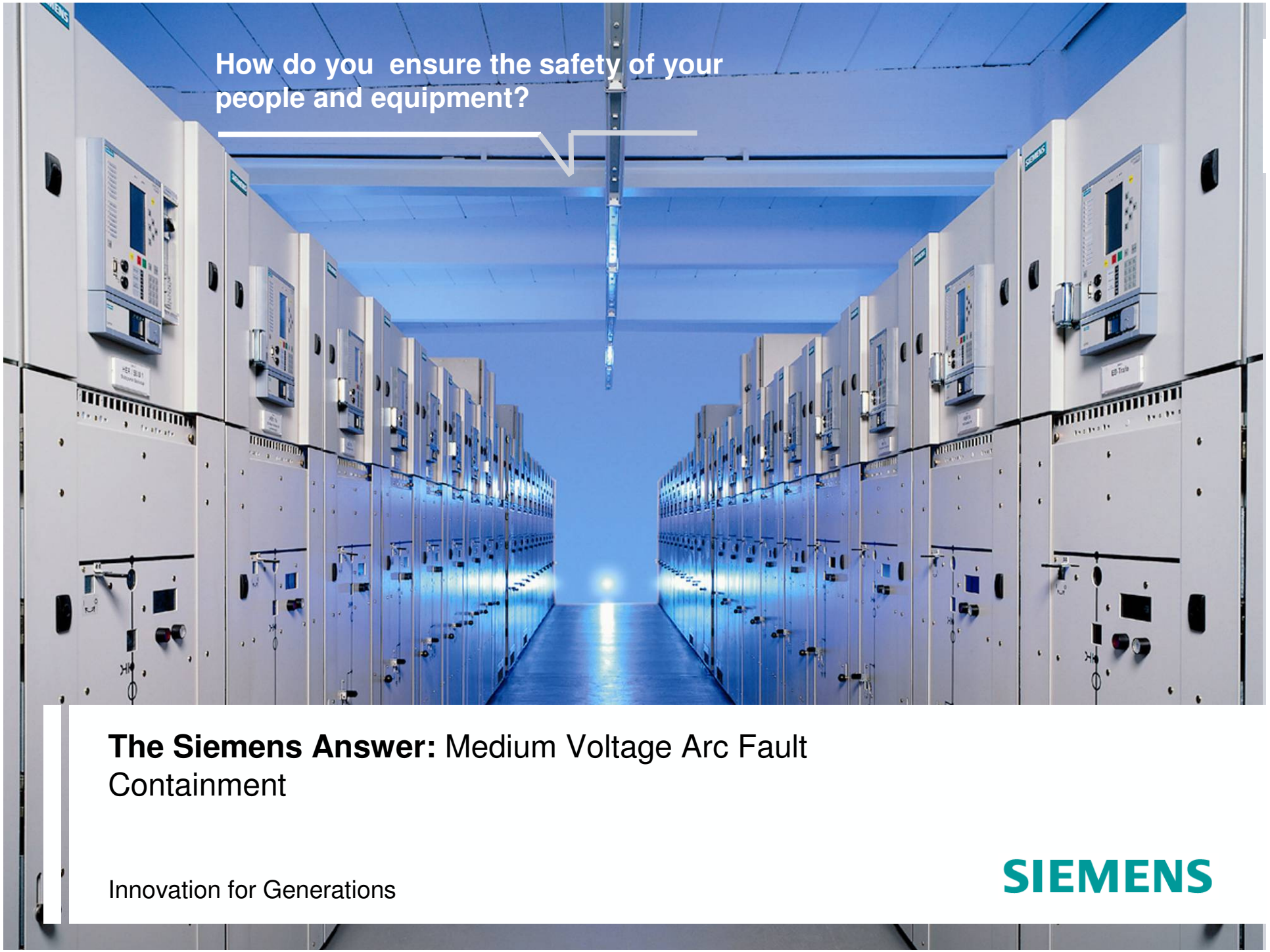

The Siemens Answer: Medium Voltage Arc Fault Containment

Innovation for Generations

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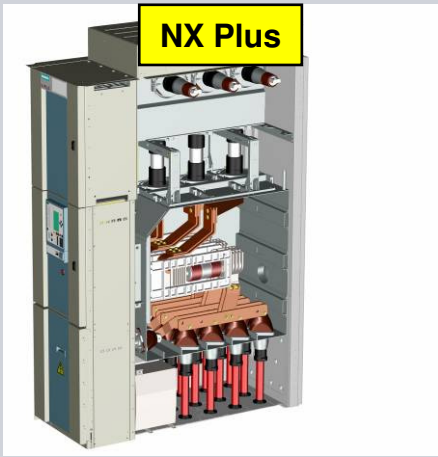
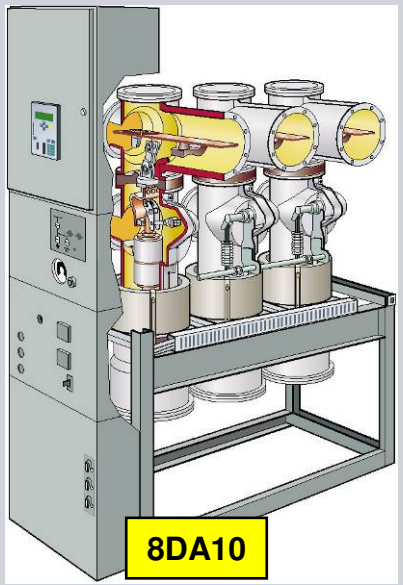
Primary Distribution Air Insulated Switchgear

- Withdrawable Air Insulated Switchgear
- Type-tested to IEC 62271-200
- Front or rear cabling
- Proven vacuum interupter technology

Primary Distribution Gas Insulated Switchgear

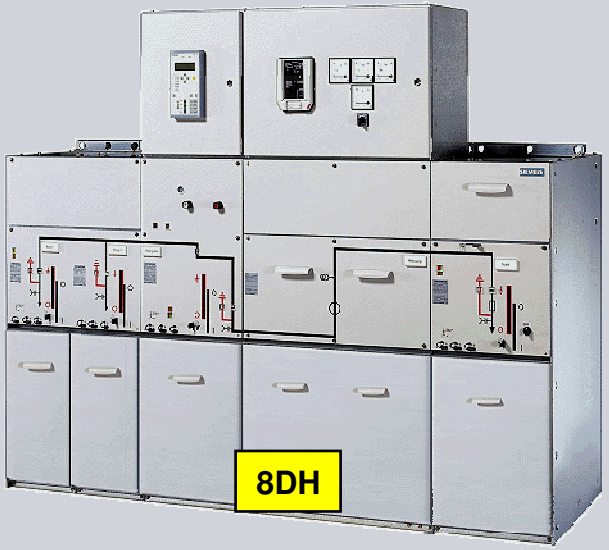
- SF6 Gas-insulated switchgear (GIS)
- Type-tested switchgear according IEC 62 271-200
- Arc fault containment tested
- Fixed pattern
- Independent of climate (altitude, humidity & pollution





Secondary Distribution Switchgear

- Fully type-tested to IEC 62271-200
- Arc fault containment tested
- Hermetically-sealed Laser welded switch-gear enclosures
- MTBF >12,000 years
- Over 450,000 sold since 1982



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IEC / AS 62271 Series of Standards

AS 62271 Series	High-voltage switchgear and controlgear	Old AS Number
1	Common specifications	*AS 2650
100*	High-voltage alternating current circuit-breakers	AS 2006
102*	Alternating current disconnectors and earthing switches	AS 1306
103	Switches for rated voltages above 1 kV and less than 52 kV	*AS/NZS 60265.1
104	Switches for rated voltages of 52 kV and above	*AS 60265.2
106	Alternating current contactors and contactor based motor-starters	*AS 2024
110	Inductive load switching	*AS 4372
200*	A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	AS 2086
201	A.C. insulation-enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 38 kV	*AS 2264
202	High-voltage/low voltage prefabricated substations	*AS 61330
203*	Gas-insulated metal enclosed switchgear for rated voltages above 52 kV	AS 2263
301*	Dimensional standardization of terminals	AS 2395
303	Use and handling of sulphur hexafluoride (SF_6) in high-voltage switchgear and controlgear	*AS 2791
304	Additional requirements for enclosed switchgear and controlgear from 1 kV to 72,5 kV to be used in severe climatic conditions	*AS 4243

IEC / AS 62271-200 - Aims & Implications

Aims

- Operational & functional reliability
- Remove ambiguity from performance criteria
- Ensure consistent approach

