

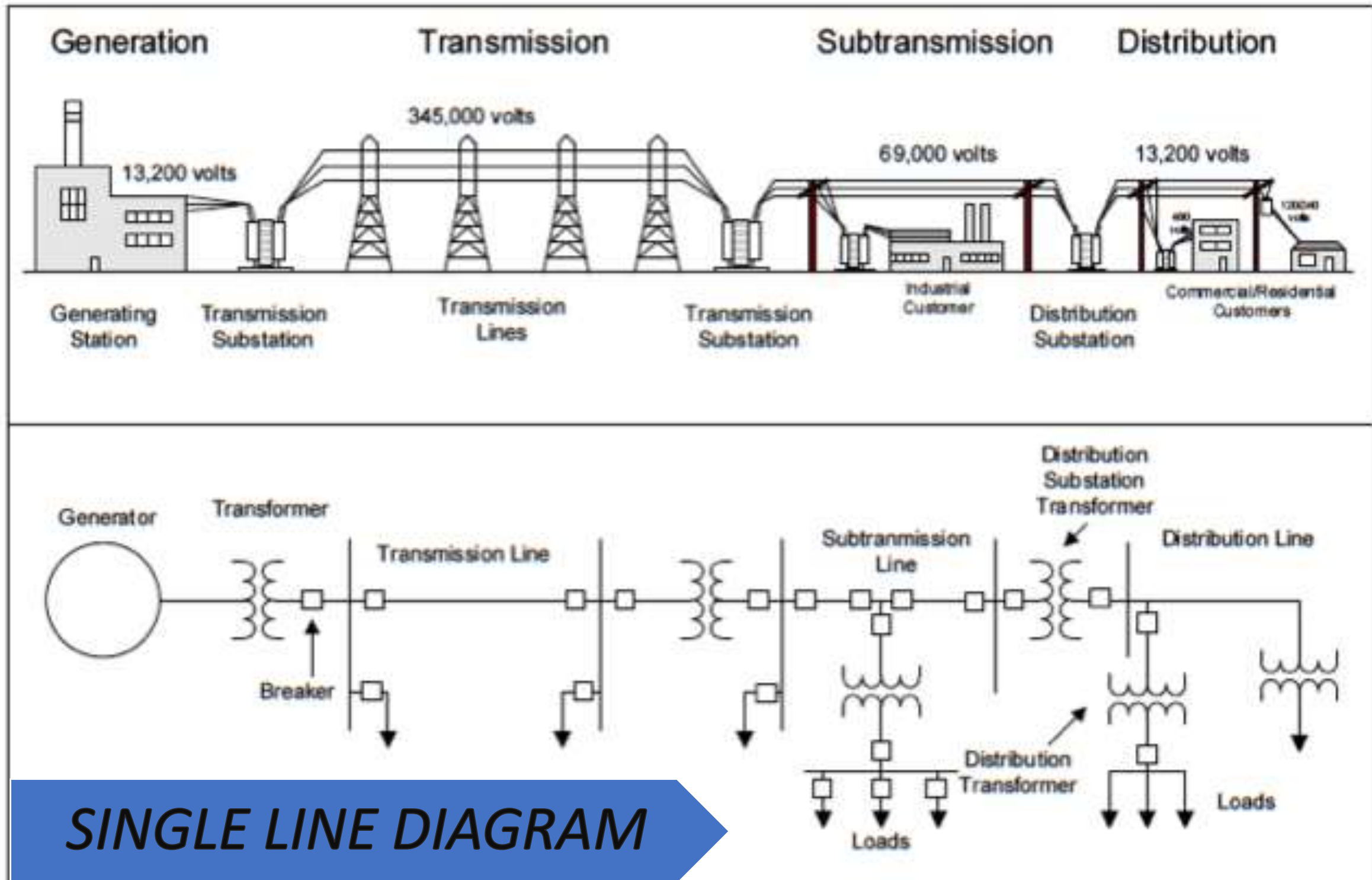


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1. Introduction:

The single-line diagram (SLD) also known as one line diagram is a high-level diagram showing how incoming power is distributed to the equipment. It is the first step in preparing a critical response plan, allowing you to become thoroughly familiar with the electrical transmission system layout and design.

