Overview of IEC 62368-1

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Some of the material in this presentation is adapted, or taken from, UL Presentation, "Overview of IEC 62368-1", UL Brea Office, 5/5/17.

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What is it?

- **Combines the current separate AV standard and IT standard to single AVIT standard**
- **Applies Hazard Based Safety Engineering**
- **Updates the requirements to be more relevant to current device safety concerns**

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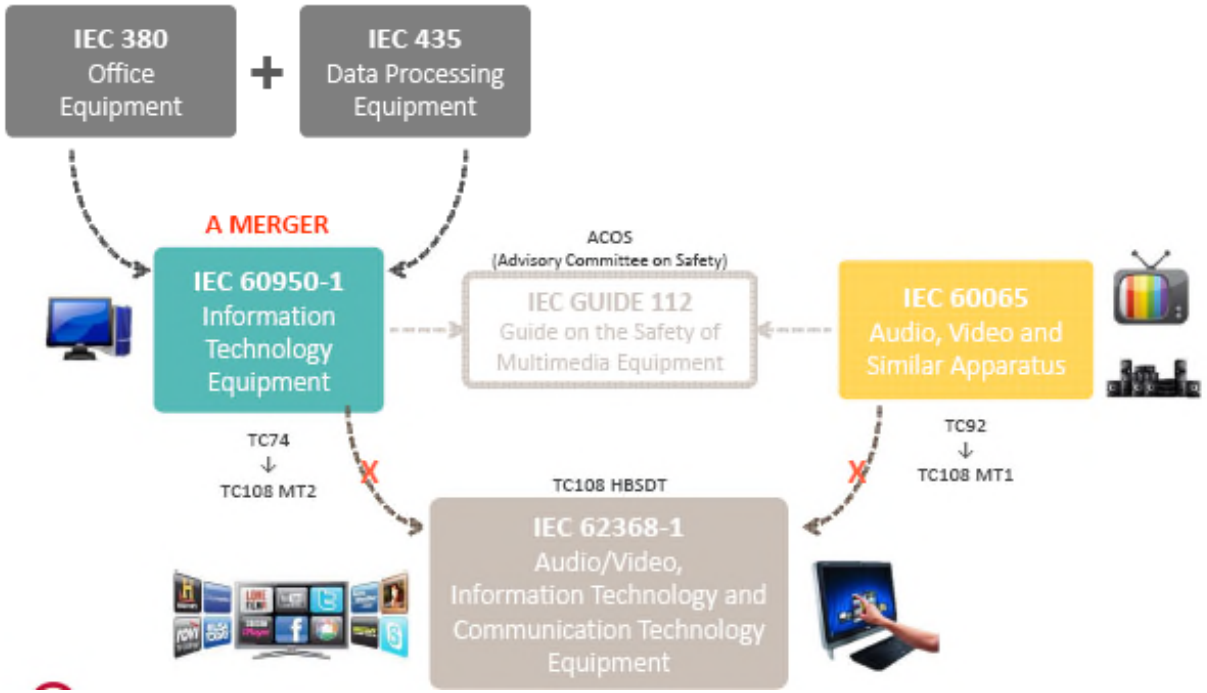
What is it?

