# UL 62368-1

## STANDARD FOR SAFETY

Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements

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UL Standard for Safety for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1

Third Edition, Dated December 13, 2019

***Summary of Topics***

***This revision of ANSI/UL 62368-1 dated October 22, 2021 includes updates to correlate with NFPA 70:2020 and NFPA 75:2020; Annex DVA, Annex DVF, Annex DVH, removes the reference of UL 60320-1 from Annex DVE and Annex DVF and miscellaneous editorial updates; R.3, T.7, and Figure V.5.***

***UL 62368-1 is an adoption of IEC 62368-1, Audio/video, information and communication technology equipment – Part 1: Safety requirements (Third Edition, issued October 2018). Please note that the national difference document incorporates all of the U.S. national differences for UL 62368-1.***

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated May 28, 2021 and July 30, 2021.

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Full document details: UL 62368-1 2021

## CONTENTS

**Preface** ..... 13

**NATIONAL DIFFERENCES** ..... 15

**FOREWORD** ..... 17

**INTRODUCTION** ..... 21

1 Scope ..... 37
1DV.1 Modify this clause by adding the following text: ..... 39
1DV.2 Modify Clause 1 by adding the following text: ..... 39
1DV.3 Modify Clause 1 by replacing Note 3 with the following: ..... 39
1DV.4 Modify Clause 1 by adding the following paragraph and Note: ..... 39
1DV.5 Add Clause 1DV.5.1 to Clause 1 ..... 40
2 Normative references ..... 41
2DV Modify Clause 2 by adding the following references: ..... 48
3 Terms, definitions and abbreviated terms ..... 52
3.1 Energy source abbreviations ..... 52
3.2 Other abbreviations ..... 52
3.3 Terms and definitions ..... 54
3.3DV Modify 3.3 by adding the term “telecommunication network” to the list. ..... 54
4 General requirements ..... 72
4.1 General ..... 72
4.2 Energy source classifications ..... 77
4.3 Protection against energy sources ..... 78
4.4 Safeguards ..... 85
4.5 Explosion ..... 88
4.6 Fixing of conductors ..... 89
4.7 Equipment for direct insertion into mains socket-outlets ..... 90
4.8 Equipment containing coin / button cell batteries ..... 91
4.9 Likelihood of fire or shock due to entry of conductive objects ..... 94
4.10 Components requirements ..... 95
5 Electrically-caused injury ..... 95
5.1 General ..... 95
5.2 Classification and limits of electrical energy sources ..... 95
5.3 Protection against electrical energy sources ..... 101
5.4 Insulation materials and requirements ..... 104
5.5 Components as safeguards ..... 147
5.6 Protective conductor ..... 152
5.7 Prospective touch voltage, touch current and protective conductor current ..... 160
5.8 Backfeed safeguard in battery backed up supplies ..... 169
6 Electrically-caused fire ..... 169
6.1 General ..... 169
6.2 Classification of power sources (PS) and potential ignition sources (PIS) ..... 169
6.3 Safeguards against fire under normal operating conditions and abnormal operating conditions ..... 175
6.4 Safeguards against fire under single fault conditions ..... 176
6.5 Internal and external wiring ..... 194
6.6 Safeguards against fire due to the connection of additional equipment ..... 195
6.7DV Add Clause 6.7DV to Clause 6: ..... 196
7 Injury caused by hazardous substances ..... 196
7.1 General ..... 196
7.2 Reduction of exposure to hazardous substances ..... 196

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Full document details: UL 62368-1 2021

7.3 Ozone exposure ... 196
7.4 Use of personal safeguards or personal protective equipment (PPE) ... 196
7.5 Use of instructional safeguards and instructions ... 197
7.6 Batteries and their protection circuits ... 197
8 Mechanically-caused injury ... 197
8.1 General ... 197
8.2 Mechanical energy source classifications ... 197
8.3 Safeguards against mechanical energy sources ... 199
8.4 Safeguards against parts with sharp edges and corners ... 200
8.5 Safeguards against moving parts ... 200
8.6 Stability of equipment ... 208
8.7 Equipment mounted to a wall, ceiling or other structure ... 212
8.8 Handle strength ... 214
8.9 Wheels or casters attachment requirements ... 215
8.10 Carts, stands, and similar carriers ... 215
8.11 Mounting means for slide-rail mounted equipment (SRME) ... 217
8.12 Telescoping or rod antennas ... 220
9 Thermal burn injury ... 220
9.1 General ... 220
9.2 Thermal energy source classifications ... 220
9.3 Touch temperature limits ... 221
9.4 Safeguards against thermal energy sources ... 223
9.5 Requirements for safeguards ... 224
9.6 Requirements for wireless power transmitters ... 224
10 Radiation ... 228
10.1 General ... 228
10.2 Radiation energy source classifications ... 228
10.3 Safeguards against laser radiation ... 231
10.4 Safeguards against optical radiation from lamps and lamp systems (including LED types) ... 231
10.5 Safeguards against X-radiation ... 235
10.6 Safeguards against acoustic energy sources ... 236

**Annex A (informative) Examples of equipment within the scope of this document**

**Annex B (normative) Normal operating condition tests, abnormal operating condition tests and single fault condition tests**

B.1 General ... 242
B.1.1 Test applicability ... 242
B.1.2 Type of test ... 242
B.1.3 Test samples ... 242
B.1.4 Compliance by inspection of relevant data ... 242
B.1.5 Temperature measurement conditions ... 242
B.2 Normal operating conditions ... 243
B.2.1 General ... 243
B.2.2 Supply frequency ... 243
B.2.3 Supply voltage ... 243
B.2.4 Normal operating voltages ... 243
B.2.5 Input test ... 244
B.2.6 Operating temperature measurement conditions ... 245
B.2.7 Battery charging and discharging under normal operating conditions ... 245
B.3 Simulated abnormal operating conditions ... 245
B.3.1 General ... 245
B.3.2 Covering of ventilation openings ... 246

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Full document details: UL 62368-1 2021

B.3.3 DC mains polarity test ... 247
B.3.4 Setting of voltage selector ... 247
B.3.5 Maximum load at output terminals ... 247
B.3.6 Reverse battery polarity ... 247
B.3.7 Audio amplifier abnormal operating conditions ... 247
B.3.8 Compliance criteria during and after abnormal operating conditions ... 247
B.4 Simulated single fault conditions ... 247
B.4.1 General ... 247
B.4.2 Temperature controlling device ... 248
B.4.3 Motor tests ... 248
B.4.4 Functional insulation ... 248
B.4.5 Short-circuit and interruption of electrodes in tubes and semiconductors ... 249
B.4.6 Short-circuit or disconnection of passive components ... 249
B.4.7 Continuous operation of components ... 249
B.4.8 Compliance criteria during and after single fault conditions ... 250
B.4.9 Battery charging and discharging under single fault conditions ... 250

**Annex C (normative) UV radiation**

C.1 Protection of materials in equipment from UV radiation ... 251
C.1.1 General ... 251
C.1.2 Requirements ... 251
C.1.3 Test method and compliance criteria ... 251
C.2 UV light conditioning test ... 252
C.2.1 Test apparatus ... 252
C.2.2 Mounting of test samples ... 252
C.2.3 Carbon-arc light-exposure test ... 252
C.2.4 Xenon-arc light-exposure test ... 252

**Annex D (normative) Test generators**

D.1 Impulse test generators ... 253
D.2 Antenna interface test generator ... 254
D.3 Electronic pulse generator ... 256

**Annex E (normative) Test conditions for equipment containing audio amplifiers**

E.1 Electrical energy source classification for audio signals ... 257
E.2 Audio amplifier normal operating conditions ... 257
E.3 Audio amplifier abnormal operating conditions ... 258

**Annex F (normative) Equipment markings, instructions, and instructional safeguards**

F.1 General ... 259
F.2 Letter symbols and graphical symbols ... 259
F.2.1 Letter symbols ... 259
F.2.2 Graphical symbols ... 259
F.2.3 Compliance criteria ... 259
F.2.3DV Modify F.2.3 by adding the following text: ... 259
F.3 Equipment markings ... 259
F.3.1 Equipment marking locations ... 259
F.3.2 Equipment identification markings ... 260
F.3.3 Equipment rating markings ... 260
F.3.3DV Modify F.3.3 by adding the following Note beneath the clause title: ... 260
F.3.4 Voltage setting device ... 263

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Full document details: UL 62368-1 2021

F.3.5 Markings on terminals and operating devices ..... 263
F.3.6 Equipment markings related to equipment classification ..... 264
F.3.7 Equipment IP rating marking ..... 265
F.3.7DV Modify F.3.7 by adding the following: ..... 265
F.3.8 External power supply output marking ..... 265
F.3.9 Durability, legibility and permanence of markings ..... 266
F.3.10 Test for the permanence of markings ..... 266
F.4 Instructions ..... 266
F.5 Instructional safeguards ..... 267

**Annex G (normative) Components**

G.1 Switches ..... 271
G.1.1 General ..... 271
G.1.2 Requirements ..... 271
G.1.3 Test method and compliance criteria ..... 272
G.2 Relays ..... 272
G.2.1 Requirements ..... 272
G.2.2 Overload test ..... 273
G.2.3 Relay controlling connectors supplying power to other equipment ..... 273
G.2.4 Test method and compliance criteria ..... 273
G.3 Protective devices ..... 273
G.3.1 Thermal cut-offs ..... 273
G.3.2 Thermal links ..... 275
G.3.3 PTC thermistors ..... 276
G.3.4 Overcurrent protective devices ..... 276
G.3.5 Safeguard components not mentioned in G.3.1 to G.3.4 ..... 276
G.4 Connectors ..... 277
G.4.1 Clearance and creepage distance requirements ..... 277
G.4.2 Mains connectors ..... 277
G.4.3 Connectors other than mains connectors ..... 277
G.4.3DV Modify G.4.3 as follows: ..... 277
G.5 Wound components ..... 278
G.5.1 Wire insulation in wound components ..... 278
G.5.2 Endurance test ..... 278
G.5.3 Transformers ..... 280
G.5.4 Motors ..... 290
G.6 Wire insulation ..... 295
G.6.1 General ..... 295
G.6.2 Enamelled winding wire insulation ..... 296
G.7 Mains supply cords ..... 296
G.7.1 General ..... 296
G.7.2 Cross sectional area ..... 297
G.7.2DV Modify G.7.2 as follows: ..... 298
G.7.3 Cord anchorages and strain relief for non-detachable power supply cords ..... 298
G.7.4 Cord entry ..... 299
G.7.5 Non-detachable cord bend protection ..... 300
G.7.6 Supply wiring space ..... 301
G.7ADV Add Clause G.7ADV as follows: ..... 302
G.8 Varistors ..... 305
G.8.1 General ..... 305
G.8.2 Safeguards against fire ..... 306
G.9 Integrated circuit (IC) current limiters ..... 308
G.9.1 Requirements ..... 308
G.9.2 Test program ..... 308
G.9.3 Compliance criteria ..... 309

