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British Standard Specification for

Automatic safe load indicators

Foreword

This British Standard was prepared under the direction of the Mechanical Handling Standards Policy Committee.

Automatic safe load indicators have been used with cranes for many years. Before this standard was introduced, the design, manufacture and type testing of these devices was largely influenced by the need, in certain circumstances, to use an automatic safe load indicator of a type approved by the Health and Safety Executive. This standard was developed from a specification produced by the Health and Safety Executive to define the essential requirements required for approval. This British Standard replaces the Health and Safety Executive's specification with regard to all aspects of approval under Health and Safety Legislation.

It is important to ensure that close cooperation exists between manufacturers and purchasers in order that automatic safe load indicators are correctly specified, installed and operated.

This British Standard has been written on the basis that the automatic safe load indicator manufacturer is responsible for the specification, installation and type testing of the automatic safe load indicator in conjunction with the crane on which it is to be used.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Contents

	Page
Foreword	Inside front cover
Committees responsible	Back cover
Specification	
1 Scope	2
2 Definitions	2
3 General	2
4 Mechanical	9
5 Electrical	9
6 ASLs using programmable electronic systems	11
7 Type testing	11
8 Protection and painting	18
9 Marking of equipment	18
10 Instruction manual	18
Appendices	
A British Standards for material and equipment suitable for use in the manufacture of automatic safe load indicators	19
B Legislation related to cranes	20
Tables	
1 Form of warnings	4
2 Indications required for ASLs for different types of cranes	8
3 Summary of tests	12
4 Test sequence	13
5 Common and differential mode transient overvoltage tests for mains supplied ASLI	14
6 Common and differential mode transient overvoltage tests for generator supplied ASLI	15
7 Common and differential mode transient overvoltage tests for vehicle supplied ASLI	15
8 Data cable interference test	17
Figures	
1 Interpolated duties	5
2 Stepped duties	6
3 Graph of safe working load against radius	7
4 Block diagram showing the position of the interference pulse generator for the test specified in 7.2.6.4	16

Specification

1 Scope

This British Standard specifies constructional and testing requirements for automatic safe load indicators for cranes.

It is common practice to fit devices associated with an automatic safe load indicator which prevent certain motions of the crane after the point has been reached where the overload warning is given; these additional motion limiting features are not covered by this British Standard.

Appendix A lists British Standards for material and equipment suitable for use in the manufacture of automatic safe load indicators. Appendix B details legislation relating to cranes.

NOTE. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1 safe load indicator. A device which when fitted to a crane gives, within certain specified tolerance limits (see 3.8.2 and 3.8.3), a warning of the approach to the safe working load of the crane, and a further warning when the safe working load has been exceeded.

NOTE 1. In addition, a safe load indicator may have to supply certain defined information (see 3.8.5) associated with the safe use of the crane.

NOTE 2. Rated capacity indicator is an equivalent term.

2.2 automatic safe load indicator (ASLI). A safe load indicator which requires no manual resetting or adjustment, from the application of a load to the crane until the release of that load.

2.3 configuration. The combination of structural members, counterweights, hook block reeving and other items which when assembled according to the crane manufacturer's instructions permit the crane to lift a range of safe working loads.

2.4 fail to a safe condition. A condition in which a fault causes an overload warning or some equally obvious indication to be given by the ASLI.

2.5 radius. For slewing cranes, the horizontal distance between the point at which the axis of rotation meets the ground and the vertical centre line through the hook. For non-slewing cranes, the horizontal distance between the front axle or other forward support and the vertical centre line through the crane hook.

2.6 safe working load (SWL). The maximum load that can be lifted by the crane under certain specified conditions.

NOTE 1. The safe working loads for a particular crane and, when appropriate, corresponding operating radii or jib angle are given in the current certificate of test for that crane.

NOTE 2. Rated capacity is an equivalent term.

2.7 actual load. The mass of all loads and of all lifting attachments suspended from the hook or fixed lifting appliance. For mobile cranes the mass of the hook block, if fitted, is also included in the actual load.

