

CCE**Departmental and Multidisciplinary Standard****I-DEP-0123****Third Party Works: Specification for Movement
Monitoring of Railway Track****Purpose**

This standard sets out the requirements for third parties when monitoring movements in railway track.

Document Control

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1 POLICY AND PRINCIPLES

1.1 Policy

1.1.1 IÉ may require third parties to monitor tracks for possible settlement arising from works adjacent to the railway.

1.2 Principles

1.2.1 This standard sets out the requirements for monitoring tracks for possible settlements at locations where IÉ deems it necessary.

1.2.2 An independent specialist survey company must be engaged by the third party to carry out the track monitoring surveys.

1.2.3 This standard must be read in conjunction with *I-DEP-0120 Guidance on Third Party Works*.

2 IMPLEMENTATION

2.1 Equipment

2.1.1 The equipment used may be of an optical survey type with readings taken using an optical survey instrument to observe the levels of rail-mounted targets.

2.1.2 The equipment may alternatively involve an electronic track monitoring system, using rail-mounted sensors that transmit via radio signals to a nearby base station.

2.1.3 Details of the proposed monitoring system must be submitted to the IÉ Designated Representative for approval.

2.1.4 The proposed monitoring system must minimise the risk to railway operations as well as track surveyors. It must be possible to undertake the survey remote from the track. Viewing of survey targets must be from a position away from the track and the survey position must be securely fenced off to allow the survey measurements to be taken without the need for attendance by IÉ protection staff.

2.2 Establishment and Maintenance of Survey Points and Control Points

2.2.1 The third party must establish survey points and control points for monitoring railway track levels before any construction works are carried out adjacent to the railway. At least 2 weeks of readings are required in advance of construction activities to establish baseline readings. Readings must be taken during the construction period and during the maintenance period thereafter.

2.2.2 It will be necessary to install the targets or sensors during a track possession.

2.2.3 The third party must, prior to any works, prepare and submit a method statement (see *I-DEP-0120*, Appendix E, for guidelines) and a location plan showing the numbering system and location of all survey positions and survey control points. The method statement must describe how the targets or sensors are to be secured to the rails.

- 2.2.4 The method statement must define the actions to be taken if limiting track geometry criteria are reached (i.e. the green, amber and red trigger levels). See Appendix A for these limiting criteria.
- 2.2.5 The method statement must contain all relevant IÉ contact details including emergency numbers. These numbers will be provided by IÉ on request.
- 2.2.6 The survey control points must be set up as follows:
1. Permanent station targets or sensors for the survey points must be located at 2.7 m intervals along each rail.
 2. Pairs of targets or sensors must be set up at right angles to the centreline of the track.
 3. The survey points must extend along the railway for the full extent of the anticipated area of influence of the works plus 21.6 m minimum beyond at each end, or as required by IÉ.
 4. The targets or sensors must be securely fixed to the rail, but must not interfere with the passage of trains. No rail may be drilled or marked in any way by the fixing of such targets or sensors. No target may protrude above the height of the plane of the top of the rails.
 5. The design of the targets or sensors must be such that they are not susceptible to vibration from passing trains, vandalism and the like.
 6. Each target or sensor must be permanently and uniquely labelled with an identifying number which is to be used in reports.
- 2.2.7 The monitoring of these survey points must be carried out remotely as access to the track area will not be permitted.
- 2.2.8 A remote tower(s), mound(s) or the like may be required to allow monitoring of the targets. Accuracy of readings is of particular importance, as tolerances are tight, and the monitoring tower, mound, etc. should not be subject to any type of movement.
- 2.2.9 The third party must establish baseline surveys as required (e.g. after removal and/or replacement of trackwork or increase in line speed).
- 2.2.10 At least 3 survey positions must be established for monitoring the levels of the survey points. The location of each survey position must not be affected by settlement due to construction works or traffic.
- 2.2.11 The national grid co-ordinates and level (mOD) of each survey point and survey position must be taken prior to the commencement of works as above.
- 2.2.12 The third party must maintain the survey positions and survey control points for the duration of construction and the duration of the maintenance period thereafter. Where any of these points become damaged, as may happen through the use of track maintenance machinery, the third party must notify the IÉ Designated Representative and submit proposals for their repair.

2.3 Monitoring Intervals

- 2.3.1 The frequency of monitoring will be a minimum of once daily and more frequently if so prescribed by IÉ.

