

Information for users

The attached standard:

RT/E/C/11772

Issue 1

has essential supplementary information within the catalogue of supplements (RT/LS/CAT/007):

Instructions for use

It is essential that you first read and understand the supplement pertaining to the standard before proceeding to the standard. You must then apply the requirements of the supplement to the standard.

Proceed to supplement ►

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Supplementary Point Drives and Detection (formerly RT/E/C/11772)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.

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CODE OF PRACTICE

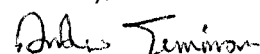
SUPPLEMENTARY POINT DRIVES AND DETECTION

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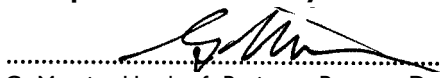


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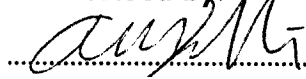
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SUPPLEMENTARY POINT DRIVES AND DETECTION

Summary

This Code of Practice contains information which represents current best practice for supplementary point drives and detection developed under British Rail.

Issue/Revision Record

This Code of Practice will be updated when necessary by the distribution of a complete document. Amendments will be marked by vertical black line in the adjacent right hand margin. The latest issue of this Standard shall be implemented immediately upon receipt.

Issue	Date	Comments
1	April 2001	New Code of Practice detailing best practice signalling maintenance.

Implementation

This Code of Practice contains information, based on experience and best practice, for the installation and maintenance of supplementary drives and detection.

Implementation may start from the date of publication. Alternative practices may be accepted where they can be demonstrated to be as good or better than the contents of this document. The following documents are superseded.

Superseded document reference number	Issue	Date
Nil		

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Supply

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Safety

All persons are reminded that all appropriate safety precautions must be observed when undertaking the work covered by this document.

CONTENTS

Section	Description	Page
I	INTRODUCTION	5
1.1	Purpose	5
1.2	Scope	5
1.3	Application	5
1.4	Technical Enquiries	6
2	GENERAL DESCRIPTION	7
2.1	BACKGROUND	7
2.2	MECHANICAL SUPPLEMENTARY DRIVES	8
2.3	HYDRAULIC SUPPLEMENTARY DRIVES	10
2.4	SUPPLEMENTARY DETECTION	11
3.0	PLANNING AND DESIGN	12
3.1	MECHANICAL SUPPLEMENTARY DRIVES	12
3.1.2	Full Depth Switch Rail Layout Historical Developments	13
3.1.3	Full Depth Switch Rail Layouts, Latest Design	13
3.1.4	Shallow Depth Switch Rail Layout Development	15
3.1.5	Shallow Depth Switch Rail Layouts, Latest Design	15
3.2	HYDRAULIC SUPPLEMENTARY DRIVES	23
3.2.1	Full Depth Switch Rail Layout Development	24
3.2.2	Full Depth Switch Rail Layout, Latest Design	25
3.2.3	Shallow Depth Switch Rail Layout Development	25
3.2.4	Shallow Depth Switch Rail Layout, Latest Design	26
3.2.5	Hydraulic Power Pack	26
3.3	SUPPLEMENTARY DETECTION	31
3.3.1	The Standard Detector	31
3.3.2	Fitting of Supplementary Detectors	32
3.3.3	12mm Obstruction	33

