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भारतीय मानक मसौदा

खनन उपकरणों हेतु टंगस्टेन कार्बाइड की विशिष्टि

(आई एस 4005 का पहला पुनरीक्षण)

Draft Indian Standard

TUNGSTEN CARBIDE FOR MINING TOOLS - SPECIFICATION

(First Revision of IS 4005)

ICS 73.100

Earth Moving Equipment and Material
Handling Sectional Committee, MED07

Last date for receipt of comment
is 04 September 2023

FOREWORD

(Formal clause to be added later)

This standard was first published in 1967. The present revision has been taken up to incorporate the modification found necessary as a result of experience gained in the use of this standard. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references to Indian Standards, wherever applicable have been updated. BIS certification marking clause has been modified to align with the revised Bureau of Indian Standards Act, 2016.

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 IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

1 SCOPE

This Standard specification covers four grades of tungsten mining tools, such as drilling bits and coal cutter picks.

2 REFERENCE

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed.

<i>IS No/ Other Standards</i>	<i>Title</i>
IS 5 : 2007	Colours for ready mixed paints and enamels (<i>sixth revision</i>)
IS 1501 (Part 1) : 2020 ISO 6507-1:2018	Metallic Materials — Vickers Hardness Test Part 1 Test Method (<i>fifth revision</i>)

2 DESIGNATION AND COLOUR

The grades of tungsten carbide shall be designated as hard (H), medium (M), tough (T) and extra tough (XT) and tools on which these grades are used and which are required to be painted shall be coloured red (signal red shade 537), yellow (canary yellow shade 309), blue (French blue shade 166) and white respectively. (*see IS 5*)

3 COMPOSITION AND GRAIN SIZE

The composition of the various grades of tungsten carbide shall be as specified in Table 1 and the grain size should lie within the limits specified (*see Note 3 in Table 1*).

4 HARDNESS TESTING

The hardness test shall be carried out in accordance with IS 1501 (Part 1) using a load of not less than 30 nor more than 50 kgf. The tests shall be carried out on the surface of the tip after removing 0.2 to 0.4 mm of material. The finish of the surface shall be fine enough to give a distinct impression for accurate measurement. To allow for variations in hardness measurement between different test Centre, a range of 25 points above or below the specified hardness ranges (*see Table 1*) shall be permitted, provided that any grade supplied by a given manufacturer does not have a range of hardness greater than 100 points *HV*.

5 DEFECTS

5.1 Tips shall be free from an undue amount of porosity, uncombined carbon and cobalt segregation. The tips shall be free from eta-phase.