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Full document details: UL 62368-1 2021

G.10 Resistors ... 310
G.10.1 General ... 310
G.10.2 Conditioning ... 310
G.10.3 Resistor test ... 310
G.10.4 Voltage surge test ... 310
G.10.5 Impulse test ... 310
G.10.6 Overload test ... 310
G.11 Capacitors and RC units ... 311
G.11.1 General ... 311
G.11.2 Conditioning of capacitors and RC units ... 311
G.11.3 Rules for selecting capacitors ... 311
G.12 Optocouplers ... 312
G.13 Printed boards ... 312
G.13.1 General ... 312
G.13.2 Uncoated printed boards ... 312
G.13.3 Coated printed boards ... 312
G.13.4 Insulation between conductors on the same inner surface ... 314
G.13.5 Insulation between conductors on different surfaces ... 314
G.13.6 Tests on coated printed boards ... 314
G.14 Coatings on component terminals ... 318
G.14.1 Requirements ... 318
G.14.2 Test method and compliance criteria ... 318
G.15 Pressurized liquid filled components ... 318
G.15.1 Requirements ... 318
G.15.2 Test methods and compliance criteria ... 318
G.15.3 Compliance criteria ... 320
G.16 IC that includes a capacitor discharge function (ICX) ... 320
G.16.1 Requirements ... 320
G.16.2 Tests ... 320
G.16.3 Compliance criteria ... 320

**Annex H (normative) Criteria for telephone ringing signals**

H.1 General ... 322
H.2 Method A ... 322
H.2DV Modify H.2 by adding the following text after the second dashed paragraph in a): ... 325
H.3 Method B ... 325
H.3.1 Ringing signal ... 325
H.3.2 Tripping device and monitoring voltage ... 326
H.4DV Add Clause H.4DV.1 to Annex H: ... 327

**Annex I (informative) Overvoltage categories(see IEC 60364-4-44)**

**Annex J (normative) Insulated winding wires for use without interleaved insulation**

J.1 General ... 331
J.2 Type tests ... 331
J.2.1 General ... 331
J.2.2 Electric strength ... 331
J.2.3 Flexibility and adherence ... 332
J.2.4 Heat shock ... 333
J.2.5 Retention of electric strength after bending ... 333
J.3 Testing during manufacturing ... 333
J.3.1 General ... 333

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Full document details: UL 62368-1 2021

J.3.2 Spark test ..... 334
J.3.3 Sampling test ..... 334

**Annex K (normative) Safety interlocks**

K.1 General ..... 335
K.1.1 General requirements ..... 335
K.1.2 Test method and compliance criteria ..... 335
K.2 Components of the safety interlock safeguard mechanism ..... 336
K.3 Inadvertent change of operating mode ..... 336
K.4 Interlock safeguard override ..... 336
K.5 Fail-safe ..... 336
K.5.1 Requirement ..... 336
K.5.2 Test method and compliance criteria ..... 336
K.6 Mechanically operated safety interlocks ..... 337
K.6.1 Endurance requirement ..... 337
K.6.2 Test method and compliance criteria ..... 337
K.7 Interlock circuit isolation ..... 337
K.7.1 Separation distances for contact gaps and interlock circuit elements ..... 337
K.7.2 Overload test ..... 338
K.7.3 Endurance test ..... 338
K.7.4 Electric strength test ..... 338

**Annex L (normative) Disconnect devices**

L.1 General requirements ..... 339
L.2 Permanently connected equipment ..... 339
L.3 Parts that remain energized ..... 339
L.4 Single-phase equipment ..... 339
L.5 Three-phase equipment ..... 340
L.6 Switches as disconnect devices ..... 340
L.7 Plugs as disconnect devices ..... 340
L.8 Multiple power sources ..... 340
L.9 Compliance criteria ..... 341

**Annex M (normative) Equipment containing batteries and their protection circuits**

M.1 General requirements ..... 342
M.2 Safety of batteries and their cells ..... 342
M.2.1 Requirements ..... 342
M.2.2 Compliance criteria ..... 342
M.3 Protection circuits for batteries provided within the equipment ..... 342
M.3.1 Requirements ..... 342
M.3.2 Test method ..... 343
M.3.3 Compliance criteria ..... 344
M.4 Additional safeguards for equipment containing a portable secondary lithium battery ..... 344
M.4.1 General ..... 344
M.4.2 Charging safeguards ..... 344
M.4.3 Fire enclosure ..... 345
M.4.4 Drop test of equipment containing a secondary lithium battery ..... 346
M.5 Risk of burn due to short-circuit during carrying ..... 347
M.5.1 Requirements ..... 347
Test method and compliance criteria ..... 347
M.6 Safeguards against short-circuits ..... 347
M.6.1 Requirements ..... 347

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Full document details: UL 62368-1 2021

M.6.2 Compliance criteria ..... 347
M.7 Risk of explosion from lead acid and NiCd batteries ..... 348
M.7.1 Ventilation preventing an explosive gas concentration ..... 348
M.7.2 Test method and compliance criteria ..... 348
M.7.3 Ventilation tests ..... 351
M.7.4 Marking requirement ..... 352
M.8 Protection against internal ignition from external spark sources of batteries with aqueous electrolyte ..... 352
M.8.1 General ..... 352
M.8.2 Test method ..... 353
M.9 Preventing electrolyte spillage ..... 355
M.9.1 Protection from electrolyte spillage ..... 355
M.9.2 Tray for preventing electrolyte spillage ..... 356
M.10 Instructions to prevent reasonably foreseeable misuse ..... 356

**Annex N (normative) Electrochemical potentials (V)**

**Annex O(normative) Measurement of creepage distances and clearances**

**Annex P (normative) Safeguards against conductive objects**

P.1 General ..... 369
P.2 Safeguards against entry or consequences of entry of a foreign object ..... 369
P.2.1 General ..... 369
P.2.2 Safeguards against entry of a foreign object ..... 369
P.2.3 Safeguards against the consequences of entry of a foreign object ..... 371
P.3 Safeguards against spillage of internal liquids ..... 373
P.3.1 General ..... 373
P.3.2 Determination of spillage consequences ..... 373
P.3.3 Spillage safeguards ..... 374
P.3.4 Compliance criteria ..... 374
P.4 Metallized coatings and adhesives securing parts ..... 374
P.4.1 General ..... 374
P.4.2 Tests ..... 375

**Annex Q (normative) Circuits intended for interconnection with building wiring**

Q.1 Limited power source ..... 377
Q.1.1 Requirements ..... 377
Q.1.2 Test method and compliance criteria ..... 377
Q.2 Test for external circuits – paired conductor cable ..... 378
Q.3DV Add Clause Q.3DV.1 to Annex Q: ..... 379

**Annex R (normative) Limited short-circuit test**

R.1 General ..... 381
R.2 Test setup ..... 381
R.3 Test method ..... 381
R.4 Compliance criteria ..... 382

**Annex S (normative) Tests for resistance to heat and fire**

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Full document details: UL 62368-1 2021

S.1 Flammability test for fire enclosure and fire barrier materials of equipment where the steady state power does not exceed 4 000 W ... 383
S.2 Flammability test for fire enclosure and fire barrier integrity ... 384
S.3 Flammability tests for the bottom of a fire enclosure ... 385
S.3.1 Mounting of samples ... 385
S.3.2 Test method and compliance criteria ... 385
S.4 Flammability classification of materials ... 386
S.5 Flammability test for fire enclosure materials of equipment with a steady state power exceeding 4 000 W ... 387

**Annex T (normative) Mechanical strength tests**

T.1 General ... 388
T.2 Steady force test, 10 N ... 388
T.3 Steady force test, 30 N ... 388
T.4 Steady force test, 100 N ... 388
T.5 Steady force test, 250 N ... 388
T.6 Enclosure impact test ... 388
T.7 Drop test ... 389
T.8 Stress relief test ... 389
T.9 Glass impact test ... 390
T.10 Glass fragmentation test ... 390
T.11 Test for telescoping or rod antennas ... 391

**Annex U (normative) Mechanical strength of CRTs and protection against the effects of implosion**

U.1 General ... 392
U.2 Test method and compliance criteria for non-intrinsically protected CRTs ... 392
U.3 Protective screen ... 393

**Annex V (normative) Determination of accessible parts**

V.1 Accessible parts of equipment ... 394
V.1.1 General ... 394
V.1.2 Test method 1 – Surfaces and openings tested with jointed test probes ... 394
V.1.3 Test method 2 – Openings tested with straight unjointed test probes ... 394
V.1.4 Test method 3 – Plugs, jacks, connectors ... 397
V.1.5 Test method 4 – Slot openings ... 398
V.1.6 Test method 5 – Terminals intended to be used by an ordinary person ... 399
V.2 Accessible part criterion ... 399

**Annex W (informative) Comparison of terms introduced in this document**

W.1 General ... 400
W.2 Comparison of terms ... 400

**Annex X (normative) Alternative method for determining clearances for insulation in circuits connected to an AC mains not exceeding 420 V peak (300 V RMS)**

**Annex Y (normative) Construction requirements for outdoor enclosures**

Y.1 General ... 412
Y.2 Resistance to UV radiation ... 412

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Full document details: UL 62368-1 2021

Y.2DV Modify Y.2 by adding the following paragraph after the second paragraph: ..... 412
Y.3 Resistance to corrosion..... 412
Y.3.1 General..... 412
Y.3.1DV Modify Y.3.1 by adding the following Note at the end: ..... 413
Y.3.2 Test apparatus..... 413
Y.3.3 Water – saturated sulphur dioxide atmosphere..... 413
Y.3.4 Test procedure..... 414
Y.3.5 Compliance criteria ..... 414
Y.4 Gaskets..... 414
Y.4.1 General..... 414
Y.4DV Modify Y.4 by adding the following paragraph at the end:..... 415
Y.4.2 Gasket tests ..... 415
Y.4.3 Tensile strength and elongation tests..... 415
Y.4.4 Compression test..... 415
Y.4.5 Oil resistance ..... 417
Y.4.6 Securing means..... 417
Y.5 Protection of equipment within an outdoor enclosure..... 417
Y.5.1 General..... 417
Y.5.1DV Modify Y.51 by adding the following paragraphs at the end: ..... 418
Y.5.2 Protection from moisture ..... 418
Y.5.3 Water spray test..... 419
Y.5.4 Protection from plants and vermin ..... 422
Y.5.5 Protection from excessive dust ..... 422
Y.6 Mechanical strength of enclosures..... 423
Y.6.1 General..... 423
Y.6.2 Impact test ..... 423