SUPPLEMENTARY POINT DRIVES AND DETECTION

4.0	INSTALLATION AND ADJUSTMENTS	36
4.1	MECHANICAL SUPPLEMENTARY DRIVES	36
4.1.1	Installation on Concrete or Timber, Latest Designs	36
4.1.2	Adjustments	37
4.1.3	Installation on Concrete or Earlier Timber Designs	38
4.1.4	Roller Baseplates	39
4.2	HYDRAULIC SUPPLEMENTARY DRIVES	39
4.2.1	Installation on Concrete or Timber, Latest Method	39
4.2.2	Adjustments	40
4.3	SUPPLEMENTARY DETECTION	40
4.3.1	Installation	40
4.3.2	Adjustment	41
4.3.2.1	Supplementary Detection (MAKE 1.5 mm ; BREAK 2 mm)	41
4.3.2.2	Supplementary Detection (MAKE 6 mm ; BREAK 8 mm)	42
5.0	TESTING AND COMMISSIONING	45
6.0	MAINTENANCE	46
6.1	ROUTINE MAINTENANCE	46
6.2	MECHANICAL FITTINGS	46
6.3	HYDRAULIC EQUIPMENT	46
6.4	DETECTORS	47
6.5	POINT CARE	47
7.0	SCHEDULE OF PARTS MECHANICAL SUPPLEMENTARY DRIVES	48
7.0	SCHEDULE OF PARTS MECHANICAL SUPPLEMENTARY DRIVES	48
7.1	FULL DEPTH SWITCH RAIL LAYOUTS MOUNTED ON TIMBER OR CONCRETE BEARERS	48
7.2	SHALLOW DEPTH SWITCH RAIL LAYOUTS MOUNTED ON TIMBER OR CONCRETE BEARERS	48
8.0	FUTURE DESIGNS	49
9.0	SWITCH RAIL OPENINGS	50
	APPENDIX A: REFERENCES	57

I INTRODUCTION

I.1 Purpose

This Code of Practice provides general information supporting the best practice in respect of the supplementary drive and detection arrangements for rail point switches developed under British Rail.

I.2 Scope

The information provided can be applied to Railtrack standard approved types of supplementary drive and supplementary detection when fitted to all full depth (Flat bottom and Bull head) switch rails, or to shallow depth (UIC-54B type) switch rails, in Plain Lead track layouts. It also covers hydraulic drives for which there are no standard drawings. Sketches are included for guidance only. Reference should be made to the Railtrack standard drawings contained in RT/LS/CAT003

The details in this Code of Practice have been formulated to address the planning, design, installation, testing, maintenance and adjustment of mechanical and hydraulic supplementary point drives and their associated detection mechanisms whether driven by Point Machine or Rail Clamp Point Lock.

This Code of Practice contains general technical information pertinent to mechanical and hydraulic supplementary point drives and their associated detection mechanisms and does not, in general, contain detailed personal safety or health and safety advice.

I.3 Application

The information given should be applied in conjunction with the relevant Signalling Maintenance Work Instructions for the equipment concerned.

Application of the information provided must be by appropriately competent staff with access to the correct tools, gauges, etc. Retention of appropriate records is important in verifying the value and effectiveness of any applied element.

The maintenance contractor is responsible for scheduling, applying and recording the maintenance in a robust and auditable manner. Appropriate records of significant test results must be kept and be available.

1.4 Technical Enquiries

All technical enquiries with regard to the content of this document are to be directed to: -

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2 GENERAL DESCRIPTION

2.1 BACKGROUND

A switch consists of two stock rails, two moveable switch rails and a number of stretcher bars, connecting the two switch rails. Movement of the switch is achieved by a point mechanism used in conjunction with a supplementary drive or drives where required. The number of stretcher bars and supplementary drives depends on the switch length.

The length of a switch is dependent upon the switch angle which relates to the turnout speed. Switch lengths are designated by a letter, with A being the shortest and, at present, H being the longest used. The prefix S means short. Suffixes used are V for vertical switches and S for switches with shallow depth switch rails. All Railtrack standard designs without an S designation can be considered to have a full depth switch rail.

Supplementary drives are used on longer switches for two reasons. First, to ensure that the switch rail fits snugly against the adjacent stock rail on the closed switch side of the layout for the entire length of engagement. Second, to ensure that the necessary flange-way clearances are maintained between switch rail and adjacent stock rail on the open switch side of the layout.

An additional benefit is the distribution of the drive force throughout the moveable switch.

