



Technical Specification 43-12

Issue 2 2013

Insulated Aerial Bundled Conductors for
Low Voltage Overhead Distribution Systems
– Erection Requirements

© 2013 Energy Networks Association

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Energy Networks Association. Specific enquiries concerning this document should be addressed to:

**Operations Directorate
Energy Networks Association
6th Floor, Dean Bradley House
52 Horseferry Rd
London
SW1P 2AF**

This document has been prepared for use by members of the Energy Networks Association to take account of the conditions which apply to them. Advice should be taken from an appropriately qualified engineer on the suitability of this document for any other purpose.

CONTENTS

| | | |
|----|---|----|
| 1 | SCOPE | 5 |
| 2 | REFERENCES | 6 |
| 3 | DEFINITIONS | 6 |
| 4 | CONDITIONS OF USE | 7 |
| 5 | DESIGN BASIS AND DESIGN DATA | 10 |
| 6 | CLEARANCES | 13 |
| 7 | SUPPORT FITTINGS | 15 |
| 8 | ELECTRICAL CONNECTIONS | 16 |
| 9 | CONDUCTOR ENDS | 17 |
| 10 | SUPPORTS | 17 |
| 11 | STAYS | 18 |
| 12 | AUXILIARY EQUIPMENT (INCLUDING FUSES) | 19 |
| 13 | CABLE GUARDS | 19 |
| 14 | SAFETY SIGNS | 19 |
| 15 | ASSOCIATED MATERIALS | 20 |
| 16 | GENERAL ARRANGEMENTS | 21 |
| 17 | DESIGN DATA | 45 |

