

A Message from the Minnesota Concrete Pipe Association, MnCPA

ARCH PIPE DESIGN

When designing and specifying reinforced concrete arch pipe (RCPA), it’s important to understand that there are differences between the available design standards. In Minnesota, there are two commonly referenced standards for RCPA, they are:

- 1) The American Society of Testing and Materials (ASTM), Specification C506.
- 2) The Minnesota Department of Transportation (MnDOT) Standard Plate 3014J.

MnDOT arch pipe are typically referred to as Class 2A, 3A & 4A, while ASTM are generally referred to as simply Class 2, Class 3 & Class 4.

Unlike regular round concrete pipe, these two agencies designs are not exactly the same and there is no easy correlation between the strength of an ASTM class of pipe verses a MnDOT class. MnDOT Standard Plate 3014J specifies use of a Class 2A pipe for up to 8 ft of overfill and a Class 3A pipe for 8 ft to 15 ft of overfill. ASTM arch pipe designs utilize a D-Load strength classification similar to round pipe. Therefore the fill height limits for the various ASTM classes of arch pipe are approximately equal to the allowable fill heights for the same class of round pipe. Please contact a representative of the Minnesota Concrete Pipe Association (MnCPA) for specific recommendations.

Table 1 and Table 2 below show the tabulated steel areas in in²/ft for the various classes of arch pipe. Table 3 shows the relative strength (ability to support a load) for the different classes of pipe for each span. Please note that all classes of pipe are not available for all of the pipe sizes.

TABLE 1 ASTM-C506

EQUIVALENT SIZE	SPAN	2		3		4	
		INNER	OUTER	INNER	OUTER	INNER	OUTER
18	22	0.11	-	0.14	-	0.26	-
24	29	0.16	-	0.22	-	0.32	-
30	36	0.18	0.14	0.24	0.18	0.36	0.27
36	44	0.22	0.18	0.3	0.24	0.44	0.33
42	51	0.26	0.2	0.36	0.28	0.54	0.43
48	59	0.3	0.24	0.44	0.34	-	-
54	65	0.36	0.28	0.48	0.38	-	-
60	73	0.42	0.34	0.46	0.44	-	-
72	88	0.52	0.4	0.72	0.56	-	-
84	102	0.64	0.48	0.88	0.68	-	-

TABLE 2 MnDOT - STD. PLATE 3014J

EQUIVALENT SIZE	SPAN	2A		3A		4A	
		INNER	OUTER	INNER	OUTER	INNER	OUTER
18	22	0.42	-	-	-	-	-
24	29	0.42	-	-	-	-	-
30	36	0.44	0.34	-	-	-	-
36	44	0.42	0.34	-	-	-	-
42	51	0.52	0.38	-	-	-	-
48	59	0.48	0.38	-	-	-	-
54	65	0.48	0.38	-	-	-	-
60	73	0.48	0.36	0.7	0.7	1.08	1.06
72	88	0.46	0.42	0.86	0.84	0.13	1.22
84	102	0.46	0.46	0.99	0.97	1.46	1.42

TABLE 3 - Comparison of MnDOT to ASTM

SPAN INCHES	INCREASING STRENGTH →				
	2	3	4	2A	4A
22	2	3	4	2A	-
29	2	3	4	2A	-
36	2	3	4	2A	-
44	2	3	2A	4	-
51	2	3	2A	4	-
59	2	2A	3	-	-
65	2	2A/3	-	-	-
73	2A	2	3	3A	4A
88	2A	2	3	3A	4A
102	2A	2	3	3A	4A

Visit <http://www.mnconcpipe.org> for more information on this and other concrete pipe issues or respond to this e-mail for additional information.

Thank you for your time,



The **Minnesota Concrete Pipe Association** is a non-profit organization comprised of concrete product suppliers in Minnesota.

Please visit our website www.mnconcpipe.org for more information.

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