

***IEC 62271-200***

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Authorized Sole Agent :

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### ► Scope

- ◆ **This standard specifies requirements for factory-assembled**  
**AC metal enclosed switchgear and controlgear for rated voltages**  
**above 1 kV and up to and including 52 kV**  
**for indoor and outdoor installation, and for service frequencies up**  
**to and including 60 Hz.**  
**Enclosures may include fixed and removable components and may**  
**be filled with fluid (liquid or gas) to provide insulation.**
- ◆ **This standard is a evolution / revision of IEC 60298 standard**  
**published under new reference.**

### ► Why a revision ?

- ◆ Last edition 1990, with several amendments published.

It has been considered a global revision should be wise

- ◆ Comments received per technical committee 17 C of IEC:
  - Compliance to standard and class not clear, too design oriented and not customer needs oriented
  - oil filled switchgear not correctly covered
  - not well adapted to fixed switchgear
  - not to let internal arc test under agreement between customer and supplier
  - ensure consistency with the latest version of the "common clauses" standard IEC60694.

▶ This new standard introduces several evolutions, in particular for the internal arc tests **to improve the operator and public safety.**

- ◆ Earthing
- ◆ Accessibility to compartments
- ◆ Service continuity of the switchgear during maintenance
- ◆ Partition classes of the compartments
- ◆ Accessibility to switchgear / controlgear
- ◆ Internal arc classification and tests
- ◆ Verification of making and breaking capacities of the switching devices (CB,SWD,ES,..) in the cubicle
- ◆ Dielectric tests on the cables test circuit with busbar live
- ◆ For cable compartment with plug-in connectors, internal arc test with two phase short-circuit current

**New classifications are oriented to the users,  
and not to the type of conception**

▶ **More details in particular on the earthing of the removable parts**

◆ **Earthing of the main circuit:**

**All parts of the main circuit to which access for maintenance is required or provided shall be capable of being earthed prior to becoming accessible.**

◆ **Earthing of the enclosure:**

**The current density in the earthing conductor, if of copper, shall not exceed 200 A / mm<sup>2</sup> 1s and 125 A / mm<sup>2</sup> 3s. However, its cross section shall be not less than 30 mm<sup>2</sup>.**

◆ **Earthing of withdrawable and removable parts:**

**The normally earthed metallic parts of a withdrawable part shall remain connected to earth in the test and disconnected positions and in any intermediate position.**

**Connections to earth in any position shall provide a current carrying capability not less than that required for enclosures, i.e. : to carry 30 A (DC) with a voltage drop of maximum 3 V to the earthing point provided.**

► **There are four types of compartment:**

— **Three types accessible:**

The first is by use of interlocks to ensure that all live parts inside are dead and / or earthed before opening.

(ex: access to cables compartment).

a) "interlock-controlled accessible compartment"

- The second relies on user procedure and locking to ensure the safety, the compartment being supplied with facilities for padlocking or equivalent.  
(ex: key + handle PIX).

b) "procedure-based accessible compartment"

**For normal operation and maintenance these types do not require tools for opening**



## Accessibility to compartments (continued)

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### — Three types accessible (continued):

- The third does not provide built-in feature to ensure electrical safety before opening. They need tools to be opened. The need of tools is normally a clear indication that the user should take other measures to ensure the safety.

(ex: access to busbar compartment).

c) "tool-based accessible compartment"

### — One type non-accessible:

- No user access is provided and the opening may destroy the integrity of the compartment. A clear indication **not to open** is provided on, or by a feature of the compartment.

(eg: RMU or GIS tank ...)

