

IEEE Recommended Practice for the Design of Buswork Located in Seismically Active Areas

IEEE Power and Energy Society

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Substations Committee

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IEEE Recommended Practice for the Design of Buswork Located in Seismically Active Areas

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Abstract: Recommended practices for the engineering and design of flexible and rigid bus connections for bus and equipment in electric power substations located in seismically active areas are provided in this document.

Keywords: bus, buswork, conductor, connections, earthquakes, electrical equipment, flexible bus, flexible buswork, IEEE 1527™, interconnected equipment, interconnection, rigid bus, rigid buswork, seismic, seismic design, slack, substations

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Introduction

This introduction is not part of IEEE Std 1527-2018, IEEE Recommended Practice for the Design of Buswork Located in Seismically Active Areas.

During an earthquake, buswork conductors may transfer significant forces at their equipment terminals, due to the dynamic effects induced by their motion when adjacent interconnected equipment items push and pull on them. The use of suitably designed and installed buswork connections, either flexible or rigid, must be considered when seismically hardening a substation. Installation of buswork is a factor that may greatly affect the seismic performance of the installed equipment. If the buswork is not properly designed, equipment that would otherwise survive may fail. The use of seismically designed buswork increases the probability that a facility will still be operational after an earthquake. This document provides recommended practices to give guidance to the substation engineer regarding seismic considerations in the engineering and design of connections, and to provide engineers and equipment manufacturers with the knowledge of the dynamic effects of connections on interconnected equipment during seismic events. It also provides methods to account for the effects of connections in the seismic qualification of substation equipment. These effects are not accounted for in detail in any other standard.

Contents

1. Overview	14
1.1 Scope	14
1.2 Purpose	14
1.3 Application	14
2. Normative references	15
3. Definitions, acronyms, and abbreviations	15
3.1 Definitions	15
3.2 Acronyms and abbreviations	17
4. General design process	17
4.1 Introduction	17
4.2 Main design criteria	18
4.3 Design process for seismic connections	19
5. Equipment movement and elongation demand	20
5.1 Introduction	20
5.2 Seismic input	21
5.3 Foundation considerations	21
5.4 Basic connection geometry	21
5.5 Determination of the elongation demand	22
6. Design of flexible conductor	28
6.1 Advantages and limitations of flexible connection	28
6.2 Available shapes, required conductor length, and qualitative behavior	29
6.3 Verification of clearances, flexibility, and stability using the nonlinear finite element method	33
6.4 Verification of clearances, stability, and flexibility experimentally	39
6.5 Spacers for bundled conductors	41
6.6 Standardized configuration design	42
7. Design of rigid bus with flexible connector	44
7.1 General description	44
7.2 Advantages and limitations of RB-FCs	46
7.3 Design principles of an RB-FC	47
7.4 Available methods to evaluate the interaction effect	47
7.5 Determination of RB-FC in-line load displacement properties	48
7.6 Evaluation of interaction between equipment connected by rigid bus using a simplified analysis method	50
8. Methodology to account for the interaction effects of conductors in the seismic qualification of substation equipment	56
8.1 Introduction	56
8.2 Inclusion of interaction effects in the seismic qualification of equipment	56
9. Other considerations	58
Annex A (informative) Bibliography	59
Annex B (informative) Electrical clearances	62
Annex C (informative) Generalized single-degree-of-freedom (SDOF) method	64
Annex D (informative) Comparison between combination methods to obtain the elongation demand	67

Annex E (informative) Effect of adding slack on the catenary configuration	69
Annex F (informative) Examples of finite element calculations.....	72
Annex G (informative) Common conductor input properties for finite element calculations.....	74
Annex H (informative) Examples of flexibility calculations for flexible conductors	75
Annex I (informative) Maximum horizontal forces measured during experiments.....	77
Annex J (informative) Other considerations.....	78

