REINFORCING STEEL SUPPORTS

GENERAL

Supports for reinforcing steel in Section 2404.07 come in various sizes and types. These types have specific names such as slab bolsters, high chairs or continuous high chairs. The supports are used to hold reinforcing steel in place while concrete is being placed. They are typically made of small diameter steel rods, steel wire, or various shapes of molded plastic.

Table 1 identifies the various configurations of steel wire supports available. Table 2 lists the minimum sizes of steel wire required for the supports. Approval is based on meeting the minimum wire diameter sizes listed in Table 2.

Also, this IM provides an approved list of plastic supports.

Steel wire supports requiring a coating of PVC shall meet the requirements of ASTM A-933. Steel wire supports requiring a coating of Epoxy shall meet the requirements of ASTM A-884

APPROVAL PROCESS

A manufacturer of plastic supports, wishing to obtain approval shall submit the following to the Iowa Department of Transportation, Office of Materials, 800 Lincoln Way, Ames, IA 50010:

1. Technical Product Information

2. Samples:
   For individual chairs - 5 pieces
   For continuous support - 10 lineal feet (3 m)

TESTING PROCEDURE

The testing procedure involves determining a point load limit for all supports and also a linear load limit for continuous devices.

The point load limit is determined by placing a #4 (#10 M) reinforcing bar on the support. The support is then placed on a 3/4 in. (19 mm) piece of fir plywood. A load is applied to the bar at a rate of 0.5 in. (13 mm) deflection per minute until the support fails. Point loads are determined at the weakest point on continuous supports.

The linear load limit is determined by placing a 1 ft. (300 mm) long plate on top of the continuous support. The support is again placed on a 3/4 in. (19 mm) piece of fir plywood and loaded at 0.5 in. (13 mm) deflection per minute until the support fails.

The supports fail in one of three principle ways:

1. Breaking
2. Excessive bending or deformation - more than 1/2 in. (13 mm)
3. Excessive gouging into the plywood - more than 0.1 in. (2.5 mm)

ACCEPTANCE

Steel supports will be accepted based on meeting the minimum wire diameter based on the type and size as listed in Tables 1 and 2. There is not an approved suppliers list for steel supports.

Plastic supports will be accepted based on approved brands as noted in Appendix A.

MONITOR SAMPLING & TESTING

Samples may be secured from the project and tested to verify compliance.

TABLE 1 METRIC - TYPICAL TYPE & SIZES OF WIRE BAR SUPPORTS

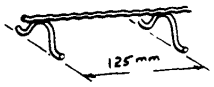
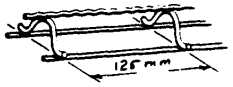
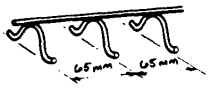
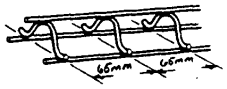
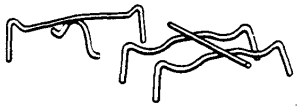
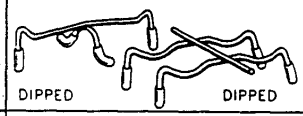
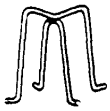
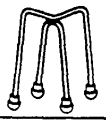
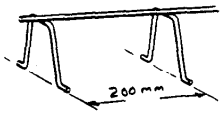
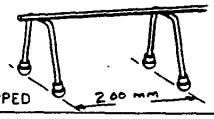
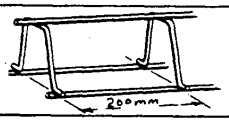
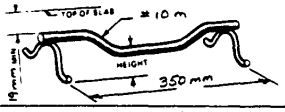
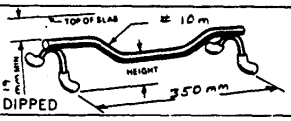
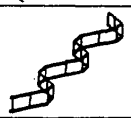
SYMBOL	BAR SUPPORT ILLUSTRATIONS	BAR SUPPORT ILLUSTRATION PLASTIC CAPPED OR DIPPED	TYPE OF SUPPORT	TYPICAL SIZES
SB		 CAPPED	Slab Bolster	20, 25, 40 and 50 mm heights in 1.5 and 3.0 m lengths
SBU*			Slab Bolster Upper	Same as SB
BB		 CAPPED	Beam Bolster	25, 40, 50 mm over 50 to 125 mm heights in increments of 5 mm in lengths of 1.5 m
BBU*			Beam Bolster Upper	Same as BB
BC		 DIPPED	Individual Bar Chair	20, 25, 40 and 45 mm heights
JC		 DIPPED DIPPED	Joist Chair	100, 125 and 150 mm widths and 20, 25, and 40 mm heights
HC		 CAPPED	Individaul High Chair	50 to 375 mm heights in increments of 5 mm
HCM*			High Chair for Metal Deck	50 to 375 mm heights in increments of 5mm
CHC		 CAPPED	Continuous High Chair	Same as HC in 1.5 and 3.0 m lengths
CHCU*			Continuous High Chair Upper	Same as CHC
CHCM*			Continuous High Chair for Metal Deck	Up to 125 mm heights in increments of 5 mm
JCU**		 DIPPED	Joist Chair Upper	350 mm span heights −25 mm thru +90 vary in 5 mm increments
CS			Continuous Support	40 to 300 mm in increments of 5 mm in lengths of 2 m