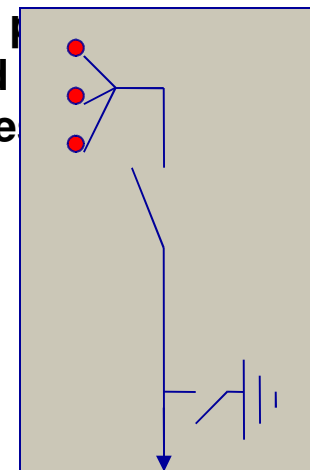
d) "non-accessible compartment"

- ▶ **The Loss of Service Continuity (LSC) category describes the extend to which other compartment and / or functional units may remain energised when a main circuit compartment is opened .**

- ◆ **Category LSC1: This form is not intended to provide service continuity during maintenance (if needed) and may require complete disconnection of the switchgear from the system / network and making dead before accessing the interior of the enclosure. The enclosure is intended to provide a level of protection of persons and of the equipment against ingress of foreign objects.**

foreign

Cubicle Type is removed

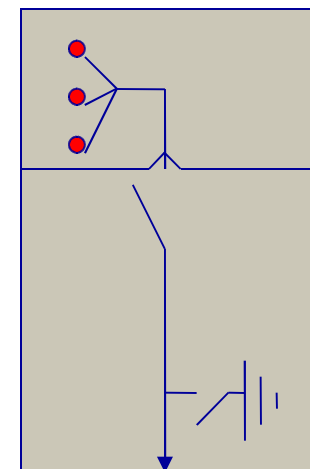




- ◆ **LSC2: This form is intended to allow maximum continuity of service of the network during access to the compartments inside the switchgear.**
  - **LSC2A: When accessing components of one functional unit the other functional units of the switchgear may be kept in service.**

eg: HV cables dead and earthed, The main circuit must be disconnected and separated (physically and electrically) from the busbars

One disconnection point eg: FLUOKIT M

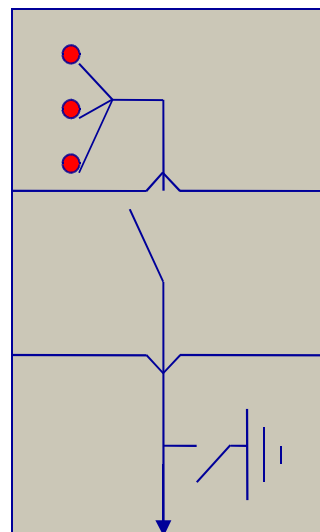


**Compartmented type is removed**

- ▶ **LSC2B:** In addition to the LSC2A category, the HV cables to the functional unit being accessed may be kept energised. This means that there is another point of disconnection and separation and there are minimum three compartments.

Two disconnection points

eg: PIX



Metal-clad type is removed

## Partition classes of the compartments

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- ▶ **These classes define if the partition material is metallic or non-metallic.**
  - ◆ **Class PM: Metal-enclosed switchgear providing continuous metallic partitions and / or shutters (if applicable) intended to be earthed, between opened accessible compartments and live parts of the main circuit.**
  - ◆ **Class PI: Metal-enclosed switchgear having one or more non-metallic partitions or shutters between opened accessible compartments and live parts of the main circuit.**

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## *Accessibility to switchgear*

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- ▶ **The types of accessibility A and B are extended to insert the type C for the pole-mounted switchgear.**
  - ◆ **Type A: access only to authorised personnel**
  - ◆ **Type B: unrestricted accessibility (includes the public)**
  - ◆ **Type C: accessibility restricted by installation out of reach**

- ▶ **To provide an acceptable protection level for operators and, where applicable, for the general public, in the case of an internal arc fault which has a probability very weak during all the life of switchgear, following an IAC (Internal Arc classification).**
- ▶ **In defining classification IAC, the following points have to be considered:**
  - ◆ **not all switchgear will be IAC classified**
  - ◆ **not all switchgear is of withdrawable design**
  - ◆ **not all switchgear is fitted with a door which can be closed in the positions: service / earthing / test**