NOTE. See also ISO 4306/1 ADD 2.

2.8 watchdog. A hardware timer which monitors the duration of internal hardware functions, and/or application program functions, and/or system software functions, and which will fail to a safe condition if not periodically reset at a predetermined interval.

2.9 continuous warning. A warning that is given visually by either a flashing or uninterrupted light or audibly by either a pulsing or uninterrupted sound and persists throughout the time that the condition being indicated exists.

2.10 protective circuit. The circuit which includes connections to the conductive mass of the crane which might in turn be connected to earth mass.

3 General

3.1 Construction

All parts of the automatic safe load indicator necessary for its operation shall comply with this standard for all configurations of the type of crane to which it is to be fitted. For a particular crane, the ASLI shall comply with this standard for all safe working loads indicated on the SWL charts of that crane.

NOTE 1. The safe working loads given on the SWL chart for a crane should be consistent with those given on the test certificate.

An automatic safe load indicator shall operate automatically to the extent that from the application of a load to the release of that load, using any motion or combination of motions permitted by the crane manufacturer, no manual resetting or adjustment of the safe load indicator is required.

The location/design of the configuration selecting device shall prevent alteration of the configuration during the lifting cycle while remaining readily accessible between lifting operations.

NOTE 2. The design should minimize the risk of accidental or inaccurate changing of any manual setting device. For example, toggle switches, which can be easily knocked to change the setting, are unsuitable and a switch having a number of possible settings exceeding the number of crane configurations by ten would be unsatisfactory.

NOTE 3. The equipment should be sufficiently robust in its construction and/or protected to prevent damage from shock, vibration and the general rigours of crane duties including erection, rope changing, use and dismantling or maintenance including arc welding on the crane.

NOTE 4. Special consideration should be given to the material strength of any part of the construction that is likely to be exposed to accidental damage.

The ASLI shall function such that at intermediate radii, between those shown on the SWL chart for the crane, it follows an interpolation of a smooth curve graph of the plots of the safe working loads and the radii given on the SWL chart.

For telescopic jib cranes capable of operating at intermediate jib lengths, between those shown on the crane SWL chart, the ASLI shall follow the duties determined for the crane by the crane designer.

Where the duties are of interpolated form the ASLI shall function as illustrated by the three dimensional graph shown in figure 1.

Where the duties are of stepped form the ASLI shall function as illustrated by the three dimensional graph shown in figure 2.

3.2 Environmental operating conditions

The correct operation (see 3.8) of the ASLI shall not be affected by the mechanical shocks and vibration transmitted by the crane structure during transportation and operation.

The ASLI shall be designed to operate in ambient temperatures between -20°C and $+60^{\circ}\text{C}$. It shall be designed, constructed and installed so that when tested in accordance with 7.2.4 to 7.2.10, the ASLI meets the relevant acceptance criteria in accordance with table 3.

The ASLI shall be protected against rain, water spray, frost, snow, dirt, dust, condensation or other adverse conditions. The degree of protection shall be in accordance with 5.7.

NOTE 1. Steps should be taken to dissipate any heat which may be generated within an enclosure that could possibly affect the correct operation of the ASLI.

NOTE 2. Guidance on the degree of protection to be adopted for explosive atmospheres is given in BS 5345 : Part 1.

NOTE 3. The automatic safe load indicator should be protected against corrosion (see clause 8).

NOTE 4. The construction and installation of the automatic safe load indicator should give adequate protection from all the effects of lightning so far as is reasonably practicable.

3.3 Overload testing of crane

The design of the ASLI shall permit overload testing of the crane without any disconnection or adjustment.

3.4 Provision for routine inspection and verification

The ASLI shall be designed so that it can be verified other than by applying loads to the crane (see 3.9 and 6.4).

NOTE. The need for routine inspection and testing should be taken into account at the design stage. When testing the ASLI without the application of loads it may be practicable for limit switches to be operated manually without the need for additional facilities. However specific provision may need to be made for checking other devices such as those incorporating electrical resistances.

