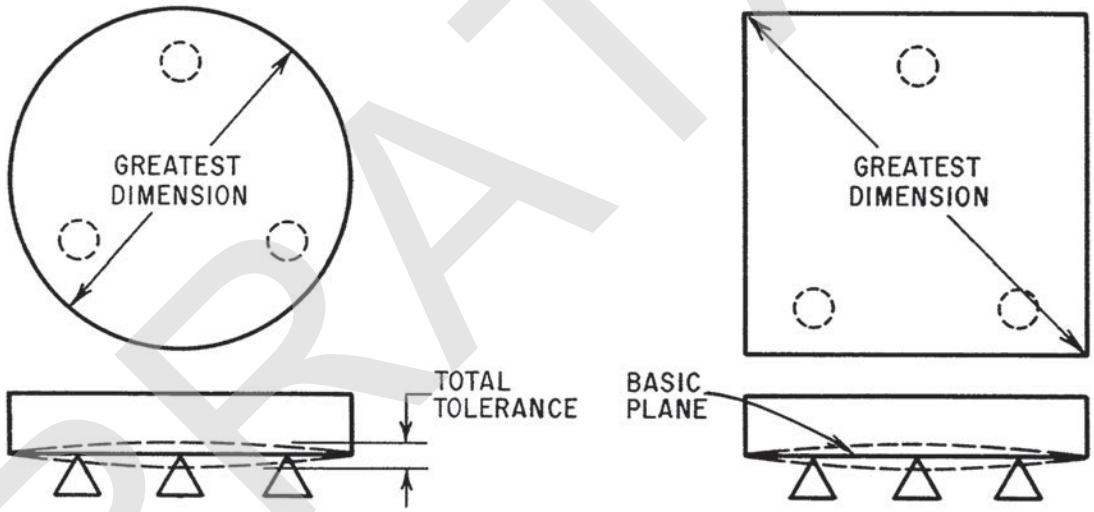
NOTE: The values shown herein represent normal production practice at the most economic level. Greater accuracy involving extra close work or care in production should be specified only when and where necessary since additional costs may be involved. Conversely, more liberal values should be indicated, when acceptable, as these tend to keep costs to a minimum. Any variations in these values shall not be binding on the foundry unless accepted in writing.

FLATNESS: Flatness is that condition which exists when all points on a surface lie in the same plane. The surfaces of castings can be measured for flatness by supporting the surface in question on three widely separated points to establish the basic plane. The flatness variation is the deviation from that plane as measured by mutually accepted methods.

FLATNESS TOLERANCE: A flatness tolerance is that total deviation permitted from a plane and consists of the distance between two parallel planes within which the entire surface so toleranced must lie.



Greates							e
in.	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**
0 thru 6	150	within 0.020	within 0.50	within 0.030	within 0.80	within 0.020	within 0.50
each additional 1 thru 24	25 thru 600	0.002 per inch	0.06 per 25 mm	0.003 per inch	0.08 per 25 mm	0.002 per inch	0.06 per 25 mm

For castings over 24 inches (600 mm), consult foundry.

Checking for flatness will be performed only on those surfaces specified.

On castings of such configuration and/or alloy where it becomes impossible or impractical to straighten, exceptions to the above tolerances are required. In such cases, the foundry should be consulted.

Tolerances closer than the above can at times be obtained. Special gauges and fixtures requiring extra costs may be needed.

STRAIGHTNESS: Straightness is that condition which, when matched with a true straight edge of a true flat surface, will permit full line contact along the full length. Tolerance should be discussed with foundry.

Quality levels as indicated in Table 6 and referenced in ASTM E155 show the type of discontinuity and maximum size or degree allowed in each case.

An illustration of a typical reference radiograph is contained in ASTM E155.

TABLE 6—DISCONTINUITY - LEVEL REQUIREMENTS FOR ALUMINUM CASTINGS IN ACCORDANCE WITH FILM REFERENCE RADIOGRAPHS E155 OR DIGITAL REFERENCE RADIOGRAPHS E2422

Discontinuity	Grade A[A]	Grade B		Grade C		Grade D	
	Section Thickness, in. (mm)						
	1/4 to 3/4 (6.4 to 19.0)	1/4 (6.4)	3/4 (19.0)	1/4 (6.4)	3/4 (19.0)	1/4 (6.4)	3/4 (19.0)
Gas holes	None	1	1	2	2	5	5
Gas porosity (round)	None	1	1	3	3	7	7
Gas porosity (elongated)	None	1	2	3	4	5	5
Shrinkage cavity	None	1	[B]	2	[B]	3	[B]
Shrinkage porosity or sponge	None	1	1	2	2	4	3
Foreign material (less dense material)	None	1	1	2	2	4	4
Foreign material (more dense material)	None	1	1	2	1	4	3
Cracks	None	None		None		None	
Cold shuts	None	None		None		None	
Surface irregularity	Not to exceed drawing tolerance						
Core shift	Not to exceed drawing tolerance						

[A] Caution should be exercised in requesting grade A because of the difficulty in obtaining this level.
[B] No reference radiographs available for this thickness. Use the 1/4 inch (6.4 mm) values for all thicknesses with a severity level 2 units greater than the one shown in the 1/4 inch column for the grade specified.