## *Internal arc classification (continued)*

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- ▶ **The following criteria may be used as a guide for the selection of the adequate switchgear with respect to internal arc.**
  - ◆ **Where the risk is considered negligible: Metal-enclosed switchgear IAC classified is not necessary.**
  - ◆ **Where the risk is considered to be relevant: Only metal-enclosed switchgear IAC classified should be used.**

for more details see table 8.1

## *Internal arc classification (continued)*

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- ▶ **The tests will be realised in the normal operating conditions required, as opening / closing, connecting / disconnecting, reading of measuring instruments and monitoring equipments....., therefore :**
  - ◆ **If to perform any door / cover closed, the test shall be carried out in this condition**
  - ◆ **If to perform any door / cover opened or removed, the test shall be carried out in this condition**
  
- ▶ **The test shall not be carried out for the maintenance conditions neither service continuity conditions**
  - ◆ **eg: replacing active components as HV fuses**

## Internal arc classification (continued)

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- ▶ With the two types A and B of accessibility to switchgear, we may have different types of accessibility on the various side of its enclosure. For identification of the different sides, the following code shall be used:

- ◆ F for Front side
- ◆ L for Lateral side
- ◆ R for Rear side

example of classification IAC: tested 12.5 KA 1 s., intended to be installed in a site of public accessibility, and tested with indicators placed in the front, lateral, rear side.

IAC BFLR

Classification

internal arc: 12.5 KA 1 s.



***Internal arc classification (continued)***

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**other example of classification IAC:**

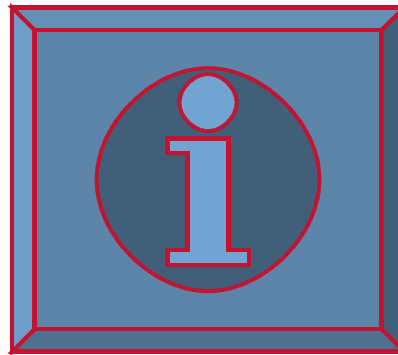
- tested 16 KA 1 s.
- Front face: public accessibility
- Lateral: not accessible
- Rear: restricted to operators

**Classification IAC BF-AR**

**internal arc: 16 KA 1 s.**

	FLUOKIT M24+ IS / PFa			FLUOKIT M24+ PGC		
	BB	SWD	Cables/fuses	BB	SWD	Cables/CB
- Type concept:withdraw/non-withdraw		N-W			N-W	
- Type of accessibility (1)						
a ) interlock			a			a
b ) procedure						
c ) tool	c			c		
d ) non-accessible		d			d	
- Type of partitions: PM / PI				PI		
- Type of service continuity						
LSC1						
LSC2A				LSC2A		
LSC2B						
- Type of IAC (for the switchgear)				IAC= AF or AFL or AFLR		
A				12,5 kA 1s.		
B				16 kA 1s		
F				20 kA 1s		
L				IAC= AF 12.5kA 0.7s for EDF version		
R						

(1 )for each compartment if applicable



**Of course, all customer's and supplier's documents  
will have to change accordingly**

Accessibilité – Classe A Accessibility – Type A		Accessibilité – Classe B Accessibility – Type B	
$h > 2\text{ m}$	$h < 2\text{ m}$	$h \geq 2\text{ m}$	$h < 2\text{ m}$

268/90

Figure A.3 – Position of indicators (i)  
Height of equipment (h)

fig A.4: Room simulation and Indicator positioning for Accessibility A, Functional Unit at or above 1,5m.

