



(Minor changes to the previous edition are indicated by ◆ placed before the relevant paragraphs)

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1. Scope

This Specification is written to comply with Engineering Standard 1-202 in defining the requirements for the overhaul of all variants of the Point Lockslide Casting (4' and 6') which are used extensively in the signalling system on the London Underground.

The specification hierarchy which supports these requirements is detailed in Attachment 4 to the Specification.

2. References

The text of this document cites other documents that provide information or guidance. These are listed in Attachment 1.

References to British Standards or standards in other standards systems shall be taken to include the words 'or equivalent'.

3. Abbreviations

The following abbreviations are used in this document (if from a published source this is indicated):

CPS	Critical Parameter or Setting
DCN	Design Change Notice
LU	London Underground
OEM	Original Equipment Manufacturer
WSL	Westinghouse Signal Limited

4. Definitions

The Client – The Client is the Infracore representative responsible for administering the contract under which the overhaul work is being performed.

The Contractor – The Contractor refers to the organisation responsible for the delivery of overhauled equipment.

5. Introduction

This specification has been written to detail the overhaul requirements of the 4' and 6' Lockslide Castings which are used in the signalling system on the London Underground.

The Lockslide Casting (hereafter referred to simply as a Lockslide) is classified as an item of vital signalling equipment which means that it is used to perform a safety critical function directly affecting the safe movement of trains. It has been designed to be an ultra reliable piece of equipment whose mechanical integrity will be relied on throughout its extended working life. It is a mandatory requirement that an item that has been overhauled shall have a functional performance, a safety integrity, a reliability, an expected service life in its installed condition and a shelf life equivalent to that of a new item.

Any failure condition which causes a set of points to be detected in a position not corresponding with the true lie of the points or to be unlocked when they should not be so, is classed as a 'wrong-side' failure. Wrong-side failures are investigated exhaustively to establish the cause of the failure. Investigations into wrong-side failures will examine materials, processes and the history of overhaul operations to establish the exact cause of the event and to ensure that no other items are likely to suffer a similar failure. An occurrence of a wrong-side failure, or a misoperation showing a tendency towards a wrong-side failure even if no accident or damage is caused, can be extremely costly to investigate and could result in the need to change many units in service.

Items supplied for overhaul will be complete units which may be in working order or may have failed in service. The failure mode of equipments will vary, ranging from simple causes such as wear caused by a long period in service with frequent operation, to items which have suffered severe damage. In the latter case there will be an element of salvage involved in the overhaul process. The equipment will be supplied in an 'as found' condition after being removed from its working position on the railway.

The service life of this equipment is 15 years. The shelf life is 3 years.

A general view of a 6' and a 4' Point Lockslide Casting are shown in Figure A and Figure B.

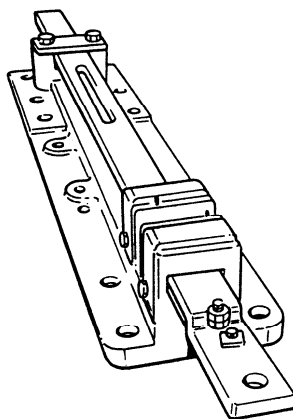


Figure A. 6' non-WL Point Lockslide Casting

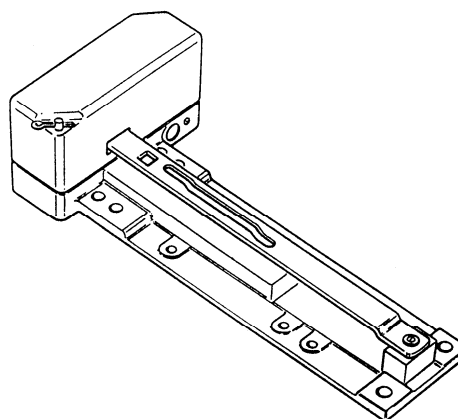


Figure B. 4' Point Lockslide Casting

6. Usage of item

The Lockslide is a component part of a 4' and 6' set of points. In both cases the Lockslide is mounted between the running rails (termed the 4' way). It is used in a very hostile environment, subject to very high vibration levels, high levels of dirt and in open sections of track, wide temperature extremes.

