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~~Draft~~ Sri Lanka Standard

GREY CAST IRON

Part 2 Specification for grey cast iron for automotive industry

Sri Lanka Standards Institution

C O N S T I T U T I O N

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FOREWORD

This Standard was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on [illegible] after the draft, finalized by the Drafting Committee on Grey Cast Iron, had been approved by the Mechanical Engineering Divisional Committee.

All values in this standard are given in SI units.

The standard on grey cast iron is presented in 6 parts,namely;

Part 1 Specification for grey cast iron for general purposes

Part 2 Specification for grey cast iron for automotive industry

Part 3 Method of test for tensile strength

Part 4 Method of test for transverse strength

Part 5 Metallographic evaluation of grey cast iron

Part 6 Heat treatment of grey cast iron

When all these parts are approved by the Council as Sri Lanka Standards SLS 178 will be withdrawn.

This part of the standard covers the technical provisions relating to grey cast iron for automotive industry.

For the information of manufacturers, typical uses of various grades of grey cast iron have been given in Appendix A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with CS 102. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

The assistance derived from related publications of the International Organization for Standardization, Bureau of Indian Standards and Society of Automotive Engineers of United States of America in the preparation of this standard is gratefully acknowledged.

1 SCOPE

This standard covers the requirements for grey cast iron used in automotive industry.

2 REFERENCES

CS 102 Presentation of numerical values
CS 146 Method for Brinell hardness test
SLS 428 Random sampling methods
SLS ...* Procedure for heat-treatment of grey iron castings
SLS ...* Method for tensile testing of grey cast iron
SLS ...* Method for transverse testing of grey cast iron
SLS ...* Method for evaluation and classification of graphite in cast iron.

3 GRADES

There shall be nine grades of grey iron as shown in Table 1.

4 REQUIREMENTS

4.1 Manufacture
The castings shall be made from metal melted and refined in a foundry.

4.2 Chemical composition
The ranges of chemical composition for the above grades of cast iron shall be as given in Table 1.

4.3 Microstructure
Microstructure of above grades of grey iron shall be as given in Table 2.

4.4 Heat treatment
The castings shall be heat treated in accordance with SLS...** to relieve stresses and to achieve the desired hardness and the corresponding microstructures.

4.5 Mechanical properties
The tensile strength, transverse strength, deflection and hardness of grey iron castings shall be as given in Table 3.

* under preparation
** Procedure for heat-tretment of grey iron (under preparation)

TABLE 1 - Grades of grey iron and Chemical composition

Grade	Carbon	Silicon	Manganese	Sulphur max.	Phosphorus max.	Chromium	Molybdenum	Nickel
	%	%	%	%	%	%	%	%
150	3.40-3.70	2.30-2.80	0.50-0.80	0.15	0.25	-	-	-
200	3.20-3.50	2.00-2.30	0.60-0.90	0.15	0.20	-	-	-
200 a	3.40 min.	1.60-2.10	0.60-0.90	0.12	0.15	as required	as required	-
250	3.10-3.40	1.90-2.30	0.60-0.90	0.15	0.15	-	-	-
300	3.00-3.30	1.80-2.20	0.60-0.90	0.15	0.12	-	-	-
300 b	3.40 min.	1.30-1.80	0.60-0.90	0.12	0.15	as required	as required	-
300 c	3.50 min.	1.30-1.80	0.60-0.90	0.12	0.15	as required	as required	-
350	3.00-3.30	1.80-2.10	0.70-1.00	0.15	0.10	-	-	-
350 d	3.10-3.60	1.95-2.40	0.60-0.90	0.15	0.10	0.85-1.50	0.40-0.60	0.20-0.45 (optional)

Table 2 - Microstructure

Grade	Graphite	Matrix
150	Flake Graphite	More ferrite and small amount of pearlite.
200	Flake Graphite	Free ferrite and pearlite. Pearlite appears at the cell boundries.
200 a	Type VII Size (2-4) A Distribution	Lamellar pearlite with small amount of ferrite
250	Flake Graphite	Mixture of pearlite and ferrite.
300	Flake Graphite	Tempered pearlite.
300 b	Type VII Size (3-5) A Distribution	Mostly lamellar pearlite with small amount of carbides.
300 c	Type VII Size (3-5) A Distribution	Mostly lamellar pearlite with small amount of carbides.
350	Flake Graphite	Pearlite.
350 d	Type VII A size (4-7) A and E Distribution	Pearlite and Carbides.

NOTE - Relevant microstructures shall be obtained in the effective surface only by localised heat treatment methods.