3.5 Security

All adjusters affecting the performance of the ASLI shall be located within enclosures or at a position giving the same level of security.

3.6 Special provision for the rigging of mobile cranes

The ASLI design shall allow for rigging operations on mobile cranes by either of the following:

- (a) the installation of a rigging switch, which, when activated, causes the audible overload warning provided for persons in the vicinity of the crane to be cancelled, but which allows the remaining audible overload warning provided for the driver to remain in full operation at all times;

NOTE 1. The rigging switch should be arranged such that it cannot be left inadvertently activated when rigging operations are completed and the crane is restored to normal duties.

NOTE 2. It is important to emphasize that this facility should only be provided to avoid the disturbance otherwise caused during long rigging operations.

- (b) the indicator giving all the appropriate warnings whenever a load is applied to the crane when it is in the rigging position.

3.7 Control positions and markings

All visual warning devices, information displays, switches and controls shall have clear markings on or adjacent to them, with symbols or words in English to indicate their function and mode of operation (see ISO 7000).

NOTE. Due consideration should be given to good ergonomic practices both in the operation of controls and in the presentation of warnings and information.

3.8 Warnings and indications

3.8.1 General. The ASLI shall give warnings and indications in accordance with 3.8.2 to 3.8.4 for all permitted motions of the crane that induce an overload and for all configurations shown on the certificate of test and thorough examination of the crane to which it is fitted.

NOTE. All graduations and markings on analogue instruments should be clearly visible from the crane operating position and should enable all the positions and loads given on the certificate of test and thorough examination of the crane to be clearly distinguished within the specified accuracy. All pointers and similar devices should provide a fast response to changing conditions and be suitably damped to prevent excessive oscillation or overrun.

3.8.2 Warning of approach to SWL. The ASLI shall give a clear and continuous warning of approach to SWL. The warning shall commence at not less than 90 % of the SWL and at not more than 97.5 % of the SWL. The approach to SWL warning shall continue to function until the percentage of the load to the SWL falls to some value which is less than the value at which the warning was initiated.

3.8.3 Warning of overload. The ASLI shall give a clear and continuous warning of overload. The warning shall commence at not less than 102.5 % of the SWL and at not more than 110 % of the SWL. The overload warning shall continue to function until the percentage of the load to the SWL falls to some value which is less than the value at which the warning was initiated.

3.8.4 Form of warnings. The warnings for both approach to SWL and overload shall be continuous and shall be audible and visual in accordance with table 1.

The audible warnings for approach to SWL and overload shall be clearly distinguishable from each other and also from other relevant sounds such as telephones.

The visual warnings shall be clearly distinguishable under all conditions (see 3.8.6.2).

3.8.5 Indications required at the driver's control station(s)

3.8.5.1 Proximity to safe working load. Continuous visual indication of the load on the crane relative to the safe working load shall be provided in accordance with table 2.

NOTE. This may be by means of a needle moving across a scale, the approach of two pointers or by some other equally clear continuous visual indications.

3.8.5.2 Other indications. The following shall be indicated by continuous visual indications in accordance with table 2.

- (a) *The radius of the load.* The radius with the safe working load suspended from the crane including any deflection caused by that load.
- (b) *The angle of the jib.* The angle with the safe working load suspended from the crane, given in degrees.
- (c) *The SWL.* The SWL corresponding to either the radius of the load or the angle of the jib.
- (d) *The load on the crane.* The load on the crane for cranes having a maximum safe working load exceeding 10 tonnes.
- (e) *The configuration of the crane.*

NOTE. There should be a clear and precise indication of the crane configuration for which the ASLI has been set and this should be visible from the crane operating position. As a minimum the configuration selecting device should provide either a direct description of the configuration selected or indicate a code from which the configuration selected can be obtained using a list of codes kept in the driver's cabin.

Table 1. Form of warnings

Function	Audible warning	Visual warning
Approach to SWL	At driver's control station(s)	Amber lamp at driver's control station(s)
Overload	At driver's control station(s) and at a position* to warn persons in the vicinity of the crane	Red lamp at driver's control station(s)
* This warning should be audible at a distance of not less than 1.5 X maximum working radius for any configuration of the crane, but should not subject the crane driver to excessive noise levels.		