**Annex DVA (normative) Canadian and U.S. regulatory-based requirements**

Annex DVA Add Annex DVA as follows: ..... 424

**Annex DVB (normative) Equipment used in health care facilities**

Annex DVB Add Annex DVB as follows:..... 442

**Annex DVC (normative) Under kitchen cabinet equipment**

ANNEX DVC Add Annex DVC as follows: ..... 446

**Annex DVD (informative) D.C. powered equipment and centralized d.c. power systems (DC mains)**

Annex DVD Add Annex DVD as follows: ..... 449

**Annex DVE (normative) UL and CSA component requirements (mandatory)**

Annex DVE Add Annex DVE as follows:..... 452

**Annex DVF (normative) UL and CSA component requirements (alternative to IEC standards)**

Annex DVF Add Annex DVF as follows: ..... 459

**Annex DVG (normative) UL and CSA component requirements (alternative)**

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Annex DVG Add Annex DVG as follows: ..... 469

**Annex DVH (normative) Permanently connected equipment – mains connections**

Annex DVH Add Annex DVH as follows: ..... 472

**Annex DVI (normative) Safeguards against electrically-caused fire due to overvoltage from power line crosses**

Annex DVI Add Annex DVI as follows: ..... 486

**Annex DVJ (normative) Acoustic tests for telecommunications equipment**

Annex DVJ Add Annex DVJ as follows: ..... 496

**Annex DVK (normative) Canadian and U.S. markings and instructions**

Annex DVK Add Annex DVK as follows: ..... 505

**Bibliography**

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# Preface

This is the harmonized CSA Group and UL standard for Audio/video, information and communication technology equipment – Part 1: Safety requirements. It is the third edition of CSA C22.2 No. 62368-1 and the third edition of UL 62368-1. This edition of CSA C22.2 No. 62368-1 supersedes the previous edition published on December 1, 2014. This edition of UL 62368-1 supersedes the previous edition published on December 1, 2014. This harmonized standard has been jointly revised on October 22, 2021. For this pupose, CSA Group and UL are issuing revision pages dated October 22, 2021.

This harmonized standard is based on IEC Publication 62368-1, third edition, Audio/video, information and communication technology equipment – Part 1: Safety requirements, issued October 2018. IEC Publication 62368-1 is copyrighted by the IEC.

This harmonized standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Committee (THC 62368) for Audio/Video, Information Technology, and Communication Technology Equipment are gratefully acknowledged.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This standard was reviewed by the CSA Subcommittee on Safety of Electronic Equipment within the Field of Audio/Video, Information, and Communication Technology, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

### Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

### Level of harmonization

This standard adopts the IEC text with national differences.

This standard is published as an equivalent standard for CSA Group and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

All national differences from the IEC text are included in the CSA Group and UL versions of the standard. While the technical content is the same in each organization's version, the format and presentation may differ.

### Reasons for differences from IEC

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Differences from the IEC are being added in order to address safety and regulatory situations present in the US and Canada.

**Interpretations**

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

**IEC Copyright**

For CSA Group, the text, figures, and tables of International Electrotechnical Commission Publication 62368-1, Audio/video, information and communication technology equipment – Part 1: Safety requirements, copyright 2018, are used in this standard with the consent of the International Electrotechnical Commission. The IEC Foreword and Introduction are not a part of the requirements of this standard but are included for information purposes only.

These materials are subject to copyright claims of IEC and UL. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of UL. All requests pertaining to the Audio/video, information and communication technology equipment – Part 1: Safety requirements, UL 62368-1 Standard should be submitted to UL.

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## NATIONAL DIFFERENCES

GENERAL

National Differences from the text of International Electrotechnical Commission (IEC) Publication 62368-1, Audio/video, information and communication technology equipment – Part 1: Safety requirements, copyright 2018, are indicated by notations (differences) and are presented in bold text. The national difference type is included in the body.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

**DR –** These are National Differences based on the **national regulatory requirements**.

**D1 –** These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

**D2 –** These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

**DC –** These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

**DE –** These are National Differences based on **editorial comments or corrections**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

> ***Addition / Add*** - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.
>
> ***Modification / Modify*** - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.
>
> ***Deletion / Delete*** - A deletion entails complete deletion of an entire numbered clause, subclause, table, figure, or annex without any replacement text.

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# FOREWORD

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT – Part 1: Safety requirements

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

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4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

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6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62368-1 has been prepared by TC 108: Safety of electronic equipment within the field of audio/video, information technology and communication technology.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

– addition of requirements for outdoor equipment;

– new requirements for optical radiation;

– addition of requirements for insulating liquids;

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– addition of requirements for work cells;

– addition of requirements for wireless power transmitters;

– addition of requirements for fully insulated winding wire (FIW);

– alternative method for determination of top, bottom and side openings for fire enclosures;

– alternative requirements for sound pressure.

The text of this document is based on the following documents:

| FDIS | Report on voting |
|---|---|
| 108/701/FDIS | 108/707/RVD |

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62368 series, published under the general title *Audio/video, information and communication technology equipment*, can be found on the IEC website.

The “in some countries” notes regarding differing national practices are contained in the following clauses, subclauses and tables:

0.2.1, 1, 3.3.8.1, 3.3.8.3, 4.1.15, 4.7.3, 5.2.2.2, 5.4.2.3.2.4, 5.4.2.5, 5.4.5.1, 5.4.10.2.1, 5.4.10.2.2, 5.4.10.2.3, 5.5.2.1, 5.5.6, 5.6.4.2.1, 5.6.8, 5.7.6, 5.7.7.1, 8.5.4.2.3, 10.5.3, 10.6.1, F.3.3.6, Y.4.1, Y.4.5, Table 12, Table 13, Table 14 and Table 39.

In this document, the following print types or formats are used:

– requirements proper and normative annexes: in roman type;

– compliance statements and test specifications: *in italic type*;

– notes/explanatory matter: in smaller roman type;

– normative conditions within tables: in smaller roman type;

– terms that are defined in 3.3: **bold**.

In figures and tables, if colour is available:

– green colour denotes a class 1 energy source;

– yellow colour denotes a class 2 energy source;

– red colour denotes a class 3 energy source.

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A comparison of terms introduced in this document that are different from other existing IEC documents is given in Annex W.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

NOTE Explanatory information related to IEC 62368-1 is contained in IEC TR 62368-2. It provides rationale together with explanatory information related to this document.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

**DV.1 DE *Modification: Add the following to the IEC Foreword:***

**The numbering system in the standard uses a space instead of a comma to indicate thousands and uses a comma instead of a period to indicate a decimal point. For example, 1 000 means 1,000 and 1,01 means 1.01.**

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# INTRODUCTION

## 0 Principles of this product safety standard

### 0.1 Objective

This part of IEC 62368 is a product safety standard that classifies energy sources, prescribes SAFEGUARDS against those energy sources, and provides guidance on the application of, and requirements for, those SAFEGUARDS.

The prescribed SAFEGUARDS are intended to reduce the likelihood of pain, injury and, in the case of fire, property damage.

The objective of the INTRODUCTION is to help designers to understand the underlying principles of safety in order to design safe equipment. These principles are informative and not an alternative to the detailed requirements of this document.

### 0.2 Persons

#### 0.2.1 General

This document describes SAFEGUARDS for the protection of three kinds of persons: the ORDINARY PERSON, the INSTRUCTED PERSON, and the SKILLED PERSON. Unless otherwise specified, the requirements for an ORDINARY PERSON apply. This document assumes that a person will not intentionally create conditions or situations that could cause pain or injury.

NOTE 1 In Australia, the work conducted by an instructed person or skilled person may require formal licensing from regulatory authorities.

NOTE 2 In Germany, a person may only be regarded as an instructed person or a skilled person if certain legal requirements are fulfilled.

#### 0.2.2 Ordinary person

ORDINARY PERSON is the term applied to all persons other than INSTRUCTED PERSONS and SKILLED PERSONS. ORDINARY PERSONS include not only users of the equipment, but also all persons who may have access to the equipment or who may be in the vicinity of the equipment. Under NORMAL OPERATING CONDITIONS or ABNORMAL OPERATING CONDITIONS, ORDINARY PERSONS should not be exposed to parts comprising energy sources capable of causing pain or injury. Under a SINGLE FAULT CONDITION, ORDINARY PERSONS should not be exposed to parts comprising energy sources capable of causing injury.

#### 0.2.3 Instructed person

INSTRUCTED PERSON is a term applied to persons who have been instructed and trained by a SKILLED PERSON, or who are supervised by a SKILLED PERSON, to identify energy sources that may cause pain (see Table 1) and to take precautions to avoid unintentional contact with or exposure to those energy sources. Under NORMAL OPERATING CONDITIONS, ABNORMAL OPERATING CONDITIONS or SINGLE FAULT CONDITIONS, INSTRUCTED PERSONS should not be exposed to parts comprising energy sources capable of causing injury.

#### 0.2.4 Skilled person

SKILLED PERSON is a term applied to persons who have training or experience in the equipment technology, particularly in knowing the various energies and energy magnitudes used in the equipment. SKILLED PERSONS are expected to use their training and experience to recognize energy sources capable of causing pain or injury and to take action for protection from injury from those energies. SKILLED PERSONS should also be protected against unintentional contact or exposure to energy sources capable of causing injury.

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## 0.3 Model for pain and injury

An energy source that causes pain or injury does so through the transfer of some form of energy to or from a body part.

This concept is represented by a three-block model (see Figure 1).

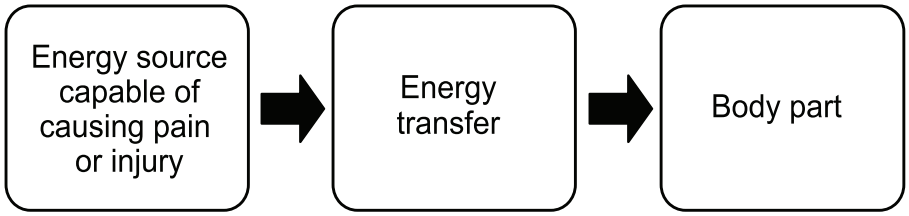


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**Figure 1**

**Three block model for pain and injury**

This safety standard specifies three classes of energy sources defined by magnitudes and durations of source parameters relative to the body responses to those electrical and thermal energy sources (see Table 1). Source parameters relative to responses to COMBUSTIBLE MATERIAL, mechanical energy sources and radiation energy sources are specified based on experience and basic safety standards.

