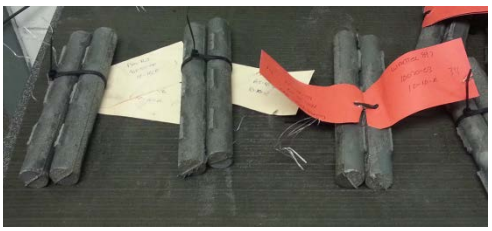
Goldens' Guide to Ductile Iron Grades

Grey and Ductile iron is classified by grade; each grade of iron corresponds to its strength, elongation (ability to stretch) and other properties. Different countries use different grades and in the US there is a standard used by the automotive industry (SAE) and a General (ASTM) classification.

USA - ASTM	USA – SAE	EU (approximate)	Germany (approximate)	Japan (approximate)	Tensile Strength psi	Yield Strength psi	% Elongation
Grey Iron							
ASTM A48	SAE J431B	EN 1561	DIN 1691	JIS G5501			
Class 20	-	EN-GJL-100	GG-10	FC100	22,000		
Class 25	G2500	EN-GJL-150	GG-15	FC150	26,000		
Class 30	G3000	EN-GJL-200	GG-20	FC200	31,000		
Class 35	G3500	EN-GJL-250	GG-25	FC250	36,500		
Class 40/45	G4000	EN-GJL-300	GG-30	FC300	42,500		
Class 50	-	EN-GJL-350	GG-35	FC350	52,500		
Ductile Iron							
ASTM 536	SAE J434B	EN 1563	DIN 1693	JIS G5502			
60-40-18	D4018	EN-GJS-400-18	GGG-40	FCD400	60,000	40,000	18
65-45-12	D4512	EN-GJS-400-18	-	FCD450	65,000	45,000	12
70-50-07	D5007	-	GGG-50	FCD500	70,000	50,000	07
80-55-06	D5506	EN-GJS-500-7	-	FCD600	80,000	55,000	06
80-60-03	D6003	EN-GJS-600-3	GGG-60	FCD600	80,000	60,000	03
100-70-03	D7003	EN-GJS-700-2	GGG-70	FCD700	100,000	70,000	03
120-90-02	D9002	EN-GJS-800-2	GGG-80	FCD800	120,000	90,000	02

The grade of iron is achieved by adding specific alloys and controlling the carbon content of each ladle. A test bar is poured from the ladle for each new grade of iron that is used in the foundry. The test bars get sent to the lab for testing, where they get machined into a test specimens that are mounted to the Universal Test Machine. The samples get pulled to the point of destruction while measuring the force and elongation to ensure the proper grade of iron has been produced.



Tensile strength is determined by the equivalent force at which a sample of the iron specimen will snap.
Yield strength is the force at which the iron specimen will start to yield or permanently deform.
% elongation is the amount of length that it can be stretched from its original shape before it permanently deforms.
Different alloying elements will help determine the strength and elongation properties of the iron.

Grade	60-40-18	65-45-12	70-50-07	80-55-06	80-60-03	100-70-03	120-90-02
C %	3.55 – 3.65	3.55 – 3.65	3.55 – 3.65	3.55 – 3.65	3.55 – 3.65	3.55 – 3.65	3.55 – 3.65
Si %	2.30 – 2.70	2.30 – 2.70	2.30 – 2.70	2.30 – 2.70	2.30 – 2.70	2.30 – 2.70	2.30 – 2.70
Mn %	.40 Max	.40 Max	.40 - .60	.40 - .60	.40 - .60	.40 - .60	.40 - .60
P %	.050 Max	.050 Max	.050 Max	.050 Max	.050 Max	.050 Max	.050 Max
S %	.008 - .015	.008 - .015	.008 - .015	.008 - .015	.008 - .015	.008 - .015	.008 - .015
Mg %	.030 - .045	.030 - .045	.030 - .045	.030 - .045	.030 - .045	.030 - .045	.030 - .045
Cu %	< .30	< .30	.40 - .60	.40 - .60	.40 - .60	.60 - .80	.60 - .80
Ni %	NA	NA	NA	.040 – 1.0	.040 – 1.0	.040 – 1.0	.040 – 1.0
Sn %	NA	NA	NA	NA	NA	.020 - .050	.020 - .050

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