Benha University

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Ameeria Integrated
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Undergraduate Course

Electric Installation Design

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Lecture (2)

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Basic Equipments in Electrical Installations

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Power Distribution System

- The electrical wiring network we are talking about, starts from the distribution substation, and ends when the loads inside the buildings. So, we will recognize the equipments that used within this stage.
- Power distribution system that consists of 4 main sets of equipments:

1. Power handling equipments.
2. Wiring and raceways.
3. Protective devices.
4. Control and utilization equipments.

1. Power Handling Equipments

Power Handling Equipments

- Medium Voltage Network
- Transformer
- Emergency Generator & UPS & ATS
- Distribution Boards

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a) Medium Voltage Network

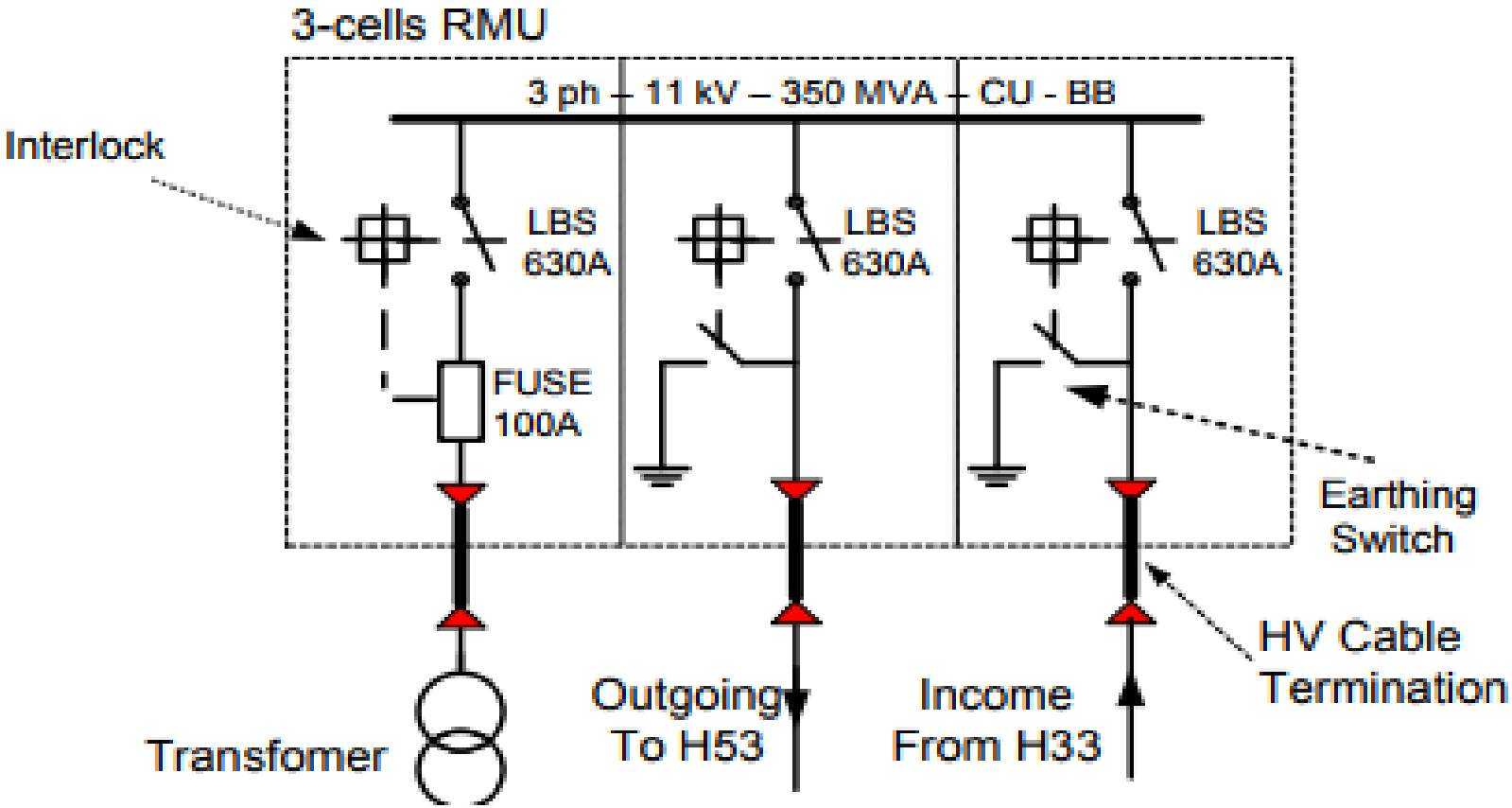
- The transformers within each substation are connected to the MV network through Ring Main Unit (RMU).
- **Ring Main Unit (RMU):**

