

11.4 Patent Rights

The patent rights of the fastening system shall be the responsibility of the Contractor who will indemnify the Employer against any claim in this connection.

8.6 TESTING OF ASSEMBLED CONCRETE SLEEPERS

PART I: DESCRIPTION

1. Scope

This section specifies tests to be performed on assembled concrete sleepers at the pre-production stage of sleeper or bearer manufacture.

2. Definitions

"Fully Assembled" - A sleeper with rails which has all the components of the rail fastening system applied to both rails.

"Set" - All the components of a sleeper fastening system that are required to secure two rails on to one sleeper.

3. Quality Assurance

(a) In addition to the requirements of SECTION 1-10: QUALITY ASSURANCE AND TESTING LABORATORY the Contractor shall maintain adequate records in accordance requirements of his quality assurance programme. These records will provide the objective evidence of compliance with the requirements of the contract, and as required by this Specification.

(b) Tests shall be performed using products accepted under:

- (i) SECTION 8-3: CONCRETE SLEEPERS AND BEARERS
- (ii) SECTION 8-5: RAIL FASTENING SYSTEM

(c) Tests shall be performed as described herein.

(d) Tests shall be performed by Testing Agency in Thailand. Where no testing equipment is provided in Thailand, such test shall be performed by Independent Testing Agency in third country upon approval by SRT.

4. Submittals

The Supplier shall submit to the Engineer in accordance with SECTION 1-4: SUBMITTALS AND SUBSTITUTIONS for approval the following:

(a) Name and address of the test site, together with

- (i) A detailed list of equipment to be employed in the tests.
- (ii) Manufacturer's data sheets, product catalogues;
- (iii) Operating manuals.

(b) Name, address and qualifications of an Independent Inspection Agency, engaged to witness testing.

(c) Copies of all test reports.

PART II: PRODUCTS

Not relevant to this Section.



PART III: EXECUTION

1. Assembly Tests

- (a) The assembly tests are tests performed to determine the suitability of the rail fastenings assembled with the concrete sleepers and the specified rails, against various types of loading applications and fatigue behaviour. These tests are performed at the pre-production stage of sleeper manufacture prior to commencement of the actual production. The tests shall be performed with EN 54E1 rails.
- (b) 50 concrete sleepers, selected at random, or ten (10) bearers together with the rail fastenings shall be available for testing to determine compliance with the specified requirements. Twenty-three sleepers are subjected to these tests.
- (c) The tests performed shall be:
- (i) clamping force,
 - (ii) fastening insert resistance (pull out),
 - (iii) fastening uplift,
 - (iv) fatigue resistance
 - (v) creep resistance,
 - (vi) lateral resistance,
 - (vii) electrical resistance
 - (viii) control of track gauge.

1.1 Four concrete sleepers, selected at random by the Inspection Agency from the 50 shall be carefully measured and examined to determine compliance with the dimensional requirements. Two bearers only shall be subject to this test

1.2 Clamping Force

(a) Arrangement

The testing arrangement requires a fully assembled concrete sleeper with two short pieces of rail.

(b) Procedure

- (i) A load shall gradually be applied to lift up a toe of one of the clips until a metal shim of 0.10mm can be extracted from under the clip toe. The load recorded at this point shall be taken as the toe load.
- (ii) The toe loads shall then be measured on the other three clips of the set. The average of the four values shall be taken as the result of the load.
- (iii) The clamping force for one railseat is two times the average toe load.

(c) Acceptance

The assembly shall be considered satisfactory when the calculated clamping force per railseat is within the range of 17 – 19 kN

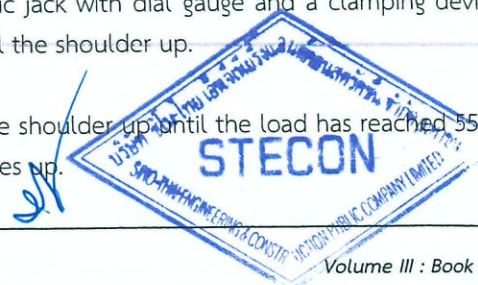
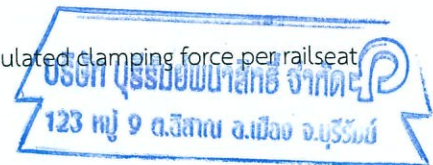
1.3 Fastener Insert Resistance (Pull out)

(a) Arrangement

The testing arrangement consists of a hydraulic jack with dial gauge and a clamping device gripping the shoulder leg on such a way to pull the shoulder up.