TABLE 2 METRIC – MINIMUM WIRE SIZES

		CARBON STEEL			STAIN-LESS STEEL	
SYMBOL	NOMINAL HEIGHT	TOP	LEGS	RUNNER	LEGS	USUAL GEOMETRY
SB	All	4 ga. Corrugated	6 ga.	–	8 ga.	Legs spaced 125 mm on center. Vertical corrugations spaced 25 mm on center.
SBU	All	4 ga. Corrugated	6 ga.	7 ga.	–	Same as SB.
BB	Up to 40 mm incl. Over 40 to 50 mm incl. Over 50 to 90 mm incl. Over 90 mm.	7 ga. 7 ga. 4 ga. 4 ga.	7 ga. 7 ga. 4 ga. 4 ga.	– – – –	9 ga. 8 ga. 7 ga. –	Legs spaced 65 mm on center.
BBU	Up to 50 mm incl. Over 50 mm	7 ga. 4 ga.	7 ga. 4 ga.	7 ga. 4 ga.	– –	Same as BB.
BC	All	–	7 ga.	–	9 ga.	–
JC	All	–	6 ga.	–	9 ga.	–
HC	50 to 90 mm incl. Over 90 to 125 mm incl. Over 125 to 225 mm incl. Over 225 to 375 mm incl.	– – – –	4 ga. 4 ga. 2 ga. 0 ga.	– – – –	7 ga. – – –	Legs at 20 deg. or less with vertical. When height exceeds 300 mm, legs are reinforced with welded corsswires or encircling wires.
HCM	50 to 125 mm incl. Over 125 to 225 mm incl. Over 225 to 375 mm incl.	– – –	4 ga.	– – –	– – –	Same as HC. The longest leg will govern the size of wire to be used.
CHC	50 to 90 mm incl. Over 90 to 125 mm incl. Over 125 to 225 mm incl. Over 225 to 375 mm incl.	2 ga. 2 ga. 2 ga. 2 ga.	4 ga. 4 ga. 2 ga. 0 ga.	– – – –	7 ga. – – –	Legs at 20 deg. or less with vertical. All legs 210 mm on center maximum, with leg within 100 mm of end of chair, and spread between legs not less than 50% of nominal height.
CHCU	50 to 125 mm incl. 125 to 225 mm incl. 225 to 375 mm incl.	2 ga. 2 ga. 2 ga.	4 ga. 2 ga. 0 ga.	4 ga. 4 ga. 4 ga.	– – –	Same as CHC.
CHCM	Up to 50 mm incl. Up to 50 mm incl. Over 50 to 125 mm incl.	4 ga. 2 ga. 2 ga.	6 ga. 4 ga. 4 ga.	– – –	– – –	With 4 ga. top wire, maximum leg spacing is 125 mm on center. With 2 ga. top wire, maximum spacing is 250 mm on center.
JCU	–25 to 90 mm incl. (Measured from form to top of middle protion of saddle bar) in 5 mm increments.	#10 m bar	2 ga.	–	–	Legs spaced 350 mm on center. Maximum height pf JCU at support legs should be slab thickness minus 20 mm.
CS	40 to 175 mm incl. 125 to 300 mm incl. 190 to 300 mm incl.	8 ga. 6 ga. 4 ga.	8 ga. 6 ga. 4 ga.	8 ga. 6 ga. 4 ga.	– – –	Legs spaced 150 mm on center, 100 mm on center at bend point. Middle runner used for heights over 175 mm.

