STANDARD NO. REBAR-DL-101

VERIFIED  
 11-28-2007  
 LRFD

SHEET 3 OF 3

REBAR - DEVELOPMENT LENGTH



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-10"	1'-4"	1'-1"
#5	2'-4"	1'-8"	1'-4"
#6	2'-9"	2'-0"	1'-7"
#7	3'-5"	2'-6"	2'-0"
#8	4'-6"	3'-3"	2'-7"
#9	5'-9"	4'-1"	3'-3"
#10	7'-3"	5'-2"	4'-2"
#11	8'-11"	6'-5"	5'-1"

\* LOCATION CATEGORY:

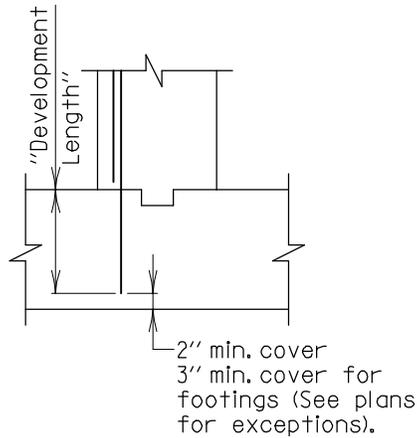
- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 4000$  psi.
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. REBAR-DL-202.

APPROVAL	
<i>L.S. Fisher</i> DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11	
REVISIONS	
SHA	FHWA
FHWA APPROVAL	
DATE:	

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING	
STANDARD NO. REBAR-DL-102	SHEET <u>1</u> OF <u>3</u>



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter	c/c Spacing
	A	B	C			
#4	2'-3"	2'-0"	1'-7"	1 1/2"	3"	3 1/2"
#5	2'-10"	2'-6"	2'-0"	1 7/8"	3 3/4"	4 3/8"
#6	3'-4"	3'-0"	2'-5"	2 1/4"	4 1/2"	5 1/4"
#7	4'-2"	3'-8"	3'-0"	2 5/8"	5 1/4"	6 1/8"
#8	5'-6"	4'-10"	3'-11"	3"	6"	7"
#9	6'-11"	6'-2"	4'-11"	3 3/8"	6 3/4"	7 7/8"
#10	8'-10"	7'-9"	6'-3"	3 3/4"	7 5/8"	8 1/8"
#11	10'-10"	9'-7"	7'-8"	4 1/4"	8 1/2"	9 1/8"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

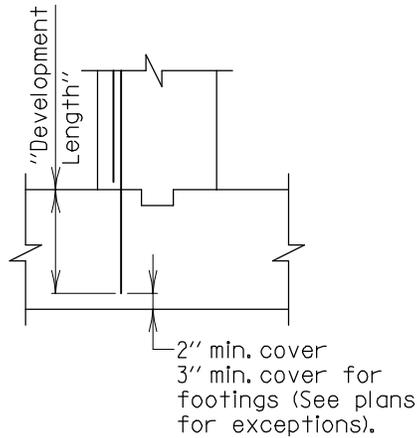
Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi, and Steel Concrete Design,  $f'_c = 4000$  psi.

CASE NO.1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.1	
STANDARD NO. REBAR-DL-102	SHEET <u>2</u> OF <u>3</u>



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	2'-3"	1'-7"	1'-3"
#5	2'-9"	2'-0"	1'-7"
#6	3'-4"	2'-5"	1'-11"
#7	4'-2"	Does Not Exist	2'-6"
#8	5'-5"		3'-1"
#9	6'-10"		3'-11"
#10	8'-9"		5'-0"
#11	10'-8"		6'-2"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

Note:

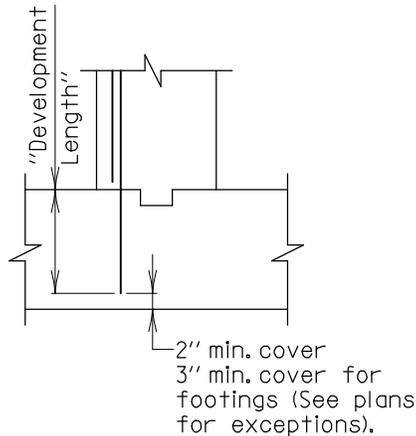
CASE NO.2 - For bars coated with epoxy not in Case No.1.

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths only apply to 4500 P.S.I. lightweight concrete.
3. These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi, and Steel Concrete Design,  $f'_c = 4000$  psi.

FHWA APPROVAL  
DATE:

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11	
REVISIONS	
SHA	FHWA

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2	
STANDARD NO. REBAR-DL-102	SHEET <u>3</u> OF <u>3</u>



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-5"	1'-0"	1'-0"
#5	1'-9"	1'-3"	1'-0"
#6	2'-2"	1'-6"	1'-3"
#7	2'-8"	1'-11"	1'-6"
#8	3'-6"	2'-6"	2'-0"
#9	4'-5"	3'-2"	2'-6"
#10	5'-7"	4'-0"	3'-3"
#11	6'-10"	4'-11"	3'-11"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

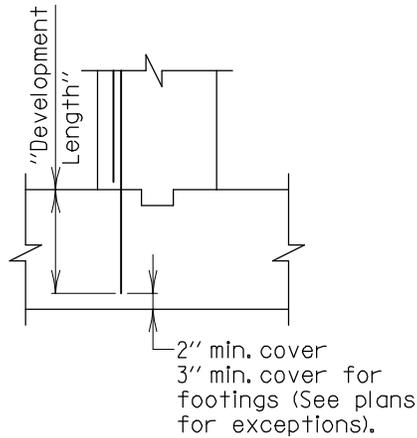
Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete  $f'_c = 4000$  psi.
4. If depth of member does not allow bar development length indicated in Categories A, B, and C; then hook shall be added to all bars not conforming, as per D, E, and F per Std. No. REBAR-DL-203.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 5/10/11	
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<p>STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES</p> <p>DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING</p>	
STANDARD NO. REBAR-DL-103	SHEET <u>1</u> OF <u>3</u>

REBAR - DEVELOPMENT LENGTH



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY			3 Times Bar Diameter	6 Times Bar Diameter	c/c Spacing
	A	B	C			
#4	1'-9"	1'-6"	1'-3"	1 1/2"	3"	3 1/2"
#5	2'-2"	1'-11"	1'-6"	1 7/8"	3 3/4"	4 3/8"
#6	2'-7"	2'-3"	1'-10"	2 1/4"	4 1/2"	5 1/4"
#7	3'-3"	2'-10"	2'-3"	2 5/8"	5 1/4"	6 1/8"
#8	4'-3"	3'-9"	3'-0"	3"	6"	7"
#9	5'-4"	4'-9"	3'-9"	3 3/8"	6 3/4"	7 7/8"
#10	6'-9"	6'-0"	4'-10"	3 3/4"	7 5/8"	8 1/8"
#11	8'-4"	7'-4"	5'-11"	4 1/4"	8 1/2"	9 1/8"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

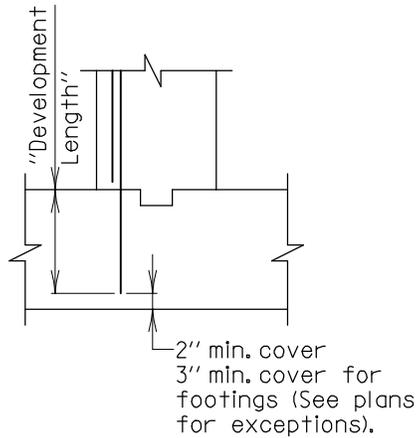
Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Steel Concrete Design,  $f'_c = 4000$  psi.

CASE NO. 1 - For bars coated with epoxy with cover less than 3 times the bar diameter or clear spacing between bars less than 6 times the bar diameter.