❖ Used to connect substations to each others.

❖ Connect the distribution transformer for a building to the medium voltage grid in the building.

❖ Used to connect the transformers less than 5 MVA.

Ring Main Unit Inside a Distribution Substation



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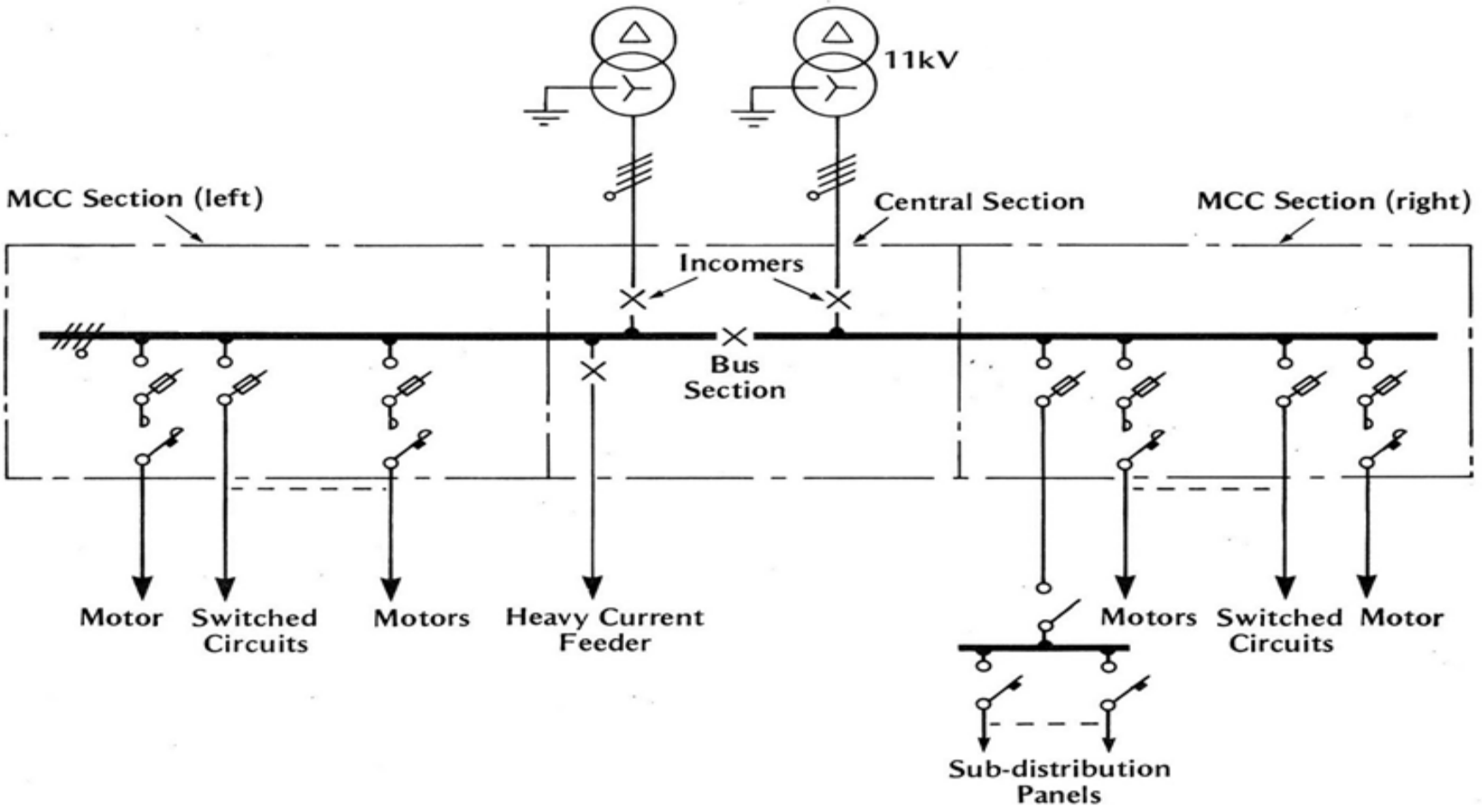
- **Medium Voltage Panels (Distributors):**
- In the case of large projects, feeding is done through MV Panels, that's connected directly with the main station (66/11 kV).
- Distributors are consists of incoming (usually 2 cells) and outgoing cells for feeding the distribution transformers.