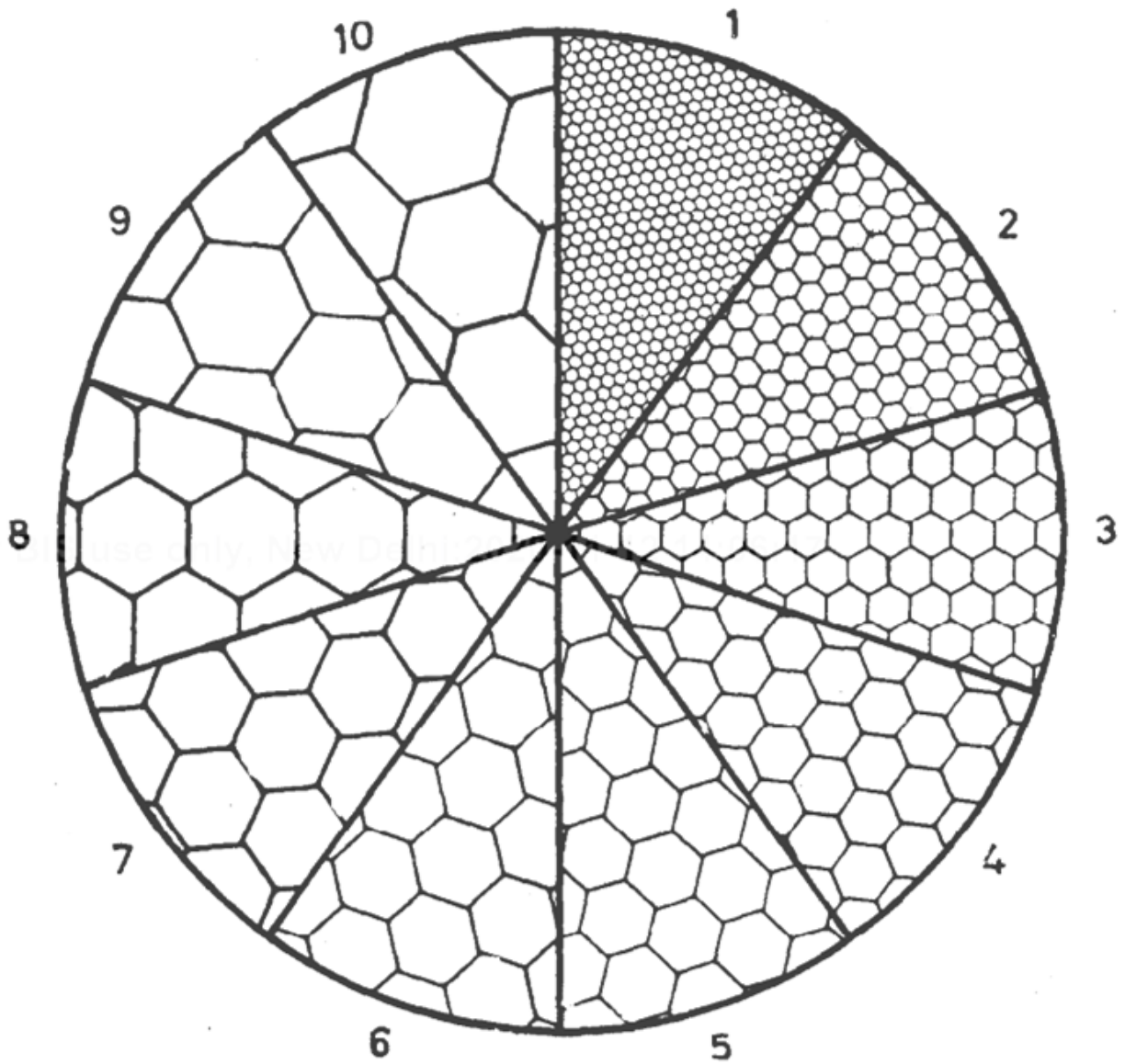
5.1.1 The surface of the tips shall be free from pitting.

Table 1 Tungsten Carbide-Grade, Hardness and Composition for Mining Tools
(Clauses 3 and 4)

Sl. No	Designation, Colour and Grade	Application	Hardness Range	Composition and Predominating Grain Size
(1)	(2)	(3)	(4)	(5)
a)	H-red hard grade	Rotary drill bits	1450 to 1550 <i>HV</i>	7.0 to 8.0 percent cobalt, 1 to 3 μm .
b)	M-yellow medium grade	Rotary drill bits	1350 to 1550 <i>HV</i>	9.0 to 10.0 percent cobalt, 1 to 3 μm .
c)	T-blue tough grade	Cutter picks percussive bits and rotary drill bits	1250 to 1350 <i>HV</i>	8.5 to 9.5 percent cobalt, 3 to 5 μm . For percussive bits the cobalt content may be reduced to 8 percent.
d)	XT-white extra tough grade	Cutter picks percussive bits and rotary drill bits	1150 to 1250 <i>HV</i>	8.5 to 11.0 percent cobalt, 1 to 3 μm . The grain size shall be between 3 and 6 μm to give the specified hardness.

NOTES —

- 1 The hard and medium grade carbides shall not contain an undue amount of recrystallized grains of length greater than 5 microns.
- 2 By predominating grain size is meant the range of grain sizes of at least 60 percent of the area of the microscopic field
- 3 The grain size figures are given for guidance only. The manufacturer is expected to produce grades having suitable grain-size distribution to give a hardness within the specified ranges. For grain-size measurement a convenient method is the use of the Miller diagram (*see* Fig. 1).



**FIG. 1 CARBIDE GRAIN SIZE CHART FOR 1 TO 10 MICRONS,
AT 1 500 DIAMETER**

6 IMPURITIES

6.1 The total impurities shall not exceed one percent and individually not exceeding the following:

Iron	0.5 percent
Titanium or other carbides (excluding tungsten carbide)	0.25 percent

7 BIS Certification Marking

BIS Certification Marking The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.