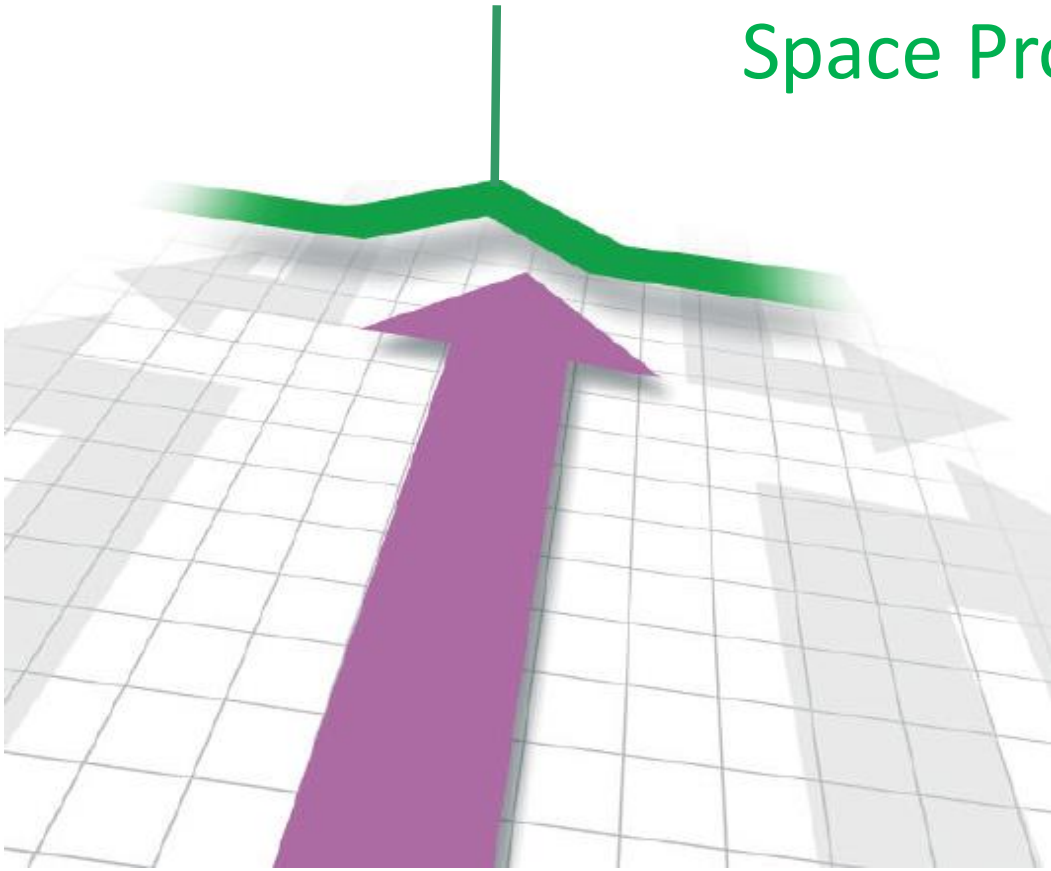


Electrical Rooms Design Space Program



By
Ahmed Besheer
Senior Electrical Design Engineer
at Schneider Electric

Schneider Electric Graduation Projects Sponsorship

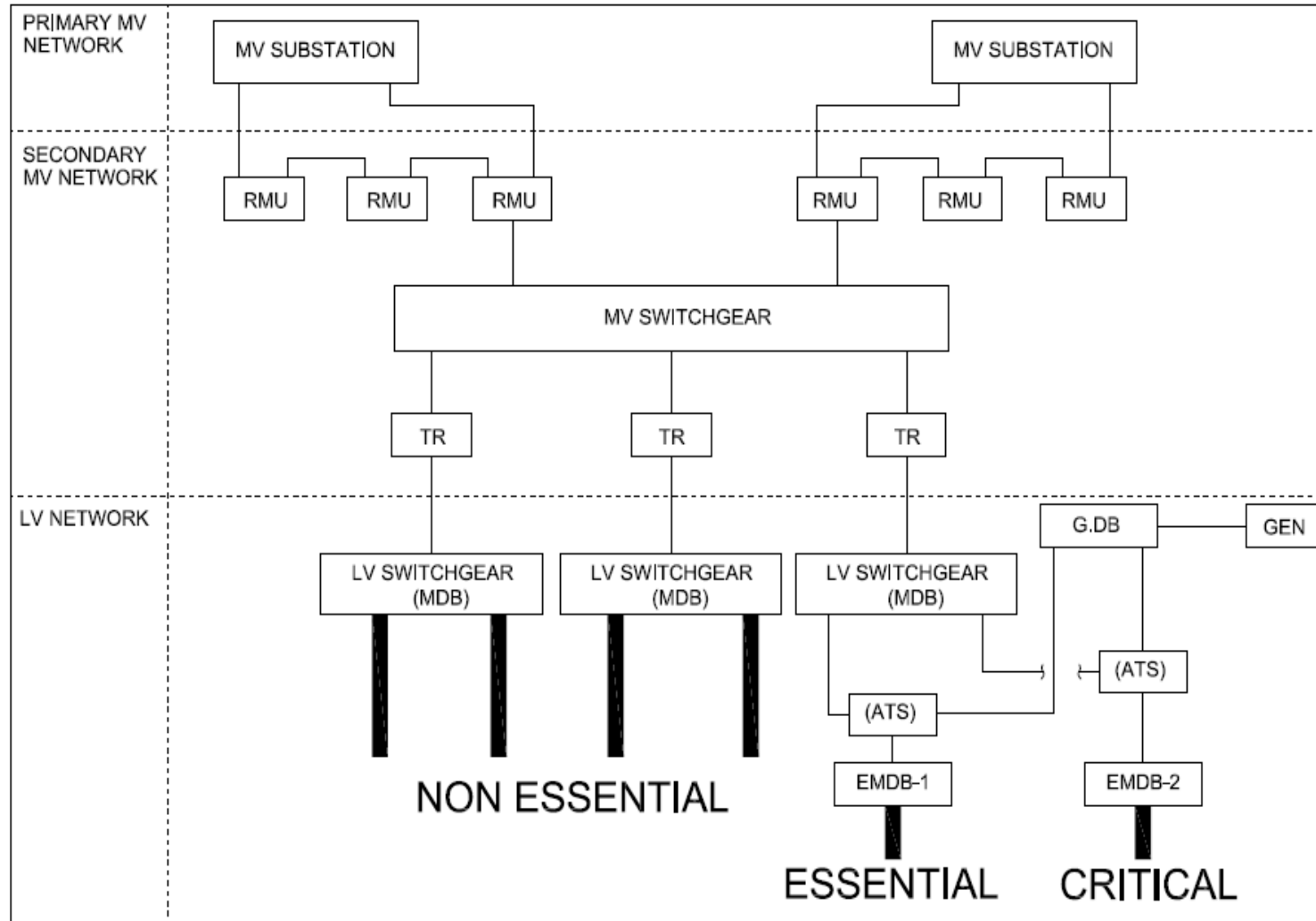


- | | |
|----------|--|
| 1 | Introduction |
| 2 | NEC - Article 110 Overview |
| 3 | RMU & Transformer Room Design |
| 4 | Generator Room Design |
| 5 | UPS Room Design |
| 6 | Central Battery Room Design |
| 7 | MVSG “Building or Room” Design |
| 8 | LV Switchgears Room Design |



Introduction

Electrical Distribution Network Architecture:



List of Bulky Equipment and Switch Gears:

Bulky Equipment:

- ✓ Distribution Transformer
- ✓ Diesel Engine Generator
- ✓ Uninterruptable Power Supply (UPS)
- ✓ Central Battery



SE: Minera



SE: Trihal



Cummins

Switch Gears:

- ✓ MV-Switch Gears
 - Distributer
 - Medium Voltage Switch Gear (MVSG)
 - Ring Main Unit (RMU)
- ✓ LV-Switch Gears
 - Free Stand Panels
 - Surface/Flush Mounted Panels



SE: APC



SE: APC



SE: MCset



SE: SM6



SE: RM6



SE: BLOKSET & OKKEN



SE: Prisma / Pragma



The Purpose of Electrical Rooms Design Aspects:

1. Providing Proper Working spaces.

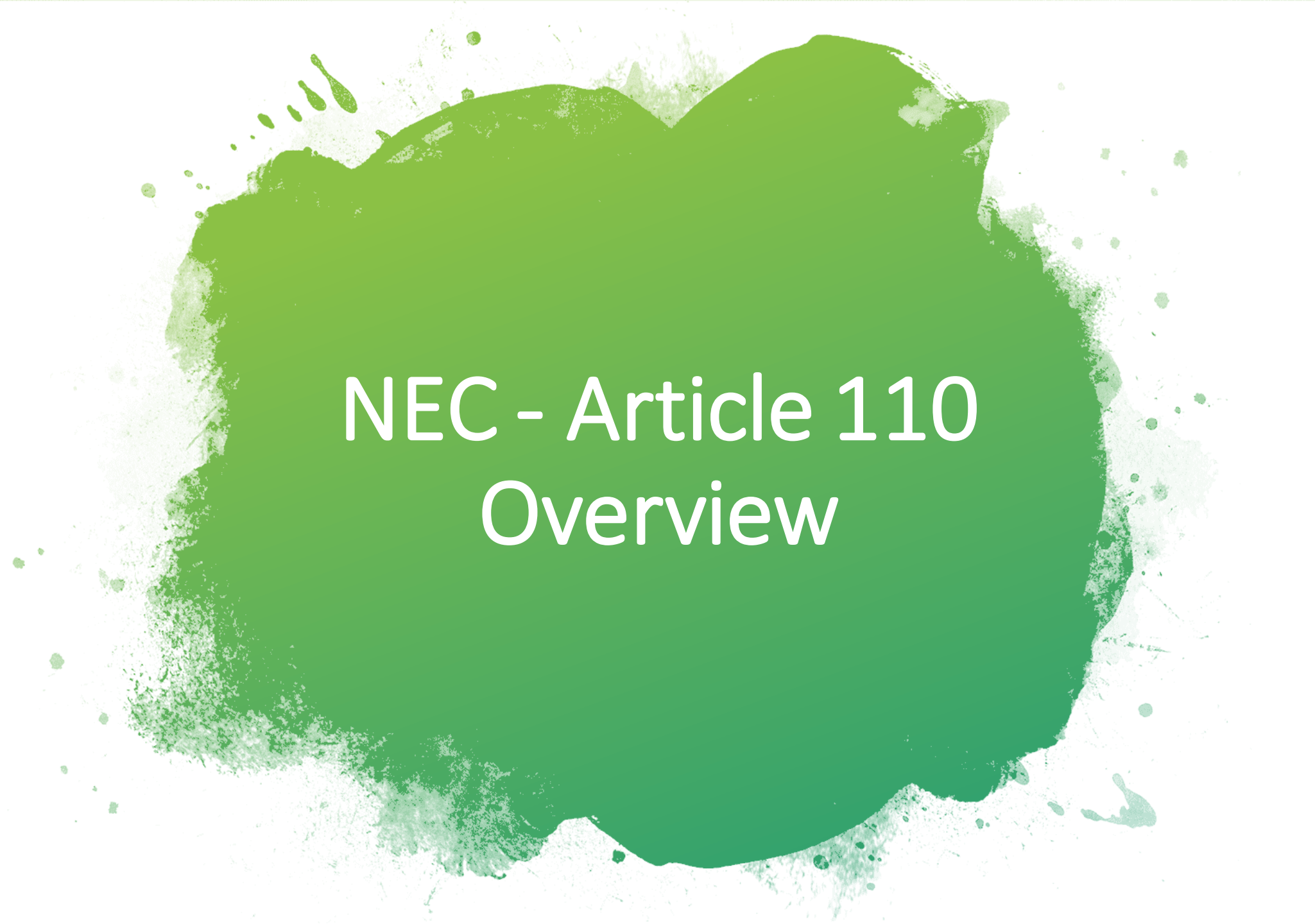
- ✓ To ensure safety of operators during dealing with any equipment or switchgear.
- ✓ To help operators to do their tasks without any interruption during installation & maintenance.
- ✓ To easily maneuver all equipment & switchgears.

2. Providing Electrical Rooms Dimensions & details.

- ✓ To Coordinate with all other Disciplines:
 - **Architecture** (Location, Space Requirements, Entrance/Egress Doors, Louvres, Ramps)
 - **Civil** (Trenches, sleeves and concrete bases required for heavy Equipment)
 - **HVAC** (Ventilation/Air Conditioning)
 - **Plumbing and Fire Fighting** (Fire Fighting Method/Fuel Tanks)
 - **Light Current** (Interface Points to BMS and Fire Points “status & command signals”)

What are references to be followed or used to design required electrical spaces for all electrical Rooms ?

- ✓ Regulations of the country at which the project will be executed.
- ✓ Data sheets of “equipment or switchgear” to know dimensions.
- ✓ Recommended clearances about the equipment or switchgear if provided by its manufacturer catalogues.
- ✓ International Codes like NEC – Article 110 which is talking about working spaces & Dedicated Electrical Spaces design.



NEC - Article 110 Overview

ARTICLE

110

REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

110.26 Spaces About Electrical Equipment



1. Working Space:

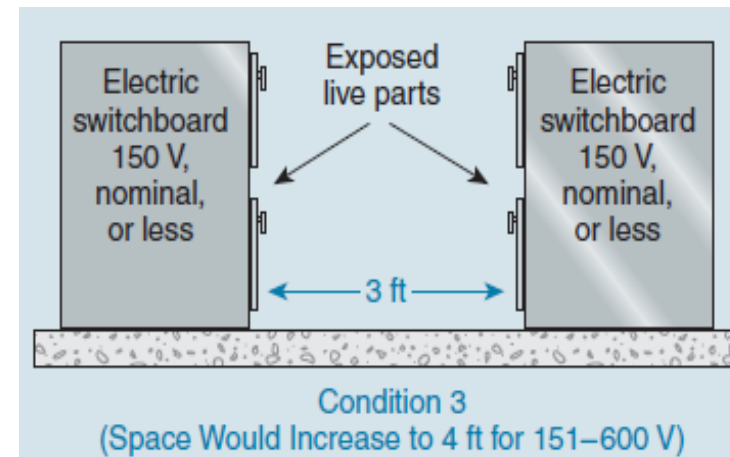
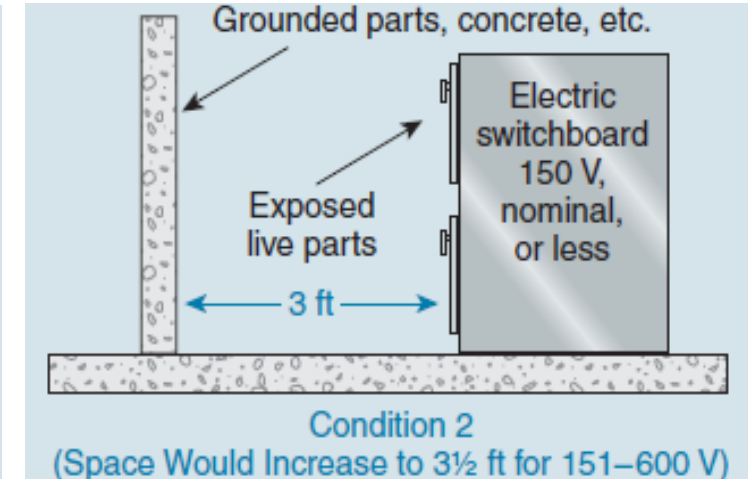
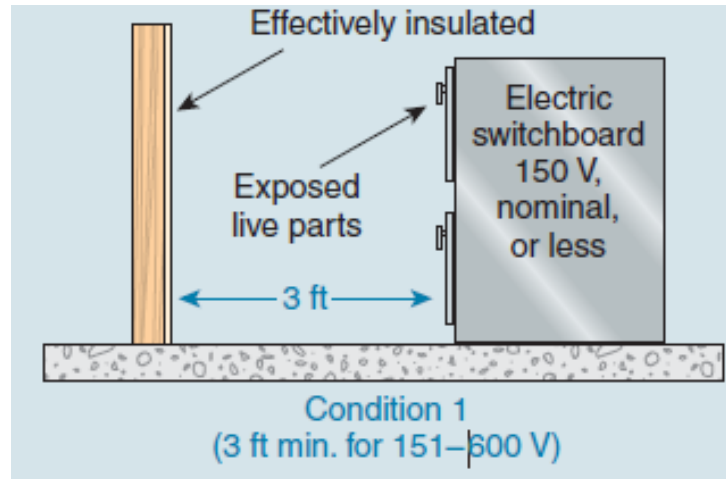
- Depth of working Space:

TABLE 110.26(A)(1) Working Spaces

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
0–150	900 mm (3 ft)	900 mm (3 ft)	900 mm (3 ft)
151–600	900 mm (3 ft)	1.0 m (3 ft 6 in.)	1.2 m (4 ft)
601–1000	900 mm (3 ft)	1.2 m (4 ft)	1.5 m (5 ft)

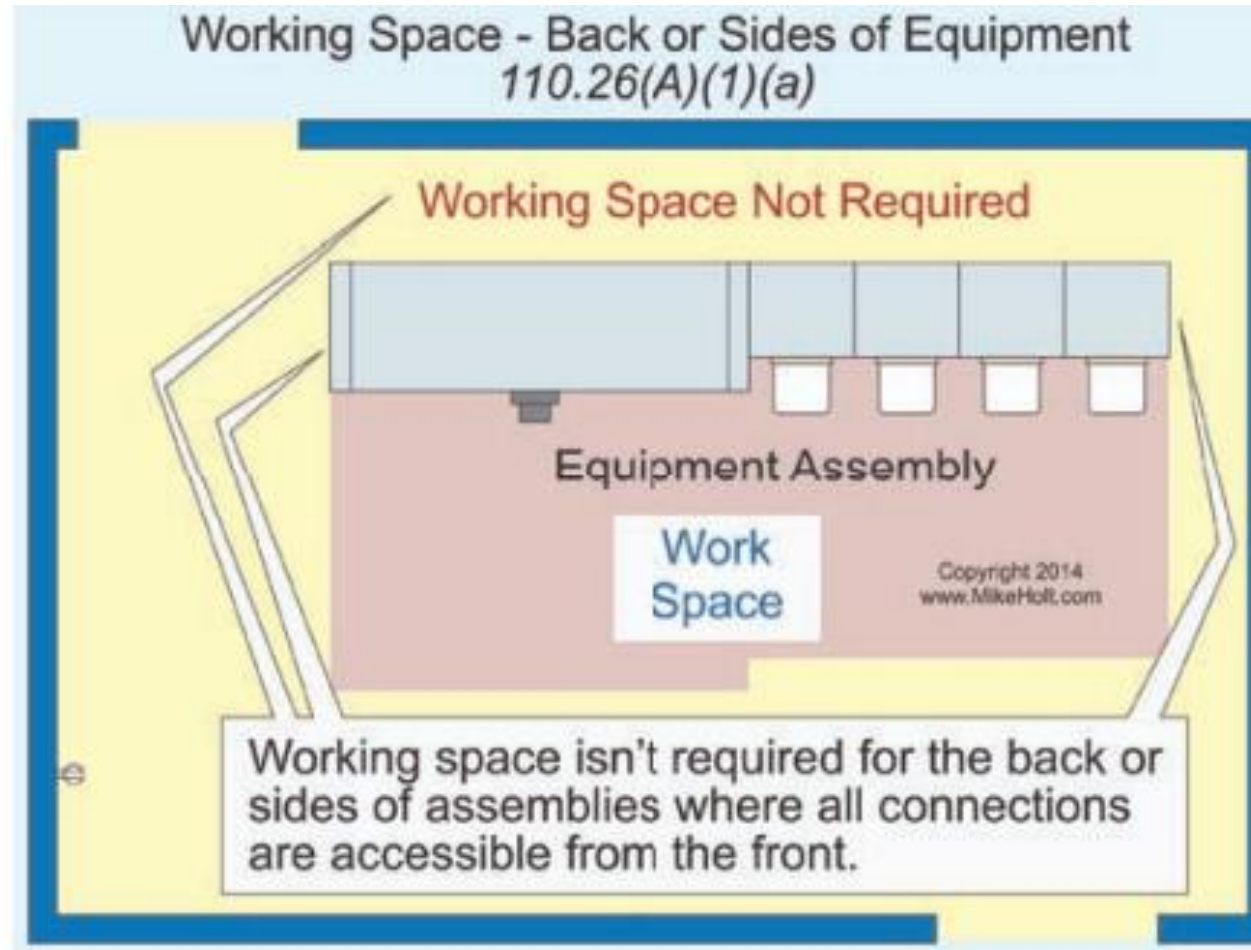
TABLE 110.34(A) Minimum Depth of Clear Working Space at Electrical Equipment

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
1001–2500 V	900 mm (3 ft)	1.2 m (4 ft)	1.5 m (5 ft)
2501–9000 V	1.2 m (4 ft)	1.5 m (5 ft)	1.8 m (6 ft)
9001–25,000 V	1.5 m (5 ft)	1.8 m (6 ft)	2.8 m (9 ft)
25,001 V–75 kV	1.8 m (6 ft)	2.5 m (8 ft)	3.0 m (10 ft)
Above 75 kV	2.5 m (8 ft)	3.0 m (10 ft)	3.7 m (12 ft)



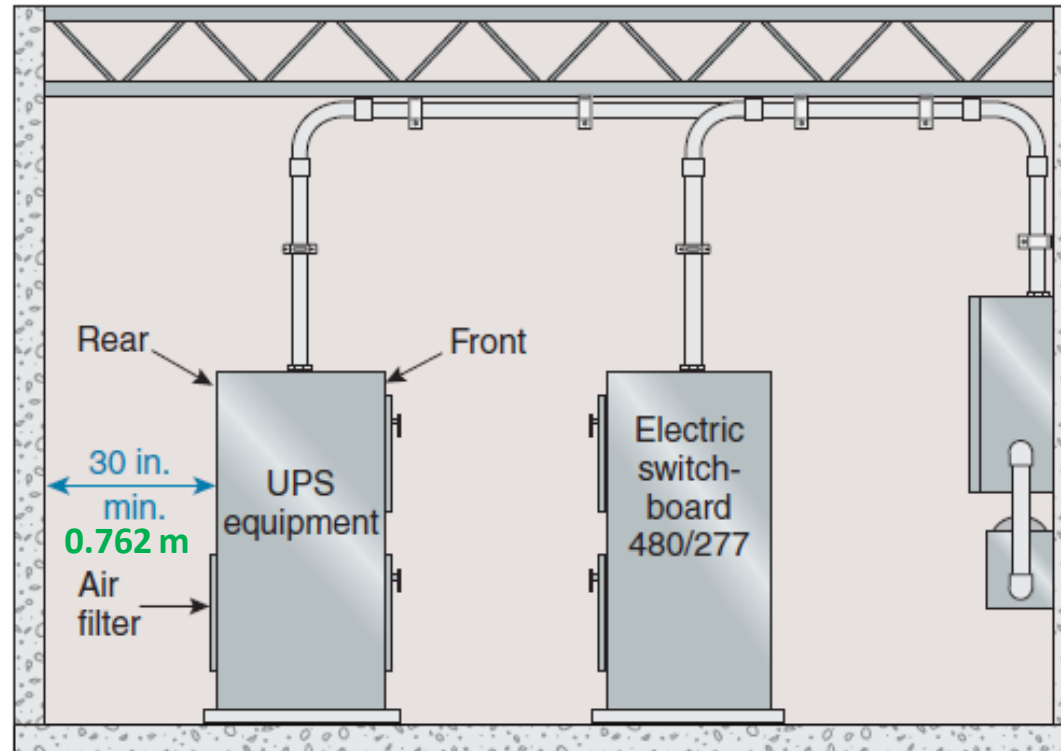
1. Working Space:

- Depth of working Space:



1. Working Space:

- Depth of working Space (Rear Access):



Note: if the Rear of equipment requires working space larger than 30 in. , we must provide the proper larger Depth of working space.

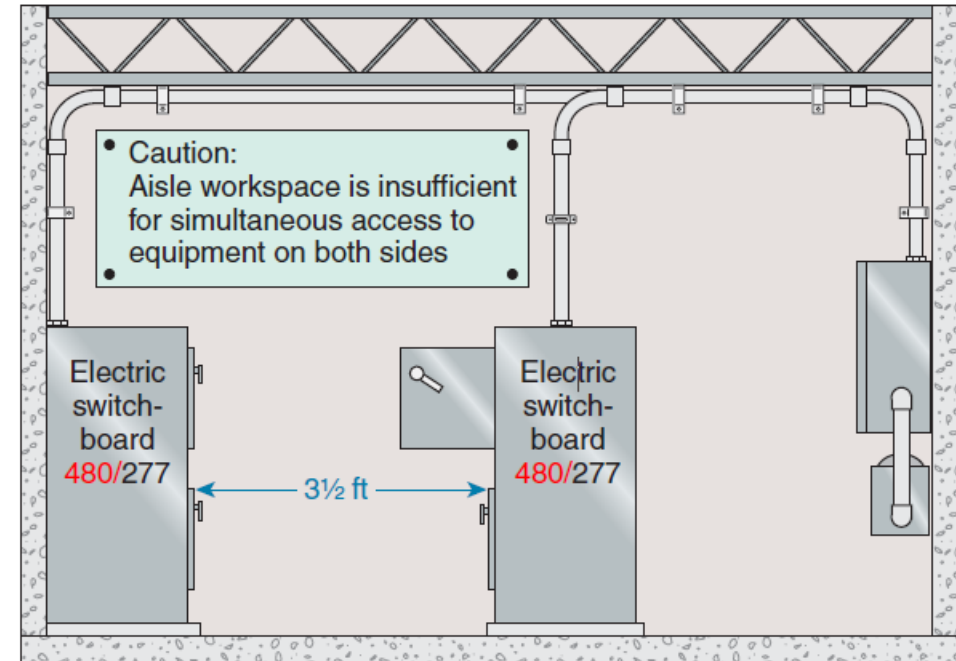
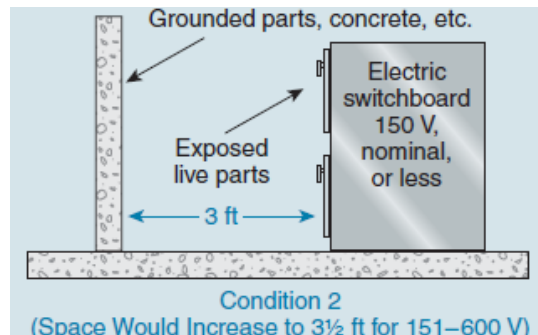
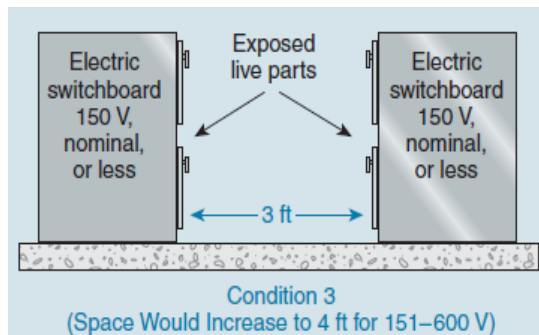
1. Working Space:

- Depth of working Space (Existing Building):

If electrical equipment is being replaced, Condition 2 working space is permitted between dead-front switchboards, panelboards, or motor control centers located across the aisle from each other where conditions of maintenance and supervision ensure that written procedures have been adopted to prohibit equipment on both sides of the aisle from being open at the same time, and only authorized, qualified persons will service the installation.

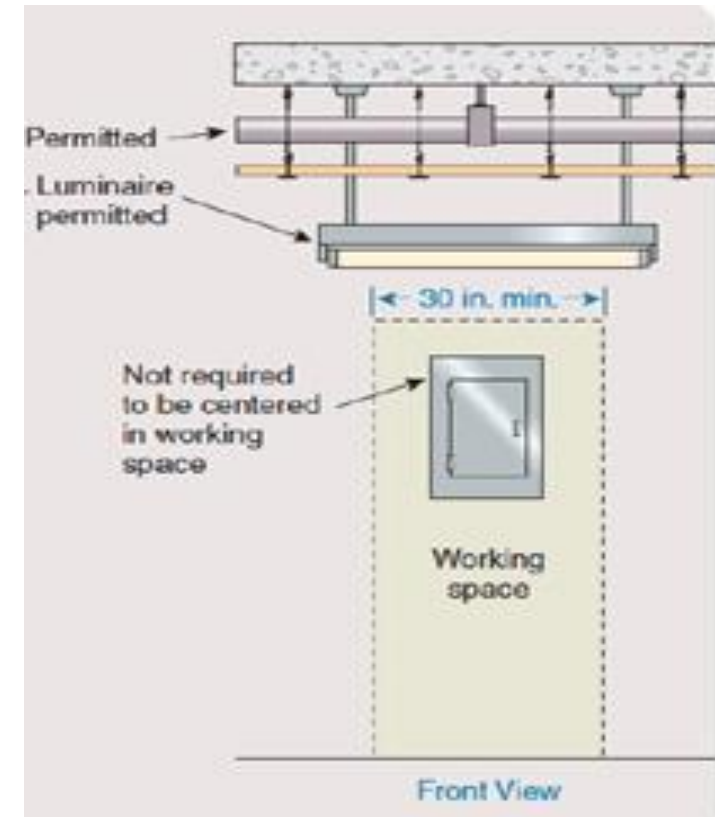
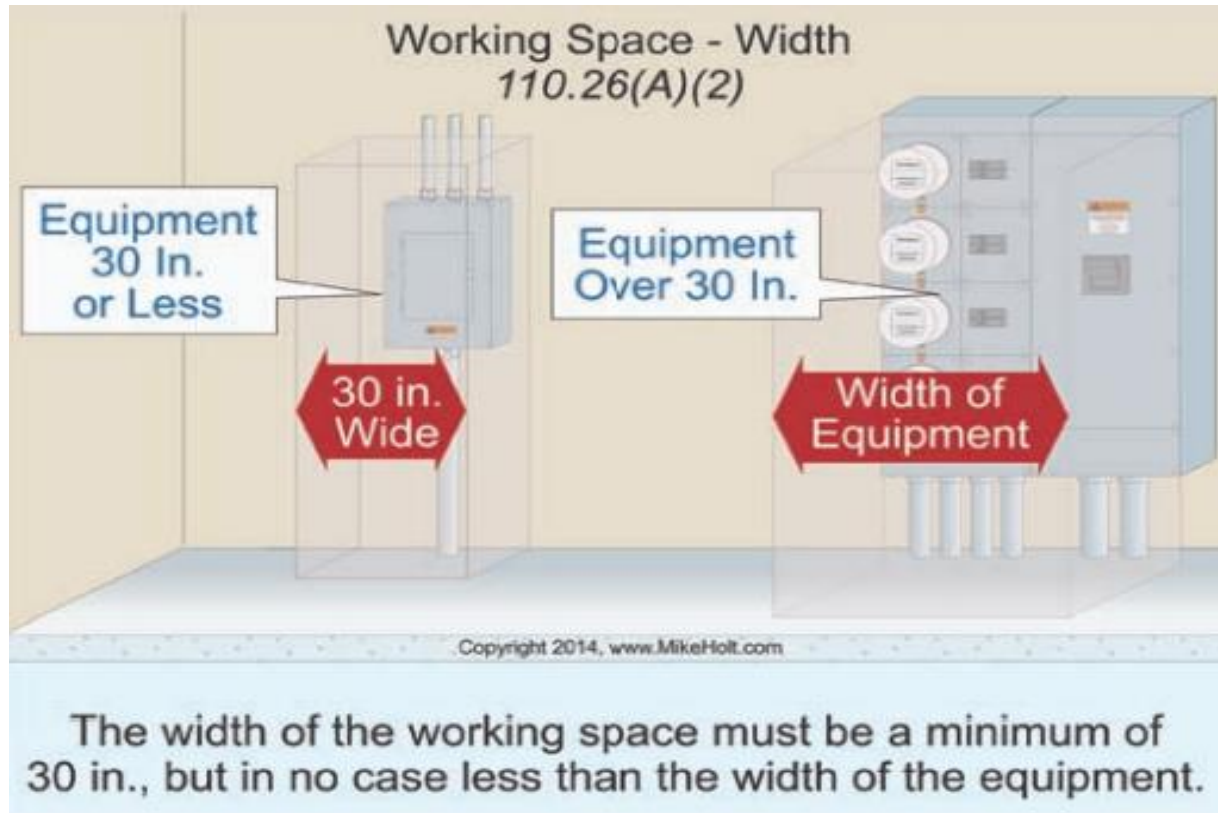
TABLE 110.26(A)(1) Working Spaces

Nominal Voltage to Ground	Minimum Clear Distance		
	Condition 1	Condition 2	Condition 3
0–150	900 mm (3 ft)	900 mm (3 ft)	900 mm (3 ft)
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601–1000	900 mm (3 ft)	1.2 m (4 ft)	1.5 m (5 ft)



