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प्रकार — पहचान और शब्दावली
(दूसरा पुनरीक्षण)

Earth — Moving Machinery — Basic
Types — Identification and
Vocabulary
(Second Revision)

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NATIONAL FOREWORD

This Indian Standard (Second Revision) which is identical to ISO 6165 : 2022 'Earth-moving machinery — Basic types — Identification and vocabulary' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on recommendation of the Earth Moving Equipment and Material Handling Sectional Committee and approval of the Mechanical Engineering Division Council.

This standard was first published in 2010 and revised in 2016. This revision supersedes ISO 6165 : 2012 'Earth-Moving Machinery — Basic Types — Identification and Terms and Definitions'. The major changes are as follows:

- a) The following terms were added: operator protective structure **(3.1.14)**, canopy **(3.1.15)**, cab **(3.1.16)**, minimal tail radius excavator **(3.2.4.2)** and vacuum excavator **(3.2.13)**;
- b) The definition for compact tool carrier **(3.2.12)** was revised;
- c) The definition for compactor **(3.2.9)** was revised;
- d) The terminological entry for horizontal directional drill was deleted; and
- e) Annexure A and Annexure B were revised according to the modification text.

The text of ISO standard has been approved for publication as Indian Standard without deviations. Certain terminology and conventions are however not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'; and
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as a decimal marker.

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.

Contents

Page

Introduction	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
3.1 Machine characteristics and operating classification.....	1
3.2 Machine families.....	5
Annex A (informative) Identification procedure	10
Annex B (informative) Earth-moving machinery operator control configurations	12
Bibliography	13
Index	15

Introduction

This document establishes the vocabulary for earth-moving machinery according to the function and configuration. The safety requirements, for most of machine families listed in this document, are provided in the ISO 20474 series.

Indian Standard

**EARTH-MOVING MACHINERY — BASIC TYPES —
IDENTIFICATION AND VOCABULARY**
(*Second Revision*)

1 Scope

This document provides vocabulary and an identification structure for classifying earth-moving machinery designed to perform the following operations:

- excavation;
- loading;
- transportation;
- drilling, spreading, compacting or trenching of earth, rock and other materials, during work, for example, on roads and dams, in quarries and mines and on building sites.

The purpose of this document is to provide a clear means to identify earth-moving machinery according to its function and design configurations which can include additional classifications according to its operating mass and control operator configuration.

[Annex A](#) provides a procedure based on the identification structure used by this document to classify the machinery and introduce detailed identifications consistent with the logic implied by the structure.

[Annex B](#) provides a hierarchy of the operator control configurations for earth-moving machinery.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 Machine characteristics and operating classification

3.1.1

earth-moving machinery

self-propelled or towed *base machine* (3.1.11) on wheels (drums or tyres), crawlers, legs, which can have *equipment* (3.1.12) or *attachment* (3.1.13), or both, primarily designed to perform excavation, loading, transportation, drilling, spreading, compacting or trenching of earth, rock and other materials

Note 1 to entry: Earth-moving machinery can be either direct-controlled or be remote-controlled. It can also operate autonomously or semi-autonomously.

Note 2 to entry: See [Annex B](#) for types of operator control configurations.

3.1.1.1

compact machine

earth-moving machinery (3.1.1), except for *compact excavators* (3.2.4.5) and *compact loaders* (3.2.2.3), having an *operating mass* (3.1.10) of 4 500 kg or less

3.1.2

direct-control machine

self-propelled *earth-moving machinery* (3.1.1) where the machine is controlled by an operator in physical contact with the machine

3.1.2.1

ride-on machine

direct-control machine (3.1.2) where the control devices are located on the machine and the machine is controlled by a seated or standing operator on the machine

3.1.2.2

non-riding machine

direct-control machine (3.1.2) where the control devices are located on the machine and the machine is controlled by a pedestrian operator (neither seated nor standing on the machine)

3.1.3

remote-control machine

self-propelled *earth-moving machinery* (3.1.1) where the machine is controlled by the transmission of signals from a remote-control box that is not located on the machine to a receiving unit located on the machine

Note 1 to entry: The remote control can either be wireless or by wire.