List of Figures

Figure 1—Flowchart for design of seismic connections.....	20
Figure 2—Basic connection geometry	21
Figure 3—Determination of basic geometry from connector extremities	22
Figure 4—Upper-bound displacement according to IEEE Std 693 performance level required spectra for 2% damping	24
Figure 5—Difference between required response spectrum and time history input spectrum	26
Figure 6—Basic flexible conductor configurations	29
Figure 7—General procedure to establish the initial configuration of the conductor.....	37
Figure 8—Measured geometry of a configuration under its self-weight (Stevenson and Beattie [B31]).....	39
Figure 9—Experimental investigation of stability using water-filled tubes (Stevenson and Beattie [B31])...	40
Figure 10—Schematic of experimental setup to investigate flexibility (Stevenson and Beattie [B31])	41
Figure 11—Recommended spacer installation for AACs.....	42
Figure 12—RB-FC (Filiatrault, Kremmidas, Elgamal, and Seible [B19])	45
Figure 13—Flexible strap connectors (Song, Der Kiureghian, and Sackman, “Seismic Response and Reliability...” [B28])	45
Figure 14—Slider connectors (Song, Der Kiureghian, and Sackman, “Seismic Response and Reliability...” [B28])	46
Figure 15—ATC-24 [B4] test protocol.....	48
Figure 16—Load displacement response of a spring connector at different ductility levels (Filiatrault, Kremmidas, Elgamal, and Seible [B19]).....	49
Figure 17—Comparison between experimental results and modeling of flexible connectors (Song, Der Kiureghian, and Sackman, “Seismic Response and Reliability...” [B28]).....	50
Figure 18—Model of two equipment items connected by a linear RB-FC	52
Figure 19—Definition of $A_{E[\Delta x]}$ and equivalent stiffness of an RB-FC	55
Figure B.1—Schematic view of electrical clearance distance requirements	62
Figure B.2—Practical example of required clearances.....	63
Figure C.1—Generalized SDOF system	64
Figure C.2—Results of survey on first modal participation factor (Dastous, Filiatrault, and Pierre [B9]).....	65
Figure E.1—Effect of adding slack for catenary shapes of different spans.....	70
Figure E.2—Effect of adding slack on the sag.....	71
Figure F.1—Comparison between calculated and measured shape of a catenary configuration.....	72
Figure F.2—Clearance check with the finite-element method.....	72

Figure F.3—Comparison between calculated and measured forces of static push-pull tests (Dastous, “Nonlinear Finite Element Analysis...” [B8]).....	73
Figure H.1—Load-displacement curve with 0.25 m cyclic displacement	75
Figure H.2—Load-displacement curve with 1.25 m cyclic displacement	76
Figure J.1—Conductor sizes to minimize corona loss.....	79
Figure J.2—Conductor capacity derating factor due to proximity effects	81
Figure J.3—Recommended aluminum adapters for 3000 A, 4000 A, and 5000 A applications.....	84
Figure J.4—5000 A rated multiple conductor termination arrangement.....	85
Figure J.5—Typical copper or aluminum terminal pad adapters	88
Figure J.6—Clamps used to prevent bird caging.....	89

List of Tables

Table 1—Upper-bound displacement for IEEE Std 693 performance level required spectra at 2% damping	24
Table 2—Summary of basic flexible configurations characteristics	29
Table 3—Example of standardized rigid bus bar dimensions	43
Table 4—Standardized table for the 145 kv example	44
Table 5—Available load-displacement curves for rigid bus flexible connector	49
Table 6—MAF for seismic qualification of substation equipment	57
Table 7—ETFs for seismic qualification at the IEEE Std 693 performance level	58
Table C.1—Results of survey on first modal participation factor	65
Table G.1—Common conductor input properties for finite element calculations ^a	74
Table I.1—Maximum horizontal forces measured during experiments with flexible connections ^{a,d}	77
Table J.1—Recommended aluminum conductor current carrying capacity based on 70 °C maximum	80
Table J.2—Current carrying capacity of bare copper	80
Table J.3—Recommended terminal pad size and hole configuration	83

IEEE Recommended Practice for the Design of Buswork Located in Seismically Active Areas

1. Overview

The use of suitably designed and installed buswork connections, either flexible or rigid, must be considered when seismically hardening a substation. Installation of buswork is a factor that may greatly affect the seismic performance of the installed equipment. If the buswork is not properly designed, equipment that would otherwise survive may fail. The use of seismically designed buswork increases the probability that a facility will still be operational after an earthquake.

1.1 Scope

This document provides recommended practices for the engineering and design of flexible and rigid bus connections for bus and equipment in electric power substations located in seismically active areas. It covers the design of buswork connections in the seismic qualification of equipment covered within the scope of IEEE Std 693™.¹

1.2 Purpose

This document provides recommended practices to give guidance to the substation engineer regarding seismic considerations in the engineering and design of buswork, and to provide engineers and equipment manufacturers with the knowledge of the dynamic effects of connections on interconnected equipment during seismic events.

1.3 Application

This document is meant for primary connections to equipment terminal(s) only and is not applicable to internal equipment connections, sensing lines, or ground connections. It reflects the practice for the design of buswork in conventional substations. Flexible alternating current transmission system (FACTS) and high voltage direct current (HVDC) substations are specialized and may have exceptional elements that are beyond the scope of the present document. Even though a known solution, telescopic buses are also beyond the scope of the present document. Those elements identified as being exceptional should have a buswork analysis developed that is consistent with the objectives of IEEE Std 1527™ and approved by the user.

¹Information on references can be found in [Clause 2](#).