Evolution



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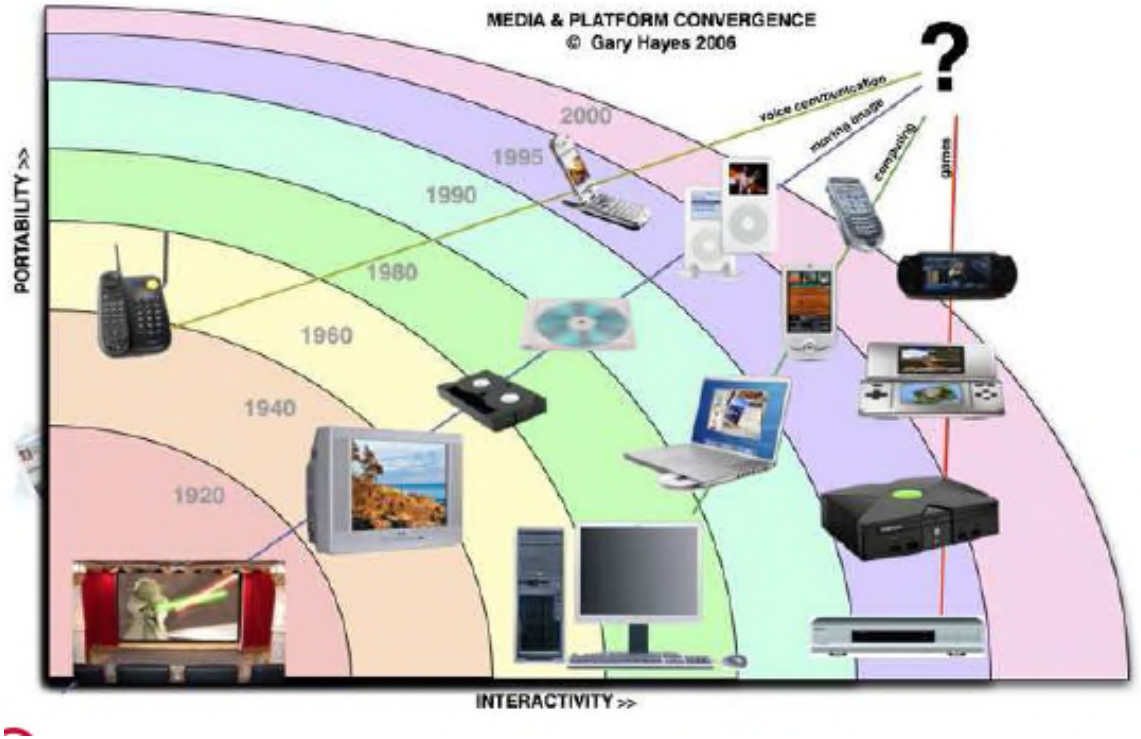

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Hazard-based Safety Engineering

Hazard-based Safety Engineering (HBSE) is a safety science discipline formalized over the last 20 years.

Key tool: 3 Block Models

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

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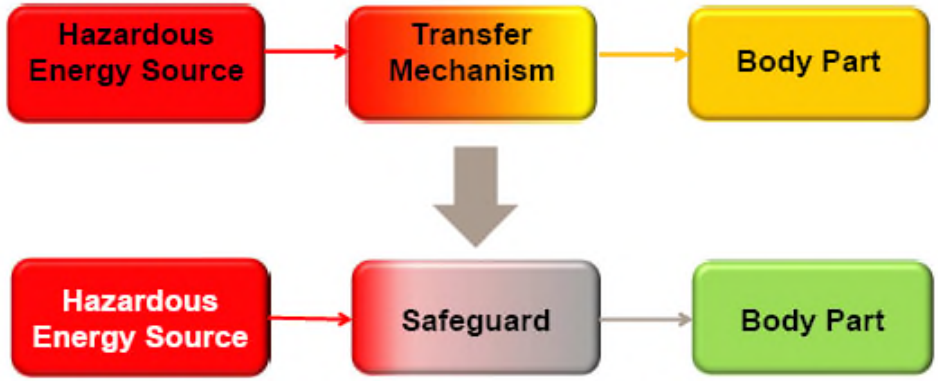
Safeguards & the Model for Safety (0.5)

Three Block Model



What Is Safeguard?

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.

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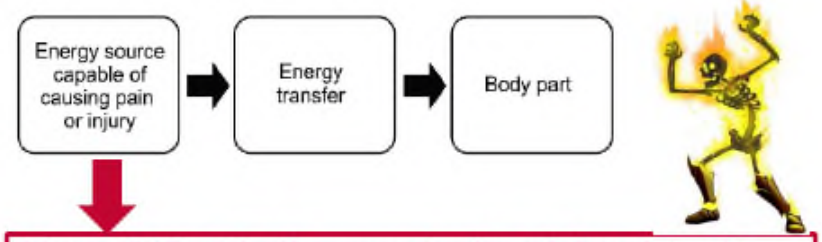
Hazard Based Safety Engineering

Energy Sources

- 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**.