3.1.3.1

wire-controlled machine

remote-control machine (3.1.3) where the control of the machine is accomplished by signals transmitted through wires from an operator-controlled device distant from the machine

Note 1 to entry: Normally, a wire-controlled machine is operated with a direct view on the working area.

3.1.3.2

wireless-controlled machine

remote-control machine (3.1.3) where the control of the machine is accomplished by signals transmitted through the air from an operator-controlled device distant from the machine

Note 1 to entry: A wireless-controlled machine is operated with or without a direct view on the working area.

3.1.4

autonomous mode

mode of operation in which an *earth-moving machinery* (3.1.1) performs all machine safety-critical and earth-moving or mining functions related to its defined operations without operator interaction

3.1.5

autonomous machine

earth-moving machinery (3.1.1) intended to operate in *autonomous mode* (3.1.4) during its normal operating cycle

3.1.6

semi-autonomous machine

earth-moving machinery (3.1.1) intended to operate in *autonomous mode* (3.1.4) during part of its operating cycle and which requires active control by an operator to complete some of the tasks assigned to the machine

3.1.7

machine family

group of machines designed for the same type of operation

Note 1 to entry: *Earth-moving machinery* (3.1.1) comprises the following machine families:

- *dozers* (3.2.1);
- *loaders* (3.2.2);
- *backhoe loaders* (3.2.3);
- *excavators* (3.2.4);
- *trenchers* (3.2.5);
- *dumpers* (3.2.6);
- *scrapers* (3.2.7);
- *graders* (3.2.8);
- *compactors* (3.2.9);
- *rollers* (3.2.10);
- *pipelayers* (3.2.11);
- *compact tool carriers* (3.2.12);
- *vacuum excavators* (3.2.13).

3.1.8

machine model

machine type

manufacturer's designation of a *machine family* (3.1.7)

Note 1 to entry: A machine family can have several models or types which are the manufacturer's type designation of the machine.

3.1.9

individual machine

machine having a unique identification number for each manufactured machine

Note 1 to entry: The product identification number (PIN) according to ISO 10261 clearly identifies the individual machine.

3.1.10

operating mass

mass of the *base machine* (3.1.11), with *equipment* (3.1.12) and empty *attachment* (3.1.13) in the most usual configuration as specified by the manufacturer, and with the operator (75 kg), full fuel tank and all fluid systems (i.e. hydraulic oil, transmission oil, engine oil, engine coolant) at the levels specified by the manufacturer and, when applicable, with the sprinkler water tank(s) half full

Note 1 to entry: The mass of the operator is not included for *non-riding machines* (3.1.2.2).

Note 2 to entry: Ballast mass at delivery can be included if it is specified by the manufacturer.

3.1.11

base machine

machine with or without a *cab* (3.1.16) or a *canopy* (3.1.15) and *operator-protective structure* (3.1.14) if required, without *equipment* (3.1.12) or *attachments* (3.1.13) but possessing the necessary mounting for such equipment and attachments

3.1.12 equipment

set of components mounted onto the *base machine* (3.1.11) which allows an *attachment* (3.1.13) to perform the primary design function of the machine

3.1.13 attachment

assembly of components that can be mounted onto the *base machine* (3.1.11) or *equipment* (3.1.12) for specific use

3.1.14 operator protective structure

system of structural members whose purpose is to provide operator with reasonable protection from hazards related to machine tip-over, machine roll-over, falling objects or penetrating objects

Note 1 to entry: In other words, it can be roll-over protective structure (ROPS), tip-over protection structure (TOPS), falling-object protective structure (FOPS) and operator protective guard (see ISO 10262, ISO 3471, ISO 3449, ISO 12117 and ISO 12117-2).

3.1.15 canopy

structure with at least a roof which affords a degree of weather protection (e.g. rain, sun) to the operator

Note 1 to entry: A ROPS with a roof, or a FOPS can provide the functionality of a canopy.

3.1.16 cab

enclosed compartment to shield the operator(s) from surrounding atmospheric elements such as heat, cold, wind, noise and dust

Note 1 to entry: A cab can meet requirements for *operator protective structure* (3.1.14).

3.1.17 Derivative machine

3.1.17.1 derivative earth-moving machinery

earth-moving machinery (3.1.1) that is a combination of features from other earth-moving *machine families* (3.1.7), creating a different configuration or arrangement

EXAMPLE Machine having the front-mounted *equipment* (3.1.12) of a *loader* (3.2.2) and a non-self-loading, rear-mounted dumper body.

