

Code of practice for safe use of cranes —

Part 14: Side boom pipelayers

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Committees responsible for this British Standard

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- Association of Lorry-Loader Manufacturers and Importers
- CEA — Construction Equipment Association
- Construction Confederation
- Construction Plant-hire Association
- HSE — Health and Safety Executive
- Institution of Occupational Safety and Health
- Institution of Structural Engineers
- Low Power Radio Association
- Safety Assessment Federation
- Co-opted Members

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Foreword

This part of BS 7121 has been prepared by Subcommittee MHE/3/11. It is intended to be used in conjunction with other parts of BS 7121 to ensure, so far as is reasonably practicable, that lifting operations are carried out safely.

The Lifting Operations and Lifting Equipment Regulations (LOLER) [1] and the Provision and Use of Work Equipment Regulations (PUWER) [2] came into force on 5 December 1998. Details of the Regulations, an Approved Code of Practice plus HSE guidance can be found in the HSE books *Safe use of lifting equipment* [3] and *Safe use of work equipment* [4].

BS 7121-1 provides general recommendations for crane types not covered in an additional part of BS 7121. BS 7121-2 covers in-service inspection, thorough examination and, where appropriate, testing for the safe use of all types of crane. This Part covers the safe use of side boom pipelayers. Subsequent parts deal with the specific crane types as follows:

- *Part 3: Mobile cranes;*
- *Part 4: Lorry loaders;*
- *Part 5: Tower cranes;*
- *Part 6: Derrick cranes;*
- *Part 7: Overhead/under-hung travelling and goliath cranes;*
- *Part 8: High pedestal and portal jib dockside cranes;*
- *Part 9: Container handling cranes;*
- *Part 10: Rail mounted cranes;*
- *Part 11: Offshore cranes;*
- *Part 12: Recovery vehicles and equipment;*
- *Part 13: Hydraulic gantry lifting systems.*

When all parts of BS 7121 have been published, CP 3010 will be withdrawn and BS 5744 will be revised to cover manually operated and light cranes only.

The Health and Safety Executive (HSE) commends the use of this British Standard to those who have duties under the Health and Safety at Work etc. Act 1974 [5]. This standard was drawn up with the participation of HSE representatives and will be referred to in relevant HSE publications.

The BS 7121 series has been accepted as representing the consensus of practical experience for safety on cranes.

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and competent people.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

Attention is drawn to the following statutory regulations:

- The Lifting Operations and Lifting Equipment Regulations (LOLER) [1];
- The Provision and Use of Work Equipment Regulations (PUWER) [2];
- Health and Safety at Work etc. Act 1974 [5];
- The Supply of Machinery (Safety) Regulations [6];
- The Management of Health, Safety and Welfare Regulations [9];
- The Personal Protective Equipment at Work Regulations [10].

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 23 and a back cover.

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1 Scope

This part of BS 7121 gives recommendations for the safe installation and use of pipelayers. Subjects covered include selection of pipelayers, planning the lifting operation, thorough examination, operation, as well as safety measures to be taken during the execution of these functions. It also covers the selection and training of personnel involved in the safe installation and use of pipelayers.

In addition a uniform method of calculating, and a test method for validating rated lift capacity as presented in commercial literature for pipelayers is included. The rated lift capacity considers hoist mechanism limits, tipping loads and rope factors.

This British Standard applies to all pipelayers when used in lifting applications as defined in BS EN ISO 6165 and BS 6914-5.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 6911-7, *Testing earth moving machinery — Part 7: Specification for units of measurement and tolerances* [ISO 9248].

BS 6914-5, *Terminology (including definitions of dimensions and symbols) for earth-moving machinery — Part 5: Glossary for pipelayers*.

BS EN 473:2000, *Non-destructive testing — Qualification and certification of NDT personnel — General principles*.

BS EN ISO 6165, *Earth-moving machinery — Basic types — Vocabulary*.

3 Terms and definitions

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

3.1

employing organization

person or organization who requires a lifting operation to be carried out and is responsible for the safe use of the pipelayer

3.2

pipelayer

self-propelled crawler machine which incorporates pipe laying equipment with mainframe, load hoist mechanism, vertically pivotable side boom and counterweight, and is primarily designed to handle and lay pipes

3.3

side boom

tractor equipment, including boom, load hoist mechanisms and a vertically pivotable side boom, added to a tractor, which is designed to handle and lay pipes and carry pipe laying equipment

NOTE A side boom might have counterweights attached.