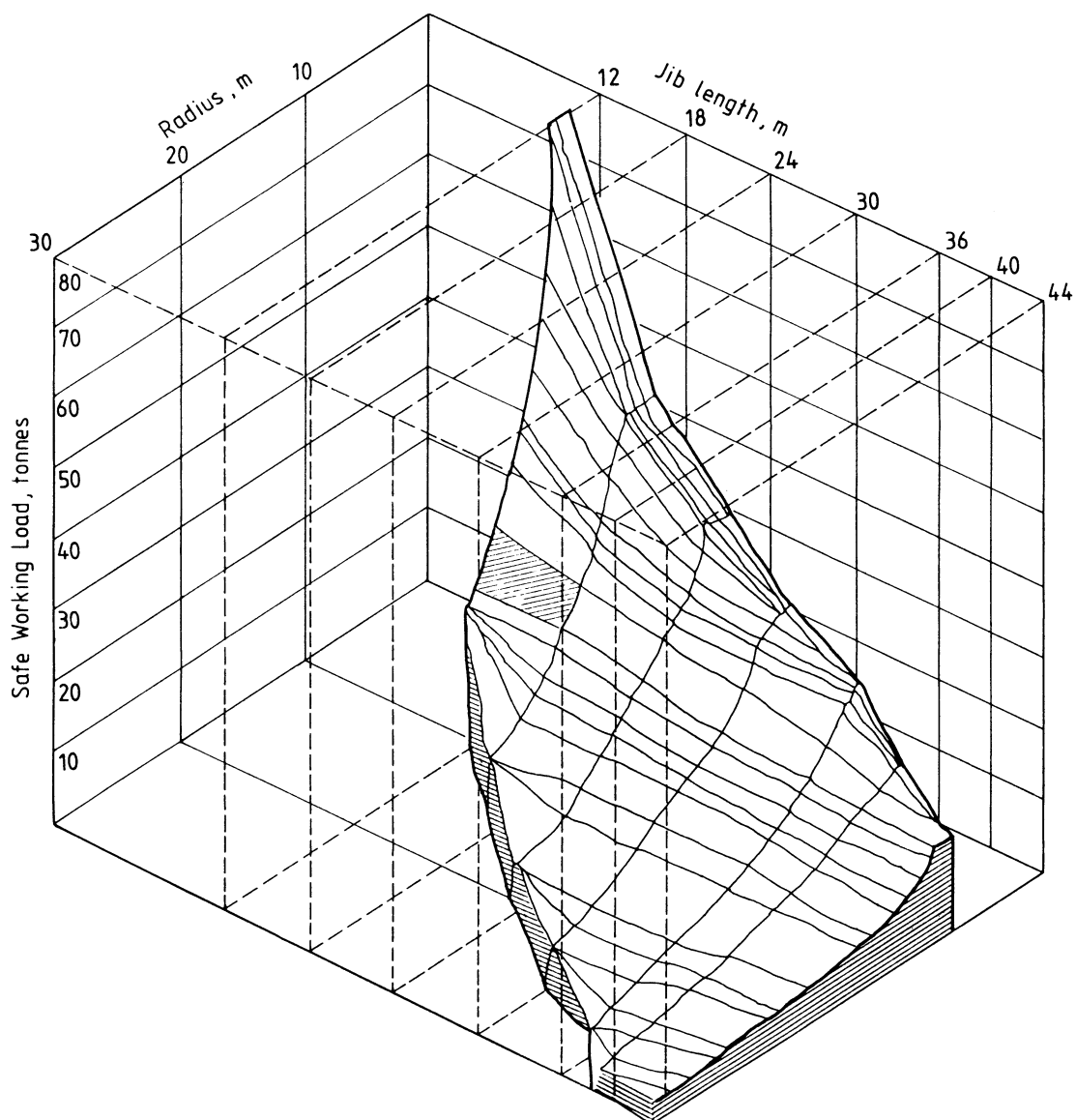


Figure 1. Interpolated duties