3.1.17.2 derivative support machinery used on earth-moving worksites

machinery derived from an earth-moving *machine family* (3.1.7), creating a different configuration or arrangement with a different intended use, primarily intended to be operated on earth-moving worksites or other building sites

EXAMPLE *Articulated-frame dumper* (3.2.6.2) with the dumper body removed and replaced by a water tank for wetting of haul roads or by a fuel tank/lubrication body.

Note 1 to entry: Such support machines are typically used to perform jobsite or machine maintenance tasks.

3.2 Machine families

3.2.1

dozer

self-propelled crawler or wheeled machine with *equipment* (3.1.12) having either a dozing *attachment* (3.1.13) which cuts, moves and grades material through forward motion of the machine or a mounted attachment used to exert a push or a pull force

Note 1 to entry: Terminology and commercial specifications for dozers are given in ISO 6747.

3.2.2

loader

self-propelled crawler or wheeled machine having front-mounted *equipment* (3.1.12), primarily designed for loading operation (bucket use), which loads or excavates through forward motion of the machine

Note 1 to entry: A loader work cycle normally comprises filling, elevating, transporting and discharging of material.

Note 2 to entry: Terminology and commercial specifications for loaders are given in ISO 7131.

3.2.2.1

swing loader

loader (3.2.2) having a swing-type lift arm which can rotate to the left and the right of the straight position

Note 1 to entry: A swing-loader work cycle is similar to a loader cycle, but additional work can be done with the *equipment* (3.1.12) offset from the longitudinal axis of the machine.

3.2.2.2

skid steer loader

loader (3.2.2) normally having an operator station between or to the side of the attachment-supporting structure(s) and steered by using variation of speed and/or direction of rotation between traction drives on the opposite sides of a machine having fixed axles on wheels or tracks

3.2.2.3

compact loader

loader (3.2.2) having an *operating mass* (3.1.10) of 4 500 kg or less for wheeled loaders and 6 000 kg or less for crawler loaders, designed to work in areas with limited space, with the associated need for greater manoeuvrability

3.2.2.4

telescopic loader

loader (3.2.2) having a centre mounted telescopic boom with the pivot point in front of the operator's station

3.2.3

backhoe loader

self-propelled crawler or wheeled machine having a main frame designed to carry both front-mounted *equipment* (3.1.12) and rear-mounted backhoe equipment (normally with outriggers or stabilizers)

Note 1 to entry: When used in the backhoe mode, the machine is stationary and normally digs below ground level.

Note 2 to entry: When used in the loader mode (bucket use), the machine loads through forward motion.

Note 3 to entry: A backhoe work cycle normally comprises excavating, elevating, swinging and discharging of material.

Note 4 to entry: Terminology and commercial specifications for backhoe loaders are given in ISO 8812.

3.2.4

excavator

self-propelled machine on crawlers, wheels or legs, (or a combination) having an upper structure capable of a 360° swing and with mounted *equipment* (3.1.12), which is primarily designed for excavating with a bucket, without movement of the undercarriage during the work cycle

Note 1 to entry: An excavator work cycle normally comprises excavating, elevating, swinging and discharging of material.

Note 2 to entry: An excavator can also be used for object or material handling/transportation, demolition, breaking.

Note 3 to entry: An excavator can be equipped with a lorry for track construction and maintenance.

Note 4 to entry: Unless specifically identified as a *cable excavator* (3.2.4.4), an excavator is also commonly referred to as a hydraulic excavator.

Note 5 to entry: Terminology and commercial specifications for excavators are given in ISO 7135.

3.2.4.1

minimal swing radius excavator

MSRX

excavator (3.2.4) designed for operation in areas with limited space, having an upper structure with a short swinging radius and with its fully retracted *equipment* (3.1.12) and *attachment* (3.1.13) swinging within a tubular envelope corresponding to 120 % of the width of the undercarriage

3.2.4.2

minimal tail radius excavator

MTRX

excavator (3.2.4) having an upper structure with a short rear-end radius swinging within a tubular envelope corresponding to 120 % of the width of the undercarriage while other parts of the machine, including its fully retracted *equipment* (3.1.12) and *attachment* (3.1.13), swinging beyond this tubular envelope

Note 1 to entry: MTRXs are used to enhance the usability on work sites where the swing area of the rear of the machine is limited, while maintaining operation performance of a standard excavator.