Distributed cell arrangement system



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b) Transformers

- The most important component in distribution station as it decreases the voltage from 11 kV to 400 V.
- The transformer is configured on several items such as:
  * Rating (MVA).
  * Earthing system.
  * Percentage impedance (z% - x%).
  * Windings connection (primary and secondary windings).
  * Transformer cooling system.
  * Volume level.

Types of Transformers

Transformers

Oil Transformer

Dry Transformer

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Differences between dry & oil transformer

	Dry Transformer	Oil Transformer
Applications	Residential and commercial buildings.	For outdoor applications, oil filled transformers are cheaper than dry types.
Voltage Rating	Limited by size and voltage rating	Higher MVA ratings and voltage ratings
Location	Can be located closer to the load	Require special location and civil construction for safety reasons
Cooling	Use air as the cooling medium	Considered a potential fire and safety hazard for indoor application.
Rating	Usually the transformers rating that used with Electrical Installations from 1 MVA to 5 MVA	

The specifications of the transformer room as stated in the Egyptian code

1. Transformer rooms are located along 6 meter wide access roads. The doors are on the access road side.
2. The access road is connected to the nearest main road.
3. H.V. Room separated from transformer room by a block wall.
4. Slot in the roof (for transformer installation) should be provided with minimum 25cm width.
5. Floor thickness shall not be less 20cm, and wall thickness not less 15cm.
6. Transformer room door have minimum clear width 2.7 m. Doors height shall not be less than 3m.