These aims are achieved by installing the correct number of supplementary drives. Supplementary drives can be of either the mechanical or the hydraulic design, although at present, there is no standard hydraulic design.

Switch rails longer than the type B up to and including type G may be fitted with either mechanical or hydraulic supplementary drives according to site and/or prime mover requirements.

The movement of type H switches is, currently, only practical using the Rail Clamp Point Lock (RCPL), in conjunction with hydraulic supplementary drives.

To detect that switch rails are in correct position supplementary detectors are fitted as required, their position depending on the type of switch rail, and type of drive.

Rail point layouts are provided with an appropriate number of stretcher bars spaced according to the turnout length and to the stiffness of the switch rail section being used. The stretcher bars transfer the forces delivered by the supplementary drive to ensure that both switch rails move, maintain the switch openings on the open side and increase the switch rail stiffness.

2.2 MECHANICAL SUPPLEMENTARY DRIVES

Mechanical supplementary drives have been used since the introduction of longer switches and heavier rail sections in the 1940 s.

Where mechanical supplementary drives are employed, the first stretcher bar and each of the other stretcher bars selected to be driven are fitted with a drive lug. Each drive lug is connected by a rod and pin joint to one arm of a 90° crank with the other arm of each crank linked together by further pin-jointed rod connections. Typical arrangements can be seen in Figures 1 to 6.

Thus, when the points are driven by a prime mover at the toe end of the layout, the movement at the first stretcher bar position will be transmitted to the supplementary drive positions via the cranked linkage arrangements.

There may be either two or three drive cranks fitted according to the length of the rail point layout and these may be positioned either all in the 4-foot or all external to the 4-foot according to site requirements or 3rd rail restrictions.

Mechanical supplementary drives have been in use for many years and they present advantages as follows :-

- i) Can be used with any type of prime mover.
- ii) Because of the rigid connection mechanism an obstruction between the switch and stock rail can prevent movement and detection of the prime drive.

They do present certain disadvantages including the following :-

- a) Difficult to install and adjust
- b) Pin-joint wear causing loss of adjustment
- c) Linkage friction causing inefficiency and closure problems
- d) May be affected by longitudinal movement of rails
- e) Connections affected by thermal expansion
- f) Failure of the rear linkage could leave the rear of the switch undriven and undetected.

Specific layout arrangements showing the mechanical supplementary drives are shown in Planning and Design .

2.3 HYDRAULIC SUPPLEMENTARY DRIVES

Hydraulic supplementary drives, with RCPL as the prime mover, were initially introduced to operate the HV type switch rails because of the difficulty experienced when using mechanical drives. Subsequently, their use was to be extended to all other lengths of switch rail requiring supplementary drives.

The hydraulic drives consist of actuator rams suitably positioned within the 4-foot at specific bearer positions, according to length of turnout. They are mounted so that they provide lateral thrust to the switch rail and assist movement in conjunction with the hydraulic prime mover at the switch toe.

The supplementary drive actuators are fed from two additional pipes or hoses connected to the RCPL hydraulic power pack. The flow of oil in these lines is suitably throttled to ensure that the heel end of the switch rail does not move before the toe end has been unlocked. Hydraulic supplementary drives offer a simple and convenient method of operation with the following advantages :-

- i) Simple hydraulic connections to current standard RCPL hydraulic power pack
- ii) Easy to install and adjust
- iii) No pin-joints to wear therefore no loss of adjustment
- iv) More force available to move the switch rails
- v) Switch rail hydraulically held against stock rail therefore fewer detection failures
- vi) Not affected by longitudinal movement of rails

Disadvantages of hydraulic supplementary drives are as follows:-

- a) Unsuitable for use with Electric Point Machine as prime mover
- b) Extra supplementary detection required
- c) Slightly longer operation time

- d) Hydraulic system needs careful evacuation of air during connection to drives
- e) During manual operation great care is required to ensure that the whole length of the switch is correctly aligned

Sketches showing the hydraulic supplementary drives are shown in Planning and Design .

