भारतीय मानक **IS 12682 : 2024**

Indian Standard

जल कूप वेधन — आघात वेधन रिग्स — सामान्य अपेक्षाएँ

(पहला पुनरीक्षण)

Water Well Drilling — Percussion Drilling Rigs — General Requirements

(First Revision)

ICS 25.080; 73.020

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Diamond Core and Waterwell Drilling Sectional Committee, MED 21

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Diamond Core and Waterwell Drilling Sectional Committee had been approved by the Mechanical Engineering Divisional Council.

This standard was first published in 1989. This standard is being revised again to keep pace with the latest technological developments and international practices. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references of Indian Standards, wherever applicable have been updated. The following major modifications have been incorporated in this revision of the standard:

a) The international classification for standards (ICS) number has been added; and
b) The reference standards have been updated.

Various types of drilling rigs are employed for water-well drilling. The selection and use of the drilling rigs depends upon the situations in which they have to be used, such as various formations they have to encounter, depth of drilling, etc.

The composition of the Committee responsible for the formulation of this standard is given in Annex 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 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.

Indian Standard

WATER WELL DRILLING — PERCUSSION DRILLING RIGS — GENERAL REQUIREMENTS

(First Revision)

1 SCOPE

This standard covers general requirements for percussion drilling rig.

2 REFERENCES

The standard given below contain provisions which, through reference in this text, constitute provision 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 edition of these standards:

IS No.	*Title*
IS 2062 : 2011	Hot rolled medium and high tensile structural steel — Specification (*seventh revision*)
IS 2266 : 2019	Steel wire ropes for general engineering purpose — Specification (*fifth revision*)

3 FUNCTIONS

Percussion drilling rig is used to construct large diameter bore holes in loose, soft, hard, rocky, and boulder-gravel-sand-clay (mixed) formations. This method of drilling is most suited to drill in stratum where large boulders in abundance are encountered at different depths. The drilling is started with large diameter drive pipe and continued with this size of the drive pipe as long as it keeps on driving smoothly. It is important to see that the drive pipe is not unnecessarily hammered to drive in, as in that case, there is a possibility of the drive pipe getting stuck and extraction difficult or at times impossible, when it is found that the large diameter drive pipe does not drive in freely, drilling is continued with the next smaller diameter drive pipe. For example, at one particular site, it may be possible to drive 550 mm diameter drive pipe up to 70 m and at another site, it may not be possible to go beyond 40 m with the same rig. Thus, the performance of the rig is not judged/linked to the driving in of the drive pipe but to its tool weight handling capacity and general ruggedness.

4 CONSTRUCTION DETAILS

The illustration of construction details of various assemblies are given in Fig. 1.

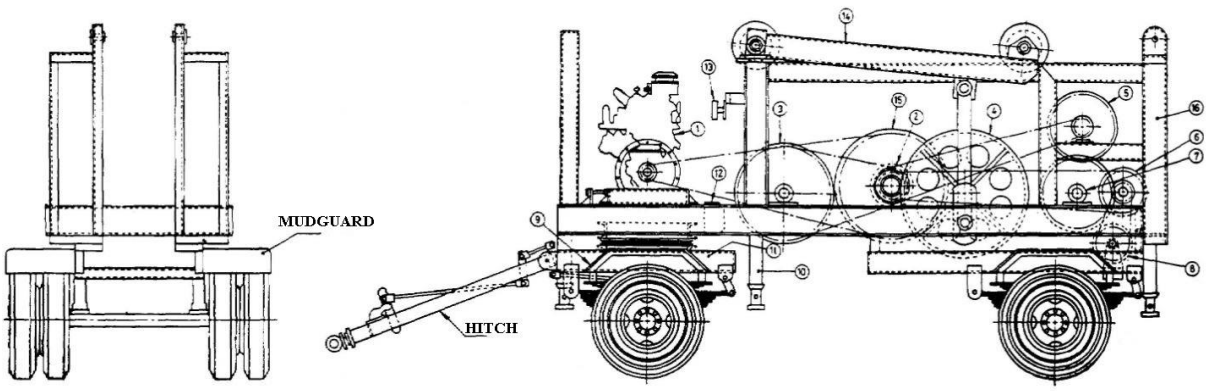
4.1 Brief description and essential requirements of various assemblies shall be as given in **4.1.1** to **4.1.20**.

4.1.1 Mast

The mast shall be constructed from structural steel conforming to grade A of IS 2062. The extended height of the mast may vary from 12.5 m to 15 m and shall telescope to about 8 m to 9 m. The lower and upper sections shall have high strength structural steel channels tied with cross bracing. It shall have a flipper type locking arrangement for supporting the upper section in extended position. The base shall have single built-in screw jack for adjustment. Mast braces shall be self-supporting, eight-point type and the lower braces ends adjustable to provide complete braces mid-way up the mast. The mast raising and telescoping system shall have separate drum provided with brakes. The mast shall be provided with necessary sheaves for drilling line, sand line and the casing line. The drilling line sheave shall be provided with shock absorbers to cushion the loads. The mast shall be provided with shear legs. The mast shall have adequate load handling capacity in conformity to the capacity of the rig.