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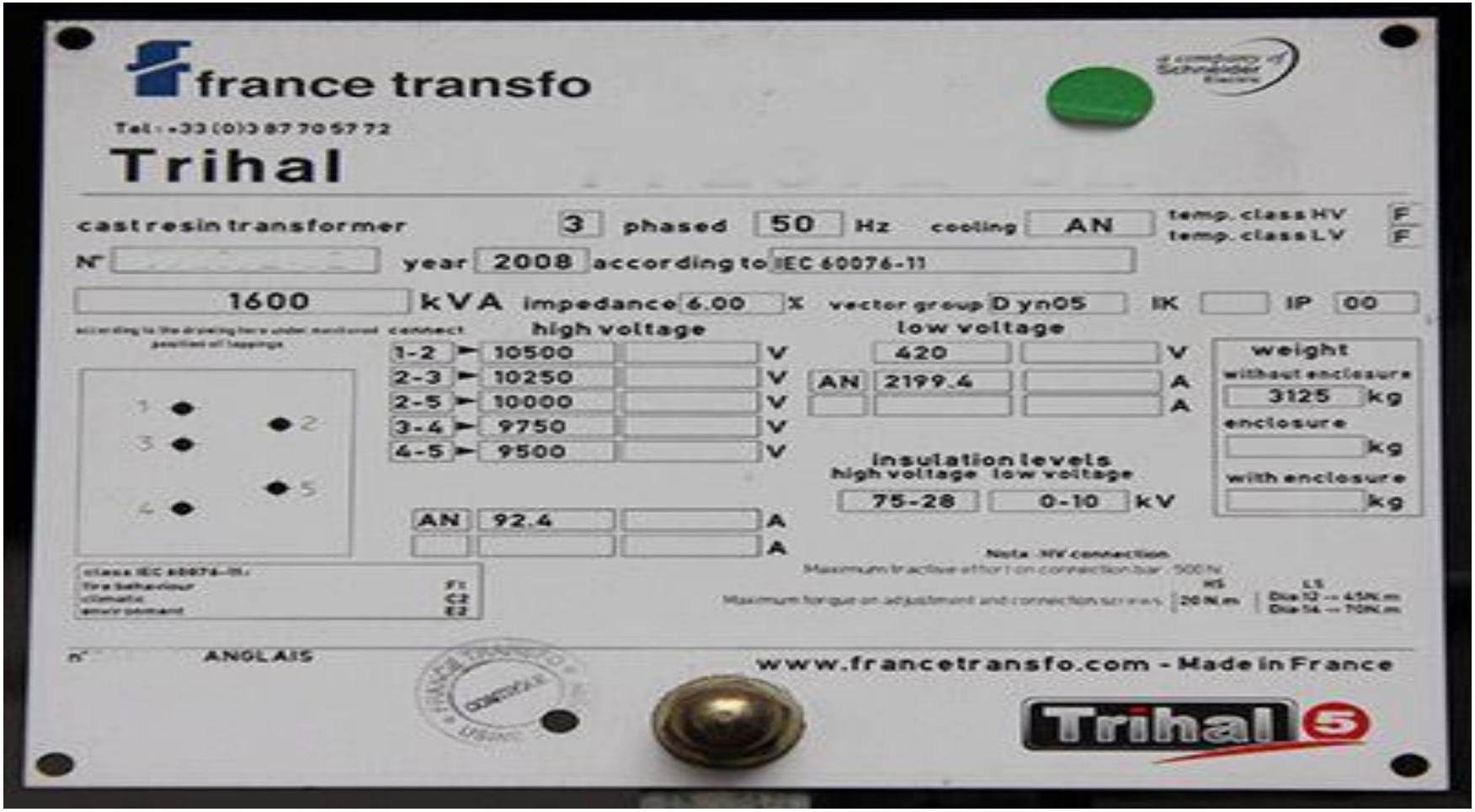
Transformer Nameplate