Gauge	Decimal Equivalent (mm)
0	7.78
1	7.19
2	6.67
3	6.19
4	5.72
5	5.26
6	4.88
7	4.49
8	4.11
9	3.77

TABLE 1 ENGLISH – TYPICAL TYPE & SIZES OF WIRE BAR SUPPORTS

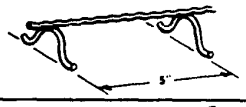
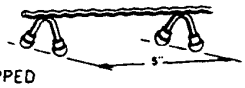
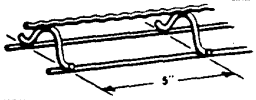
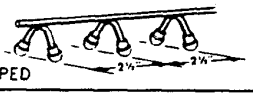
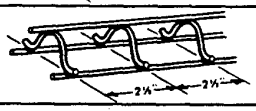
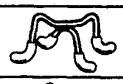
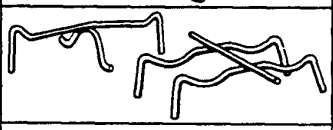
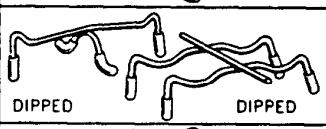
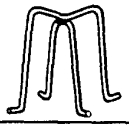
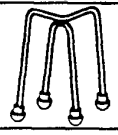
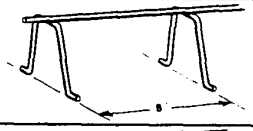
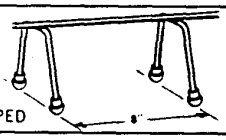
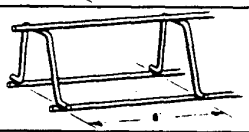
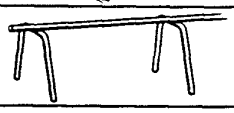
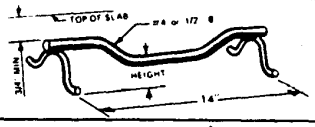
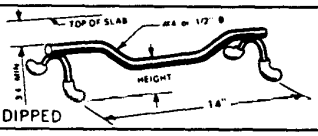
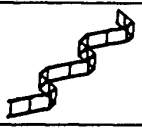
SYMBOL	BAR SUPPORT ILLUSTRATION	BAR SUPPORT ILLUSTRATION PLASTIC CAPPED OR DIPPED	TYPE OF SUPPORT	TYPICAL SIZES
SB		 CAPPED	Slab Bolster	¾, 1, 1½, and 2 inch heights in 5 ft. and 10 ft. lengths
SBU			Slab Bolster Upper	Same as SB
BB		 CAPPED	Beam Bolster	1, 1½, 2, over 2" to 5" heights in increments of ¼" in lengths of 5 ft.
BBU*			Beam Bolster Upper	Same as BB
BC		 DIPPED	Individual Bar Chair	¾, 1, 1½, and 1¾" heights
JC		 DIPPED DIPPED	Joist Chair	4, 5, and 6 inch widths and ¾, 1 and 1½ inch heights
HC		 CAPPED	Individual High Chair	2 to 15 inch heights in increments of ¼ inch
HCM			High Chair for Metal Deck	2 to 15 inch heights in increments of ¼ in.
CHC		 CAPPED	Continuous High Chair	Same as HC in 5 foot and 10 foot lengths
CHCU			Continuous High Chair Upper	Same as CHC
CHCM*			Continuous High Chair for Metal Deck	Up to 5 inch heights in increments of ¼ in.
JCU		 DIPPED	Joist Chair Upper	14" Span Heights – 1" thru +3½" vary in ¼" increments
CS			Continuous Support	1½" to 12" in increments of ¼" in lengths of 6'-8"