APPROVAL	
<i>L.S. Fisher</i> DIRECTOR OFFICE OF STRUCTURES	
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO. 1	
STANDARD NO. REBAR-DL-103	SHEET <u>2</u> OF <u>3</u>



STANDARD STRAIGHT BAR

BAR SIZE	* LOCATION CATEGORY		
	A	B	C
#4	1'-9"	1'-3"	1'-0"
#5	2'-2"	1'-6"	1'-3"
#6	2'-7"	1'-10"	1'-6"
#7	3'-2"	Does Not Exist	1'-10"
#8	4'-2"		2'-5"
#9	5'-3"		3'-0"
#10	6'-9"		3'-10"
#11	8'-3"		4'-9"

\* LOCATION CATEGORY:

- A- Bars in horizontal layers in top of pour with 12" or more of concrete below them such as in: footings, pier caps, etc.
- B- All bars not in Category A spaced less than 6" apart.
- C- All bars not in Category A spaced 6" or more apart.

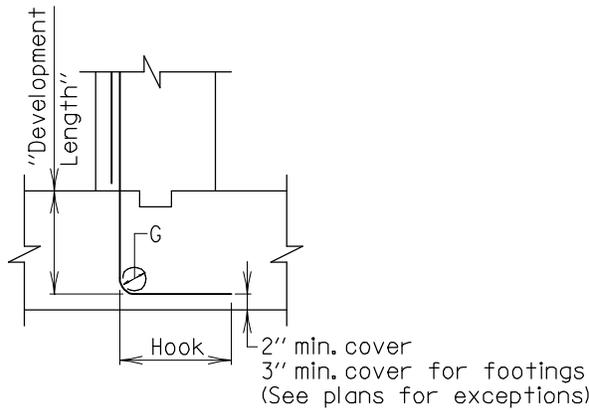
Note:

CASE NO.2 - For bars coated with epoxy not in Case No.1.

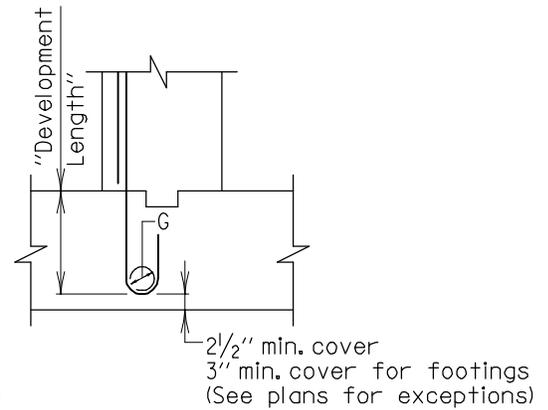
1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi, and Steel Concrete Design,  $f'_c = 4000$  psi.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 5/10/11	
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS FOR GRADE 60 REINFORCING STEEL IN MIX NO.6 (4500 P.S.I.) CONCRETE EPOXY COATED REINFORCING CASE NO.2	
STANDARD NO. REBAR-DL-103	SHEET <u>3</u> OF <u>3</u>



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	8"	11"	9"
#5	10"	1'-2"	11"
#6	1'-0"	1'-5"	1'-2"
#7	1'-2"	1'-8"	1'-4"
#8	1'-4"	1'-10"	1'-6"
#9	1'-6"	2'-1"	1'-8"
#10	1'-8"	2'-4"	1'-11"
#11	1'-10"	2'-7"	2'-1"

Note:  
For Hook Dimensions and Bends,  
see Std. No. REBAR-BB-102.

\* LOCATION CATEGORY:

- D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".
- E- All bars not in Category D.
- F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

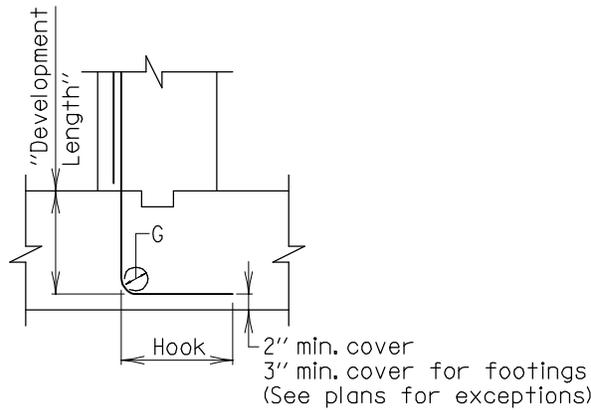
Note:

1. When development length is not specified on the Plans, the above dimensions shall be used.
2. These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
3. These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 3000$  psi.
4. If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. REBAR-DL-101; then hook shall be added to all bars not conforming, as per D, E & F.

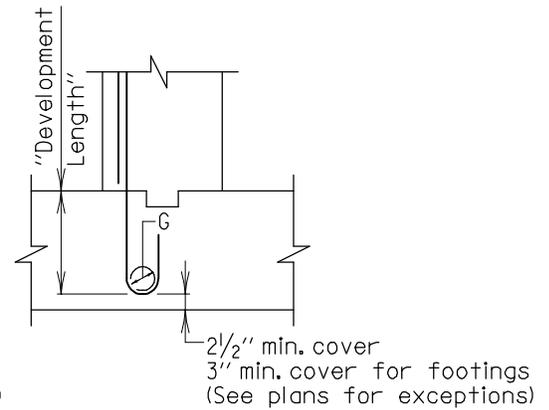
APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 5/10/11	
REVISIONS	
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 3 (3500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING	
STANDARD NO. REBAR-DL-201	SHEET <u>  </u> OF <u>  </u>

FHWA APPROVAL  
DATE: 7-19-11



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	9"	1'-1"	10"
#5	11"	1'-4"	1'-1"
#6	1'-1"	1'-7"	1'-3"
#7	1'-4"	1'-10"	1'-6"
#8	1'-6"	2'-1"	1'-8"
#9	1'-8"	2'-4"	1'-11"
#10	1'-10"	2'-8"	2'-2"
#11	2'-1"	2'-11"	2'-4"

Note:  
For Hook Dimensions and Bends,  
see Std. No. REBAR-BB-102.

\* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".

E- All bars not in Category D.

F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

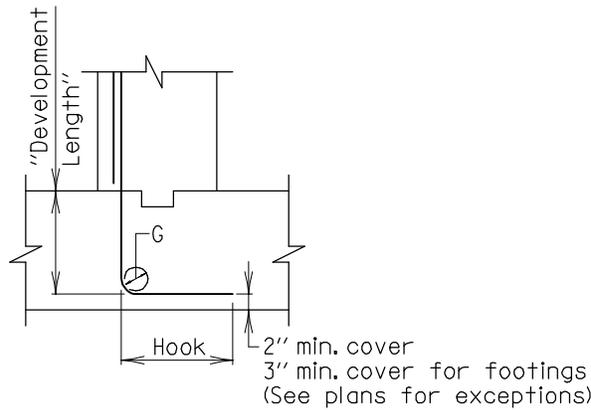
Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths only apply to 4500 P.S.I. lightweight concrete.
- These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 4000$  psi.
- If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. REBAR-DL-102; then hook shall be added to all bars not conforming, as per D, E & F.

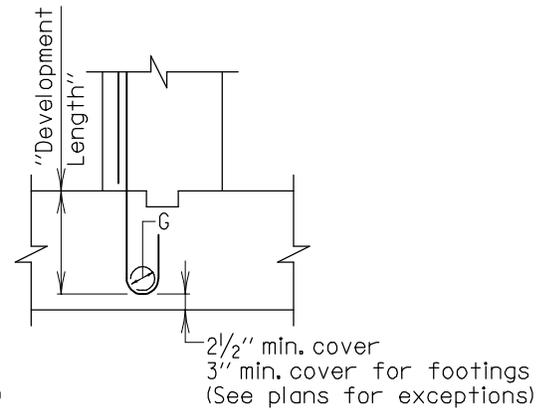
FHWA APPROVAL  
DATE:

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 5/10/11	
REVISIONS	
SHA	FHWA

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN LIGHTWEIGHT (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING	
STANDARD NO. REBAR-DL-202	SHEET <u>  </u> OF <u>  </u>



STANDARD 90° HOOK



STANDARD 180° HOOK

BAR SIZE	* LOCATION CATEGORY		
	D	E	F
#4	7"	10"	8"
#5	9"	1'-0"	10"
#6	10"	1'-3"	1'-0"
#7	1'-0"	1'-5"	1'-2"
#8	1'-2"	1'-7"	1'-4"
#9	1'-4"	1'-10"	1'-6"
#10	1'-5"	2'-1"	1'-8"
#11	1'-7"	2'-3"	1'-10"

Note:  
For Hook Dimensions and Bends,  
see Std. No. REBAR-BB-102.