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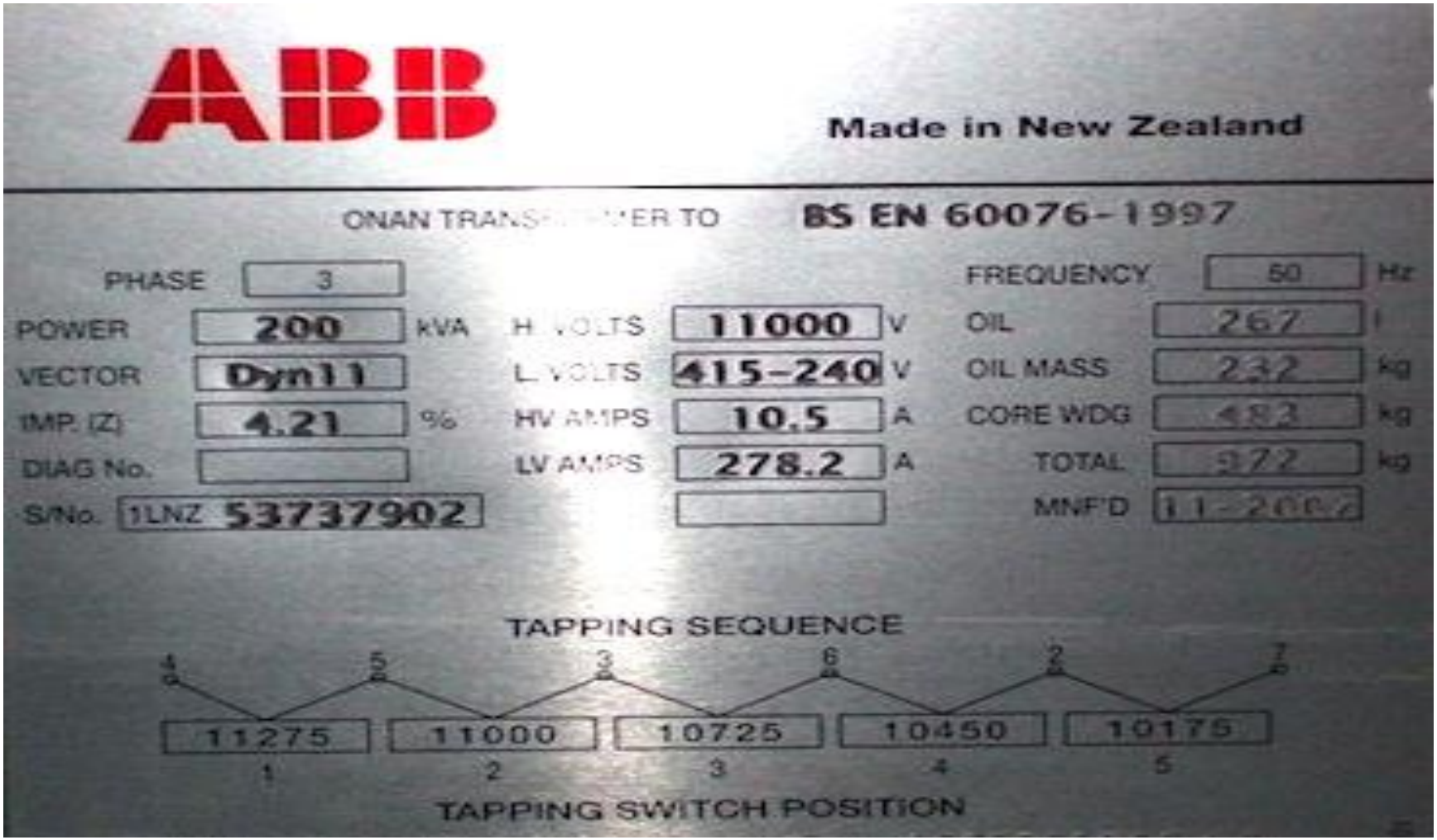
Transformer Nameplate