Table 3 - Mechanical properties

Grade	Tensile strength, min. MPa	Transverse Strength, min. kN	Deflection min. mm	Hardness Range HB
150	124	7.65	3.6	187 max
200	173	8.90	4.3	170 - 229
200 a	173	8.90	4.3	170 - 229
250	207	9.79	5.1	187 - 241
300	241	10.90	6.1	207 - 255
300 b	241	10.68	6.1	207 - 255
300 c	241	10.68	6.1	207 - 255
350	276	11.56	6.9	217 - 269
350 d	276	11.56	6.9	241 - 321

4.6 Workmanship and finish
The casting shall conform to the pattern or working drawing.

The castings shall be free from defects except for minor imperfections not associated with the structural functions. Casting shall be well fettled/dressed.
No welding repair shall be carried out other than by approved methods as agreed to between the purchaser and the supplier.

5 METHODS OF TESTS

5.1 Hardness test
The hardness shall be ascertained in accordance with CS 146.

5.2 Tensile test
The tensile strength shall be ascertained in accordance with SLS ...*.

5.3 Transvers strength and deflection test
The transvers strength and deflection shall be ascertained in accordance with SLS ...**.

5.4 Metallographic test
The Metallographic Test shall be carried out in accordance with SLS ...+.

6 PREPERATION OF TEST BARS

6.1 All test bars shall be cast separately in sand moulds and the number of test bars required shall be as specified in **8.** They shall be cast at the same time and from the same melt as the castings they represent.

6.2 When castings are subjected to heat treatment, the test bars shall be treated simultaneously under the same conditions as the castings they represent.

6.3 All test bars shall be suitably marked to identify them with the casting they represent.

* Method for tensile Testing of grey Cast Iron (under preparation)
** Method for transverse testing of grey cast iron (under preparation)
+ Method for evaluation and classification of graphite in cast iron (under preparation)

7 MARKING

7.1 Each casting shall be legibly marked with the following:

a) A number or identification mark by which it can be traced to the melt, and the batch of heat treatment, if done, from which it was made; and

b) Manufacturer's name or trade mark.

8 SAMPLING

8.1 Lot
All grey iron castings of the same grade belonging to one batch of manufacture or supply shall constitute a lot.

8.2 Scale of sampling

8.2.1 Test bars provided from each lot shall be tested for ascertaining its conformity to the requirements of this specification.

8.2.2 The number of bars to be selected from the lot shall be in accordance with Columns 2 and 3 of Table 4.

TABLE 4 - Number of test bars

Mass of grey iron casting in the lot	No. of bars required to be selected	
(1)	(2)	(3)
Up to 2000 kg	1	1
Over 2000 kg	2	2

NOTE- The number of test bars given in Column 2 shall be of sufficient length to be tested for transverse strength and deflection and the number of test bars given in Column 3 shall be of sufficient length to be tested for tensile strength.

8.2.3 Grey iron bars shall be selected at random. In order to ensure randomness of selection tables of random numbers as given in SLS 428 shall be used.

8.3 Number of tests

8.3.1 Each bar selected as in Column 2 of Table 4 shall be tested for transverse strength and deflection.

8.3.2 Each bar selected as in Column 3 of Table 4 shall be tested for tensile strength.

8.3.3 Any one casting taken from the lot shall be tested for hardness.

8.4 Retest and rejection

8.4.1 If a sample selected for testing according to 8.3 fails to meet the requirements specified, the purchaser shall select two further samples representing the same castings. If on testing either of the samples fails to meet the specified requirements, the castings represented shall be rejected.

8.4.2 In case of failure of any test bar showing obvious casting defects, another test bar shall be taken from spare test bars and the results obtained from this substituted for those obtained from defective test bar.

8.5 Criteria for Conformity

A lot shall be declared as conforming to the requirements of this specification if the following conditions are satisfied.

8.5.1 Each iron bar tested as in **8.3.1** and **8.3.2** satisfies the relevant requirement.

8.5.2 The casting tested as in **8.3.3** satisfies the relevant requirement.

APPENDIX A

A.1 TYPICAL APPLICATIONS

A.1.1 Typical applications of grey iron for Automotive castings

Grade	Typical applications
150	Miscellaneous soft iron castings (as-cast or annealed) in which strength is not of primary consideration. Exhaust manifolds may be made of this grade of iron, alloyed or unalloyed.
200	Small cylinder blocks, cylinder heads, air cooled cylinders, pistons clutch plates, oil pump bodies, transmission cases gear boxes, clutch housings and light- duty brake drums.
200a	Brake drums and clutch plates for moderate service requirements, where high-carbon iron is desired to minimize heat checking.
250	Automobile and diesel cylinder blocks, cylinder heads, flywheels, cylinder liners, pistons, medium-duty brake drums and clutch plates.
300	Diesel engine blocks, truck and tractor cylinder blocks and heads, heavy flywheels tractor transmission cases, differential career castings and heavy gear boxes.
300b	Brake drums and clutch plates for heavy duty service where both resistance to heat checking and higher strength are definite requirements.
300c	Extra - heavy - duty brake drums.
350	Diesel engine castings, liners cylinders and pistons and heavy parts in general.
350d	Automotive camshaft applications

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