Preparing Activity: USACE Superseding
UFGS-26 05 48.00 10 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT
10/07

NOTE: This guide specification covers the requirements for seismic protection of electrical equipment, conduit, and exterior utilities..

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

NOTE: The intent of this specification is to provide for adequate resistance to lateral forces induced by earthquakes for electrical equipment and systems described herein. The design seismic lateral forces are in addition to the "normal" gravity forces (weight) acting on the components of a system. This guide specification will be used in conjunction with Section 13 48 73 SEISMIC CONTROL FOR MISCELLANEOUS EQUIPMENT

Equipment in the following seismic design categories do not require protection from seismic events (refer to UFC 3-301-01 for definition of categories A through F).

a. Equipment in Seismic Design Categories A and B.

b. Equipment in Seismic Design Category C when the importance factor is equal to 1.0.

c. Equipment in Seismic Design Categories D, E, and F that are mounted at 1.2 m 4 feet or less above a floor level and weigh 1780 N 400 lbs or less and are not critical to the continued operation of the structure.

d. Equipment in Seismic Design Categories C, D, E, and F weighing 95 N 20 lbs or less or distribution systems weighing 7 N/m 5 lb/ft or less.

This section can be used for bracing details of medical equipment by editing the specification accordingly.

****

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2017) Steel Construction Manual

ASTM INTERNATIONAL (ASTM)

ASTM E580/E580M	(2022) Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01 (2023) Structural Engineering

UNDERWRITERS LABORATORIES (UL)

UL 1598 (2021; Reprint Jun 2021) Luminaires

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

****

NOTE: Designer should verify that specified details do not interfere with the performance of the cathodic protection system (when used) or of the vibration isolation systems.

For systems and equipment in buildings that have a performance objective higher than life-safety, the designer should show a "GA" classification for the items under SD-02 Shop Drawings in the SUBMITTALS paragraph. The Engineer of Record (EOR) should review the details of these essential systems and assess their impact on the structural supporting system of the essential building.

****

Apply the requirements for seismic protection measures described in this section to the electrical equipment and systems listed below. Structural requirements are in accordance with Section 13 48 73 SEISMIC CONTROL FOR MISCELLANEOUS EQUIPMENT.

1.2.2 Electrical Equipment

****

NOTE: The designer must ensure that the list below includes all electrical items to be braced. Delete the items which are not part of the project and add items which are not included in the list.

For equipment and systems in buildings with a performance objective greater than life-safety, the designer should provide two separate lists of equipment and systems: 1) Items that are essential to the higher level of post-earthquake performance, and 2) Items that are not essential but are necessary to provide a life-safety level of earthquake protection.

****

Include the following items to the extent required on the drawings or in other sections of these specifications:

Control Panels	Air Handling Units

Pumps with Motors	Switchgear
Light Fixtures	Unit Substations
Motor Control Centers	Transformers
Switchboards (Floor Mounted)	Storage Racks
Solar Heating Units	[_____]

1.2.3 Electrical Systems

****
NOTE: The designer must list below all electrical systems which are to be installed or modified.
****

Install the following electrical systems as required on the drawings and other sections of these specifications and seismically protect in accordance with this specification: [_____]

1.2.4 Contractor Designed Bracing

****
NOTE: Retain this paragraph when the Contractor will design the bracing. The designer will refer and/or modify the listings above or will list below the equipment and systems to receive seismic bracing. Delete this paragraph when all bracing details and locations are indicated on the drawings.
****

Submit copies of the Design Calculations with the Drawings. Calculations must be approved, certified, stamped and signed by a Registered Professional Engineer. Verify the capability of structural members to which bracing is attached for carrying the load from the brace. Design the bracing in accordance with UFC 3-301-01 and additional data furnished by the Contracting Officer. Accomplish resistance to lateral forces induced by earthquakes without consideration of friction resulting from gravity loads. UFC 3-301-01 uses parameters for the building, not for the equipment in the building; therefore, corresponding adjustments to the formulas are required. Loadings determined using UFC 3-301-01 are based on strength design; therefore, use AISC 325 for the design. Develop the bracing for the following electrical equipment and systems: [_____].

1.2.5 Conduits Requiring No Special Seismic Restraints

****
NOTE: Retain only those items found in the project for this list of conduits that do not require seismic restraints. For facilities designated as critical, hazardous, or essential, delete or make exceptions for conduits which will require seismic restraint.
****

Seismic restraints may be omitted from electrical conduit less than 64 mm

2-1/2 inches trade size and [_____]. Seismically protect all other interior conduit as specified.

1.3 EQUIPMENT REQUIREMENTS

****

NOTE: Seismic control does not guarantee that the equipment itself is rugged enough to survive earthquake shaking. When a piece of equipment is required to remain operational after an earthquake, the manufacturer should be consulted regarding the capabilities of the equipment to withstand seismic loading.