The single-line diagram also becomes your lifeline of information when updating or responding to an emergency. An accurate diagram ensures optimum system performance and coordination for all future testing and can highlight potential risks before a problem occurs.

An effective single-line diagram will clearly show how the main components of the electrical system are connected, including redundant equipment and available spares.

To develop single-line diagrams for your facility Some steps are need to be taken:

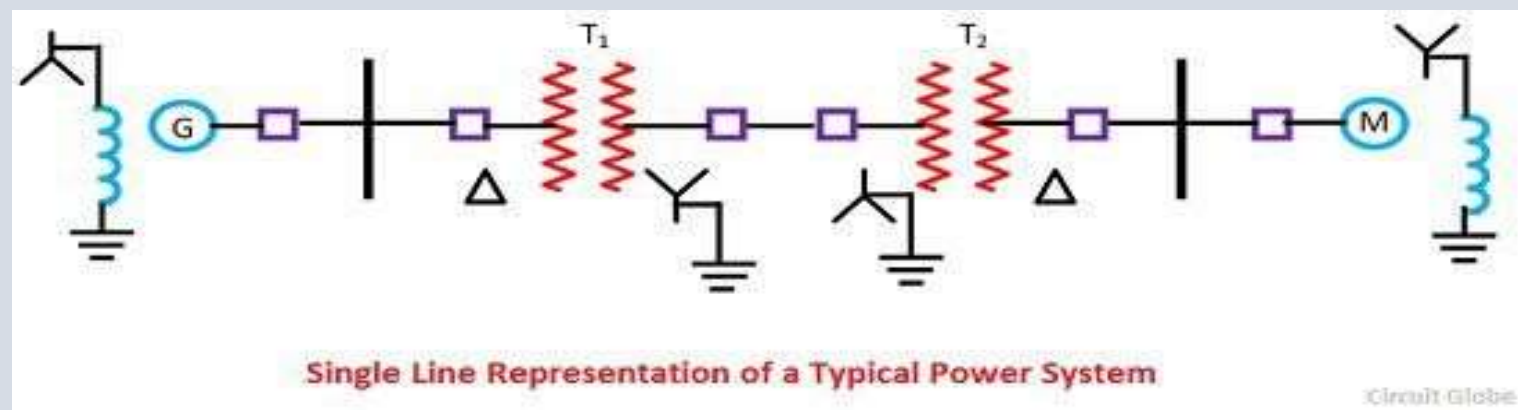
- Verify its existence and that they are adequately available.
- Confirm loads are connected to emergency/standby feeders.
- Verify potential single points of failure.
- Make a report that outlines the findings by site along with recommended actions.
- Provide a copy of single-line electrical diagram in AutoCAD format
- An up-to-date single-line diagram is vital for a variety of service activities including:
 - Short circuit calculations, Coordination studies, Load flow studies, Safety evaluation studies, All other engineering Studies, Electrical safety procedures & Efficient maintenance etc.

2. Scope:

To give you an accurate picture of your electrical system, the single-line diagram information normally includes:

- ❖ Incoming lines ,circuit breakers , Relays, fused switches and tie breakers
- ❖ Power & instrument transformers
- ❖ All main cable and wire runs with their associated isolating switches and potheads

- ❖ Nature of the load in each feeder and on each substation
- ❖ Critical equipment voltage and size (UPS, battery, generator, power distribution, transfer switch) etc.



