Ferro Alloy Industries in the Liberalised Economy
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An Introduction to Indian Standards on Ferro Alloys

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ABSTRACT

Ferro alloys are used in iron and steel industries for degassification or for alloying the cast with the desired elements. They are produced with least possible impurities so that their introduction in the melt does not lead to large quantities of impurities in the material. Their sizes are also required to be controlled so that they produce least segregation in the melt within the time frame of processing and so on. The availability of raw materials for manufacturing the ferro alloys is also an important factor to be considered in the standardization process. Ferro alloys have been taken up for standardization coinciding with the standardization process of iron and steel. The standardization process however accelerated on the advent of development of steel industry in the country. The existing standards are subjected to revision as and when need arises to meet the ever changing demands of engineering and technology. The standards are also brought in line with international standards through harmonizations wherever required to help in the international trade. A standard is subjected to review after fine years of its publication towards revision or reaffirmation depending upon the need.

Keywords : Ferro alloys, Standardization, Feroalloys specification.

INTRODUCTION

We are aware of ferro manganese, ferro silicon, ferro chromium etc., as the important inputs in the processing of cast iron or steel melting. These materials known as ferroalloys are used in iron and steel industries for degassification or for alloying the cast with the desired elements. Definition wise these are master alloys with iron and the metal, at times with more than one, like in ferro silico zirconium. In the parlance of standard formulation beside them metals have also been included which are used for alloying purposes. The specifications in each

case define the ferro alloys with respect to main alloying elements and their minimum and maximum content stipulated, for example in case of ferro manganese the respective content of manganese have been specified as 65 and 95 percent where as in ferro silico zirconium the zirconium content has been specified as 12 percent minimum to 40 percent maximum by mass.

STANDARDIZATION AND ITS BENEFITS

ISO definition as given below is a compact elucidation of this widely used term, 'standardization'. Activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context. The activity consists of the processes of formulating, of issuing and implementing standards. The benefits of standardization to trade, industry and consumers can be broadly given as:

a) Promoting better understanding between producers and consumers.
b) Aiding mass production of goods.
c) Facilitating interchangeability of products and component
d) Variety reduction.
e) Stipulation of optimum quality of products
f) Guarding against factors affecting health and safety
g) Conservation and optimum utilisation of materials

Standard established and used under the process of standardization thus may be a product, a process, service, testing standard or a code of practice etc.

NEED OF STANDARDIZATION IN CASE OF FERRO ALLOYS

As has already been stated that ferroalloys have got their various uses in the processing of iron and steel, it is but natural that their compositions are specified they are produced with least possible impurities so that their introduction in the melt does not lead to large quantities of impurities in the material. Their sizes are also required to be controlled and supplied so that they produce least segregation in the melt within the time frame of processing and so on. The availability of raw materials for manufacturing the ferro alloys also is the important factor to be considered in the standardization process, so that an optimum use of the scarce material is made keeping in view the economy of the production. Consideration of all such factors as also some commercial aspects to maintain harmonious relations between supplier and purchaser standardization in the field of ferroalloys is important.

STANDARDIZATION AT NATIONAL LEVEL

BIS has been providing the necessary platform for the standardization at national level in the areas of almost all engineering and technology. Ferroalloys have also been taken up for standardization coinciding with the standardization process of iron and steel as they could not have gone farther without the standards on ferroalloys having been formulated. The standardization process however accelerated on the advent of development of steel industry in the country. The Ferro-Alloys Sectional Committee, MTD 5 working at Metallurgical Engineering Department remained instrumental in the formulation of relevant standards. The outcome of its efforts have been formulation of 30 standards on ferro alloys, metallic manganese, metallic silicon, primary nickel, niobium, misch metal, wolframite concentrate, vanadium pentoxide etc. A list of the standards so for formulated has been given in the Annexure I.

FERRO ALLOYS SPECIFICATION

In order to illustrate the points as detailed in the foregoing lines an example of a standard on ferro manganese has been given in Annexure II. It may be observed that the standards are taking care of the various important aspects of specifications such as the scope, definition, the terminology, the composition, the size, particulars of order by the purchaser and the requirement of supply. All the standards being related to product, the emphasis is on the quality and requirements on supply which will provide necessary guidance to the manufacturer and the consumers of the ferro alloys in processing their heats.

CONCLUSION

The standardization is a dynamic and continuous process. Standards are formulated on new subjects as and when they are required. The existing standards are also subjected to revisions or publication of amendments as and when need arises to meet the demand of ever changing needs of engineering and technology. The standards on the ferro alloys are no exception. They are also required to be revised and amendments to be issued on the basis of demands from the purchasers. The standards are also brought in line with international standards through harmonizations to bring them to international level as also to help in the international trade. The standards are subjected to review after five years of its publication or revision and reaffirmed if no changes are felt necessary. In the list as in Annexure I the status of the standards in respect to reaffirmation and amendments have also been shown.