TABLES

| | | |
|----------|---|----|
| Table 1 | Augured depths of support foundations | 11 |
| Table 2 | Values of K..... | 14 |
| Table 3 | Support/attachment loadings | 16 |
| Table 4 | ABC, 4x120mm ² – summary data – in-line structures | 45 |
| Table 5 | ABC, 4x120mm ² – summary data – angle structures | 45 |
| Table 6 | ABC, 4x120mm ² – summary data – terminal structures | 46 |
| Table 7 | ABC, 4x120mm ² – design sag/tension | 46 |
| Table 8 | ABC, 4x120mm ² – erection sag/tension..... | 47 |
| Table 9 | ABC, 4x120mm ² – pole data (ground good/average) no baulks | 48 |
| Table 10 | ABC, 4x120mm ² – single pole stay capability | 49 |
| Table 11 | ABC, 4x120mm ² – Single Pole Strut Loading (Level Conditions) | 49 |
| Table 12 | ABC, 4x120mm ² – Single Pole Strut Loading (1:10 Downpull Conditions)..... | 50 |
| Table 13 | ABC, 4x95mm ² – summary data – in-line structures | 51 |
| Table 14 | ABC, 4x95mm ² – summary data – angle structures | 52 |
| Table 15 | ABC, 4x95mm ² – summary data – terminal structures | 52 |
| Table 16 | ABC, 4x95mm ² – design sag/tension | 53 |
| Table 17 | ABC, 4x95mm ² – erection sag/tension..... | 54 |
| Table 18 | ABC, 4x95mm ² – pole data (ground good/average) no baulks | 55 |
| Table 19 | ABC, 4x95mm ² – single pole stay capability | 56 |
| Table 20 | ABC, 4x95mm ² – single pole strut loading (level conditions)..... | 56 |
| Table 21 | ABC, 4x95mm ² – single pole strut loading (1:10 downpull conditions)..... | 57 |
| Table 22 | ABC, 2x95mm ² – summary data – in-line structures | 58 |
| Table 23 | ABC, 2x95mm ² – summary data – angle structures | 58 |
| Table 24 | ABC, 2x95mm ² – summary data – terminal structures | 58 |
| Table 25 | ABC, 2x95mm ² – design sag/tension | 59 |
| Table 26 | ABC, 2x95mm ² – erection sag/tension..... | 60 |
| Table 27 | ABC, 2x95mm ² – pole data (ground good/average) no baulks | 61 |
| Table 28 | ABC, 2x95mm ² – single pole stay capability | 62 |
| Table 29 | ABC, 2x95mm ² – single pole strut loading (level conditions)..... | 62 |
| Table 30 | ABC, 2x95mm ² – single pole strut loading (1:10 downpull conditions)..... | 63 |
| Table 31 | ABC, 4x70mm ² – summary data – in-line structures | 64 |
| Table 32 | ABC, 4x70mm ² – summary data – angle structures | 64 |
| Table 33 | ABC, 4x70mm ² – summary data – terminal structures | 65 |
| Table 34 | ABC, 4x70mm ² – design sag/tension..... | 65 |
| Table 35 | ABC, 4x70mm ² – erection sag/tension..... | 66 |
| Table 36 | ABC, 4x70mm ² – pole data (ground good/average) no baulks | 67 |
| Table 37 | ABC, 4x70mm ² – single pole stay capability | 68 |
| Table 38 | ABC, 4x70mm ² – single pole strut loading (level conditions)..... | 68 |
| Table 39 | ABC, 4x70mm ² – single pole strut loading (1:10 downpull conditions)..... | 69 |
| Table 40 | ABC, 4x50mm ² – summary data – in-line structures | 70 |
| Table 41 | ABC, 4x50mm ² – summary data – angle structures | 70 |
| Table 42 | ABC, 4x50mm ² – summary data – terminal structures | 71 |
| Table 43 | ABC, 4x50mm ² – design sag/tension | 71 |
| Table 44 | ABC, 4x50mm ² – erection sag/tension..... | 72 |
| Table 45 | ABC, 4x50mm ² – pole data (ground good/average) no baulks | 73 |
| Table 46 | ABC, 4x50mm ² – single pole stay capability | 74 |
| Table 47 | ABC, 4x50mm ² – single pole strut loading (level conditions)..... | 74 |
| Table 48 | ABC, 4x50mm ² – single pole strut loading (1:10 downpull conditions)..... | 75 |
| Table 49 | ABC, 2x50mm ² – summary data – in-line structures | 76 |
| Table 50 | ABC, 2x50mm ² – summary data – angle structures | 76 |
| Table 51 | ABC, 2x50mm ² – summary data – terminal structures | 76 |
| Table 52 | ABC, 2x50mm ² – design sag/tension | 77 |
| Table 53 | ABC, 2x50mm ² – erection sag/tension..... | 78 |
| Table 54 | ABC, 2x50mm ² – pole data (ground good/average) no baulks | 79 |
| Table 55 | ABC, 2x50mm ² – single pole stay capability | 80 |
| Table 56 | ABC, 2x50mm ² – single pole strut loading (level conditions)..... | 80 |
| Table 57 | ABC, 2x50mm ² – single pole strut loading (1:10 downpull conditions)..... | 81 |
| Table 58 | ABC, 4x35mm ² – summary data – in-line structures | 82 |

