Division / Business Unit: Corporate Services & Safety
Function: Track & Civil
Document Type: Work Instruction

Track SFT Measurement by VERSE

ETI-06-08

Applicability

ARTC Network Wide

SMS

Publication Requirement

Internal / External

Primary Source

Document Status

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1.2	09 Jul 18	Standards	Stakeholders	A/Manager Standards	A/General Manager Technical Standards 10/07/2018

Amendment Record

Amendment Version #	Date Reviewed	Clause	Description of Amendment
1.0	21 Nov 17		First Issue
1.1	12 Dec 17	1.3 & 1.4	Risks controlled amended; Updated responsibilities.
1.2	09 Jul 18	2.5	Additional safety requirements added following the breakage of the adjustable jack strut.

Table of Contents

1 Introduction

1.1 Purpose

The purpose of this work instruction is to facilitate the operation and maintenance of VERSE equipment for the measurement of Stress Free Temperature in rail.

1.2 Scope

This work instruction covers general information, operating instructions, and maintenance instructions for VERSE equipment. This includes instructions for post-measurement analysis of data.

1.3 Risks Controlled

This work instruction is a control for the risk of track buckle or broken rail caused by the stress free temperature out of tolerance.

1.4 Responsibilities

The user of VERSE equipment is responsible for the compliance of this work instruction.

The authority with the overall responsibility for the delivery of safe and reliable track and civil infrastructure for the business unit or their delegate is responsible for the implementation of this work.

The Manager Standards is the owner of this Work Instruction and should be contacted for any queries or suggested improvements.

1.5 Reference Documents

The following documents support this work instruction:

- ETE-00-01 Calibration of Track Inspection and Testing Equipment;
- ETM-06-08 Managing Track Stability.
- VERSE manual.

1.6 Definitions

The following terms and acronyms are used within this document:

Term or acronym	Description
ARTC	Australian Rail Track Corporation Ltd.
Hand-held computer	Radix or Husky hand held computer forming part of the VERSE equipment.
Stress Free Temperature (SFT)	The temperature at which a rail is neither in tension nor in compression.
VERSE	Proprietary device for non-destructive measurement of Stress Free Temperature in rail.

2 General

2.1 Introduction

VERSE is a proprietary device used for non-destructively measuring the Stress Free Temperature in rail. VERSE is marketed by Pandrol Australia Pty Ltd.

This work instruction provides ARTC with specific guidance, and is to be read in conjunction with the manufacturer's manual.

2.2 Operating Principles

The device works on the principle that the more a rail is in tension, the greater the force required to lift it.

VERSE is essentially a lifting frame, which enables a short section of rail to be raised using a hydraulic jack, with both the lifting force and lifting height being measured. Transducers are used to determine the applied force with respect to the vertical displacement of the rail. Rail temperature at the time of lifting is also recorded.

By knowing the rail profile, rail temperature, applied lifting force, and the height through which the rail is raised, the temperature at which the rail would be stress free can be calculated. Stress Free Temperature is calculated, to the nearest whole ºC, by proprietary software in a dedicated hand-held computer connected to the lifting device.

2.3 Description

A general view of an ARTC VERSE machine is shown in Figure 1.

Figure 1: VERSE

The hand operated, hydraulically activated lifting frame is placed on a sleeper and sits astride the rail being measured. The frame accommodates different rail heights, sleeper types and applied cants. The aluminium lifting frame weighs about 25 kg.

A diagram of the VERSE machine, identifying principal components, is shown in Figure 2.

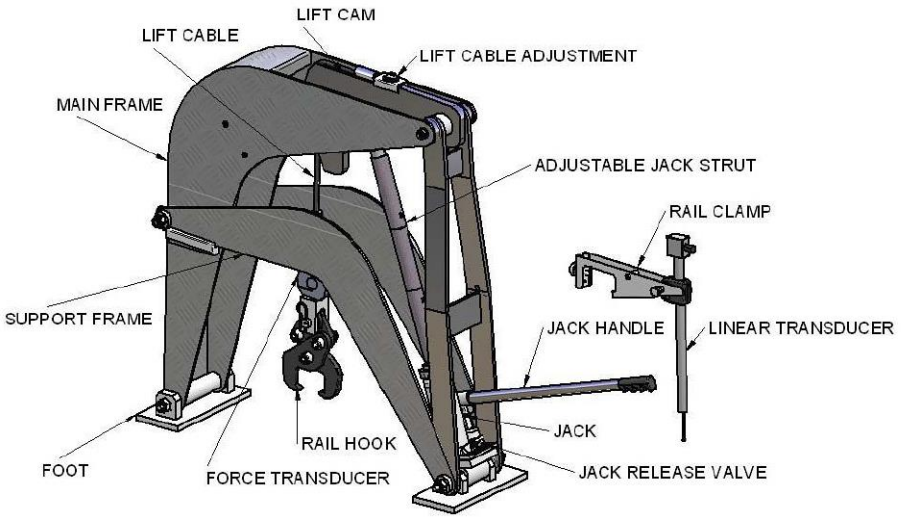

Figure 2 – Diagram of VERSE machine, showing principal components

The personal computer requirements to run the calculation software are referred to in supplier's manual.