Both styles of Lockslide casting provide a mounting position for the Point and Lock Detector (P&LD) Box and the twin cylinder E.P. Groundlock. The Slide Bar of the Lockslide contains a shaped cutout which drives the parabola ball of the P&LD Box and two ports into which the Groundlock lock plunger fits.

An additional function of the 6' version is to provide the means of locking each switch of the Points. The 6' Lockslide base is therefore longer than the 4' version and contains a lock box through which the track mounted locking bars pass. (The locking bars are not returned for overhaul and are therefore not considered part of the Lockslide.) Two locking dabs are required to operate in conjunction with the track mounted locking bars. These are riveted onto opposite faces of the Slide Bar in the area which passes through the locking box.

7. Equipment design outline

Design features built into the Lockslides include:-

- Construction that is designed to be, as far as is practicable, ultra reliable in operation
- Construction designed to resist the considerable forces to which it will be subjected when holding a set of points (6' version only)
- An ability to be used on left-handed or right-handed configurations
- An ability to re-furbish the main wearing components without the need to scrap the major components.

8. Applicability

This specification applies to the following items.

Item	Stores List No.
Lockslide – 4 ft	26S32
Lockslide – 6 ft – With Groundlock mount	26S779
Lockslide – 6 ft – Without Groundlock mount	26S778

The Illustrated Parts List and accompanying figures, Attachment 2 to this document, forms part of this specification.

All 4' Lockslides have provision for mounting a Twin Cylinder E.P. Groundlock.

The part numbers 26S32 and 26S779 do not include the Groundlock which is supplied as a separate item.

9. Critical functions

Critical Functions of the Lockslide are defined to be:-

Ultra-reliable Operation: The equipment has been designed to be a highly reliable item which will work in a hostile environment where it is mounted on the track-bed and therefore subject to high levels of vibration.

High Structural Integrity of Lockbox (6' version): Considerable force may be exerted on the Lockbox when a train is traversing the points which the Lockslide forms a part. It is imperative that the structural integrity is maintained under all circumstances to ensure that the locking rods are securely held at all times. Any failure which allows free movement of a locking rod (part of the fixed trackside equipment which connects directly to a switch rail) will be considered a wrong-side failure.

High Structural Integrity of Lock Plates (6' version): The Lock Plates are required to prevent the Locking Bars (part of the fixed trackside equipment) from moving except when caused to do so as a result of movement of the Escapement. The Lock Plates are therefore required to be securely attached to the Camplate and the Camplate is to be securely supported by the guideways and associated components fixed to the Base. Any failure which allows the Locking Bars (part of the fixed trackside equipment) to move when they should be held in a locked position will be considered a wrong-side failure.

The ability of the item to meet the critical functions listed above throughout its life depends on many factors, not all of which are immediately obvious to people not familiar with all aspects of the design, overhaul and use of the equipment. To ensure that the significance of certain of the detailed requirements is understood and complied with, a number of Critical Parameters or Settings have been designated throughout the text.

Attachment 3 to this Specification lists all the Critical Parameters or Settings [CPS], a reference to the section from which the requirement originates and provides a Criticality Rating of the importance of each CPS item.

The Criticality Rating is based on the severity of the consequence if there is a deviation of the subject parameter from the value specified. Numerical values have been assigned to various levels of the Criticality Rating (CR) according to the table below.

Criticality Rating (CR)	SAFETY RELATED CRITERIA	RELIABILITY RELATED CRITERIA
10	Life critical – sole dependence Occurrence of this deviation alone may lead to an incident causing death or injury.	
8	Life critical – shared dependence Occurrence of this deviation, together with a second deviation which is potentially latent (i.e. not self announcing), may lead to an incident causing death or injury.	
7	Life critical – contributory Occurrence of this deviation increases the probability of an event which may lead to an incident causing death or injury.	Service critical – sole dependence Occurrence of this deviation alone may lead directly to an incident causing major service delays, and indirectly to the danger of a life threatening incident through enforced use of manual rules for operating the railway.
6		Service critical – shared dependence

Criticality Rating (CR)	SAFETY RELATED CRITERIA	RELIABILITY RELATED CRITERIA
		Occurrence of this deviation, together with a second deviation which is potentially latent (i.e. not self-announcing), may lead directly to an incident causing major service delays, and indirectly to the danger of a life threatening incident through enforced use of manual rules for operating the railway.
5		Service critical – contributory Occurrence of this deviation, increases the probability of an event which may lead to major service delays, and indirectly to the danger of a life threatening incident through enforced use of manual rules for operating the railway.
1	Not life critical	Not service critical

The criticality rating provides a scale of the importance of achieving the specified parameter and therefore of the care needed in designing the process or processes that will lead to the parameter being achieved. The design of the process or processes that will lead to the parameter being met are the responsibility of the Contractor and they shall be designed and documented in accordance with the requirements of Engineering Standard 1-202, Signalling equipment overhaul.