\* LOCATION CATEGORY:

D- All bars terminating with a standard 180° hook with side cover (normal to plane of hook) not less than 2 1/2", and for 90° deg. hook, cover on bar extension beyond hook not less than 2".

E- All bars not in Category D.

F- All bars with hook enclosed vertically or horizontally within ties or stirrup-ties spaced along the full development length not greater than 3d where d is the diameter of the hooked bar.

Note:

- When development length is not specified on the Plans, the above dimensions shall be used.
- These development lengths do not apply when bar is in lightweight concrete or any other strength of concrete.
- These development lengths only apply where the General Notes indicate Reinforcing Steel Design,  $f_y = 60$  ksi. and Concrete Design,  $f'_c = 4000$  psi.
- If depth of member does not allow bar development length indicated in Categories A, B, and C: Std. No. REBAR-DL-103; then hook shall be added to all bars not conforming, as per D, E & F.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 5/10/11	
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	
DEVELOPMENT LENGTH DIMENSIONS OF HOOKED BARS FOR GRADE 60 REINFORCING STEEL IN MIX NO. 6 (4500 P.S.I.) CONCRETE NON-EPOXY COATED REINFORCING	
STANDARD NO. REBAR-DL-203	SHEET <u>  </u> OF <u>  </u>

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DATE:

# REINFORCING DETAILS

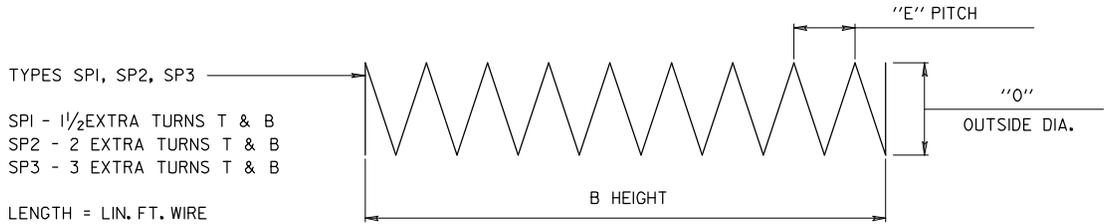
BAR BENDS

(REBAR-BB)

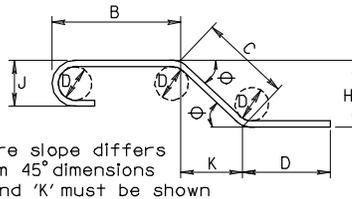
# TYPICAL BAR BENDS

## DETAILS AND NOTES

### SPIRAL



Unless otherwise noted diameter D is the same for all bends and hooks on a bar



ENLARGED VIEW SHOWING  
 BAR BENDING DETAILS

**Notes:**

- All dimensions are out-to-out of bar or to tangent points for 135° and 180° hooks.
- 'J' dimensions on 180° hooks to be shown only where necessary to restrict hook size. Otherwise standard hooks are to be used.
- Where 'J' is not shown, 'J' will be kept equal to or less than 'H' on truss bars. Where 'J' can exceed 'H' it should be shown.
- 'H' dimension on stirrups to be shown where necessary to fit within concrete.
- Where bars are to be bent more accurately than standard bending tolerances, bending dimensions which require closer fabrication should have limits indicated.

**NOTE TO FABRICATOR**

**BENDING TOLERANCE NOTE**

TIES AND STIRRUPS SHALL BE BENT WITH A PLUS ZERO INCH (+0") MINUS (-) NORMAL ACI BENDING TOLERANCES

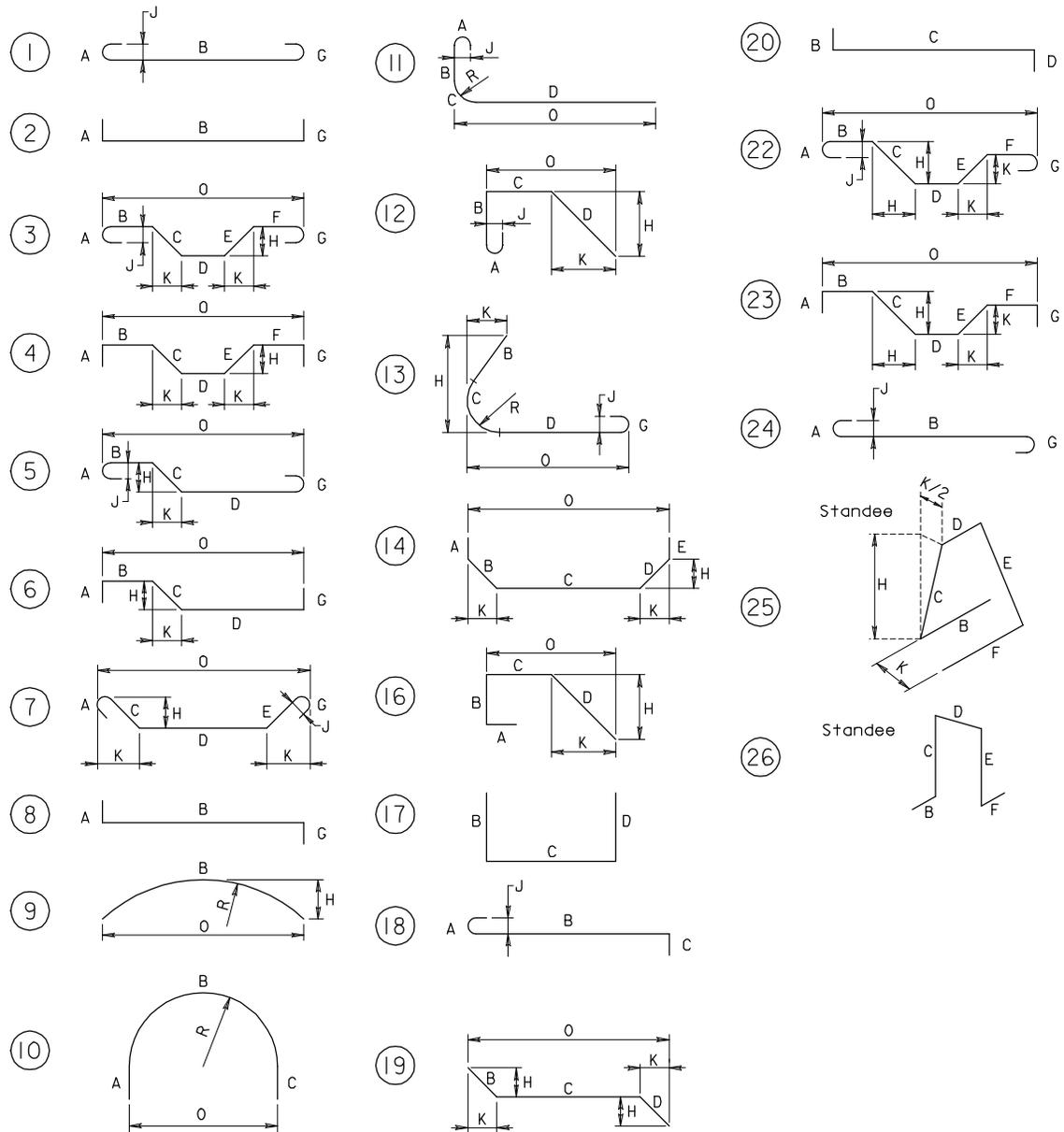
APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/10/94	
REVISIONS	
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STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	BAR BEND TYPES GENERAL NOTES
SHEET <u>1</u> OF <u>8</u>	REBAR BAR BENDS