2.4 Equipment and Tools

Additional tools and equipment required during the measurement process include:

- Tools for removing and replacing fastenings;
- Track jacks;
- Shovels and/or forks for digging out ballast
- Broom (or motorised blower) for cleaning loose material from rail seats;
- (Where applicable) lighting plant for night measurements.

And, for curved track:

- Lining bars for reinstating rail (excavator or similar on sharp curves); and
- Stringline and ruler for measuring versines.

2.5 Safety

Before all works commence, all relevant ARTC Rail Safety and WHS requirements must be in place.

When handling and positioning, use correct manual handling techniques for heavy and bulky items.

Always take particular care to ensure that hands and fingers are clear when unfolding and folding the lift frame, as a scissor action exists.

Be aware of signs of buckling, and stop the test immediately if rail is likely to buckle. Re-fasten the rail and do not perform test until rail temperature has lowered.

Operator must stop jacking when load reaches 10kN.

The adjustable jack strut should be inspected in accordance with the following steps prior to use:

1. Unfold the VERSE frame in accordance with the manual.
2. Wind the adjustable jack strut from a fully contracted position to fully extended position (measure an extension of 130m in overall Adjustable Strut Length).
3. If the Adjustable Jack Strut shows any of the three signs below, there is an indication of a bend in the Adjustable Jack Strut which could lead to premature failure.
    a. A visible bend being detected
    b. Difficulty in adjustment with resistance in rotation
    c. Difficulty in adjustment with an oscillating increase and decrease in the torque required to adjust.
4. If the Adjustable Jack Strut is detected as bent, it should be replaced by the nearest VERSE service centre.

Refer to the supplier's manual for additional safety requirements.

2.6 Preliminary

Ensure all equipment is operating correctly, batteries are charged, and calibrations are current. If hand computer runs out of battery, ensure the time and date is reset correctly after recharging.

Ensure latest version of supplier's manual is available. An uncontrolled copy is available on the ARTC intranet at Engineering/Track and Civil/Manufacturer / Supplier Manuals. Contact supplier to verify version.

2.7 Site Selection

VERSE equipment shall not be used within 30 metres of turnouts, road crossings, or other fixed points in the track.

The lifted section of rail, which is 30 metres long (33 meters on AS60 rail or other similar heavy gauge rail sections), must not contain any insulated rail joints. The rail size must be the one for which the computer is programmed.

Must be of uniform rail size (i.e. must not contain a rail junction).

Should be reasonably clear of ballast around the rail foot and fastenings (to facilitate unfastening and refastening).

Should desirably contain no bolt holes or aluminothermic welds. If bolt holes or aluminothermic welds are unavoidable:

- Locate the lifting points as far away as possible from a single aluminothermic weld or set of bolt holes; and
- Locate the lifting point mid-way between two aluminothermic welds or sets of bolt holes.

Preferred site requirements, to minimise degradation of the Stress Free Temperature calculation, refer to the supplier's manual.

2.8 Measuring Conditions

Ideally the VERSE lift is not carried out when sudden changes in rail temperature are occurring i.e. when the sun shines on the rail which has previously been in the shade during a measuring run.

VERSE measurements are not carried out at rail temperatures above 28^0C.

VERSE measurements are not carried out at rail temperatures below 6^0C on curves.

Note: If any rail movement is observed during the measuring, stop immediately and put the fasteners back. Come back and measure the SFT at a lower temperature.

3 Taking measurements

All SFT measurements to be taken as per the supplier's manual and type approval.

Record and report results to the responsible ARTC Manager.

Minimum information to be recorded:

- Date
- Location details
- Rail size
- Instrument calibration details
- Rail temperature
- SFT readings

Additional information may be recorded depending on jurisdictional requirement. The information must be recorded either by written or electronic means. If written, ETM0606F-03 should be used. Electronic recording may include a computer software printout or spreadsheet.

4 VERSE kit Operation and Data Process

Refer to supplier's manual.

5 Maintenance Requirements for VERSE

Refer to supplier's manual.