Clause 5.Electrically-caused pain or injury (shock)
Clause 6.Electrically-caused fire
Clause 7.Hazardous Substances
Clause 8.Mechanically-caused injury
Clause 9.Thermally-caused injury
Clause10.Radiation-caused injury

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Hazard Based Safety Engineering
Energy source classifications (0.3, Table 1)

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

Energy Source	Electrical Source	Power Source	Mechanical Source	Thermal Source	Radiation Source
Class 1	ES1	PS1	MS1	TS1	RS1
Class 2	ES2	PS2	MS2	TS2	RS2
Class 3	ES3	PS3	MS3	TS3	RS3

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Hazard Based Safety Engineering-Persons (0.2)

The standard prescribes **safeguards** for the protection of three types of persons:

Ordinary Person	Instructed Person	Skilled Person
		
Other than instructed or skilled person	Instructed, trained or supervised by skilled person	Have training and experience to recognize energy sources capable of pain or injury and take action to protect

The standard assumes that a person will not intentionally create conditions or situations that could cause pain or injury.

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Hazard-based Safety Engineering

Hazard-based Safety Engineering (HBSE) is a safety science discipline formalized over the last 20 years.

Key tool: 3 Block Models

- HBSE typically consists of
  - (a) **identifying energy sources** in the product,
  - (b) **classifying the energy** (e.g., Class 1) due to potential for causing injury or damage (harm),
  - (c) identifying needed **safeguards** for protection from energy sources with the potential for causing injury or damage, and
  - (a) **qualifying the safeguards** as effective.

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Hazard-based Safety Engineering-Safeguards

Safeguard-physical part or system or instructions specifically provided to reduce the likelihood of pain or injury or for fire

- **Basic Safeguard**-safeguard that provides protection to a circuit under
  - Normal operating conditions AND
  - Abnormal operating conditions
- **Supplemental Safeguard**-safeguard applied in addition to the basic safeguard that is or becomes operational in the event of failure of the basic safeguard
- **Reinforced Safeguard**- single safeguard that is operational under
  - Normal operating conditions
  - Abnormal operating conditions AND
  - Single fault conditions

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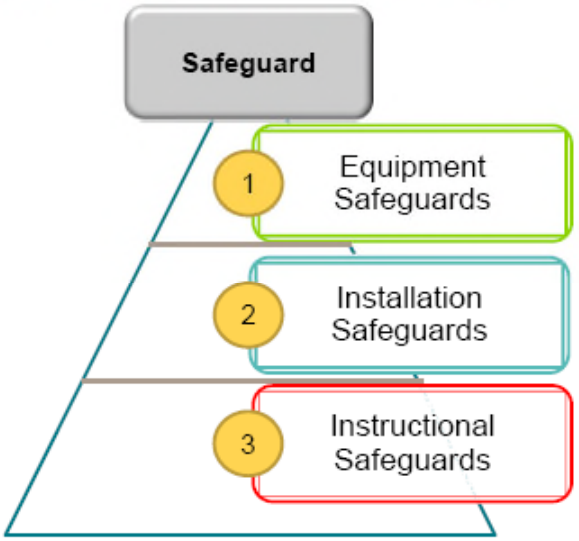
Hazard-based Safety Engineering
Priority of Safeguards (Safeguard Hierarchy)



Equipment safeguards are preferred as they do not require any knowledge or actions by persons coming into contact with the equipment.