3. Uses & Significance:

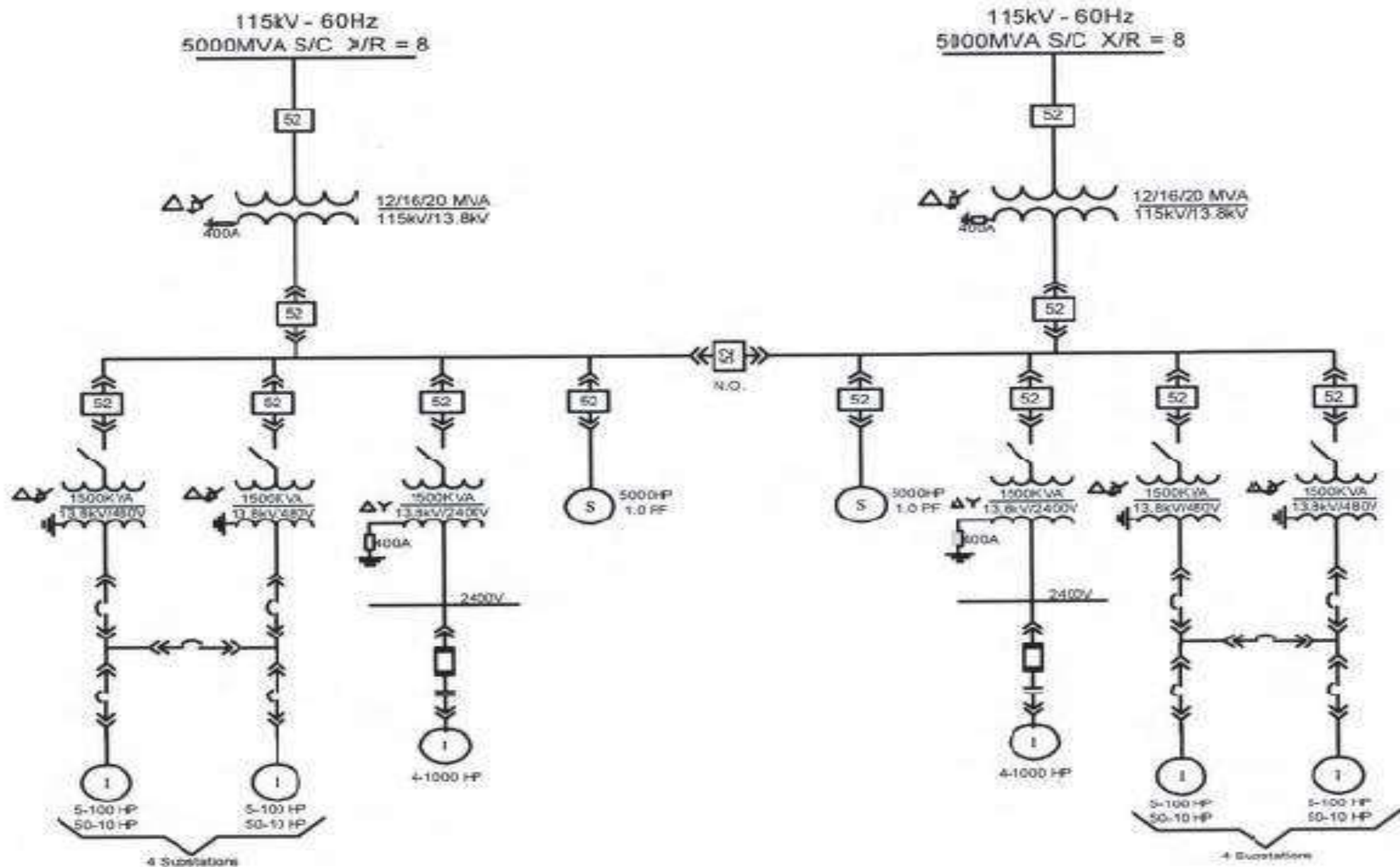
Single-line diagrams are used by several trades including HVAC and plumbing, but the electrical one-line diagram is the most common.

An electrical single-line diagram is a representation of a complicated electrical distribution system into a simplified description using a single line, which represents the conductors, to connect the components. The diagram provides information on how the components connect and how the power flows through the system.

Single-line diagrams are used by several trades including HVAC and plumbing, but the
There are a few things that make a single-line diagram special and help to keep it readable:

- ❑ Remember that you are using a single line to represent multiple conductors.
- ❑ Diagrams start at the top of the page with the incoming source of a system's power.
- ❑ Electrical symbols are typically fed from the top and feed from the bottom.
- ❑ There is no physical location or size represented of the electrical equipment.

