



Method Statement Operation of the Beam Engine Electric Signalling System

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Operation of the Beam Engine Electric Signalling System

Issue History

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1. Purpose and Scope

This method statement sets out the instructions that must be followed when operating the beam engine signalling system. It also includes the checks that must be carried out prior to the use of the signalling system.

2. Description of the Control Boxes

The Beam Engine Electrical Signalling System consists of a base station located adjacent to the Beam Engine and 3 remote stations. Information interchange between the base station and the remote stations is via a hardwired system from the base station control box and terminating in a control box at each of the remote stations. There are two types of control box: a Remote Station Control Box and a Base Station Control Box.

The principles behind the operation of these Boxes are set out in an Appendix (Section 7). The Appendix illustrates a typical Remote Control Box and describes its control functions. It also illustrates and describes the control functions of the Base Station Control Box.

3. Safety

- 1 The beam engine signalling system (BESS) is an essential safety related system
 - a The engine must not be operated when the public is present unless
 - ◇ BESS has been checked and is operational
 - ◇ Or, in the absence of BESS, the Head of the Beam Engine Technical Area (HTA^{*}) has approved an alternative control system.
 - b The use of BESS when the public is absent is not mandatory
 - ◇ The safety of operations associated with the line shafting must however be safeguarded by the use of an appropriate safety system approved by the HTA.
- 2 BESS must only be operated by approved operators or by trainees under the personal supervision of an approved supervisor.

4. Periodic Inspection, Testing and Maintenance

4.1. Pre-steaming Inspection and Testing

- 1 Prior to each steaming the HTA must inspect BESS and confirm that:
 - a Any recorded faults have been addressed
 - ◇ In the case of minor fault it would be sufficient to record that in the opinion of the inspector the fault was minor and did not prevent the correct operation of BESS and would be addressed at a later date.
 - b Any necessary maintenance has been carried out.
 - c Confirm that BESS appears fit for purpose.
- 2 The outcome of the inspection must be recorded in the Beam Engine logbook, dated and signed

4.2. Maintenance

- 1 Maintenance is carried out on a breakdown basis.

* In this Method Statement the abbreviation 'HTA' means the Head of the Beam Engine Technical Area or other approved competent person

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- ◇ Under this system maintenance is only carried out when inspection and/or testing shows that remedial work is necessary.
- ◇ There is no need for pre-emptive work.

5. Setting up and checking the Operation of BESS

5.1. Essential Preliminaries

- 1 An approved operator proposing to use BESS must satisfy himself that the instructions in Section 4.1 have been satisfactorily completed,
- 2 In the event that the BESS has not been inspected
 - a An approved operator who is also a competent person may self-certify the system.
 - b An approved operator who is not a competent person must seek the approval of a competent person or in the absence of a competent person the Authorised Person before using BESS.
- 3 The outcome of any inspection must be recorded in the Beam Engine logbook, dated and signed.

5.2. Pre-Use checks

- 1 Before BESS is used, its correct operation must be checked using the following procedure:
 - a Visit each of the remote stations and confirm that the switch on the remote control box is in the 'ready to start' position.
 - ◇ If necessary move the switch to the "ready to start" position'
 - ◇ There are three remote stations. They are:
 - ⇒ The Band Saw
 - ⇒ The large Wood Lathe
 - ⇒ The Small Steam Engines
 - b Turn on the power supply to the base unit
 - ◇ Three blue lights should illuminate on the base station
 - ◇ If any of the red lights flash there is a fault within the system
 - ⇒ The presence of a fault means that BESS cannot be used until the fault has been rectified
 - ⇒ Be aware that this fault could simply be that someone has moved the signal switch on a remote station to 'do not start'
- 2 If BESS passes the overall test in paragraph 1 immediately above, test each individual circuit as follows:
 - a Before starting the individual circuit tests confirm that all the circuit lights on the base unit are showing blue
 - ◇ If any are flashing red reset the switch on the affected remote station control unit to 'ready to start'
 - b Activate the start switch on the base station control box
 - ◇ Confirm that the green LED on the control box is illuminated
 - ◇ Confirm that the red LED at the remote station is illuminated
 - c Turn off the start switch on the control box
 - ◇ The green LED on the control box should go out