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Clause 4 – General Requirements: Safeguards

Safeguard	Basic Safeguard	Supplementary Safeguard	Reinforced Safeguard
	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
Equipment Safeguard A physical part of the equipment	Basic insulation	Supplementary insulation	Reinforced insulation
	Normal temperature below auto-ignition temperature	Fire enclosure	Not applicable
Installation Safeguard A physical part of a man-made installation	Wire size	Overcurrent protective device	Socket outlet
Personal Safeguard (in the absence of equipment safeguard) A physical device worn on the body	Glove	Insulating floor mat	Electrically-insulated glove for handling live conductors
Instructional Safeguard (in the absence of equipment safeguard) A voluntary or instructed behavior intended to reduce the likelihood of transfer of energy to a body part	Instructional safeguard to disconnect telecom. cable before opening the cover	After the opening a door, instruction safeguard against hot parts	Instruction for hot parts in an office photocopier, or a continuous roll paper cutter on a commercial printer

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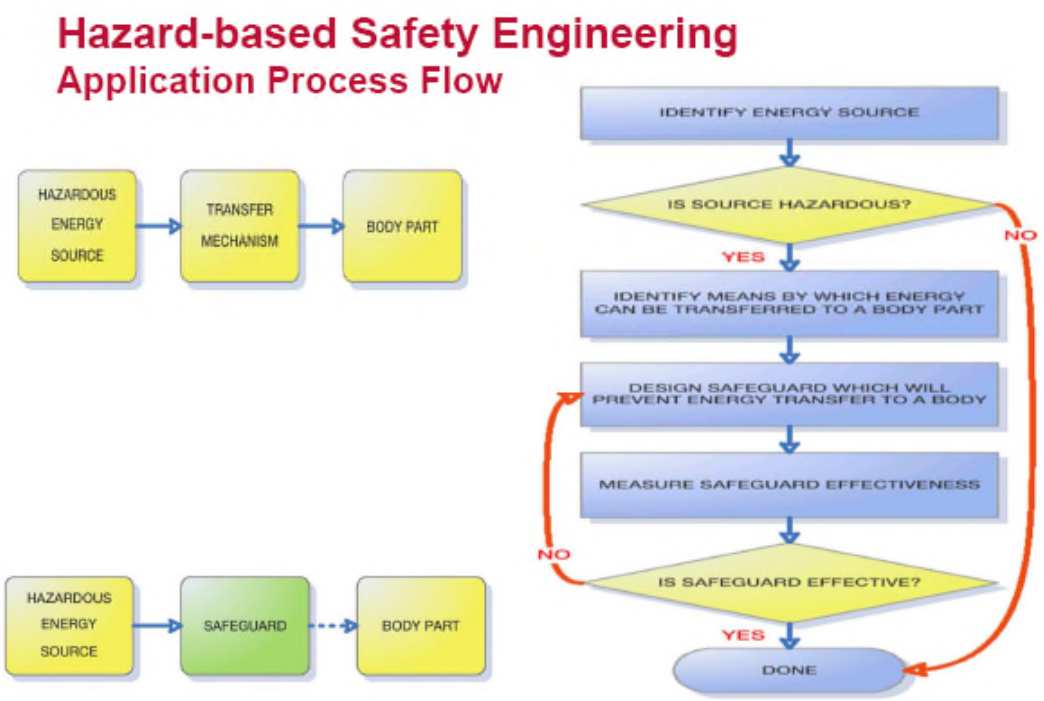

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Structure of IEC 62368-1

CLAUSES

0	Principles
1	Scope
2	Normative references
3	Terms, definitions and abbreviations
4	General requirements
5	***Electrically-caused injury***
6	***Electrically-caused fire***
7	***Injury caused by hazardous substances***
8	***Mechanically-caused injury***
9	***Thermal burn injury***
10	***Radiation***

ANNEXES (partial list)

- Annex A (Examples of equipment in scope)
- Annex B (Normal operating condition, abnormal operating condition, and single-fault condition tests)
- Annex F (Equipment markings, instructions and instructional safeguards)
- Annex G (Components)
- Annex M (Batteries and fuel cells)
- Annex Q (Interconnection with building wiring)
- Annex T (Mechanical strength tests)
- Annex V (Determination of accessible parts)
- Annex DVA – Canadian and U.S. Regulatory Requirements
- Annex DVB – Health Care Facilities
- Annexes DVE, DVF, DVG – Components
- Annex DVK – Canadian and U.S. Markings and Instructions