2.4 SUPPLEMENTARY DETECTION

Supplementary detection is fitted at appropriate stretcher bar positions to ensure that the entire length of switch rail has fully closed against its associated stock rail and that the opposite switch rail of the set of points has been fully opened via the stretcher bar.

Supplementary detectors are used on all hydraulic multiple drive switch layouts because each hydraulic drive can operate independently and can generate sufficient force to bend the switch rail around an obstruction. Up to three supplementary detectors are fitted according to length of switch and type of switch rail. (See Table D)

Because the mechanical drives derive their movement from the main drive, via the first stretcher bar, the rigid linkage provides its own detection for obstructions. The number of supplementary detectors on mechanical supplementary drives is thus lower than hydraulic drives.

Where mechanical supplementary drive arrangements are incorporated the detection requirements differ according to length of switch and type of switch rail but only need to be provided on the longer turnouts as follows :-

- i) FV , SGV and GV layouts with 113A Full Depth switch rails
- ii) EVS , FVS , SGVS and GVS layouts with UIC54B Shallow Depth switch rails

The specific arrangements for layouts incorporating supplementary detection are shown in Planning and Design .

3.0 PLANNING AND DESIGN

3.1 MECHANICAL SUPPLEMENTARY DRIVES

The number of stretcher bars, supplementary drives and supplementary detectors, required when fitting mechanical supplementary drives, will vary according to the rail section and switch type being considered and this information is tabulated in Table A below.

TRACK LAYOUT INFORMATION RELATING TO MECHANICAL												
Switch Type	TYPE OF RAIL SECTION											
	FLAT BOTTOM INCLINED			BULLHEAD INCLINED			FLAT BOTTOM VERTICAL			UIC 54B SWITCH 113A FBV STOCK		
	Number of Stretcher Bars	Supp Drives on Stretcher	Supp Detector on Stretcher	Number of Stretcher Bars	Supp Drives on Stretcher	Supp Detector on Stretcher	Number of Stretcher Bars	Supp Drives on Stretcher	Supp Detector on Stretcher	Number of Stretcher Bars	Supp Drives on Stretcher	Supp Detector on Stretcher
A	2	-	-	2	-	-	2	-	-	2	-	-
B	2	-	-	2	-	-	2	-	-	2	-	-
C	3	-	-	3	-	-	3	3	-	2	2	-
D	3	3	-	4	4	-	4	4	-	2	2	-
E	4	4	-	4	4	-	4	4	-	3	3	2
F	4	4	-				5	3 & 5	3	3	2 & 3	2
SG	6	4 & 6	4				6	4 & 6	4	5	3 & 5	2 & 4
G	6	4 & 6	4				6	4 & 6	4	5	3 & 5	2 & 4

Table A

Number of stretcher bars with positions of drives and detectors for mechanical supplementary drive layouts according to rail section

Notes:

Mechanical Supplementary Drives are suitable for use with any prime mover mechanism but only on Switch types up to and including type G .

Not suitable for use with type H switches

3.1.2 Full Depth Switch Rail Layout Historical Developments

Mechanical supplementary drives have gone through several design stages since their introduction.

When mechanical supplementary drives were introduced all point work was mounted on timber sleepers. Crank bases and rod rollers were screwed or bolted directly to the timbers. The BRS-SM drawings showing such an installation are BRS-SM 350/1 and 350/2

During the 1980s concrete bearers were introduced and a new standard produced, shown on Railtrack standard drawing BRS-SM 622. In order to have an arrangement which was suitable for D.C. third rail applications a 4 foot layout was chosen as standard. This arrangement required the drilling of the concrete bearers and the use of anchor bolts to mount rod rollers and crank bases.

These layouts were generally installed with the adjustable sleeve of the 12 x15 adjustable crank connected via a rod to the drive lug on the stretcher bar.

