WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

ENGINEERING SPECIFICATION
EE SPEC : 2/6

Relating to 12kV Cable Connected Outdoor Switchgear – Non Oil Type

Policy Summary

1. This specification details requirements for 12kV outdoor cable connected distribution switchgear. In addition to conventional ring main units and free-standing switchgear, it covers 12kV metering units.

2. The specification is based on EA Technical Specification 41-36. (Issue 3, 2012)

Author:	**R N Lang**
Implementation Date:	**January 2015**
Approved by	
	Policy Manager
Date:	23 January 2015

IMPLEMENTATION PLAN

Introduction

This document specifies the requirement for 12kV distribution switchgear and shall be used by the purchasing department to go out for competitive tender.

Main Changes

Document updated in line with ENA Technical Specification 41-36 (v3) 2012.

Impact of Changes

No significant impact for Network Services Teams.

Distribution switchgear will be purchased under one contract for the whole of WPD.

Implementation Actions

Procurement will tender the revised specification and aware new contract.

Implementation Timetable

New framework contract will be awarded under the new specification by 1st April 2015.

Document Revision & Review Table		
Date	**Comments**	**Author**
12 January 2015	• Minor updates to incorporate revisions to ENATS 41-36 (2012)	R Lang

1.0 Scope

This specification covers the supply and delivery of outdoor distribution switchgear up to 12kV (Cable Connected), non-oil design.

2.0 Forewords

All equipment supplied under this specification will meet the technical requirements of EA Technical Specification 41-36 – Issue 3 2012.

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(Distribution Switchgear for service up to 36kv Cable and Overhead Conductor Connected)

Additional clauses contained within this specification are in addition to the requirements of the standards outlined in EA Technical Specification 41-36. Where there is any conflict between EA Technical Specification 41-36 and this document, then the EE:SPEC 2/6 shall take precedence.

3.0 Schedule of Equipment

This specification covers non-oil switches, circuit breakers, and non-oil type of metering equipment for outdoor use up to 12kV.

The type and rating of equipment covered by this specification is given in Schedules 1 to 5. Schedule 6 shall be completed and returned by the equipment supplier as part of any tendering process.

The requirements of this document is not intended to restrict or inhibit the introduction of new forms of switchgear provided that such designs comply with those requirements in respect of safety, security and operation which are generally understood by manufacturers and users.

Any non-compliance with EA Technical Specification 41-36 (issue 3-2012) or with EE:SPEC 2/6 shall be detailed by the tenderer at the time of tender.

4.0 Quality Assurance

Quality assurance shall be in accordance with ISO 9000 standards. Details of failure analysis studies for the products being offered shall be included with the tender.

5.0 Maintenance/Defects

Manufacturers shall state at time of tender how a population of the equipment offered would be checked and cleared of any potential type defect occurring in the future. This information shall also detail any cost implications to WPD.

6.0 Test Facilities

The test facilities shall be effected by means of 3 phase integral device. Removable test plugs are not acceptable.

7.0 Cable Terminations (Section 1.5.103.1.101 - 41-36)

Cable boxes shall be to EATS 12-11 and shall be of the dry termination design. Cable boxes shall be fitted with glands suitable for cable size up to 300mm single core EPR.

Cover plates shall be provided with vandal proof fixings.

8.0 Padlocking

Wherever padlocking facilities are provided, provision shall be made for a padlock with 38mm square body and with a 7mm diameter shackle having a clear inside width of 20mm and an inside length of 16mm to 30mm. The holes provided for the shackle shall not be less than 8mm diameter.

9.0 Current Transformers (Section 10.2 - 41-36)

9.1 Protection Current Transformers

The class and characteristics of protection CTs shall be adequate for the burden and function of the associated protection equipment and wiring, over the full range of available fault current.

Recommended CT ratios are included in the schedules but in all situations the CT ratings should not limit the overall rating of the switchgear.

9.2 Metering Current Transformers

Metering CTs shall be precision grade or commercial grade and shall have independent cores and secondary windings to those used for protection purposes.

Metering CTs shall be tested to conform with BS EN 60044-1 but shall also be error tested on each ratio at 7.5VA 0.9 power factor lagging burden at 5%, 20%, 100% and 120% test load points. Three copies of test certificates shall be provided in advance of the switchgear/metering unit delivery, for each metering current transformer.