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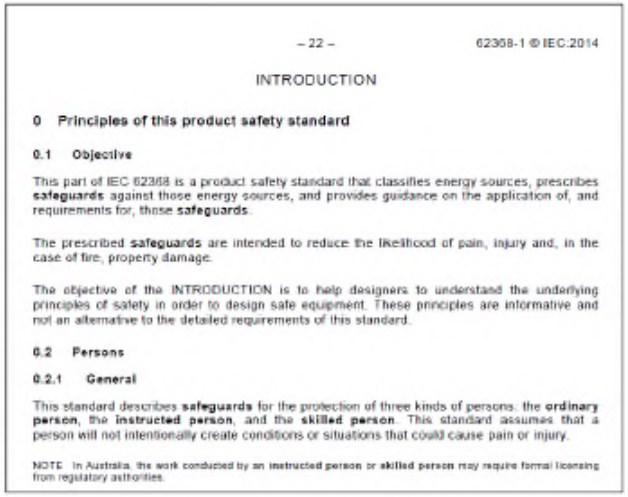
Clause 0 - Principles

- **Excellent primer** (backgrounder) on the principles and HBSE approach the Standard takes towards safety.
- Should be studied as part of the initial learning of the Standard.



– 22 – 62368-1 © IEC:2014

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 standard.

0.2 Persons

0.2.1 General

This standard describes **safeguards** for the protection of three kinds of persons: the **ordinary person**, the **instructed person**, and the **skilled person**. This standard assumes that a person will not intentionally create conditions or situations that could cause pain or injury.

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

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Clause 1 – Scope (and Annex A, Examples)

- Scope similar to IEC 60065 & IEC 60950-1
- Examples of products covered under scope provided in Annex A, essentially same examples as in IEC 60065 & 60950-1
- IEC TC108 intentionally did not widen the Scope or Examples in Annex A (of Eds 1 & 2) as to not confuse what types of products that are intended to be covered by the Standard.
- Annex A will be updated in Ed. No. 3.

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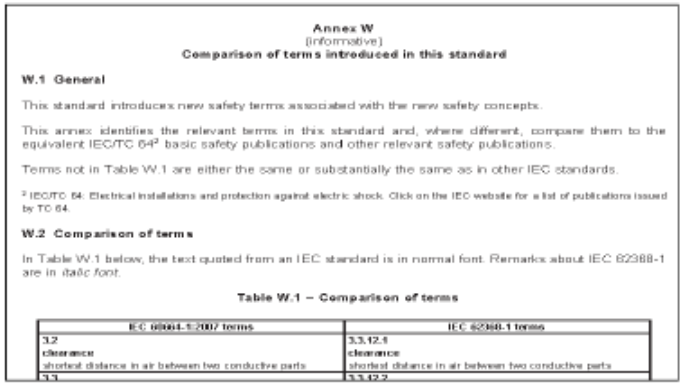
Clause 3 – Terms, Definitions and Abbreviations

- **Valuable reference – Annex W (Informative)**
  Comparison of terms introduced in this standard.
  - Compares terms used in 62368-1 with, terms used in ***IEC 60950-1*** (ITE), IEC 60065 (AV), IEC 60664-1 (Insulation Coordination), IEC 61140 (Protection against electric shock), IEC 60728-11 (CATV), and IEC 62151 (Telecom).



Annex W
(informative)
Comparison of terms introduced in this standard

W.1 General

This standard introduces new safety terms associated with the new safety concepts.

This annex identifies the relevant terms in this standard and, where different, compare them to the equivalent IEC/TC 64[2] basic safety publications and other relevant safety publications.

Terms not in Table W.1 are either the same or substantially the same as in other IEC standards.

[2] IEC/TC 64: Electrical installations and protection against electric shock. Click on the IEC website for a list of publications issued by TC 64.

W.2 Comparison of terms

In Table W.1 below, the text quoted from an IEC standard is in normal font. Remarks about IEC 62368-1 are in *italic font*.

