

1. SCOPE

This document details the application of SOP 206 (Applicable to Reyrolle LMT23T) issued by the Energy Networks Association.

2. ISSUE RECORD

This is a Reference document. The current version is held on the EN Document Library.

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| Issue Date | Issue No. | Author | Amendment Details |
|-------------------|------------------|----------------|--|
| October 2000 | 1 | Esther Stewart | Initial Issue in New Format: 3 Page Document |
| January 2022 | 2 | Ryan Miller | Addition of content from related restriction OR50 Update to affected units installed Reference to PSB 36 added for remedial action |

3. ISSUE AUTHORITY

| Author | Owner | Issue Authority |
|---------------------------------|---|---|
| Ryan Miller Project Engineer | Fraser Ainslie Head of Engineering Design and Standards | Fraser Ainslie Head of Engineering Design and Standards |

4. REVIEW

This is a Reference document which has a 5 year retention period after which a reminder will be issued to review and extend retention or archive.

5. DISTRIBUTION

This document is not part of a Manual maintained by Document Control and does not have a maintained distribution list.

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7. SOP DETAILS

EQUIPMENT TYPE Reyrolle LMT23T 11kV Circuit Breaker
ORIGINATING COMPANY Yorkshire Electric
DATE 16th June 1998
NUMBER INSTALLED IN ENERGY NETWORKS NORTH 3

| Functional Location | District | Number of Units | Circuit Name | Equipment Number | Manufacturer Serial Number |
|---|----------------|-----------------|------------------------|------------------|----------------------------|
| Craigenbay St-011 [GSS-NS6167/004-011] | Glasgow | 1 | Transformer/03/1 | 700191443 | 2TSLMT1135 |
| Linburn School-011 [GSS-NT1186/008-011] | Central & Fife | 1 | Local Transformer/02/1 | 700208508 | 2QSLMT/263 |
| South Parks School [GSS-NO2601/008-011] | Central & Fife | 1 | Local Transformer/01/1 | 700159621 | 20SLMT261 |

NUMBER INSTALLED IN ENERGY NETWORKS SOUTH 1

| Functional Location | District | Number of Units | Circuit Name | Equipment Number | Manufacturer Serial Number |
|---|--------------|-----------------|---------------------------|------------------|----------------------------|
| Thames Board Mill-011 [PS-SJ6086/012-011] | Mid-Cheshire | 1 | HV/61/11/33KV Transformer | 700338342 | 3CSLMT2497 |

REASON

A Reyrolle Type LMT23T 11kV oil circuit breaker, manufactured in 1974, suffered catastrophic failure resulting in extensive damage to the 11kV switchboard.

An investigation has revealed that the circuit breaker was partially open following a previous operation four weeks earlier. The circuit breaker was one of two transformer 11kV incomers in a primary substation, and since both transformers operated in parallel, no apparent signs of the partially open contacts were evident. When another fault occurred, the circuit breaker did not fully open to clear the fault successfully and the subsequent passage of fault current through the partially open contacts caused burning, arcing and ultimate failure. This was due to the opening spring dashpot piston seizing within the cylinder resulting in incomplete travel of the main contacts.

The dashpot contains a PVC buffer washer which is immersed in oil and over a long period of time the plasticiser in the PVC can migrate into the oil, in some cases causing shrinkage and hardening of the washer. Subsequently the washer could become loose and displaced, and due to the impact of the piston, it could disintegrate, and fragments of the washer can cause the damper piston to jam in the bore of the dashpot cylinder. This can prevent the circuit breaker main contacts from fully opening, and under certain circumstances, it may prevent the circuit breaker from fully closing.

**STATUS IN INITIATING
COMPANY**

1. During live open and close operations no personnel to be in the switchroom. Racking in and out permitted, however earthing is not, due to the inability to prove the integrity of the contact.
2. Extended presence adjacent to live prohibited.

Restriction to be lifted on individual units after buffer washers replaced and Dashpot assemblies found to be in good condition.

SPEN APPLICATION

The following Operational Restriction shall be applied to all Reyrolle Type LMT23T 11kV oil circuit breakers:

1. Access to switch rooms shall be restricted to short periods for essential operational purposes only until the undernoted remedial action has been undertaken. Access may only be permitted in order to restore supplies or other valid and pressing reasons for such time as necessary to carry out operational duties.
2. Live opening and closing of the circuit breaker shall be carried out from a remote point wherever possible. (e.g. From a separate control room, from PSMC or by using a remote-control unit). Where this cannot be achieved then live local operation shall only be sanctioned after the following precautions have been taken.
 - i) Before opening the circuit breaker, the feeder side shall be isolated from all load by switching from remote points so that negligible current is interrupted (e.g. cable charging current). For transformer circuit breakers in secondary substations, the transformer LV links shall be opened and the HV busbars made not live to ensure that negligible current is interrupted
 - ii) Before closing the CB then wherever reasonably practicable the remedial action shall first be undertaken. When this is not practicable, the moving portion shall be racked down and withdrawn. The interlock shall be moved to the "locked" position and the isolated CB closed. The electrical resistance across each phase shall then be measured using a micro ohmmeter such as a Ducter to ensure that all three contacts are making successfully. The resistance value across all three phase contacts must be of similar value and in any case

should be less than 200 micro ohms. The CB may then be returned to the service position and closed.

3. Racking a CB into or out of the service position is permitted as moving the interlock to the "free" position proves the contacts open with adequate clearance
4. Before circuit breaker is to be used as a Circuit Main Earth (CME) then wherever reasonably practicable, the remedial action shall first be undertaken. In exceptional circumstances, then the precautions described in 2(b) above shall be carried out.

ADDITIONAL INFORMATION N/A

UPDATE N/A

REMEDIAL ACTION The dashpot assembly on all Reyrolle Type LMT23T oil circuit breakers shall be inspected and the PVC buffer washer replaced with a new washer manufactured from a superior material with a trade name of "GACO" in accordance with the procedure detailed in PSB36 (SWG-19-036)

Note: In accordance with this restriction, any remedial work shall be carried out at a location remote from the switch room (e.g. control room) unless all other Reyrolle Type LMT 23T circuit breakers in the switch room have been previously modified or have been made dead.

8. SOP HEADER

| Field Name | Field Value | Field Size |
|---|---|------------|
| Name (SOPXXX) * | SOP206 | 6 |
| The reason for the Operational Restriction * | CB partially open potential | 30 |
| Nature of the Operational Restriction * | Remote live switching where practicable | 50 |
| Comments * | Partially open condition was caused by a seizure of the damping dashpot piston within the dashpot assembly Live local switching after precautions followed as per SPEN application | 200 |
| Restricted Access to Substation Flag * | Y | 1 |
| SOP Impact Code * <i>(highlight or underline the appropriate code)</i> | 0 Temporary/Impact under assessment <u>1 Very minor operational/network impact</u> 2 Moderate operational/network impact 3 Significant impact on system perf./measurable business costs 4 Inoperable without intervention 5 Inoperable – no cost effective solution/must be replaced | N/A |
| SOP component type * <i>(highlight or underline the appropriate code)</i> | 01 Bushing only <u>02 Circuit Breaker</u> 03 Fixed Portion only 04 Moving Portion only 05 Switch 06 RMU 07 Transformer only 08 Tap Changer only 09 Transformer & Bushing 10 Transformer & Tap Changer | N/A |
| Search Criteria * | Reyrolle – LMT/X2/JO LMT/X5/JO LMT/X8QMRC | N/A |

* This denotes a Mandatory Field