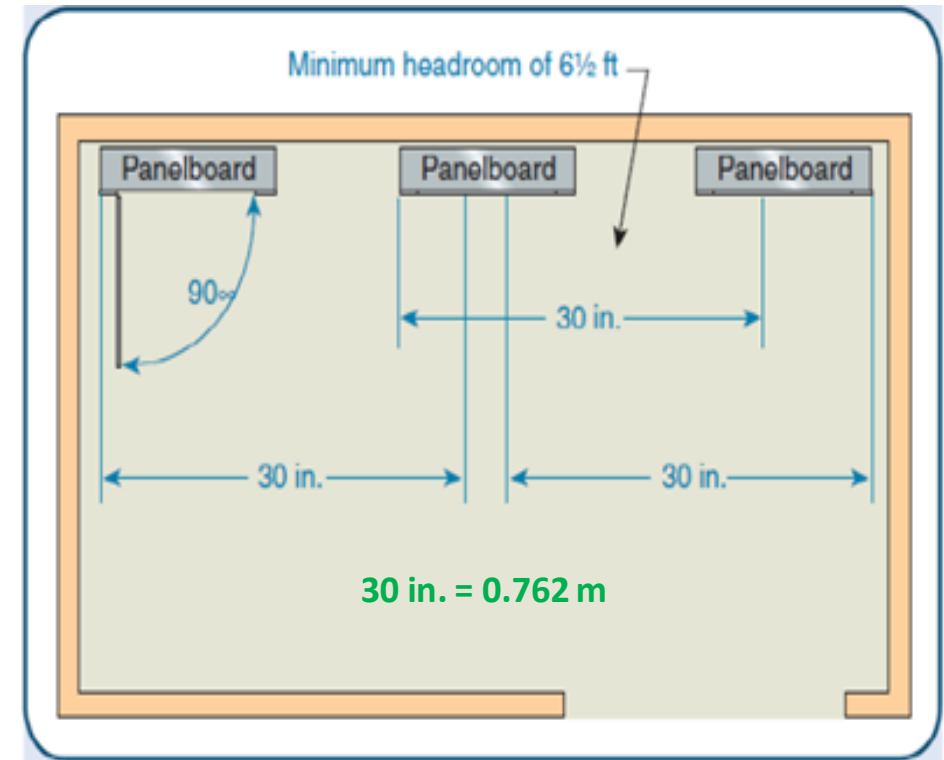
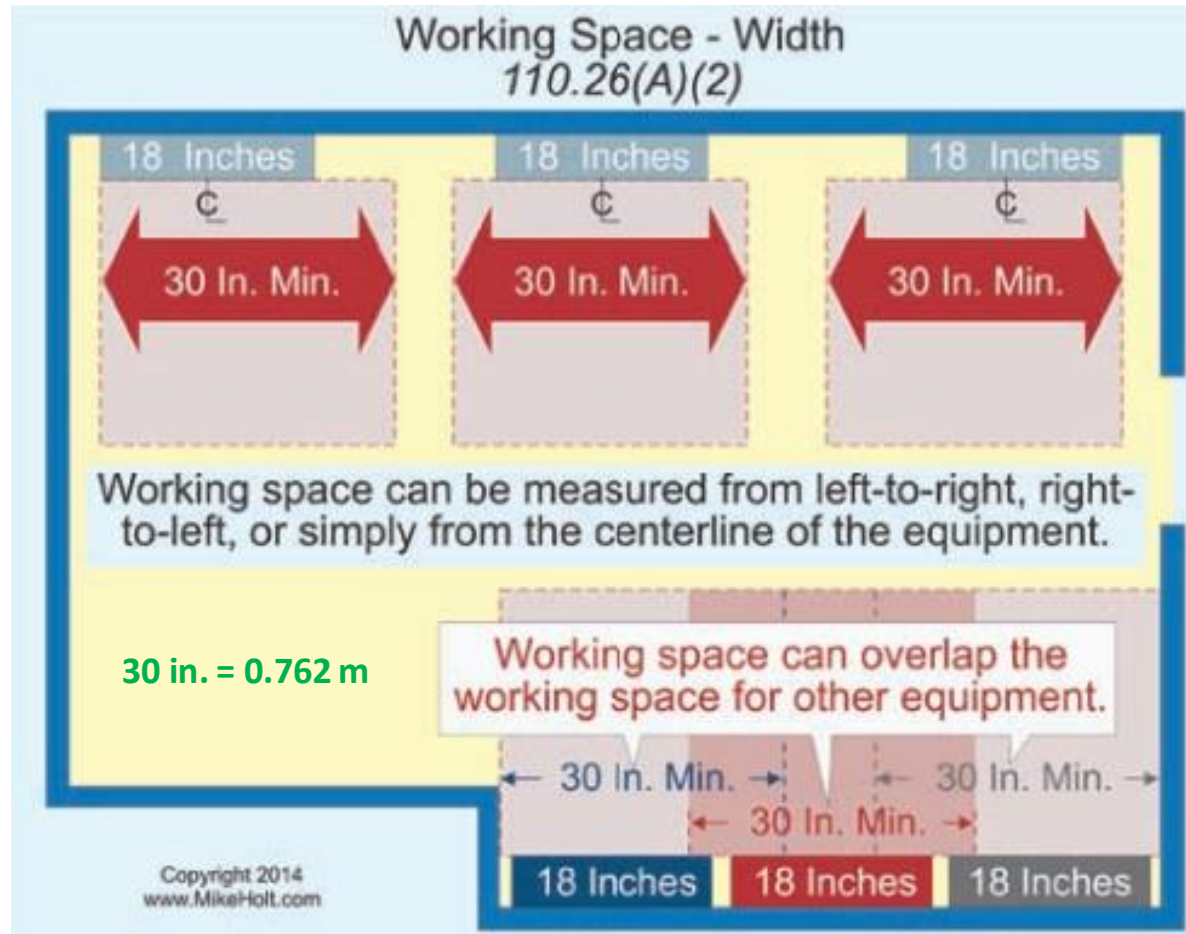
1. Working Space:

- Width of working Space



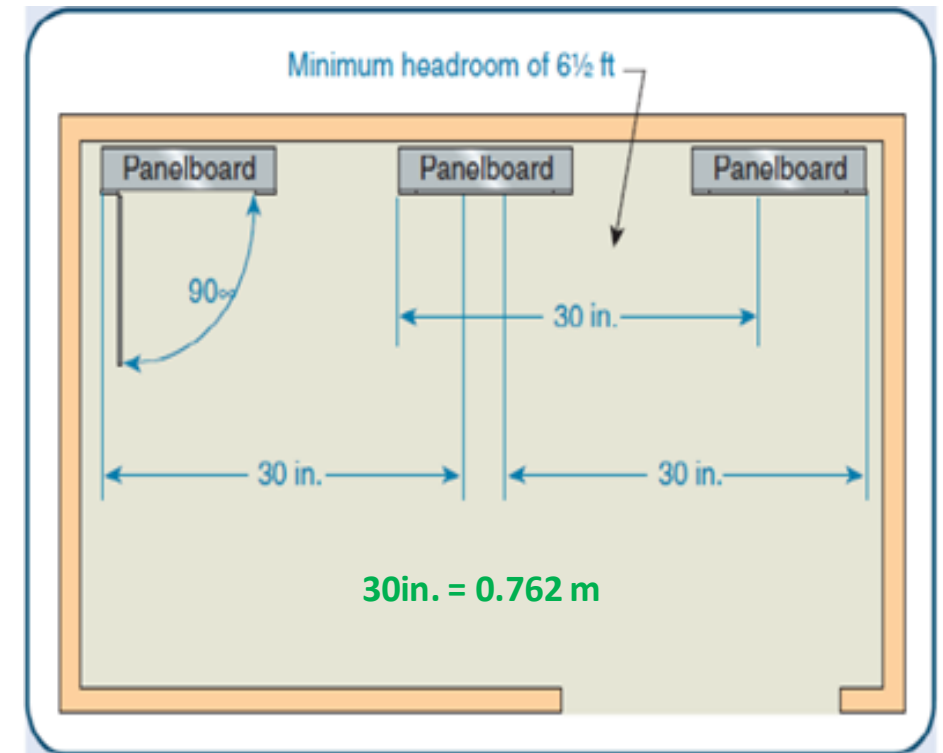
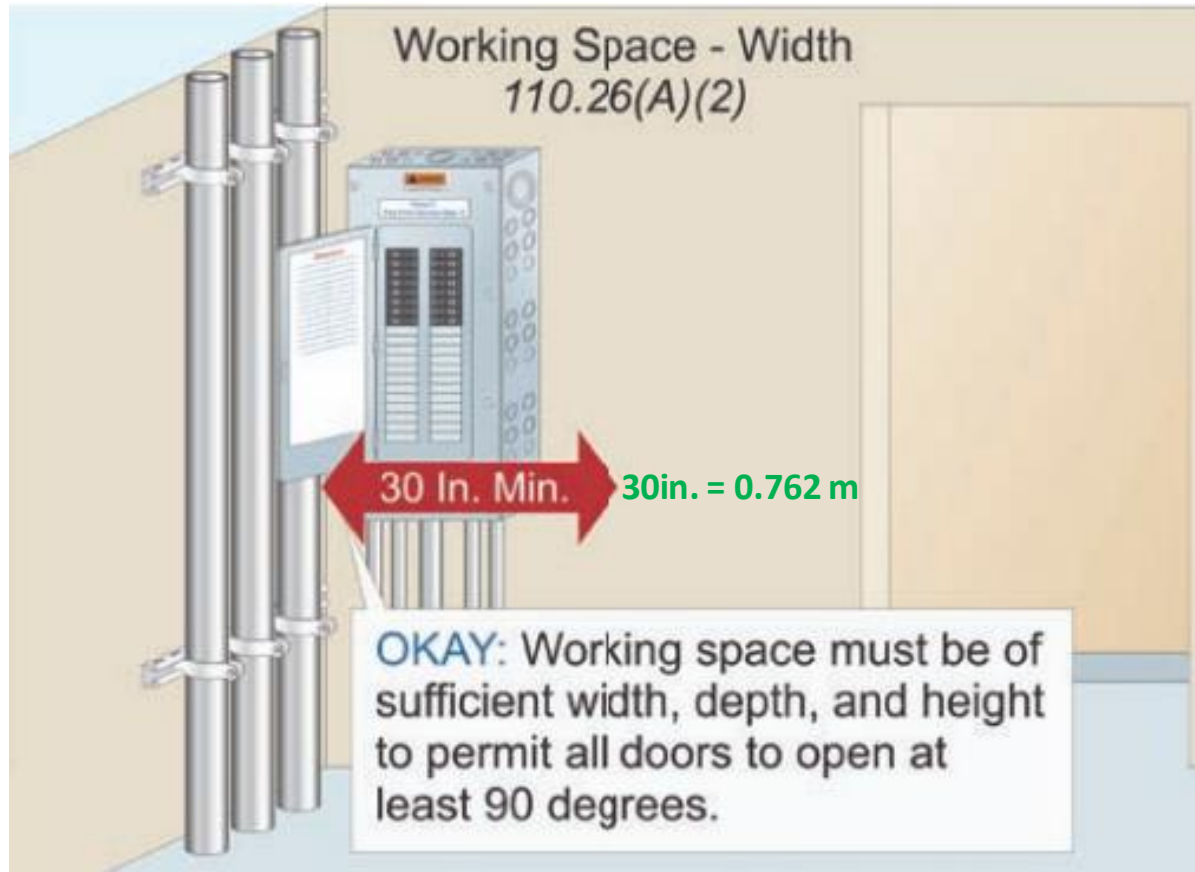
1. Working Space:

- Width of working Space (width measurement methodology & Overlapping)



1. Working Space:

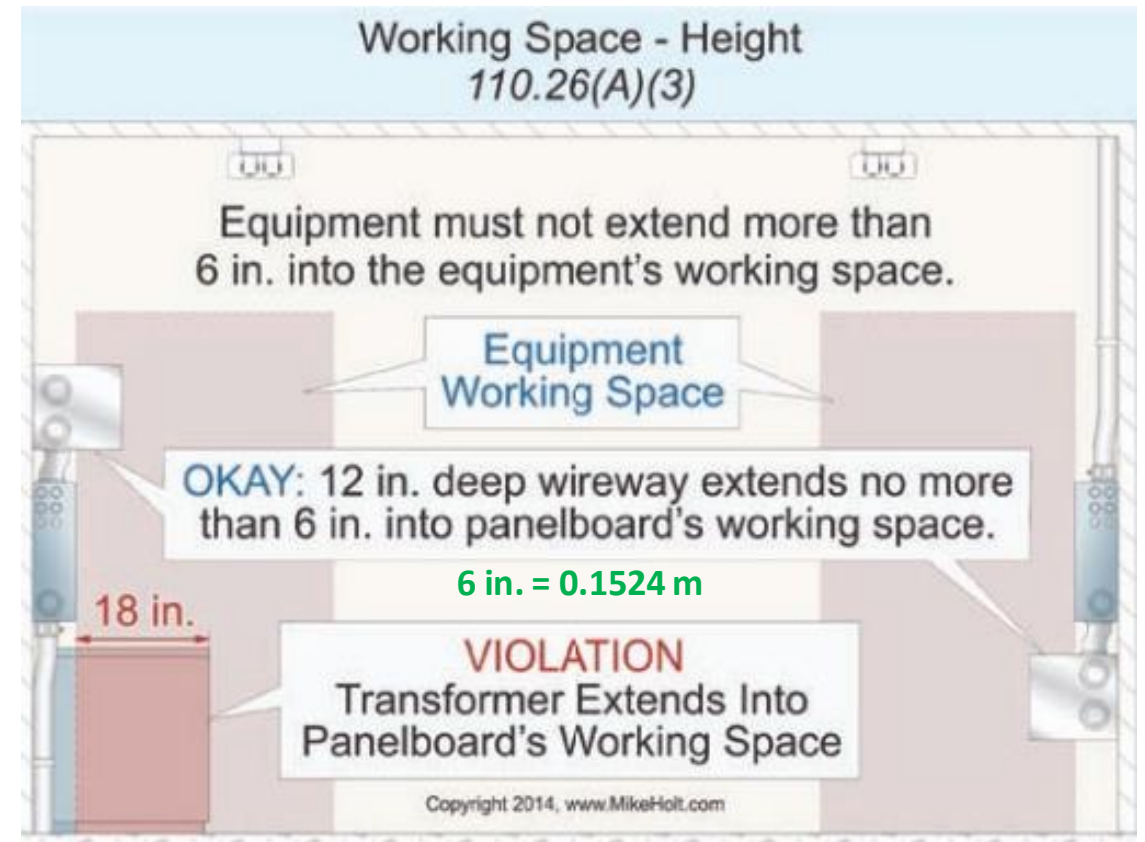
- Width of working Space (Equipment door opening)



1. Working Space:

- Height of working Space

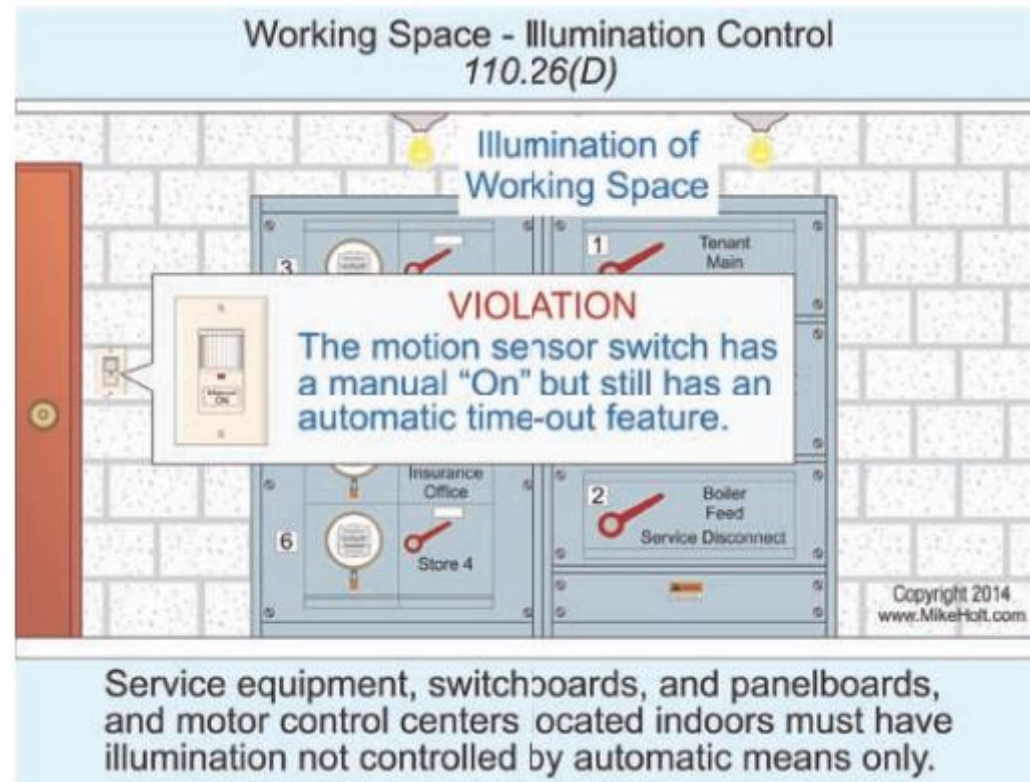
Equipment such as raceways, cables, wireways, cabinets, panels, and so on, can be located above or below electrical equipment, but must not extend more than 6 in. into the equipment's working space.



1. Working Space:

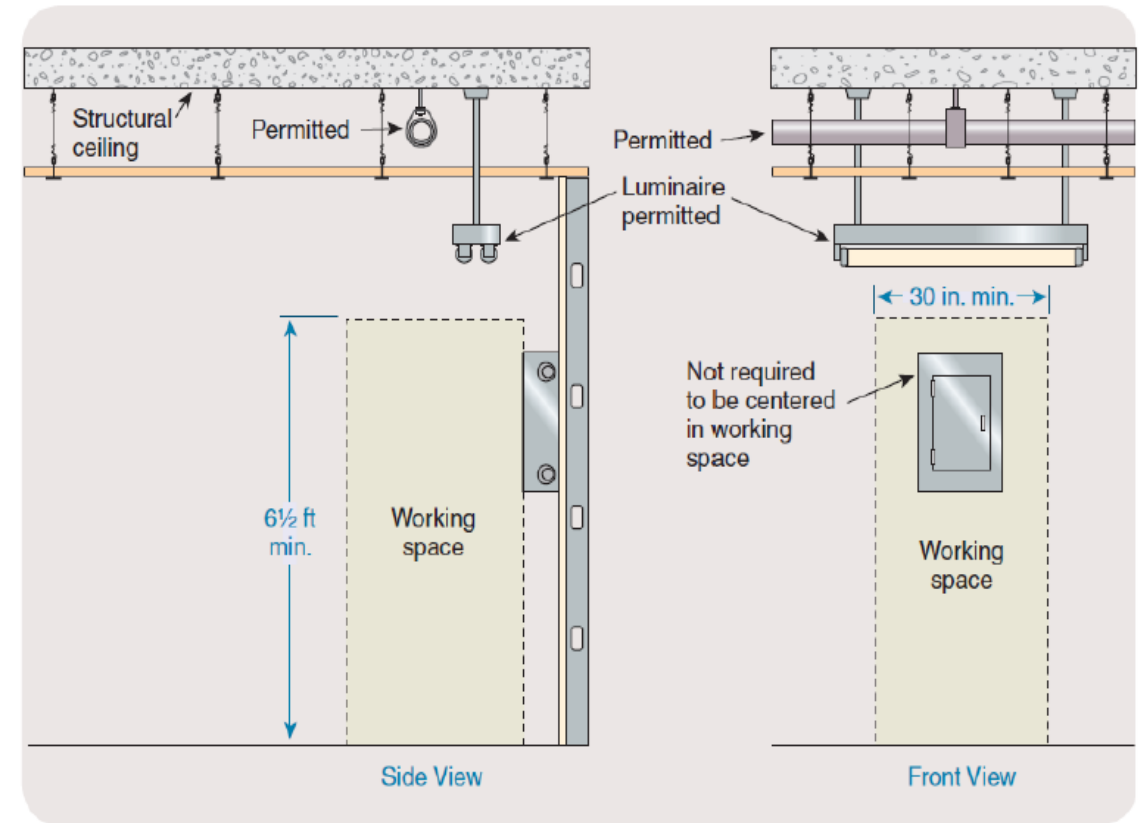
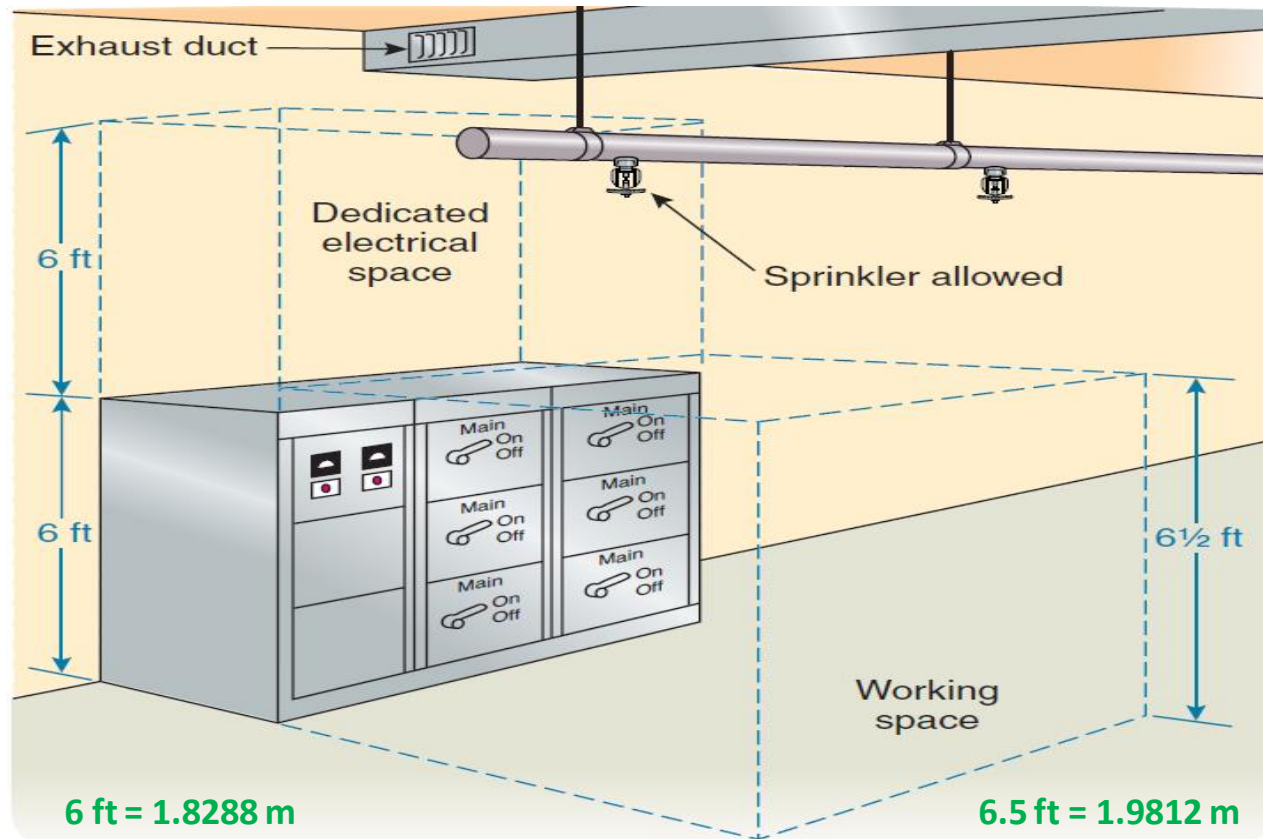
- Illumination of working space

Service equipment, switchboards, and panelboards, as well as motor control centers located indoors must have illumination located indoors and must not be controlled by automatic means



2. Dedicated Electrical Space:

The dedicated electrical space extends the footprint of the equipment from the floor to a height of 6 feet above the height of the equipment or to the “structural ceiling” (whichever is lower) must be dedicated for the electrical installation. No piping, ducts, or other equipment foreign to the electrical installation can be installed in this dedicated footprint space.



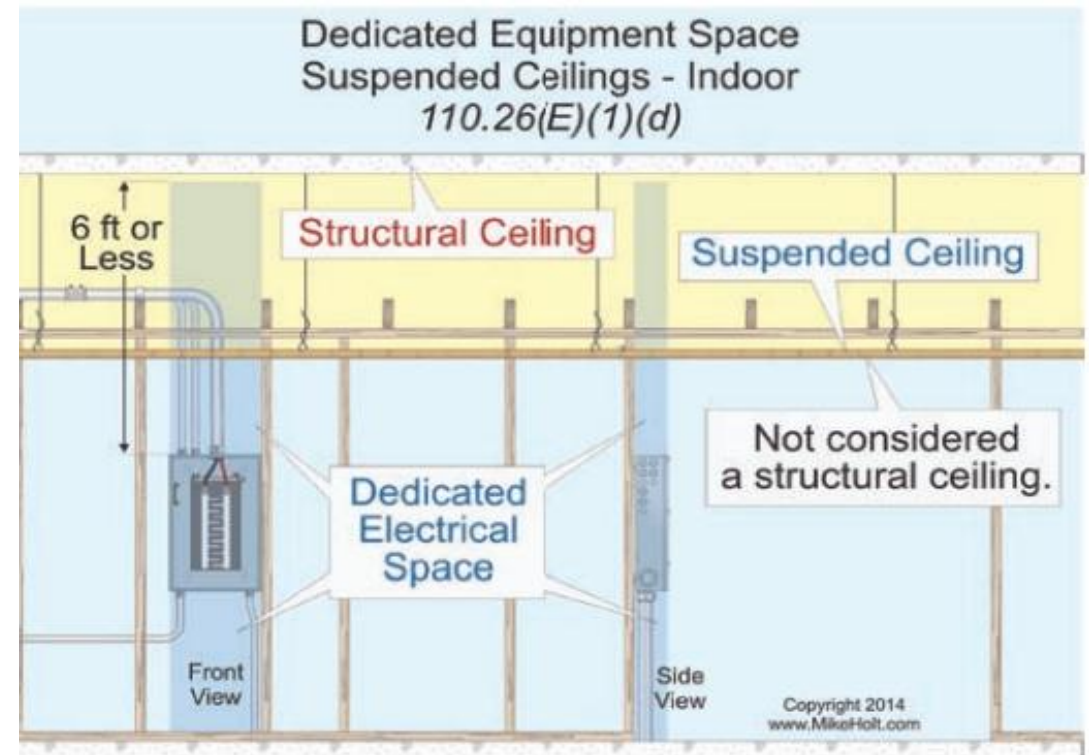
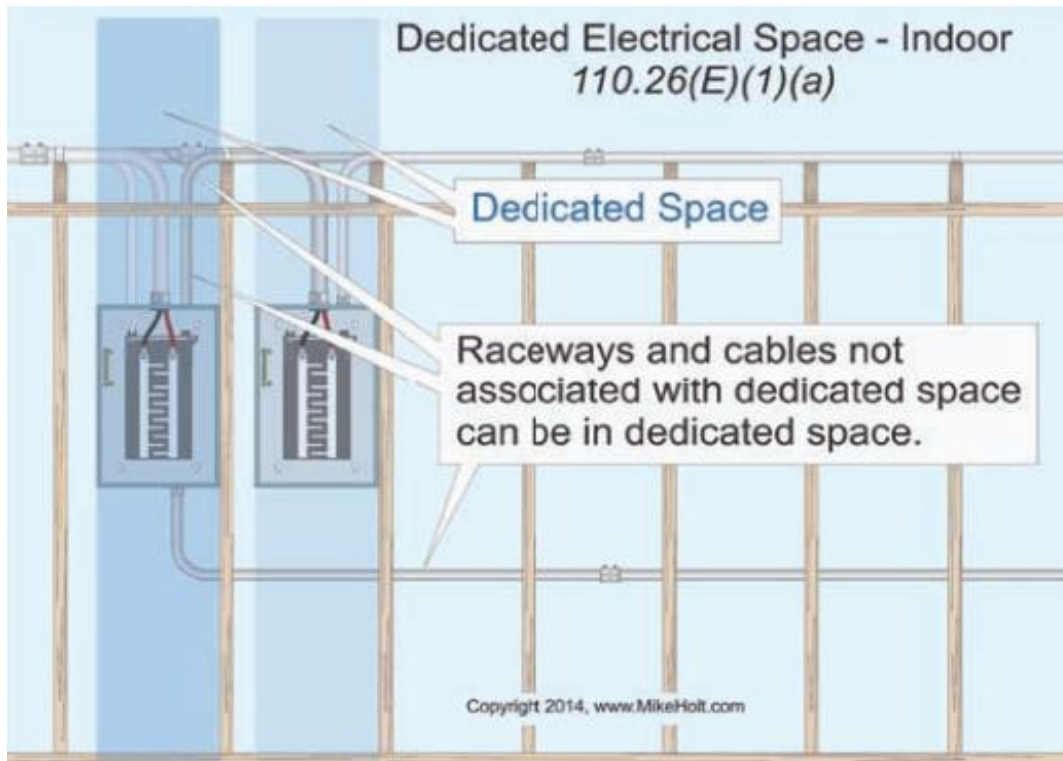
2. Dedicated Electrical Space:

- Raceways, cables

Electrical raceways and cables not associated with the dedicated space can be within the dedicated space. These aren't considered "equipment foreign to the electrical installation."

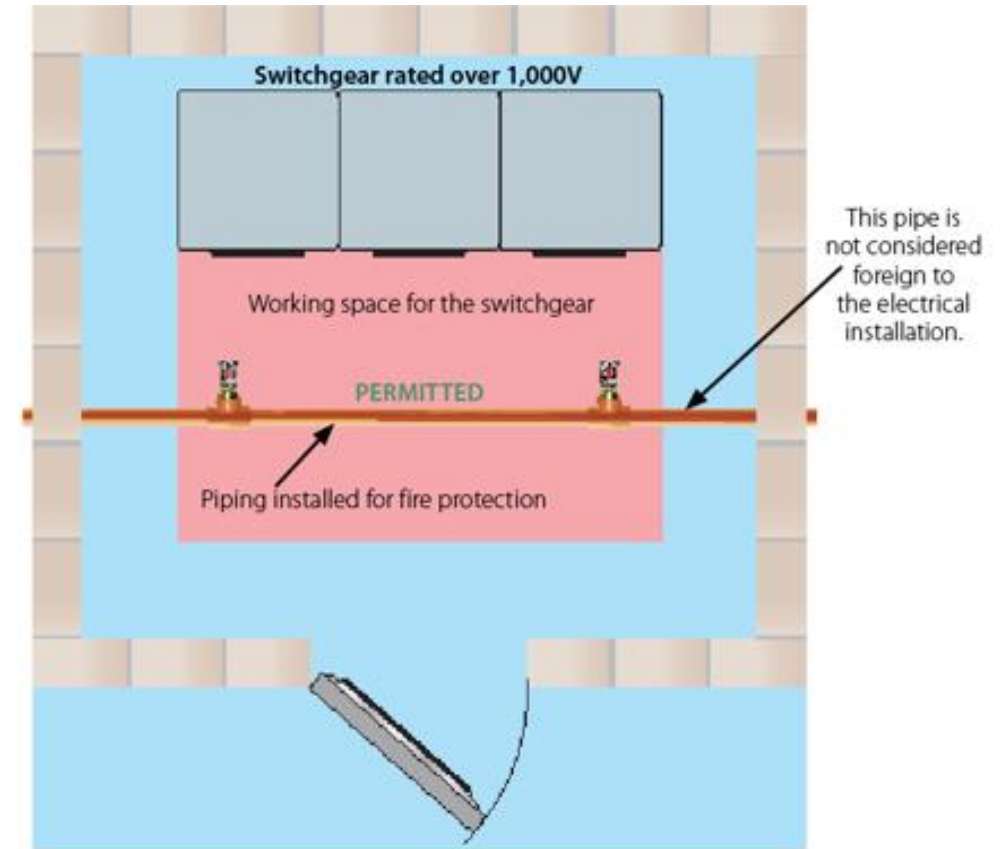
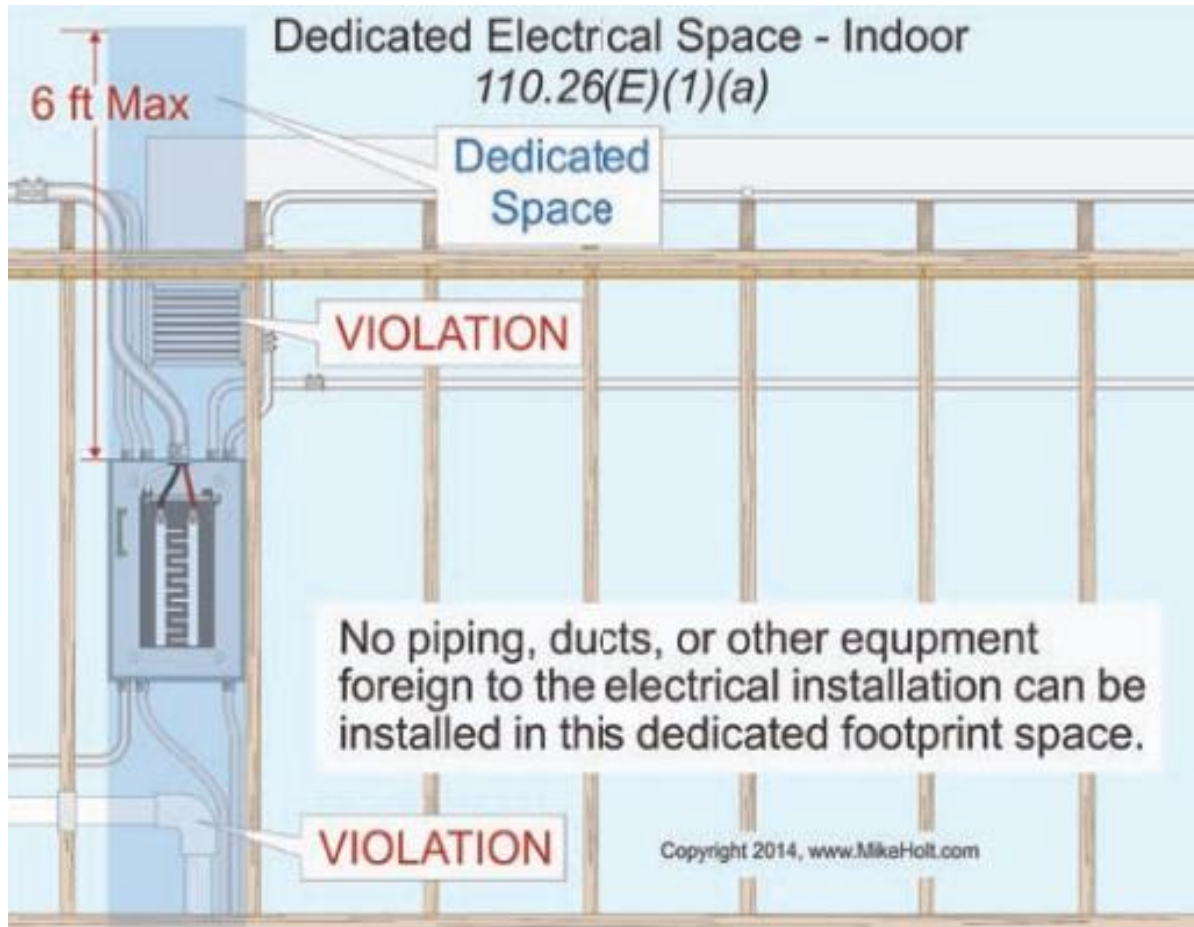
- **Suspended Ceiling:**

Dropped, suspended, or similar ceiling isn't considered a structural ceiling.