Table W.1 – Comparison of terms

IEC 60664-1:2007 terms	IEC 62368-1 terms
3.2 **clearance** shortest distance in air between two conductive parts	3.3.12.1 **clearance** shortest distance in air between two conductive parts
3.3	3.3.12.2

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Clause 3 – Terms, Definitions & Abbreviations: Differences

IEC 60950-1	IEC 62368-1
User (Operator)	**Ordinary Person**
(Operator w/ limited training, e.g., allowed access to RAL)	**Instructed Person**
Service Person	**Skilled Person**
SELV (voltage based) **LCC** (current based)	**ES1** (considers both voltage & current)
TNV e.g., TNV-1	**External Circuit,** with transient considerations e.g., ES1 with Table 16, ID Nos. 4, 6,7 etc.
Marking **Instruction**	**Instructional Safeguard**

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Clause 4 – General Requirements

- Many same elements as **60950-1's** 1.3 (General Requirements, 1.4 (General Conditions – Tests) and 1.5 (Components)
- Includes general requirements, or points to Annexes, used throughout the Standard, such as,
  - Use of components (4.1.2)
  - Constructions not specifically covered (4.1.5)
  - Temperature measurements (4.1.10)
  - Markings & instructions (4.1.15)
  - Energy source classifications (4.2), protection against energy sources (4.3) and Safeguards (4.4).

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Annex G (Components)

- All the component requirements have been grouped into Annex G rather than dispersed throughout Standard like 60950-1.
- Level of requirements is similar to 60950-1 (or 60065), including requirements for **switches** (G.1), **relays** (G.2), **protective devices** (G.3), **connectors** (G.4), **wound components** (G.5), **wire insulation** (G.6), **mains supply cords** (G.7), **varistors** (G.8), **IC current limiters** (G.9), **resistors** (G.10), **capacitors & RC units** (G.11), **optocouplers** (G.12), **printed boards** (G.13), **pressurized liquid filled components** (G.15), and **IC with capacitor discharge function (ICX)** (G.16), etc.

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Annex M (Batteries and fuel cells)

- Similar to 4.3.8 of 60950-1, except
- Batteries and cells need to comply with the appropriate IEC standards for cells and batteries, including IEC 62133 for rechargeable battery packs.
- More detail contained in annex to address battery packs (system requirements).
- Mention of Fuel Cells taken out of Edition No. 2

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Key Takeaways - general

1. Main difference between IEC 60065/60950-1 and IEC 62368-1 is in ***approach*** (HBSE).
2. Many of the prescriptive options in 60950-1 (and/or 60065) remain and are still permitted in 62368-1.
   - The main advantages are added flexibility due to more performance-based options.

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Publication History/Status

Edition No. 1

- IEC 62368-1, Ed. 1: January 2010
- EU: Ed. 1 not adopted.
- *CAN/US: CSA/UL 62368-1, Ed 1: February 2012*

Edition No. 2

- IEC 62368-1, Ed. 2: February 2014
- *EU: EN 62368-1, Ed 2: August 2014*
- *CAN/US: CSA/UL 62368-1, Ed 2: December 2014*

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Standards Development Technical Bodies CLC/TC 108X **EN 62368-1:2014**

Implementation Dates

date of Ratification (DOR) (1)	2014-06-20
date of Availability (DAV) (2)	2014-08-01
date of Announcement (DOA) (3)	2014-12-20
date of Publication (DOP) (4)	2015-06-20
date of Withdrawal (DOW) (5)	2020-12-20

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Announced Formal Transition Dates

EU *Date of Withdrawal (DOW)* - Legacy Standards (60065/60950-1): **June 20, 2019**

- Official Journal (OJ) of the EU (latest): July 8, 2016
- DOW = Date superseded standards (60065 & 60950-1) cease to give 'presumption of conformity' with the essential requirements of the relevant Union legislation

Cenelec	EN 62368-1:2014 Audio/video, information and communication technology equipment - Part 1: Safety requirements (IEC 62368-1:2014, modified) IEC 62368-1:2014 (Modified)	08/07/2016	EN 60065:2014# + A1:2015# + A:2014 EN 60950-1:2006# + A11:2009# + A12:2011# + A1:2010# + A2:2013 Note 2.1	20/06/2019
	EN 62368-1:2014/AC:2015	08/07/2016		

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Announced Formal Transition Dates

US (UL) *Effective Date* – New Products: **June 20, 2019**

- ✓ Soft Transition: No formal Industry File Review of existing certifications.