(b) Procedure

The force shall gradually be applied to pull the shoulder up until the load has reached 55kN and remain for 3 minutes or the shoulder moves up.



- (c) Acceptance
The insert shall be considered satisfactory when the shoulder can sustain the pull-out force of not less than 55kN without movement or cracking of concrete.
- 1.4 Fastener Uplift
- (a) Arrangement
The testing arrangement consists of a section of rail fitted to the railseat of one rail with the complete fastening assembly. The rail shall be supported on both sides of the sleeper and a loading frame, with a hydraulic jack, shall apply load to both sides of the railseat at least 50mm from the outer edges of the fastening assemblies.
- (b) Procedure
A load shall be applied so as to just lift the rail clear of the rail pad or the rail pad clear of the rail seat. The load including the unsupported weight of the sleeper shall be recorded and released.
A load equal to 1.5 times the recorded load but not exceeding 50kN shall then be applied in the same manner.
- (c) Acceptance
The sleeper and fastening shall be considered satisfactory if the fastener inserts do not pull out or loosen, no part of the fastening system fractures, and the rail is not released.
- 1.5 Fatigue Resistance
- (a) Arrangement
- (i) The testing arrangement consists of one fully assembled sleeper or bearer with two rails with the sleeper securely fastened to a support
- (ii) A hydraulic ram shall apply vibratory loading to the rail head at 20° from vertical.
- (b) Procedure
- (i) The vibratory loading shall be applied to the assembly at the rate of 300 cycles per minute with downward loading of 150 kN and upward loading of 0.6 times of the load recorded in 3.5 above.
- (ii) The loads shall be applied to three million cycles or until failure occurs.
- (c) Acceptance
- (i) The assembly shall be considered satisfactory when it can sustain a minimum of three million cycles of the repetition of the loads without any defect.
- (ii) The test shall be performed to failure for reference purpose.
- 1.6 Creep Resistance
- (a) Arrangement
The testing arrangement consists of two fully assembled sleepers fixed at 600mm centers, with two pieces of rail each of 2.0m in length fixed over the four rail seats.
- (b) Procedure
A gradually increasing load shall be applied horizontally in graduated steps in accordance with AREMA Chapter 30-1-23, at the end of each rail and the movement is recorded. The test records of both rails shall be averaged and taken as the result.
- (c) Acceptance
The assembly shall be considered satisfactory when the creep resistance meets the requirements of not less than 20 kN for two railseats, at not more than 5mm initial longitudinal



movement of the rail within the initial three minutes, the load is held for a further 15 minutes and any additional movement does not exceed 0.5 mm.

1.7 Lateral Resistance

(a) Arrangement

The testing arrangement consists of a short section of rail fastened to the rail seat of one sleeper, or bearer, with the rail fasteners.

(b) Procedure

A load shall be applied to the gauge face corner of the rail at an angle of 30° from vertical of 90 kN. This load shall then be released and the measuring equipment zeroed.

Load will then be applied at a rate of not more than 22 kN per minute until a total load of 155 kN has been applied.

(c) Acceptance

If the rail base moves laterally by 3 mm or less under 155 kN load the assembly will be considered satisfactory.

1.8 Electrical Resistance

(a) Arrangement

The testing arrangement comprises two lengths of rail not less than 1.5 metres long fixed on the rail seats of a concrete sleeper or bearers at 600mm centres complete with all fastening components placed in ballast.

(b) Procedure

(i) The complete assembly shall be immersed in water for six hours. One hour after removal a 10 Volts AC current shall be applied across the rails for 15 minutes.

(ii) An AC ammeter shall record the electric current whilst the spraying of water is being carried out.

(iii) The electrical resistance of the assembly shall be calculated as follows;

Electrical resistance in ohms = $10 / \text{Recorded amperes}$

(c) Acceptance

The assembly shall be considered satisfactory when the calculated electrical resistance is equal to or higher than 4,000 ohms or meet minimum requirements for the function of SRT's track Circuits.

1.9 Control of Track Gauge

An approximate 6 metres of track shall be assembled with concrete sleepers, rail fasteners and rails for a check of track gauge.

Should the track gauge be out of tolerance, the placing and fixing of the rail fasteners in the moulds shall be corrected. The production shall not be started until it is proved that the track gauge is within the specified tolerance of +0.5 mm/ -1.5mm.

The surface finish and dimension of the concrete sleepers in the test length of track will be used by the Engineer as a basis for accepting track gauge, surface finish and dimensions of production run concrete sleepers.

