INTERNATIONAL STANDARD

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Cranes — Training of drivers —

Part 1: General

Appareils de levage à charge suspendue — Formation des conducteurs

Partie 1: Généralités

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9926-1 was prepared by Technical Committee ISO/TC 96, *Cranes*.

ISO 9926 consists of the following parts, under the general title *Cranes — Training of drivers*:

— *Part 1: General*

— *Part 2: Mobile cranes*

— *Part 3: Tower cranes*

— *Part 4: Jib cranes*

— *Part 5: Overhead travelling cranes and portal bridge cranes*

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Cranes — Training of drivers —

Part 1:
General

1 Scope

This part of ISO 9926 specifies the minimum training to be given to trainee drivers of cranes, to develop basic operational skills and to impart the requisite knowledge for the proper use of those skills.

It defines the overall training scheme within which specific training should be given for each type of crane (for example tower cranes, mobile cranes, etc.).

It assumes that the trainees have no previous practical experience in driving cranes. It does not specify any procedure for evaluating their capabilities or qualifications.

2 General

The driving of cranes must incorporate the safety of persons and properly situated within their field of action. Cranes are often installations of considerable value occupying a key position in the working process. The drivers shall therefore be selected carefully and shall receive basic training by experienced specialists. It is also essential that the persons making up the handling team (slingers, signalmen, supervisor) receive appropriate training.

3 Prerequisite aptitudes and knowledge

Drivers shall be at least 18 years old. They shall be recognized to be medically fit for the profession. The following items should be considered:

a) Physically

- — sight and hearing;
- — no dizziness when driving at a height;
- — no disqualifying ailment or infirmity;
- — no drugs- or alcohol-related troubles.

b) Mentally

- — behaviour under stress;
- — mental balance;
- — sense of responsibility.

Tests may be used to determine the aptitude of the trainees (manual skill, common sense, self-control, coolness, accuracy, motion coordination and reflexes).

Trainees shall be able to understand and read the language in which the documents and information labels of the crane are written.

If the drivers have to transport their crane by road, they shall know the legislation concerned, have the appropriate documentation, and possess driving authorisation if required by the legislation of the country.

4 Training objectives

The objectives of the training are

a) to provide thorough knowledge of the rules applicable to cranes and to their environment, and to apply them at all times;

b) to provide knowledge of hand signals and radio communication, and also equipment and technique for load handling, sufficient to allow the driver to

— perform operations effectively and without endangering himself and others,

— carry out normal and emergency crane operations;

c) to provide technical knowledge of cranes, their characteristics and load diagrams, mechanisms and safety equipment, sufficient to

— drive different cranes of the same type,

— make optimal use of their characteristics,

— identify defects,

— perform daily checks,

— know how to use the documentation;

d) the acquisition of driving skills, including

— combination and accuracy of movements,

— determination of loads and distances,

— optimal use of control devices and instruments in the driver's cabin.

5 Training procedure

The duration and content of training should be sufficient to attain the objectives.

Training should essentially be directed towards the practical aspects of driving (at least 75 % of training time), and theoretical learning should be checked through operational aptitudes.

For practical training, the crane take-over phase should be carried out with a single trainee per crane with the trainer. For the subsequent phases, it is advisable to have no more than two trainees at the same time, except for a school-crane specially equipped for this purpose. One trainer should not have to monitor more than three cranes.

Training should be marked by theoretical and practical tests designed to check whether the objectives have been attained.

6 Content of the training

The content of the training programme is the essential factor for meeting the objectives. It includes the assessment requirements and the programme.

For each subject, the assessment requirements define the following:

a) the level of know-how that the trainees should reach;

b) the time allotted (depends on the trainee);

c) the methods, means, teaching aids and recommended information media.

These are not dealt with in this part of ISO 9926.

The programme is the list of subjects which should be taught. It is given by topic and not chronologically.