CAN-CSA C22.2 No 62368-1/ANSI-UL 62368-1, Edition No. 2

- Canadian/U.S. Bi-national Standard
  - **Published: December 2014**
  - SCC & ANSI Approved in Canada & U.S.

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Current Status and Schedule of Adoption

- EU adoption of 2nd edition based on published DOW of legacy standards-June 20 2019
- UL will harmonize with EU date to move to 2nd edition starting June 20 2019
- CELENEC voted to extend DOW from June 20,2019 to December 20 2020 (18 month ext.)
- CENELEC and European Regulators currently in discussions to establish this date as new published date in Official Journal (OJ)
- CENELEC also agreed to remove the legacy component provision in 4.1.1 from 2nd Edition (effective December 20,2020)

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Current Status and Schedule of Adoption

- **62368-1 3rd edition** moving from Committee Draft for comment to Committee Draft for Vote
- Vote and Comments to be discussed at next IEC TC108 meeting in Toronto Canada in Oct 2017
- Target Publication Date: Q4 2018 or Q1 2019

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Current Transition Schedule

Likely EU/NA Transition:
Legacy AV/ICT Standards → 62368-1 (present)

Year:	2016	2017	2018	2019	2020	2021	2022	2023 +
IEC	IEC 60065, Ed 8 (2014)							
	IEC 60950-1, Ed 2, Am 2 (2013)							
	IEC 62368-1,Ed2 (2014)							
	IEC 62368-1,Ed3 (pub: Q1/2019?)							
EU	EN 60065, Ed 8 (2014)							
	EN 60950-1, Ed 2, Am 2 (2013)							
	EN 62368-1, Ed2 (2014) w/ DOW of 06/19							
	~~***EN 62368-1, Ed3***~~							
CAN/ US	UL 60065, Ed 8 (2015)							
	CSA/UL 60950-1, Ed 2, Am2 (2014)							
	CSA/UL 62368-1, Ed2 (2014) w/ ED of 06/19							
	~~***CSA/UL 62368-1, Ed3***~~							

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Current Status and Schedule of Adoption

- Global adoption rates by country will vary and may requiring duo certification

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Hybrid TRF


IEC

For IEC use only

108/575/INF

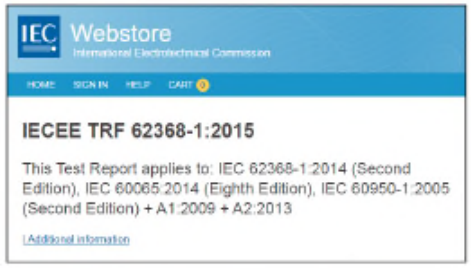
2015-01-16

INTERNATIONAL ELECTROTECHNICAL COMMISSION

TECHNICAL COMMITTEE NO. 108: SAFETY OF ELECTRONIC EQUIPMENT WITHIN THE FIELD OF AUDIO/VIDEO, INFORMATION TECHNOLOGY AND COMMUNICATION TECHNOLOGY

- **Solution: Hybrid TRF**
  - One 62368-based TRF that also documents requirements/principles in IEC 60065 & IEC 6(
  - One 62368-based investigation
  - TRF documents compliance with 62368-1, and 60065 &/or 60950-1.
- IEC TC108 supports in principle: **108/575/INF.**

Hybrid TRF - Status



- Hybrid TRF published in IECEE
  - Available @ IEC Webstore
- Some opposition by NCBs

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Transition Strategy

- Get the standard and familiarize
- Maintain visibility with the standard transition roadmap
- Review your products lifecycle and introduction timelines
- Conduct a file analysis for existing products
- Finalize your roadmap
- Establish a budget and schedule
- Transition early to avoid delays and missed schedules

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- Questions?
- Discussions?