The above arrangements were suitable only for full depth switch rails, and have since been superseded because the drilling of the concrete bearers proved unacceptable to the Permanent Way Engineer

An alternative arrangement was produced which represents the latest standard, described below.

3.1.3 Full Depth Switch Rail Layouts, Latest Design

To avoid drilling either timber or concrete bearers, all supplementary drive component mounting brackets are sandwiched beneath the Civil Engineers baseplates.

These standard layouts are suitable for use with concrete bearers or timber sleepers and for fitting either in the 4-foot or external to the 4-foot depending on site requirements and/or 3rd rail considerations.

The drawings for all Full Depth switch layouts are included in the series BRS-SM 2530 to 2601, details being tabulated in Table B.

SUPPLEMENTARY POINT DRIVES AND DETECTION

These layouts show the adjustable sleeve on the 12 x15 adjustable crank fitted in the channel rod run. This ensures that any adjustment does not misalign the drive lug /crank operation.

Typical arrangement drawings are shown in Figures 1, 2, 3 and 4.

Note that a long jaw connection is used on the supplementary crank adjusting sleeves, this is done to maintain the crank geometry.

MECHANICAL SUPPLEMENTARY DRIVES FOR FULL DEPTH SWITCH RAIL LAYOUTS SUITABLE FOR MOUNTING ON TIMBER OR CONCRETE									
	CLAMP LOCK DRIVE				POINT MACHINE DRIVE				
	BRS-SM 2512 CAT No. 86/33272				M/c Mounted RHS BRS-SM 2510 CAT No. 86/33268		M/c Mounted LHS BRS-SM 2511 CAT No. 86/33269		
	Supplementary Drive Positions				Supplementary Drive Positions				
Switch Type	External to 4ft LHS	In 4ft	External to 4ft RHS	Supplementary Detectors and Positions	External to 4ft LHS	In 4ft LHS	In 4ft RHS	External to 4ft RHS	Track Area
CV	SM2530 86/33215	SM2570 86/33239	SM2531 86/33216	NONE	SM2590 86/33245	SM2550 86/33227	SM2551 86/33228	SM2591 86/33246	Normal & 3rd Rail
DV	SM2532 86/33217	SM2572 86/33240	SM2533 86/33218	NONE	SM2592 86/33247	SM2552 86/33229	SM2553 86/33230	SM2593 86/33248	Normal & 3rd Rail
EV	SM2534 86/33219	SM2574 86/33241	SM2535 86/33220	NONE	SM2594 86/33249	SM2554 86/33231	SM2555 86/33232	SM2595 86/33250	Normal & 3rd Rail
FV	SM2536 86/33221	SM2576 86/33242	SM2537 86/33222	I (Stretcher 3)	SM2596 86/33251	SM2556 86/33233	SM2557 86/33234	SM2597 86/33252	Normal
SGV	SM2538 86/33223	SM2578 86/33243	SM2539 86/33224	I (Stretcher 4)	SM2598 86/33253	SM2558 86/33235	SM2559 86/33236	SM2599 86/33254	Normal
GV	SM2540 86/33225	SM2580 86/33244	SM2541 86/33226	I (Stretcher 4)	SM2600 86/33255	SM2560 86/33237	SM2561 86/33238	SM2601 86/33256	Normal

FV		SM2582 86/33265		I (Stretcher 3)		SM2562 86/33259	SM2563 86/33260		3rd Rail
SGV		SM2584 86/33266		I (Stretcher 4)		SM2564 86/33261	SM2565 86/33262		3rd Rail
GV		SM2586 86/33267		I (Stretcher 4)		SM2566 86/33263	SM2567 86/33264		3rd Rail

Table B
Identification of Mechanical Supplementary Drive Arrangements
for Full Depth Switch Layouts

Notes:

All numbers quoted SM are Standard Railtrack Drawings in the BRS-SM series

All numbers quoted 86/ are the former BR Cat Nos. and refer to kits of parts.