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- ◇ The red LED at the remote station should also go out
- d Move the switch at the remote station to the 'do not start' position
 - ◇ Confirm that the appropriate circuit blue signal light on the control box has gone out
 - ◇ Confirm that the appropriate circuit red signal light on the control box is flashing
 - ◇ Confirm that the buzzer is sounding.
- e Switch the audible warning off by actuating the muting switch
 - ◇ Confirm that the buzzer has ceased to sound and that the fourth red LED on the control box is flashing
- f Return the switch at the remote station to the 'ready to start' position
- g Return the muting switch on the control box to the off position to allow the buzzer to sound.
 - ◇ This completes the steps necessary to test the correct operation of the circuit.
- 3 Repeat the instructions in paragraph 2 immediately above for the remaining remote stations.
- 4 The outcome of this inspection must be recorded in the Beam Engine logbook, dated and signed.

6. Using the Signalling System to Transmit Intentions & Requests

6.1. Initial Start Up of the Engine

- 1 The following signalling protocol must be followed by the beam engine operator when he/she wishes to start the engine for the first time on a given day:
 - a Visit each remote station and ensure that the switch on the remote control box is set to 'OK to start'.
 - ◇ Where operators are present their consent to the proposed start-up must be obtained.
 - ⇒ If the required consent is not forthcoming the control box switch must be set to 'do not start'
 - ◇ Where an appropriate competent person is not present at the remote station the person making the inspection must satisfy himself that the machine is in a condition such that the beam engine may be safely started,
 - ⇒ He/she may then, if necessary, set the switch on the relevant remote control box to the 'ready to start' position: thus preparing to start up the beam engine.
 - ⇒ The inspector must leave a note on the machine to indicate that the control has been set to 'OK to Start'
 - ⇒ **Note:** Where the start-up is due to follow on immediately from the checks in Section 5.2 the checks set out in this paragraph (sub paragraph a in Section 6.1) may be amalgamated with those in paragraph 2 of Section 5.2.
 - b Confirm that all the circuit LEDs on the base unit are showing blue
 - ◇ If any of these LEDs are flashing red, the engine must not be started until the cause of the flashing LED has been identified and rectified.
 - c Activate the start switch on the base control box
 - ◇ This will cause the green light to illuminate on the panel of the base control box
 - ◇ It will also cause the red LEDs to come on on each of the remote control boxes.

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- d Wait for a short period to see if any of the remote stations wish to prevent the start up
 - ◇ Allow approximately 1 minute for a response
 - ⇒ A negative response will manifest itself by the illumination of a flashing red LED on the base control box and the sounding of an audible alarm
 - ⇒ The procedure an operator at a remote station must use to register a negative response is set in Section 6.3.1
 - ⇒ The engine **must not** be started if a negative response is received.
- e If no negative response is received the engine operator may start the engine in his/her own time.
- f When the engine operation has been fully established, the operator should turn off the start switch
 - ◇ This will extinguish the red light on the remote control boxes and the green light on the base control box
 - ⇒ **Note:** The Red LEDs on the remote control boxes are very bright in order to catch the attention of the machine operators. They can be distracting to visitors. It is therefore desirable to turn the start switch off once the engine is running and the LED's associated illumination serves no useful purpose.

6.2. Signalling the Start Up of the Engine after a Short Outage

- 1 The following signalling protocol must be followed by the beam engine operator when he/she wishes to restart the engine after a short outage
 - a Consider the need to carry out the checks in sub paragraph a in paragraph 1 of Section 6.1.
 - ◇ The checks will not normally be required unless the outage has been lengthy.
 - b Confirm that all the circuit LEDs on the base unit are showing blue
 - ◇ If any of these LEDs are flashing red, the engine must not be started until the cause of the flashing LED has been identified and rectified.
 - c Activate the start switch on the base control box
 - d Wait for a short period to see if any of the remote stations wish to prevent the start up
 - ◇ Allow approximately 1 minute for a response
 - ⇒ The engine **must not** be started if a negative response is received.
 - e If no negative response is received the engine operator may start the engine in his/her own time.
 - f When the engine operation has been fully established, the operator should turn off the start switch.