2. Dedicated Electrical Space:

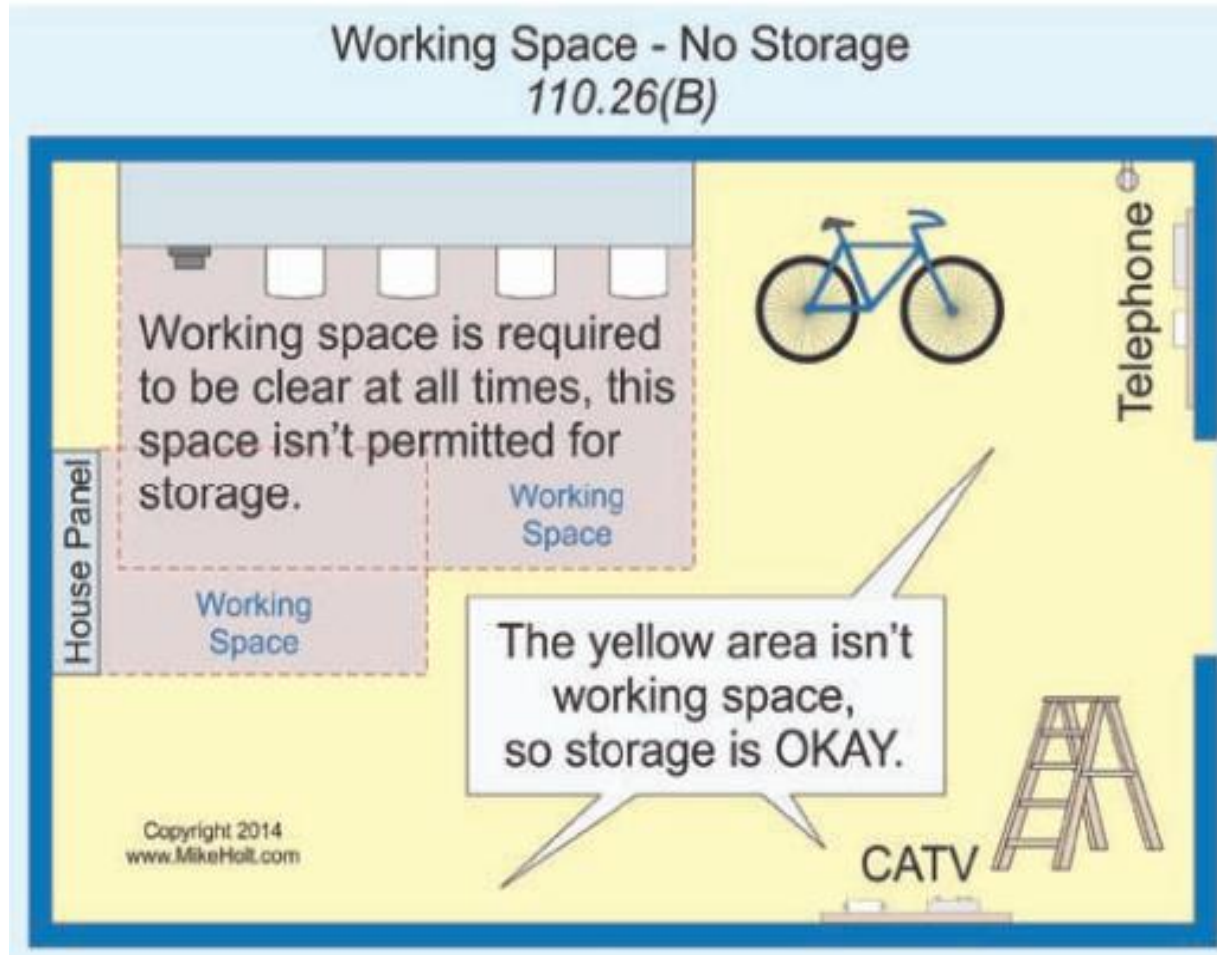
- Violations



Piping and other facilities shall not be considered foreign if provided for fire protection of the electrical installation [110.34(F)].

2. Dedicated Electrical Space:

- Storage

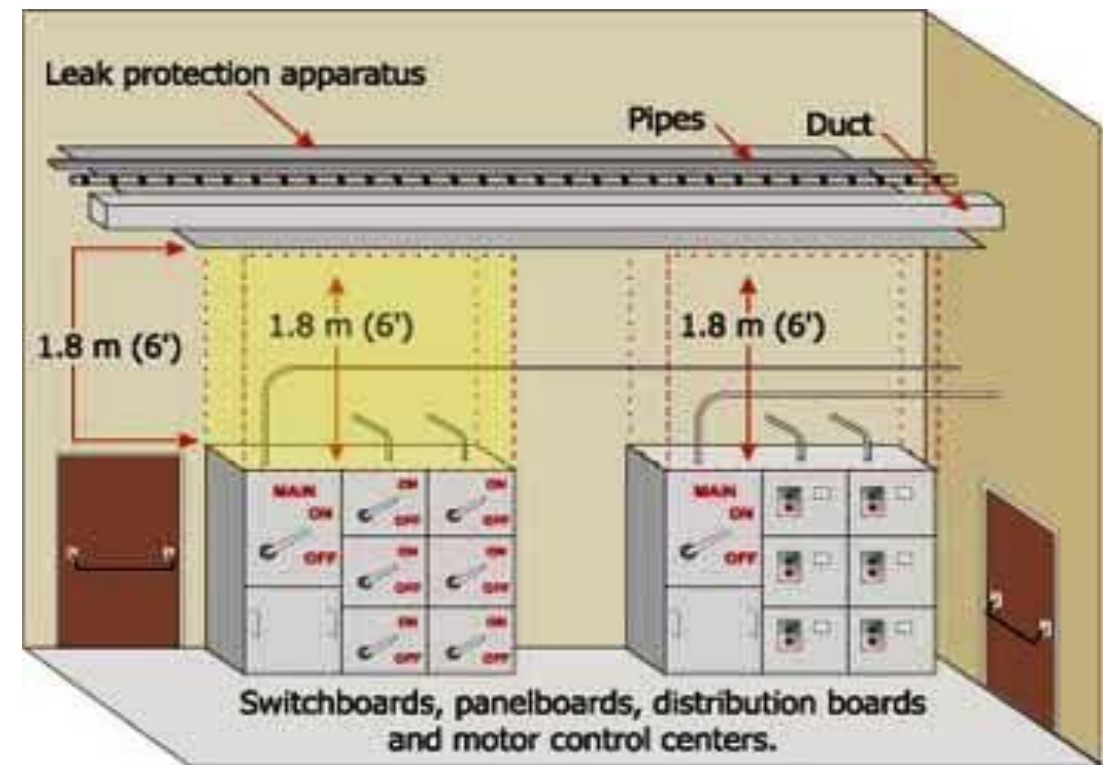
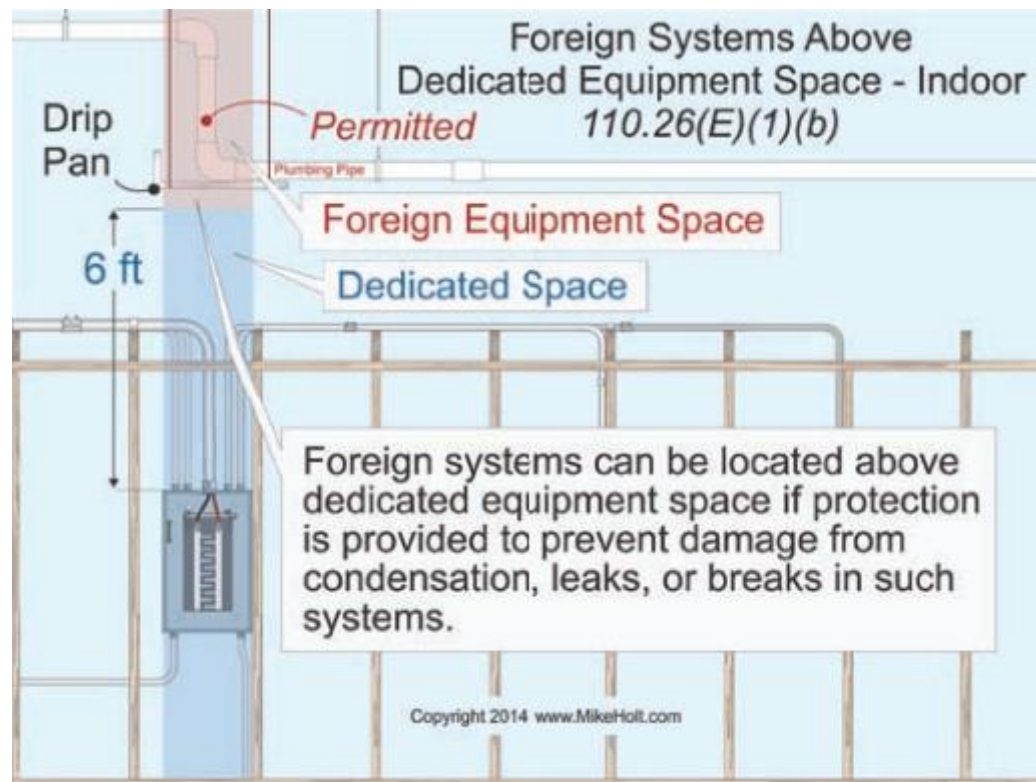


CAUTION: *It's very dangerous to service energized parts in the first place, and it's unacceptable to be subjected to additional dangers by working around bicycles, boxes, crates, appliances, and other impediments.*

2. Dedicated Electrical Space:

- Foreign systems above dedicated space.

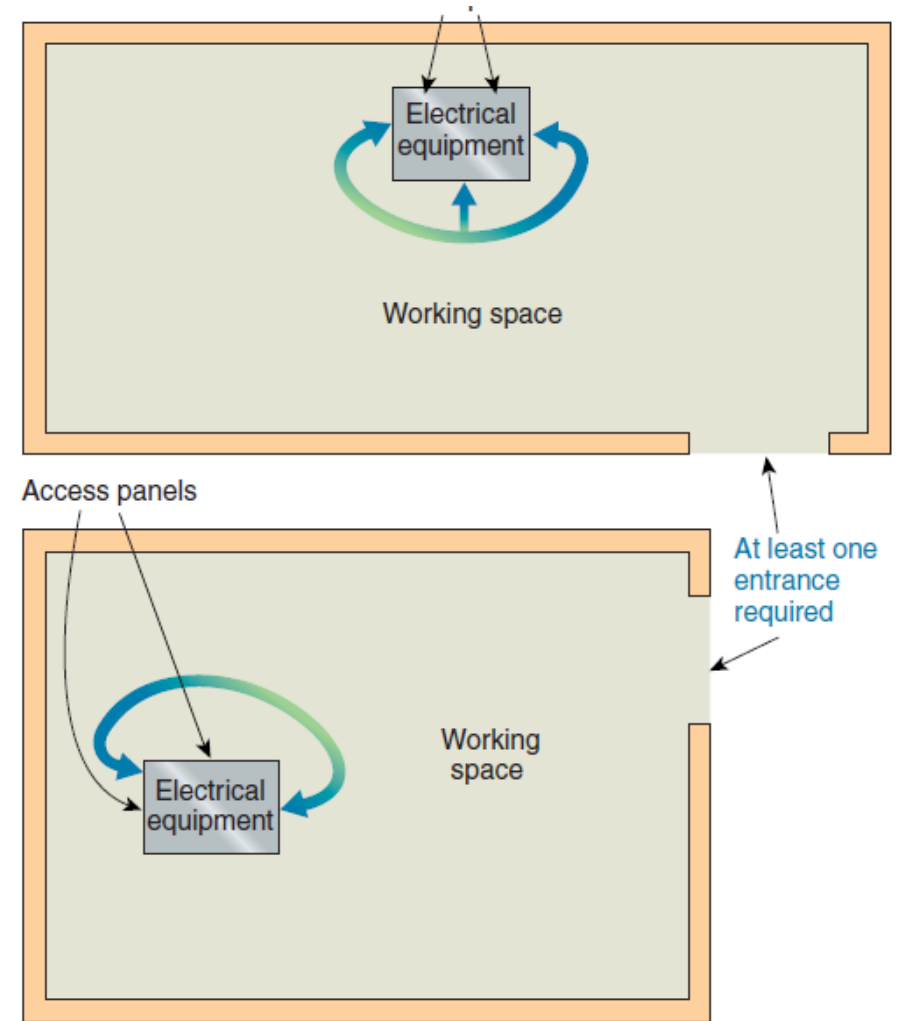
Foreign systems can be located “above” the dedicated space if protection is installed to prevent damage to the electrical equipment from condensation, leaks, or breaks in the foreign systems, which can be as simple as a drip-pan.



3. Entrance and Egress:

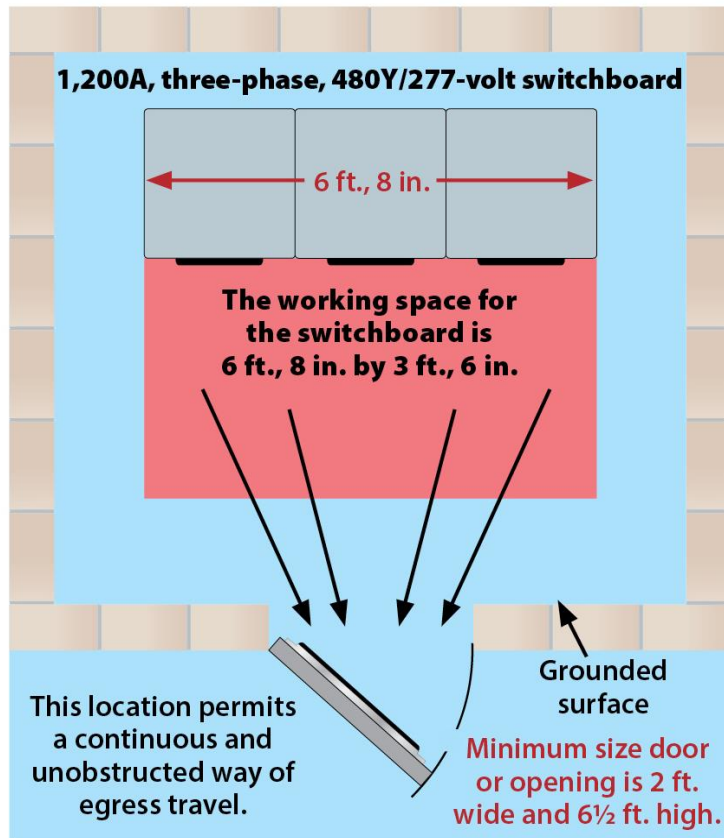
- Small Equipment (below 1200A or “6 ft = 1.8288 m” wide)

At least one entrance of sufficient area must provide access to and egress from the working space.



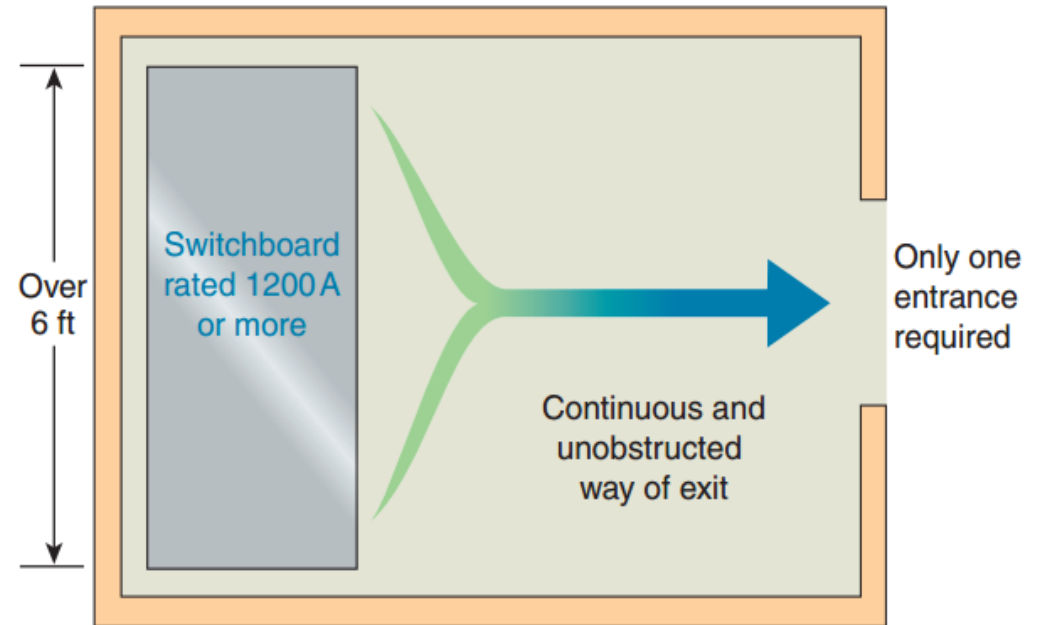
3. Entrance and Egress:

- Large Equipment (“1200A or above” or “more than {6 ft = 1.8288 m}” wide)
 - (Case - A) Unobstructed Egress: Only one entrance is required where the location permits a continuous and unobstructed way of egress travel.



Large equipment (equipment rated 1,200A or more and more than 6 feet wide) containing overcurrent devices, switching devices, or control devices normally requires each end of the working space to have an entrance to and egress from the required working space.

Where a space contains large equipment, a single entrance to and egress from the required working space is permitted if the installation complies with either 110.26(C)(2)(a) or 110.26(C)(2)(b).

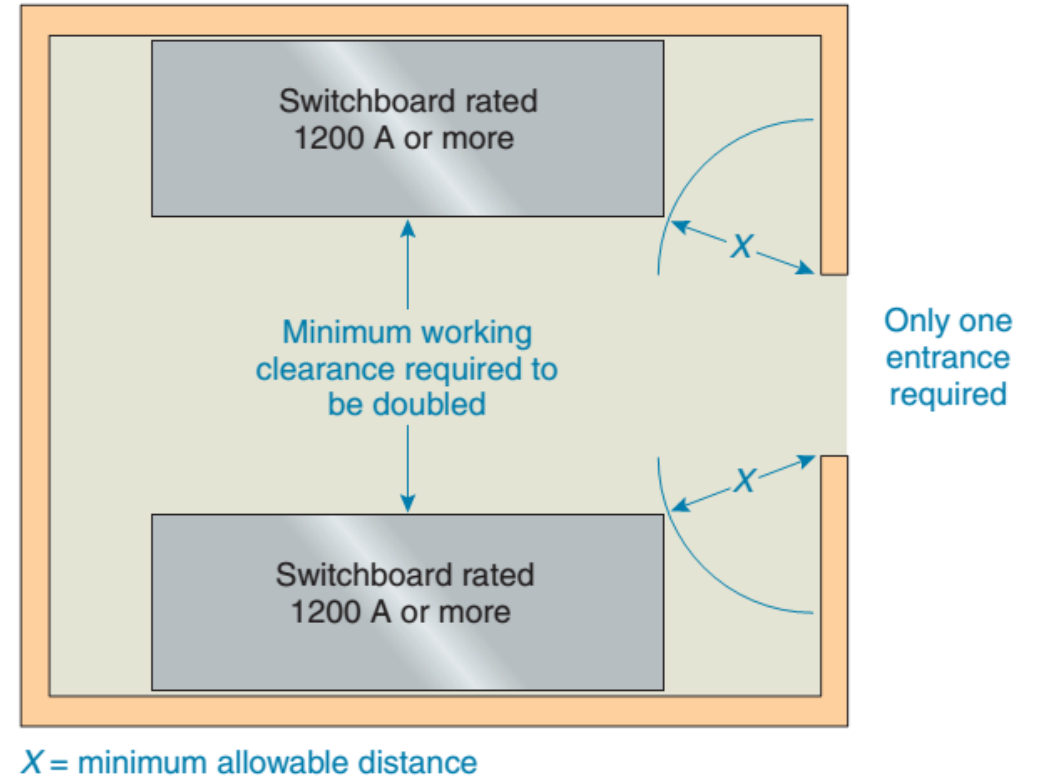
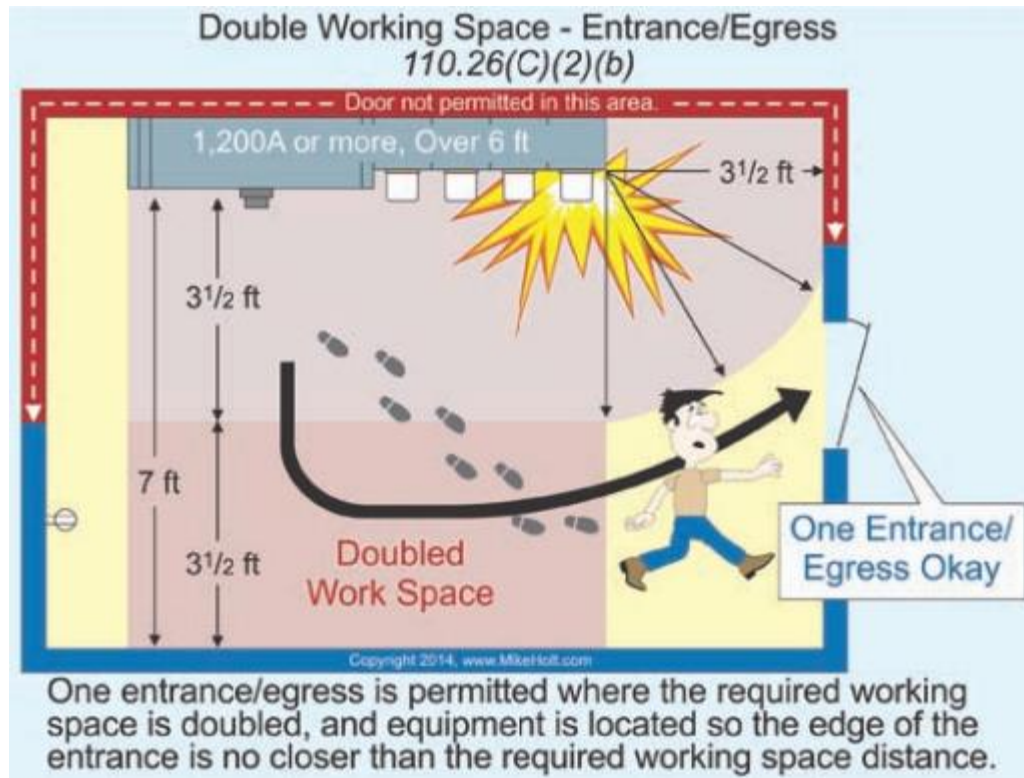


Where the location for large equipment permits a continuous and unobstructed way of egress travel, a single entrance to the working space shall be permitted [110.26(C)(2)(a)].

6.5 ft = 1.9812 m
2 ft = 0.6096 m

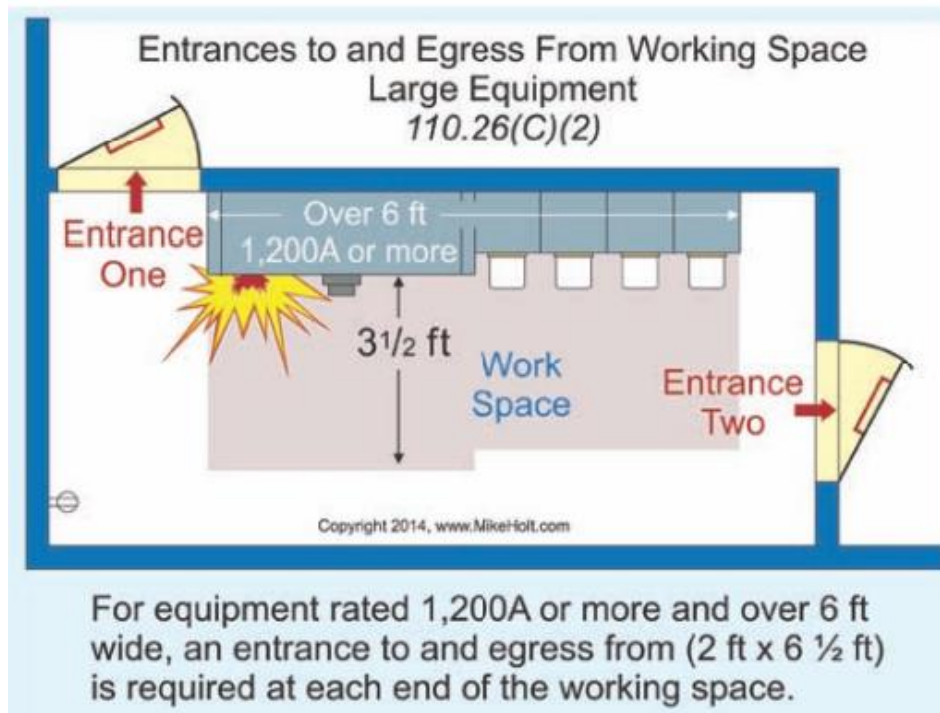
3. Entrance and Egress:

- Large Equipment (“1200A or above” or “more than {6 ft = 1.8288 m}” wide)
 - (Case - B) obstructed Egress with One door “Double Workspace required”: Only one entrance is required where the required working space depth is doubled, and the equipment is located so the edge of the entrance is no closer than the required working space distance.



3. Entrance and Egress:

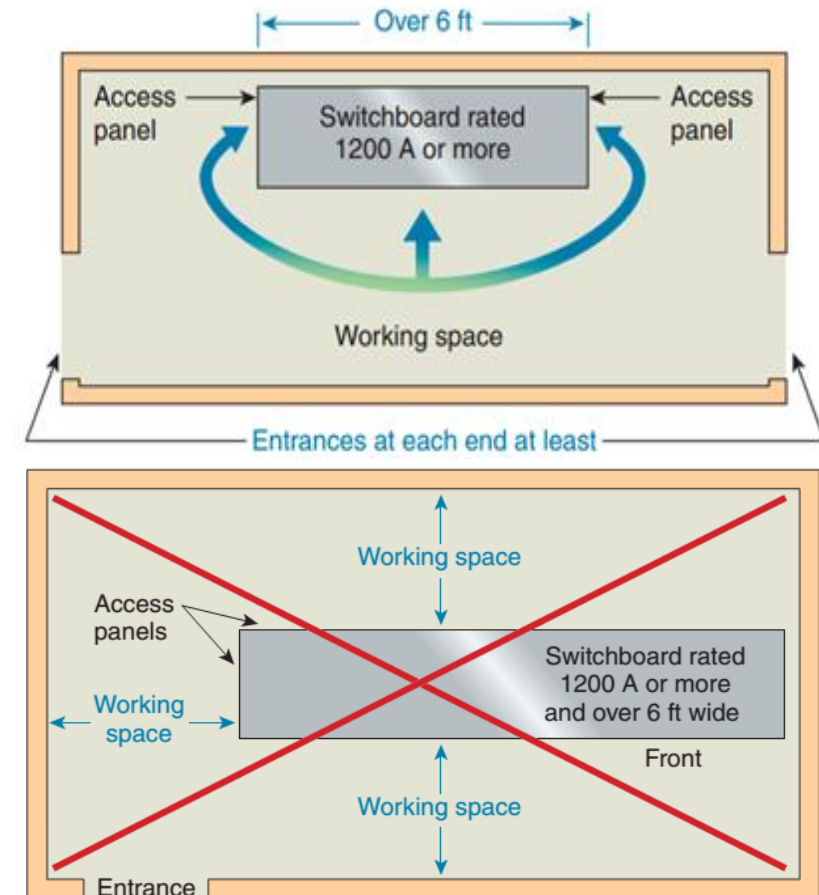
- Large Equipment (“1200A or above” or “more than {6 ft = 1.8288 m}” wide)
 - (Case - C) obstructed Egress with two doors: An entrance to and egress from each end of the working space of electrical equipment rated 1,200A or more that’s over 6 ft wide is required. The opening must be a minimum of 24 in. wide and 6½ ft high,



6.5 ft = 1.9812 m

24 in. = 0.6096 m

2 ft = 0.6096 m



3. Entrance and Egress:

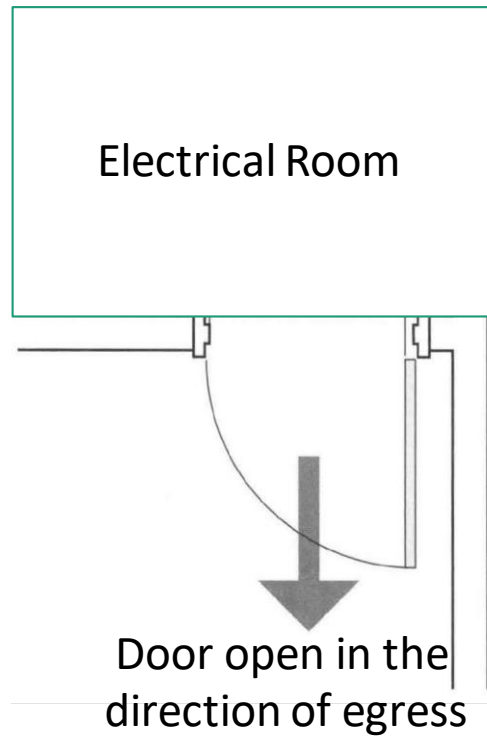
- Importance of Egress doors design to avoid Arc Trap.



3. Entrance and Egress:

- Doors Specs.

If equipment with overcurrent or switching devices rated 800A or more is installed, personnel door(s) for entrance to and egress from the working space located less than 25 ft from the nearest edge of the working space must have the door(s) open in the direction of egress and be equipped with listed panic hardware.





RMU & Transformer Room Design

Rooms Configurations according to The Egyptian Electricity Holding company

١. غرفة داخل المبنى

أبعاد الغرفة (طول × عرض × ارتفاع) م	قدرة المحول (ك.ف.أ.)		عدد المحولات داخل الغرفة	نوع المحول	جهد التشغيل (ك.ف.)
	من	إلى			
(٣ × ٥ × ٤) (يركب بها محول + لوحة جهد متوسط + لوحة جهد منخفض)	٥٠٠	١٠٠٠	محول واحد	جاف أو زيتي	١٢
(٤ × ٨ × ٥) (يركب بها محول + لوحة جهد متوسط + لوحة جهد منخفض)	١٥٠٠	٢٠٠٠	محول واحد		
وذلك في حالة عدم إمكانية تسليم غرفة لكل محول (٣ × ٨ × ٥)	٥٠٠	١٠٠٠	محولات		
غرفة المنخفض (٣ × ٣ × ٢) غرفة (المحول + لوحة المتوسط) في حالة عدم توافر غرفة واحدة لجميع المهمات	٥٠٠	٢٠٠٠	محول واحد		
أبعاد غرفة المحول (يركب بها محول فقط) (٣ × ٤ × ٤)	٥٠٠	٢٠٠٠	محول واحد	جاف أو زيتي	٢٢
أبعاد غرفة لوحتي الجهد المتوسط والمنخفض (٣ × ٤ × ٣)	٥٠٠	٢٠٠٠	محول واحد		

• وفي حالة عدم مطابقة أبعاد الغرفة للأبعاد المطلوبة طبقاً لطبيعة المكان، يجب مراعاة أن تكون الأبعاد تسمح بسهولة دخول وفرش المهمات بشكل فني سليم وأمن للعاملين وإجراء أعمال الصيانة الوقائية والعلاجية بسهولة وأمان.

• يجب مراعاة ألا يعلو سطح غرفة المحول حمام أو أي مصدر آخر للمياه لحماية المهمات.

• يجب مراعاة أن يتم فرش المهمات داخل الغرف طبقاً للرسومات المرفقة لكل حانة.