****

Submit detail drawings along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed. Submittals must be complete in detail, indicating thickness, type, grade, class of metal, and dimensions; and must show construction details, reinforcement, anchorage, and installation with relation to the building construction. Submit copies of the design calculations with the detail drawings. Calculations must be stamped by a registered engineer and must verify the capability of structural members to which bracing is attached for carrying the load from the brace.

1.3.1 Rigidly Mounted Equipment

****

NOTE: Rigidly mounted equipment is defined as having a period of vibration of 0.06 seconds or less for the equipment plus its mounting. Equipment with a fundamental period greater than 0.06 seconds should be assumed to be flexibly mounted or nonrigid and designed in accordance with the next paragraph below.

List items that may require additional reinforcements (internally) to prevent permanent deformation, dislocations, separation of components, or other damage, which would render the equipment inoperative for significant periods of time following a seismic event and to meet the specified requirements (such as engine-driven generators, etc., which consist of a number of individual components built into an assembly by the manufacturers). For emergency generators include auxiliary items required for the generator to operate, such as battery racks and day tanks.

****

The following specific items of equipment: [_____] to be furnished under this contract must be constructed and assembled to withstand the seismic forces specified in UFC 3-301-01. Entirely locate each item of rigid electrical equipment and rigidly attach on one side only of a building expansion joint. Provide items such as piping, electrical conduit, which cross the expansion joint with flexible joints that are capable of accommodating displacements equal to the full width of the joint in both orthogonal directions.

Engine-Generators
Substations
Transformers
Switch Boards and Switch Gears
Motor Control Centers
Free Standing Electric Motors
[_____]

1.3.2 Nonrigid or Flexibly-Mounted Equipment

****
NOTE: The appropriate lateral force coefficient, based on the guidelines in Section 13 48 73 SEISMIC CONTROL FOR MISCELLANEOUS EQUIPMENT for nonrigid or flexibly-mounted equipment, should be calculated and inserted in the second bracketed blank space.
****

The following specific items of equipment to be furnished: [_____] must be constructed and assembled to resist a horizontal lateral force of [_____] times the operating weight of the equipment at the vertical center of gravity of the equipment.

1.4 SUBMITTALS

****
NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed

item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Lighting Fixtures in Buildings

Equipment Requirements

SD-03 Product Data

Lighting Fixtures in Buildings; G[, [_____]]

Equipment Requirements; G[, [_____]]

Contractor Designed Bracing; G[, [_____]]

PART 2 PRODUCTS

****
NOTE: Appropriate materials for structural supports must be used in corrosive environments. Dissimilar metals must be isolated.
****

2.1 LIGHTING FIXTURE SUPPORTS

Provide lighting fixtures and supports conforming to UL 1598.

2.2 SWAY BRACING MATERIALS

Provide sway bracing materials (e.g. rods, plates, rope, angles, etc.) as specified in Section 13 48 73 SEISMIC CONTROL FOR MISCELLANEOUS EQUIPMENT.

PART 3 EXECUTION

3.1 SWAY BRACES FOR CONDUIT

Brace conduit as for an equivalent weight pipe in accordance with Section 23 05 48.19 [SEISMIC] BRACING FOR HVAC.

3.2 LIGHTING FIXTURES IN BUILDINGS

Provide lighting fixtures and supports conforming to the following:

3.2.1 Pendant Fixtures

Provide pendant fixtures conforming to the requirements of UFC 3-301-01.

3.2.2 Ceiling Attached Fixtures

3.2.2.1 Recessed Fluorescent Fixtures

Support recessed fluorescent individual or continuous-row mounted fixtures by a seismic-resistant suspended ceiling support system built in accordance with [ASTM E580/E580M][Section 09 51 00 ACOUSTICAL CEILINGS]. Provide seismic protection for the fixtures conforming to the requirements of UFC 3-301-01. Recessed lighting fixtures not over 25 kg 56 pounds in weight may be supported by and attached directly to the ceiling system runners using screws or bolts, number and size as required by the seismic design. Provide lock or screw attachments for fixture accessories, including louvers, diffusers, and lenses.

3.2.2.2 Surface-Mounted Fluorescent Fixtures

Attach surface-mounted fluorescent individual or continuous-row fixtures to a seismic-resistant ceiling support system built in accordance with [ASTM E580/E580M][Section 09 51 00 ACOUSTICAL CEILINGS]. Provide seismic protection for the fixtures conforming to the requirements of UFC 3-301-01.

3.2.3 Assembly Mounted on Outlet Box

Design a supporting assembly, that is intended to be mounted on an outlet box, to accommodate mounting features on [100] [75] mm [4] [3] inch boxes, plaster rings, and fixture studs.

3.2.4 Wall-Mounted Emergency Light Unit

Design and secure attachments for wall-mounted emergency light units for the worst expected seismic disturbance at the site.

3.2.5 Lateral Force

Provide structural requirements for light fixture bracing in accordance with Section 13 48 73 SEISMIC CONTROL FOR MISCELLANEOUS EQUIPMENT.

-- End of Section --