Annexure – I

MTD 5 FERRO ALLOYS SECTIONAL COMMITTEE

Scope : Standardization in the field of ferro alloys and other metallic additions used for iron steel making LIAISON ISO/TC 132 Ferroalloys

Sl. No.	IS. No./ DOC.No.	Title	Reaffirm No. of Amendments
Standards Published			
1.	IS 1110:1990	Ferrosilicon (4th Revision)	July 94
2.	IS 1170:1992	Ferrochromium (2nd revision)	
3.	IS 1171:1988	Ferromanganese (3rd revision)	Oct. 92
4.	IS 1466:1985	Ferrovanadium (3rd revision)	Feb. 91
5.	IS 1467:1993	Ferrotungsten (3rd revision)	
6.	IS 1468:1990	Ferrotitanium (3rd revision)	July 94
7.	IS 1469:1993	Ferromolybdenum (4th revision)	
8.	IS 1470:1990	Silicomanganese (3rd revision)	July 94
9.	IS 1471:1988	Ferrophosphorous (2nd revision)	Oct. 92
10.	IS 2021:1993	Metallic manganese (2nd revision)	
11.	IS 2022:1988	Calcium silicon (2nd revision)	Oct. 92
12.	IS 2023:1993	Metallic chromium (2nd revision)	
13.	IS 2024:1988	Ferrosilicochromium (3rd revision)	Oct. 92
14.	IS 2301:1987	Metallic silicon (1st revision)	Sept. 91
15.	*IS 2391:1970	Foundry nickel (1st revision)	Feb. 91
16.	IS 2782:1964	Primary nickel	Feb. 91
17.	*IS 3011:1973	Ferrosilicozirconium (1st revision)	Feb. 91
18.	IS 3012:1985	Chromemanganese (1st revision)	Feb. 91
19.	IS 3013:1991	Ferroboron (3rd revision)	
20.	IS 3014:1993	Ferroniobium (Ferrocolumbium) 2nd revision	
21.	IS4182:1988	Misch metal (1st revision)	Oct. 92
22.	IS 4409:1973	Ferronickel (1st revision)	Sept. 91
23.	IS 5632:1970	Wolframite concentrate	Feb. 91
24.	IS 5633:1973	Vanadium pentoxide (1st revision)	Feb. 91
25.	IS 5634:1987	Molybdenum oxide (technical) (1st revision)	Sept. 91
26.	IS 7148:1980	Ferro alloys for welding industry	Sept. 93
27.	IS 7965:1976	Niobium (Columbium)	Feb. 91
28.	IS 11945:1987	Charge chrome	Sept. 91
29.	IS 12908:1990	Ferroaluminium	
30.	IS 13164:1991	Ferrosilicomagnesium	July 94

Draft Standards Finalized but not yet under print

DOC:MTD 5(3934)	Revision of IS 2391
DOC:MTD 5(4072)	Revision of IS 2022
DOC:MTD 5(4073)	Revision of IS 1171

Drafts completed wide circulation

DOC:MTD 5(3935)	Revision of IS 3011
DOC:MTD 5(3986)	Method of sampling ferroalloys for sieves analysis and size determination.

* Indicates standards under revision. ** standards to be revised/ dual numbered standards : equalent standards

Annexure – II

For Comments Only

BUREAU OF INDIAN STANDARDS

Draft Indian Standard
FERRO MANGANESE — SPECIFICATION
(4th Revision of IS 1171)

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FOREWORD
(formal clauses will be added later)

This standard was first published in 1957 and was subsequently revised in 1964. 1973 and 1988. In view of the experience gained during these years, it was felt necessary to revise this standard. In this revision, the following main modifications have been made.

a) Information to be given while ordering the material has been incorporated for the benefit of the purchaser;

b) Keeping in view the international trade, Grade Fe.Mn. 74 under high carbon ferro manganese has been included. Limit of phosphorus content of low carbon ferro manganese has been modified to 0.5 Max. for all grades.

c) New Clause have been incorporated to avoid wide segregation of the chemical constituents, thereby safeguarding the small consumers of this product; and

d) Size ranges have been modified and aligned with international standards on ferromanganese.

1. SCOPE

This standard covers the requirements and condition of delivery of Ferro Manganese used by the Iron and Steel Industry.

2. REFERENCES

The following Indian Standards are necessary adjuncts to this standard.

IS No.	Title
1387:1993	General requirements for the supply of metallurgical materials (2nd revised).
1472:1977	Methods of sampling ferroalloys for determination of chemical composition (first revision)
1559:1961	Methods of chemical analysis of ferroalloys

3. TERMINOLOGY

3.1 Cast (Melt)

The product of any of the following :

a) one furnace heat; or

b) one tap of continuous furnace; or

c) a number of furnace or crucible heats of similar composition mixed in a ladle of holding furnace and used for making a cast.

3.2 Consignment

3.2.1 Tapped Lot Method

A consignment constituted by the tapped lot method consists of a ferro manganese mass of the one melt (or one part of continuous tap).