The general rule for 3rd rail electrified areas is for mechanical supplementary drives to be fitted in the 4-foot.

3.1.4 Shallow Depth Switch Rail Layout Development

The first Shallow depth switch layouts were on timber and layout drawings showing components screwed or bolted to the timber were produced, these were numbered BRS-SM 2330 for drives in the 4-foot and BRS-SM 2335 for drives external to the 4-foot. The above arrangements have now been superseded.

When concrete bearers were introduced, the decision had already been made to dispense with drilling and to mount the brackets under the baseplates. The latest layouts show this arrangement.

3.1.5 Shallow Depth Switch Rail Layouts, Latest Design

The drawings of Mechanical Supplementary Drives on Shallow Depth UIC54B switch rail layouts are included in the series BRS-SM 2370/1 to 12 and BRS-SM 2371/1 to 20 and tabulated in Table C.

These standard layouts are suitable for use with concrete bearers or timber sleepers and for fitting either in the 4-foot or external to the 4-foot depending on specific site requirements and/or 3rd rail considerations.

Typical arrangement drawings are shown in Figures 5 and 6.

SUPPLEMENTARY POINT DRIVES AND DETECTION

MECHANICAL SUPPLEMENTARY DRIVES FOR UIC54B SHALLOW DEPTH SWITCH RAIL LAYOUTS SUITABLE FOR MOUNTING ON TIMBER OR CONCRETE						
		CLAMP LOCK DRIVE BRS-SM 2430 CAT No. 86/33866				
		POINT MACHINE DRIVE				
		M/c Mounted RHS BRS-SM 2360/I CAT No. 86/33867		M/c Mounted LHS BRS-SM 2360/2 CAT No. 86/33817		
		Supplementary Drive Positions				
Switch Type	Supplementary Detectors and Positions	External to 4ft LHS	In 4ft LHS	In 4ft RHS	External to 4ft RHS	Track Area
CVS	NONE	SM2370/7 86/33853	SM2371/I 86/33877	SM2371/7 86/33847	SM2370/I 86/33883	Normal & 3rd Rail
DVS	NONE	SM2370/8 86/33852	SM2371/2 86/33876	SM2371/8 86/33846	SM2370/2 86/33882	Normal & 3rd Rail
EVS	I (Stretcher 2)	SM2370/9 86/33851	SM2371/3 86/33875	SM2371/9 86/33845	SM2370/3 86/33881	Normal
FVS	I (Stretcher 2)	SM2370/10 86/33850	SM2371/4 86/33874	SM2371/10 86/33844	SM2370/4 86/33880	Normal
SGVS	2 (Stretcher 2&4)	SM2370/11 86/33849	SM2371/5 86/33873	SM2371/11 86/33843	SM2370/5 86/33879	Normal
GVS	2 (Stretcher 2&4)	SM2370/12 86/33848	SM2371/6 86/33872	SM2371/12 86/33842	SM2370/6 86/33878	Normal

EVS	I (Stretcher 2)		SM2371/13 86/33841	SM2371/17 86/33837		3rd Rail
FVS	I (Stretcher 2)		SM2371/14 86/33840	SM2371/18 86/33836		3rd Rail
SGVS	2 (Stretcher 2&4)		SM2371/15 86/33839	SM2371/19 86/33835		3rd Rail
GVS	2 (Stretcher 2&4)		SM2371/16 86/33838	SM2371/20 86/33834		3rd Rail