10. Performance parameters

Performance parameters applicable to Lockslides are defined and quantified below.

10.1 Operating stroke

For 6' Lockslides, the operating stroke shall be $8" \pm \frac{7}{64}"$.

10.2 Parabola ball travel

The travel of the spherical roller shall be 0.404" – 0.408" from the centre-line of the Camplate.

11. Equipment configuration

An Illustrated Parts List is provided as Attachment 2, comprising an itemized list and an exploded component drawing to describe the equipment as identified in Section 8 of this specification. The Illustrated Parts List contains all relevant drawing numbers.

A convention of using the figure number followed by the item number has been adopted in this document to uniquely refer to specific components where necessary. Thus, item 1-2a is the Base for a 4' Lockslide.

Unless specifically noted, drawings and figures used in this Specification are for reference only.

12. General requirements

12.1 Compliance with specification

No departures from the requirements of this Specification shall be permitted (either permanently or temporarily) without compliance with the relevant change control procedures.

Neither equivalence of process nor substitution of materials shall be recognised by the Client in receiving work performed against this specification. The Client shall have the immutable expectation that equipment overhauled to this version of the specification shall be 100% compliant with the specification herein.

12.2 Workshop environment

There are no special requirements covering the workshop environment.

The services of a blacksmith may be required.

Calibrated test equipment shall be used to carry out all measurements specified.

12.3 Calibre of staff

Any staff involved in the overhaul process shall be competent in the tasks they carry out and the overhauling contractor shall demonstrate this in accordance with the requirements of Engineering Standard 1-203, Competence of personnel working on signal and control systems.

12.4 Operator accountability

Process control documentation is required to be completed by identified certified (stamp-holding) operators and inspectors throughout the overhaul process. Each certified operator and inspector shall possess a uniquely numbered stamp which is traceable to the owner. Only competent operators shall be provided with a stamp. Records of the issue and withdrawal (if appropriate) of every stamp shall be kept and shall be made available to the Client on request. The retention period of these records is required to be indefinite.

13. Overhaul definition

13.1 Full overhaul

A full overhaul will be performed on items which generally will have been in service for their full routine service life, or which will have been removed from service as a result of a failure.

No item returned after failing in service shall be overhauled until the failure report has been reviewed and accepted by the Client in accordance with a defined arrangement agreed with the Client.

Unless stated to the contrary, all processes detailed in this specification shall be performed for each overhaul.

13.1.1 Dismantle

The Lockslide shall be dismantled in a manner that shall not damage or shorten the life of any component that is required to be re-used. The life of all recyclable components is indefinite.

The items listed below shall be discarded and replaced with new items at every overhaul.

Oil Nipples	Asset Plate	Split Pins
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The Camplate Assembly shall only be dismantled after it has been gauged and examined and specific refurbishment work has been identified.

Cover Posts (items 1-4 and 2-4, and, 1-13 and 2-13) shall not be removed from the Base until they have been examined to determine whether they need to be replaced.

13.1.2 Cleaning

The following shall be implemented after the relay has been dismantled in accordance with Section 13.1.1 above.

All components shall be cleaned and degreased using a technique suitable for that component. A 'suitable technique' shall not cause short term or long term degradation to the component nor shall any solvent used leave undesirable residues on the component which will affect the performance of the component when it forms part of an overhauled unit.

13.1.3 Examination and gauging

All components shall be examined for the effects of excessive or unusual wear, general damage, damage caused by misuse or age, electrical arcing or tracking or overheating. All thread forms shall be checked for signs of over-tightening. Items exhibiting damage that will not be corrected by the specified re-furbishing processes shall be discarded. Signs of electrical tracking or arcing shall be treated as excessive wear.

All occurrences of excessive or unusual wear or damage shall be catalogued and reported to the Client.