| | | |
|-----------|--|-----|
| Table 59 | ABC, 4x35mm ² – summary data – angle structures | 82 |
| Table 60 | ABC, 4x35mm ² – design sag/tension | 83 |
| Table 61 | ABC, 4x35mm ² – erection sag/tension | 84 |
| Table 62 | ABC, 4x35mm ² – pole data (ground good/average) no baulks | 85 |
| Table 63 | ABC, 4x35mm ² – single pole stay capability | 86 |
| Table 64 | ABC, 4x35mm ² – single pole strut loading (level conditions) | 86 |
| Table 65 | ABC, 4x35mm ² – single pole strut loading (1:10 downpull conditions) | 87 |
| Table 66 | ABC, 2x35mm ² – summary data – in-line structures | 88 |
| Table 67 | ABC, 2x35mm ² – summary data – angle structures | 88 |
| Table 68 | ABC, 2x35mm ² – design sag/tension | 89 |
| Table 69 | ABC, 2x35mm ² – erection sag/tension | 90 |
| Table 70 | ABC, 2x35mm ² – pole data (ground good/average) no baulks | 91 |
| Table 71 | ABC, 2x35mm ² – single pole stay capability | 92 |
| Table 72 | ABC, 2x35mm ² – single pole strut loading (level conditions) | 92 |
| Table 73 | ABC, 2x35mm ² – single pole strut loading (1:10 downpull conditions) | 93 |
| Table 74 | ABC, 4x25mm ² – summary data – in-line structures | 94 |
| Table 75 | ABC, 4x25mm ² – summary data – angle structures | 94 |
| Table 76 | ABC, 4x25mm ² – design sag/tension | 95 |
| Table 77 | ABC, 4x25mm ² – erection sag/tension | 96 |
| Table 78 | ABC, 4x25mm ² – pole data (ground good/average) no baulks | 97 |
| Table 79 | ABC, 4x25mm ² – single pole stay capability | 98 |
| Table 80 | ABC, 4x25mm ² – single pole strut loading (level conditions) | 98 |
| Table 81 | ABC, 4x25mm ² – single pole strut loading (1:10 downpull conditions) | 99 |
| Table 82 | ABC, 2x25mm ² – summary data – in-line structures | 100 |
| Table 83 | ABC, 2x25mm ² – summary data – angle structures | 100 |
| Table 84 | ABC, 2x25mm ² – design sag/tension | 101 |
| Table 85 | ABC, 2x25mm ² – erection sag/tension | 102 |
| Table 86 | ABC, 2x25mm ² – pole data (ground good/average) no baulks | 103 |
| Table 87 | ABC, 2x25mm ² – single pole stay capability | 104 |
| Table 88 | ABC, 2x25mm ² – single pole strut loading (level conditions) | 104 |
| Table 89 | ABC, 2x25mm ² – single pole strut loading (1:10 downpull conditions) | 105 |
| Table 90 | Service, pole-to-house, ABC, 4x35mm ² – design sag/tension | 106 |
| Table 91 | Service, pole-to-house, ABC, 4x35mm ² – erection sag/tension | 107 |
| Table 92 | Service, pole-to-house, ABC, 2x35mm ² – design sag/tension | 108 |
| Table 93 | Service, pole-to-house, ABC, 2x35mm ² – erection sag/tension | 109 |
| Table 94 | Service, pole-to-house, ABC, 4x25mm ² – design sag/tension | 110 |
| Table 95 | Service, pole-to-house, ABC, 4x25mm ² – erection sag/tension | 111 |
| Table 96 | Service, pole-to-house, ABC, 2x25mm ² – design sag/tension | 112 |
| Table 97 | Service, pole-to-house, ABC, 2x25mm ² – erection sag/tension | 113 |
| Table 98 | Service, pole-to-house, concentric, Cu, single phase, 25mm ² – design sag/tension | 114 |
| Table 99 | Service, pole-to-house, concentric, Cu, single phase, 25mm ² – erection sag/tension | 115 |
| Table 100 | Concentric, Cu, three phase, 25mm ² – design sag/tension | 116 |
| Table 101 | Concentric, Cu, three phase, 25mm ² – erection sag/tension | 117 |
| Table 102 | Concentric, Cu, single phase, 35mm ² – design sag/tension | 118 |
| Table 103 | Concentric, Cu, single phase, 35mm ² – erection sag/tension | 119 |
| Table 104 | Concentric, Cu, three phase, 35mm ² – design sag/tension | 120 |
| Table 105 | Concentric, Cu, three phase, 35mm ² – erection sag/tension | 121 |
| Table 106 | Unstayed poles – maximum angle of deviation without aerial service attachment | 122 |
| Table 107 | Unstayed poles – maximum angle of deviation with aerial attachment | 122 |
| Table 108 | Additional Sag due to 50mm ² Bare Copper Conductor | 122 |

ILLUSTRATIONS

| | | |
|--------|--|----|
| Fig. 1 | Drilling and marking of wood poles for LV overhead lines using ABC | 21 |
| Fig. 2 | Unstayed intermediate support | 22 |
| Fig. 3 | Intermediate support up to 60° line deviation | 23 |
| Fig. 4 | Intermediate inside angle support up to 30° line deviation | 24 |
| Fig. 5 | Section support for angles 0° - 20° line deviation | 25 |
| Fig. 6 | Section support for angles 20° - 90° line deviation | 26 |
| Fig. 7 | Section support with LV fuses | 27 |