2.4 Reporting

- 2.4.1 The third party must e-mail or fax a report of the monitoring results on the day that they are taken to the IÉ Designated Representative and/or any other persons as directed by the IÉ Designated Representative.

- 2.4.2 The format of the report must be approved by the IÉ Designated Representative and may not be changed without consent. The minimum content of each report is as follows:

1. Project title
2. Survey date
3. Target/sensor unique reference number
4. Target/sensor location
5. Level, easting and northing of each target/sensor
6. Rail level versus previous surveys and trends to be highlighted
7. Short twist (2.7 m baseline) and long twist (10.8 m baseline) between relevant targets/sensors
8. Top (5.4 m baseline)
9. Green, amber and red geometric limit criteria to be highlighted

2.5 Generic Actions to be taken Following Readings

Note: These actions may be amended by the IÉ Designated Representative to suit the specific circumstances of the works to which they apply.

2.5.1 All Green Reading

1. The third party must issue a report to the IÉ Designated Representative, and/or any other persons as directed by the IÉ Designated Representative.
2. The report should clearly state 'ALL GREEN'.

2.5.2 An Amber Reading or Readings

1. The third party must immediately make verbal contact with the IÉ Designated Representative for instruction. It is not acceptable to leave messages, send facsimiles or e-mails, etc.
2. If the Designated Representative cannot be immediately contacted, the third party must make verbal contact with the other IÉ emergency contacts set out in the method statement.
3. Monitoring of all targets or sensors must be continued until further instruction.

2.5.3 A Red Reading or Readings

1. The third party must immediately suspend all operations and make immediate verbal contact with the IÉ Designated Representative for instruction. It is not acceptable to leave messages, send facsimiles or e-mails, etc.
2. If the IÉ Designated Representative cannot be immediately contacted, the third party must make verbal contact with the other IÉ emergency contacts set out in the method statement.
3. IÉ will carry out remedial works as necessary.
4. Monitoring of all survey points must be continuous until further instruction.
5. All works must remain suspended until the IÉ Designated Representative has confirmed that they may recommence.

2.6 Sample Template

- 2.6.1 A sample monitoring table is included in Appendix B. This table indicates when the limiting track geometry criteria are reached for different trigger action levels (red, amber and green). The limiting criteria are set out in Appendix A.
- 2.6.2 On request, the monitoring table is issued in electronic format as an Excel worksheet for use by the third party. It automatically calculates twist and top values based on readings entered by the third party. All measurements must relate to the top of rail level and pairs of readings must be taken at right angles to the track centreline.
- 2.6.3 Short twist is defined as the difference in cant over a 2.7 m baseline.
- 2.6.4 Long twist is defined as the difference in cant over a 10.8 m baseline.
- 2.6.5 Top is defined as the difference in rail level between the mid-point and end points over a 5.4 m baseline.

3 REVIEW

3.1 Review Procedure

- 3.1.1 This standard will need to be reviewed every five years or earlier if required.
- 3.1.2 If changes arise from the review, this standard will be reissued. If no changes arise from the review, the current version of this standard will remain in force.

4 REVISION HISTORY

<i>Issue No and Date</i>	<i>Section No and Reason for Change</i>

APPENDIX A LIMITING TRACK GEOMETRY CRITERIA

LIMITING CRITERIA FOR SHORT TWIST (2.7 m baseline)	
Twist <1 in 540	Green
Twist between 1 in 540 and 1 in 271	Amber
Twist >1 in 270	Red

LIMITING CRITERIA FOR LONG TWIST (10.8 m baseline)	
Warp <1 in 1120	Green
Warp between 1 in 560 and 1 in 1120	Amber
Warp >1 in 560	Red

LIMITING CRITERIA FOR TOP (5.4 m baseline)	
Difference in Top <5 mm over 5400 m	Green
Difference in Top between 7.5 mm and 10 mm over 5400 mm	Amber
Difference in Top > 10 mm in 5400 mm	Red