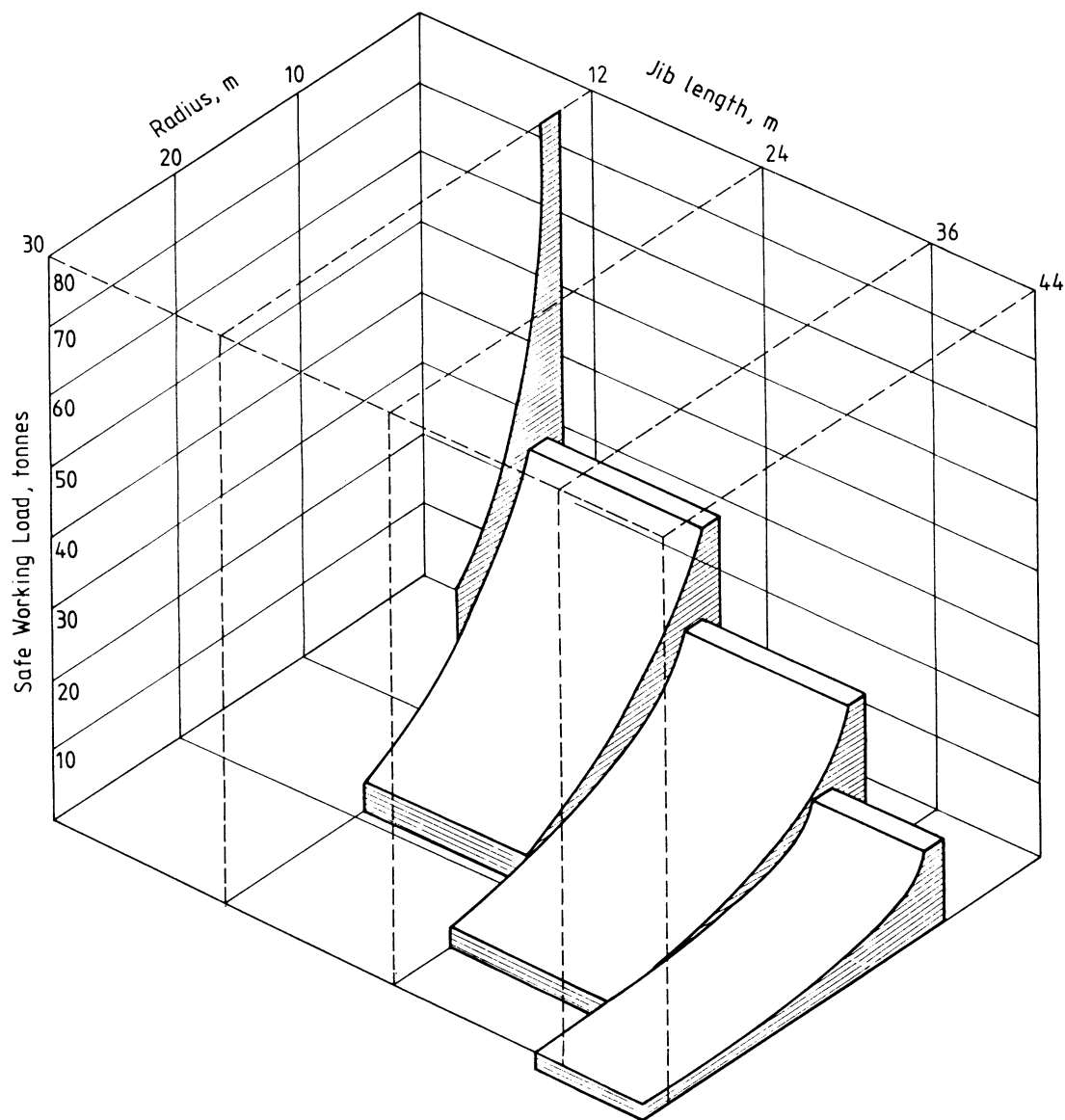


Figure 2. Stepped duties