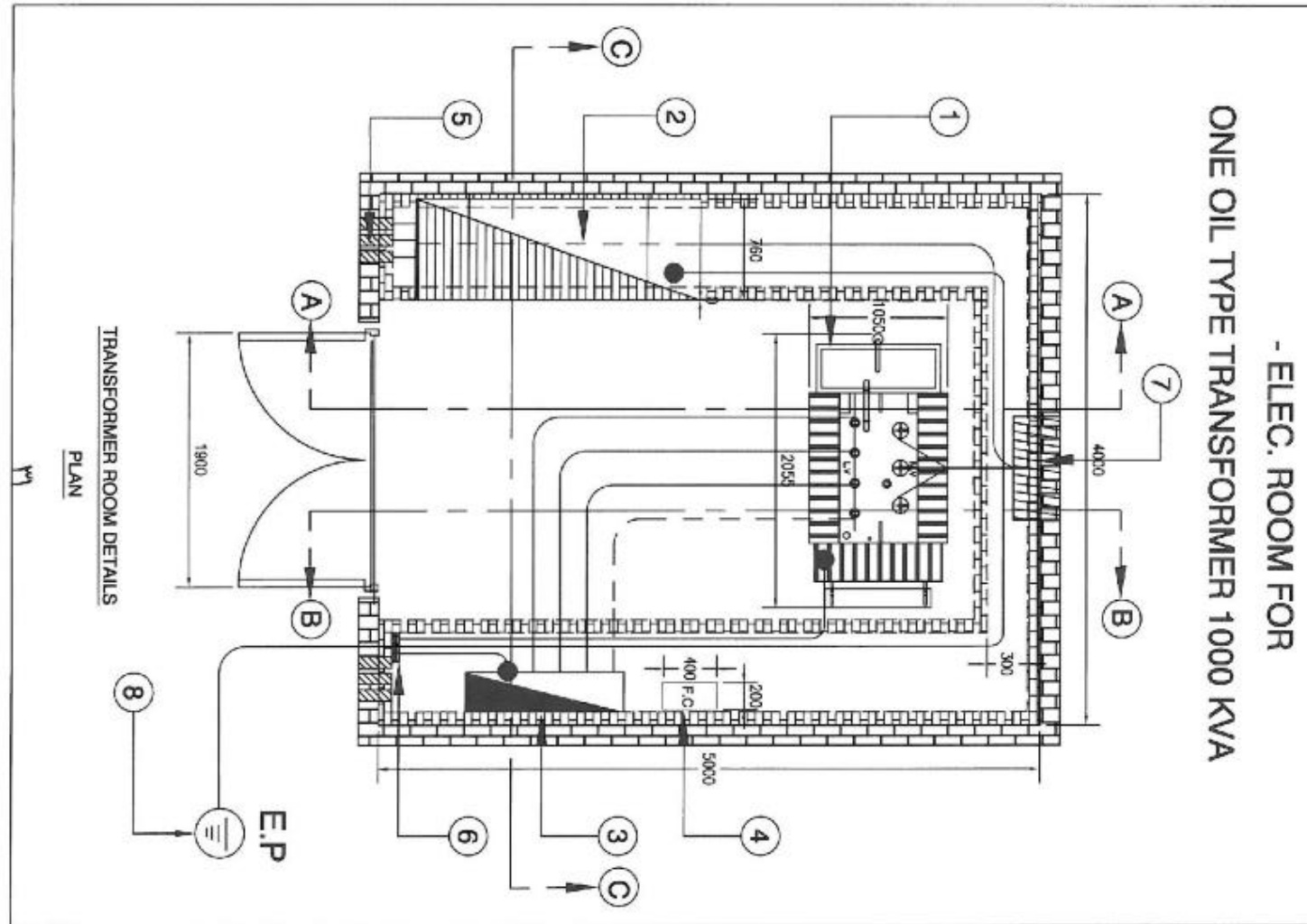
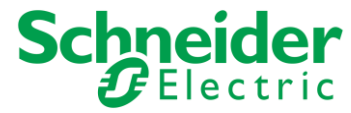
في حالة وجود أي معوقات لاستلام الغرفة بالمواصفات السابق ذكرها يتم العرض على لجنة برئاسة السيد المهندس/ رئيس مجلس الإدارة والعضو المنتدب أو من ينوب عنه لبحث ومعاينة وضع الغرفة على الطبيعة وإمكانية استلام الغرفة في حدود المساحة الإجمالية المطلوبة تقريباً أو طبقاً لشكل الغرفة من الداخل.

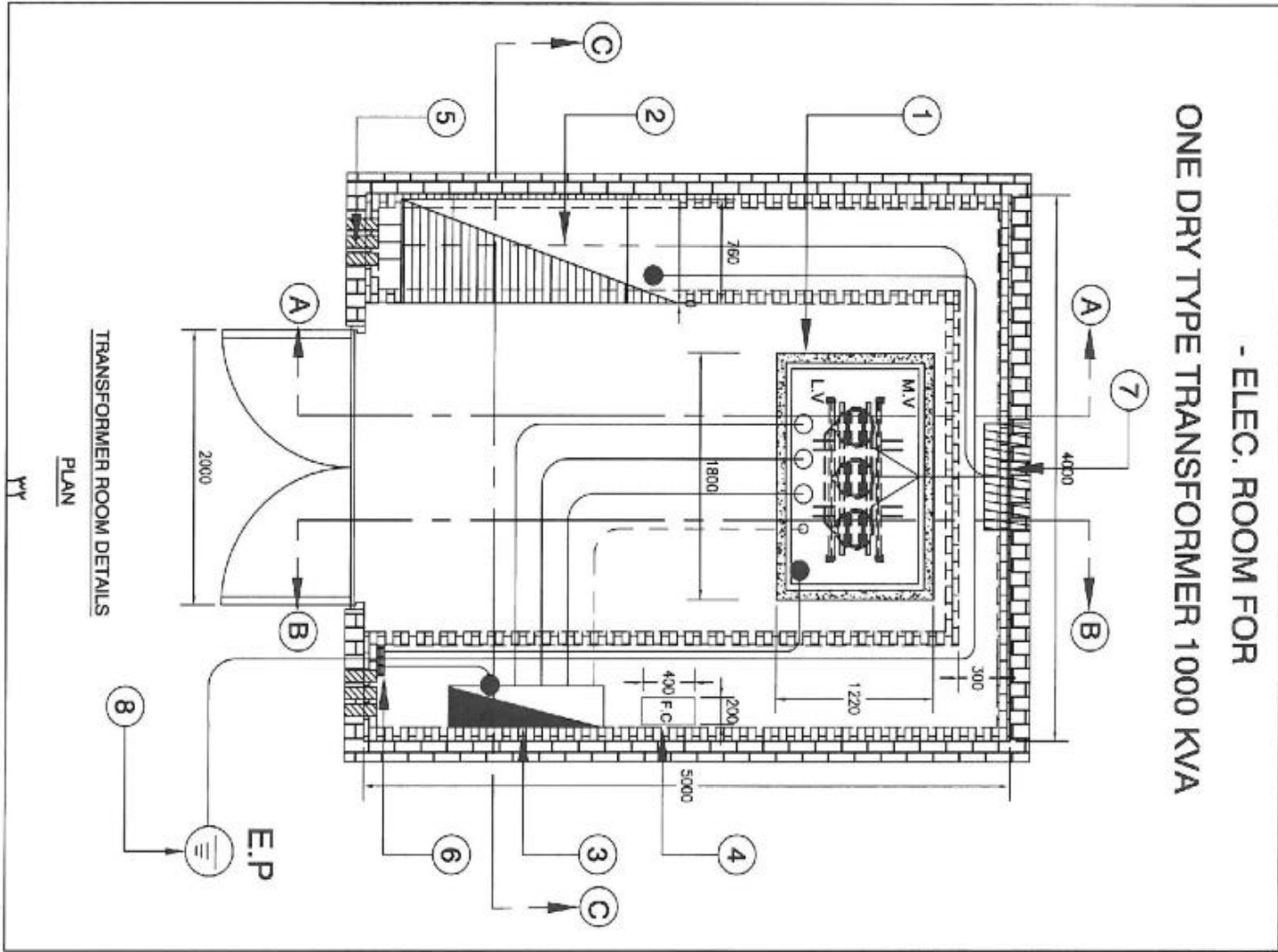
٢. الغرف خارج المبنى (السماوية):

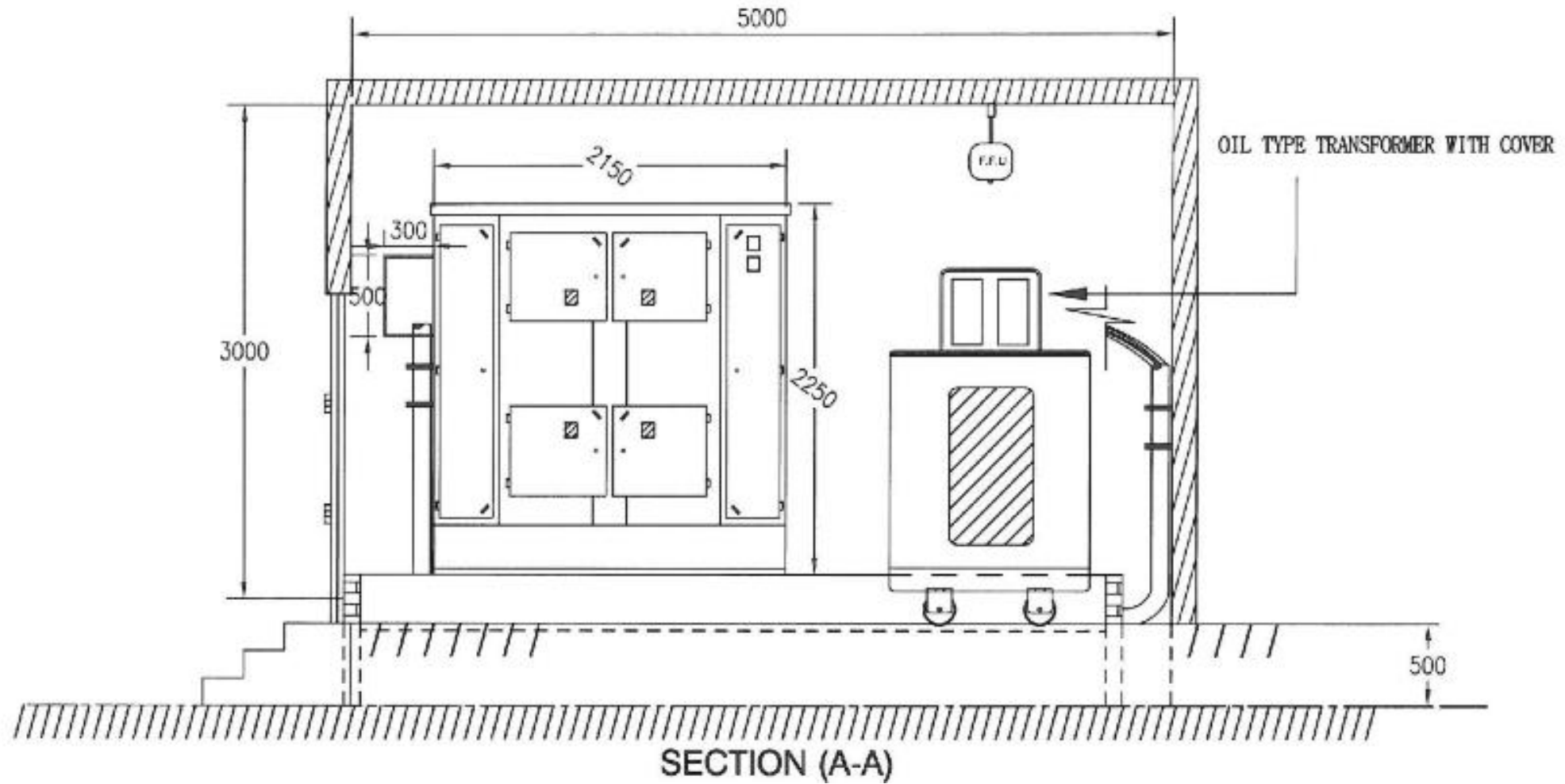
• تطبق جميع الشروط بالبنود السابق (غرف المحولات داخل مبنى) على ألا يقل الارتفاع عن ٤م.

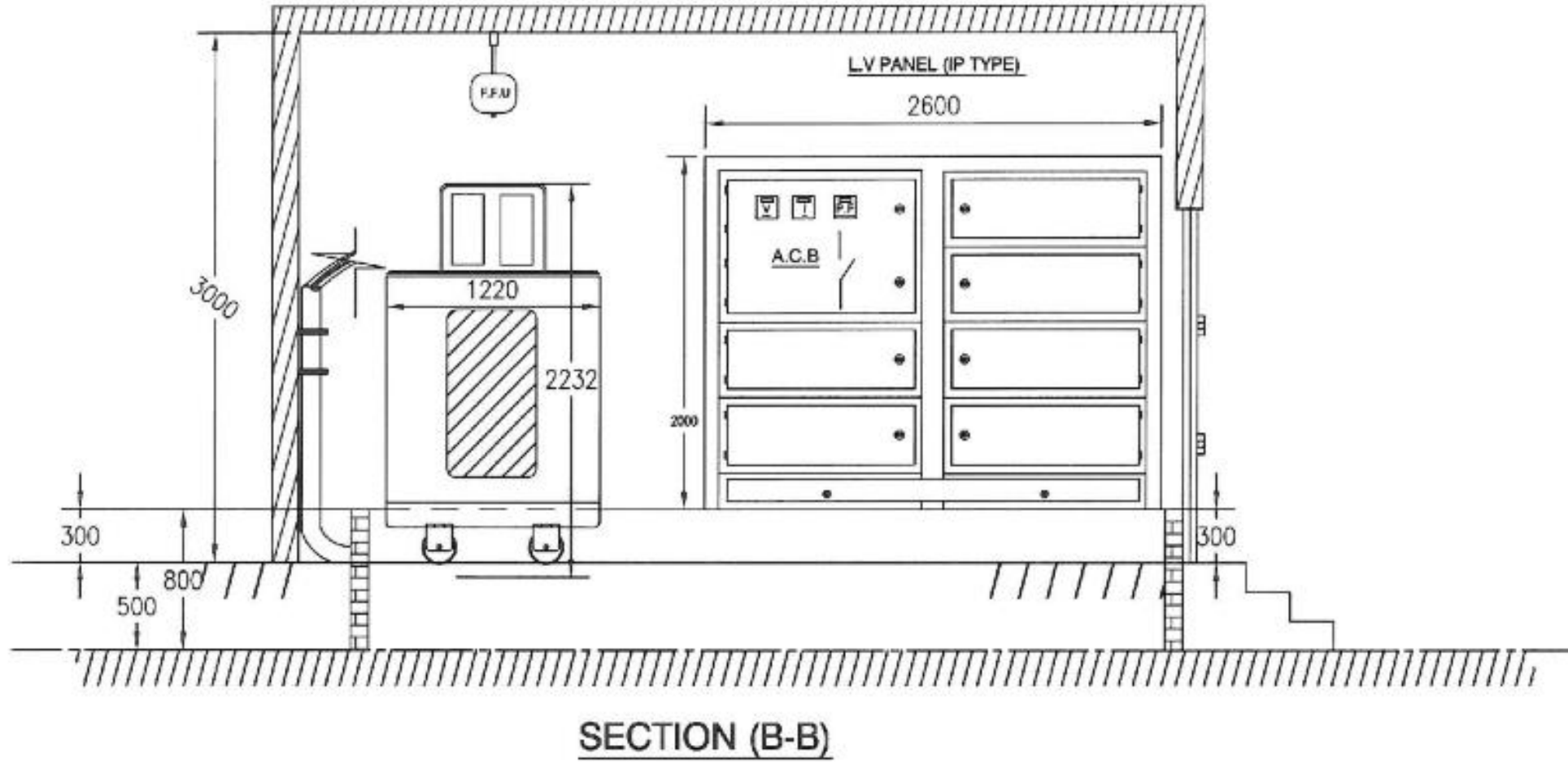
Room for:

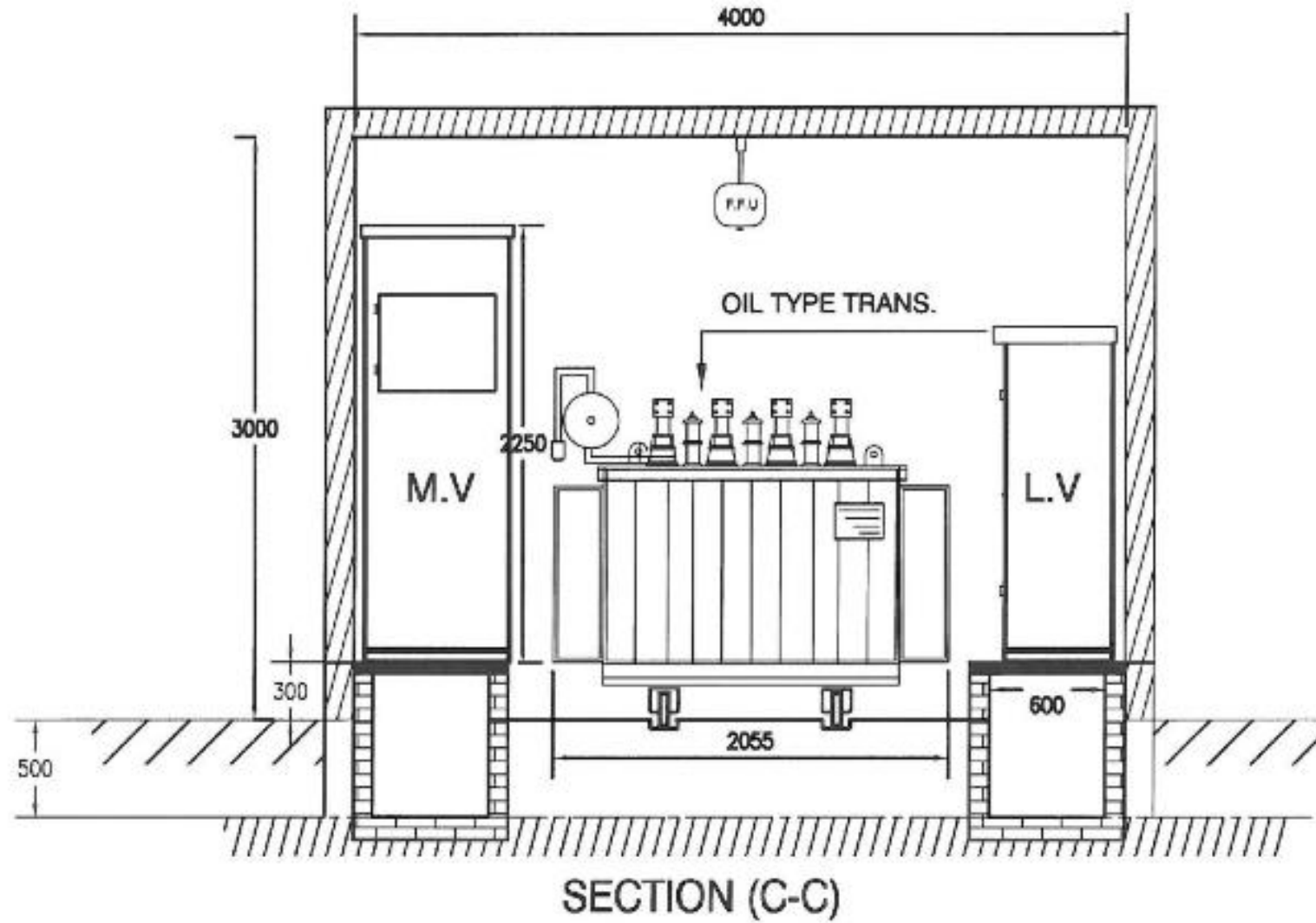
RMU + 1 Transformer <1000 KVA + LVSG







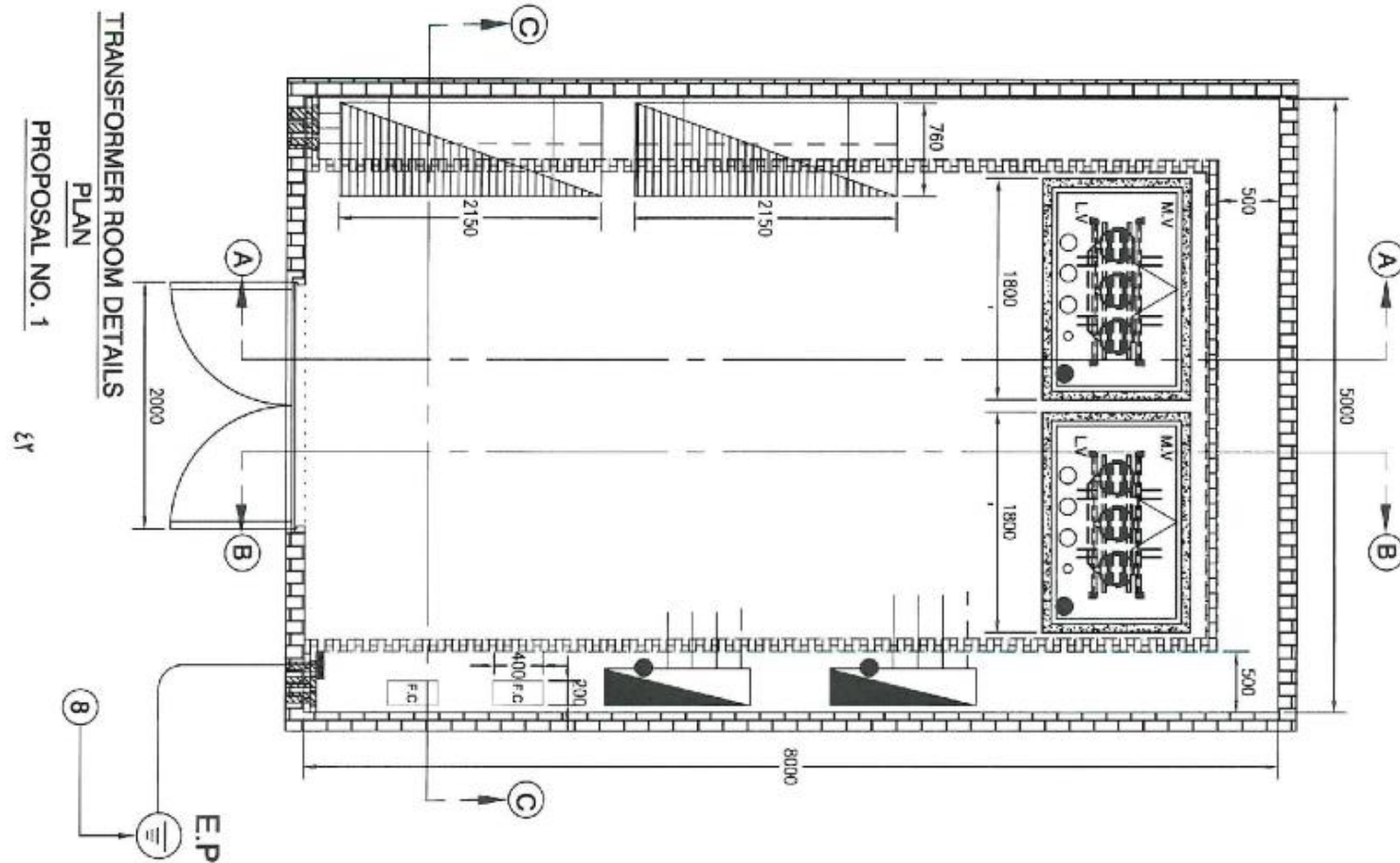




Room for:

2 RMU + 2 Transformer <1000 KVA + 2 LVSG

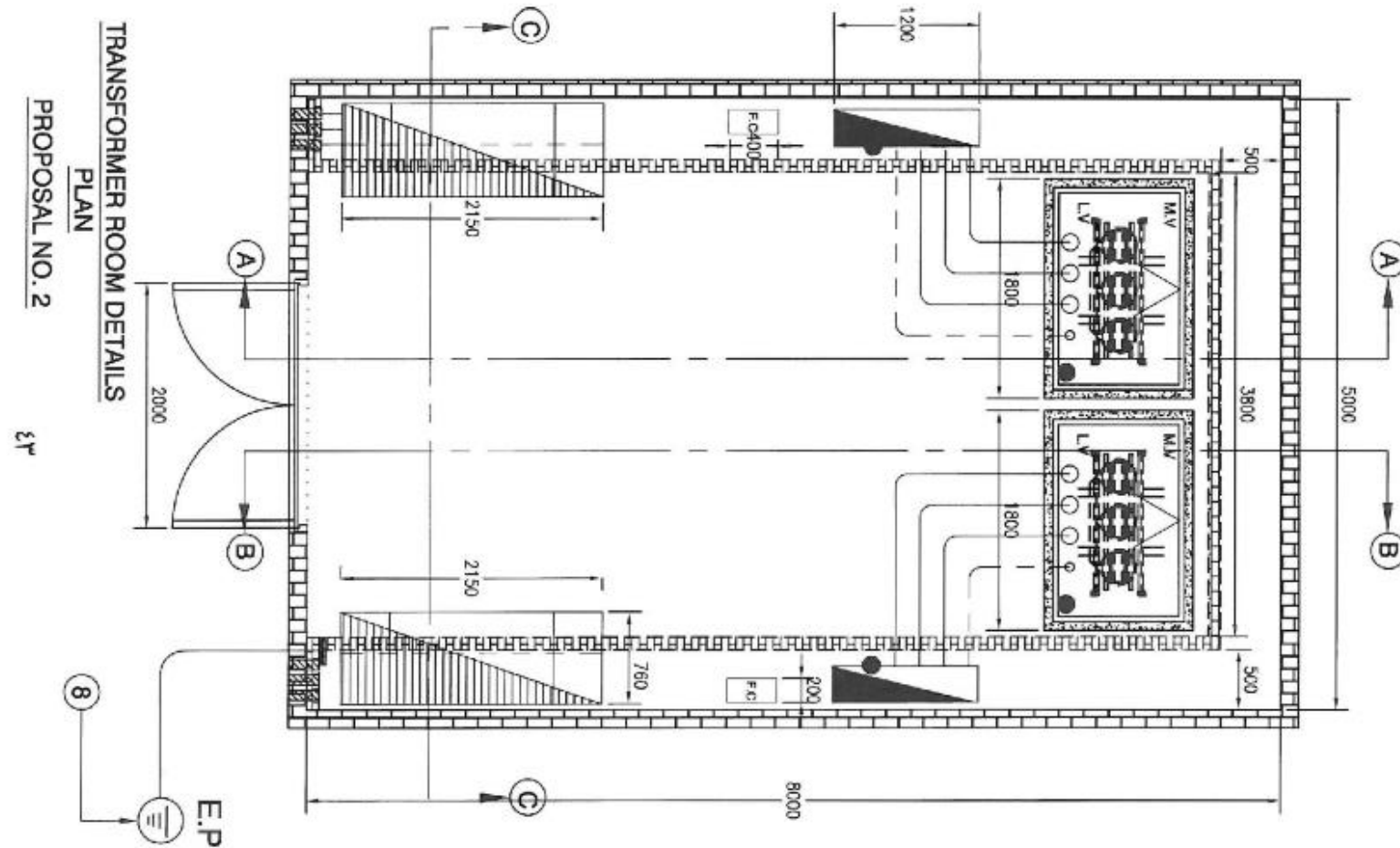
Proposal (1)) – Plan View



Room for:

2 RMU + 2 Transformer <1000 KVA + 2 LVSG

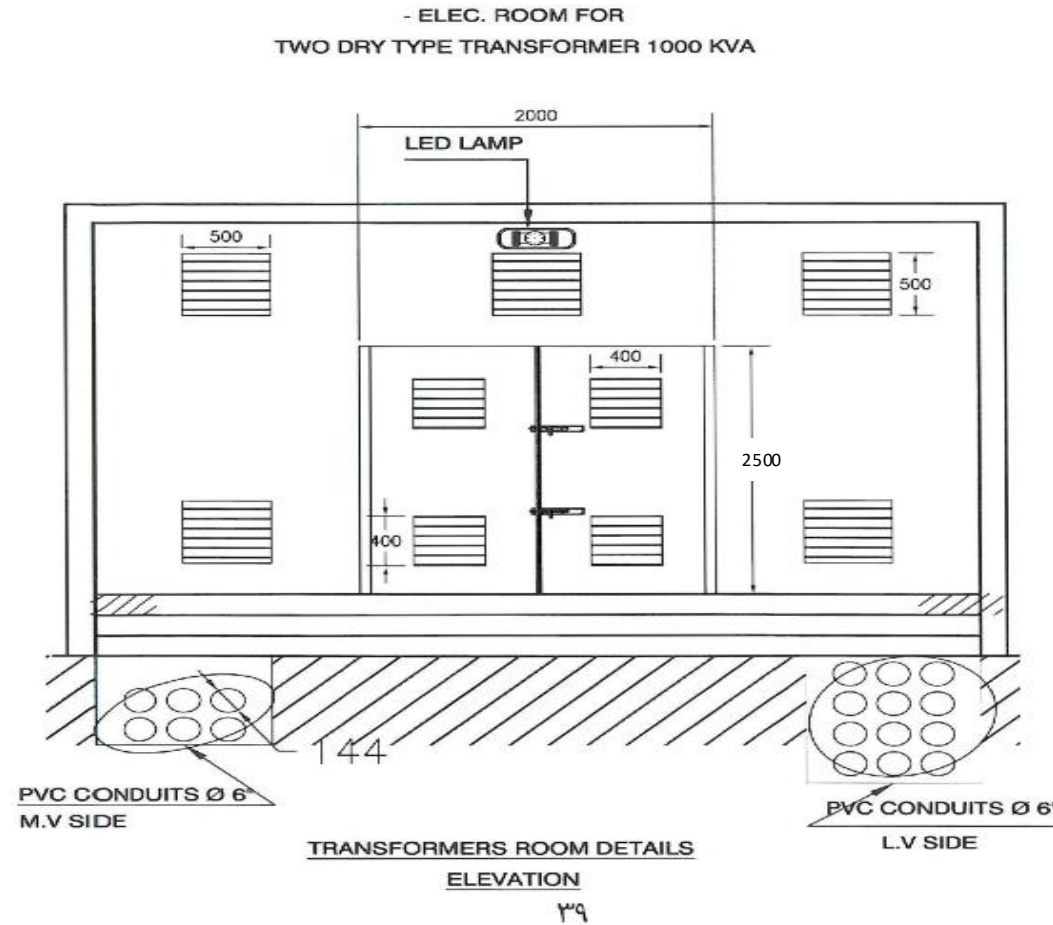
Proposal (2) – Plan View



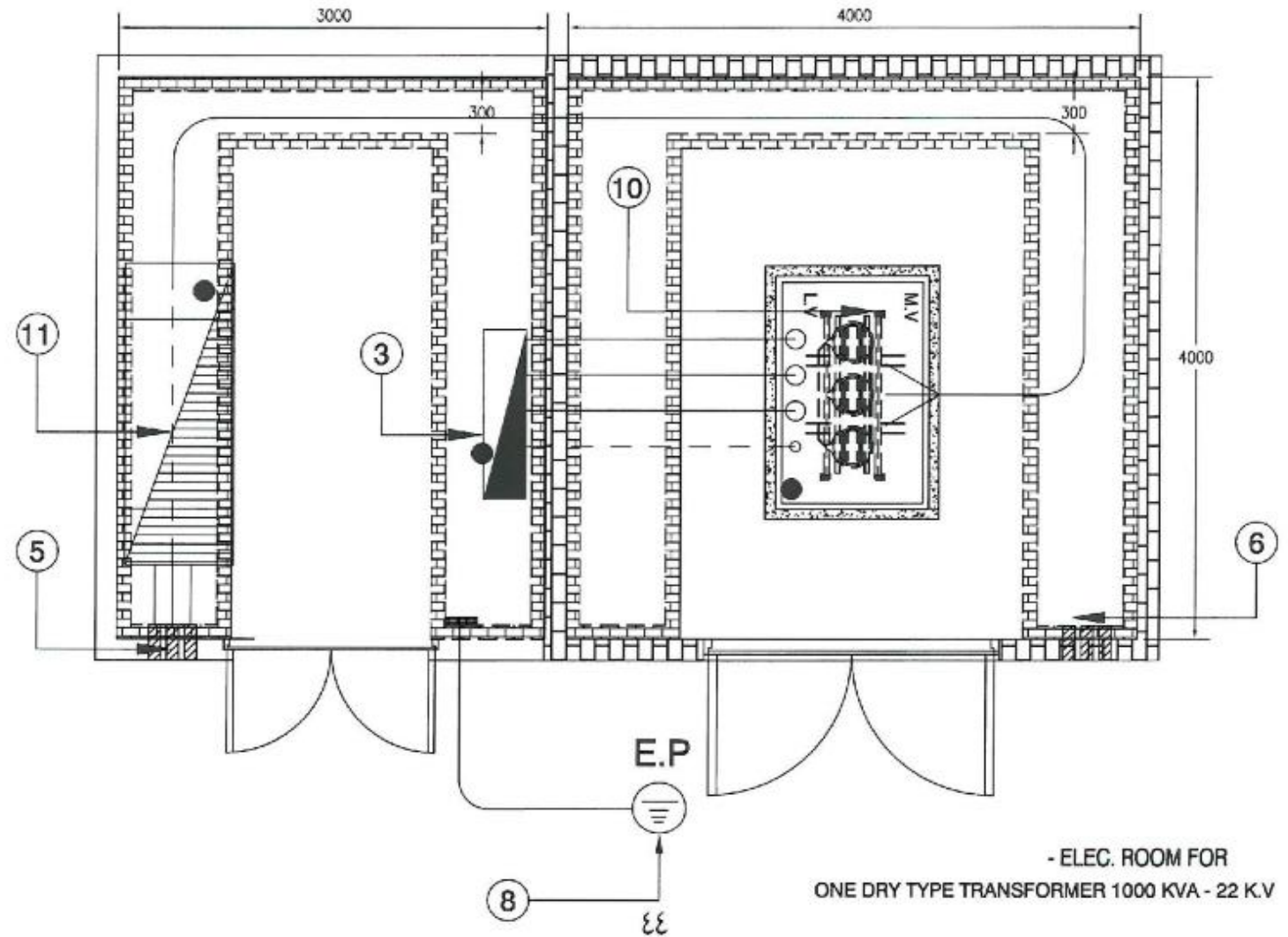
Room for:

2 RMU + 2 Transformer <1000 KVA + 2 LVSG

Proposal (1 or 2) – Elevation



1. Room for: 1 transformer up to 2MVA
2. Room for RMU & LSVG



General Specs:

الابواب

- الباب على شارع رئيسي أو فرعي لا يقل عرضه عن (٦ متر) ويسمح بدخول وخروج المهمات بسهولة وأمان خلال ٢٤ ساعة وبدون عوائق
- أبعاد الباب (٢,٥ × ٢ متر) (أو طبقاً لطبيعة واجهة الغرفة وأبعادها)
- عدد ٢ ضلفة عرض كل منها لا يقل عن ١ متر
- عدد ٢ سجان والزرزة.
- عدد ٢ فتحة تهوية إحداهما سفلية والأخرى علوية (٤٠ × ٤٠ × ٤ سم) بكل ضلفة عبارة عن ريش من الصاج الأملس سمك ٢ مم متداخلة من أعلى إلى أسفل وبسلك شبك من الداخل وخوص حديد (٢ سم) للتثبيت

النوافذ في حالة الغرف السماوية

- عدد (٢) نافذة سفلية وعلوية (٥٠ × ٥٠ سم) على الواجهة الأمامية للغرفة عبارة عن ريش من الصاج الأملس سمك ٢ مم متداخلة من أعلى إلى أسفل وبسلك شبك من الداخل وخوص حديد (٢ سم) للتثبيت
- عدد (٢) نافذة علوية (٥٠ × ٥٠ سم) على الواجهة الخلفية للغرفة عبارة عن ريش من الصاج الأملس سمك ٢ مم متداخلة من أعلى إلى أسفل وبسلك شبك من الداخل وخوص حديد (٢ سم) للتثبيت

النوافذ في حالة الغرف داخل المبنى (العمارات)

- يتم عمل عدد (٢) نافذة علوية (٥٠ × ٥٠ سم) على الواجهة الأمامية للغرفة عبارة عن ريش من الصاج الأملس سمك ٢ مم متداخلة من أعلى إلى أسفل وبسلك شبك من الداخل وخوص حديد ٢ سم للتثبيت.