APPENDIX B TRACK MONITORING TEMPLATE**(Target Spacing 2.7 m)**

Ref. No.	Reduced level at target on Up Rail	Difference in height between target and top of Up Rail (m)	Reduced level at top of Up Rail	Ref. No.	Reduced level at target on Down Rail	Difference in height between target and top of Down Rail (m)	Reduced level at top of Down Rail	Top at Up Rail mm	Top at Down Rail mm	Cant mm	Short Twist (1 in xxxx)	Long Twist (1 in xxxx)
1.000	103.587	0.096	103.683	101.000	103.591	0.096	103.687			0.004		
2.000	103.577	0.097	103.674	102.000	103.584	0.092	103.676			0.002	1350	
3.000	103.566	0.096	103.662	103.000	103.574	0.096	103.670	-1.500	2.500	0.008	-450	
4.000	103.557	0.092	103.649	104.000	103.567	0.099	103.666	-0.500	1.000	0.017	-300	
5.000	103.550	0.096	103.646	105.000	103.556	0.096	103.652	5.000	-5.000	0.006	245	-5400
6.000	103.539	0.099	103.638	106.000	103.547	0.094	103.641	-2.500	1.500	0.003	900	-10800
7.000	103.525	0.096	103.621	107.000	103.536	0.097	103.633	-4.500	1.500	0.012	-300	-2700
8.000	103.522	0.094	103.616	108.000	103.520	0.096	103.616	6.000	-4.500	0.000	225	635
9.000	103.507	0.097	103.604	109.000	103.506	0.096	103.602	-3.500	1.500	-0.002	1350	1350
10.000	103.500	0.096	103.596	110.000	103.500	0.093	103.593	2.000	2.500	-0.003	2700	1800
11.000	103.494	0.096	103.590	111.000	103.492	0.096	103.588	1.000	2.000	-0.002	-2700	771
12.000	103.483	0.093	103.576	112.000	103.484	0.098	103.582	-4.000	-0.500	0.006	-338	-1800
13.000	103.474	0.096	103.570	113.000	103.467	0.096	103.563	4.000	-6.500	-0.007	208	2160
14.000	103.464	0.098	103.562	114.000	103.467	0.096	103.563	-1.000	9.500	0.001	-337	-2700
15.000	103.456	0.096	103.552	115.000	103.455	0.092	103.547	-1.000	-8.000	-0.005	450	3600

Ref. No.	Reduced level at target on Up Rail	Difference in height between target and top of Up Rail (m)	Reduced level at top of Up Rail	Ref. No.	Reduced level at target on Down Rail	Difference in height between target and top of Down Rail (m)	Reduced level at top of Down Rail	Top at Up Rail mm	Top at Down Rail mm	Cant mm	Short Twist (1 in xxxx)	Long Twist (1 in xxxx)
16.000	103.437	0.096	103.533	116.000	103.446	0.096	103.542	-4.500	5.500	0.009	-193	-3600
17.000	103.427	0.092	103.519	117.000	103.440	0.099	103.539	2.500	1.000	0.020	-245	-400
18.000	103.425	0.096	103.521	118.000	103.430	0.096	103.526	8.000	-5.000	0.005	180	-2700
19.000	103.414	0.099	103.513	119.000	103.424	0.094	103.518	-5.000	2.500	0.005	#####	-1080
20.000	103.408	0.096	103.504	120.000	103.416	0.097	103.513	0.500	1.500	0.009	-675	#####
21.000	103.401	0.094	103.495	121.000	103.412	0.096	103.508	0.000	0.000	0.013	-675	1543
22.000	103.391	0.097	103.488	122.000	103.406	0.096	103.502	1.000	-0.500	0.014	-2700	-1200
23.000	103.389	0.096	103.485	123.000	103.402	0.093	103.495	2.000	-0.500	0.010	675	-2160
24.000	103.382	0.096	103.478	124.000	103.392	0.096	103.488	-2.000	0.000	0.010	#####	-10800
25.000	103.378	0.093	103.471	125.000	103.391	0.098	103.489	0.000	4.000	0.018	-337	-2160
26.000	103.366	0.096	103.462	126.000	103.384	0.096	103.480	1.000	-5.000	0.018	#DIV/0!	-2700
27.000	103.360	0.098	103.458	127.000	103.376	0.096	103.472	2.500	0.500	0.014	675	-2700
28.000	103.353	0.096	103.449	128.000	103.370	0.096	103.466	-2.500	1.000	0.017	-900	-1543
29.000	103.341	0.096	103.437	129.000	103.355	0.096	103.451	-1.500	-4.500	0.014	900	2700
30.000	103.327	0.096	103.423	130.000	103.343	0.096	103.439	1.000	1.500	0.016	-1350	5400
31.000	103.319	0.096	103.415	131.000	103.328	0.096	103.424	3.000	-1.500	0.009	386	2160
32.000	103.304	0.096	103.400	132.000	103.316	0.096	103.412	-3.500	1.500	0.012	-900	2160
33.000	103.292	0.096	103.388	133.000	103.305	0.096	103.401	1.500	0.500	0.013	-2700	10800