4.1.2 *Spudding Beam*

All steel electric welded construction shall be driven by gear through spudding friction clutch. Beams shall be equipped with double crank arms and provided with an adjustable crank pin to give three different spudding strokes of 40 cm, 65 cm, and 90 cm at 30 strokes to 60 strokes per minute. The arms shall be provided with bronze bushings. The steel tubes shall conform to Grade A of IS 2062.



Key

1	Engine assembly	9	Mud guard
2	Jack shaft assembly	10	Levelling jacks
3	Drilling assembly	11	Turn table
4	Spudding gear assembly	12	Tool box
5	Sand line assembly	13	Rope adjuster
6	Idler shaft assembly	14	Spudding beam
7	Casing line assembly	15	V-belt pulley
8	Mast lifting reel	16	Mast pillar

FIG. 1 ILLUSTRATION OF GENERAL ARRANGEMENT OF PERCUSSION DRILLING RIG

4.1.3 *Mounting*

The rig shall be mounted on a heavy duty full trailer with a dual wheeled axle and dual wheeled dolly in the front having 8 numbers of 9.00 × 20.00 tyres. The front dolly shall have a strong and suitable tow bar complete with tow hook. The rig frame shall be of heavy duty channels and joists made of steel conforming to grade A of IS 2062. The prime-mover shall be fixed in an easy accessible position with provision for foundation adjustment. The outer V-belt drive shall be properly shielded. Frame shall have provision for telescopic mast in lowered position.

4.1.4 *Prime-Mover*

The rig shall be provided with a suitable industrial type diesel engine, water/air cooled complete with radiator, air cleaner, self-starting equipment, fuel tank, dynamo, batteries, cut-out, acceleration control, available at drillers position. The engines shall be heavy duty, capable of continuous running during various operations of rig. It shall be complete with a power take-off clutch with clutch housing and stopping/starting control. The engine shall be capable of delivering at least 115 percent of the rated power at rated speed continuously for two hours in a period of 12 h rating test, ten hours out of which shall be at rated power at rated speed.

4.1.5 *Transmission*

The power transmission from engines to the jack shaft shall be through V-belt through power take-off clutch.

4.1.6 *Bull Reel*

The bull reel shall be fabricated steel construction, heavy duty chain driven from jack shaft through friction clutch mounted on suitable stationery shaft provided with adjustable divider. Barrel diameter, barrel length, and brake drum diameter shall be in conformity of the rig and shall have adequate spooling capacity of tested quality steel wire rope. The wire rope shall conform to IS 2266.

4.1.7 *Sand Reel*

The sand reel shall be friction driven through a large size friction drum. It shall be mounted on bronze bushings on strong shaft. Barrel diameter, barrel length, and brake drum diameter shall be in conformity of the rig and shall have adequate spooling capacity of steel wire rope. The wire rope shall conform to IS 2266.

4.1.8 *Casing Reel*

The casing reel shall be gear driven, jaw clutch

release controlled by friction clutch and separate single control brake 150 mm wide, shall have large band brake providing large effective brake area. Barrel diameter, barrel length, brake drum diameter shall be in conformity of the rig and shall have adequate spooling capacity of steel wire rope. The wire rope shall conform to IS 2266.

4.1.9 *Bearings*

Ball bearings of suitable quality shall be used on jack shaft, roller bearings on cat-head shaft, on engine drive shaft and power take-off clutch. Roller bearings shall be used on all other places which move frequently. Ball reel, sand reel and casing reel shall be mounted on two self-aligning spherical roller pillow block bearings. Bronze bushing may be used for tow and heel sheaves at the top of the pitmen where the use of roller bearings may not be possible.

4.1.10 *Brakes*

The brake drums shall consist of external band type brakes with lining.

4.1.11 *Controls*

The controls including engine acceleration control shall be provided at driller's position to enable the driller to actuate them conveniently as and when needed to be actuated/operated.

4.1.12 *Safety Guard*

The drives shall be provided with safety guards.

4.1.13 *Cat Head and Drill Stem Guide*

The rig shall be complete with cat head and drill stem guide.

4.1.14 *Shock Absorbers*

A shock absorber of suitable quality shall be provided below the crown sheave.

4.1.15 Sheaves

All sheaves meant for drilling, casing, spudding, sand sheaves, and heel sheave shall be of steel or steel fabricated mounted on anti-friction bearings.

4.1.16 *Leveling Jacks*

The rig shall be provided with 4 numbers of screw type heavy duty levelling jacks for levelling of the rig during operation.

4.1.17 *Clutches*

The clutches shall be multiple disc type and they shall have removable drive rings.

4.1.18 *Frame*

The frame shall be of section steel beam for principal side members. Crank sills shall be stiffened with suitable section steel beams.