Implications

- Stricter type test requirements
- More onerous & clearly defined tye test requirements
- New partition classes
- Accessibility clearly defined

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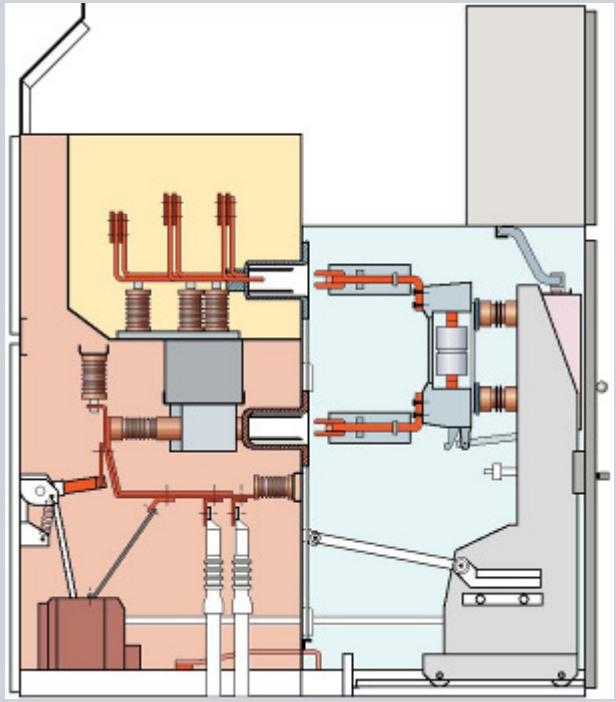
IEC / AS 62271-200 - Mandatory requirements

- Verification of insulation level
- Temperature rise
- Withstand capability of main and earthing ccts
- Making & breaking capacity of CB‘s
- Making & through fault capacity of earth switches
- Satisfactory operation of switching devices
- Protection of persons & equipment



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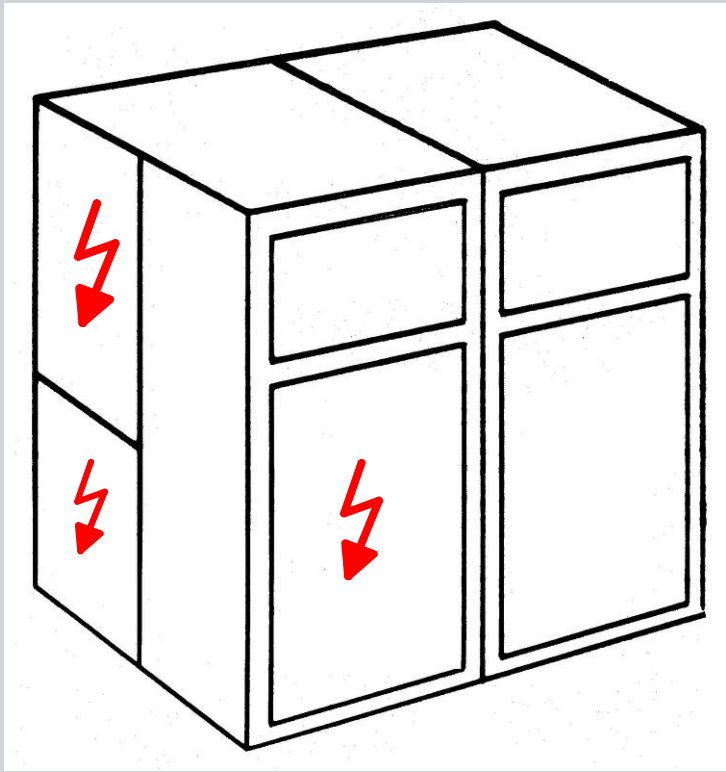
IEC / AS 62271-200 - Internal Arc Fault