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# ACI TYPICAL BAR BENDS

## STANDARD PIN BENDING



### NOTE TO FABRICATOR

#### BENDING TOLERANCE NOTE

TIES AND STIRRUPS SHALL BE BENT WITH A PLUS ZERO INCH (+0") MINUS (-) NORMAL ACI BENDING TOLERANCES

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/10/94	
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DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

BAR BEND TYPES  
ACI - STANDARD PIN BENDING

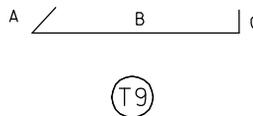
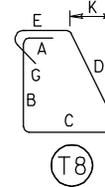
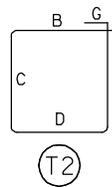
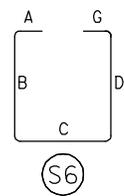
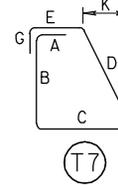
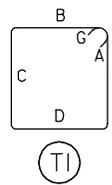
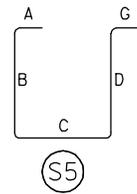
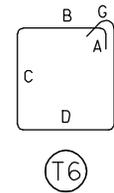
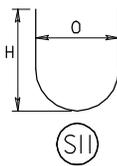
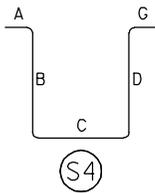
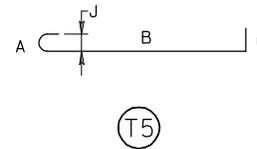
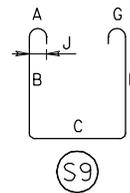
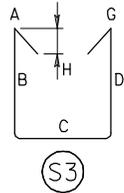
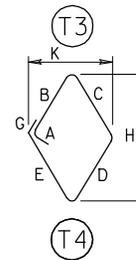
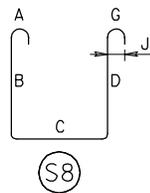
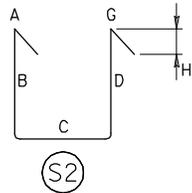
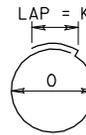
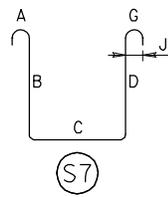
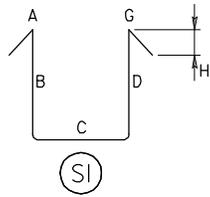
FHWA APPROVAL  
DATE: \_\_\_\_\_

STANDARD NO. REBAR-BB-101

SHEET 2 OF 8

# ACI TYPICAL BAR BENDS

## TIES AND STIRRUPS



### NOTE TO FABRICATOR

#### BENDING TOLERANCE NOTE

TIES AND STIRRUPS SHALL BE BENT WITH A PLUS ZERO INCH (+0") MINUS (-) NORMAL ACI BENDING TOLERANCES

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/10/94	
REVISIONS	
SHA	FHWA

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

BAR BEND TYPES  
ACI- TIES A

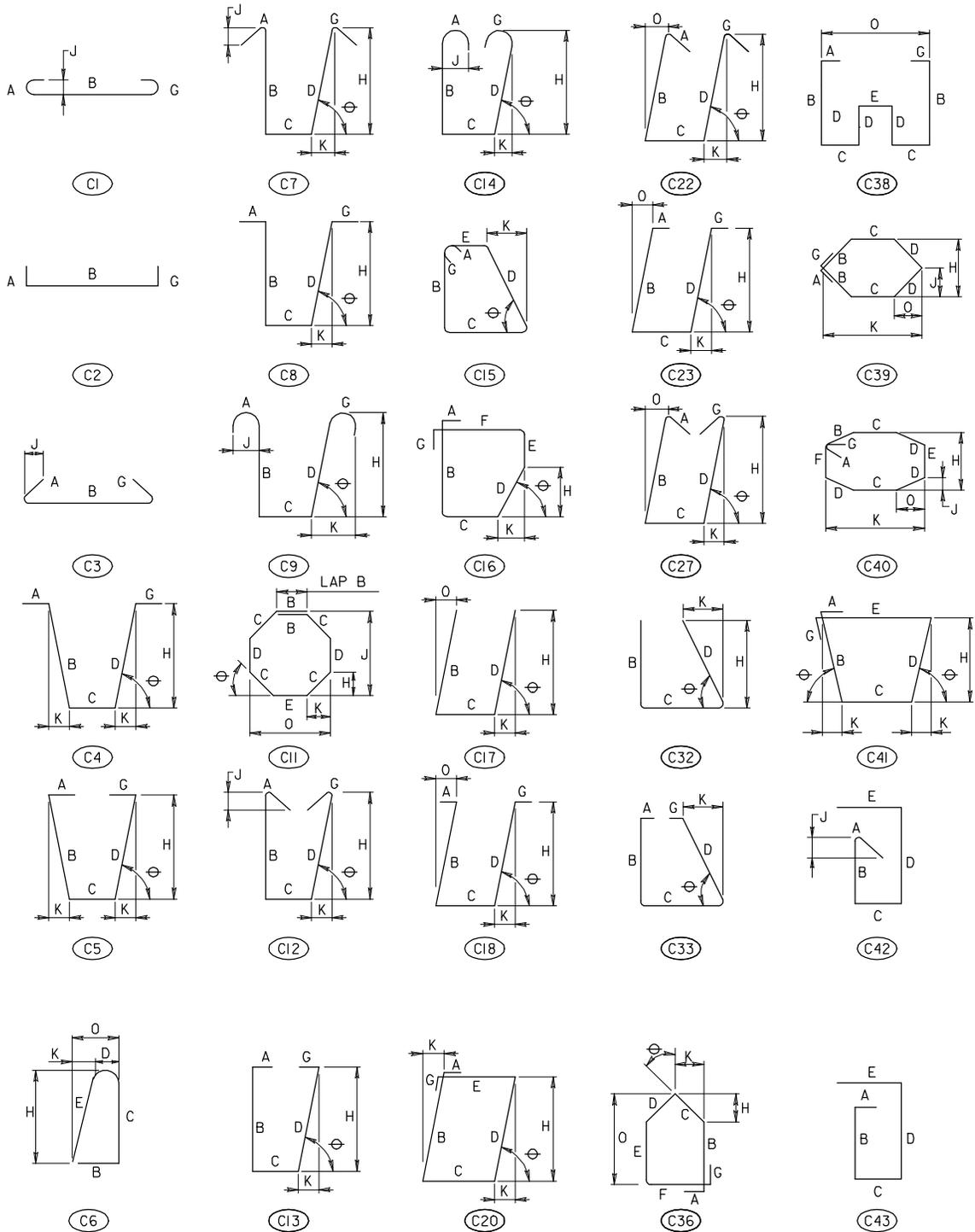
FHWA APPROVAL  
DATE:

STANDARD NO. REBAR-BB-101

SHEET 3 OF 8

# SHA TYPICAL BAR BENDS

## TIES AND STIRRUPS



### NOTE TO FABRICATOR

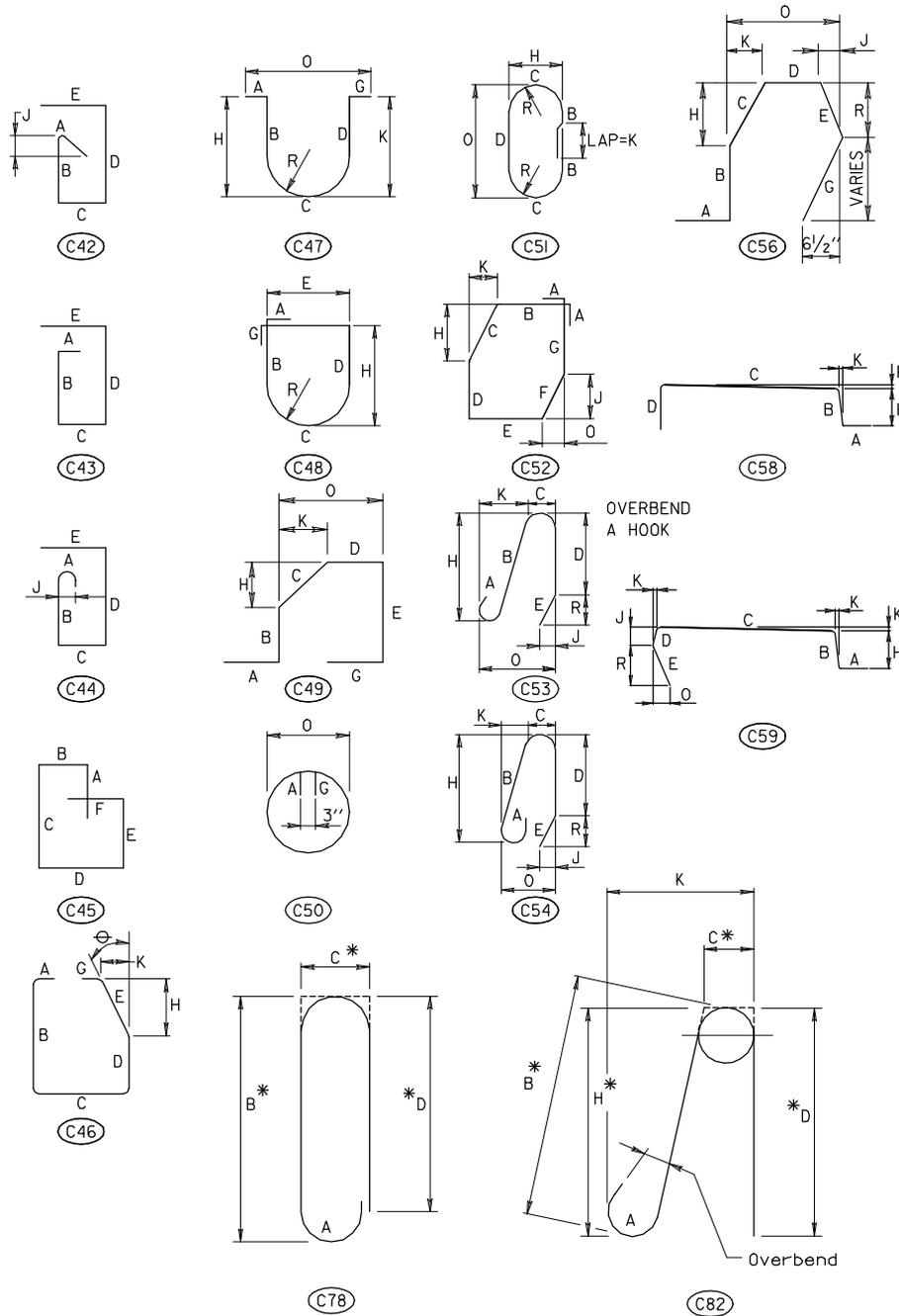
**BENDING TOLERANCE NOTE**  
 TIES AND STIRRUPS SHALL BE BENT WITH A PLUS ZERO INCH (+0") MINUS (-) NORMAL ACI BENDING TOLERANCES

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/10/94	
REVISIONS	
SHA	FHWA
FHWA APPROVAL	
DATE:	

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES  BAR BEND TYPES SHA - TIES AND STIRRUPS	STANDARD NO. REBAR-BB-101  SHEET 4 OF 8
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# SHA TYPICAL BAR BENDS

## TIES AND STIRRUPS



### NOTE TO FABRICATOR

#### BENDING TOLERANCE NOTE

TIES AND STIRRUPS SHALL BE BENT WITH A PLUS ZERO INCH (+0") MINUS (-) NORMAL ACI BENDING TOLERANCES

\* Measured to Tangents of Curves.

APPROVAL	
<i>E.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 2/10/94	
REVISIONS	
SHA	FHWA

STATE OF MARYLAND  
 DEPARTMENT OF TRANSPORTATION  
 STATE HIGHWAY ADMINISTRATION  
 OFFICE OF STRUCTURES

BAR BEND TYPES  
 SHA - TIES AND STIRRUPS

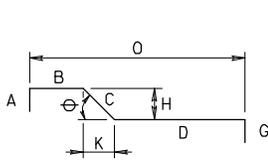
FHWA APPROVAL  
 DATE:

STANDARD NO. REBAR-BB-101

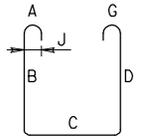
SHEET 5 OF 8

# SHA TYPICAL BAR BENDS

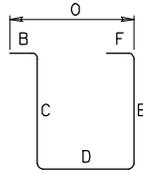
## STANDARD PIN BENDING



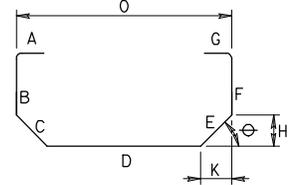
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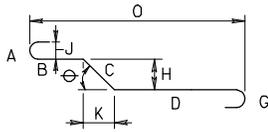
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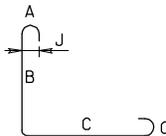
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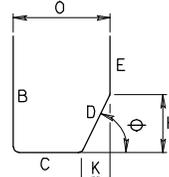
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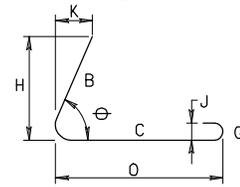
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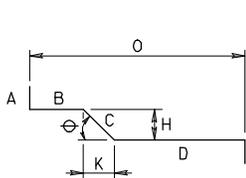
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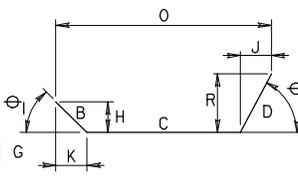
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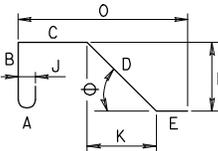
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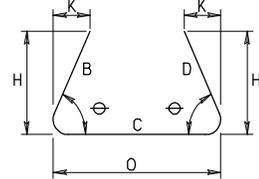
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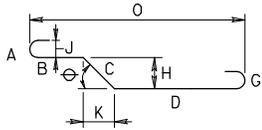
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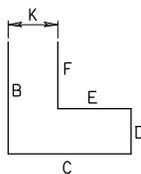
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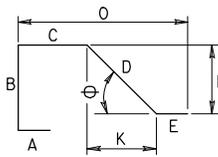
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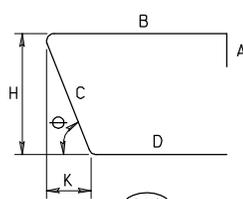
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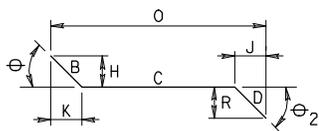
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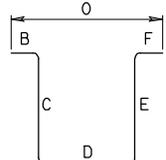
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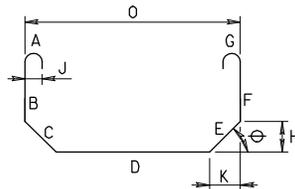
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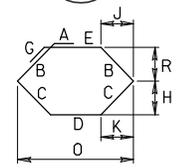
(C64)



(C70)



(C75)



(H I)