10.0 Voltage Transformers (Section 10.3 - 41-36)

Voltage transformers (VTs) shall unless otherwise specified be to 50VA class 0.5 and protection class 3P with a rated voltage factor of 1.9 for 8 hours.

VTs for use on the 11kV system shall have 11000/110V windings.

VTs for use on the 6.6kV system shall have 11000/6600/110V windings, delivered with 6600/110V selected. It shall be possible to subsequently convert them to 11000/110 by means of internal links with the minimum of operational difficulty. L.V. isolation shall be provided by the fitment of LV fuses.

10.1 Protection Voltage Transformers

VT's used for protection purposes shall consist of either a single 5 limb type or three single phase VTs with a open delta winding, class 3P rated at 20VA.

10.2 Metering Voltage Transformers

Metering VTs shall comprise of either:

2 phase-phase "V" connected winding.
3 phase star-star winding.
3 single phase windings.

Metering VTs shall be tested to conform with BS EN 60044-2 but shall also be error tested on red/yellow and yellow/blue at 10VA 0.5 power factor lagging burden. Three copies of the test certificate shall be provided prior to delivery of the switchgear.

Whenever possible metering VTs and CTs shall be arranged so that the VT is connected before the CTs, in respect of normal power flow.

10.3 Voltage Transformer Fusing

L.V. side of Voltage Transformers shall be fused at 6 Amps.

11.0 Actuator Units

With the exception of transformer circuit breakers associated with Ring Main Units, all units shall be pre-wired for the provision of the retro-fitment of actuator units, this to include auxiliary contacts for switch position indication.

12.0 Spares

A copy of the maintenance manual and a list of recommended, priced spares, shall be included with the tender.

13.0 Protection Relays

Protection relays shall satisfy the requirements of BS EN 60255 and IEC 60255.

Self-powered protection relays shall as a minimum include the following functions.

Instantaneous high set overcurrent protection.
2 or 3 phase IDMT overcurrent protection (with selectable IEC type characteristics).
IDMT earth fault protection (with selectable IEC type characteristics).
Suitable for use with CTs with a 1A secondary rating.

Sensitive earth fault (SEF) protection relays as minimum include:

SEF protection (current pick up selectable between 0.03A and 0.4A).
Definite time characteristic (time setting selectable between 0 to 10s).
30Vd.c. auxiliary supply.
Suitable for use with CTs with a 1A secondary rating.

Neutral voltage displacement (NVD) protection relays shall include:

NVD protection (with voltage pick up selectable between 10 and 50V).
Definite time characteristic (time setting selectable between 0 and 10s).
30Vd.c. auxiliary supply.

A list of approved protection relays is included in Appendix A. Other relays with equivalent functions may be acceptable subject to approval of the author of this document, prior to placement of the contract.

14.0 Battery Systems

Battery systems may be required where the following equipment is installed:

Sensitive earth fault (SEF) protection.
Neutral voltage displacement (NVD) protection.

The provision of these battery systems is outside of the scope of EE:SPEC 2/6.

30Vd.c. battery systems for protection auxiliary supplies shall comply with the latest issue of EE:SPEC 24.

15.0 Earth Fault Passage Indicator CTs

- RMU's shall have 500/1 earth fault passage indicator CTs fitted on the bushings of the left hand cable box.
- Extensible switches shall have 500/1 earth fault passage indicator CTs fitted to the outgoing cable bushings.

CT wiring shall be connected back to a junction box within the RMU secondary wiring compartment.

16.0 Pfisterer Phase/Voltage Indicators

Indicators meeting the requirements of BS EN61243-5 2001, shall be fitted to all ring switches on RMUs and extensible range of switchgear.

17.0 Non Conformances

All non-conformance with ENATS 41-36 (Issue 3) shall be outlined by the tenderers on return of tenders.

APPENDIX A

APPROVED PROTECTION RELAYS

The following protection relays are approved for use with Western Power Distribution. Other relays may be acceptable, subject to approval by the Author of this document, prior to placing the contract.