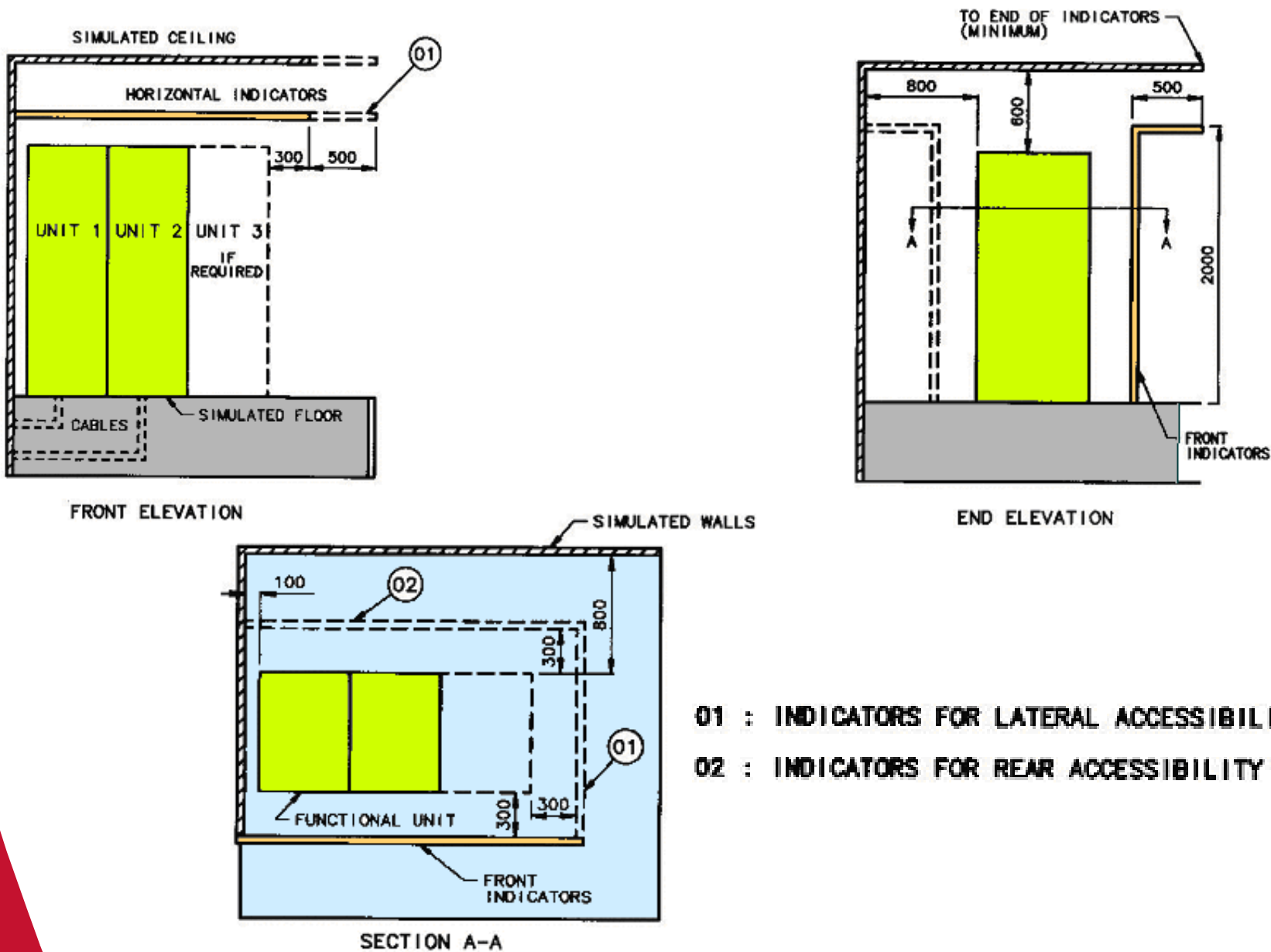
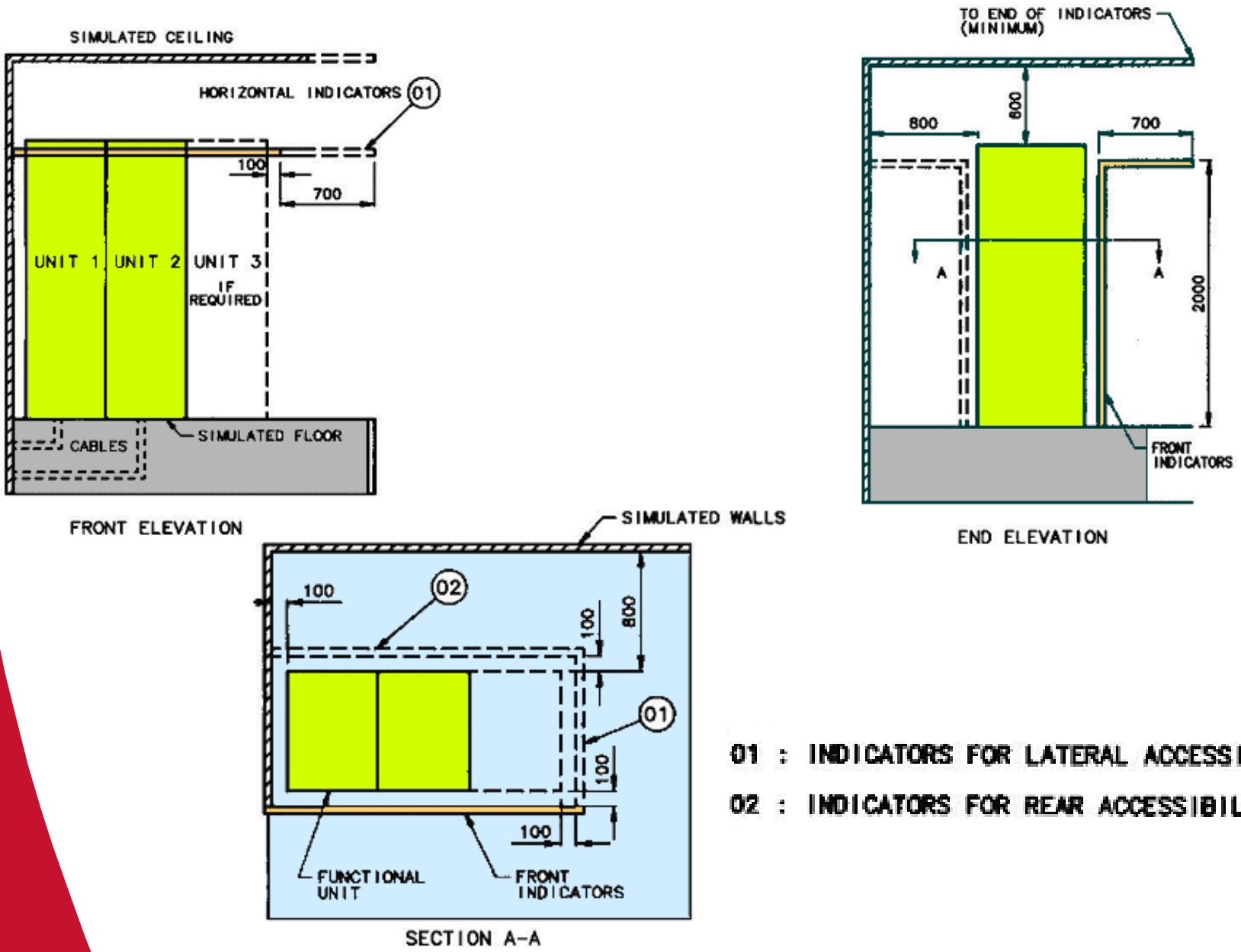
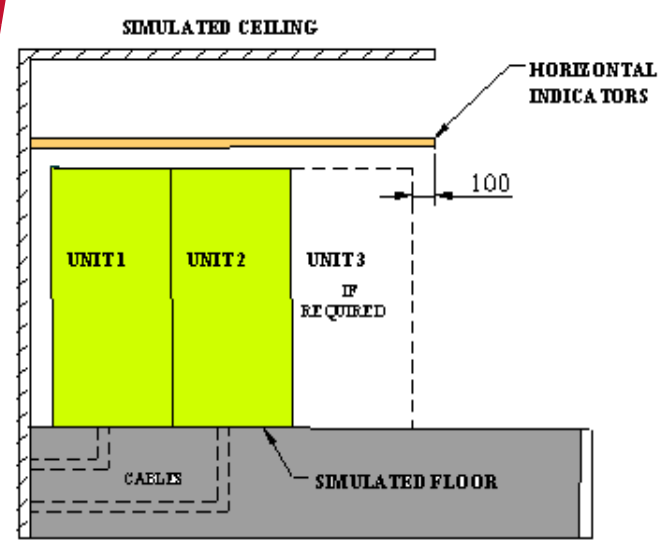