### NOTE TO FABRICATOR

#### BENDING TOLERANCE NOTE

TIES AND STIRRUPS SHALL BE BENT WITH A PLUS ZERO INCH (+0") MINUS (-) NORMAL ACI BENDING TOLERANCES

#### APPROVAL

*L.S. Friedman* DIRECTOR  
OFFICE OF STRUCTURES

DATE: 2/10/94

#### REVISIONS

SHA	FHWA

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

BAR BEND TYPES  
SHA - STANDARD PIN BENDING

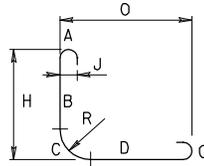
FHWA APPROVAL  
DATE:

STANDARD NO. REBAR-BB-101

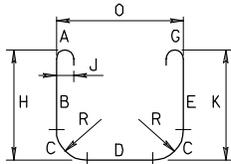
SHEET 6 OF 8

# SHA TYPICAL BAR BENDS

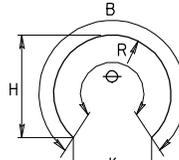
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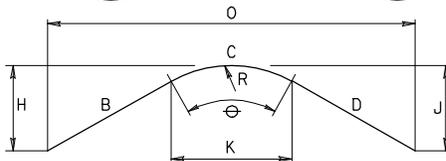
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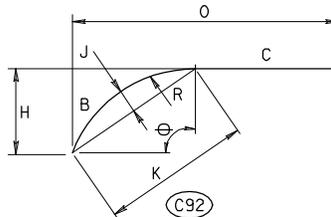
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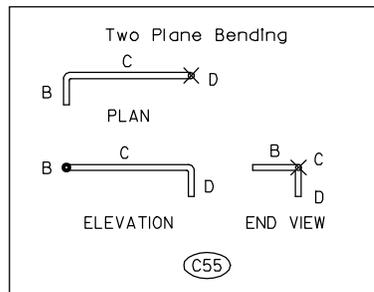
(C87)



(C91)



(C92)



(C55)

### NOTE TO FABRICATOR

#### BENDING TOLERANCE NOTE

TIES AND STIRRUPS SHALL BE BENT WITH A PLUS ZERO INCH (+0") MINUS (-) NORMAL ACI BENDING TOLERANCES

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/10/94	
REVISIONS	
SHA	FHWA

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

BAR BEND TYPES  
SHA - RADIUS BENDING

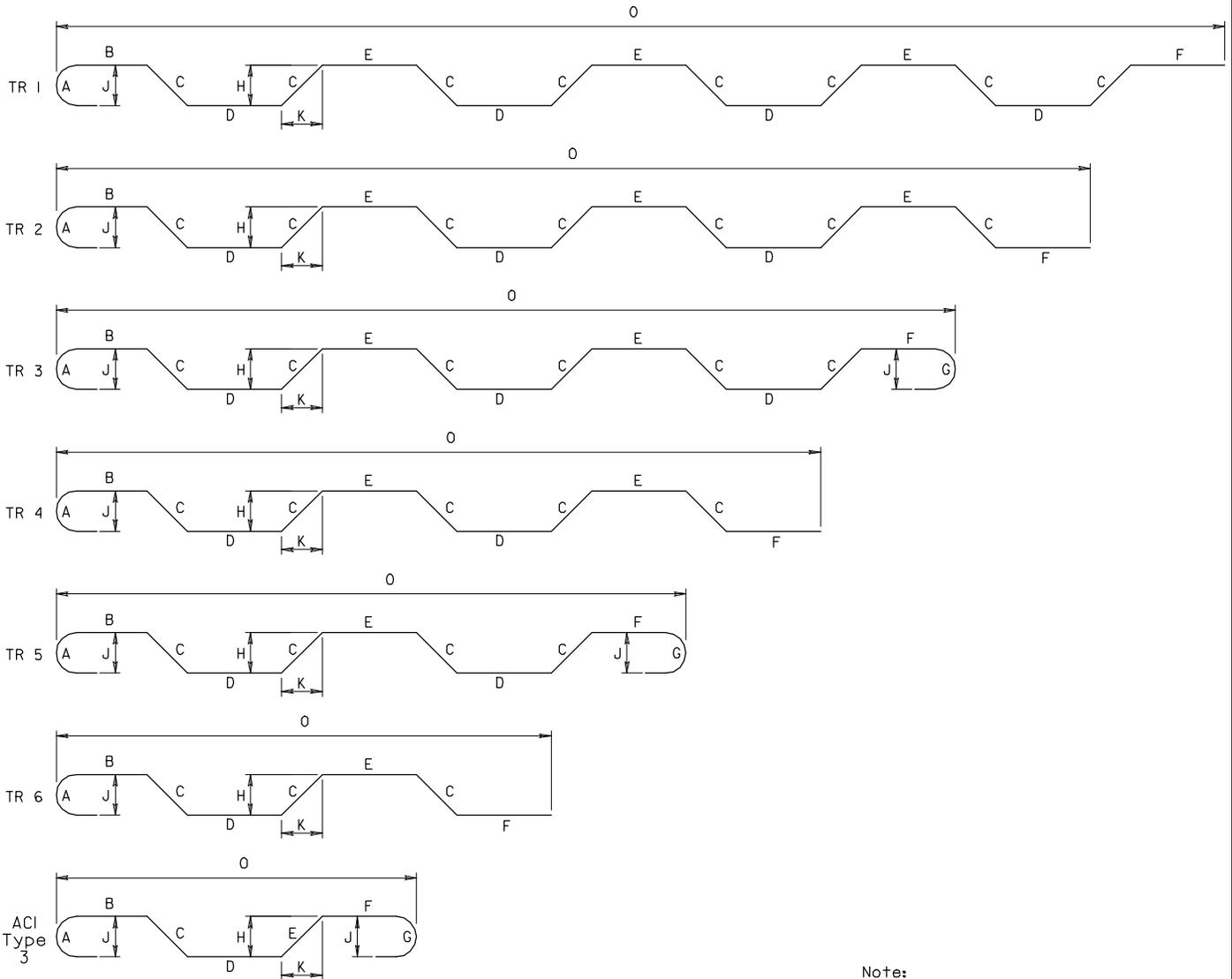
FHWA APPROVAL  
DATE:

STANDARD NO. REBAR-BB-101

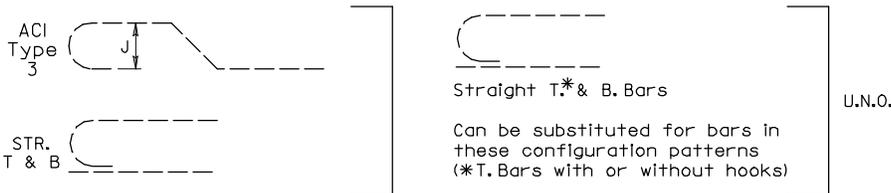
SHEET 7 OF 8

# SHA TYPICAL BAR BENDS

## TRUSS BAR CONFIGURATIONS



Note:  
TR 1 and TR 2 are to be used only when there are more than three bays and it is necessary to splice truss bars.



Hooks for truss bars optional.