4. Flow Diagram of SLD:



Preliminary one-line diagram

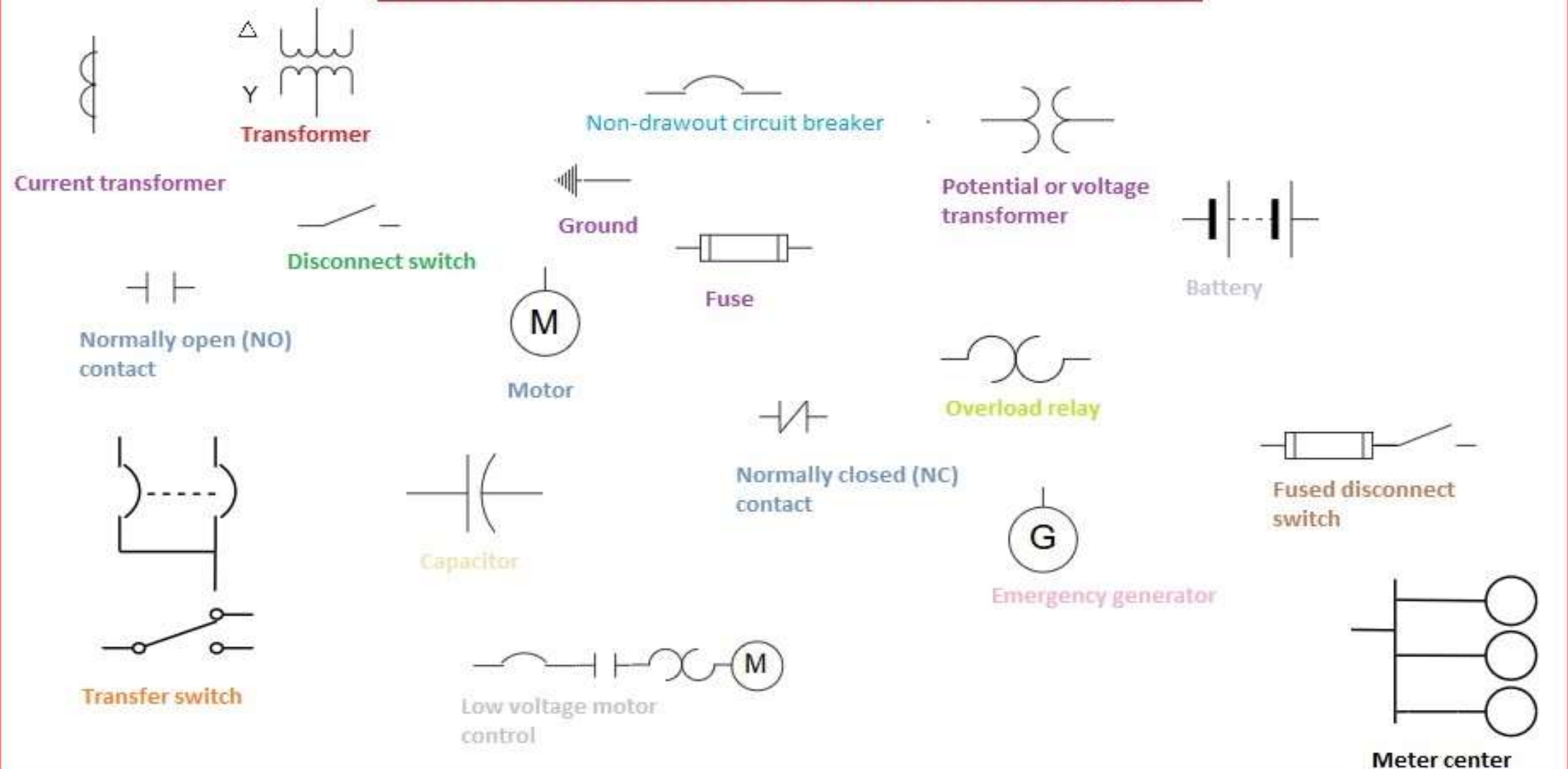
5. Calculation Procedure:

1. Identify the appropriate symbols:

To interpret one-lines you first need to be familiar with the electrical symbols. This chart shows the most frequently used symbols.

For electric power networks an appropriate selection of graphic symbols is the most important step.