Fig. 8 Section support with circuit disconnecter 28

Fig. 9 Transition support for ABC to open wire 29

Fig. 10 Terminal support 30

Fig. 11 Terminal support for ABC to underground cable 31

Fig. 12 Tee-off from intermediate support..... 32

Fig. 13 Tee-off from section support 33

Fig. 14 Tee-off from section support with LV fuses 34

Fig. 15 Tee-off from section support with circuit disconnecter..... 35

Fig. 16 Single phase ABC overhead service from support 36

Fig. 17 Single phase CNE/SCNE overhead service from support..... 37

Fig. 18 Single phase CNE/SCNE underground service from support 38

Fig. 19 Multiple service distribution box (fused)..... 39

Fig. 20 Typical attachments on and between buildings 40

Fig. 21 Typical attachments to buildings 41

Fig. 22 Areas requiring proximity protection 42

Fig. 23 Typical wall-mounted distribution box 43

Fig. 24 Intermediate small angle support without strut or stay 44

INSULATED AERIAL BUNDLED CONDUCTORS FOR LOW VOLTAGE OVERHEAD DISTRIBUTION SYSTEMS – ERECTION REQUIREMENTS

FOREWORD

This technical specification supersedes ENATS 43-12 issue 1 1986 and covers the design and erection requirements of insulated Aerial Bundled Conductors (ABC) for Low Voltage (LV) overhead distribution systems for use by Distribution Network Operators (DNOs).

The data tables for this issue have been generated using ENATS 43-40 software, although this is not mandatory for voltages below 1000V.

1 SCOPE

This specification covers the constructional requirements for the erection, on poles and attached to buildings, of the following insulated LV ABC:

- 25mm² – 2 and 4 conductor bundles.
- 35mm² – 2 and 4 conductor bundles.
- 50mm² – 2 and 4 conductor bundles.
- 70mm² – 4 conductor bundles.
- 95mm² – 2 and 4 conductor bundles.
- 120mm² – 4 conductor bundles.
- Additionally, the following 4-conductor bundles may incorporate 1 or 2, 25mm² control conductors, or one 50mm² bare copper conductor:
50mm²; 70mm²; 95mm²; 120mm².

The above conductors are specified in ENATS 43-13.

General arrangements are illustrated in Clause 16. Each general arrangement incorporates a schedule of components. The data included in Clause 17 are based on these general arrangements.

This specification is written to comply with the Electricity Safety, Quality and Continuity Regulations (ESQCR) as amended.

Other conductor bundles may be used in conjunction with this specification, subject to users supplying their own erection data and verifying that the strengths of components are adequate.

2 REFERENCES

This specification makes reference to, or should be read in conjunction with, the following documents:

Electricity Safety, Quality and Continuity Regulations

| | |
|-------------|---|
| BS EN 14229 | Structural timber – Wood poles for overhead lines |
| BS 3288-1 | Insulator and conductor fittings for overhead power lines. |
| BS 7656 | Specification for low-voltage pole-mounting fuses (cut-outs). 315 A rating |
| ENATS 43-8 | Overhead Line Clearances |
| ENATS 43-13 | Aerial Bundled Conductors Insulated with Cross-Linked Polyethylene for Low Voltage Overhead Distribution |
| ENATS 43-14 | Insulated Aerial Bundled Conductors for Low Voltage Overhead Distribution Systems - Conductor Fittings and Associated Apparatus |
| ENATS 35-1 | Distribution Transformers (from 16 kVA to 1000 kVA) |
| ENATS 43-40 | High Voltage Single Circuit Overhead Lines on Wood Poles |
| ENATS 43-88 | Treatment of wood poles and associated timber for overhead lines |
| ENATS 43-91 | Stay strands and stay fittings for overhead lines |
| ENATS 43-92 | Conductor fittings for overhead lines |
| ENATS 43-95 | Steelwork for overhead lines |
| ENATS 43-96 | Fasteners and washers for wood pole overhead lines |

3 DEFINITIONS

3.1 Aerial Bundled Conductors (ABC)

The term ABC in this Specification refers to the assembly of 2 or 4 conductors to ENATS 43-13.

3.2 Anchor Clamp

A fitting which transfers the tensile forces within the tensioned conductor cores to the supporting structure.

3.3 Control Cores

Additional cores which are carried by the ABC system laid up in the outer interstices.