### NOTE TO FABRICATOR

#### BENDING TOLERANCE NOTE

TIES AND STIRRUPS SHALL BE BENT WITH A PLUS ZERO INCH (+0") MINUS (-) NORMAL ACI BENDING TOLERANCES

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 2/10/94	
REVISIONS	
SHA	FHWA

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

BAR BEND TYPES  
TRUSS BAR CONFIGURATIONS

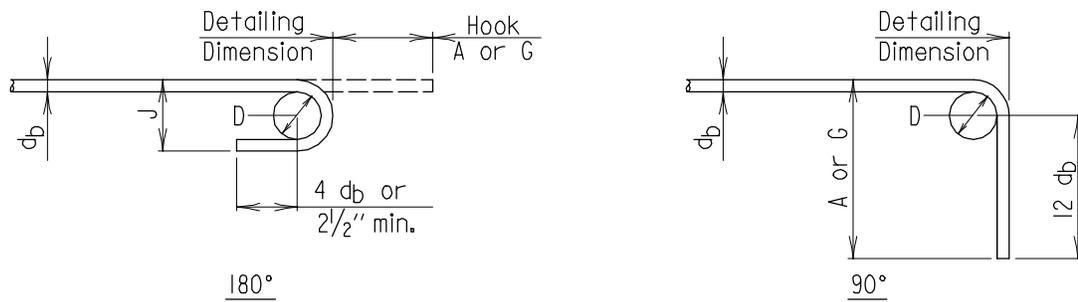
FHWA APPROVAL  
DATE: \_\_\_\_\_

STANDARD NO. REBAR-BB-101

SHEET 8 OF 8

HOOKS  
TABLE I  
REFERENCES

1. ACI Types I thru 26
2. SHA Standard Pin Bending
3. SHA Radius Bending



RECOMMENDED END HOOKS, ALL GRADES				
BAR SIZE	Finished bend diameter D, in.	180 - deg hook		90 - deg hook
		A or G in	J, in.	A or G in
#3	2 1/4	5	3	6
#4	3	6	4	8
#5	3 3/4	7	5	10
#6	4 1/2	8	6	1-0
#7	5 1/4	10	7	1-2
#8	6	11	8	1-4
#9	9 1/2	1-3	11 3/4	1-7
#10	10 3/4	1-5	1-1 1/4	1-10
#11	12	1-7	1-2 3/4	2-0
#14	18 1/4	2-3	1-9 3/4	2-7
#18	24	3-0	2-4 1/2	3-5

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 11/17/97	
REVISIONS	
SHA	FHWA

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	REINFORCING STEEL HOOK TABLES AND DIAGRAMS
STANDARD NO. REBAR-BB-102	SHEET <u>1</u> OF <u>2</u>

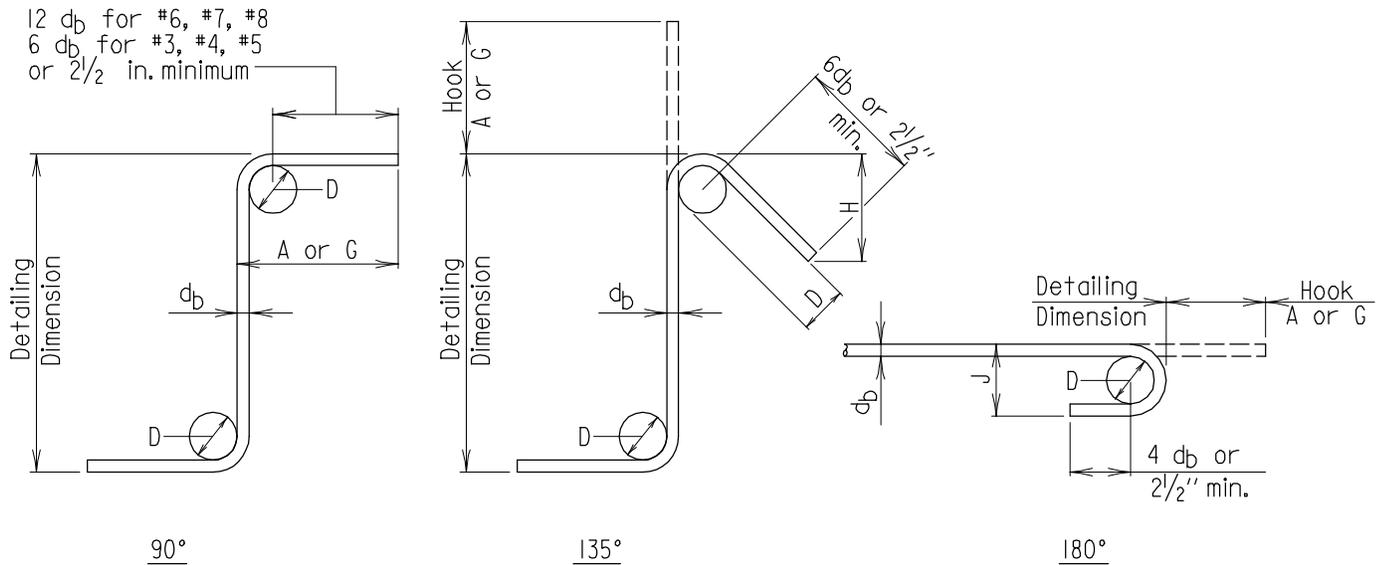
FHWA APPROVAL  
DATE:

HOOKS  
TABLE II  
REFERENCES

1. ACI Types SI thru SII
2. ACI Types TI thru T8
3. SHA Ties and Stirrups

(Note: Tie and stirrup types supplied in sizes #3-#8)

STIRRUP AND TIE HOOKS



STIRRUP AND TIE HOOK DIMENSIONS, in.				
BAR SIZE	D, in.	90 - deg hook		
		A or G	A or G	H, approx
#3	1 1/2	4	4	2 1/2
#4	2	4 1/2	4 1/2	3
#5	2 1/2	6	5 1/2	3 3/4
#6	4 1/2	1-0	7 3/4	4 1/2
#7	5 1/4	1-2	9	5 1/4
#8	6	1-4	10 1/4	6

RECOMMENDED END HOOKS, ALL GRADES			
BAR SIZE	Finished bend diameter	180 - deg hook	
	D, in.	A or G in	J, in.
#3	2 1/4	5	3
#4	3	6	4
#5	3 3/4	7	5
#6	4 1/2	8	6
#7	5 1/4	10	7
#8	6	11	8

**APPROVAL**  
*L.S. Fisher* DIRECTOR  
OFFICE OF STRUCTURES  
DATE: 11/17/97

**REVISIONS**

SHA	FHWA
12-19-97	

STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
OFFICE OF STRUCTURES

REINFORCING STEEL HOOK TABLES AND DIAGRAMS

FHWA APPROVAL  
DATE:

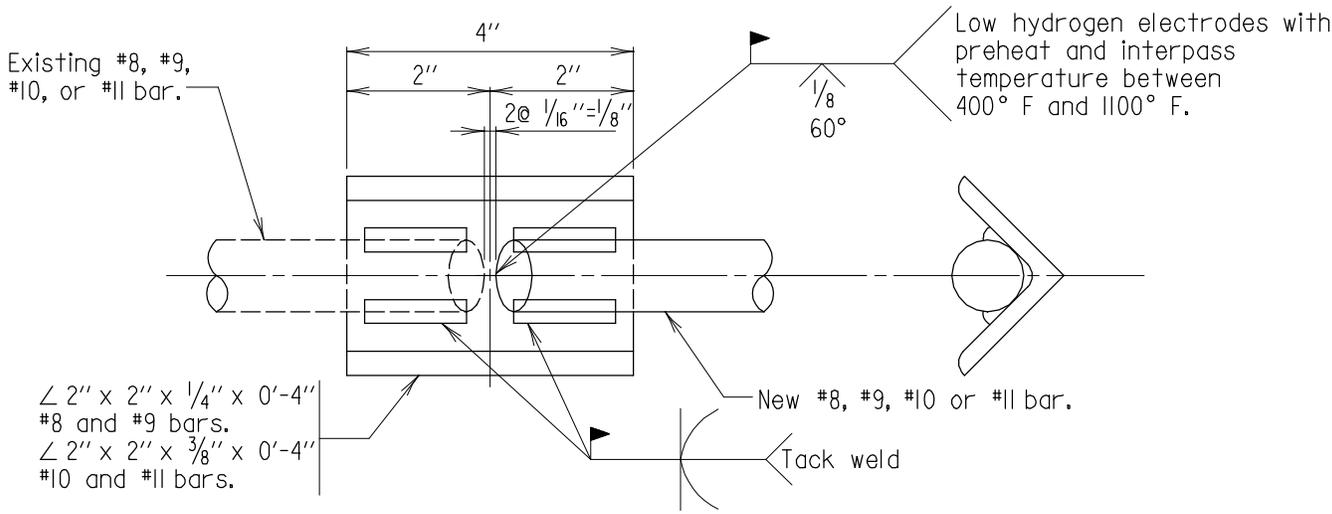
STANDARD NO. REBAR-BB-102

SHEET 2 OF 2

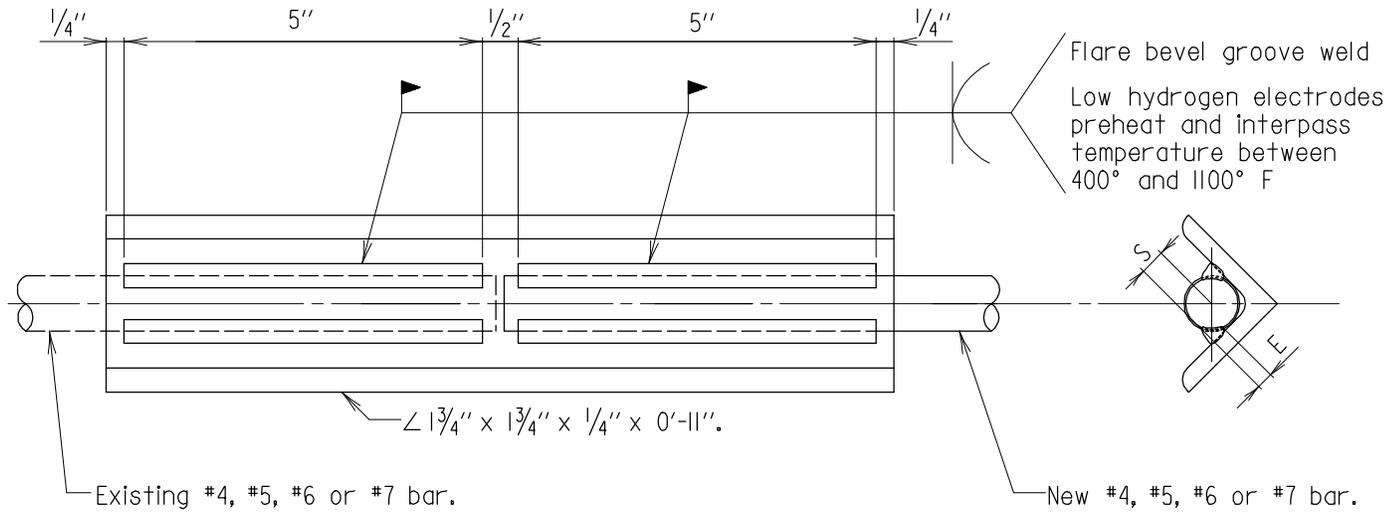
# REINFORCING DETAILS

EXISTING REINFORCING DETAILS

(REBAR-ER)



DETAIL FOR WELD SPLICE  
FOR #8, #9, #10 OR #11 BARS  
 Scale:  $\frac{3}{8}'' = 1''$



DETAIL FOR WELD SPLICE  
FOR #4, #5, #6 OR #7 BARS  
 Scale:  $\frac{3}{8}'' = 1''$

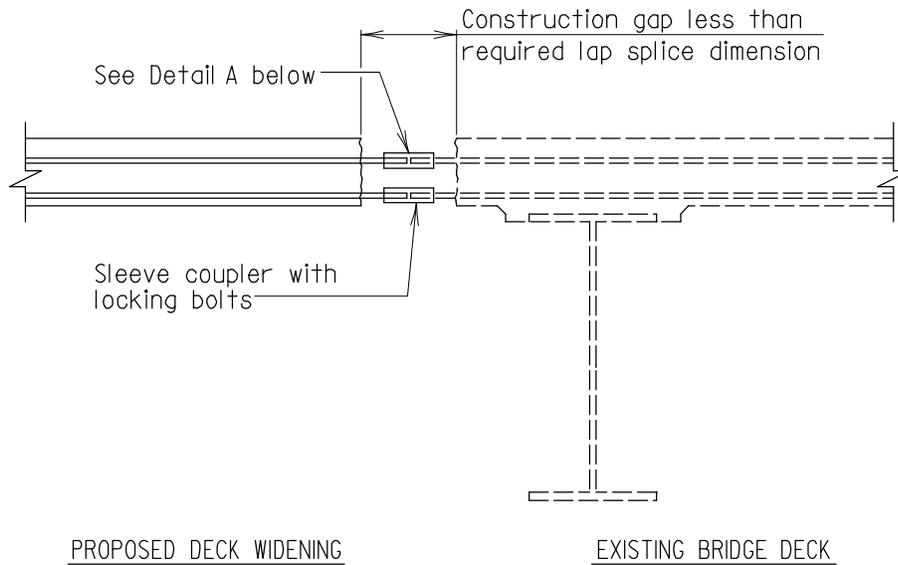
E = Effective throat weld  
 E = .4S  
 S = Radius rebar

- Notes:
1. All welding to be in conformance with ANSI/AWS-latest addition.
  2. Prequalification required in conformance with ANSI/AWS-latest addition.
  3. Angles shall be made of ASTM A 709 Grade 36 or AISI1010, 1015 or 1020 steel.
  4. E7018 electrodes shall be used in making the above welded splices.
  5. If sufficient bar lap is not available when existing reinforcing steel is exposed, this detail to extend bars shall be used. Cost of these connections shall be included in contract prices bid on pertinent concrete items.
  6. Welded splices shall not be used in decks.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES DATE: 2/18/76	
REVISIONS	
SHA	FHWA
9-24-96	
8-7-98	
1-22-01	
FHWA APPROVAL	DATE: 11-9-76
	11-26-07

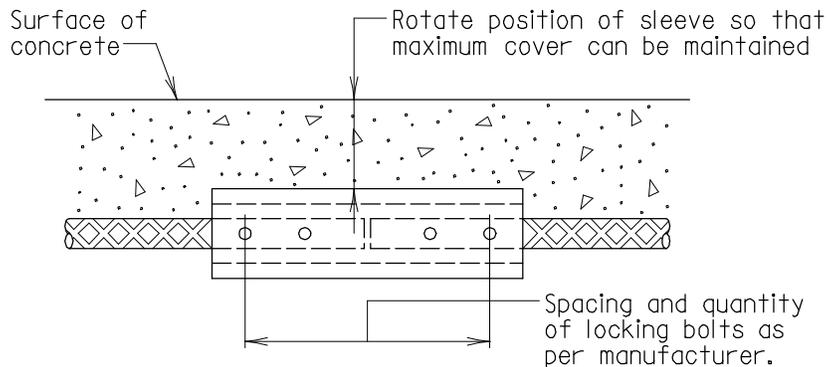
STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES	SPLICING TO EXISTING REINFORCING STEEL WELDED SPLICE
STANDARD NO. REBAR-ER-101	SHEET <u>1</u> OF <u>2</u>

REBAR - EXISTING



SECTION THROUGH SLAB

Scale: 1" = 1'-0"



DETAIL A

Scale: 3" = 1'-0"

Notes:

1. The coupler must develop a minimum of 125% of the specified yield strength of the reinforcing bar being spliced.
2. Couplers used to connect epoxy coated reinforcing bars must be epoxy coated.
3. The uncoated surface of the sheared off indicator bolt must be covered with epoxy prepared from an approved epoxy touchup kit.
4. Longitudinal deck reinforcing steel is not shown.
5. Existing slab shown dashed.
6. These couplers will not be measured for payment, but all costs thereof shall be included in the Contract lump sum price for the pertinent Reinforcing Steel items.

APPROVAL	
<i>L.S. Friedman</i> DIRECTOR OFFICE OF STRUCTURES	
DATE: 8/7/98	
REVISIONS	
SHA	FHWA
FHWA APPROVAL	
DATE:	

STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
SPLICING TO EXISTING REINFORCING STEEL MECHANICAL SPLICE
STANDARD NO. REBAR-ER-101
SHEET <u>2</u> OF <u>2</u>

REBAR - EXISTING