سطح الغرفة في حالة الغرف السماوية

- الطبقة العازلة أعلى سطح الغرفة ضد المياه والحرارة اتجاه ونسبة ميول السطح
- مزارب لتصريف المياه في اتجاه نهاية ميول السطح



أرضية الغرفة ومجاري الكابلات

● أرضية الغرفة من طبقه خراسانيه مسلحة لا تقل عن ٣٠ سم وأن تتحمل الوزن الكلي للمحول والمهمات (ويتم إثبات ذلك بالمعاينة على الطبيعة ويطلب شهادة معتمدة من استشاري متخصص) ويرتفع منسوب أرضية الغرفة عن مستوى الشارع بحوالي ٥٠ سم.

● مجرى لكل من كابلات الجهد المنخفض والمتوسط على شكل حرف U بعرض ٦٠ سم من جهة المنخفض والمتوسط وتكون عرض المجرى خلف المحول ٣٠ سم فقط لكابل المحول على أن يكون عمق مجرى الكابلات ٦٠ سم داخل الغرفة ويتم تغطية الاجزاء المفتوحة لمجرى الكابلات بعد فرش المهمات داخل الغرفة بأغطية صاج مناسبة ويتم دهانها بماده ضد الرطوبة والصدأ

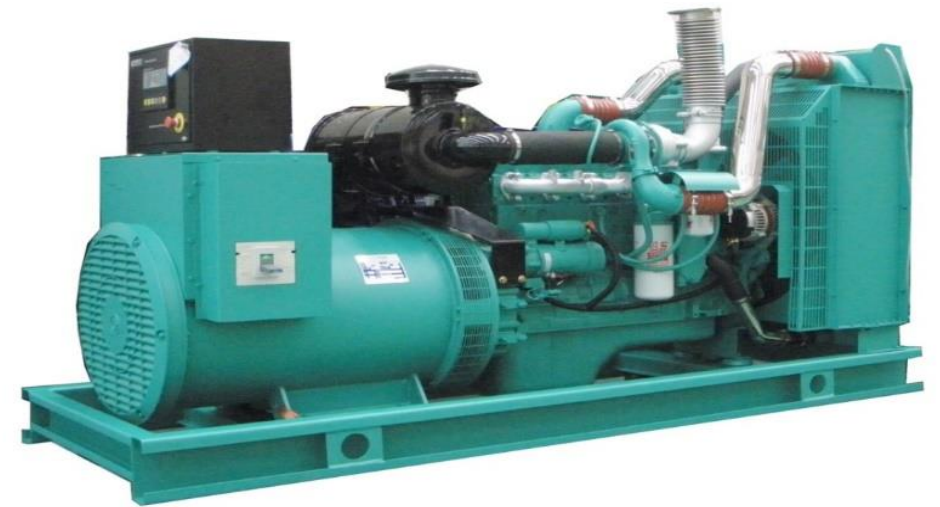
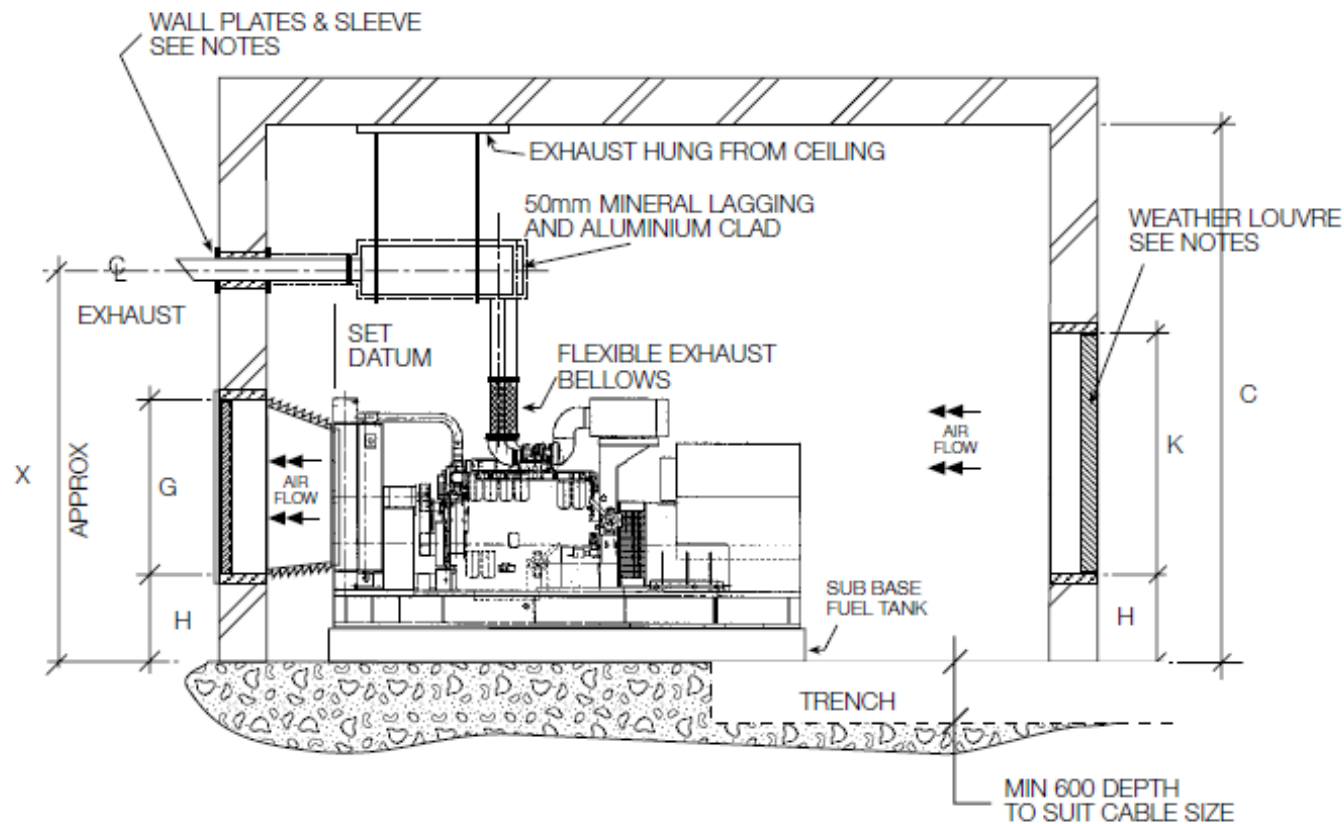
● مواسير بلاستيكية (PVC) قطر ٦ بوصة لدخول وخروج الكابلات من خلالها وذلك أسفل الواجهة الأمامية للغرفة على جانبي باب الغرفة. على أن يكون عدد مواسير التي يمر من خلالها كابلات الجهد المتوسط (٣) ويتم تحديد عدد المواسير التي يمر من خلالها كابلات الجهد المنخفض طبقاً لقدرة المحول.

● عدد (٢) مجرى لدخول المحول (كمر حديدي قطاع حرف "U") غاطسة بأرضية الغرفة على أن تكون المسافات بين الكمر تلائم التوسعات المستقبلية في حاله تغيير المحول بقدرة مختلفة.



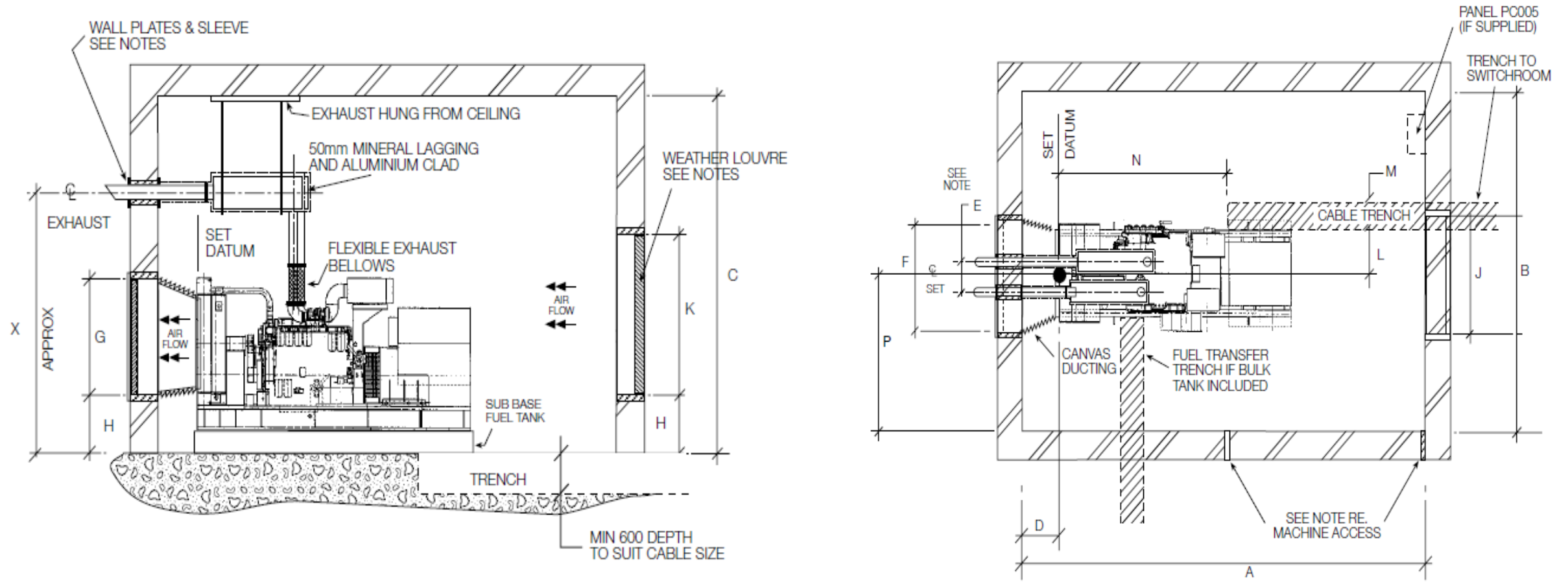
Generator Room Design

Generator Set overview



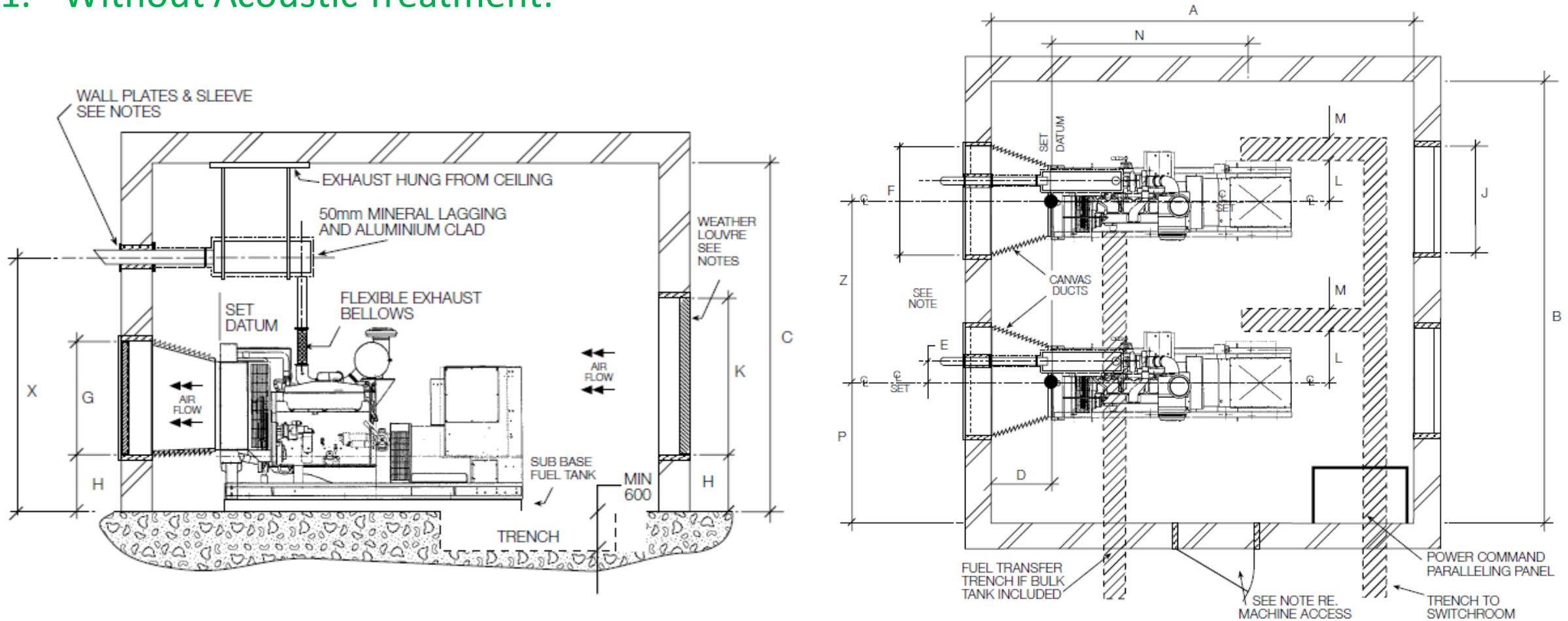
Generator Room Types according to Acoustic Treatment:

1. Without Acoustic Treatment:



Generator Room Types according to Acoustic Treatment:

1. Without Acoustic Treatment:



Generator Room Types according to Acoustic Treatment:

2. With Acoustic Treatment:

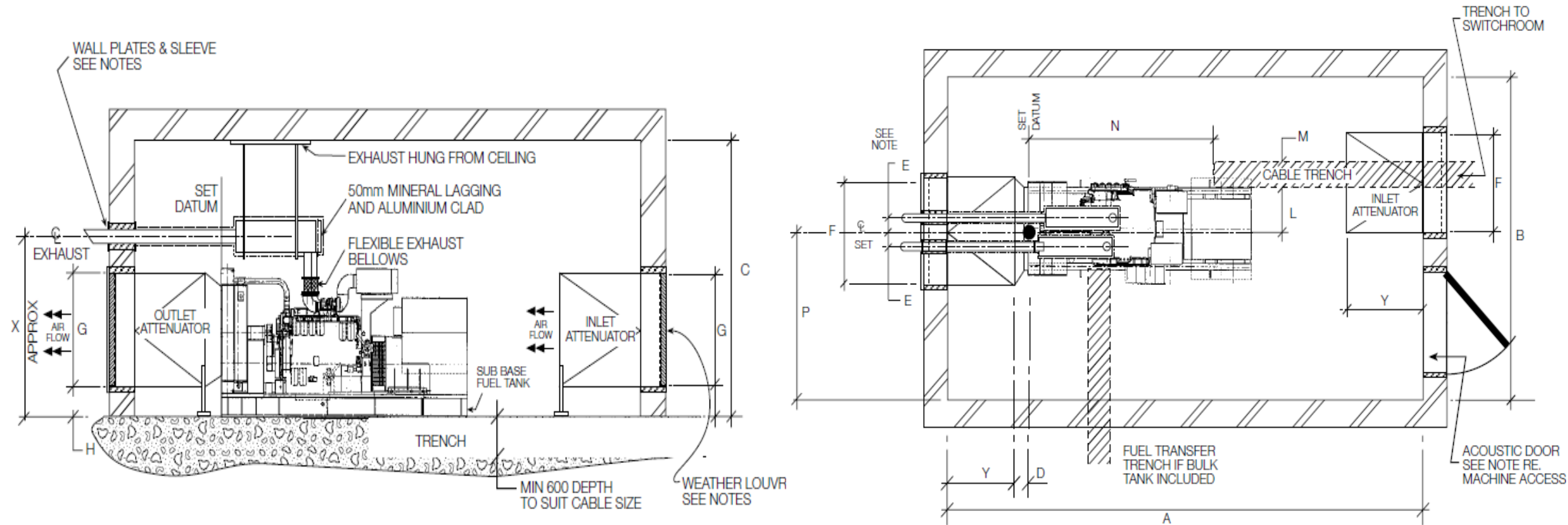
Noise permissible levels

Table. F16 Decibel Rating - (dB) - Environments

Decibels	dB
Threshold of hearing at 1kHz	0
Studio for sound pictures	20
Residence - no children	40
Conversation	60
Heavy Traffic	80
Underground train	100
Close to pneumatic drill	120
Gas turbine engine at 30m (damage to ears)	140
Rocket engine at 30m (panting of stomach)	160
110dB in vicinity of airports	
Logarithmic scale of measurement	
Sound of 1 watt at 0.3m distance	= Intensity of 10^4 (painful to ears)
Each step of 10 decibels	= Increase of intensity of 10 times
Therefore 20 dB	= 100 times the minimum
Therefore 30 dB	= 1000 times the minimum

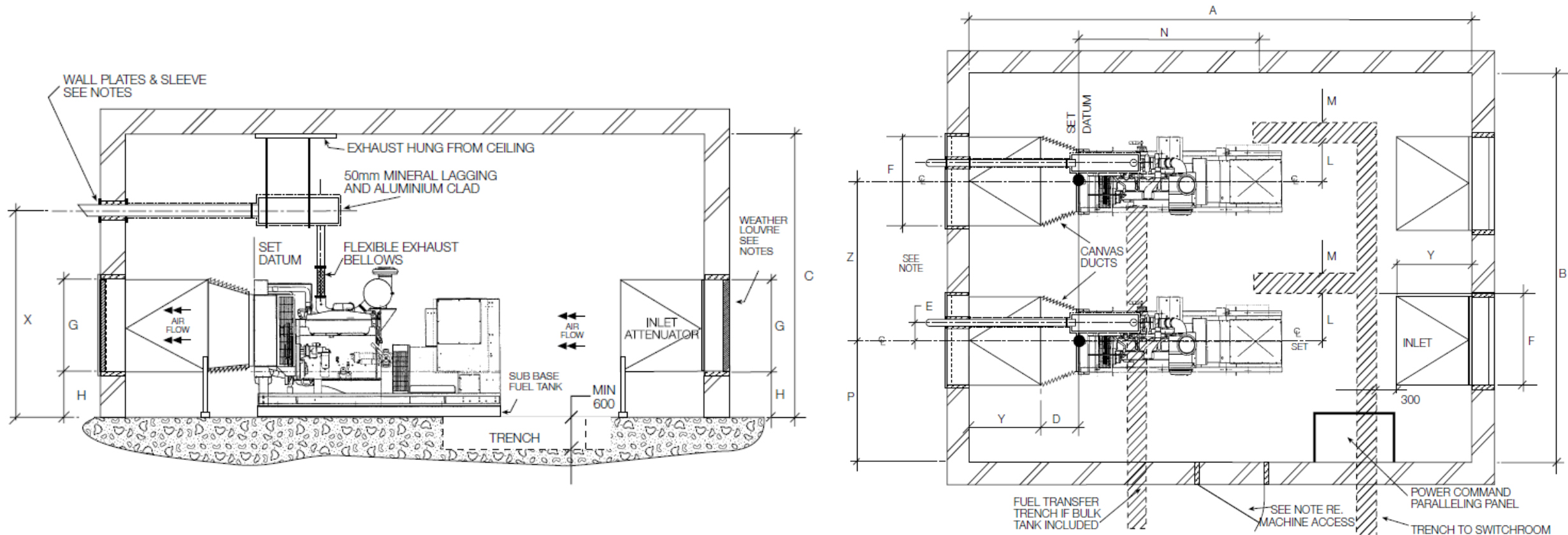
Generator Room Types according to Acoustic Treatment:

2. With Acoustic Treatment:



Generator Room Types according to Acoustic Treatment:

2. With Acoustic Treatment:

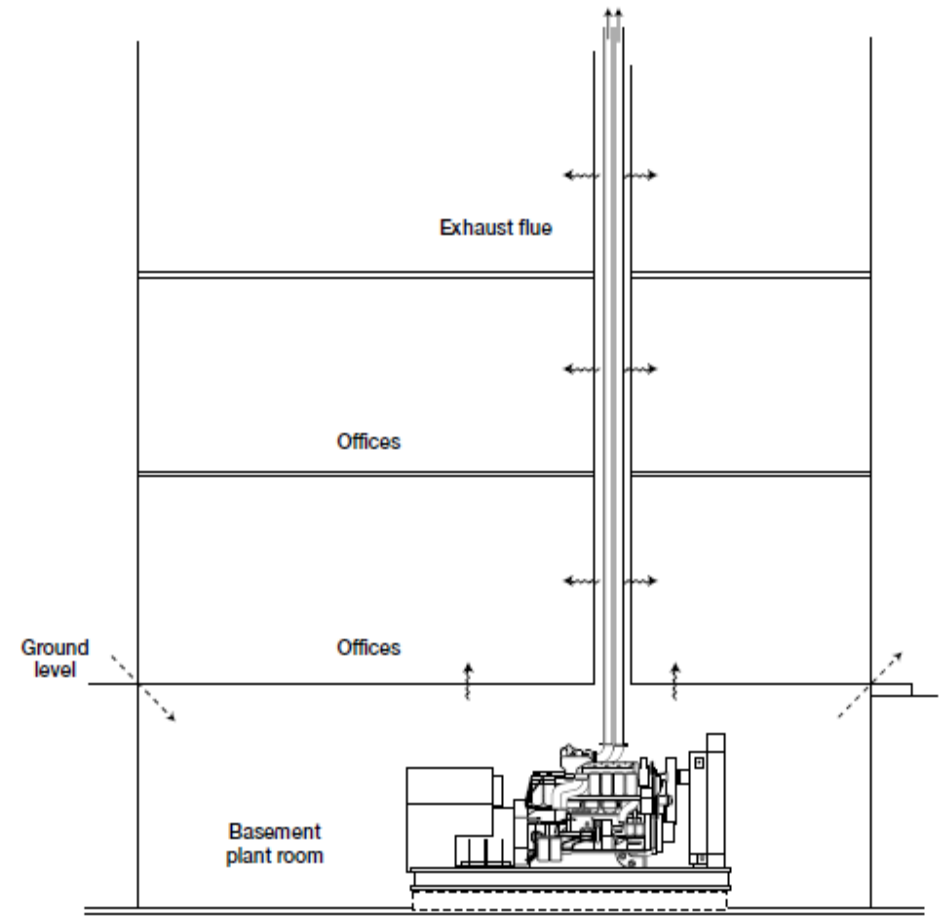


Tips:

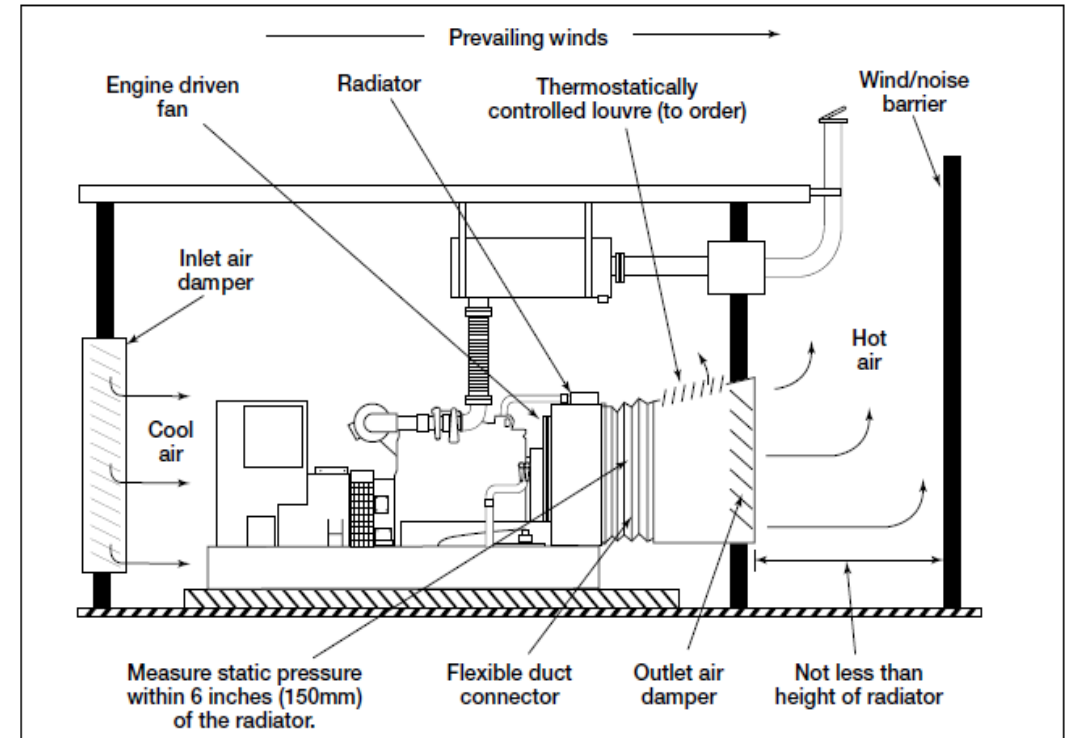
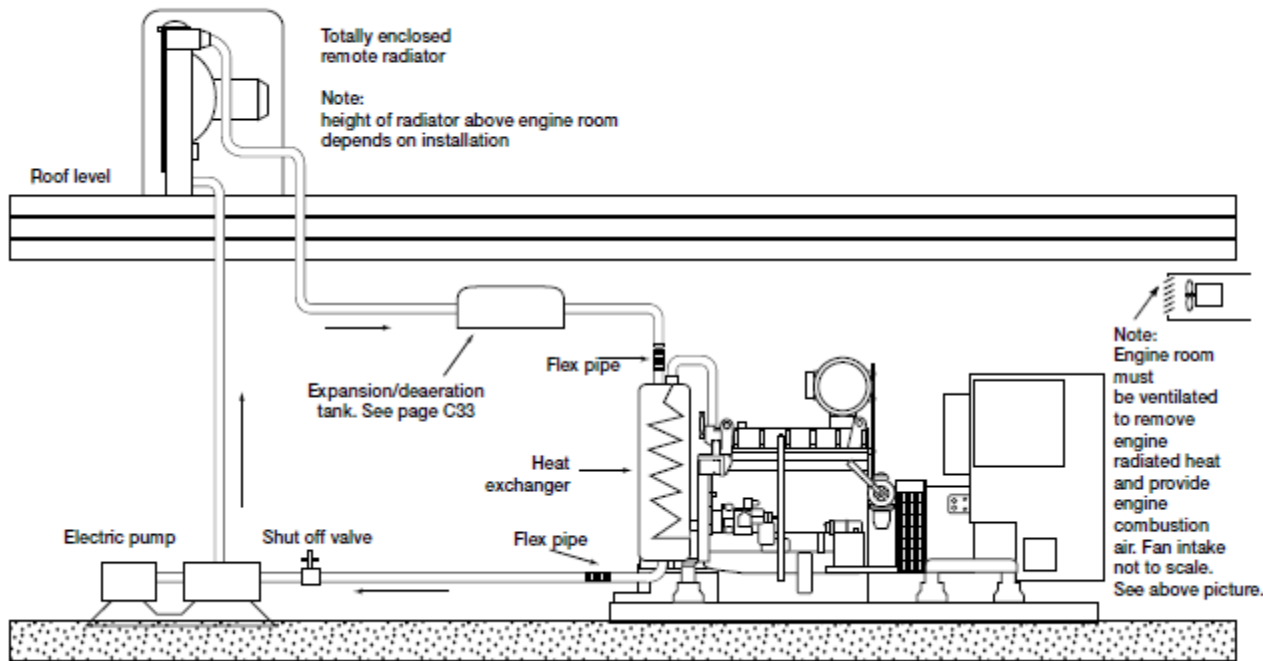
a. Special Cases of Generator room must be coordinated

✓ Exhaust “up to the sky”

- Noise Levels studies must be done according to manufacturer catalogues.
- Architectural Noise treatment should be implemented
- Recommendation by manufacturer to be considered.
- Coordination with HVAC, Civil & Architecture departments must be done.



REMOTE RADIATOR COOLING – HIGH LEVEL



Tips:

b. Technical data of generator set:

- It is mandatory to be check in design phase & in Coordination with MEP departments.

Set output	220-480 V 60 Hz	220-480 V 60 Hz
Prime at 40°C ambient	281 kWe 351 kVA	322 kWe 402 kVA
1999 Set Model (Prime)	CP350-6	CP400-6
New Model (Prime)	281 DFCE	322 DFCE
Standby at 40°C ambient	312 kWe 390 kVA	350 kWe 437 kVA
1999 Set Model (Standby)	CS400-6	CS450-6
New Model (Standby)	312 DFCE	350 DFCE
Engine Make	Cummins	Cummins
Model	NTA855G2	NTA855G3
Cylinders	Six	Six
Engine build	In-line	In-line
Governor/Class	Electronic/A1	Electronic/A1
Aspiration and cooling	Turbo Aftercooled	Turbo Aftercooled
Bore and stroke	140 mm x 152 mm	140 mm x 152 mm
Compression ratio	14.0:1	14.0:1
Cubic capacity	14 Litres	14 Litres
Starting/Min °C	Unaided/-7°C	Unaided/-7°C
Battery capacity	127 A/hr	127 A/hr
Nett Engine output – Prime	299 kWm	344 kWm
Nett at flywheel – Standby	333 kWm	395 kWm
Speed	1800 rpm	1800 rpm
Alternator voltage regulation	±1.0%	±1.0%
Alternator insulation class	H	H
Single load step to NFPA110	100%	100%
Fuel consumption (Prime) 100% load	79 l/hr	87 l/hr
Fuel consumption (Standby) 100% load	89 l/hr	96 l/hr
Lubrication oil capacity	38.6 Litres	38.6 Litres
Base fuel tank capacity – open set	800 Litres	800 Litres
Coolant capacity – radiator and engine	79.8 Litres	84.8 Litres
Exhaust temp – full load prime	466°C	521°C
Exhaust gas flow – full load prime	4136 m ³ /hr	4734 m ³ /hr
Exhaust gas back pressure max	76 mm Hg	76 mm Hg
Air intake – engine	1613 m ³ /hr	1717 m ³ /hr
Air flow – radiator (50°C)	9.7 m ³ /s	9.2 m ³ /s
Pusher fan head (duct allowance) 50°C	13 mm Wg	13 mm Wg
Total heat radiated to ambient	72 kW	76 kW
Engine derating – altitude	4% per 300 m above 1525 m	4% per 300 m above 1525 m
Engine derating – temperature	2% per 11°C above 40°C	2% per 11°C above 40°C

Tips:

c. Cable Connections & Routing:

- Trench and sleeves must be provided with proper dimensions & quantities according to no. of cables.
- If Cables trays are used, they must by sized and routed properly according to no. of cables and room design.