6.3. Signalling the Need to Abort a Proposed Engine Start

6.3.1. Request from a Remote Operator

- 1 An operator working at one of the remote stations wishing to abort a start-up must move the switch on the station's remote control box from the 'ready to start' position' to the 'do not start' position'
 - a This action will activate the flashing red LED on the base control box and sound the audible alarm.
 - b On hearing the alarm the engine driver must immediately abort the start-up sequence.

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6.3.2. Abandonment by the Engine Operator

- 1 The beam engine's operator may abort the start-up sequence at any stage
 - a The signalling system is not used to convey this intention
 - b It is however desirable, as soon as practicable, to explain the problem to the operators at the remote stations.

6.4. Signalling the Need to Shut Down the Operating Engine

6.4.1. Request from a Remote Operator

- 1 An operator working at one of the remote stations needing to have the operating engine shut down must move the switch on the station's remote control box from the 'ready to start' position to the 'do not start' position'
 - a This action will activate the flashing red LED on the base control box and sound the audible alarm.
 - b On hearing the alarm the engine driver must immediately shut the engine down.

6.4.2. Shut Down by the Engine Operator

- 2 The beam engine's operator may, if necessary, shut down the engine at any time
 - a The signalling system is not used to convey this intention
 - b It is however desirable, as soon as practicable, to explain the problem to the operators at the remote stations.

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7. Appendix: Control Boxes and their Functions

7.1. Remote Station Control Box

- 1 A Typical Remote Station Control Box is illustrated immediately below and its control functions are set out in Table 1.



Table 1 Remote Station Control Functions

Item	Item Condition	Meaning
Engine Start LED	LED shines red	Engine Operator is seeking permission to start the engine. The light will be turned off by the engine operator once engine operation is achieved.
	LED not illuminated	No signal being received (no operational significance)
Status switch	Switch to left (marked OK on the boxes)	Remote station is ready for the engine to start or has no objection if the engine continues to run: depending on the context ('ready to start' position in instructions above).
	Switch to right (marked stop on the boxes)	Do not start the engine or please shut the engine down: depending on the context ('do not start' position in instructions above)

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7.2. Base Station Control Box

- 1 The Base Station Control Box is illustrated immediately below. Table 1 provides a key to the remote station connections of LEDs 1-6. Table 3 sets out the Box's control functions.