TABLE 7—FREQUENCY LEVELS

Frequency Level**	Radiographic	Penetrant
1	100%	100%
2	See Table 8	See Table 8
3	Foundry Control	
4	Visual Inspection Only	

**Differing frequency levels for radiographic and penetrant inspection may be negotiated.

TABLE 8—SAMPLING PLAN

Lot Size†	Sample Size	Acceptable Number	Rejection Number
2–50	2	0	1
51–500	8	1	2
501–Over	13	2	3

†Unless otherwise specified, a lot shall consist of all castings of a specific design of one alloy produced at one facility by the same production technique and submitted for inspection at one time.

TABLE 2: CHEMICAL COMPOSITION LIMITS FOR COMMONLY USED SAND AND PERMANENT MOLD CASTING ALLOYS ①②

DESIGNATION																						OTHERS⑦		
AA No.	DATE REGISTERED	PRODUCTS④	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	Be	Pb	Sn	Zr		FNs	Each	Total③	Al
201.0	1968-04-17	S	0.10	0.15	4.0-5.2	0.20-0.50	0.15-0.55	...	...	...	0.15-0.35	0.40-1.0	...	...	...	...		...	0.05	0.10	Rem.
204.0	1974-10-01	S&P	0.20	0.35	4.2-5.0	0.10	0.15-0.35	...	0.05	0.10	0.15-0.30	...	...	...	0.05	...		...	0.05	0.15	Rem.
206.0	1976-04-23	S&P	0.10	0.15	4.2-5.0	0.20-0.50	0.15-0.35	...	0.05	0.10	0.15-0.30	...	...	...	0.05	...		...	0.05	0.15	Rem.
A206.0	1976-04-23	S&P	0.05	0.10	4.2-5.0	0.20-0.50	0.15-0.35	...	0.05	0.10	0.15-0.30	...	...	...	0.05	...		...	0.05	0.15	Rem.
242.0	...	S&P	0.7	1.0	3.5-4.5	0.35	1.2-1.8	0.25	1.7-2.3	0.35	0.25	...	...	...	...	...		...	0.05	0.15	Rem.
295.0	....	S	0.7-1.5	1.0	4.0-5.0	0.35	0.03	...	...	0.35	0.25	...	...	...	...	...		...	0.05	0.15	Rem.
296.0	....	P	2.0-3.0	1.2	4.0-5.0	0.35	0.05	...	0.35	0.50	0.25	...	...	...	...	...		...	...	0.35	Rem.
308.0	....	S&P	5.0-6.0	1.0	4.0-5.0	0.50	0.10	...	...	1.0	0.25	...	...	...	...	...		...	...	0.50	Rem.
319.0	....	S&P	5.5-6.5	1.0	3.0-4.0	0.50	0.10	...	0.35	1.0	0.25	...	...	...	...	...		...	...	0.50	Rem.
328.0	2003-07-09	S	7.5-8.5	1.0	1.0-2.0	0.20-0.6	0.20-0.6	0.35	0.25	1.5	0.25	...	...	...	...	...		...	...	0.50	Rem.
332.0	....	P	8.5-10.5	1.2	2.0-4.0	0.50	0.50-1.5	...	0.50	1.0	0.25	...	...	...	...	...		...	...	0.50	Rem.
333.0	....	P	8.0-10.0	1.0	3.0-4.0	0.50	0.05-0.50	...	0.50	1.0	0.25	...	...	...	...	...		...	...	0.50	Rem.
336.0	.....	P	11.0-13.0	1.2	0.50-1.5	0.35	0.7-1.3	...	2.0-3.0	0.35	0.25	...	...	...	...	...		...	0.05	...	Rem.
354.0	....	P	8.6-9.4	0.20	1.6-2.0	0.10	0.40-0.6	...	...	0.10	0.20	...	...	...	...	...		...	0.05	0.15	Rem.
355.0	....	S&P	4.5-5.5	0.6⑥	1.0-1.5	0.50⑦	0.40-0.6	0.25	...	0.35	0.25	...	...	...	...	...		...	0.05	0.15	Rem.
C355.0	....	S&P	4.5-5.5	0.20	1.0-1.5	0.10	0.40-0.6	...	...	0.10	0.20	...	...	...	...	...		...	0.05	0.15	Rem.
356.0	....	S&P	6.5-7.5	0.6⑥	0.25	0.35⑦	0.20-0.45	...	...	0.35	0.25	...	...	...	...	...		...	0.05	0.15	Rem.
A356.0	....	S&P	6.5-7.5	0.20	0.20	0.10	0.25-0.45	...	...	0.10	0.20	...	...	...	...	...		...	0.05	0.15	Rem.
B356.0	1981-09-17	S&P	6.5-7.5	0.09	0.05	0.05	0.25-0.45	...	...	0.05	0.04-0.20	...	...	...	...	...		...	0.05	0.15	Rem.
357.0	....	S&P	6.5-7.5	0.15	0.05	0.03	0.45-0.6	...	...	0.05	0.20	...	...	...	...	...		...	0.05	0.15	Rem.