TABLE 2 ENGLISH - MINIMUM WIRE SIZES

		CARBON STEEL			STAIN-LESS STEEL	
SYMBOL	NOMINAL HEIGHT	TOP	LEGS	RUNNER	LEGS	USUAL GEOMETRY
SB	All	4 ga. Corrugated	6 ga.	—	8 ga.	Legs spaced 5 in. on center. Vertical corrugations spaced 1 in. on center.
SBU	All	4 ga. Corrugated	6 ga.	7 ga.	—	Same as SB
BB	Up to 1½" incl. Over 1½" to 2" incl. Over 2" to 3½" incl. Over 3½"	7 ga. 7 ga. 4 ga. 4 ga.	7 ga. 7 ga. 4 ga. 4 ga.	— — — —	9 ga. 8 ga. 7 ga. —	Legs spaced 2½ in. on center.
BBU	Up to 2" incl. Over 2"	7 ga. 4 ga.	7 ga. 4 ga.	7 ga. 4 ga.	— —	Same as BB.
BC	All	—	7 ga.	—	9 ga.	—
JC	All	—	6 ga.	—	9 ga.	—
HC	2" to 3½" incl. Over 3½" to 5" incl. Over 5" to 9" incl. Over 9" to 15" incl.	— — — —	4 ga. 4 ga. 2 ga. 0 ga.	— — — —	7 ga. — — —	Legs at 20 deg. or less with vertical. When height exceeds 12 in., legs are reinforced with welded crosswires or encircling wires.
HCM	2" to 5" incl. Over 5" to 9" incl. Over 9" to 15" incl.	— — —	4 ga.	— — —	— — —	Same as HC. The longest leg will govern the size of wire to be used.
CHC	2" to 3½" incl. Over 3½" to 5" incl. Over 5" to 9" incl. Over 9" to 15" incl.	2 ga. 2 ga. 2 ga. 2 ga.	4 ga. 4 ga. 2 ga. 0 ga.	— — — —	7 ga. — — —	Legs at 20 deg. or less with vertical. All legs 8¼ in. on center maximum, with leg within 4 in. of end of chair, and spread between legs not less than 50% of nominal height.
CHCU	2" to 5" incl. Over 5" to 9" incl. Over 9" to 15" incl.	2 ga. 2 ga. 2 ga.	4 ga. 2 ga. 0 ga.	4 ga. 4 ga. 4 ga.	— — —	Same as CHC.
CHCM	Up to 2" incl. Up to 2" incl. Over 2" to 5" incl.	4 ga. 2 ga. 2 ga.	6 ga. 4 ga. 4 ga.	— — —	— — —	With 4 ga. top wire, maximum leg spacing is 5 in. on center. With 2 ga. top wire, maximum spacing is 10 in. on center.
JCU	−1" to +3½" incl. (Measured from form to top of middle portion of saddle bar) in ¼" increments.	#4 bar or ½" ø	2 ga.	—	—	Legs spaced 14 in. on center. Maximum height of JCU at support legs should be slab thickness minus ¾ in.
CS	1½" to 7" incl. 5" to 12" incl. 7½" to 12" incl.	8 ga. 6 ga. 4 ga.	8 ga. 6 ga. 4 ga.	8 ga. 6 ga. 4 ga.	— — —	Legs spaced 6 in. on center, 4 in. on center at bend point. Middle runner used for heights over 7 in.

Gauge	Decimal Equivalent (Inches)
0	.3065
1	.2830
2	.2625
3	.2437
4	.2253
5	.2070
6	.1920
7	.1770
8	.1620
9	.1483