3.4

base machine

pipelayer including undercarriage, without equipment or attachments, as described by the manufacturer's specification

3.5

equipment

set of components, boom and counterweights mounted onto a base machine to fulfil the primary design function of a pipelayer

3.6

boom

structural member that supports a load

3.7

counterweight

additional removable mass and its support which is added to increase the stability of a pipelayer

3.7.1

adjustable counterweight

portion of the counterweight that is movable

3.8

attachment

assembly of components that could be mounted on the base machine, or equipment, for a specific use

3.9

component

part, or an assembly of parts, of a base machine, equipment or attachment

3.10

load

external force acting on the pipelayer, including the mass of attaching equipment applied at the load hook

3.11

lift point line

vertical line through the centre of the load hook

3.12

tipping line

<for crawler machines> outer edge of the outer track link rail on the boom side of the machine, see Figure 1

3.13

radius

<for crawler machines> perpendicular distance from a vertical plane passing through the outer edge of the outer track link rail, on the boom side, to a parallel vertical plane passing through the lift point, which is the load bearing surface midpoint of the hook

NOTE This radius for crawler machines is indicated by dimension R1 in Figure 1.

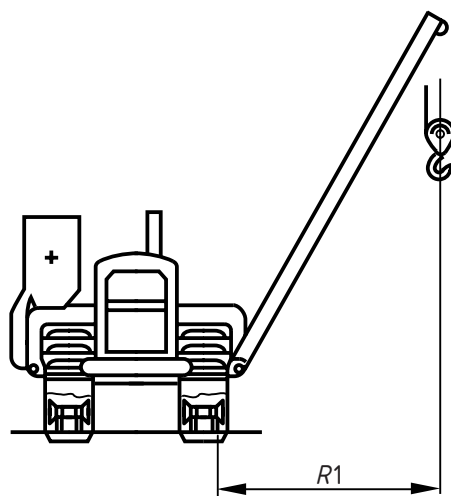


Figure 1 — Dimension R1 for a crawler machine

3.14**moment acting to overturn machine**

product of a force acting on a machine through the lift point line and the radius

3.15**moment acting to resist overturn of machine**

product of the mass of the machinery and the distance from the centre of gravity to the tipping line

3.16**measured balance point**

<for crawler machines> moment acting to overturn the machine at a specific radius that does not cause any track roller on the track opposite the boom side to lift more than 6 mm from the track link

3.17**tipping load**

vertical load applied at the load hook at a specific radius, which achieves the balance point

3.18**rope**

wire rope used for the boom support or load line

3.19**rope factor**

rope breaking strength divided by rope load

3.20 draw works**3.20.1****mechanical draw works**

drums and mechanical drive systems that operate the boom position and the load hoist lines

3.20.2**hydraulic draw works**

hydraulic pumps, motors, valve lines and cylinders, that position the boom and operate the hoist line

3.21 hydraulic pressure**3.21.1****working circuit pressure**

nominal pressure applied to the specific circuit by the hydraulic pumps

3.21.2**holding circuit pressure**

maximum static pressure in a specific circuit limited by a relief valve pressure that is measured at a flow no greater than 10 % of rated flow

3.22**lift mechanism lift capacity**

maximum load that can be lifted at the load hook by a force generated by any combination of mechanical or hydraulic power to the draw works and/or hydraulic cylinder(s) at a specific draw radius without exceeding any of the following limits:

- tipping load;
- hydraulic working or holding circuit pressure in any circuit;
- rope factor in either load or boom hoist line.

NOTE Some of the possible combinations of power to the lift mechanism include:

- a) mechanical draw works power to the load;
- b) hydraulic draw works power to the load and boom hoist line;
- c) mechanical power to the draw works for the load hoist line and hydraulic cylinder(s) for the boom hoist line;
- d) hydraulic cylinders for the boom hoist line.

3.23

mechanical draw works lift capacity

lift capacity obtained by applying mechanical power to the load and boom hoist draw works without exceeding tipping load or rope factor

3.24

hydraulic lift capacity

lift capacity obtained by applying working circuit pressure to the hydraulically actuated draw works and/or lift cylinder(s) without exceeding the holding circuit pressure in any circuit

3.25

rated lift capacity

maximum load that can be raised without exceeding the rated tipping load lift capacity

NOTE The rated lift capacity is also known as “rated lift mechanism lift capacity” or the “rated rope factor lift capacity” see 4.1.