Manufacturer	Type	Function/s
Schneider	VIP300	Self powered overcurrent and earth fault relay
Alstom	Micom P124	Self powered overcurrent and earth fault relay
Alstom	Micom P120	Sensitive earth fault relay
Alstom	Micom P125	Sensitive earth fault Neutral Voltage Displacement
VA Tech	Argus 1	Sensitive earth fault
Schneider	Sepam S40	Sensitive earth fault and NVD

APPENDIX B

SUPERSEDED DOCUMENTATION

EE:SPEC 2/5 dated September 2010 is superseded on issue of this document

APPENDIX C

ASSOCIATED DOCUMENTATION

EE:SPEC 24 30V Battery Systems

APPENDIX D

IMPACT ON COMPANY POLICY

All new ground mounted 12kV distribution switchgear shall be in accordance with this specification. This update includes mandatory provision of earth fault passage CTs and pre wiring for fitment of actuators.

APPENDIX E

IMPLEMENTATION OF POLICY

This document shall be implemented on issue

APPENDIX F

KEY WORDS

Switchgear, Ring Main Unit, RMU, Circuit Breaker

SCHEDULE 1

NON-EXTENSIBLE RING MAIN UNIT (RMU)

Equipment	**Further Details**	**Type RMUF12**	**Type RMUF12A**	**Type RMUT12A** (See Note 1)	**Type RMUT12B** (See Note 1)
General	Normal rated voltage: 12kV Rated short time current: 20kA	Free standing, non-extensible RMU with TLF protection	Free standing, non-extensible RMU with self powered protection relay.	Transformer mounted RMU with TLF protection	Transformer mounted RMU with self powered protection relay
Busbars	Nominal rating: 630A	1 set	1 set	1 set	1 set
Ring switches	Nominal rating: 630A	2	2	2	2
Ring cable earth switch	Fitted with built in test facilities	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch
Transformer tee off circuit breaker	Nominal rating:	200A	630A	200A	200A
Transformer tee off earth switch	Short time (3s) withstand: 3.15kA	3.15kA	20kA	13.1kA	13.1kA
Ring Switch Cable Box	Suitable for 3 single core cables up to 300 mm^2 with shear bolt connection, or suitable for interface "C" outer cone separable connector.	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch
Transformer tee off cable box	Suitable for 3 single core cables terminated with shear bolt connection, or suitable for interface "C" outer cone separable connector.	185 $mm^{2\,(Max)}$	300 $mm^{2\,(Max)}$		
Protection on Transformer tee off circuit breaker	2 overcurrent and 1 earth fault, time limit fuse protection utilising XF type TLFs and suitable a.c. trip coils.	1 set		1 set	
	Self powered protection relay (clause 13) and suitable circuit breaker release.		1		1
Protection CTs	100/50/5 CTs for TLF protection (see clause 9.1)	3		3	
	CTs for self powered protection relay (clause 9.1)		800/1 CTs		200/1 CTs
Multicore Box		1	1	1	1
Terminals, fuses and links		As required	As required	As required	As required

Note 1: Transformer mounted equipment shall also be suitable for connection to TM type metering units included in Schedule 4.

SCHEDULE 2

NON EXTENSIBLE CIRCUIT BREAKER TEE OFF

Equipment	**Further Details**	**NFCB12**	**NTC12A** (See Note 1)	**NTC12B** (See Note 1)
General	Normal rated voltage: 12kV Rated short time current: 20kA Nominal current rating: (TEE) 200A Ring switches 630A	Free standing, non-extensible circuit breaker with TLF protection	Transformer mounted circuit breaker with TLF protection	Transformer mounted circuit breaker with self powered protection relay
Incoming cable earth Switch	Fitted with built in test facilities Short time (3s) withstand: 20kA	1	1	1
Transformer tee off earth switch	Short time (3s) withstand: 3.15kA	1	1	1
Incoming cable box	Suitable for 3 single core cables up to 300 mm^2 fitted with shear bolt connections, or suitable for interface "C" outer core separable connectors.	1	1	1
Transformer tee off cable box	Suitable for 3 single core cables up to 185 mm^2 fitted with shear bolt connections, or suitable for interface "C" outer core separable connectors.	1		
Protection on Transformer tee off circuit breaker	2 overcurrent and 1 earth fault, time limit fuse protection utilising XF type TLFs and suitable a.c. trip coils.	1 set	1 set	
	Self powered protection relay (clause 13) with suitable circuit breaker release.			1
Protection CTs	100/50/5 CTs for TLF protection (clause 9.1)	3	3	
	200/1 CTs for self powered protection relay (clause 9.1)			3
Multicore Box		1	1	1
Terminals, fuses and links		As required	As required	As required