3.2.2 Graded Lot Method

A consignment constituted by the graded lot method consists of a number of melts (or parts of continuous taps) of one ferromanganese designation. The manganese content of the melts (or part of continuous taps) constituting the consignment shall not differ from each other by more than 3 percent absolute.

3.2.3 Blended Lot Method

A consignment constituted by the blended lot method consists of a number of melts (or parts of continuous taps) of one ferro manganese designation, which have been crushed to a particle size 50 mm and thoroughly mixed. The content of the main constituent of the melts (or parts of continuous taps)

constituting the consignment mass vary between the minimum and maximum limit specified for the appropriate ferrochromium designation.

4. DEFINITION

A master alloy of iron and manganese with a minimum manganese content of 65 percent by mass, and maximum manganese content of 95 percent, by mass obtained by reduction from the corresponding raw materials.

5. GRADES

This standard covers 13 grades of ferro manganese as specified in Table 1.

Table 1 : Chemical composition of ferro manganese (clause 8.2)

Grade Designation	Mn	C	Percent Si,Max	S,Max	P,Max
High Carbon Ferro Manganese					
FeMn 80	78–82	6–8	1.50	0.050	0.50
FeMn 76	74–78	"	"	0.050	"
FeMn 72	70–74	"	"	0.050	"
FeMn 68	65–70	"	"	0.050	"
FeMn 74	72–76	"	"	0.030	"
Medium Carbon Ferro Manganese					
2FeMn 80	78–82	1.0–3.0	1.50	0.030	0.35
2FeMn 76	74–78	"	"	0.050	"
Low Carbon Ferro Manganese*					
05 FeMn 80	85 Min	0.50 Max.	2.0	0.030	0.30
01 FeMn 83	80–85	0.10 "	1.0	0.050	0.30
02 FeMn 83	"	0.20 "	"	"	"
03 FeMn 83	"	0.30 "	"	"	"
05 FeMn 83	"	0.50 "	"	"	"
07 FeMn 83	"	0.70 "	1.0	"	"

*Aluminium content shall be 0.5% Max., when produced by alumino thermic process.

6. PARTICULARS TO BE SPECIFIED WHILE ORDERING

For the benefit of the purchaser, particulars to be specified while ordering for the material to this specification shall be as follows:

a) Quantity of the material;

b) Constitution of consignment
c) Name of the material
d) Grade
e) Size range; and
f) Necessary requirements for analysis reports, packing etc., as appropriate.

7. SUPPLY OF MATERIALS

General requirements relating to supply of the material to this specification shall be as laid down in IS 1387.

8. REQUIREMENTS

8.1 Constitution of Consignment

Ferromanganese shall be delivered in consignment constituted by one of the methods defined earlier.

8.2 Chemical Composition

8.2.1 Each consignment of the material shall conform to the requirements of the chemical composition specified in Table 1 and if so specified by the purchaser at the time of enquiry and order, shall supply a test certificate of chemical analysis of the sample of material for each melt.

8.2.2 If specified by the purchaser at the time of enquiry and order that each lump of the consignment should conform to the chemical composition specified in Table 1, this shall be agreed to between the purchaser and the manufacturer.

The chemical composition given in Table 1 shows only the main constituent elements and the usual impurities. If the purchaser requires closer ranges for the main element contents and/or different limits for specified elements/or non-specified elements this shall be agreed to between the purchaser and the manufacturer.

The chemical composition of the material shall be determined either by the method specified in IS 1559:1961 or any other established instrumental/chemical method. In case of dispute, the procedure given in the latest version of IS 1559 the referee method. However, where the method is not given in IS 1559, the referee method shall be agreed to between the purchaser and the manufacturer.

9. SIZE RANGE

The material is supplied in lumps or as crushed and screened particles. The particle size ranges and tolerances shall be as given in Table 2. The under size values shall be valid at the point of delivery to the purchaser.

–3 mm fraction on not to exceed 5 percent in size deviation 1, 2 and 3.

Table 2 : Particle size range (clause 9)

Size Designation	Size Range, mm Over	Upto & including	Undersize % Max.	Oversize % Max.	Remarks
1	50	150	15	10	No piece to exceed
2	25	50	15	10	1.15 times the max
3	10	25	15	10	limit of the size
4	2	10	5	10	range specified in
5	–	2	–	10	two or directions

10. EXTRANEOUS CONTAMINATION

The material shall be reasonably free from extraneous contaminations like slag and nonmetallic inclusions etc.

11. SAMPLING

Each consignment of the material shall be sampled in accordance with IS 1472:1977.

12. PACKING

The material shall be packed in suitable containers, or shipped in bulk or as mutually agreed to between supplier and the purchaser.

13. MARKING

The packing containing the material shall be marked legibly and indeliably with the following :

a) Supplier's name or trademark;
b) Grade designation and size;
c) Quantity;
d) Date of manufacture; and
e) Shelf like, if needed.