4 Lift capacity determination procedure

4.1 Machine preparation

All lift capacity determinations should be made either with adjustable counterweights fully extended or with variable ballast configurations, for example ballast retracted, ballast not fitted. All lifting operation specifications tested should be shown on the test certificate and machine. See 4.11 and 9.3.6.

4.2 Tipping load test

The tipping load test is carried out for all permitted counterweights and counterweight positions. A live test weight (freely suspended load) should be used in the tipping load test.

4.3 Test site

The lift capacity determination test site should consist of a concrete, steel or equally firm surface and should be level to within 1 %. The test site should be secured, to prevent access by unauthorized persons, and of sufficient area to enable the test to be carried out without endangering personnel.

4.4 Test equipment

The following test equipment with tolerances in accordance with BS 6911-7 should be available.

- a) Sufficient freely suspended weights. The weights should either be of known mass or a calibrated weighing device should be available to determine the mass of the weights.
- b) Means to measure the radius distance.

4.5 Test conditions

The test should be conducted under the control of a competent person.

The pipelayer should be thoroughly examined in accordance with Clause 8 before the test to determine whether it is in a suitable condition to withstand the loads applied during testing.

The manufacturer's operating instructions (but not duty charts) for the pipelayer and the test equipment should be followed at all times.

After load testing, a thorough examination should be undertaken by a competent person to determine whether the pipelayer has withstood testing without signs of structural change that could affect its safety, such as:

- a) cracking;
- b) permanent deformation;
- c) paint flaking;
- d) loosening of or damage to structural connections.

4.6 Test load

A test load, sufficient to cause the pipelayer to attain the measured balance point at approximately the maximum radius, should be lifted at an intermediate radius position. With the load kept as close to the ground as possible, the pipelayer should be boomed out slowly until the measured balance point is achieved. The radius should be measured.

The test should be repeated with different loads applied, to enable the radius to be measured at the balance point for two intermediate positions and approximately the minimum radius position.

4.7 Test results

The results of the test should be recorded and the record should also show the make, model and serial number of the pipelayer, together with the length and identification number of the boom. A graph showing the measured radius at the corresponding load should be drawn, this graph shows the maximum lift capacity. A graph should then be drawn showing 0.714 times the load at the corresponding radius. This graph shows the maximum load that the pipelayer can lift at various radii within the stability requirement [i.e. safe working load (SWL) due to stability].

NOTE See Annex A for an example of a lifting capacity chart.

4.8 Rope factor

The SWL of the pipelayer should not cause the ropes to be loaded beyond one fifth of their ultimate strength in accordance with the rope manufacturer's specification.

4.9 Winch pull

It is essential that the SWL of the pipelayer does not cause the winch to be loaded beyond the maximum line pull permitted by the winch manufacturer.

4.10 Safe working load of the pipelayer

The SWL for the pipelayer is the lesser value given by the SWL for stability, SWL due to rope factor and SWL due to winch pull. The graph produced in accordance with 4.7 should also show the SWL for the pipelayer, see Annex A.

4.11 Duty chart

From the graph showing the SWL for the pipelayer a duty chart should be produced. The duty chart should have legible letters and figures such that at each specified machine configuration and radius positions the rated capacity can be clearly identified.

The data and information provided in the duty chart should include, but not necessarily be limited to the following.

- a) The established rated lift capacities at stated radii.
- b) Number of parts of line (hoist and boom).
- c) Boom length.
- d) Counterweight amount and position.
- e) The standard the pipelayer is rated in accordance with.

NOTE Annex B gives an example of a duty chart for a 583(H) pipelayer.

5 Hoist mechanism

On boom hoist winches driven by a friction clutch (i.e. non-hydraulic machines) a positive locking device to prevent inadvertent lowering of the boom should be provided. Where possible, an automatic means to stop the boom motion when the maximum permissible height is reached should also be provided.

When the load hoist mechanism has power operated brakes for controlling loads without continuous mechanical linkage between the actuation and braking means, an automatic means should be provided that prevents the load from falling in the event of a loss of power.

Hoist drums should be set up with the specified rope capacity with recommended rope size and reeving to operate the boom and hook within the range of boom lengths, operating overhang and vertical lift recommended by the manufacturer, with no less than three full wraps of rope remaining on the drum during operation.