3.2.4.3

walking excavator

excavator (3.2.4) with three or more supporting legs, which can be articulated, telescopic or both, and which can be fitted with wheels

3.2.4.4

cable excavator

excavator (3.2.4) having a wire-rope-operated upper structure designed primarily for excavating (e.g. with a dragline bucket, a front shovel or grab), compacting material (e.g. with a compaction plate), demolition work (e.g. by hook or ball) and material handling with special *equipment* (3.1.12) and *attachments* (3.1.13)

Note 1 to entry: Terminology and commercial specifications for cable excavators are given in ISO 15219.

3.2.4.5

compact excavator

excavator (3.2.4) having an *operating mass* (3.1.10) of 6 000 kg or less

3.2.5

trencher

self-propelled crawler or wheeled machine, having rear- and/or front-mounted *equipment* (3.1.12) or *attachment* (3.1.13), primarily designed to produce a trench in a continuous operation, through motion of the machine

Note 1 to entry: The attachment can be a digging chain, wheel, disk, plough blade or similar.

Note 2 to entry: Terminology and commercial specifications for trenchers are given in ISO 13539.

3.2.6 dumper

self-propelled or towed crawler or wheeled machine with an open body, which transports and dumps or spreads material, and where loading is performed by means external to the dumper

Note 1 to entry: Terminology and commercial specifications for dumpers are given in ISO 7132.

3.2.6.1 rigid-frame dumper

dumper (3.2.6) having a rigid frame and wheel or crawler steering

3.2.6.2 articulated-frame dumper

dumper (3.2.6) with an articulated frame which accomplishes the steering of the machine

3.2.6.3 swing dumper

dumper (3.2.6) having a 360° swing upper structure, whose upper structure consists of a rigid frame, the open body and the operator's station, and whose undercarriage consists of a track type or wheeled unit

3.2.6.4 towed dumper

towed wagon

dumper (3.2.6) that is not self propelled but which is propelled instead by a towing machine on which the operator's station is located

Note 1 to entry: The towed dumper can function in different ways (e.g. side-dump, bottom-dump, rear-dump or use an ejector).

3.2.6.5 compact dumper

articulated-frame dumper (3.2.6.2) or *rigid-frame dumper* (3.2.6.1) having an *operating mass* (3.1.10) of 4 500 kg or less

Note 1 to entry: A compact dumper can have integral self-loading *equipment* (3.1.12).

Note 2 to entry: A compact dumper can have a front or rear mounted body.

3.2.7 scraper

self-propelled or towed crawler or wheeled machine which has a bowl with a cutting edge positioned between the axles, and which cuts, loads, transports, discharges and spreads material through its forward motion

Note 1 to entry: The loading through a forward motion can be assisted by a powered mechanism (elevator) fixed to the scraper bowl.

Note 2 to entry: Terminology and commercial specifications for scrapers are given in ISO 7133.

3.2.7.1 towed scraper

scraper (3.2.7) that is not self propelled but that is propelled instead by a towing machine on which the operator's station is located

3.2.8 grader

self-propelled wheeled machine with an adjustable blade positioned between the front and rear axles, which can be equipped with a front-mounted blade or scarifier that can also be located between the front and rear axles

Note 1 to entry: The machine is primarily designed for grading, sloping, ditching and the scarifying of materials through its forward motion.

Note 2 to entry: Terminology and commercial specifications for graders are given in ISO 7134.

3.2.9 compactor

self-propelled wheeled compaction machine having front-mounted *equipment* (3.1.12) with a dozing or loading *attachment* (3.1.13) and wheels provided with means to crush and compact waste material, which also moves, grades and loads soil, landfill or sanitary (refuse) materials through its motion

Note 1 to entry: Terminology and commercial specifications for compactors are given in ISO 8811.

3.2.10 roller

self-propelled or towed machine having a compaction device, consisting of one or more metallic cylindrical bodies (drums) or rubber tyres, which compacts material such as crushed rock, earth, asphalt or gravel through a rolling and/or vibrating action of the compaction device

Note 1 to entry: Terminology and commercial specifications for rollers are given in ISO 8811.