**Table 1**
**Response to energy class**

| Energy source | Effect on the body | Effect on combustible materials |
|---|---|---|
| Class 1 | Not painful, but may be detectable | Ignition not likely |
| Class 2 | Painful, but not an injury | Ignition possible, but limited growth and spread of fire |
| Class 3 | Injury | Ignition likely, rapid growth and spread of fire |

The energy threshold for pain or injury is not constant throughout the population. For example, for some energy sources, the threshold is a function of body mass; the lower the mass, the lower the threshold, and vice-versa. Other body variables include age, state of health, state of emotions, effect of drugs, skin characteristics, etc. Furthermore, even where outward appearances otherwise appear equal, individuals differ in their thresholds of susceptibility to the same energy source.

The effect of duration of energy transfer is a function of the specific energy form. For example, pain or injury from thermal energy can be very short (1 s) for high skin temperature, or very long (several hours) for low skin temperature.

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Furthermore, the pain or injury may occur some considerable time after the transfer of energy to a body part. For example, pain or injury from some chemical or physiological reaction may not be manifested for days, weeks, months, or years.

## 0.4 Energy sources

Energy sources are addressed by this document, together with the pain or injury that results from a transfer of that energy to the body, and the likelihood of property damage that results from fire escaping the equipment.

An electrical product is connected to an electrical energy source (for example, the MAINS), an external power supply, or a BATTERY. An electrical product uses the electrical energy to perform its intended functions.

In the process of using electrical energy, the product transforms the electrical energy into other forms of energy (for example, thermal energy, kinetic energy, optical energy, audio energy, electromagnetic energy, etc.). Some energy transformations may be a deliberate part of the product function (for example, moving parts of a printer, images on a visual display unit, sound from a speaker, etc.). Some energy transformations may be a by-product of the product function (for example, heat dissipated by functional circuits, X-radiation from a cathode-ray tube, etc.).

Some products may use energy sources that are non-electrical energy sources such as moving parts or chemicals. The energy in these other sources may be transferred to or from a body part, or may be transformed into other energy forms (for example, chemical energy may be converted to electrical energy through a BATTERY, or a moving body part transfers its kinetic energy to a sharp edge).

Examples of the types of energy forms and the associated injuries and property damage addressed in this document are in Table 2.

**Table 2**
**Examples of body response or property damage related to energy sources**

| Forms of energy | Examples of body response or property damage | Clause |
|---|---|---|
| Electrical energy (for example, energized conductive parts) | Pain, fibrillation, cardiac arrest, respiratory arrest, skin burn, or internal organ burn | 5 |
| Thermal energy (for example, electrical ignition and spread of fire) | Electrically-caused fire leading to burn-related pain or injury, or property damage | 6 |
| Chemical reaction (for example, electrical ignition and spread of fire) | Skin damage, organ damage, or poisoning | 7 |
| Kinetic energy (for example, moving parts of equipment, or a moving body part against an equipment part) | Laceration, puncture, abrasion, contusion, crush, amputation, or loss of a limb, eye, ear, etc. | 8 |
| Thermal energy (for example, hot ACCESSIBLE parts) | Skin burn | 9 |
| Radiated energy (for example, electromagnetic energy, optical energy, acoustic energy) | Loss of sight, skin burn, or loss of hearing | 10 |

## 0.5 Safeguards

### 0.5.1 General

Many products necessarily use energy capable of causing pain or injury. Product design cannot eliminate such energy use. Consequently, such products should use a scheme that reduces the likelihood of such

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energy being transferred to a body part. The scheme that reduces the likelihood of energy transfer to a body part is a SAFEGUARD (see Figure 2).

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**Figure 2**

**Three block model for safety**

A SAFEGUARD is a device or scheme or system that:

– is interposed between an energy source capable of causing pain or injury and a body part, and

– reduces the likelihood of transfer of energy capable of causing pain or injury to a body part.

NOTE SAFEGUARD mechanisms against transfer of energy capable of causing pain or injury include:

– attenuating the energy (reduces the value of the energy); or

– impeding the energy (slows the rate of energy transfer); or

– diverting the energy (changes the energy direction); or

– disconnecting, interrupting, or disabling the energy source; or

– enveloping the energy source (reduces the likelihood of the energy from escaping); or

– interposing a barrier between a body part and the energy source.

A SAFEGUARD can be applied to the equipment, to the local installation, to a person or can be a learned or directed behaviour (for example, resulting from an INSTRUCTIONAL SAFEGUARD) intended to reduce the likelihood of transfer of energy capable of causing pain or injury. A SAFEGUARD may be a single element or may be a set of elements.

Generally, this document uses an order of preference for providing SAFEGUARDS based on the requirements given in ISO/IEC Guide 51 as follows:

– EQUIPMENT SAFEGUARDS are always useful, since they do not require any knowledge or actions by persons coming into contact with the equipment;

– INSTALLATION SAFEGUARDS are useful when a safety characteristic can only be provided after installation (for example, the equipment has to be bolted to the floor to provide stability);

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– behavioural SAFEGUARDS are useful when the equipment requires an energy source to be ACCESSIBLE.

In practice, SAFEGUARD selection accounts for the nature of the energy source, the intended user, the functional requirements of the equipment, and similar considerations.

### 0.5.2 Equipment safeguard

An EQUIPMENT SAFEGUARD may be a BASIC SAFEGUARD, a SUPPLEMENTARY SAFEGUARD, a DOUBLE SAFEGUARD, or a REINFORCED SAFEGUARD.

### 0.5.3 Installation safeguard

INSTALLATION SAFEGUARDS are not controlled by the equipment manufacturer, although in some cases, INSTALLATION SAFEGUARDS may be specified in the equipment installation instructions.

Generally, with respect to equipment, an INSTALLATION SAFEGUARD is a SUPPLEMENTARY SAFEGUARD.

NOTE For example, the SUPPLEMENTARY SAFEGUARD providing protective earthing is located partly in the equipment and partly in the installation. The SUPPLEMENTARY SAFEGUARD providing PROTECTIVE EARTHING is not effective until the equipment is connected to the PROTECTIVE EARTHING of the installation.

Requirements for INSTALLATION SAFEGUARDS are not addressed in this document. However, this document does assume some INSTALLATION SAFEGUARDS, such as PROTECTIVE EARTHING, are in place and are effective.

### 0.5.4 Personal safeguard

A PERSONAL SAFEGUARD may be a BASIC SAFEGUARD, a SUPPLEMENTARY SAFEGUARD, or a REINFORCED SAFEGUARD.

Requirements for PERSONAL SAFEGUARDS are not addressed in this document. However, this document does assume that PERSONAL SAFEGUARDS are available for use as specified by the manufacturer.

### 0.5.5 Behavioural safeguards

#### 0.5.5.1 Introduction to behavioural safeguards

In the absence of an EQUIPMENT, INSTALLATION, or PERSONAL SAFEGUARD, a person may use a specific behaviour as a SAFEGUARD to avoid energy transfer and consequent injury. A behavioural SAFEGUARD is a voluntary or instructed behaviour intended to reduce the likelihood of transfer of energy to a body part.

Three kinds of behavioural SAFEGUARDS are specified in this document. Each kind of behavioural SAFEGUARD is associated with a specific kind of person. An INSTRUCTIONAL SAFEGUARD is usually addressed to an ORDINARY PERSON, but may also be addressed to an INSTRUCTED PERSON or a SKILLED PERSON. A PRECAUTIONARY SAFEGUARD is used by an INSTRUCTED PERSON. A SKILL SAFEGUARD is used by a SKILLED PERSON.

#### 0.5.5.2 Instructional safeguard

An INSTRUCTIONAL SAFEGUARD is a means of providing information, describing the existence and location of an energy source capable of causing pain or injury, and is intended to invoke a specific behaviour on the part of a person to reduce the likelihood of transfer of energy to a body part (see Annex F).

An INSTRUCTIONAL SAFEGUARD may be a visual indicator (symbols or words or both) or an audible message, as applicable to the expected use of the product.

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When accessing locations where the equipment needs to be energized to perform a service activity, an INSTRUCTIONAL SAFEGUARD may be considered acceptable protection to bypass an EQUIPMENT SAFEGUARD such that the person is made aware of how to avoid contact with a class 2 or class 3 energy source.

If EQUIPMENT SAFEGUARDS would interfere with or prohibit the equipment function, an INSTRUCTIONAL SAFEGUARD may replace an EQUIPMENT SAFEGUARD.

If exposure to an energy source capable of causing pain or injury is essential to the correct functioning of equipment, an INSTRUCTIONAL SAFEGUARD may be used to ensure protection of persons instead of another SAFEGUARD. Consideration should be given as to whether the INSTRUCTIONAL SAFEGUARD should require the use of a PERSONAL SAFEGUARD.

Provision of an INSTRUCTIONAL SAFEGUARD does not result in an ORDINARY PERSON becoming an INSTRUCTED PERSON (see 0.5.5.3).

#### 0.5.5.3 Precautionary safeguard (used by an instructed person)

A PRECAUTIONARY SAFEGUARD is the training and experience or supervision of an INSTRUCTED PERSON by a SKILLED PERSON to use precautions to protect the INSTRUCTED PERSON against class 2 energy sources. PRECAUTIONARY SAFEGUARDS are not specifically prescribed in this document but are assumed to be effective when the term INSTRUCTED PERSON is used.

During equipment servicing, an INSTRUCTED PERSON may need to remove or defeat an EQUIPMENT SAFEGUARD. In this case, an INSTRUCTED PERSON is expected to then apply precaution as a SAFEGUARD to avoid exposure to class 2 energy sources.

#### 0.5.5.4 Skill safeguard (used by a skilled person)

A SKILL SAFEGUARD is the education, training, knowledge and experience of the SKILLED PERSON that is used to protect the SKILLED PERSON against class 2 or class 3 energy sources. SKILL SAFEGUARDS are not specifically prescribed in this document but are assumed to be effective when the term SKILLED PERSON is used.

During equipment servicing, a SKILLED PERSON may need to remove or defeat an EQUIPMENT SAFEGUARD. In this case, a SKILLED PERSON is expected to then apply skill as a SAFEGUARD to avoid injury.