SINGLE-LINE OR ONE-LINE DIAGRAM Electrical Power System



2. Draw the required system:

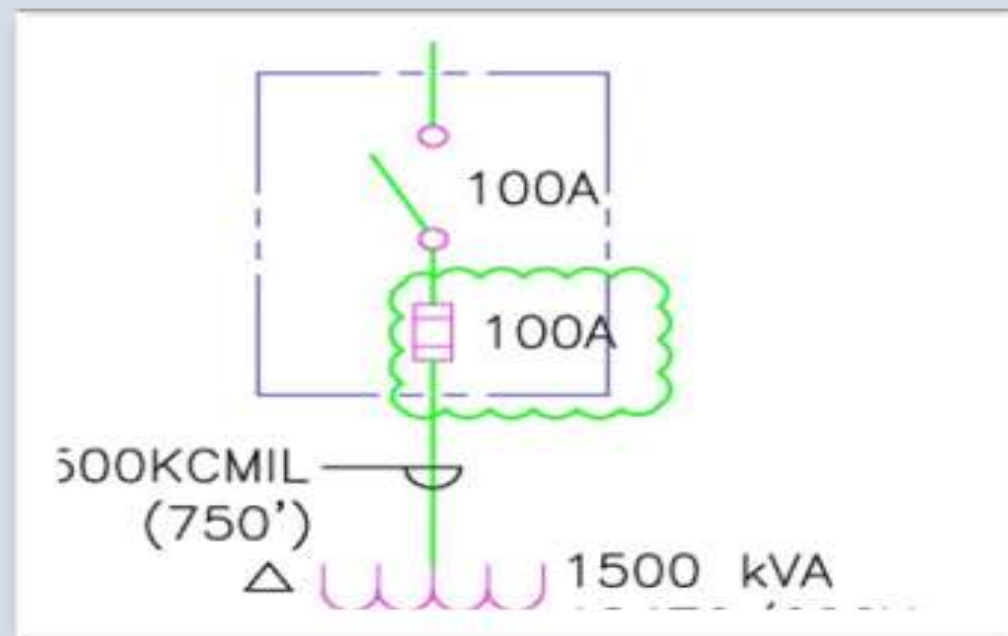
To draw the electrical single line diagram first we need all the information of electrical equipment's and the supply of receiving power. The most important information to include is:

- a) Incoming service voltage
- b) Equipment rated current
- c) Identification names of equipment
- d) Bus voltage, frequency, phases, and short circuit current withstand ratings
- e) Cable sizes, runs of cables, and lengths
- f) Transformer connection type, kVA, voltages, and impedance
- g) Generator voltage and kW
- h) Motor HP
- i) Current and Voltage ratios of instrument transformers
- j) Relay device numbers

3. Related calculations: to represent three phase system various other cal. are required:
Cal. Of generator reactance ,Cal. Of transformer reactance ,Cal. Of transmission-line reactance ,Cal. Of reactance of motors and other equipment's etc.

6. Updating SLD:

- Updated single-line diagram provide brief maps of equipment, redundancy, and protection. Regular updates with every change needed, no matter how small. by making revisions we can see what has changed on the drawing by circle the change with a 'revision cloud'.



7. Software's used to draw SLD:

- ❖ AutoCAD:.. AutoCAD Electrical has a schematic library and a single line diagram sub-library. This enables the user to place two different representations down of the same component.
- ❖ ETAP : ETAP Single-Line Diagram / View is an intelligent user-interface to model, validate, visualize, analyze, monitor, and manage electrical power systems, from high to low voltage AC and DC networks.
- ❖ Eco dial : It is a low voltage electrical installation design software developed by Schneider Electric.it is a user-friendly software that helps you optimize equipment and costs while managing operating specifications, all along with the design of your power distribution projects.
- ❖ Microsoft Visio: Visio Professional or Visio Plan 2 to create electrical and electronic schematic diagrams.

8. Benefits:

- ☐ Help identify fault locations which identify when to perform troubleshooting & simplifies troubleshooting
- ☐ Identify potential sources of electric energy during distribution process.
- ☐ Accurate single line diagram will further ensure the safety of personnel work
- ☐ Meets compliance with applicable regulations and standards
- ☐ Ensure safe, reliable operation of facility

9. References:

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