3.2.10.1 towed roller

roller (3.2.10) that is not self propelled but that is propelled instead by a towing machine on which the operator's station is located

3.2.11 pipelayer

self-propelled crawler or wheeled machine having pipe-laying *equipment* (3.1.12) with main frame, load-hoist mechanism, vertically pivotable boom and counterweight, primarily designed to handle and lay pipes

Note 1 to entry: Terminology and commercial specifications for pipelayers are given in ISO 7136.

3.2.11.1 side-boom pipelayer

pipelayer (3.2.11) with the vertically pivotable boom mounted to the side of the machine so that it only moves in a vertical direction

3.2.11.2 rotating pipelayer

pipelayer (3.2.11) with rotating upper structure to which the vertically pivoting boom is attached so that the boom can also move with the rotation of the upper structure

3.2.12 compact tool carrier

self-propelled direct control crawler or wheeled machine having a *base machine* (3.1.11) mass of less than 2 000 kg, having either a pedestrian operating position or a standing operator platform at the rear of the machine and either front-mounted interchangeable *equipment* (3.1.12) or lift arms with quick coupler capable of coupling to interchangeable, front-mounted *attachments* (3.1.13)

3.2.13

vacuum excavator

self-propelled or towed machine designed to operate a non-mechanical process of soil excavation that utilizes high velocity fluid or airflow or both and suction to loosen, remove, and capture soil, material and debris body

Note 1 to entry: Addition of fluid for breaking up material for extraction may be used.

Note 2 to entry: Vacuum excavation is considered a form of soft excavation.

Annex A (informative)

Identification procedure

This annex provides information on the identification structure used by this document, as well as a procedure for using the structure to classify machinery and introduce detailed identification consistent with the logic implied.

Machines are identified according to their:

- a) machine family (see [3.2](#)),
- b) operating mass ([3.1.10](#)), and
- c) operator control configuration (see [Annex B](#)).

The machine family structure is based on the chart shown in [Figure A.1](#).

The machine's operating mass is used to identify possible mass limits in some machine configurations (e.g. compact machines).

Operator control configuration is related to the way in which the machine is controlled, and to the posture of the operator and location of the operator's station (see [Annex B](#)).

In general, earth-moving machinery can be broadly identified by combining specifications from each of the characteristics mentioned above. This allows the unique identification of machines not explicitly referenced in this document, provided that they belong to one of the existing machine families.

EXAMPLE 1 Compact rigid-frame dumper with seated operator.

Other characteristics can be added to provide additional clarification.

EXAMPLE 2 Tracked compact rigid-frame dumper with seated operator.