### 0.5.6 Safeguards during ordinary or instructed person service conditions

During ORDINARY PERSON or INSTRUCTED PERSON service conditions, SAFEGUARDS for such persons may be necessary. Such SAFEGUARDS can be EQUIPMENT SAFEGUARDS, PERSONAL SAFEGUARDS, or INSTRUCTIONAL SAFEGUARDS.

### 0.5.7 Equipment safeguards during skilled person service conditions

During SKILLED PERSON service conditions, EQUIPMENT SAFEGUARDS should be provided to protect against the effects of a body's involuntary reaction (for example, startle) that might cause unintentional contact with a class 3 energy source located outside the view of the SKILLED PERSON.

NOTE This SAFEGUARD typically applies in large equipment, where the SKILLED PERSON needs to partially or wholly enter between two or more class 3 energy source locations while servicing.

### 0.5.8 Examples of safeguard characteristics

Table 3 lists some examples of safeguard characteristics.

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**Table 3**
**Examples of safeguard characteristics**

| Safeguard | Basic safeguard | Supplementary safeguard | Reinforced safeguard |
|---|---|---|---|
| EQUIPMENT SAFEGUARD: a physical part of an equipment | Effective under NORMAL OPERATING CONDITIONS | Effective in the event of failure of the BASIC SAFEGUARD | Effective under NORMAL OPERATING CONDITIONS and in the event of a SINGLE FAULT CONDITION elsewhere in the equipment |
| | Example: BASIC INSULATION | Example: SUPPLEMENTARY INSULATION | Example: REINFORCED INSULATION |
| | Example: normal temperatures below ignition temperatures | Example: FIRE ENCLOSURE | Not applicable |
| INSTALLATION SAFEGUARD: a physical part of a man-made installation | Effective under NORMAL OPERATING CONDITIONS | Effective in the event of failure of an equipment BASIC SAFEGUARD | Effective under NORMAL OPERATING CONDITIONS and in the event of a SINGLE FAULT CONDITION elsewhere in the equipment |
| | Example: wire size | Example: overcurrent protective device | Example: socket outlet |
| PERSONAL SAFEGUARD: a physical device worn on the body | In the absence of any EQUIPMENT SAFEGUARD, effective under NORMAL OPERATING CONDITIONS | Effective in the event of failure of an equipment BASIC SAFEGUARD | In the absence of any EQUIPMENT SAFEGUARD, effective under NORMAL OPERATING CONDITIONS and in the event of a SINGLE FAULT CONDITION elsewhere in the equipment |
| | Example: gloves | Example: insulating floor mat | Example: electrically-insulated glove for handling live conductors |
| INSTRUCTIONAL SAFEGUARD: a voluntary or instructed behaviour intended to reduce the likelihood of transfer of energy to a body part | In the absence of any EQUIPMENT SAFEGUARD, effective under NORMAL OPERATING CONDITIONS | Effective in the event of failure of an equipment BASIC SAFEGUARD | Only effective on an exceptional basis, when providing all appropriate SAFEGUARDS would prevent the intended functioning of the equipment |
| | Example: INSTRUCTIONAL SAFEGUARD to disconnect telecommunication cable before opening the cover | Example: after opening a door, an INSTRUCTIONAL SAFEGUARD against hot parts | Example: INSTRUCTIONAL SAFEGUARD of hot parts in an office photocopier, or a continuous roll paper cutter on a commercial printer |

## 0.6 Electrically-caused pain or injury (electric shock)

### 0.6.1 Models for electrically-caused pain or injury

Electrically-caused pain or injury may occur when electrical energy capable of causing pain or injury is transferred to a body part (see Figure 3).

Electrical energy transfer occurs when there are two or more electrical contacts to the body:

– the first electrical contact is between a body part and a conductive part of the equipment;

– the second electrical contact is between another body part and

- earth, or
- another conductive part of the equipment.

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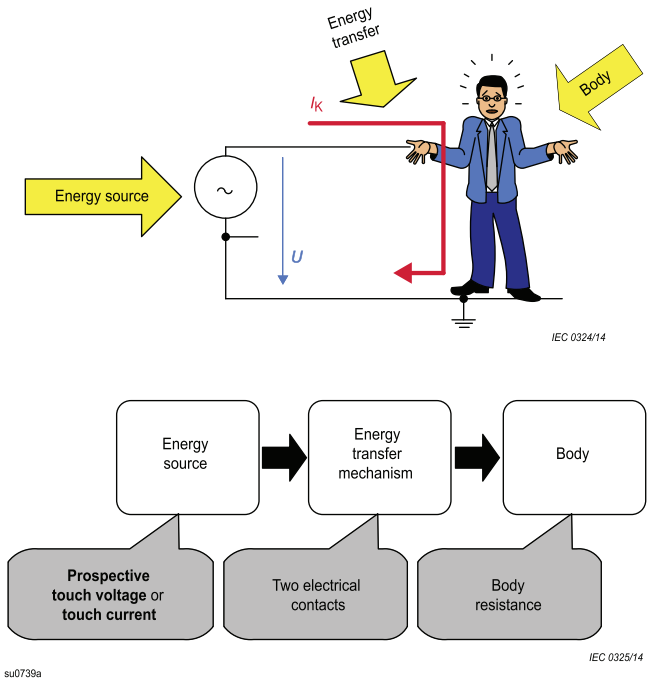


**Figure 3**

**Schematic and model for electrically-caused pain or injury**

Depending on the magnitude, duration, wave shape, and frequency of the current, the effect on the human body varies from undetectable to detectable to painful to injurious.

### 0.6.2 Models for protection against electrically-caused pain or injury

One or more SAFEGUARDS are interposed between an electrical energy source capable of causing pain or injury and a body part to protect against electrically-caused pain or injury (see Figure 4).

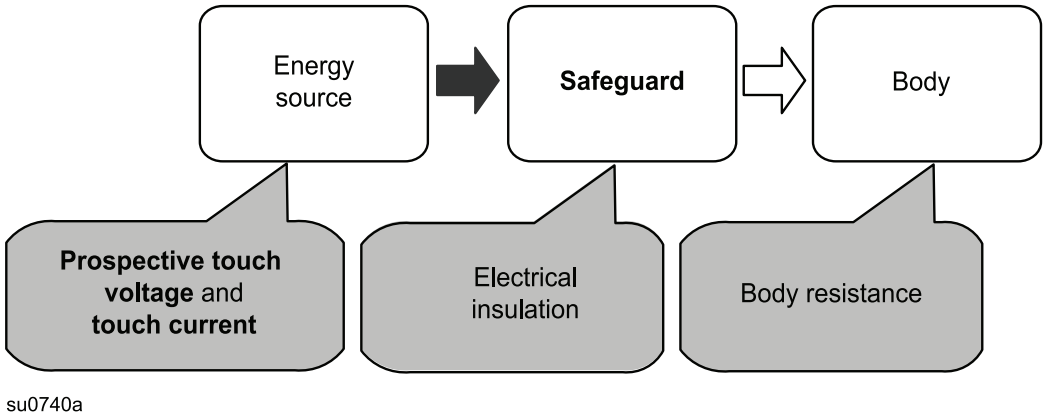


**Figure 4**

**Model for protection against electrically-caused pain or injury**

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Protection against electrically-caused pain is provided under NORMAL OPERATING CONDITIONS and ABNORMAL OPERATING CONDITIONS. For such protection, under NORMAL OPERATING CONDITIONS and ABNORMAL OPERATING CONDITIONS, a BASIC SAFEGUARD is interposed between an electrical energy source capable of causing pain and an ORDINARY PERSON.

The most common BASIC SAFEGUARD against an electrical energy source capable of causing pain is electrical insulation (also known as BASIC INSULATION) interposed between the energy source and a body part.

Protection against electrically-caused injury is provided under NORMAL OPERATING CONDITIONS, ABNORMAL OPERATING CONDITIONS, and SINGLE FAULT CONDITIONS. For such protection, under NORMAL OPERATING CONDITIONS and ABNORMAL OPERATING CONDITIONS, both a BASIC SAFEGUARD and a SUPPLEMENTARY SAFEGUARD are interposed between an electrical energy source capable of causing injury and an ORDINARY PERSON (see 4.3.2.4), or an INSTRUCTED PERSON (see 4.3.3.3). In the event of a failure of either SAFEGUARD, the other SAFEGUARD becomes effective. The SUPPLEMENTARY SAFEGUARD against an electrical energy source capable of causing injury is placed between the BASIC SAFEGUARD and a body part. A SUPPLEMENTARY SAFEGUARD may be additional electrical insulation (SUPPLEMENTARY INSULATION) or a protectively earthed conductive barrier or other construction that performs the same function.

Another SAFEGUARD against an electrical energy source capable of causing injury is electrical insulation (also known as DOUBLE INSULATION or REINFORCED INSULATION) placed between the energy source and a body part.

Likewise, a REINFORCED SAFEGUARD may be placed between an electrical energy source capable of causing injury and a body part.

## 0.7 Electrically-caused fire

### 0.7.1 Models for electrically-caused fire

Electrically-caused fire is due to conversion of electrical energy to thermal energy (see Figure 5), where the thermal energy heats a fuel material followed by ignition and combustion.

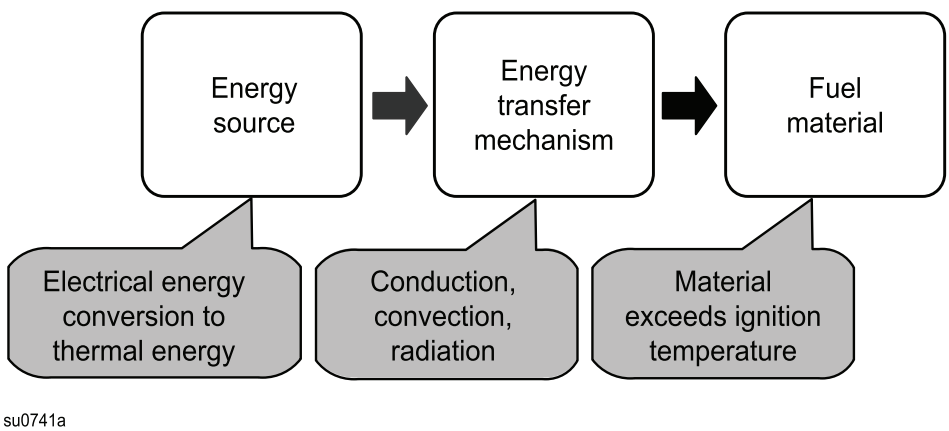


**Figure 5**

**Model for electrically-caused fire**

Electrical energy is converted to thermal energy either in a resistance or in an arc and is transferred to a fuel material by conduction, convection, or radiation. As the fuel material heats, it chemically decomposes

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into gases, liquids and solids. When the gas is at its ignition temperature, the gas can be ignited by an ignition source. When the gas is at its spontaneous ignition temperature, the gas ignites by itself. Both result in fire.