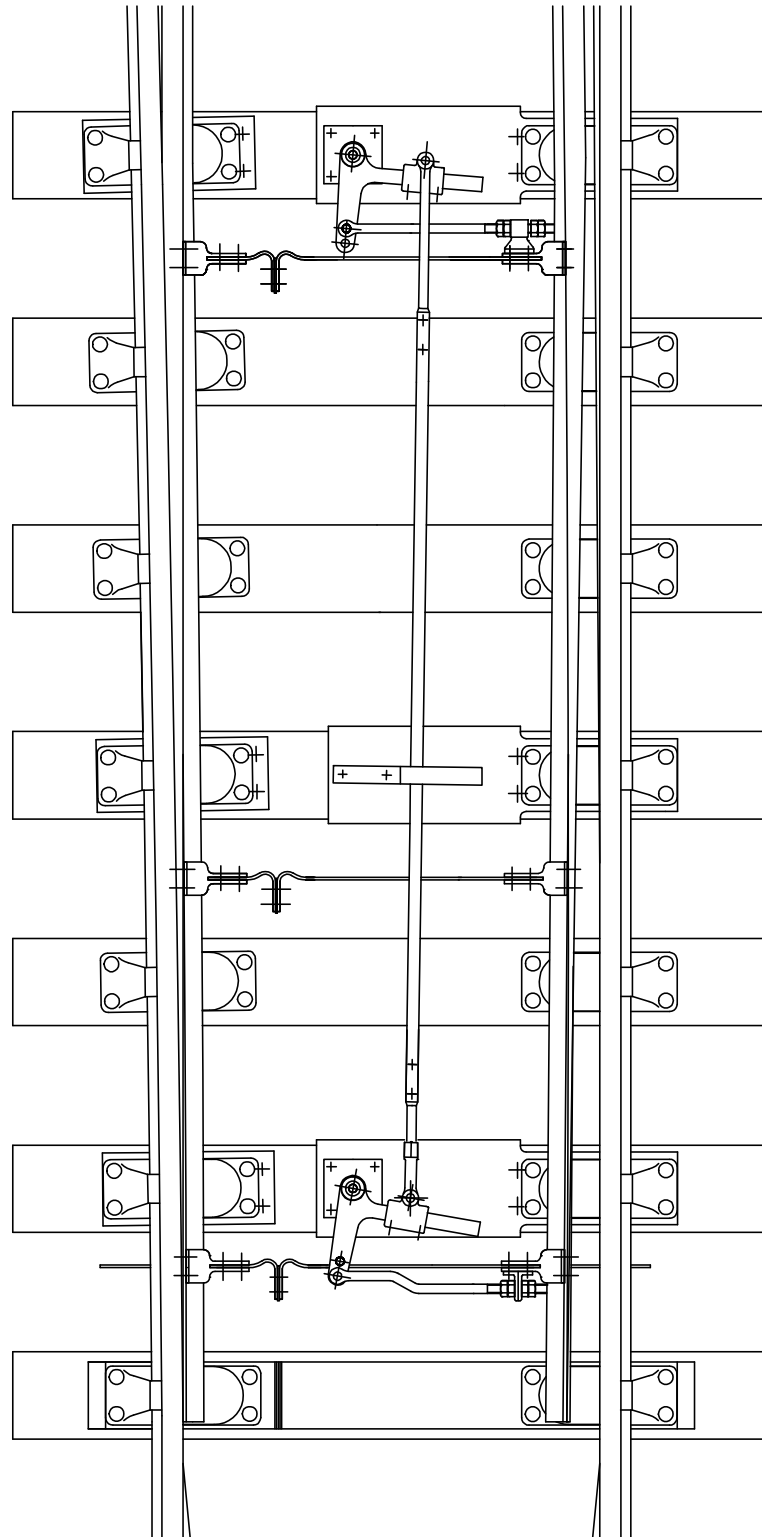
Table C
Identification of Mechanical Supplementary Drive Arrangements
for UIC54B Shallow Depth Switch Layouts

Notes:

All numbers quoted SM are Standard Railtrack Drawings in the BRS-SM series

All numbers quoted 86/ are the former BR Cat Nos. and refer to kits of parts.

The general rule for 3rd rail electrified areas is for mechanical supplementary drives to be fitted in the 4-foot.

**Figure 1****CV Switch with Mechanical Supplementary Drive in the 4-Foot for RCPL**