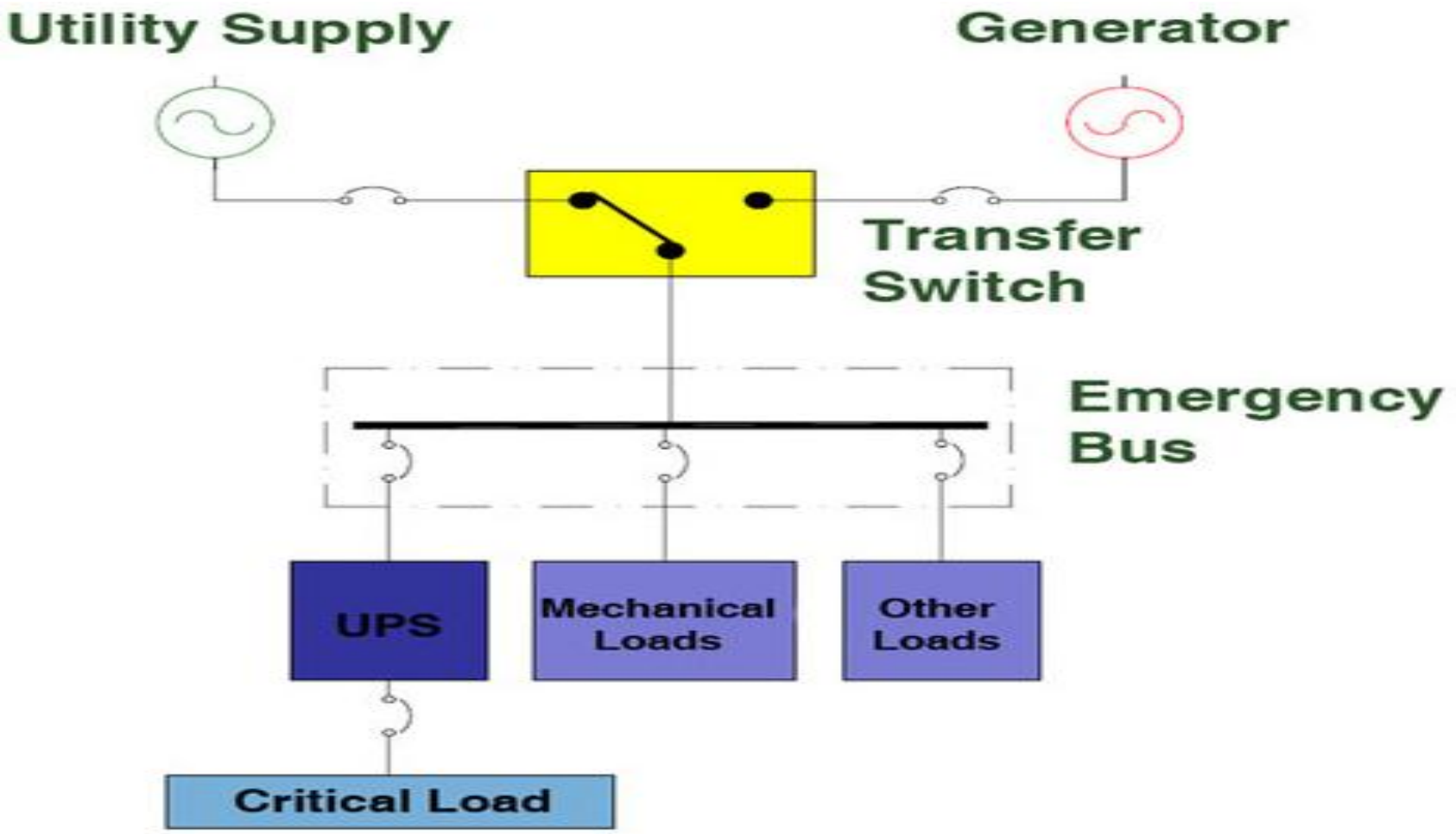
c) Emergency Generators

- Loads in buildings divided into two types: general loads and emergency loads. The different between them, the current not be interrupted in the emergency loads.
- The emergency loads are connected in separately panels that called (emergency distribution panels).
- These panels supplied with emergency generators when the main supply is cutoff.
- In general the emergency loads in buildings are about 10-20%.

- Emergency loads are transferred to the emergency generator by two ways:

- Automatically by ATS (Automatic Transfer Switch).
- Manually by MTA (Manual Transfer Switch).