The design shall be such that the engine can be removed without cutting any member of the frame. It shall have screw jacks for adjustment to convenient height.

4.1.19 *Steel Wire Rope*

The steel wire rope shall be of 155/170.5 MPa tensile strength and shall conform to the requirements of IS 2266.

4.1.20 *Other Features*

The rig shall have the following features:

a) Cat head on idler or counter shaft;
b) Mechanical reel for mast;
c) Guyline, anchors on mast;
d) Turn buckles on guy ropes; and
e) Brakes on trailer.

4.1.21 *Drilling Tools, Drive Pipes and Fishing Tools*

These shall be supplied as specified by the purchaser and as agreed to between the supplier/manufacturer and the purchaser.

5 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The tool weight handling capacity of the rig basically depends upon the anticipated depth as the number of telescopic stages is in accordance with the depth to be drilled. As the percussion drilling is considered to be one of the best suited drilling for boulder formations, the purchaser shall furnish the following information mainly in order to ascertain the tool weight of the rig required:

a) Geological formations to be drilled;
b) Height with reference to mean sea level (MSL), that is, it may be either positive or negative difference of level from MSL;
c) Maximum diameter and depth to be drilled; and
d) Special features required, if any.

6 INFORMATION TO BE SUPPLIED BY THE SUPPLIER/MANUFACTURER

The supplier/manufacturer shall supply the following information to the purchaser:

a) Maximum diameter of the hole at the first stage of drilling;
b) Number of stages of telescope suggested indicating sizes thereof;
c) Maximum diameter and depth rating of the rig under normal conditions;
d) Approximate rate of drilling under normal conditions;
e) Maximum load handling capacity of the mast and the size of the sheaves;
f) Tool weight handling capacity of the rig indicating stock frequency/variability;
g) Special features of the spudding arm;
h) Capacity of the brakes;
j) Line pull capacity of the various reels on bare drum, indicating the size and the type of recommended wire ropes;
k) Prime-mover's type, make, rating, and the transmission ratio; and
m) Any other information that shall be helpful to the buyer in deciding the selection of the rig.

7 TESTING

7.1 Testing shall be as agreed to between the purchaser and the supplier/manufacturer.

7.2 The object of testing the percussion drilling rig may be to determine its ruggedness and the tool weight handling capacity.

7.3 The testing of the rig may include training of the purchaser's drilling crew and shall be as agreed to between the supplier/manufacturer and the purchaser. It is recommended that the testing may include installation of the rig and demonstration of drilling of a bore hole up to a depth of say, 30 to 50 as agreed to between the supplier/manufacturer and the purchaser.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Diamond Core and Waterwell Drilling Sectional Committee, MED 21

Organization	*Representative(s)*
Geological Survey of India, New Delhi	SHRI AJAY AGARWAL **(*Chairperson*)**
Aqseptence Group (India) Pvt Ltd (Formaly Known as Johanson Screens India Pvt Ltd), Sanand	SHRI SHIV NARAYAN SINGH SHRI SHIVEN AMIN (*Alternate*)
Atlas Copco (I) Ltd, Pune	SHRI SHUDHANSHU NIGAM SHRI S. DATTA MAJUMDAR (*Alternate*)
Central Ground Water Board, Faridabad	SHRI G. L. MEENA SHRI NIDHISH VERMA (*Alternate*)
Central Mine Planning and Design Institute, Ranchi	SHRI ANIL SAVANUR SHRI A.V. RAMAKRISHNA (*Alternate*)
Epiroc Mining India Limited, Nashik	SHRI SUJEET KUMAR SHRI CHANDAN GHOSH (*Alternate*)
Geological Survey of India, Kolkata	SHRI ANUP KUMAR JOHRI SHRI C. B. TIWARI (*Alternate* I) SHRI S. SHANKAR (*Alternate* II)
Indian Institute of Technology (ISM), Dhanbad	MOHAMMED HAMID SIDDIQUE SHRI PAWAN GUPTA (*Alternate* I) SHRI VINAY KUMAR RAJAK (*Alternate* II)
Indian Institute of Technology Kharagpur, Kharagpur	PROF KHANINDRA PATHAK SHRIMATI SUNITA MISHRA (*Alternate*)
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Mining Associates Pvt Ltd, Asansol	SHRI RAM BABU BANSAL
Rites Ltd, Gurugram	SHRI S. KUNAL

Organization	*Representative(s)*
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Sandvik Smith Asia Limited, Medak	SHRI RANGAYYA NAIDU SHRI N. BHASKARA REDDY (*Alternate*)
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In Personal Capacity (*D-5/10, Rail Vihar, Indirapuram, Ghaziabad*)	SHRI P. C. DEWLI
In Personal Capacity (*90 Mayur Vihar, Sec 48, Chandigarh*)	SHRI MAHESH CHANDRA JINDAL
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(MECHANICAL ENGINEERING), BIS

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