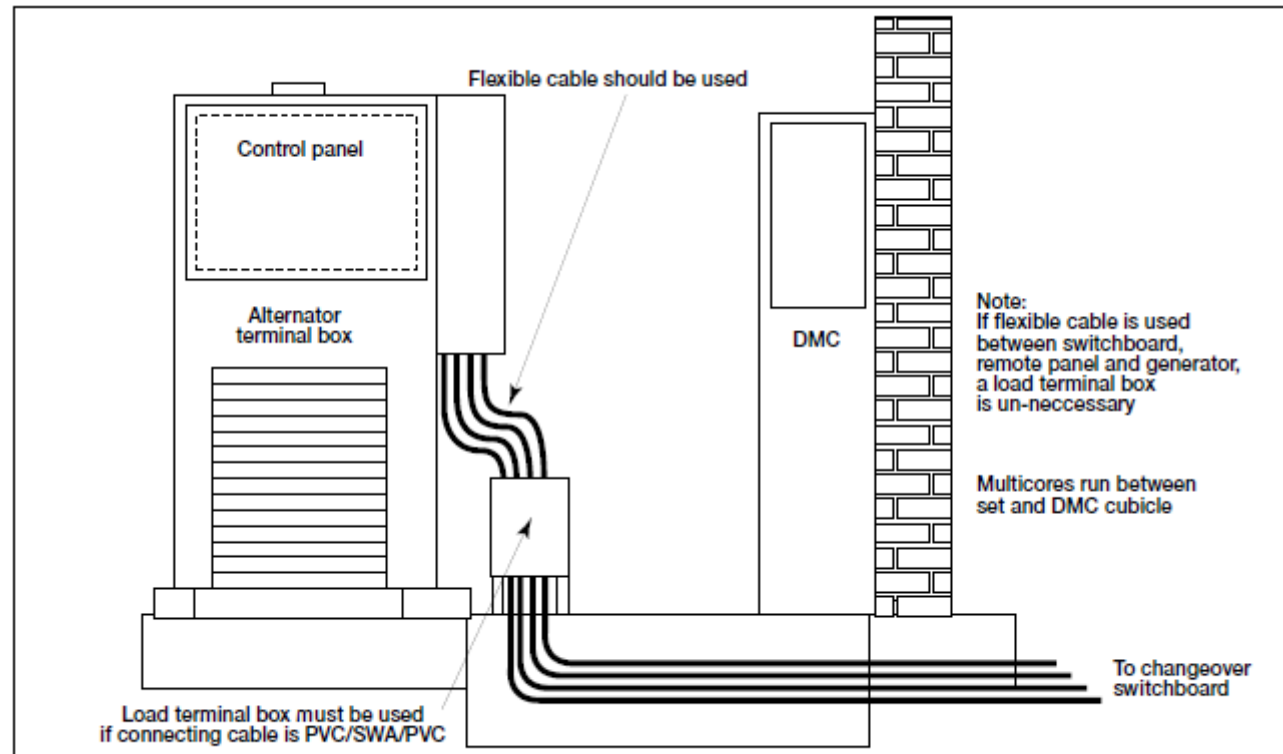


Fig. B1 Cable Connections

Tips:

d. Silenced Generator Set:

- Drop over silenced enclosure is used.

Silenced Generating Sets 85dB(A) @ 1 m

Type Sil

Rating Prime KVA	Engine	2000 Model	1999 Model	Length A mm	width B mm	height C mm	Weight (Dry)	Style
38	4B3.9G	30 DGBC	CP40-5	2850	1050	1725	1210	CF
52	4BT3.9G1	42 DGCA	CP50-5	2850	1050	1725	1510	CF
64	4BT3.9G2	51 DGCB	CP60-5	2850	1050	1725	1560	CF
70	4BTA3.9G1	56 DGCC	CP70-5	2850	1050	1725	1590	CF
96	6BT5.9G2	77 DGDB	CP90-5	2850	1050	1725	2010	CF
106	6BT5.9G2	85 DGDF	CP100-5	2850	1050	1725	2010	CF
129	6CT8.3G2	103 DGEA	CP125-5	3523	1050	1825	2700	CF
153	6CTA8.3G	122 DGFA	CP150-5	3523	1050	1825	2800	CF
185	6CTA8.3G	148 DGFB	CP180-5	3523	1050	1825	2880	CF
233	LTA10G2	186 DFAB	CP200-5	4350	1400	2200	3980	CF
252	LTA10G3	202 DFAC	CP250-5	4350	1400	2200	3990	CF
313	NT855G6	250 DFBF	CS300-5	4350	1400	2200	5030	CF
315	NT855G6	252 DFBH	CP300-5	4350	1400	2200	5160	CF

Rating Prime KVA	Engine	2000 Model	1999 Model	Length A mm	width B mm	height C mm	Weight (Dry)	Style
350	NTA855G4	280 DFCC	CP350-5	4350	1400	2200	5205	CF
425	NTA855G6	340 DFCE	CS400-5	4350	1400	2200	5338	CF
431	KTA19G3	345 DFEC	CP400-5	7062	2451	3020	9716	WR
450	KTA19G3	360 DFEL	CP450-5	7062	2451	3020	9820	WR
511	KTA19G4	409 DFED	CP500-5	7062	2451	3020	9856	WR
575	VTA28G5	460 DFGA	CP575-5	8052	2451	3020	11635	WR
640	VTA28G5	512 DFGB	CP625-5	8052	2451	3020	12010	WR
725	QST30G1	580 DFHA	CP700-5	9137	2451	3020	15602	WR
800	QST30G2	640 DFHB	CP800-5	9137	2451	3020	15752	WR
939	QST30G3	751 DFHC	CP900-5	9137	2451	3020	16202	WR
1000	QST30G4	800 DFHD	CP1000-5	9137	2451	3020	16547	WR
1256	KTA50G3	1005 DFLE	CP1250-5	10127	2451	3020	21198	WR
1406	KTA50G8	1125 DFLE	CP1400-5	10127	2451	3020	22595	WR



Tips:

e. Super Silenced Generator Set:

- Drop over super silenced enclosure is used.

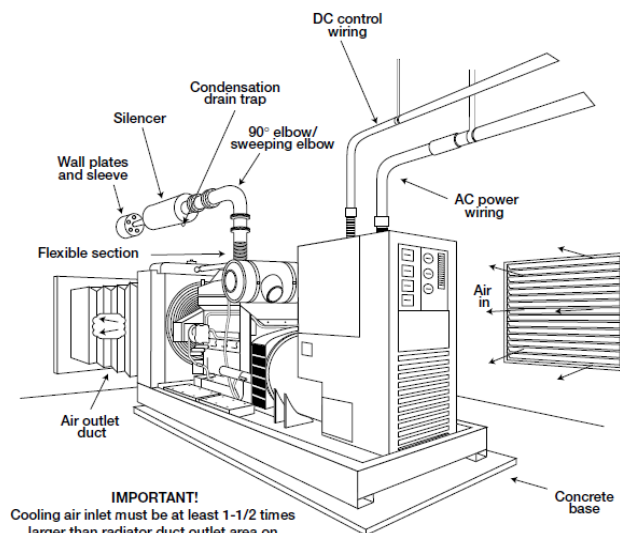
Supersilenced Generating Sets 75dB(A) @ 1 m Type SSil

Rating Prime KVA	Engine	2000 Model	1999 Model	Length A mm	width B mm	height C mm	Weight (Dry)	Style	Rating Prime KVA	Engine	2000 Model	1999 Model	Length A mm	width B mm	height C mm	Weight (Dry)	Style
38	4B3.9G	30 DGBC	CP40-5	2850	1050	1725	1330	CF	350	NTA855G4	280 DFCC	CP350-5	4900	1400	2200	5725	CF
52	4BT3.9G1	42 DGCA	CP50-5	2850	1050	1725	1661	CF	425	NTA855G6	340 DFCE	CS400-5	4900	1400	2200	5872	CF
64	4BT3.9G2	51 DGCB	CP60-5	2850	1050	1725	1710	CF	431	KTA19G3	345 DFEC	CP400-5	8052	2451	3020	104716	WR
70	4BTA3.9G1	56 DGCC	CP70-5	2850	1050	1725	1740	CF	450	KTA19G3	360 DFEL	CP450-5	8052	2451	3020	10820	WR
96	6BT5.9G2	77 DGDB	CP90-5	3400	1050	1725	2201	CF	511	KTA19G4	409 DFED	CP500-5	8052	2451	3020	10856	WR
106	6BT5.9G2	85 DGDF	CP100-5	3400	1050	1725	2201	CF	575	VTA28G5	460 DFGA	CP575-5	9137	2451	3020	14235	WR
129	6CT8.3G2	103 DGEA	CCP125-5	3923	1050	1825	2970	CF	640	VTA28G5	512 DFGB	CP625-5	9137	2451	3020	14610	WR
153	6CTA8.3G	122 DGFA	CP150-5	3923	1050	1825	3080	CF	725	QST30G1	580 DFHA	CP700-5	11120	2451	3020	16302	WR
185	6CTA8.3G	148 DGFB	CP180-5	3923	1050	1825	3168	CF	800	QST30G2	640 DFHB	CP800-5	11120	2451	3020	16452	WR
233	LTA10G2	186 DFAB	CP200-5	4900	1400	2200	4378	CF	939	QST30G3	751 DFHC	CP900-5	11120	2451	3020	16902	WR
252	LTA10G3	202 DFAC	CP250-5	4900	1400	2200	4389	CF	1000	QST30G4	800 DFHD	CP1000-5	11120	2451	3020	17247	WR
313	NT855G6	250 DFBF	CS300-5	4900	1400	2200	5533	CF	1256	KTA50G3	1005 DFLE	CP1250-5	12200	2451	3020	22298	WR
315	NT855G6	252 DFBH	CP300-5	4900	1400	2200	5670	CF	1406	KTA50G8	1125 DFLE	CP1400-5	12200	2451	3020	23695	WR



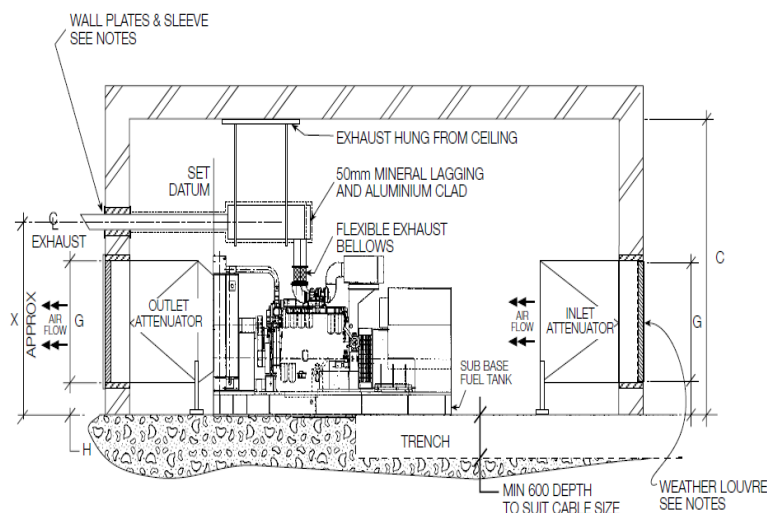
Generator Room Dimensions Design:

- Specify if the room will be with acoustic treatment or not.
- Specify Rating of Generator & get the model number of the generator set from generator catalog.
- Specify if the Room “Inlet/outlet air flow openings” will be “I – SHAPE” or “L – SHAPE”.
- Follow the layouts and tables in the generator catalog to specify dimensions.
- If required, Follow the generator set dimensions drawings & tables in the generator catalog.
- Any special case of exhaust or air flow & ventilation must be coordinated with other departments.

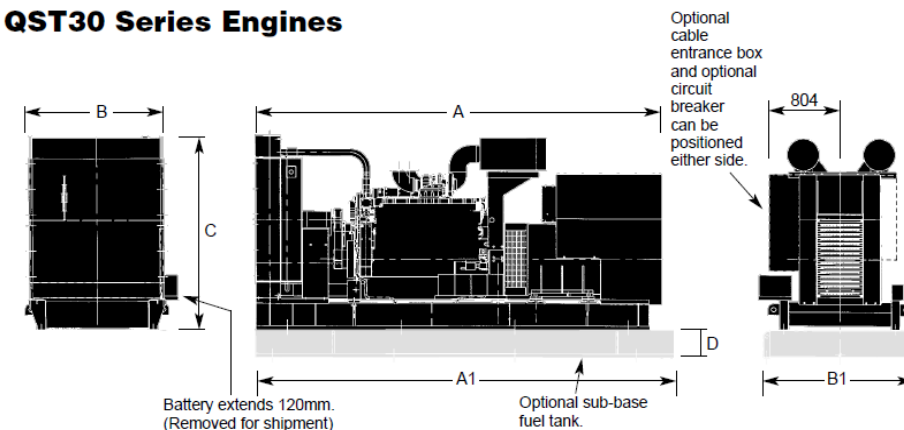


IMPORTANT!
Cooling air inlet must be at least 1-1/2 times larger than radiator duct outlet area on radiator cooled models

Flow or cooling air and heated air can be controlled by automatically operated louvres



QST30 Series Engines



New Model	Engine	Old Model	Dimensions and Weights (mm/kg)						Set Weight kg dry	Set Weight kg Wet	Tank Weight kg (dry)	Tank Weight kg (wet)
			A	A1	B	B1	C	D				
580 DFHA	QST30G1	CP700-5	4297	4460	1442	1640	2092	300	6552	6850	850	2210
640 DFHB	QST30G2	CP800-5	4297	4460	1442	1640	2092	300	6702	7000	850	2210
751 DFHC	QST30G3	CP900-5	4297	4460	1442	1640	2092	300	7152	7450	850	2210
800 DFHD	QST30G4	CP1000-5	4547	4460	1722	1640	2332	300	7712	8000	850	2210

Generator Room Dimensions Design:

- ✓ Example from Cummins Application & installation guide.
 - Room Type according to acoustic treatment: with Acoustic Treatment.
 - Room air inlet/outlet shape: I – shape
 - Required standby gen. set “Type / rating / quantity at the same room” = Standby / 950KVA / one Gen. set at the room.

➤ Design Steps:

- By checking the Catalog,
the suitable page for our case is page 24.

RECOMMENDED ROOM SIZES

Section B/60

CUMMINS ENGINE POWERED 681 kVA – 2500 kVA – 60 Hz GENERATING SETS **WITH ACOUSTIC TREATMENT.** **SINGLE SETS.**

Standby Rating kVA	Prime Rating kVA	Type of ENGINE	2000 Model	1999 Model	Room dimensions			Set back D	Set C/L position P	Exhaust offset E	Exhaust height X	Attenuator Dimensions			uplift H	Cable trench position.		
					Length A	width B	height C					F	Y	G		L	M	N
754	681	VTA28G5	603 DFGB	CS750-6	9000	3450	3450	400	1725	400	2950	1800	1800	2150	300	775	500	5150
950	862	QST30G1	760 DFHA	CS950-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1012	920	QST30G2	810 DFHB	CS1000-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1156	1044	QST30G3	925 DFHC	CS1100-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1276	1160	KTA38G4	1020 DFJD	CS1250-6	10300	3800	4000	500	1900	450	3200	2100	2200	2650	200	920	600	3655
1587	1400	KTA50G3	1270 DFLE	CS1600-6	11160	3800	4000	500	1900	450	3100	2100	2200	2650	200	920	600	4375
1931	1608	KTA50G9	1545 DFLE	CS1900-6	12700	4000	4500	500	2000	500	3800	2700	2600	3050	200	920	600	5000
2188	2000	QSK60G6	1600 DQKB	CS2200-6	13650	4500	4500	600	2250	693	3800	3000	3000	3150	325	645	600	4800
2500	2250	QSK60G6	2000 DQKC	CS2500-6	13650	4500	4500	600	2250	693	3800	3000	3000	3150	325	645	600	4800

Before finalising the generator room layout design please ensure you read the guidance notes.

The attenuator dimensions indicated are based on 100mm airways and 200mm acoustic modules.

In free field conditions we would expect this treatment to achieve 85dBA at 1 metre.

➤ Note for L – shape Rooms:

- The mentioned dimensions in the catalog is only for I – Shape Rooms.
- In case of L – Shape rooms, we must draw the room manually to know the accurate dimensions.

➤ What are additional steps to do that?

1. Get the type of engine name from the catalog based on your selection.

RECOMMENDED ROOM SIZES

Section B/60

CUMMINS ENGINE POWERED 681 kVA – 2500 kVA – 60 Hz GENERATING SETS **WITH ACOUSTIC TREATMENT.**
SINGLE SETS.

Standby Rating kVA	Prime Rating kVA	Type of ENGINE	2000 Model	1999 Model	Room dimensions			Set back D	Set C/L position P	Exhaust offset E	Exhaust height X	Attenuator Dimensions			uplift H	Cable trench position.		
					Length A	width B	height C					F	Y	G		L	M	N
754	681	VTA28G5	603 DFGB	CS750-6	9000	3450	3450	400	1725	400	2950	1800	1800	2150	300	775	500	5150
950	862	QST30G1	760 DFHA	CS950-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1012	920	QST30G2	810 DFHB	CS1000-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1156	1044	QST30G3	925 DFHC	CS1100-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1276	1160	KTA38G4	1020 DFJD	CS1250-6	10300	3800	4000	500	1900	450	3200	2100	2200	2650	200	920	600	3655
1587	1400	KTA50G3	1270 DFLE	CS1600-6	11160	3800	4000	500	1900	450	3100	2100	2200	2650	200	920	600	4375
1931	1608	KTA50G9	1545 DFLE	CS1900-6	12700	4000	4500	500	2000	500	3800	2700	2600	3050	200	920	600	5000
2188	2000	QSK60G6	1600 DQKB	CS2200-6	13650	4500	4500	600	2250	693	3800	3000	3000	3150	325	645	600	4800
2500	2250	QSK60G6	2000 DQKC	CS2500-6	13650	4500	4500	600	2250	693	3800	3000	3000	3150	325	645	600	4800

Before finalising the generator room layout design please ensure you read the guidance notes.

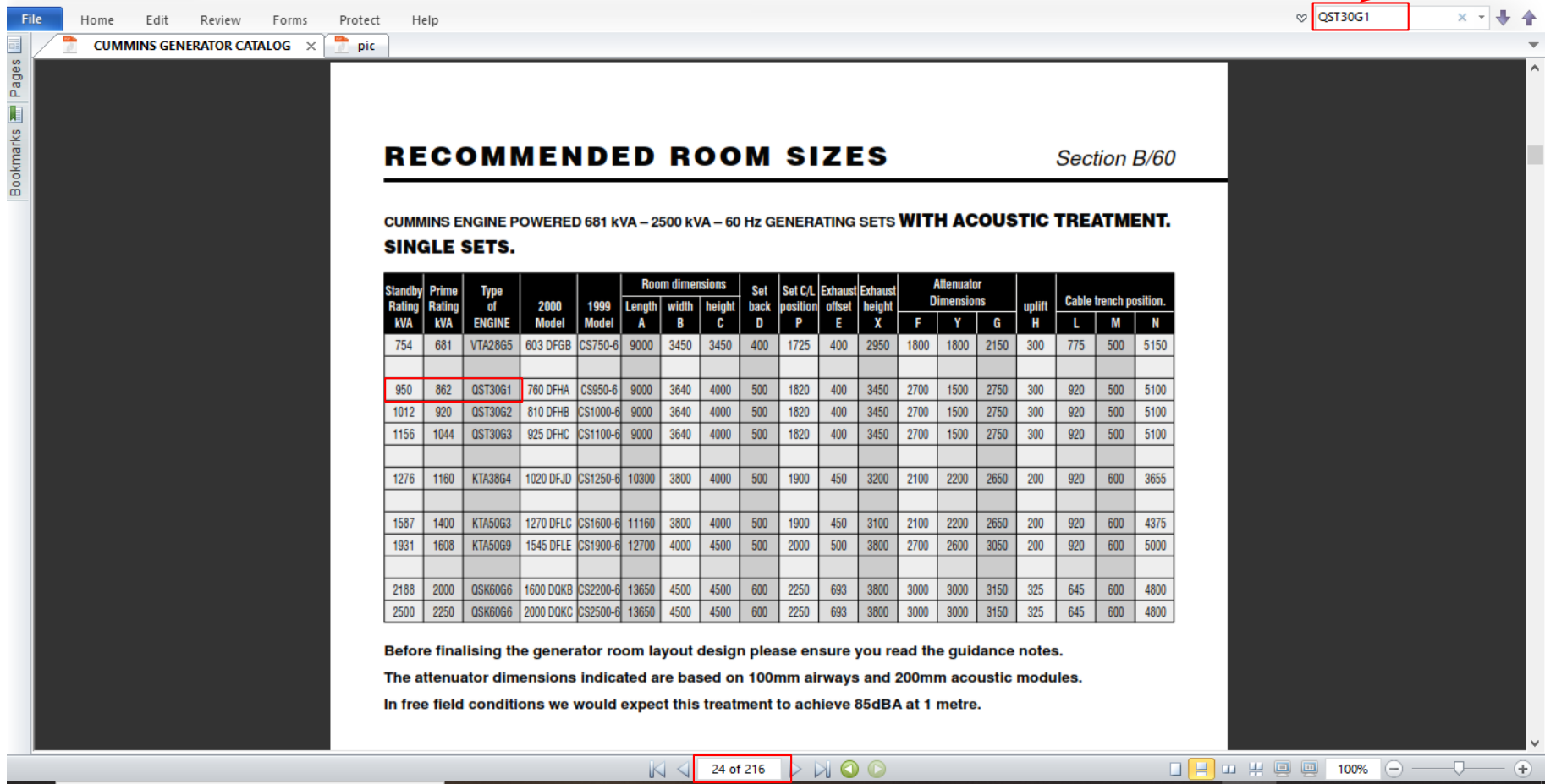
The attenuator dimensions indicated are based on 100mm airways and 200mm acoustic modules.

In free field conditions we would expect this treatment to achieve 85dBA at 1 metre.

➤ What are additional steps to do that?

2. Search for type of engine until you find the page illustrating the engine detailed dimensions.

Search



RECOMMENDED ROOM SIZES Section B/60

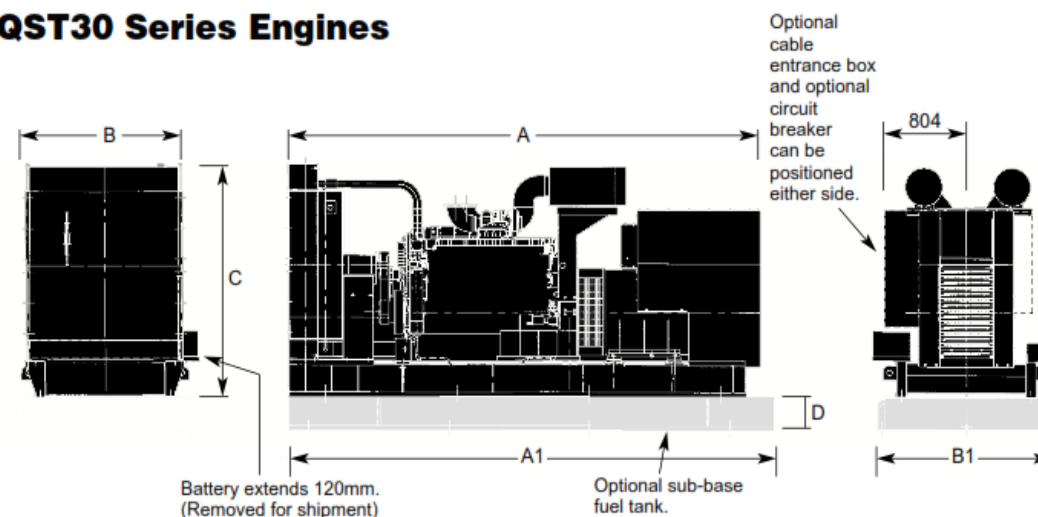
CUMMINS ENGINE POWERED 681 kVA – 2500 kVA – 60 Hz GENERATING SETS WITH ACOUSTIC TREATMENT. SINGLE SETS.

Standby Rating kVA	Prime Rating kVA	Type of ENGINE	2000 Model	1999 Model	Room dimensions			Set back D	Set C/L position P	Exhaust offset E	Exhaust height X	Attenuator Dimensions			uplift H	Cable trench position.		
					Length A	width B	height C					F	Y	G		L	M	N
754	681	VTA28G5	603 DFGB	CS750-6	9000	3450	3450	400	1725	400	2950	1800	1800	2150	300	775	500	5150
950	862	QST30G1	760 DFHA	CS950-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1012	920	QST30G2	810 DFHB	CS1000-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1156	1044	QST30G3	925 DFHC	CS1100-6	9000	3640	4000	500	1820	400	3450	2700	1500	2750	300	920	500	5100
1276	1160	KTA38G4	1020 DFJD	CS1250-6	10300	3800	4000	500	1900	450	3200	2100	2200	2650	200	920	600	3655
1587	1400	KTA50G3	1270 DFLE	CS1600-6	11160	3800	4000	500	1900	450	3100	2100	2200	2650	200	920	600	4375
1931	1608	KTA50G9	1545 DFLE	CS1900-6	12700	4000	4500	500	2000	500	3800	2700	2600	3050	200	920	600	5000
2188	2000	QSK60G6	1600 DQKB	CS2200-6	13650	4500	4500	600	2250	693	3800	3000	3000	3150	325	645	600	4800
2500	2250	QSK60G6	2000 DQKC	CS2500-6	13650	4500	4500	600	2250	693	3800	3000	3000	3150	325	645	600	4800

Before finalising the generator room layout design please ensure you read the guidance notes.
The attenuator dimensions indicated are based on 100mm airways and 200mm acoustic modules.
In free field conditions we would expect this treatment to achieve 85dBA at 1 metre.

- What are additional steps to do that?
 2. Now you can draw manually all generator set dimensions based on the below mentioned table.
 3. Attenuator, exhaust dimensions can be taken from the I – SHAPE room table data mentioned previously.

QST30 Series Engines



New Model	Engine	Old Model	Dimensions and Weights (mm/kg)						Set Weight	Set Weight	Tank Weight	Tank Weight
			A	A1	B	B1	C	D	kg Dry	kg Wet	kg (dry)	kg (wet)
580 DFHA	QST30G1	CP700-5	4297	4460	1442	1640	2092	300	6552	6850	850	2210
640 DFHB	QST30G2	CP800-5	4297	4460	1442	1640	2092	300	6702	7000	850	2210
751 DFHC	QST30G3	CP900-5	4297	4460	1442	1640	2092	300	7152	7450	850	2210
800 DFHD	QST30G4	CP1000-5	4547	4460	1722	1640	2332	300	7712	8000	850	2210

Set weights are **without** sub-base tank.
 Dimensions and weights are for **guidance** only. Do not use for installation design. Ask for certified drawings on your specific application.
 Specifications may change without notice.

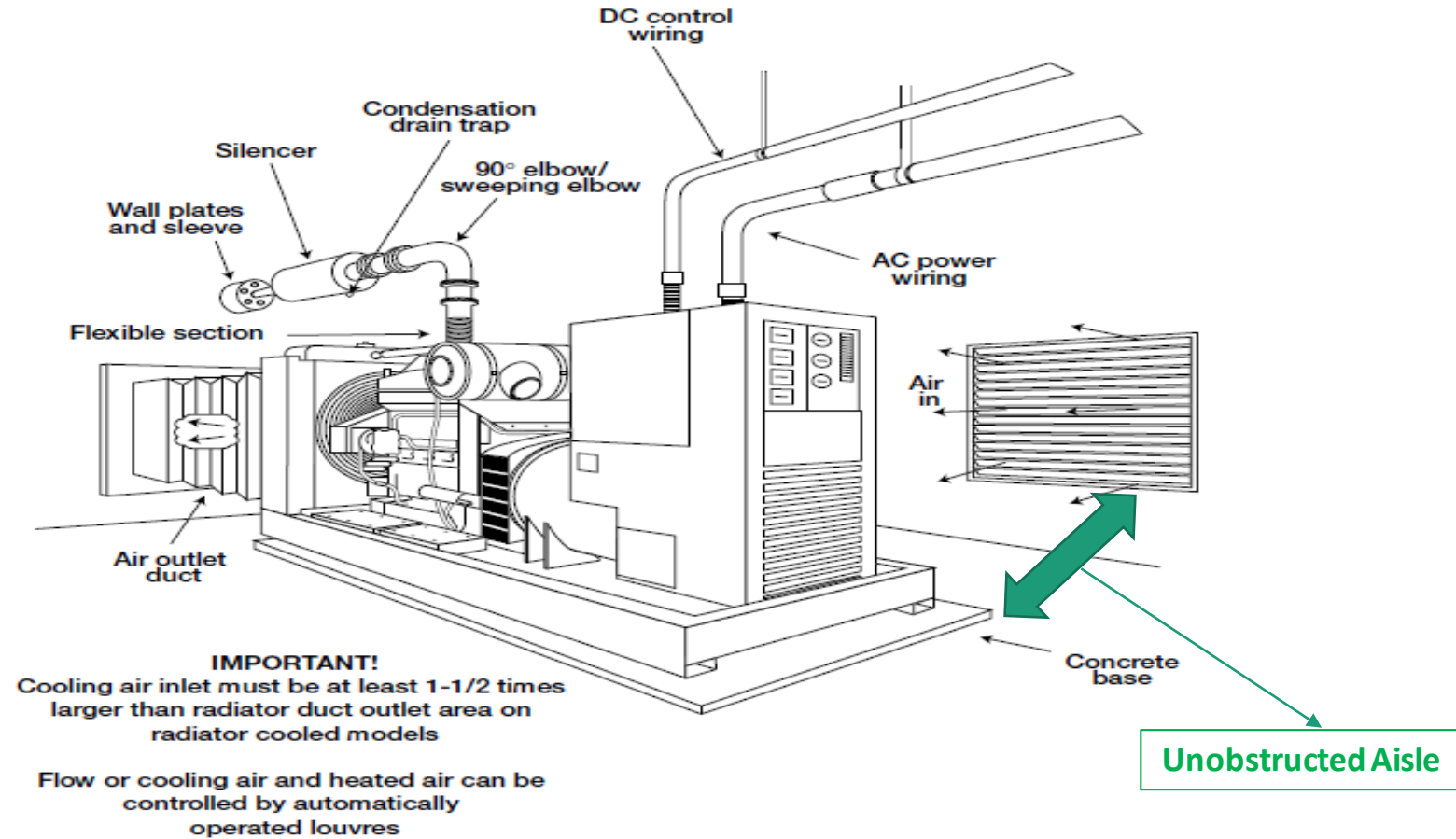
G13

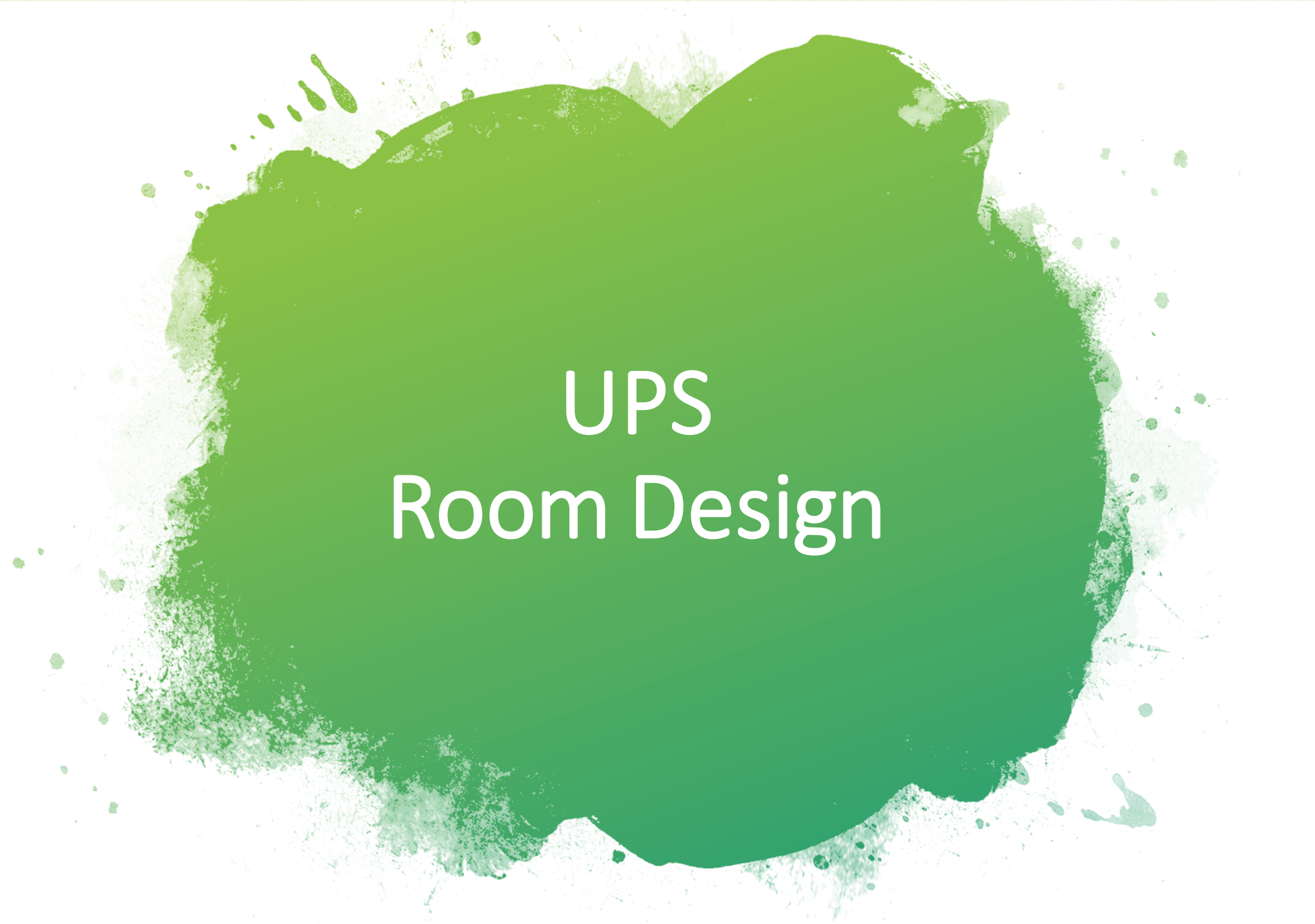
➤ What are additional steps to do that?