Generator Automatic Transfer Systems



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Diesel Generator types

Diesel Generator

Low voltage

Medium voltage

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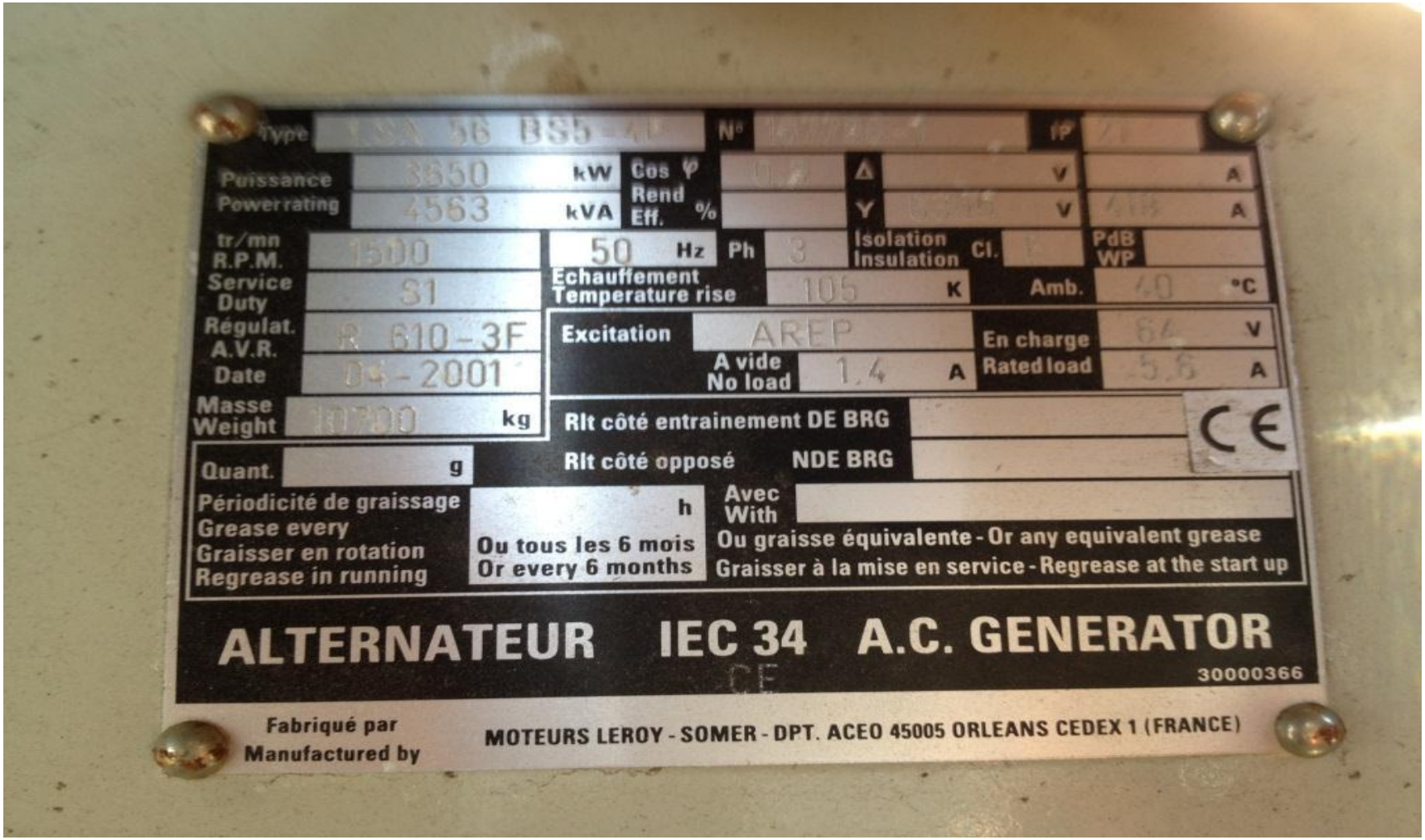
The specifications of the generator room as stated in the Egyptian code

1. Leave a distance not less than one meter from the sides and behind the generator.
2. The air outlet cross section area is equal to the radiator surface area.
3. Entrance air area equal the outlet air area.
4. Take into the consideration the area of daily fuel tank.