The subject items of such reports and as much of the unit from which they were removed as possible, shall be saved in their as near as original condition after being discovered and shall be clearly tagged and identified and shall be made available for Client inspection if so desired.

It is critical that **only** those components specified for refurbishment should be reclaimed after failing the wear tolerances specified.

Items not meeting the examination criteria shall be discarded if there is no refurbishment process detailed for it in this Specification.

Major components and items with specific examination criteria are listed below.

All component parts set aside for use at assembly shall be to a current approved design. Modification schemes may have been commenced which may not yet have been fully implemented. Units submitted for overhaul may not be to the current build standard. Some components may therefore require to be modified or discarded.

13.1.3.1 Base (Items 1-2a, 2-2b or 3-2c)

The Base shall be checked for general condition. No items shall exhibit cracking or chipped corners.

Cover Posts (items 1-4 and 2-4, and, 1-13 and 2-13) shall be checked using a Cover (item 1-3 and 2-3) as a gauge to ensure that the posts are squarely aligned and fit through the cover. Both posts shall be securely fixed to the Base and the cross pin hole in item 1-4 shall accept item a Split Pin (item 1-28 and 2-28) with the Cover in position. Replace bent or damaged Cover Posts with new.

Check that holes exist for fixing a 6-way P&LD Box. If necessary add two holes in accordance with drawing AS28563.

Check that the casting has already been modified in accordance with drawing DS10576 to receive detachable wire inlets. (Items 1-2a and 2-b only).

The width of the Camplate bearing at the Groundlock end shall not be greater than 2.265".

The width of the locating recess for the Groundlock shall not be greater than 2.386".

For 6' Bases, the height above the base of the casting of the Camplate bearing surfaces in the lock box shall be between 1.435" and 1.440". The height of the Camplate bearing surfaces from the base shall not be less

than $2\frac{7}{8}$ ". Measurements taken at opposite end of the casting shall be ≤ 0.010 ". Any adjustment to achieve this limit shall be made at the ground Lock end of the casting.

For 6' Bases, the longitudinal dimension over the outer faces of the Lock Box part of the casting shall be $6\frac{3}{4}" \pm \frac{1}{64}"$. If worn below this dimension it may be refurbished as detailed in section 13.1.4.1 below.

The maximum acceptable width of the guide way for the slide bar in the casting is 2.285".

13.1.3.2 Camplate assembly

All Camplates shall have ramped lock holes in accordance with drawing AS22883/1.

Camplates shall not have damage to the edges of the lock ports.

The minimum acceptable width of the Camplate is 2.235".

Minimum width of Lockplates (items 2 and 3-19) shall be 1.495". Lockplates with damaged edges or corners shall be replaced with new. Lockplates which are not securely riveted shall be replaced with new.

The link pin holes at each end of the 6' Camplate shall be gauged. The maximum acceptable diameter is 0.880". Oversized holes shall be rebushed.

The link pin hole at the end of the 4' Camplate shall be gauged. The maximum acceptable diameter is 0.755". Oversized holes shall be rebushed.

The condition of the cam slot shall be checked. The maximum acceptable width is 0.905". If a groove has been worn into the slot the width of the slot shall be measured within the grooved area. Bruising in the end sections of the slot is not acceptable.

13.1.3.3 Cover (Item 1-3 and 2-3)

The Cover shall be checked for signs of physical damage or cracking. No cracking or damage is acceptable.

All Covers shall be modified in accordance with drawing CS37267 to provide clearance when a Twin Cylinder E.P. Groundlock is fitted.

13.1.4 Refurbishment

13.1.4.1 Base (Items 2-2b and 3-2c)

For 6' Bases which fail the longitudinal dimension criteria, the impact face of the Lock Box part of the casting may be machined off and built up with weld. Final machining shall bring the dimension back to $6\frac{3}{4}" \pm \frac{1}{64}"$ whilst leaving a minimum thickness of weld of 0.025".

13.1.4.2 Camplates (Items 1-6a, 2-6b and 3-6c)

The link pin hole shall, if necessary, be bushed in accordance with drawing AS27007 item 17 for 6' components, or AS27007 item 18 for 4' components.

Worn bushes shall be replaced with a new bush as appropriate in accordance with detail in previous paragraph.

Worn or damaged lock plates shall be replaced with new.

No other refurbishment operation shall be performed on Camplates.