5. About 1 meter aisle in front of the inlet “air opening or attenuator” must be unobstructed to provide proper space for operators moving through the room and for maintenance activities.

➤ General Note:

- Don't forget to check the technical data of generator set as mentioned previously in TIP. b



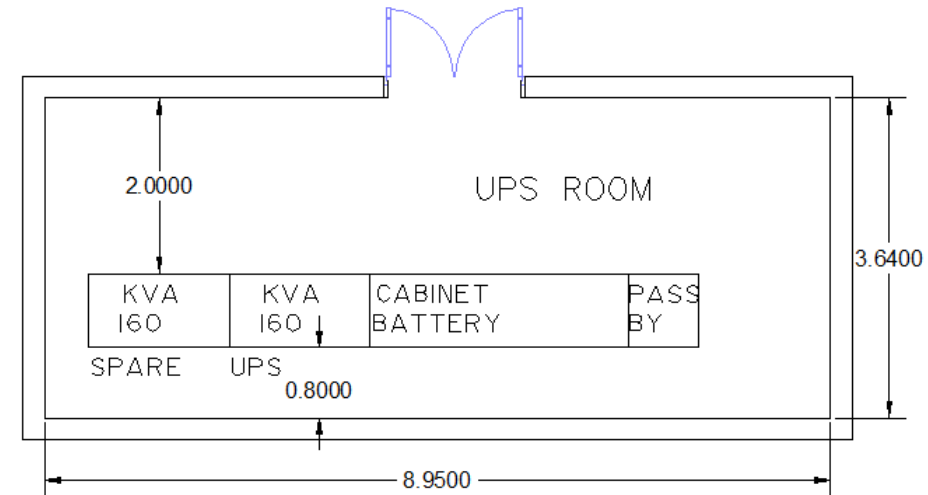
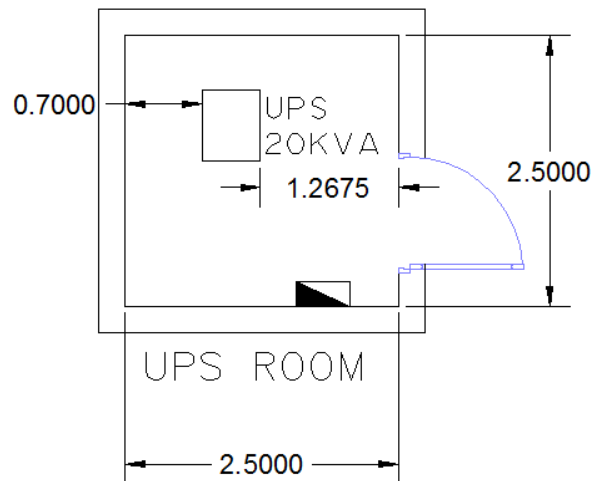


UPS Room Design

UPS Room Design Aspects



- Specify suitable family & UPS type for your application www.se.com - search for "UPS" - Use filters to easily select UPS suitable for your application.
- Follow data sheet or Catalog of UPS to know dimensions W x D x H & to specify backup period & weight.
- Follow recommendation of clearances about the UPS according to manufacturers catalogues or follow NEC Article 110 as illustrated before.
- You must specify if the UPS batteries will be built-in or external to take this in consideration while designing room spaces if batteries are external.
- You must specify if there is a need to use external maintenance bypass to take this in consideration while designing room spaces.
- Width & Height of Door required for UPS room must be suitable for equipment maneuvering.
- Weight to be coordinated with Civil Engineer to provide suitable Room structural base.
- Coordination with HVAC is mandatory to maintain required ambient temperature.



Cutsheet Example

APC "MGE Galaxy 5000" – By Schneider Electric



Life Is On



Cutsheet Example

APC "MGE Galaxy 5000"

By Schneider Electric

- 80KVA
- From 5 minutes to 35 minutes
 1. With built-in batteries.
 2. With external battery cubicles.



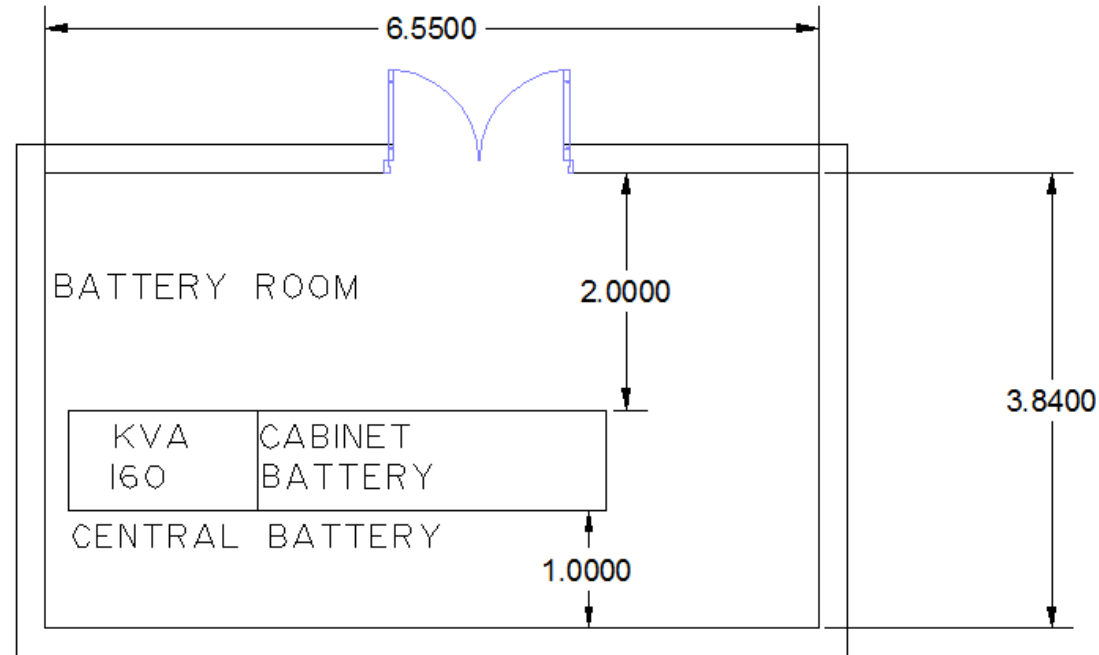
UPS Rating kVA/kW (PF = 0.8)	20/16	30/24	40/32	60/48	80/64	100/80	120/96
Normal AC supply input							
Input voltage range (V)	250V to 470V 3-phase						
Inputs Mains 1 and Mains 2	Separate or common						
Frequency	50Hz / 60Hz ± 8%						
Input Power Factor	> 0.99						
Input current total harmonic distortion (THDI)	< 3%						
Bypass system input							
Nominal input voltage	340V to 470V 3-phase + neutral						
Frequency	50Hz / 60Hz ± 8%						
Output							
Output Voltages (V)	380V - 400V - 415V +3% 3-phase + neutral						
Frequency (Hz)	50Hz / 60Hz						
Voltage Regulation	± 1%						
Overload	150% 1 minute, 125% 10 minutes						
Output voltage total harmonic distortion	THDU < 2%						
Max load crest factor	3:1						
Overall efficiency							
Double conversion mode	up to 94%						
Economy mode	up to 97%						
Environmental							
Storage temperature	-25°C to +45°C						
Operating temperature	up to 40°C (2)						
Operating altitude	1000 m						
Parallel-connection							
Modular	up to 6 modules						
Standards and approvals							
Performance and safety	IEC/EN 62040-1, IEC/EN 60950						
Performance and design	IEC/EN 62040-3						
Design and manufacturing	ISO 14001, ISO 9001, IEC 60146						
EMC immunity	IEC 61000-4 - 2 to 6						
EMC emissions	IEC 62040-2 C3						
Approvals	TUV - LCIE - CEM - CE Mark						
Dimensions and weights (depth = 850 mm and height = 1900 mm)							
	20	30	40	60	80	100	120
UPS without batteries (width in mm)	710						
Weight	400 kg						520 kg
UPS + built-in batteries (width in mm)	1010						
From 5 minutes to 35 minutes (3)	736 kg						1050 kg
From 10 minutes to 50 minutes (3)	732 kg						888 kg
From 15 minutes to 90 minutes (3)	975 kg						975 kg
From 20 minutes to 110 minutes (3)	736 kg						888 kg
From 30 minutes to 120 minutes (3)	888 kg						975 kg
Battery cubicles (width and weight)							
From 5 minutes to 35 minutes (3) (width in mm)	710						
From 5 minutes to 35 minutes (3) (weight)	885 kg						980 kg
From 10 minutes to 50 minutes (3) (width in mm)	710						1010
From 10 minutes to 50 minutes (3) (weight)	885 kg						1142 kg
From 15 minutes to 80 minutes (3) (width in mm)	710						1010
From 15 minutes to 80 minutes (3) (weight)	885 kg						1142 kg
From 30 minutes to 120 minutes (3) (width in mm)	710						1010
From 30 minutes to 120 minutes (3) (weight)	882 kg						1307 kg



Central Battery Room Design

Central Battery Room Design Aspects

- Specify “Ampere hour” needed for your network and no of circuits that will be supplied by central battery to select the proper dimensions.
- specify if the Central Battery’s batteries will be built-in or external to take this in consideration while designing room spaces if batteries are external.
- Width & Hight of Door required for Central Battery room must be suitable for equipment maneuvering.
- Weight to be coordinated with Civil Engineer to provide suitable Room structural base.



- Exiway Central Battery Configuration



Electronics cabinet



Battery cabinet



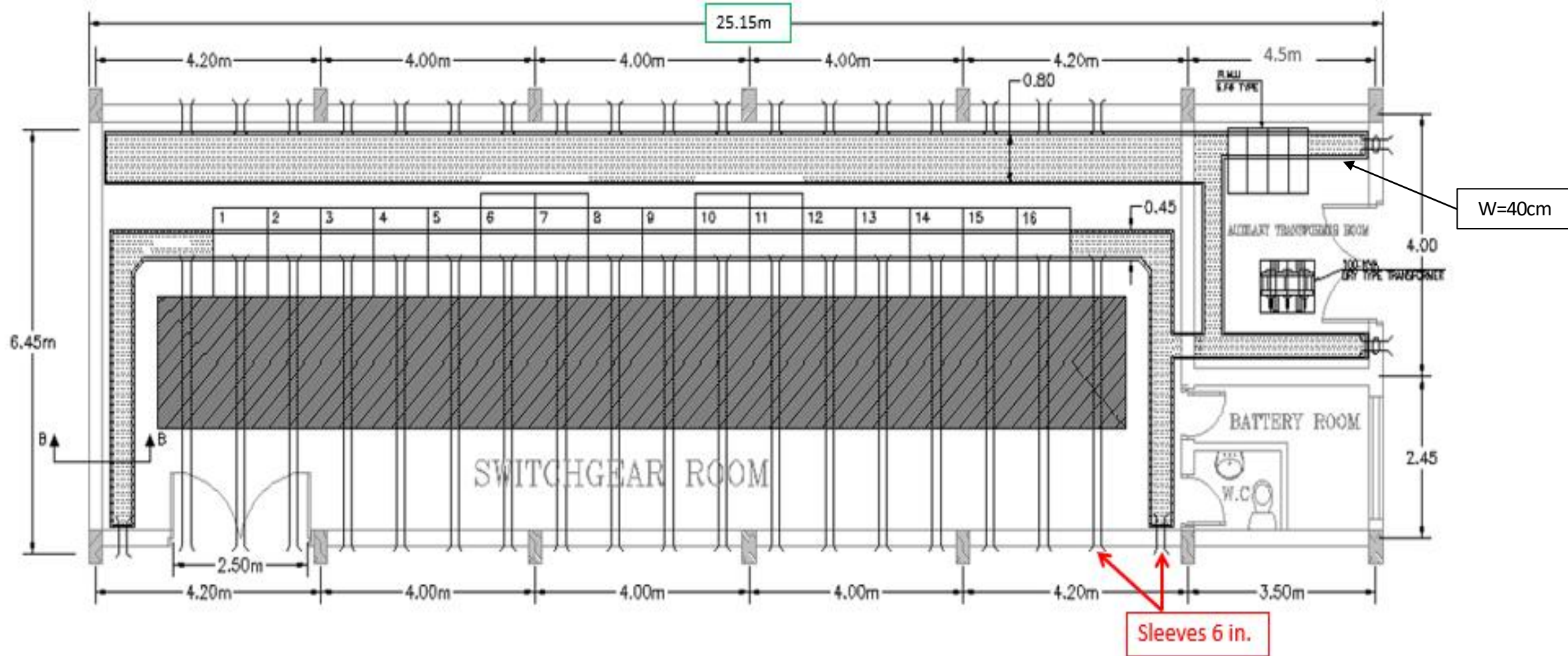
Battery Racks

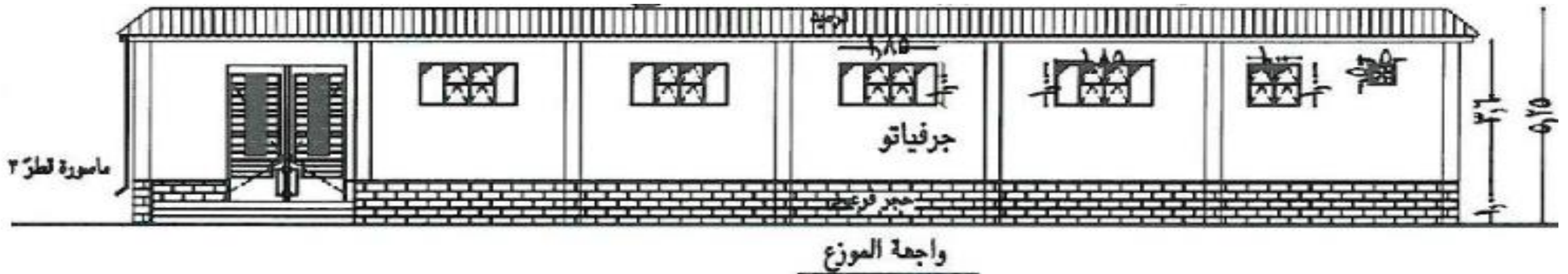
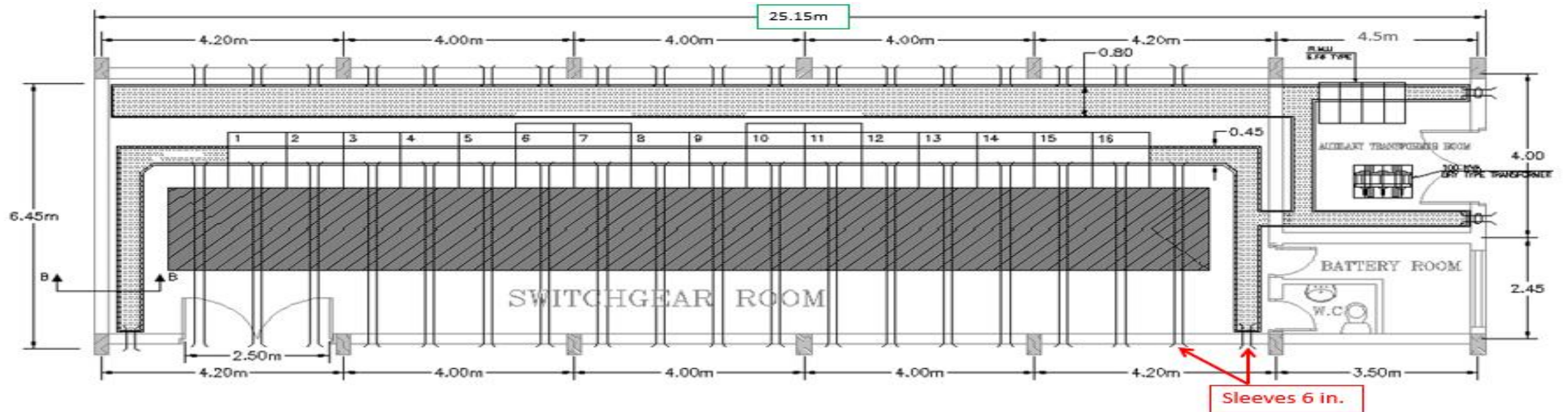
- Exiway Catalog Overview

MVSG
“Building or Room”
Design

MVSG “Distributor Building” Design Aspects

- Standard Room details are according to Electricity company Regulation. The below typical is for 22KV Approved Distributor Building.





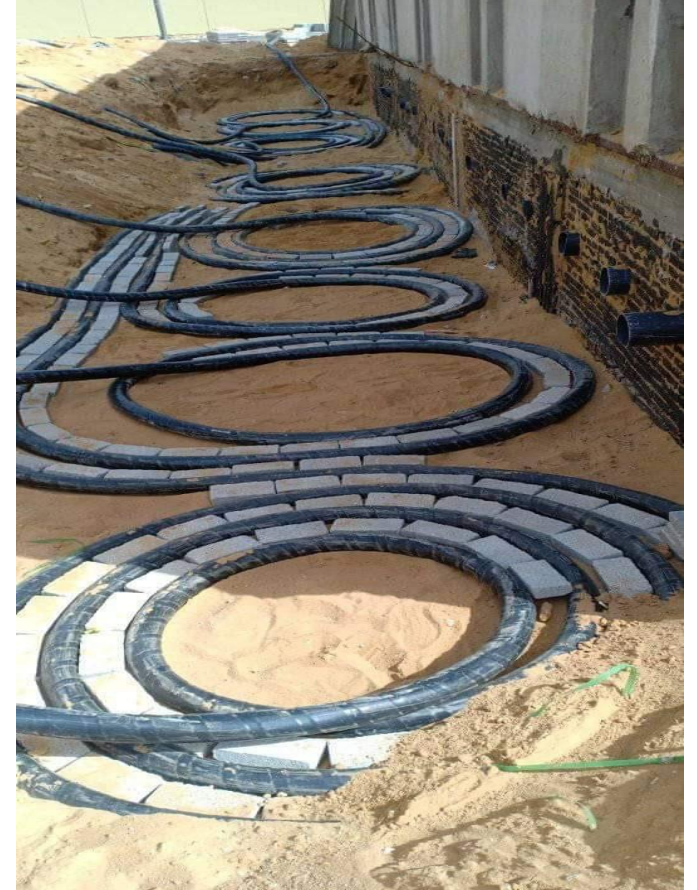
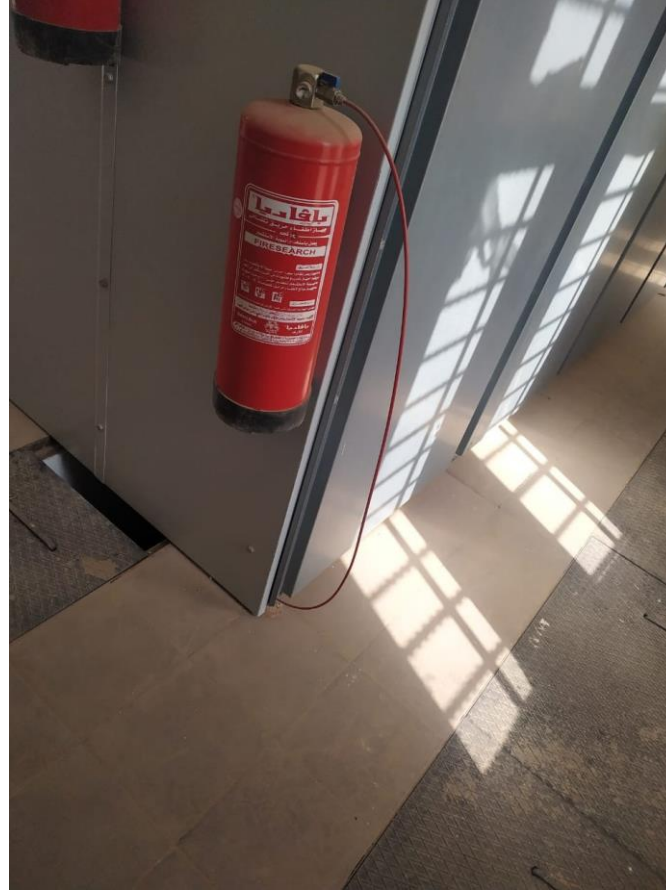
MVSG “Distributor Building” Design Aspects

- Shots from Site



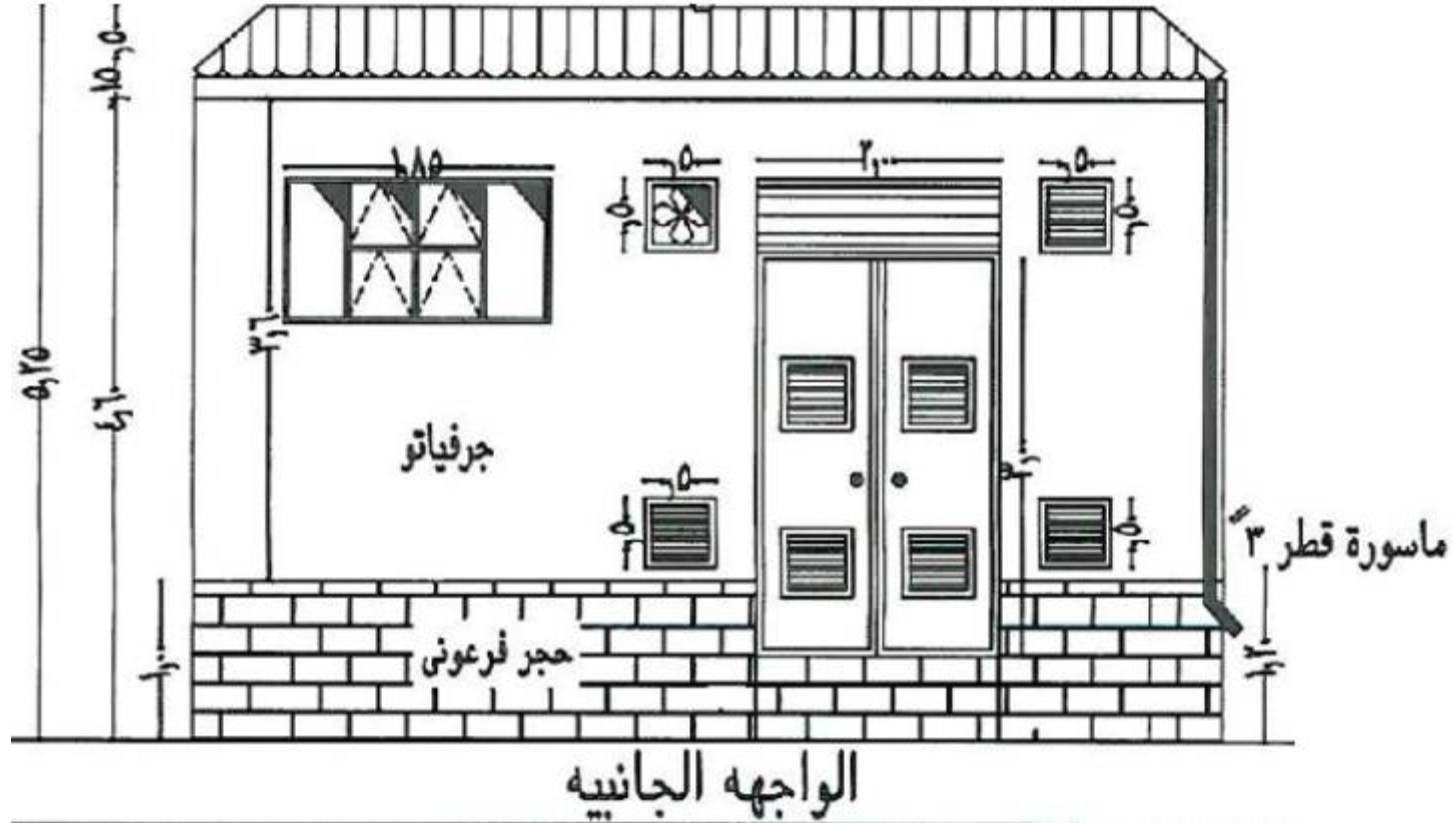
MVSG “Distributor Building” Design Aspects

- Shots from Site



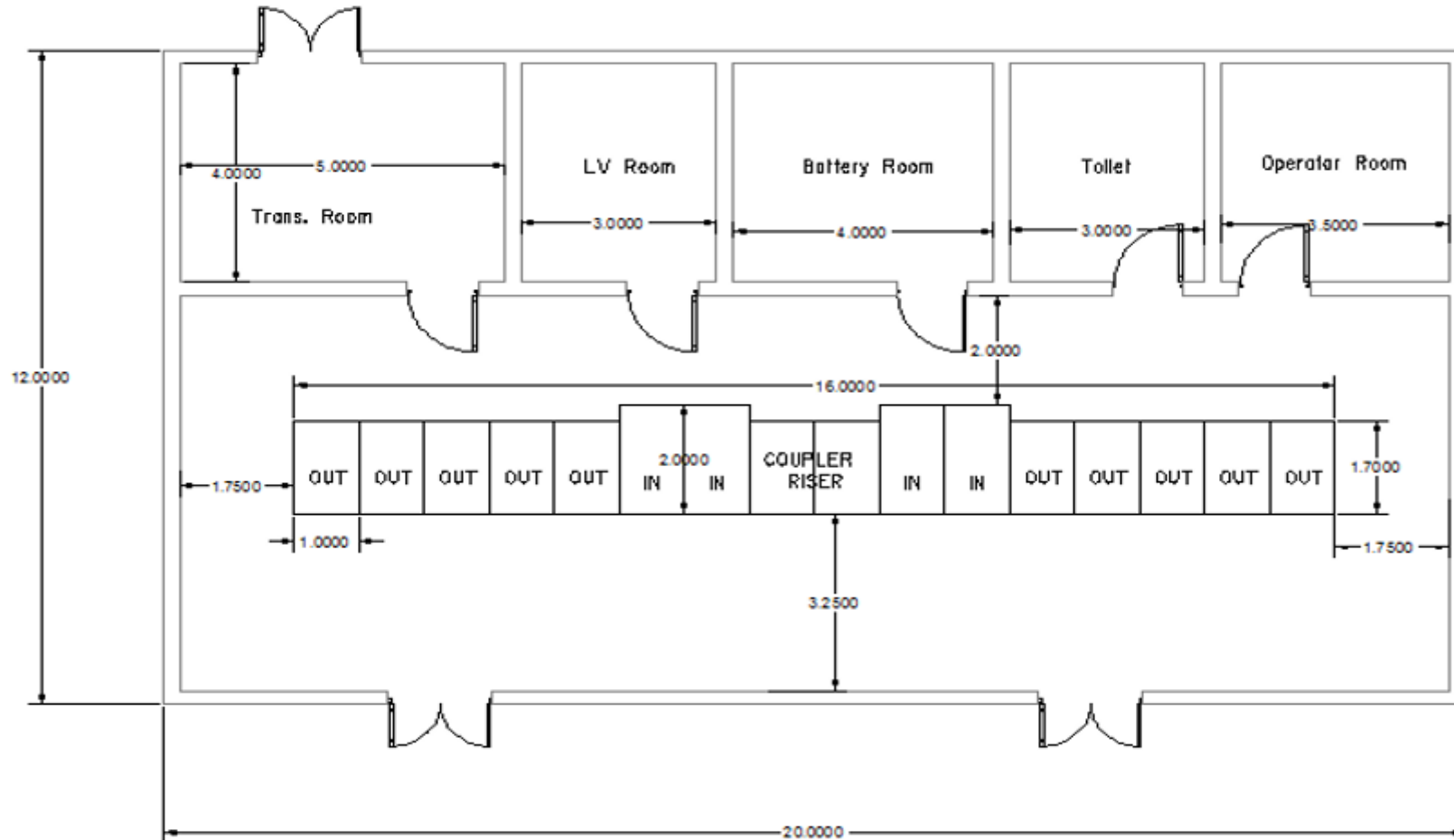
MVSG “Distributor Building” Design Aspects

- Standard Room details are according to Electricity company Regulation.



MVSG “Distributor Building” Design Aspects

- In some special cases, MVSG building design can be customized but should be approved by the Electricity company.



- To be cancelled





LV Switchgears Room Design

LV Switchgears Room Design Aspects

- Approximate dimensions Sizing of LV switchgears basically depends on:
 - ✓ Ratings of circuit breakers.
 - ✓ Quantity of each rating of required circuit breakers.
 - ✓ Capacitor Banks if required.
 - ✓ Detuning reactors with capacitor Banks if required.
 - ✓ Complexity of control required from the switchgear.
 - ✓ Drawability: Withdrawable or fixed?
 - ✓ Accessibility: Front or Rear?
 - ✓ There are some other important aspects will affect sizing of LV switchgear which will be implemented in shop drawings phase by the switchgear manufacturer. These shop drawings must be revised with the designed electrical rooms to know if the room dimensions will be suitable or not. Below mentioned, some of these factors:
 - Form
 - IP
 - Temperature
 - No of cables entering the switchgear ... etc.

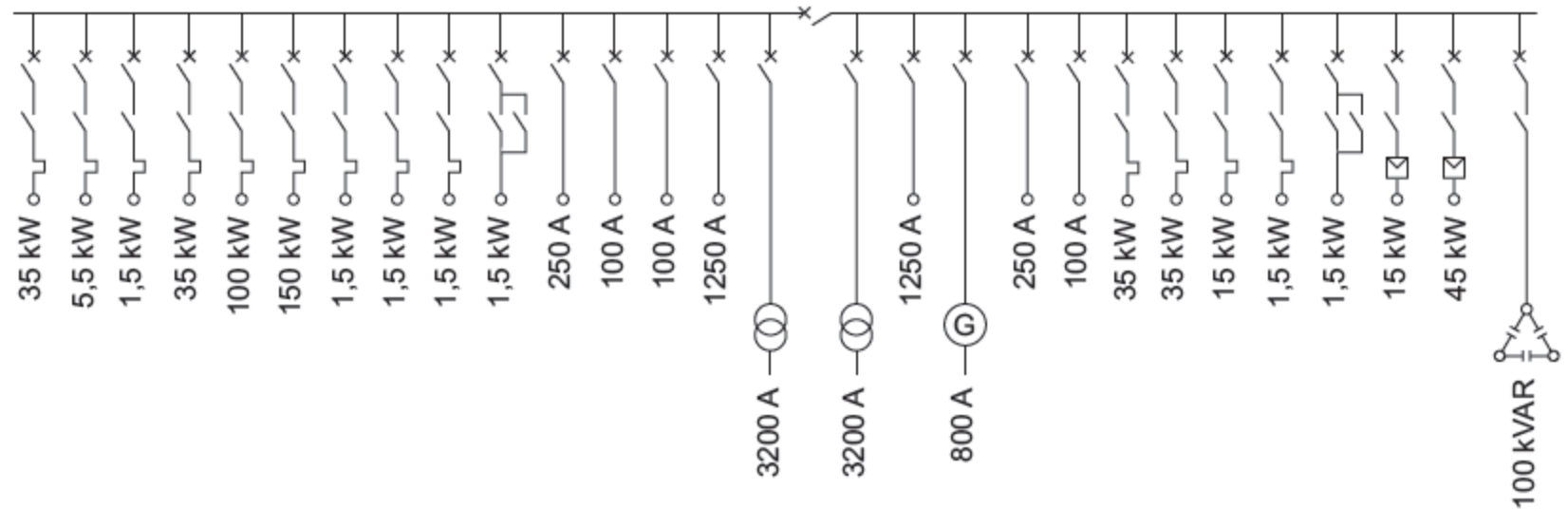
1. Free Stand Switchgear Sizing Example

- Family Name: Blokset



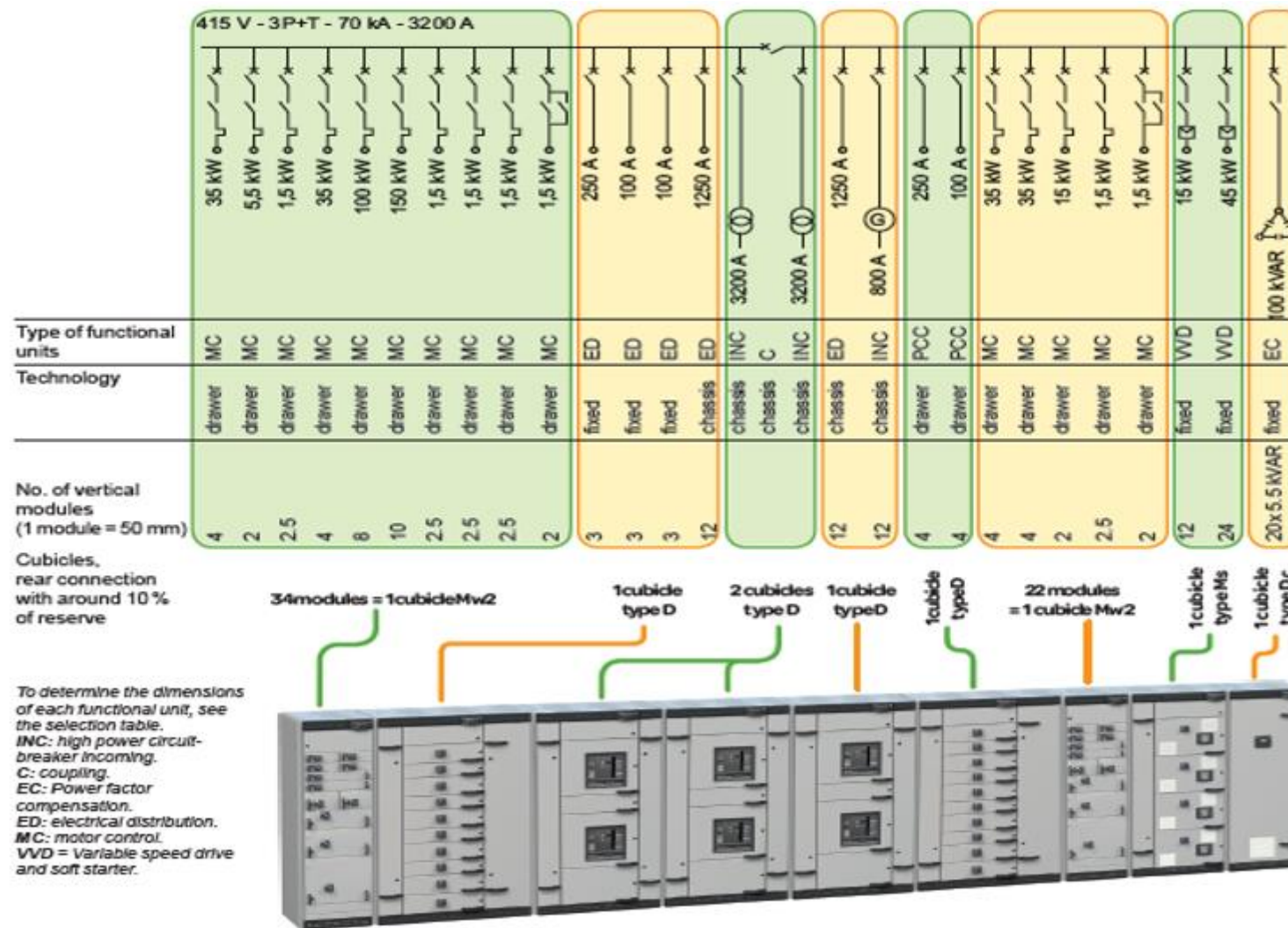
single-wire diagramm of the installation

415 V - 3P+T - 70 kA - 3200 A



1. Free Stand Switchgear Sizing Example

- Family Name: Blokset



- Guidance Notes for Blokset family are stated below for approximate dimensions sizing:
 - Consisting of 40 vertical modules.
 - Each Module is 50 mm which means the total height of the functional units space = 2000 mm (2 m).
 - Standard front or rear access “cable compartment” is 400 mm width.
 - Standard vertical “Busbar compartment” is $W = 200 \text{ mm}$,
 $D = 600 \text{ mm}$ if panel is front access or $= 1000 \text{ mm}$ if panel is rear access.
 - Standard “functional unit compartment” is $W = 700 \text{ mm}$
except if there will be 4000A or larger C.B (NW40b, NW50, NW63): Width will be 1200 mm.
- Follow [Blokset Solution guide](#) to make approximate LV Free stand switchgear dimensions sizing.