### 0.7.2 Models for protection against electrically-caused fire

The BASIC SAFEGUARD against electrically-caused fire (see Figure 6) is that the temperature of a material, under NORMAL OPERATING CONDITIONS and ABNORMAL OPERATING CONDITIONS, does not cause the material to ignite.

The SUPPLEMENTARY SAFEGUARD against electrically-caused fire reduces the likelihood of ignition or, in the case of ignition, reduces the likelihood of spread of fire.

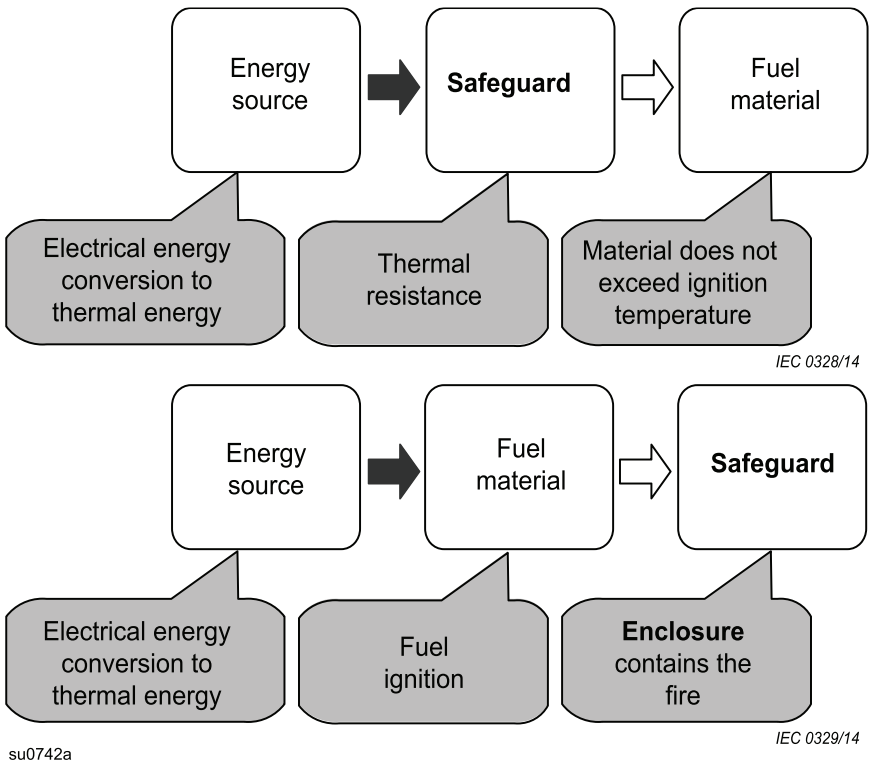


**Figure 6**

**Models for protection against fire**

## 0.8 Injury caused by hazardous substances

Injury caused by HAZARDOUS SUBSTANCES is due to a chemical reaction with a body part. The extent of injury by a given substance depends on both the magnitude and duration of exposure and on the body part susceptibility to that substance.

The BASIC SAFEGUARD against injury caused by HAZARDOUS SUBSTANCES is containment of the material.

SUPPLEMENTARY SAFEGUARDS against injury caused by HAZARDOUS SUBSTANCES may include:

– a second container or a spill-resistant container;

– containment trays;

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– tamper-proof screws to prevent unauthorized access;

– INSTRUCTIONAL SAFEGUARDS.

National and regional regulations govern the use of and exposure to HAZARDOUS SUBSTANCES used in equipment. These regulations do not enable a practical classification of HAZARDOUS SUBSTANCES in the manner in which other energy sources are classified in this document. Therefore, energy source classifications are not applied in Clause 7.

### 0.9 Mechanically-caused injury

Mechanically-caused injury is due to kinetic energy transfer to a body part when a collision occurs between a body part and an equipment part. The kinetic energy is a function of the relative motion between a body part and ACCESSIBLE parts of the equipment, including parts ejected from the equipment that collide with a body part.

Examples of kinetic energy sources are:

– body motion relative to sharp edges and corners;

– part motion due to rotating or other moving parts, including pinch points;

– part motion due to loosening, exploding, or imploding parts;

– equipment motion due to instability;

– equipment motion due to wall, ceiling, or rack mounting means failure;

– equipment motion due to handle failure;

– part motion due to an exploding BATTERY;

– equipment motion due to cart or stand instability or failure.

The BASIC SAFEGUARD against mechanically-caused injury is a function of the specific energy source. BASIC SAFEGUARDS may include:

– rounded edges and corners;

– an ENCLOSURE to prevent a moving part from being ACCESSIBLE;

– an ENCLOSURE to prevent expelling a moving part;

– a SAFETY INTERLOCK to control access to an otherwise moving part;

– means to stop the motion of a moving part;

– means to stabilize the equipment;

– robust handles;

– robust mounting means;

– means to contain parts expelled during EXPLOSION or implosion.

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The SUPPLEMENTARY SAFEGUARD against mechanically-caused injury is a function of the specific energy source. SUPPLEMENTARY SAFEGUARDS may include:

– INSTRUCTIONAL SAFEGUARDS;

– instructions and training;

– additional ENCLOSURES or barriers;

– SAFETY INTERLOCKS.

The REINFORCED SAFEGUARD against mechanically-caused injury is a function of the specific energy source. REINFORCED SAFEGUARDS may include:

– extra thick glass on the front of a CRT;

– rack slide-rails and means of support;

– SAFETY INTERLOCK.

## 0.10 Thermally-caused injury (skin burn)

### 0.10.1 Models for thermally-caused injury

Thermally-caused injury may occur when thermal energy capable of causing injury is transferred to a body part (see Figure 7).

Thermal energy transfer occurs when a body touches a hot equipment part. The extent of injury depends on the temperature difference, the thermal mass of the object, rate of thermal energy transfer to the skin, and duration of contact.

The requirements in this document only address SAFEGUARDS against thermal energy transfer by conduction. This document does not address SAFEGUARDS against thermal energy transfer by convection or radiation.

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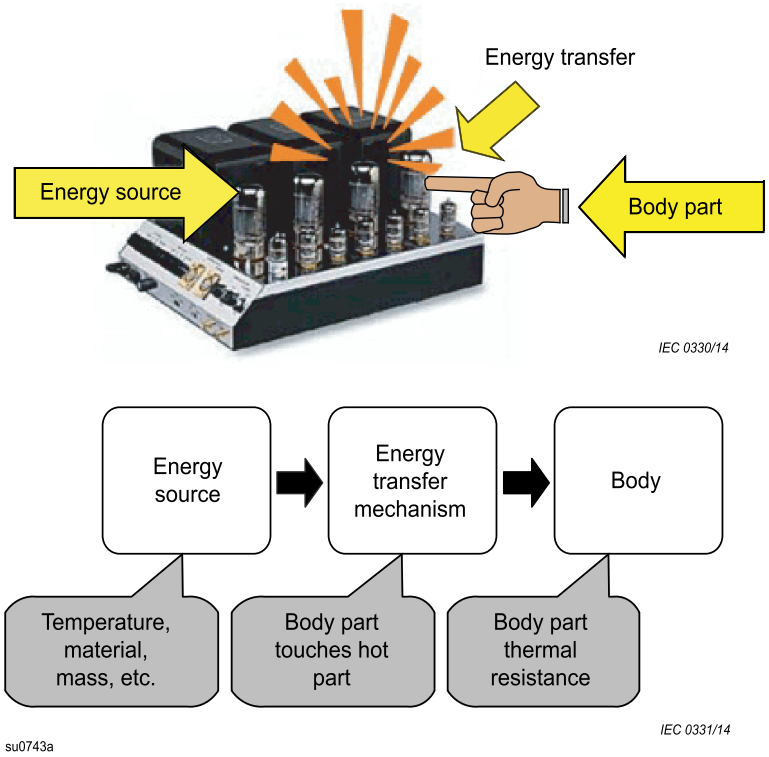


**Figure 7**

**Schematic and model for thermally-caused injury**

Depending on the temperature, contact duration, material properties, and mass of the material, the perception of the human body varies from warmth to heat that may result in pain or injury (burn).

### 0.10.2 Models for protection against thermally-caused pain or injury

One or more SAFEGUARDS are interposed between a thermal energy source capable of causing pain or injury and an ORDINARY PERSON (see Figure 8).

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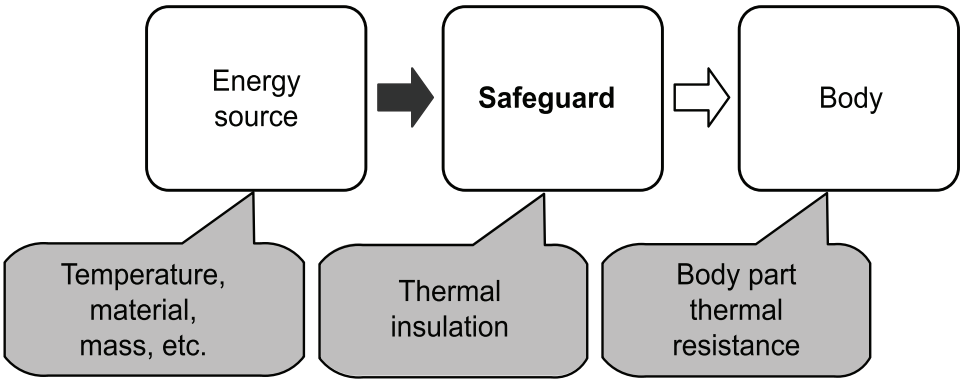


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**Figure 8**

**Model for protection against thermally-caused injury**

Under NORMAL OPERATING CONDITIONS and ABNORMAL OPERATING CONDITIONS, protection is used against thermally-cause pain. For such protection, a BASIC SAFEGUARD is interposed between a thermal energy source capable of causing pain and an ORDINARY PERSON.

Under NORMAL OPERATING CONDITIONS, ABNORMAL OPERATING CONDITIONS and SINGLE FAULT CONDITIONS, protection is used against thermally-caused injury. For such protection, a BASIC SAFEGUARD and a SUPPLEMENTARY SAFEGUARD are interposed between a thermal energy source capable of causing injury and an ORDINARY PERSON.