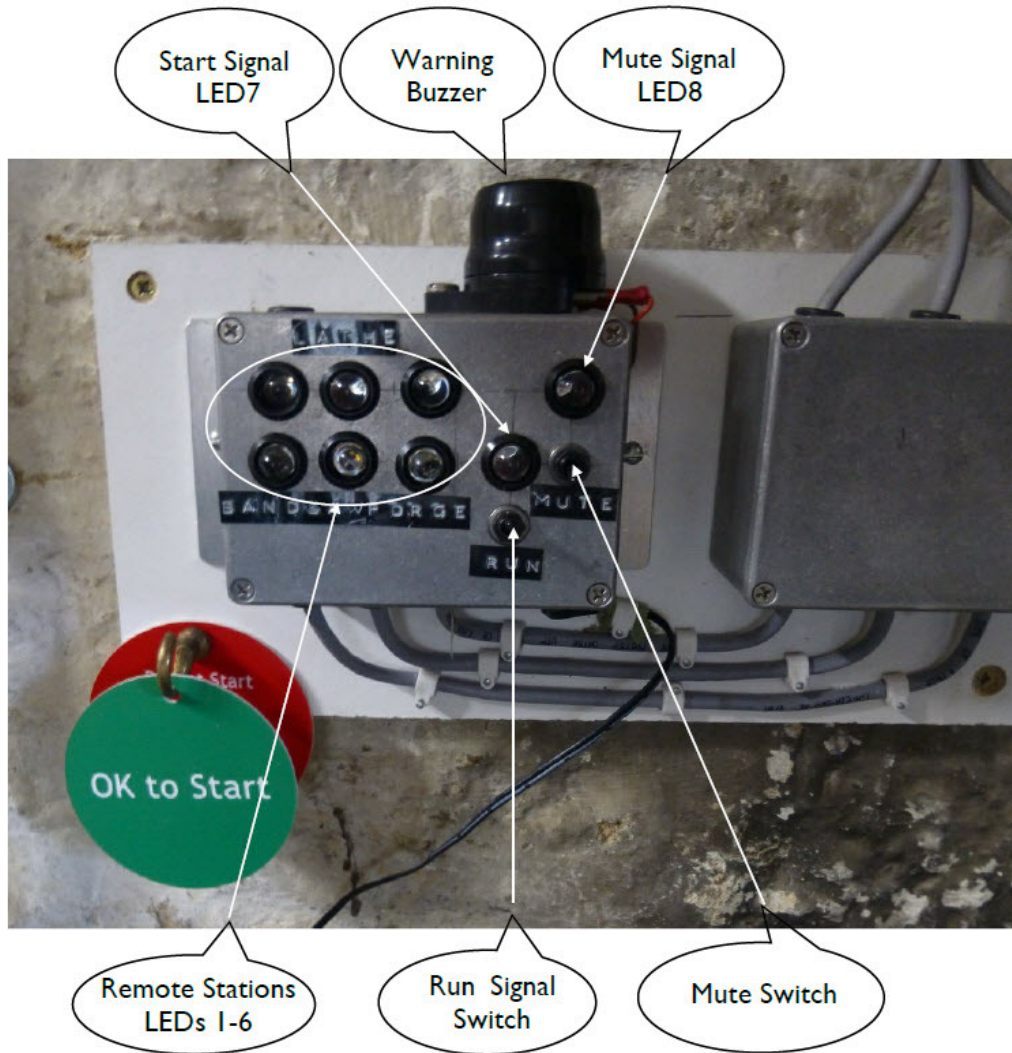


Table 2 Terminating Connections of Remote Station LEDs in Picture Above

LED number	Position on Box	Location of Control Switch
1	Top left	Flashing Red LED connected to Band saw
2	Bottom left	Blue LED connected to Band saw
3	Centre Top	Flashing Red LED connected to Wood Lathe
4	Centre Bottom	Blue LED connected to Wood Lathe
5	Top Right	Flashing Red LED connected to Forge Area (terminated adjacent to small steam engines and labelled 'Forge')
6	Bottom Right	Blue LED connected to Forge Area ((terminated adjacent to small steam engines and labelled 'Forge')

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Table 3 Base Station Control Functions

Item	Item Condition	Meaning
Remote Stations' signalling LEDs	Blue LED illuminated (Numbers 2,4 & 6)	Remote station concerned has no objection to the engine being started up or continuing to operate: depending on the context. LEDs labelled 2.4 and 6
	Flashing red LED illuminated (Numbered 1,3 &5)	Do not start up the engine or, if it is running, shut it down. LEDs labelled 1, 3 and 5.
	Both LEDs in a pair illuminated	Fault in relevant circuit.
	Both LEDs in a pair not illuminated	Fault in relevant circuit.
Run signal switch	Switch up	Switch off (no significance)
	Switch down	Sending a signal to the remote stations requesting approval to start up. The switch is turned off once the engine is operating
Run signal warning LED (LED 7)	LED glows green	A signal is being sent to the remote stations
	LED is not illuminated	Run switch is in the off position (no operational significance)
Mute switch	Switch up	The audible alarm will sound if a signal is received
	Switch down	The audible alarm is muted and will not sound if a signal is received.
Audible alarm LED (LED8)	LED is not illuminated	The audible alarm will sound if a signal is received from a remote station.
	LED flashes red	The base station is receiving a stop/ do not start signal from one or more remote stations but the alarm cannot sound as the switch is in the muted position.
Green 'OK to Start' Disc		This disc is part of the separate line shaft safety system and is not relevant to the signalling system.