Note 1: Transformer mounted equipment shall also be suitable for connection to TM type metering units included in Schedule 4

SCHEDULE 3

EXTENSIBLE SWITCHGEAR

Equipment	**Further Details**	EFS12	EFC12A	EFC12B 200A	EFC12B 630A	EBMC
General	Normal rated voltage: 12kV Rated short time current: 20kA	Free standing extensible switch unit	Free standing extensible circuit breaker with TLF protection	200A Free standing extensible circuit breaker with self-powered protection relay	630A Free standing extensible circuit breaker with self-powered protection relay	630A Free standing metering bus-section circuit breaker with self-powered protection relay
Busbars	Nominal rating: 630A	1 set	1 set	1 set	1 set	1 set
Switch unit	Nominal rating: 630A	1				
Switch unit earth switch	Fitted with built in test facilities	1				
Circuit breaker	Nominal rating: 200A		1	1		
	Nominal rating: 630A				1	1
Circuit breaker earth switch	Fitted with built in test facilities. Short time (3s) withstand: 20kA		1	1	1	1
Switch unit cable box	Suitable for 3 single core cables up to 300 mm^2 with shear bolt connection, or suitable for interface "C" outer core separable connectors.	1				
Circuit breaker cable box	Suitable for 3 single core cables up to 300 mm^2 with shear bolt connections, or suitable for interface "C" outer core separable connectors.		1	1	1	
Circuit breaker Protection	2 overcurrent and 1 earth fault, time limit fuse protection utilising XF type TLFs and suitable a.c. trip coils.		1 set			
	Self powered protection relay (clause 13) and suitable circuit breaker release.			1	1	1

SCHEDULE 3

EXTENSIBLE SWITCHGEAR

CTs (Clause 8)	100/50/5 CTs for TLF protection		3			
	200/1 CTs for self powered protection relay			3		
	800/1 CTs for self powered protection relay				3	3
	400/200/5 CTs for metering					3
VT (Clause 9)	11000/110V winding for metering					1
Multicore Box		1	1			
Terminals, fuses and links		As required	As required	As required		
Additional requirements for 6.6kv system						**EBMC/A** As EBMC except VT has a dual winding 11000/6600/110 for use on 6.6kV system

SCHEDULE 4

TM TYPE METERING UNITS

Description	Further Details	TM12A/1	TM12B/1	TM12C/1	TM12D/1	TM12E/1
General requirements	Normal rated voltage: 12kV Rated short time (3s) current: 16kA	Non-extensible metering unit for direct coupling to transformer circuit flange of switchgear	Non-extensible metering unit for direct coupling to transformer circuit flange of switchgear	Non-extensible metering unit for direct coupling to transformer circuit flange of switchgear	Non-extensible metering unit for direct coupling to transformer circuit flange of switchgear	Non-extensible metering unit for direct coupling to transformer circuit flange of switchgear
	Nominal Rating	200A	200A	400A	200A	400A
Supporting Steelwork for metering unit and switchgear		√	√	√	√	√
Incoming circuit flange and bushings	Suitable for mounting on Transformer mounted type RMU and tee off circuit breakers in Schedule 1 and 2	√	√	√	√	√
Outgoing circuit cable box	Suitable for 3 single core cables up to 185 mm^2 fitted with shear bolt connections.	√	√	√	√	√
CTs (See clause 8)	Metering CTs	100/50/5	200/100/5	400/200/5	200/100/5	400/200/5
VT (see clause 9)	11000/110V winding for metering	√	√	√	√	√
	11000/110 open delta winding for NVD protection				√	√
Multicore Box		√	√	√	√	√
Terminals, fuses and links		√	√	√	√	√