- Capacitor Bank Cells approximate Dimensions guidance table:

Capacitor Bank KVAR	No of cells	Cell Width configuration (mm)	Total Dimensions Required (mm)
Up to 300 KVAR without Detuning Reactors	1	(200 + 700)	900
Up to 300 KVAR with Detuning Reactors	1	(200 + 700 + 400)	1300
More than 300 KVAR up to 600 KVAR without Detuning Reactors	2	(700) + (200 + 700)	1600
More than 300 KVAR up to 600 KVAR with Detuning Reactors	2	(400 + 700) + (200 + 700 + 400)	2600

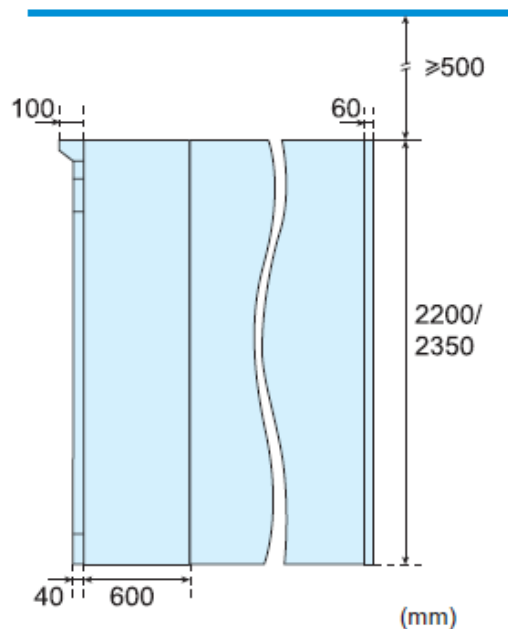
- Notes:

- The Required No of steps affects cells dimensions, Varlogic type “VPL6N / VPL12N” & the cost.
- The above mentioned approximated table is based on 6 Step x 50 KVAR for each “total required 300 KVAR”.
- The above mentioned approximated table is based on Temperature=40 degrees Celsius.
- If Temperature is more than 40 degrees Celsius & capacitor Banks are “with Detuning Reactors”: all a/m “400 mm” will be “700 mm”
- Capacitor Bank Circuit Breaker isn’t considered in the a/m dimensions.

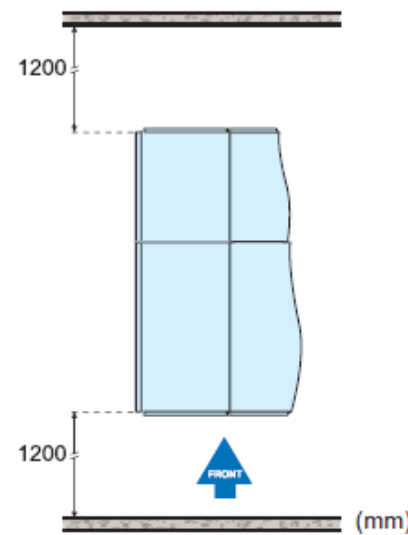
- Recommended Clearances about the switchgear stated by Manufacturer can be followed.
 - ✓ Below shot is Schneider Electric Recommendation regarding clearances about BLOKSET.
- NEC – Article 110 to be applied.

Minimum distances around switchboard

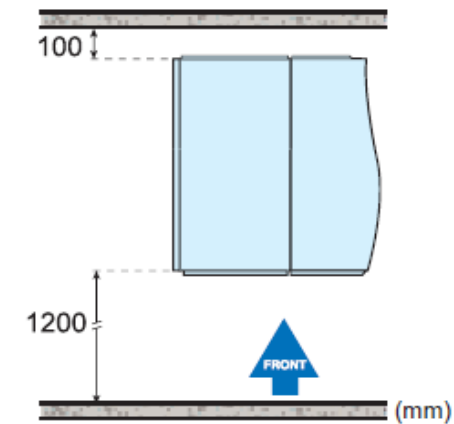
■ Provide a minimum space of 500 mm above the switchboard for connection by cables or for fishplating the horizontal busbar.



Clearance above the switchboard.

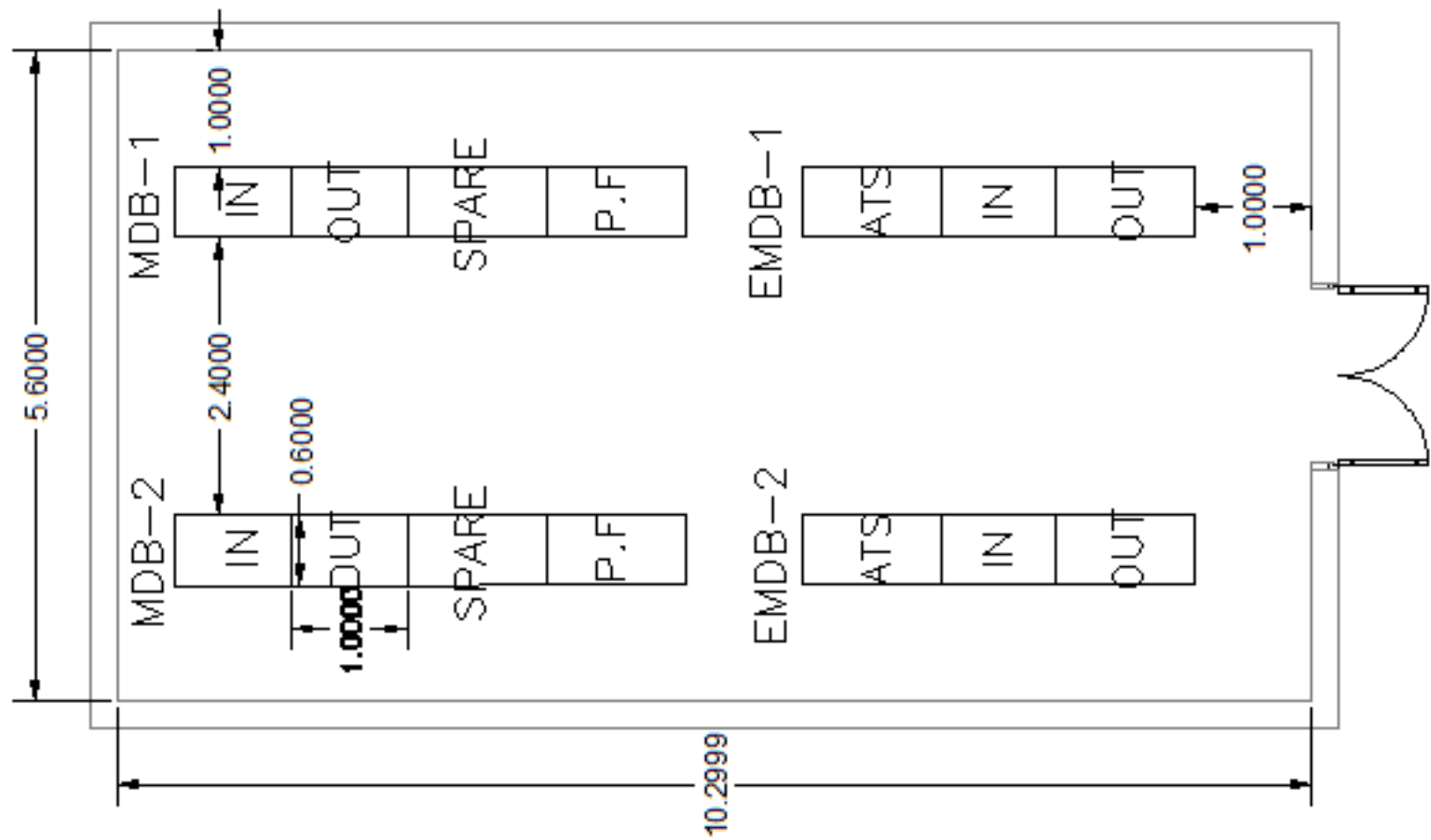
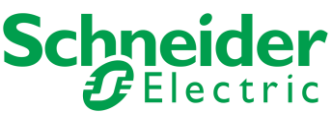


Rear connection.



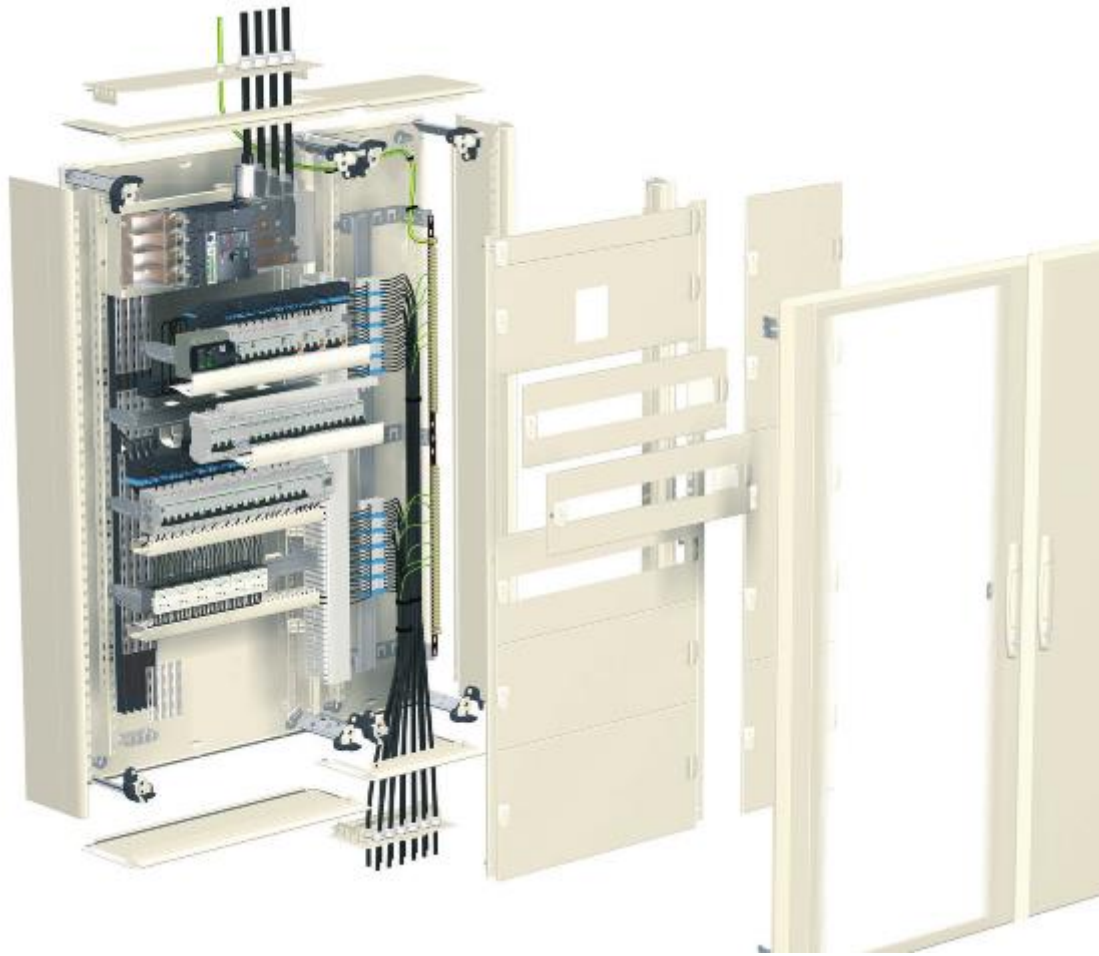
Front connection.

• LV Switchgears Room Layout Sample



2. Surface Mounted

- Product Name: Prisma Plus G



2. Surface Mounted

- Product Name: Prisma Plus G

Solutions with 150 mm distance between axis for modular devices

Height		Functional units	Enclosure			Door		Plain front plate To complete the enclosure	Earth bar + plain front plate
			IP	Cat. no.	H x W x D (mm)	Plain	Transp.		
6 vertical modules = 300 mm	Plain front plate								
	Incoming device	Cat. no. chosen above according to incoming device							
	1 row 24 horizontal modules	x 1 row	IP30	08104	630 x 595 x 243	08124	08134	Not necessary	04200 + 03803
	1 row 24 horizontal modules	x 2 rows	IP30	08105	780 x 595 x 243	08125	08135	Not necessary	04200 + 03803
	1 row 24 horizontal modules	x 3 rows	IP30	08106	930 x 595 x 243	08126	08136	Not necessary	04200 + 03803
	1 row 24 horizontal modules	x 4 rows	IP30	08107	1080 x 595 x 243	08127	08137	Not necessary	04200 + 03803
	1 row 24 horizontal modules	x 5 rows	IP30	08108	1230 x 595 x 243	08128	08138	Not necessary	04200 + 03803
	1 row 24 horizontal modules	x 6 rows	IP30	08109	1380 x 595 x 243	08222	08232	Not necessary	04200 + 03803
2 or 3 vert. mod.	Earth bar								

Each Module is 18 mm
24 modules = 24x18mm = 432mm

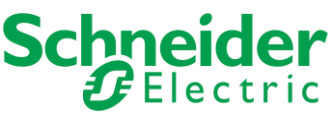
1 row =
vertical modules of 50 mm = 150 mm

Rail 03001 + front plate 03203



2. Surface Mounted

- Product Name: Prisma Plus G



Solutions with 200 mm distance between axis for modular devices

Height		Functional units	Enclosure			Door		Plain front plate To complete the enclosure	Earth bar + plain front plate
			IP	Cat. no.	H x W x D (mm)	Plain	Transp.		
	Plain front plate								
6 vertical modules = 300 mm	Incoming device	Cat. no. choosen above according to incoming device							
	1 row 24 horizontal modules	x 1 row	IP30	08104	630 x 595 x 243	08124	08134	Not necessary	04200 + 03802
1 row = 4 vertical modules of 50 mm = 200 mm	1 row 24 horizontal modules	Rail 03001 + front plate 03204 x 2 rows	IP30	08106	780 x 595 x 243	08126	08136	03801	04200 + 03803
	1 row 24 horizontal modules	x 3 rows	IP30	08107	930 x 595 x 243	08127	08137	Not necessary	04200 + 03803
	1 row 24 horizontal modules	x 4 rows	IP30	08108	1230 x 595 x 243	08128	08138	Not necessary	04200 + 03802
2 or 3 vert. mod.	Earth bar								

Each Module is 18 mm
24 modules = 24x18mm = 432mm

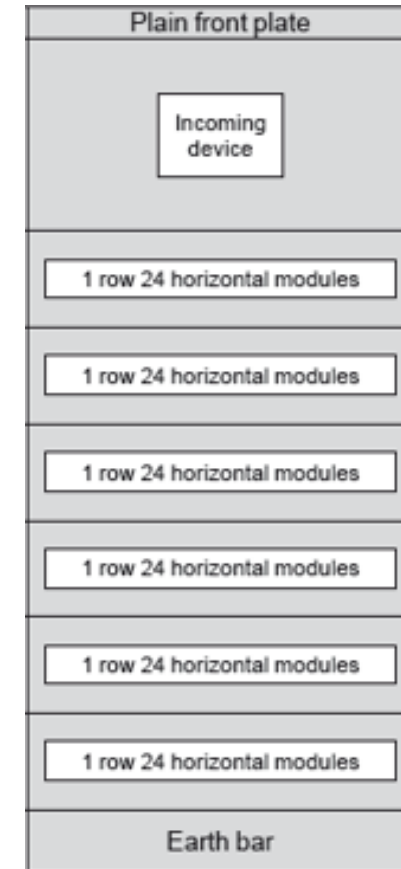


Approximated estimation for no of MCBs inside panel

- Product Name: Prisma Plus G

Maximum permissible 24 Modules for one Row - Each Module is 18 mm - hence; One row = 24 x 18mm = 432 mm

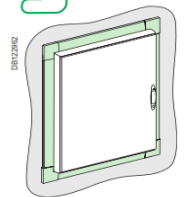
CB type	Family NAME	No of poles	Width in 18-mm (1-module)	Maximum quantity of MCBs per 24 modules row
MCB	IC60	1P	1	$24 / 1 = 24$ MCBs
MCB	IC60	2P	2	$24 / 2 = 12$ MCBs
MCB	IC60	3P	3	$24 / 3 = 8$ MCBs
MCB	IC60	4P	4	$24 / 4 = 6$ MCBs



H x W x D (mm)
1380 x 595 x 243



The surface-mounted Prisma Plus G range can be built-in easily using its **flush-mounting kit**



3. Flush Mounted Panels

- Product Name: Mini Pragma



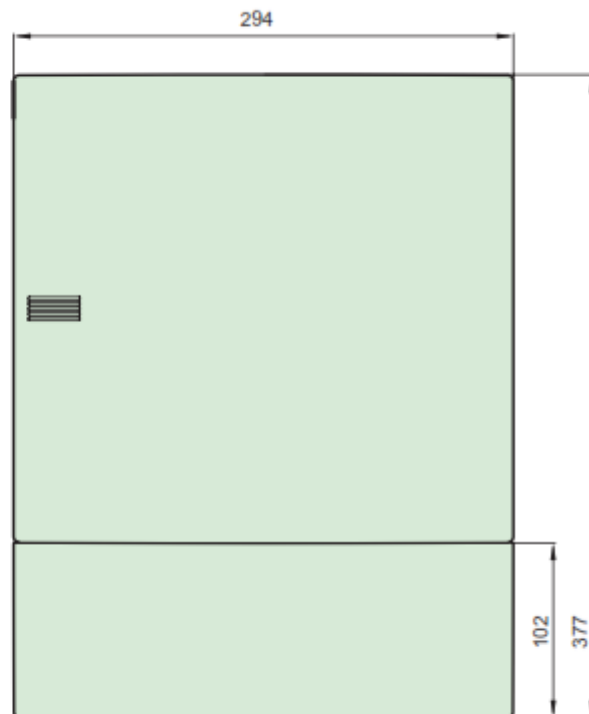
3. Flush Mounted Panels

- Product Name: Mini Pragma

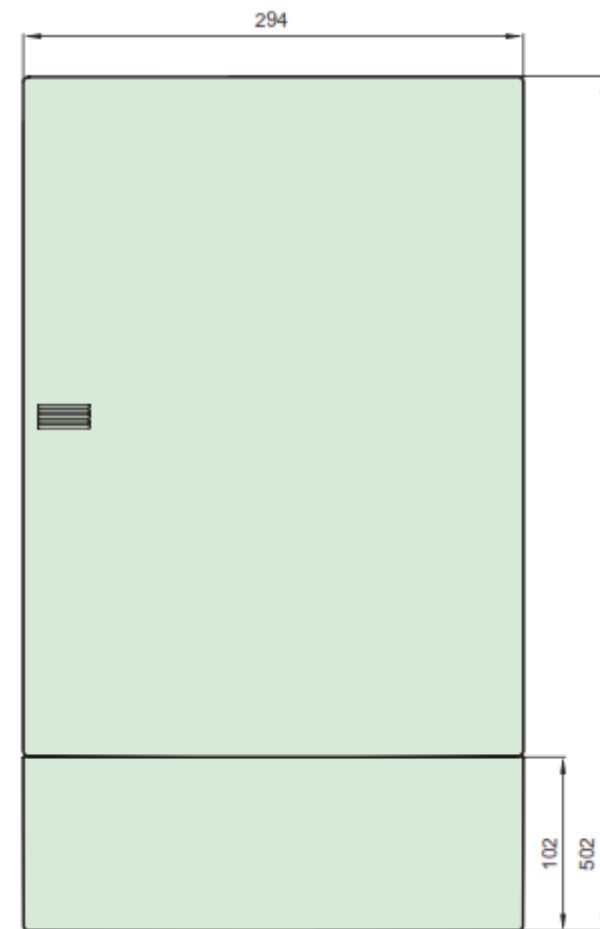
Front view



4, 6, 8, 12, 18 modules



24 modules



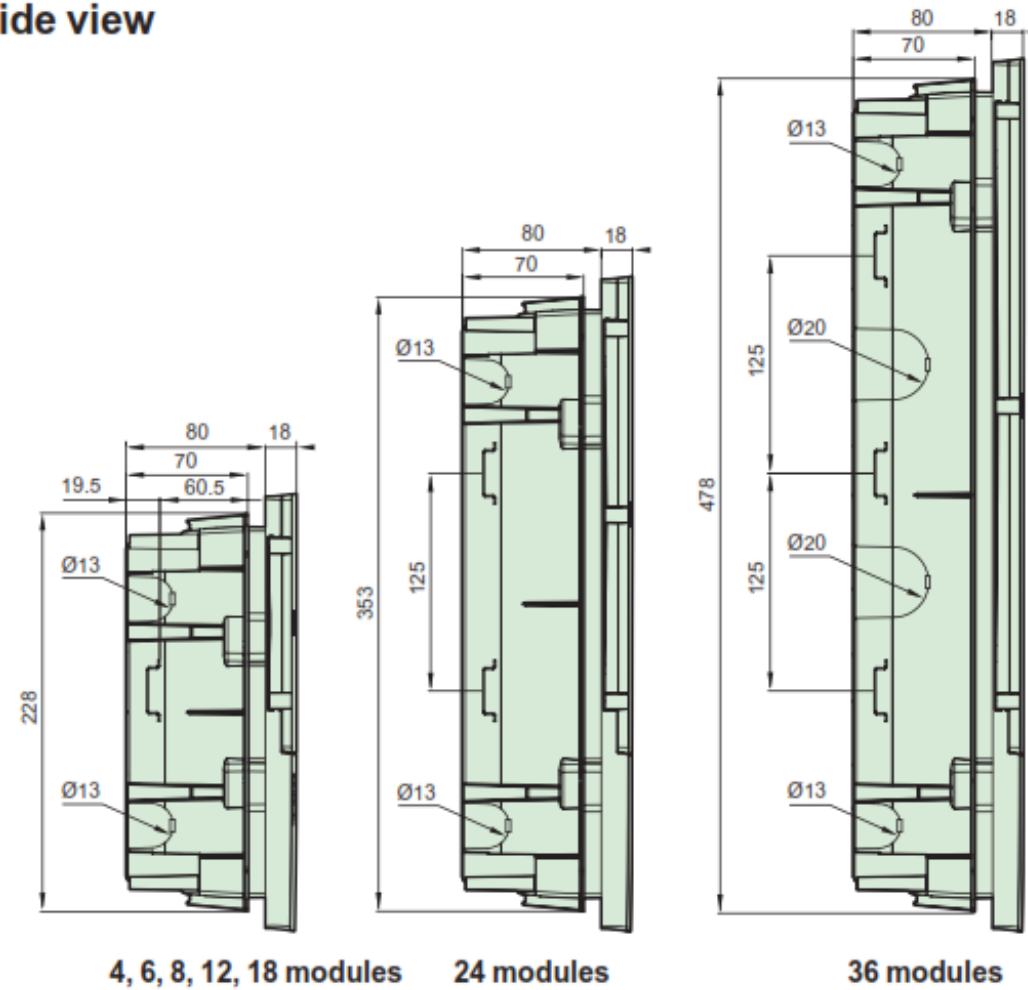
36 modules

3. Flush Mounted Panels

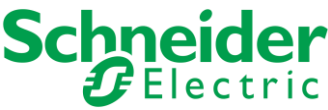
- Product Name: Mini Pragma



Side view



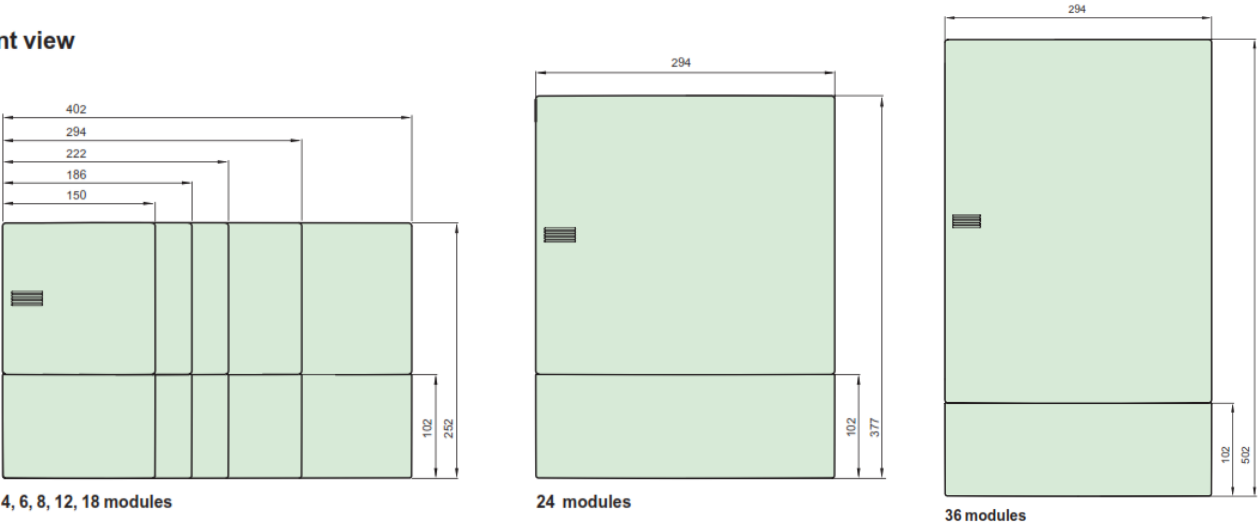
3. Flush Mounted Panels



- Product Name: Mini Pragma

Maximum permissible 18 Modules for one Row - Each Module is 18 mm - hence; One row = 18 x 18mm = 324 mm				
CB type	Family NAME	No of poles	Width in 18-mm (1-module)	Maximum quantity of MCBs per 18 modules in 1 row
MCB	IC60	1P	1	18 / 1 = 18 MCBs
MCB	IC60	2P	2	18 / 2 = 9 MCBs
MCB	IC60	3P	3	18 / 3 = 6 MCBs
MCB	IC60	4P	4	18 / 4 : can contain max. 4 MCBs

Front view

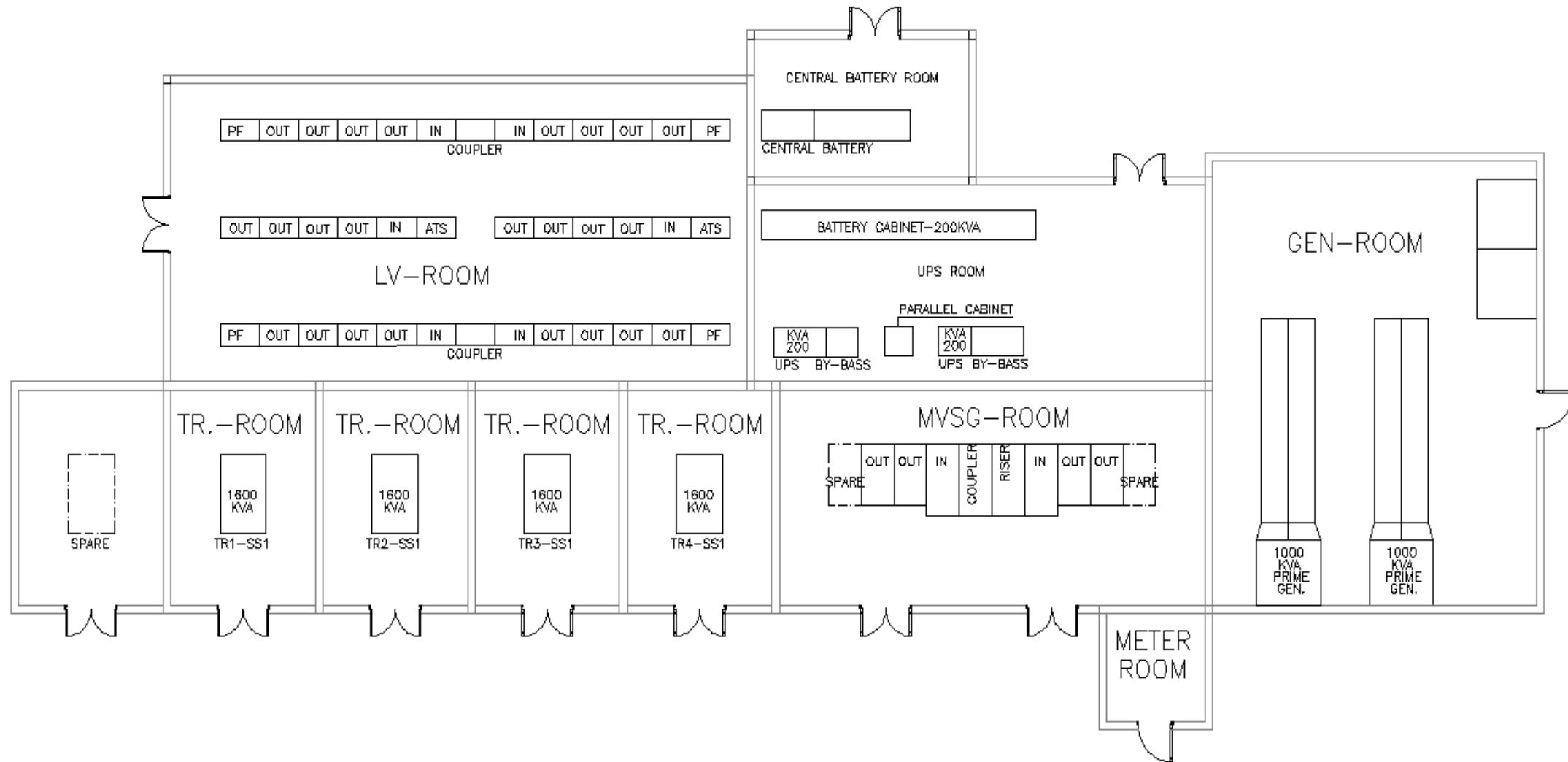


White enclosures			
Number of rows	Number of modules per row	Capacity in 18 mm modules	Rated current In (A)
1	4	4	50
	6	6	63
	8	8	63
	12	12	63
	18	18	63
2	12	24	63
3	12	36	63



Collective Layout

Full Combined Electrical Rooms layout:





Thank You