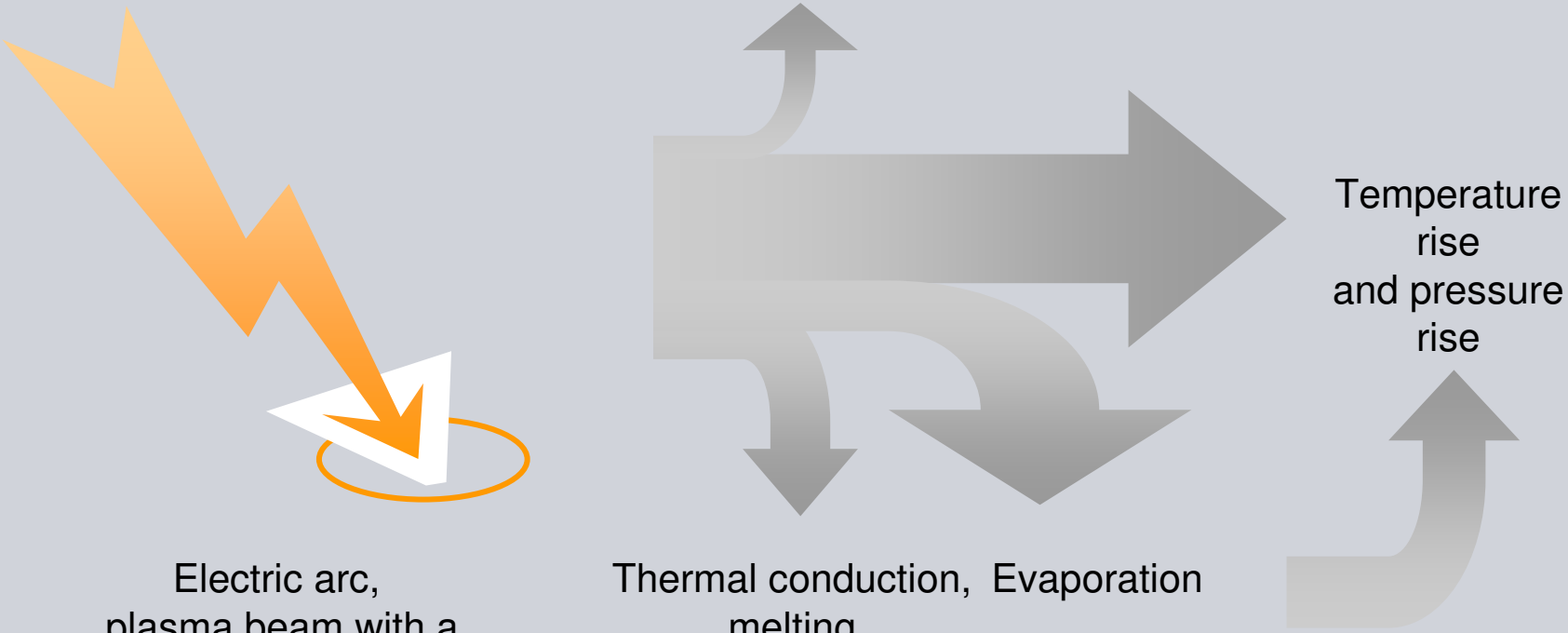
Optional Requirement

- 5 criteria mandatory to pass
- Tests in bus, CB & cable chamber
- Declaration of results mandatory
- 1 sec, 0.5 sec, 0.1 sec duration



Physical Effects of an Internal Fault

Energy balance



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Acceptance criteria

1) Covers and doors do not open,

new limited deformations are accepted

\+

new **If switchgear mounted closer to the wall than tested:**

new **permanent deformations < distance to the wall**

new **hot gases are not directed to the wall**

2) No fragmentation of the enclosre,

new projection of small parts < 60 g accepted

3) No holes in the accessible sides up to a height of 2 m

new

4) Indicators do not ignite due to hot gases

5) Connection of the enclosure to earth remains effective

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Causes of Internal Arcing Faults

- Ageing of insulating materials under electrical stress
- Corrosion
- Thermal overstressing
- Overvoltages
- Defective installation
- No maintenance or incorrect maintenance
- Maloperation / abuse
- Pollution - humidity, small animals penetrating in the switchgear