SCHEDULE 4

TM TYPE METERING UNITS

Additional requirements for 6.6kV system		**TM12A/1A**As TM12A/1 except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**TM12B/1A** As TM12B/1 except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**TM12C/1A** As TM12C/1 except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**TM12D/1A** As TM12D/1 except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**TM12E/1A** As TM12E/1 except VT has a dual winding 11000/6600/110 for use on 6.6kV system

SCHEDULE 5

OPTIONAL REQUIREMENTS

Description	Further details
Circuit Breaker Trip Release Coil	Rated for both 110V a.c. and 20 to 48V d.c. auxiliary supply. Auxiliary contacts to be incorporated into trip coil circuit.
Switch Actuator	24V d.c. with at least 1 spare normally open and 1 spare normally closed auxiliary contact.

SCHEDULE 6

WESTERN POWER DISTRIBUTION CONTRACT FOR THE SUPPLY OF NON-OIL HV SWITCHGEAR PRICING SCHEDULE

MANUFACTURER:

ITEM	APPROX QTY P.A.	MAKERS TYPE	DRAWING NUMBER	DELIVERED PRICE EACH – FIRM (NO ACTUATORS)	DELIVERED PRICE (ACTUATORS FITTED)
Non-extensible RMU					
RMUF12 Freestanding with TLF	15			£	£
RMUF12A Freestanding with relay (630A Tee off)	10			£	£
RMUT12A T/F mounted with TLF	440			£	£
RMUT12B T/F mounted with relay	50			£	£
Non-extensible CB tee off (200A)					
NFC12 Freestanding CB with TLF	5			£	£
NTC12A T/F mounted with TLF	18			£	£
NTC12B T/F mounted CB with relay	5			£	£
Extensible Switchgear					
EFS12 (630A) Extensible switch	10			£	£
EFC12A (200A) Extensible CB with TLF	5			£	£
EFC12B (200A) Extensible 200A CB with relay	5			£	£
EFC12B (630A) Extensible 630A CB with relay	5			£	£
EBMC (630A) Metering bus-section CB (for use on 11kV system)	5			£	N/A

SCHEDULE 6 (Continued)

WESTERN POWER DISTRIBUTION CONTRACT FOR THE SUPPLY OF NON-OIL HV SWITCHGEAR PRICING SCHEDULE

MANUFACTURER:

ITEM	APPROX QTY P.A.	MAKERS TYPE	DRAWING NUMBER	DELIVERED PRICE EACH - FIRM
TM Type Metering Units				
TM12A/1 (100/50/5) 200A non-extensible metering unit with 100/50/5 CTs for 11kV system	70			£
TM12B/1 (200/100/5) 200A non-extensible metering unit with 200/50/5 CTs for 11kV system	60			£
TM12A/1A (100/50/5) As TM12/1 (100/50/5) but for use on 6.6kV system	2			£
TM12B/1A (200/100/5) As TM12/1 (200/50/5) but for use on 6.6kV system	2			£
TM12D/1 200A non-extensible metering unit for use with NVD relay with 200/100/5 CTs for 11kV system	20			£
TM12E/1 200A non-extensible metering unit for use with NVD relay with 400/200/5 CTs for 11kV system	20			£
TM12D/1A As TM12D/1A (200/100/5) but for use on 6.6kV system	2			£
TM12E/1A As TM12E/1 (400/200/5) but for use on 6.6kV system	2			£
Optional Requirements				
Circuit Breaker Trip Release Coil Fitted to CB at time of purchase	N/A			£
Circuit Breaker Trip Release Coil For retrofitting to existing CB	N/A			£
Switch Actuator For retrofitting to existing switchgear	N/A			£
Ring switch – cable box core balance CT for SEF Protection inc. mounting kit	50			£

RTU (Remote Terminal Unit)

Supplies shall provide information on the range of RTUs available to remotely and automatically control switchgear detailed in this tender submission.

Information shall include:-

- Number of switches that can be controlled
- Is the RTU module construction enabling various switch number options?
- Sizes and mounting arrangements shall be detailed.
- Types of communication channels supported.
- Battery capacity and details of on line testing/monitoring methods.
- Details of fault detection and ranges for overcurrent, earth fault and SEF.
- Details on programming of the unit.
- Costs
- Data security

Supplies shall outline where their product has already been successfully operated.