The BASIC SAFEGUARD against a thermal energy source capable of causing pain or injury is thermal insulation placed between the energy source and a body part. In some cases, a BASIC SAFEGUARD against a thermal energy source capable of causing pain or injury may be an INSTRUCTIONAL SAFEGUARD identifying the hot parts and how to reduce the likelihood of injury. In some cases, a BASIC SAFEGUARD reduces the likelihood of a non-injurious thermal energy source from becoming a thermal energy source capable of causing pain or injury.

Examples of such BASIC SAFEGUARDS are:

– control of electrical energy being converted to thermal energy (for example, a THERMOSTAT);

– heat sinking, etc.

The SUPPLEMENTARY SAFEGUARD against a thermal energy source capable of causing injury is thermal insulation placed between the energy source and a body part. In some cases, a SUPPLEMENTARY SAFEGUARD against a thermal energy source capable of causing pain or injury may be an INSTRUCTIONAL SAFEGUARD identifying the hot parts and how to reduce the likelihood of injury.

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## 0.11 Radiation-caused injury

Radiation-caused injury within the scope of this document is generally attributed to one of the following energy transfer mechanisms:

– heating of a body organ caused by exposure to non-ionising radiation, such as the highly localised energy of a laser impinging on the retina; or

– auditory injury caused by over stimulation of the ear by excessive peaks or sustained loud sound, leading to physical or nerve damage; or

– X-radiation; or

– UV radiation.

Radiated energy is transferred by impingement of wave emission upon a body part.

The BASIC SAFEGUARD against radiation-caused injury is containment of the energy within an ENCLOSURE that is opaque to the radiated energy.

There are several SUPPLEMENTARY SAFEGUARDS against radiation-caused injury. The SUPPLEMENTARY SAFEGUARDS may include SAFETY INTERLOCKS to disconnect power to the generator, tamper-proof screws to prevent unauthorized access, etc.

The BASIC SAFEGUARD against auditory injury is to limit the acoustic output of personal music players and their associated headphones and earphones.

Examples of SUPPLEMENTARY SAFEGUARDS against auditory pain and injury are the provision of warnings and information advising the user how to use the equipment correctly.

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# AUDIO/VIDEO, INFORMATION AND COMMUNICATION TECHNOLOGY EQUIPMENT – Part 1: Safety requirements

## 1 Scope

This part of IEC 62368 is applicable to the safety of electrical and electronic equipment within the field of audio, video, information and communication technology, and business and office machines with a RATED VOLTAGE not exceeding 600 V. This document does not include requirements for performance or functional characteristics of equipment.

NOTE 1 Examples of equipment within the scope of this document are given in Annex A.

NOTE 2 A RATED VOLTAGE of 600 V is considered to include equipment rated 400/690 V.

This document is also applicable to:

– components and subassemblies intended for incorporation in this equipment. Such components and subassemblies need not comply with every requirement of this document, provided that the complete equipment, incorporating such components and subassemblies, does comply;

– external power supply units intended to supply other equipment within the scope of this document;

– accessories intended to be used with equipment within the scope of this document;

– large equipment installed in RESTRICTED ACCESS AREAS. For equipment having large machinery aspects, additional requirements may apply; and

– equipment to be used in tropical regions.

This document also includes requirements for audio/video, information and communication technology equipment intended to be installed in an OUTDOOR LOCATION. The requirements for OUTDOOR EQUIPMENT also apply, where relevant, to OUTDOOR ENCLOSURES suitable for direct installation in the field and supplied for housing audio/video, information and communication technology equipment to be installed in an OUTDOOR LOCATION. See Annex Y for specific construction requirements not covered elsewhere in this document.

Each installation may have particular requirements. In addition, requirements for protection of the OUTDOOR EQUIPMENT against the effects of direct lightning strikes are not covered by this document.

NOTE 3 For information on this subject, see IEC 62305-1.

This document assumes a maximum altitude of 2 000 m unless otherwise specified by the manufacturer.

Additional requirements for equipment having the capability to supply DC power over commonly used communication cables, such as USB or Ethernet (PoE), are given in IEC 62368-3. IEC 62368-3 does not apply to:

– equipment supplying power using proprietary connectors; or

– equipment using a proprietary protocol for power selection.

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This document specifies SAFEGUARDS for ORDINARY PERSONS, INSTRUCTED PERSONS, and SKILLED PERSONS. Additional requirements may apply for equipment that is clearly designed or intended for use by children or specifically attractive to children.

NOTE 4 In Australia, the work conducted by an INSTRUCTED PERSON or a SKILLED PERSON may require formal licensing from regulatory authorities.

NOTE 5 In Germany, in many cases a person may only be regarded as an INSTRUCTED PERSON or a SKILLED PERSON if certain legal requirements are fulfilled.

This document does not apply to:

– equipment with non-self-contained hazardous moving parts, such as robotic equipment; and

NOTE 6 For requirements related to robotic equipment in an industrial environment, see IEC 60204-1, IEC 60204-11, ISO 10218-1 and ISO 10218-2.

– personal care robots, including mobile servant robots, physical assistant robots, and person carrier robots; and

NOTE 7 For requirements related to personal care robots, see ISO 13482.

– power supply systems that are not an integral part of the equipment, such as motor-generator sets, BATTERY backup systems and distribution transformers.

This document does not address:

– manufacturing processes except for ROUTINE TESTS;

– injurious effects of gases released by thermal decomposition or combustion;

– disposal processes;

– effects of transport (other than as specified in this document);

– effects of storage of materials, components, or the equipment itself;

– the likelihood of injury from particulate radiation such as alpha particles and beta particles;

– the likelihood of thermal injury due to radiated or convected thermal energy;

– the likelihood of injury due to flammable liquids;

– the use of the equipment in oxygen-enriched or EXPLOSIVE atmospheres;

– exposure to chemicals other than as specified in Clause 7;

– electrostatic discharge events;

– exposure to electromagnetic fields;

– environmental aspects; or

– requirements for functional safety, except for those related to WORK CELLS.

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NOTE 8 For specific functional and software safety requirements of electronic safety-related systems (for example, protective electronic circuits), see IEC 61508-1.

**1DV.1 DR** ***Modify this clause by adding the following text:***

**1DV.1.1 This standard is applicable to equipment designed to be installed in accordance with the Canadian Electrical Code (CE Code), Part I, CSA C22.1-18; the National Electrical Code, NFPA 70-2017; and the National Electrical Safety Code, IEEE C2 2017.**

**1DV.1.2 The standard is applicable to equipment, when identified by a marking or instruction [see Annex DVK (Annex DVA, Clause 1 entry)], designed to be installed in accordance with Article 645 of the National Electrical Code, NFPA 70-2017, and the Standard for the Protection of Information Technology Equipment, NFPA 75-2017.**

**1DV.1.3 See Annex DVA for requirements and references to regulatory requirements that apply to this equipment, as applicable.**

**1DV.2 D2** ***Modify Clause 1 by adding the following text:***

**1DV.2.1 This standard includes additional requirements for equipment used for entertainment purposes intended for installation in general patient care areas of health care facilities. See Annex DVB.**

**1DV.2.2 This standard includes additional requirements for equipment intended for mounting under cabinets. See Annex DVC.**

**1DV.2.3 Additional requirements for equipment with DC power transfer through communication cables and ports are given in IEC 62368-3. IEC 62368-3 clause 5 for DC power transfer at ES1 or ES2 voltage levels is considered informative. IEC 62368-3 clause 6 for remote power feeding telecommunication (RFT) circuits is considered normative (see ITU K.50). Alternatively, equipment with RFT circuits are given in either UL 2391 or CSA/UL 60950-21. RFT-C circuits are not permitted unless the RFT-C circuit complies with RFT-V limits (≤ 200V per conductor to earth).**

**1DV.2.4 This standard does not cover Modular Data Centers (MDCs), only the information and communication technology equipment contained within.**

**NOTE In the U.S., Modular Data Centers are covered by UL 2755, Modular Data Centers.**

**1DV.3 DR** ***Modify Clause 1 by replacing Note 3 with the following:***

**NOTE 3 For information on this subject, see IEC 62305-1, NFPA 780 or CAN/CSA-B72.**

**1DV.4 DC** ***Modify Clause 1 by adding the following paragraph and Note:***

**Battery backup systems including storage batteries and battery management equipment that are not an integral part of stationary AV and ICT equipment, such as provided in separate cabinets, are subject to the appropriate standard for battery backup systems, such as UL 1973, Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications.**

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**NOTE 9DV See Figures 1.1 and 1.2 of UL 1973 for more information on independent electric energy storage systems (EESS) covered by UL 1973, which can consist of both low voltage (class ES or ES2) and high voltage (class ES3) subsystems, battery management, thermal management, and related features and safeguards. When interconnected with AV, IT, and CT Equipment, and typically used in conjunction with an uninterruptible power supply (UPS), such EESS typically serve as a short-term substitution of the mains supply during power outages and similar disturbances.**

## 1DV.5 DC *Add Clause 1DV.5.1 to Clause 1*

### 1DV.5.1 Power Distribution Equipment and Subassemblies

**1DV.5.1.1 This standard also is applicable to power distribution subassemblies connected to a mains used to distribute power entirely within a system of equipment also covered by this standard, such as power distribution units (PDUs) in the form of cord-connected power strips and shelves with multiple power outlets (receptacles) and intended to be installed in system racks, cabinets, home entertainment centers, etc.**

**1DV.5.1.2 For equipment covered by this standard that incorporates components and subassemblies that perform a power distribution and control function covered by other standards, such as panelboards, load transfer equipment, or uninterruptible power systems utilized in power conditioners and computer power centers, this standard only may be used for investigation of safety for those aspects not covered by the other standards.**

**1DV.5.1.3 This standard also does not apply to stand-alone equipment used for distribution of mains power that is covered by individual power distribution equipment standards.**

**1DV.5.1.4 Based on the specific function, the following requirements are applicable to the stand-alone distribution equipment, or apply additionally to power distribution subassemblies and components of equipment covered by this standard, as described in Clauses 1DV.5.1.1 to 1DV.5.1.3:**

- **For Industrial Control Equipment, see CSA C22.2 No. 14 and UL 508;**
- **For Panelboards, see CSA C22.2 No. 29 and UL 67;**
- **For Switchboards, see CSA C22.2 No. 244 and UL 891;**
- **For Transfer Switch Equipment, see CSA C22.2 No.178.1 and UL 1008;**
- **For Uninterruptible Power Systems, see CSA C22.2 No. 107.3 and UL 1778;**
- **For Power Distribution Centers for Communications Equipment, see UL 1801; and**
- **For other forms of power distribution units for general applications, such as,**

