

**E.10/11: SURVEY AND SETTING OUT OF TRACK
ALIGNMENT AND REFERENCING**

RAILWAY ENGINEERING SPECIFICATION

E.10/11: SURVEY AND SETTING OUT OF TRACK ALIGNMENT AND REFERENCING CONTENTS

Clause	Page
1. SCOPE	2
2. INTERPRETATIONS	2
2.1 SUPPORTING SPECIFICATIONS	2
2.2 DEFINITIONS.....	2
3. MATERIALS	2
4. PLANT	2
5. CONSTRUCTION	2
5.1 GENERAL	2
5.2 SAFETY	3
5.3 PROGRAMME AND METHOD STATEMENT	3
5.4 METHODS AND PROCEDURES	3
5.5 STANDARDS	4
5.6 COMPLETION.....	4
6. TOLERANCES	4
7. TESTING	5
8. MEASUREMENTS AND PAYMENT	5

1. SCOPE

This specification covers the work necessary for the surveying, setting out and referencing of the centre line of new track and of existing track to be either slewed, aligned or realigned.

2. INTERPRETATIONS

2.1 SUPPORTING SPECIFICATIONS

2.1.1 Where this specification is required for a project, the following specifications, shall, inter alia, form part of the contract documents:

- a) SABS 1200A or SABS 1200 AA, as specified in the Project Specification.
- b) The E.10 Gen - General.

2.2 DEFINITIONS

2.2.1 The following abbreviations shall apply:

BTC	:	Beginning of the transition curve.
BCC	:	Beginning of the circular curve.
PI	:	Point of intersection.
ECC	:	End of the circular curve.
ETC	:	End of the transition curve.
CP	:	Crown peg.

3. MATERIALS

3.1 Steel pegs at least 10 mm diameter and 300 mm long shall be used for setting out and referencing of track.

3.2 Concrete for encasing survey pegs shall have a maximum aggregate size of 19 mm and a strength of not less than 10 MPa when tested in accordance with SABS method 863.

4. PLANT

Void.

5. CONSTRUCTION

5.1 GENERAL

Void.

5.2 SAFETY

Void.

5.3 PROGRAMME AND METHOD STATEMENT

Void.

5.4 METHODS AND PROCEDURES

5.4.1 GENERAL

5.4.1.1 Drawings with the basic designs, showing rail levels and horizontal alignment information will be provided by the Engineer. On curved track, the rail levels given will refer to the low rail of the curve.

5.4.1.2 The basic survey information, including where relevant base line pegs and their co-ordinates and levels, will also be provided by the Engineer, as specified in the Project Specification.

5.4.1.3 Centre line and level pegs shall be referenced by the Contractor, as specified in the Project Specification. The Contractor shall replace any pegs lost or displaced due to his activities. The levels of such replaced pegs shall be determined by the Contractor from the bench marks provided by the Engineer.

5.4.1.4 The Contractor shall encase all reference pegs in concrete, 250 mm in diameter and 150 mm deep. Name tags showing the peg number, level, distance from centre line and other information required as specified in the Project Specification shall be fixed in the concrete.

5.4.1.5 The detailed setting out of sets shall be as directed by the Engineer, who will supply the necessary dimensions.

5.4.1.6 In complicated layouts the Engineer may direct that certain key pegs be co-ordinated.

5.4.2 NEW LINES

5.4.2.1 The Contractor shall provide the following pegs :

- a) Centre line pegs on straights at intervals specified in the Project Specification to suit the vertical alignment of the formation.
- b) Centre line pegs on curves with transitions at the BTC, BCC, PI where possible, CP, ECC, ETC and pegs at distances apart not exceeding 100 m.

- c) Centre line pegs on curves without transitions at the BCC, PI where possible, CP, ECC and check pegs at distances apart not exceeding 100 m.

5.4.2.2 After the staking as described in 5.4.2.1 hereof has been completed, the Contractor shall provide level and centre line pegs at 20 m intervals, starting from a kilometre post unless otherwise specified in the Project Specification.

5.4.3 EXISTING TRACK

5.4.3.1 The Contractor shall check all clearances and shall, if any structures are found to foul the minimum clearance shown in Appendixes 1 to 4 to specification E7/1, get the Engineer's directive.

5.4.3.2 After the Contractor has established the true centre line of the track from the information provided by the Engineer as specified in 5.4.1 hereof, he shall permanently reference the position of the true centre line, as specified in the Project Specification.

5.5 STANDARDS

5.5.1 STAKING FOR TRACKWORK

5.5.1.1 All staking points shall be established from the reference pegs to an accuracy of 10 mm.

5.5.1.2 Centre line pegs on straights shall be established from the nearest line peg, including BTC and ETC. Centre line pegs on transition curves shall be established from the BTC and ETC. Centre line pegs on circular curves shall be established from the nearest staking point.

5.5.2 LEVELLING

5.5.2.1 Levels shall be observed and recorded to the nearest 2 mm using an approved surveyor's level.

5.5.2.2 All levelling shall be performed in a closed circuit and have a misclosure not exceeding $0.03 \sqrt{S}$ metres, where S is the distance in kilometres from the start of the circuit. Measured levels shall be adjusted in proportion to distance.

5.5.2.3 An independent set of check levels shall be taken on all points in a circuit.

5.5.2.4 The difference between the 2 values of the adjusted measured levels established by the original and check levelling shall not exceed $0.03 \sqrt{S}$ metres, where S is the distance in kilometres from the start of the circuit. The true reduced level of a point shall be taken as the average of the two values, rounded off to the nearest 2 mm.

5.6 COMPLETION

Void.

6. TOLERANCES

The error in the alignment of centre line pegs shall not exceed 10 mm. The cumulative error in the distance pegs between two staking points shall not exceed 30 mm per 100 m.

7. TESTING

Void.

8. MEASUREMENT AND PAYMENT

8.1 SCHEDULED ITEMS

8.1.1 Set out centre line of trackUnit: m or km

Setting out the centre line of track will be measured along the staked centre line.

8.1.1.1 Separate items will be scheduled for the following:

- a) Track on existing ballast.
- b) Track on new formation.
- c) Staking on straights.
- d) Staking on curves with transitions.
- e) Staking on curves without transitions.

8.1.1.2 The rates tendered shall include for the following:

- a) Staking of the track centreline in accordance with standard survey practice.
- b) Measuring as necessary for setting out from the base line pegs provided by the Engineer.
- c) Preserving and referencing of the pegs.

8.1.2 Level pegs for trackworkUnit: m or km

Levelling of pegs for trackwork will be measured along the centre line of the track.

8.1.2.1 Separate items will be scheduled for the following:

- a) Track on existing ballast.
- b) Track on new formation.

8.1.2.2 The rates tendered shall include for the following:

- a) Levelling all pegs staked, as per standard surveying practice.
- b) Performing all calculations necessary for levelling.
- c) Preserving and referencing of the pegs.

8.1.3 Reference pegs of track..... Unit: Each

8.1.3.1 The rates tendered shall include for the following:

- a) Staking of the reference pegs.
- b) Final aligning of the reference pegs.
- c) Encasing of the pegs in concrete.

8.1.4 No payment will be made for the replacement of any pegs lost or displaced by the Contractor.