TABLE 2: CHEMICAL COMPOSITION LIMITS FOR COMMONLY USED SAND AND PERMANENT MOLD CASTING ALLOYS ①② (CONTINUED)

DESIGNATION																				OTHERS ⑦		
AA No.	DATE REGISTERED	PRODUCTS ④	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	Be	Pb	Sn	Zr		FNs	Each	Total ③	Al
A357.0	....	S&P	6.5-7.5	0.20	0.20	0.10	0.40-0.7	...	...	0.10	0.04-0.20	...	0.04-0.07	...	...	...	...	...	0.05	0.15	Rem.
E357.0	2001-06-06	S,P&I	6.5-7.5	0.10	....	0.10	0.55-0.6	...	...	0.10-0.20	...	...	0.002	...	...	...	...	...	0.05	0.15	Rem.
359.0	....	S&P	8.5-9.5	0.20	0.20	0.10	0.50-0.7	...	...	0.10	0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
443.0	....	S&P	4.5-6.0	0.8	0.6	0.50	0.05	0.25	...	0.50	0.25	...	...	...	...	...	...	...	...	0.35	Rem.
B443.0	....	S&P	4.5-6.0	0.8	0.15	0.35	0.05	...	...	0.35	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
A444.0	....	P	6.5-7.5	0.20	0.10	0.10	0.05	...	...	0.10	0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
512.0	....	S	1.4-2.2	0.6	0.35	0.8	3.5-4.5	0.25	...	0.35	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
513.0	....	P	0.30	0.40	0.10	0.30	3.5-4.5	...	...	1.4-2.2	0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
514.0	....	S	0.35	0.50	0.15	0.35	3.5-4.5	...	...	0.15	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
520.0	....	S	0.25	0.30	0.25	0.15	9.5-10.6	...	...	0.15	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
535.0	....	S	0.15	0.15	0.05	0.10-0.25	6.2-7.5	...	...	...	0.10-0.25	...	0.003-0.007	...	...	...	0.005 B	...	0.05	0.15	Rem.
705.0	....	S&P	0.20	0.8	0.20	0.40-0.6	1.4-1.8	0.20-0.40	...	2.7-3.3	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
707.0	....	S&P	0.20	0.8	0.20	0.40-0.6	1.8-2.4	0.20-0.40	...	4.0-4.5	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
710.0	....	S	0.15	0.50	0.35-0.6	0.05	0.6-0.8	...	...	6.0-7.0	0.25	...	...	...	...	...	...	...	0.05	0.15	Rem.
711.0	....	P	0.30	0.7-1.4	0.35-0.6	0.05	0.25-0.45	...	...	6.0-7.0	0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
712.0	....	S	0.30	0.50	0.25	0.10	0.50-0.65⑤	0.40-0.6	...	5.0-6.5	0.15-0.25	...	...	...	...	...	...	...	0.05	0.20	Rem.
713.0	....	S&P	0.25	1.1	0.40-1.0	0.6	0.20-0.50	0.35	0.15	7.0-8.0	0.25	...	...	...	...	...	...	...	0.10	0.25	Rem.
771.0	....	S	0.15	0.15	0.10	0.10	0.8-1.0	0.06-0.20	...	6.5-7.5	0.10-0.20	...	...	...	...	...	...	...	0.05	0.15	Rem.
850.0	....	S&P	0.7	0.7	0.7-1.3	0.10	0.10	...	0.7-1.3	...	0.20	...	...	...	5.5-7.0	...	...	...	...	0.30	Rem.
851.0	....	S&P	2.0-3.0	0.7	0.7-1.3	0.10	0.10	...	0.30-0.7	...	0.20	...	...	...	5.5-7.0	...	...	...	...	0.30	Rem.
852.0	....	S&P	0.40	0.7	1.7-2.3	0.10	0.6-0.9	...	0.9-1.5	...	0.20	...	...	...	5.5-7.0	...	...	...	...	0.30	Rem.