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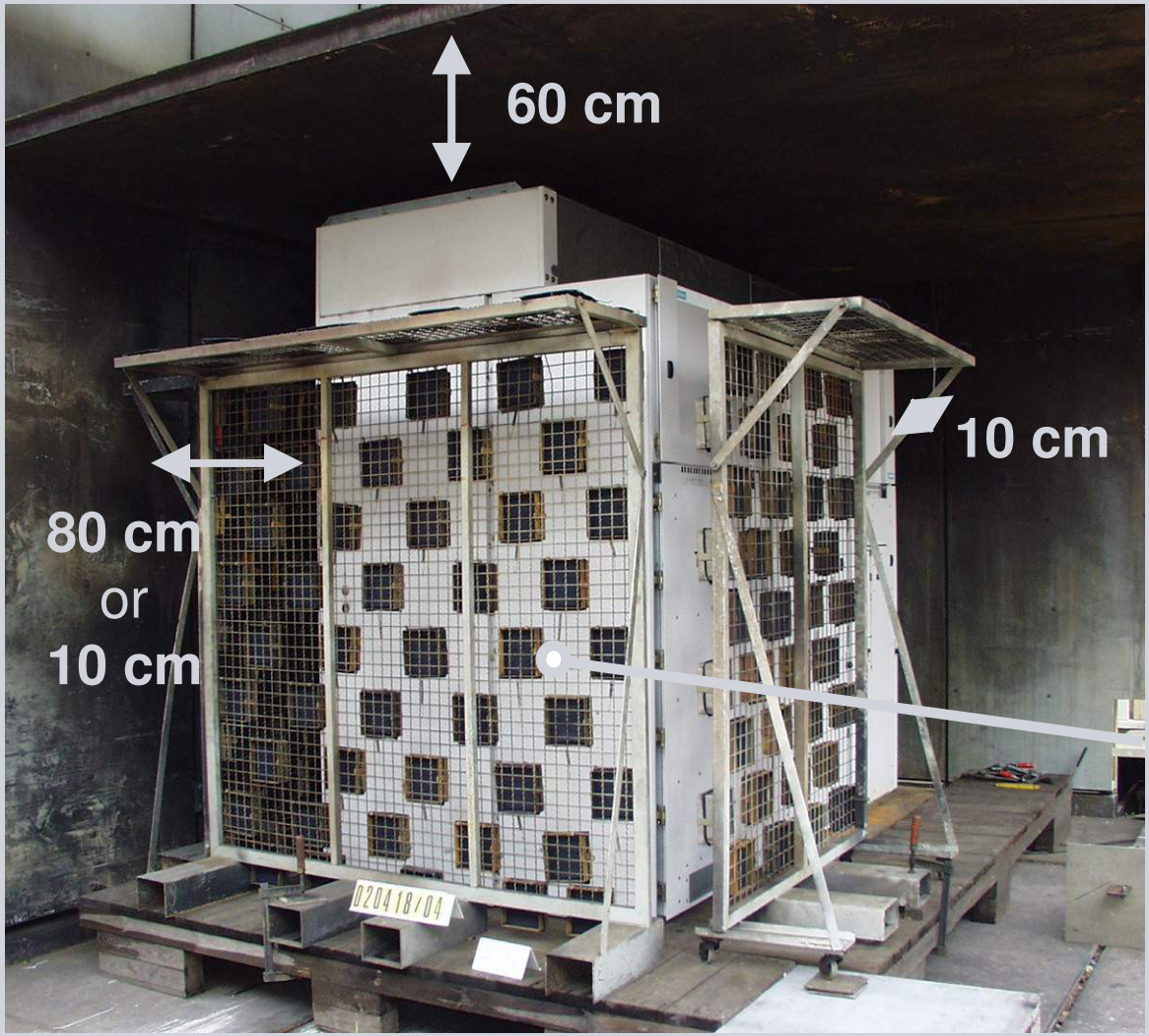
Test arrangement (principle)



Ceiling
Height ≥ 2 m
if test specimen less than 1,5 m high

Non accessible rear side
distance 10 cm or distance < deformation

Indicators:
checkerboard pattern covering 40 – 50 % of the area

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Non-accessible rear side

Installations mounted closer to the wall than tested (10 cm) require:

- **the permanent deformation must be less than the distance to the wall**
- **exhausting gases are not directed to the wall**

IEC 62271-200 Summary

- 7 mandatory requirements that switchgear must meet
- Clearly defined with no ambiguity in performance criteria
- Aims to ensure consistent approach

Arc Fault Containment Testing

- Remains an optional requirement

5 criteria mandatory to pass

- Tests in bus, CB & cable chamber
- Declaration of results mandatory
- 1 sec, 0.5 sec, 0.1 sec duration