Generator Nameplate



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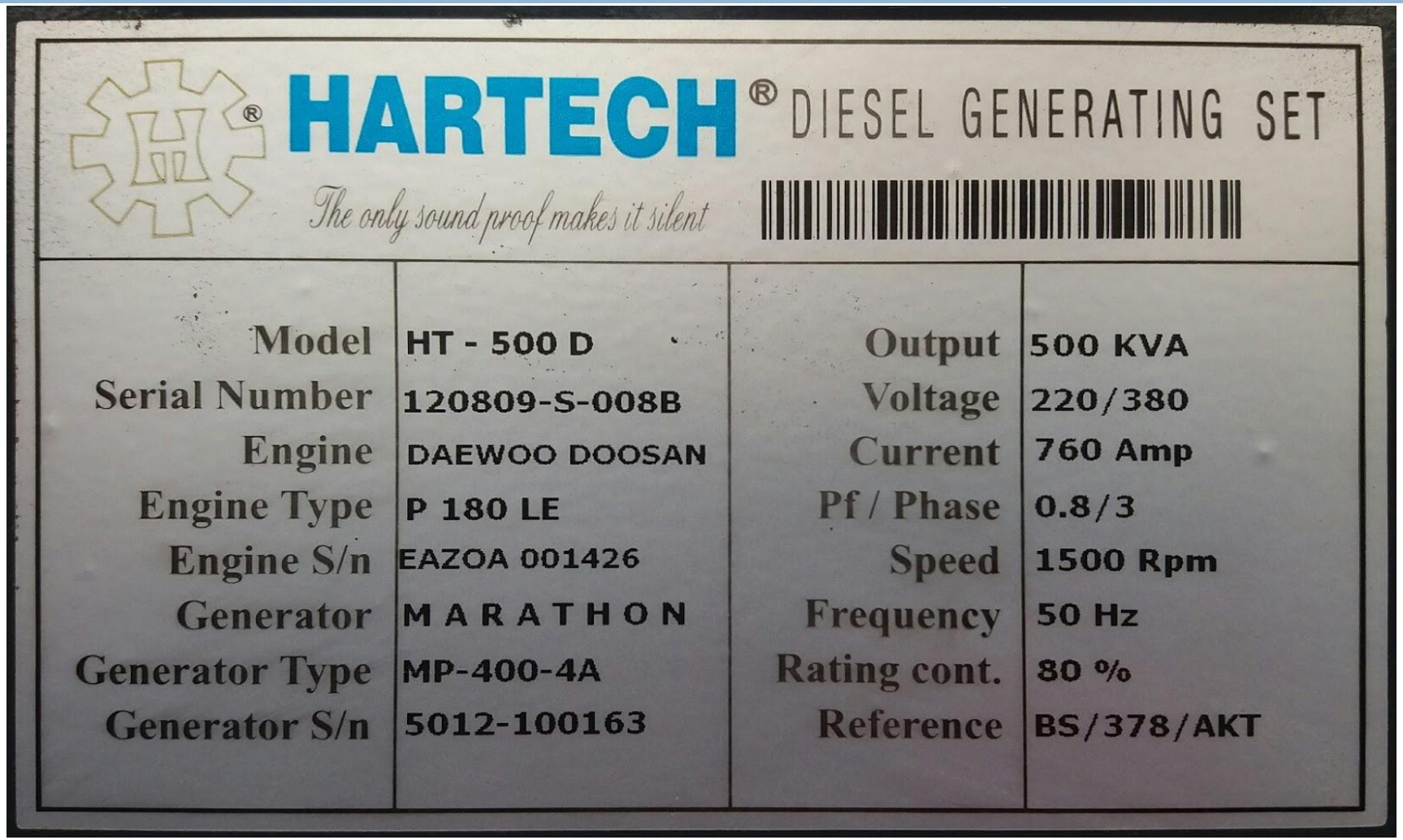
Generator Nameplate



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Activity

1. What are the most famous companies for transformers, generators, cables, and distribution boards?