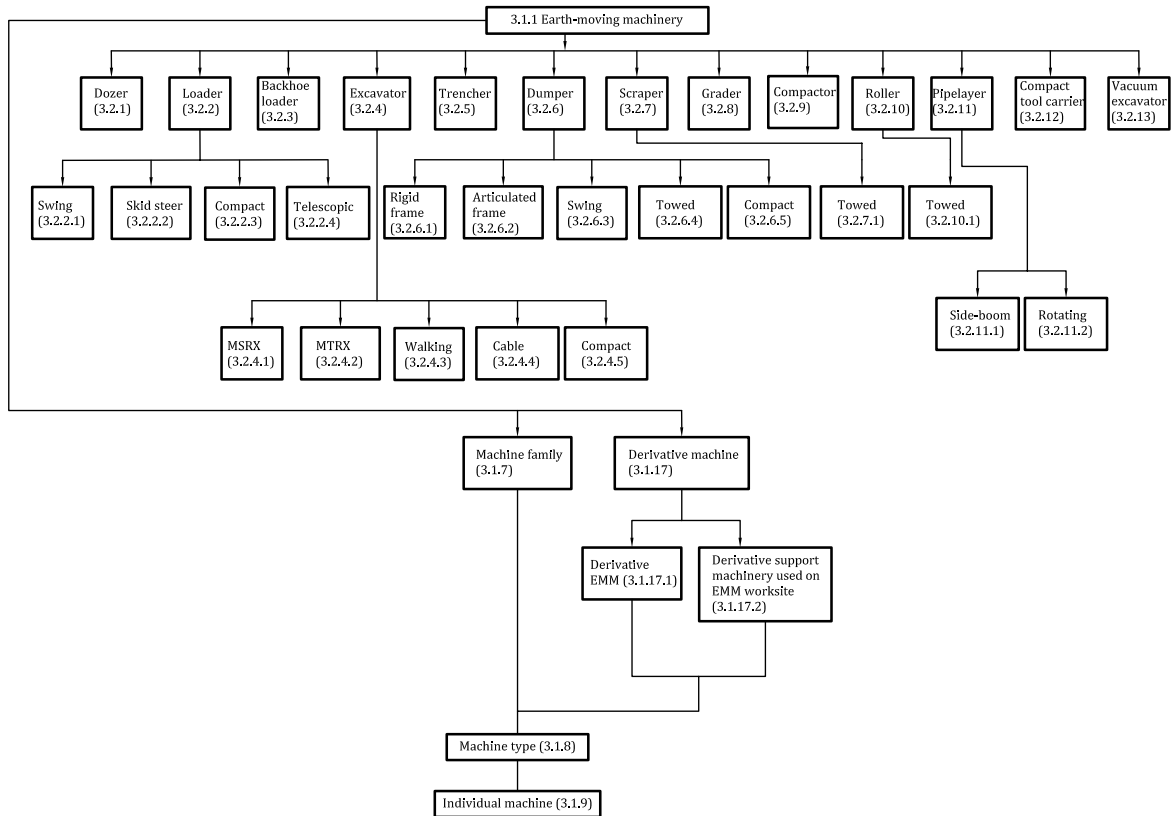


Figure A.1 — Machine identification chart

Annex B (informative)

Earth-moving machinery operator control configurations

The operator control configurations of earth-moving machinery can be arranged in a hierarchical structure according to the control type, operating classification and operator posture, as shown in [Figure B.1](#).

NOTE The structure shown in [Figure B.1](#) does not preclude the possibility of introducing new configurations according to advances in technology.

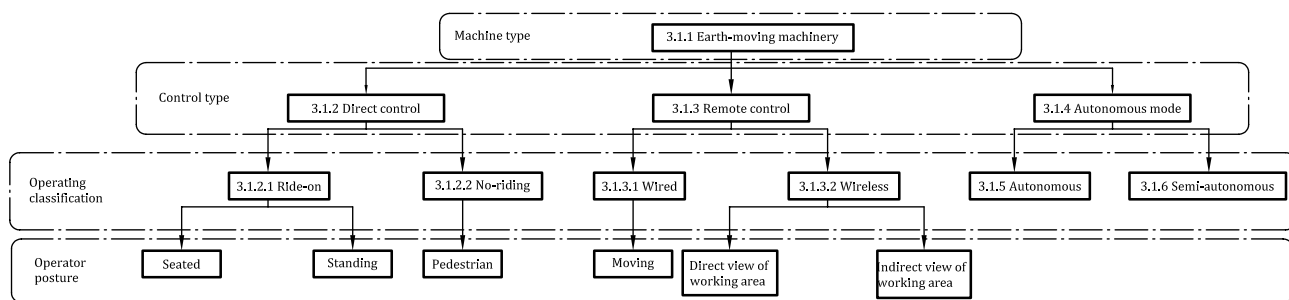


Figure B.1 — Earth-moving machinery operator control configurations

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Reference terminology standards:

- [1] ISO 6747, *Earth-moving machinery — Dozers — Terminology and commercial specifications*
- [2] ISO 7131, *Earth-moving machinery — Loaders — Terminology and commercial specifications*
- [3] ISO 7132, *Earth-moving machinery — Dumpers — Terminology and commercial specifications*
- [4] ISO 7133, *Earth-moving machinery — Scrapers — Terminology and commercial specifications*
- [5] ISO 7134, *Earth-moving machinery — Graders — Terminology and commercial specifications*
- [6] ISO 7135, *Earth-moving machinery — Hydraulic excavators — Terminology and commercial specifications*
- [7] ISO 7136, *Earth-moving machinery — Pipelayers — Terminology and commercial specifications*
- [8] ISO 8811, *Earth-moving machinery — Rollers and compactors — Terminology and commercial specifications*
- [9] ISO 8812, *Earth-moving machinery — Backhoe loaders — Terminology and commercial specifications*
- [10] ISO 13539, *Earth-moving machinery — Trenchers — Definitions and commercial specifications*
- [11] ISO 15219, *Earth-moving machinery — Cable excavators — Terminology and commercial specifications*
- [12] ISO 21467, *Earth-moving machinery — Horizontal directional drills — Terminology and specifications*