  **– Relocatable Power Taps, see CSA C22.2 No. 21, Cord Sets and Power Supply Cords or C22.2 No. 308, Cord Reels and Multi-outlet assemblies, and UL 1363, Relocatable Power Taps.**

  **– Cord-connected Surge Protective Devices, see CSA C22.2 No. 21, Cord Sets and Power Supply Cords or C22.2 No. 269.3, Surge protective device – Type 2 – cord connected, direct plug-in and receptacle type, and UL 1449, Surge Protective Devices.**

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**– Furniture Power Distribution Units, see CSA C22.2 No. 21, Cord Sets and Power Supply Cords, and UL 962A, Furniture Power Distribution Units.**

**NOTE 1 It is assumed that power distribution equipment covered by the scope of this standard is interconnected to the "outlet" of a "branch circuit" as defined in Section 0 of the CE Code, Part I, and Article 100 of the NEC. In the case of cord-connected equipment, the outlet is the receptacle associated with the building wiring. In the case of permanently connected equipment, the outlet is the interface between the branch circuit conductors associated with the building wiring and the input terminals, pressure connectors, or leads associated with the power distribution equipment covered in whole or part by this standard.**

**NOTE 2 The following are common definitions of the hardware with related functions that require additional investigation to the appropriate Canadian and U.S. standards:**

**– Industrial Control Panel: An assembly of two or more components consisting of one of the following:**

**• power circuit components only, such as motor controllers, overload relays, fused disconnect switches, and circuit breakers;**

**• control circuit components only, such as pushbuttons, pilot lights, selector switches, timers, switches, control relays; or**

**• a combination of power and control circuit components.**

**These components, with associated wiring and terminals, are mounted on or contained within an enclosure or mounted on a subpanel. The industrial control panel does not include the controlled equipment.**

**– Panelboard: a single panel or group of panel units designed for assembly in the form of a single panel, including buses and automatic overcurrent devices, and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall, partition, or other support; and accessible only from the front.**

**– Switchboard: a large single panel, frame, or assembly of panels on which are mounted, on the face, back, or both, switches, overcurrent and other protective devices, buses, and usually instruments. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets.**

**– Transfer switch: an automatic or nonautomatic device for transferring one or more load conductor connections from one power source to another.**

**– Uninterruptible Power Supply: a power supply used to provide alternating current power to a load for some period of time in the event of a power failure.**

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027-1, *Letter symbols to be used in electrical technology – Part 1: General*

IEC 60065, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-11, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60073, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators*

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IEC 60076-14, *Power transformers – Part 14: Liquid-immersed power transformers using high-temperature insulation materials*

IEC TR 60083, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60086-4, *Primary batteries – Part 4: Safety of lithium batteries*

IEC 60086-5, *Primary batteries – Part 5: Safety of batteries with aqueous electrolyte*

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60127 (all parts), *Miniature fuses*

IEC 60227-1, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60227-2:1997, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods*
IEC 60227-2:1997/AMD1:2003

IEC 60245-1, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60296, *Fluids for electrotechnical applications – Unused mineral insulating oils for transformers and switchgear*

IEC 60309 (all parts), *Plugs, socket-outlets and couplers for industrial purposes*

IEC 60317 (all parts), *Specifications for particular types of winding wires*

IEC 60317-0-7:2017, *Specifications for particular types of winding wires – Part 0-7: General requirements – Fully insulated (FIW) zero-defect enamelled round copper wire*

IEC 60317-43, *Specifications for particular types of winding wires – Part 43: Aromatic polyimide tape wrapped round copper wire, class 240*

IEC 60317-56, *Specifications for particular types of winding wires – Part 56: Solderable fully insulated (FIW) zero-defect polyurethane enamelled round copper wire, class 180*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

IEC 60320-1, *Appliance couplers for household and similar general purposes – Part 1: General requirements*

IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

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Full document details: UL 62368-1 2021

IEC 60332-1-3, *Tests on electric and optical fibre cables under fire conditions – Part 1-3: Test for vertical flame propagation for a single insulated wire or cable – Procedure for determination of flaming droplets/particles*

IEC 60332-2-2, *Tests on electric and optical fibre cables under fire conditions – Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable – Procedure for diffusion flame*

IEC 60384-14, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60417, *Graphical symbols for use on equipment, available from: <http://www.graphical-symbols.info/equipment>*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60691:2015, *Thermal-links – Requirements and application guide*

IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60695-10-3, *Fire hazard testing – Part 10-3: Abnormal heat – Mould stress relief distortion test*

IEC 60695-11-5:2016, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60695-11-20:2015, *Fire hazard testing – Part 11-20: Test flames – 500 W flame test methods*

IEC TS 60695-11-21, *Fire hazard testing – Part 11-21: Test flames – 500 W vertical flame test method for tubular polymeric materials*

IEC 60728-11:2016, *Cable networks for television signals, sound signals and interactive services – Part 11: Safety*

IEC 60730 (all parts), *Automatic electrical controls for household and similar use*

IEC 60730-1:2013, *Automatic electrical controls – Part 1: General requirements*

IEC 60738-1:2006, *Thermistors – Directly heated positive temperature coefficient – Part 1: Generic specification*

IEC 60747-5-5:2007, *Semiconductor devices – Discrete devices – Part 5-5: Optoelectronic devices – Photocouplers*

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Full document details: UL 62368-1 2021

IEC 60747-5-5:2007/AMD1:2015

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*

IEC 60825-12, *Safety of laser products – Part 12: Safety of free space optical communication systems used for transmission of information*

IEC 60836, *Specifications for unused silicone insulating liquids for electrotechnical purposes*

IEC 60851-3:2009, *Winding wires – Test methods – Part 3: Mechanical properties*
IEC 60851-3:2009/AMD1:2013

IEC 60851-5:2008, *Winding wires – Test methods – Part 5: Electrical properties*
IEC 60851-5:2008/AMD1:2011

IEC 60884-1, *Plugs and socket-outlets for household and similar purposes – Part 1: General requirements*

IEC 60896-11, *Stationary lead-acid batteries – Part 11: Vented types – General requirements and methods of tests*

IEC 60896-21:2004, *Stationary lead-acid batteries – Part 21: Valve regulated types – Methods of test*

IEC 60896-22, *Stationary lead-acid batteries – Part 22: Valve regulated types – Requirements*

IEC 60906-1, *IEC system of plugs and socket-outlets for household and similar purposes – Part 1: Plugs and socket-outlets 16 A 250 V AC*

IEC 60906-2, *IEC system of plugs and socket-outlets for household and similar purposes – Part 2: Plugs and socket-outlets 15 A 125 V AC*

IEC 60947-1, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-5-5, *Low-voltage switchgear and controlgear – Part 5-5: Control circuit devices and switching elements – Electrical emergency stop device with mechanical latching function*

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

IEC 60998-1, *Connecting devices for low-voltage circuits for household and similar purposes – Part 1: General requirements*

IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm$^2$ up to 35 mm$^2$ (included)*

IEC 60999-2, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm$^2$ up to 300 mm$^2$ (included)*

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Full document details: UL 62368-1 2021

IEC 61039, *Classification of insulating liquids*

IEC 61051-1, *Varistors for use in electronic equipment – Part 1: Generic specification*

IEC 61051-2:1991, *Varistors for use in electronic equipment – Part 2: Sectional specification for surge suppression varistors*
IEC 61051-2:1991/AMD1:2009

IEC 61056-1, *General purpose lead-acid batteries (valve-regulated types) – Part 1: General requirements, functional characteristics – Methods of test*

IEC 61056-2, *General purpose lead-acid batteries (valve-regulated types) – Part 2: Dimensions, terminals and marking*

IEC 61058-1:2016, *Switches for appliances – Part 1: General requirements*

IEC 61099, *Insulating liquids – Specifications for unused synthetic organic esters for electrical purposes*

IEC 61204-7, *Low-voltage power supplies – Part 7: Safety requirements*

IEC 61293, *Marking of electrical equipment with ratings related to electrical supply – Safety requirements*

IEC 61427 (all parts), *Secondary cells and batteries for renewable energy storage – General requirements and methods of test*

IEC TS 61430, *Secondary cells and batteries – Test methods for checking the performance of devices designed for reducing explosion hazards – Lead-acid starter batteries*

IEC 61434, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Guide to designation of current in alkaline secondary cell and battery standards*

IEC 61558-1:2017, *Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests*

IEC 61558-2-16, *Safety of transformers, reactors, power supply units and similar products for voltages up to 1 100 V – Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units*

IEC 61643-11:2011, *Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems – Requirements and test methods*

IEC 61643-331:2017, *Components for low-voltage surge protective devices – Part 331: Performance requirements and test methods for metal oxide varistors (MOV)*

IEC 61810-1:2015, *Electromechanical elementary relays – Part 1: General and safety requirements*

IEC 61959, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Mechanical tests for sealed portable secondary cells and batteries*

IEC 61965, *Mechanical safety of cathode ray tubes*

IEC 61984, *Connectors – Safety requirements and tests*

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IEC 62133 (all parts), *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications*

IEC 62133-1, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 1: Nickel systems*

IEC 62133-2, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems*

IEC 62281, *Safety of primary and secondary lithium cells and batteries during transport*

IEC TS 62332-1, *Electrical insulation systems (EIS) – Thermal evaluation of combined liquid and solid components – Part 1: General requirements*

IEC 62440:2008, *Electric cables with a rated voltage not exceeding 450/750 V – Guide to use*

IEC 62471:2006, *Photobiological safety of lamps and lamp systems*

IEC 62471-5:2015, *Photobiological safety of lamps and lamp systems – Part 5: Image projectors*

IEC 62485-2, *Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries*

IEC 62619, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications*

ISO 37, *Rubber, vulcanized or thermoplastic – Determination of tensile stress-strain properties*

ISO 178, *Plastics – Determination of flexural properties*

ISO 179-1, *Plastics – Determination of Charpy impact properties – Part 1: Non-instrumented impact test*

ISO 180, *Plastics – Determination of Izod impact strength*

ISO 306, *Plastics – Thermoplastic materials – Determination of Vicat softening temperature (VST)*

ISO 527 (all parts), *Plastics – Determination of tensile properties*

ISO 871, *Plastics – Determination of ignition temperature using a hot-air furnace*

ISO 1798, *Flexible cellular polymeric materials – Determination of tensile strength and elongation at break*

ISO 1817:2015, *Rubber, vulcanized or thermoplastic – Determination of the effect of liquids*

ISO 2719, *Determination of flash point – Pensky-Martens closed cup method*

ISO 3231, *Paints and varnishes – Determination of resistance to humid atmospheres containing sulfur dioxide*

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