fig A.5: Room simulation and Indicator positioning for Accessibility **B**, Functional Unit **above** 2m high.

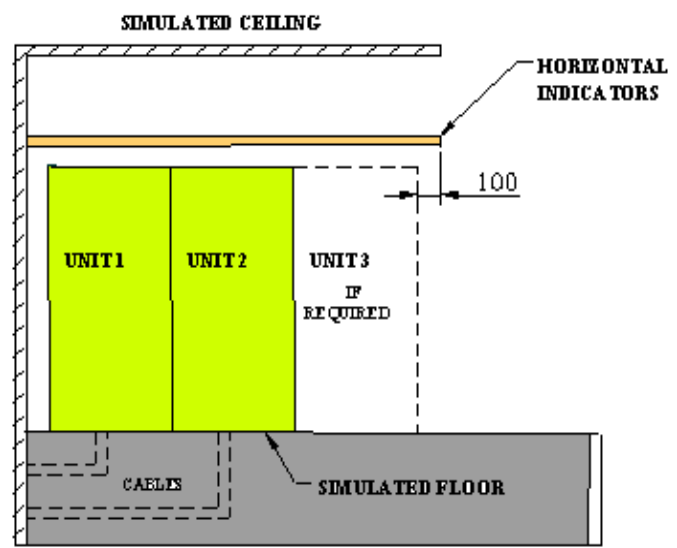


- 01 : INDICATORS FOR LATERAL ACCESSIBILITY
- 02 : INDICATORS FOR REAR ACCESSIBILITY

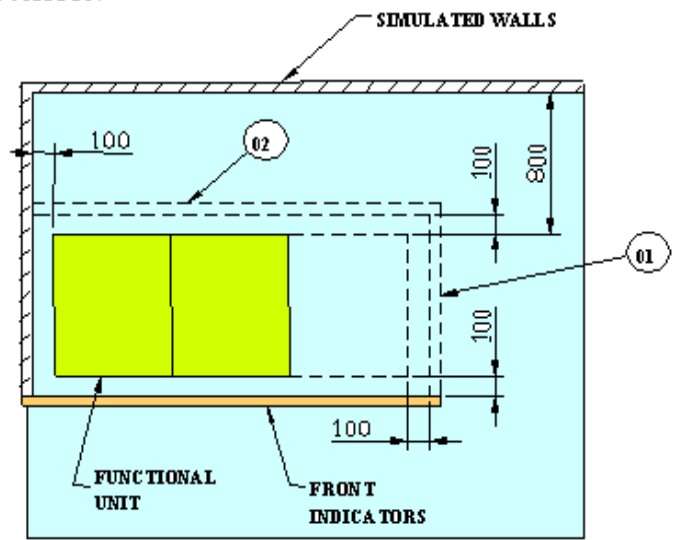
fig A.6: Room simulation and Indicator positioning for Accessibility B, Functional Unit below 2m high.



FRONT ELEVATION



FRONT ELEVATION



SECTION A-A

- 01 : INDICATORS FOR LATERAL ACCESSIBILITY
- 02 : INDICATORS FOR REAR ACCESSIBILITY