Related standards:

- [13] ISO 3471, *Earth-moving machinery — Roll-over protective structures — Laboratory tests and performance requirements*
- [14] ISO 3449, *Earth-moving machinery — Falling-object protective structures — Laboratory tests and performance requirements*
- [15] ISO 6016, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*
- [16] ISO 6746-2, *Earth-moving machinery — Definitions of dimensions and codes — Part 2: Equipment and attachments*
- [17] ISO 10261, *Earth-moving machinery — Product identification numbering system*
- [18] ISO 10262, *Earth-moving machinery — Hydraulic excavators — Laboratory tests and performance requirements for operator protective guards*
- [19] ISO 12117, *Earth-moving machinery — Tip-over protection structure (TOPS) for compact excavators — Laboratory tests and performance requirements*
- [20] ISO 12117-2, *Earth-moving machinery — Laboratory tests and performance requirements for protective structures of excavators — Part 2: Roll-over protective structures (ROPS) for excavators of over 6 t*
- [21] ISO 15817, *Earth-moving machinery — Safety requirements for remote operator control systems*

- [22] ISO 17757, *Earth-moving machinery and mining — Autonomous and semi-autonomous machine system safety*
- [23] ISO 20474, *Earth-moving machinery — Safety*

Index

A

articulated-frame dumper [3.2.6.2](#)
attachment [3.1.13](#)
autonomous machine [3.1.5](#)
autonomous mode [3.1.4](#)

B

backhoe loader [3.2.3](#)
base machine [3.1.11](#)

C

cab [3.1.16](#)
cable excavator [3.2.4.4](#)
canopy [3.1.15](#)
compact dumper [3.2.6.5](#)
compact excavator [3.2.4.5](#)
compact loader [3.2.2.3](#)
compact machine [3.1.1.1](#)
compact tool carrier [3.2.12](#)
compactor [3.2.9](#)

D

derivative earth-moving machinery [3.1.17.1](#)
Derivative machine [3.1.17](#)
derivative support machinery used on earth-moving worksites [3.1.17.2](#)
direct-control machine [3.1.2](#)
dozer [3.2.1](#)
dumper [3.2.6](#)

E

earth-moving machinery [3.1.1](#)
equipment [3.1.12](#)
excavator [3.2.4](#)

G

grader [3.2.8](#)

I

individual machine [3.1.9](#)

L

loader [3.2.2](#)

M

machine family [3.1.7](#)
machine model [3.1.8](#)
machine type [3.1.8](#)
minimal swing radius excavator [3.2.4.1](#)
minimal tail radius excavator [3.2.4.2](#)
MSRX [3.2.4.1](#)
MTRX [3.2.4.2](#)

N

non-riding machine [3.1.2.2](#)

O

operating mass [3.1.10](#)
operator protective structure [3.1.14](#)

P

pipelayer [3.2.11](#)

R

remote-control machine [3.1.3](#)
ride-on machine [3.1.2.1](#)
rigid-frame dumper [3.2.6.1](#)
roller [3.2.10](#)
rotating pipelayer [3.2.11.2](#)

S

scraper [3.2.7](#)
semi-autonomous machine [3.1.6](#)
side-boom pipelayer [3.2.11.1](#)
skid steer loader [3.2.2.2](#)
swing dumper [3.2.6.3](#)
swing loader [3.2.2.1](#)

T

telescopic loader [3.2.2.4](#)
towed dumper [3.2.6.4](#)
towed roller [3.2.10.1](#)
towed scraper [3.2.7.1](#)
towed wagon [3.2.6.4](#)
trencher [3.2.5](#)

V

vacuum excavator [3.2.13](#)

W

walking excavator [3.2.4.3](#)
wire-controlled machine [3.1.3.1](#)
wireless-controlled machine [3.1.3.2](#)

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