6.1 Theoretical programme

6.1.1 The driver

— His aptitudes and responsibilities

— His role within the handling team (slingers, signalmen, supervisor)

6.1.2 Technology of cranes

— Terminology and characteristics

— Different versions and their methods of setting up

— Engines (operational principles)

— Mechanisms (kinematic chain, operating principles and appropriate control)

— Brakes, travel and speed limiters (operating principles and tests)

— Electrical remote-control equipment (operating principles, safety functions: tests and setting)

— Hydraulic and pneumatic control equipment (operating principles, safety functions: tests and setting)

— Steel wire ropes (installation, periodic checks, discard criteria)

— Safety devices (operating principles: tests and setting)

6.1.3 Putting crane into and out of service

— Ground connections (jacking, rails, anchorage blocks)

— Specific setting up (anchored or guyed crane, climbing inside the building)

— Auxiliary equipment and accessories (for example fly jib)

— Electric power (dangers, protection systems)

— Hydraulic and pneumatic systems and fuels (dangers and precautions)

— Erection, putting into service, tests, dismantling, maintenance operations

— Travel of the crane on site and on road

6.1.4 Use of cranes and safety rules

— Load diagrams, reeving and crane configuration: selection procedure (optimum use)

— Rated capacity limiters and indicators (operating principles and tests)

— Forces acting on the crane (conditions in and out of service)

— Stability of the crane (influence of various configurations)

— Influence of atmospheric and ambient conditions (for example low temperatures, build-up of ice, fog, wind, storm, lightning, dust, smoke, corrosive atmosphere)

— Environment of the crane and its constraints [power lines, lines, prohibited or dangerous areas, other cranes, radio transmitters, air traffic (beaconing), noise or pollution limits]

— Start-up and shut-down procedures

— Prohibited or dangerous operations

— Limits to the use of cranes

— Instructions specific to the work of the crane or to the site where it is used

— Action priorities

6.1.5 Driving

— Driver's cabin (access, safety and features contributing to the driver's comfort)

— Control and monitoring equipment

— Driving aids (indicators and interference detector)

— Operation from the ground (by cable or radio control)

— The proper use of movements and of their combinations

— Distance estimation and marking

— Appropriate driving of the various mechanisms to obtain maximal output

6.1.6 Communication

— Hand signals (direct or relay signalling)

— Radio communication

— Control assisted by video circuit

6.1.7 Materials handling

— Slinging equipment (rules for use)

— Load lifting attachments (rules for use)

— Manual load guidance

— Loads (evaluation, centre of gravity, balance, influence of wind)

— Common handling operations (turning over a load)

— Handling a load with more than one crane

— Personnel transport

6.1.8 Inspection, maintenance and incidents

— Using the documentation

— Regular inspections and inspections prior to operation

— Reports on malfunctions

— Actions in case of malfunctions or failure of drive power (how to lower the load)

6.2 Practical programme

The practical programme shall include visualisation of the components, equipment and attachments mentioned in the theoretical programme, together with the following.

6.2.1 Operating exercises

— Use of controls, operating aids and monitoring instruments

— Executions of movements one by one, with no load, then loaded

— Combination of two movements with no load, then loaded

— Reduction of load swinging

— Combination of three or four movements

— Site travelling, no load, then loaded (as appropriate)

— Crane preparation and travel by road

— Exercises with targets to develop the faculties of

  - the evaluation of distances in space
  - the accuracy of load picking-up and placing
  - the speed of travel in space
  - the search for optimal time of handling cycle

— Operation when the load is out of the driver's sight (with signalman or with radio communication)

— Driving various cranes of the same family

— Operation with interference from a fixed obstacle or from another crane

— Driving from the ground for types of crane where this is applicable

6.2.2 Handling exercises (load picking-up and placing)

— Handling of common loads (crates, containers, pallets, skips, etc.)

— Handling of

  - long and flexible loads
  - high loads
  - loads with large horizontal area
  - loads with large vertical area

— Handling of loads with specific attachments

— Exercises in load slinging and guidance

— Communication exercises by hand signals and radio

6.2.3 Exercises in use, tests, maintenance and emergency situations

— Jacking and start-up of the crane and checking the environment

— Start-up and shut-down procedures

— Regular inspections (brakes, safety devices and load state monitor)

— Change in reeving

— Change of lifting attachments

— Lubrication and level checks

— Safe escape

7 Training follow-up

The training is only intended to give the trainee the knowledge and skills required for the proper and safe use of cranes. The driver's capability can only be developed through experience gained by working under actual conditions and adequate supervision. For these reasons, it may be useful that the experience gained in driving different cranes be recorded chronologically on a training form.

It is also necessary to plan sessions for updating the drivers' knowledge in order to retrain drivers who have temporarily ceased their activity and to give advanced training in technical changes and improvements to drivers.