ATME College of Engineering

AY:2024-25

Course – Computer Aided Electrical Drawing
Code- 21EE741

Module-2: SUBSTATION

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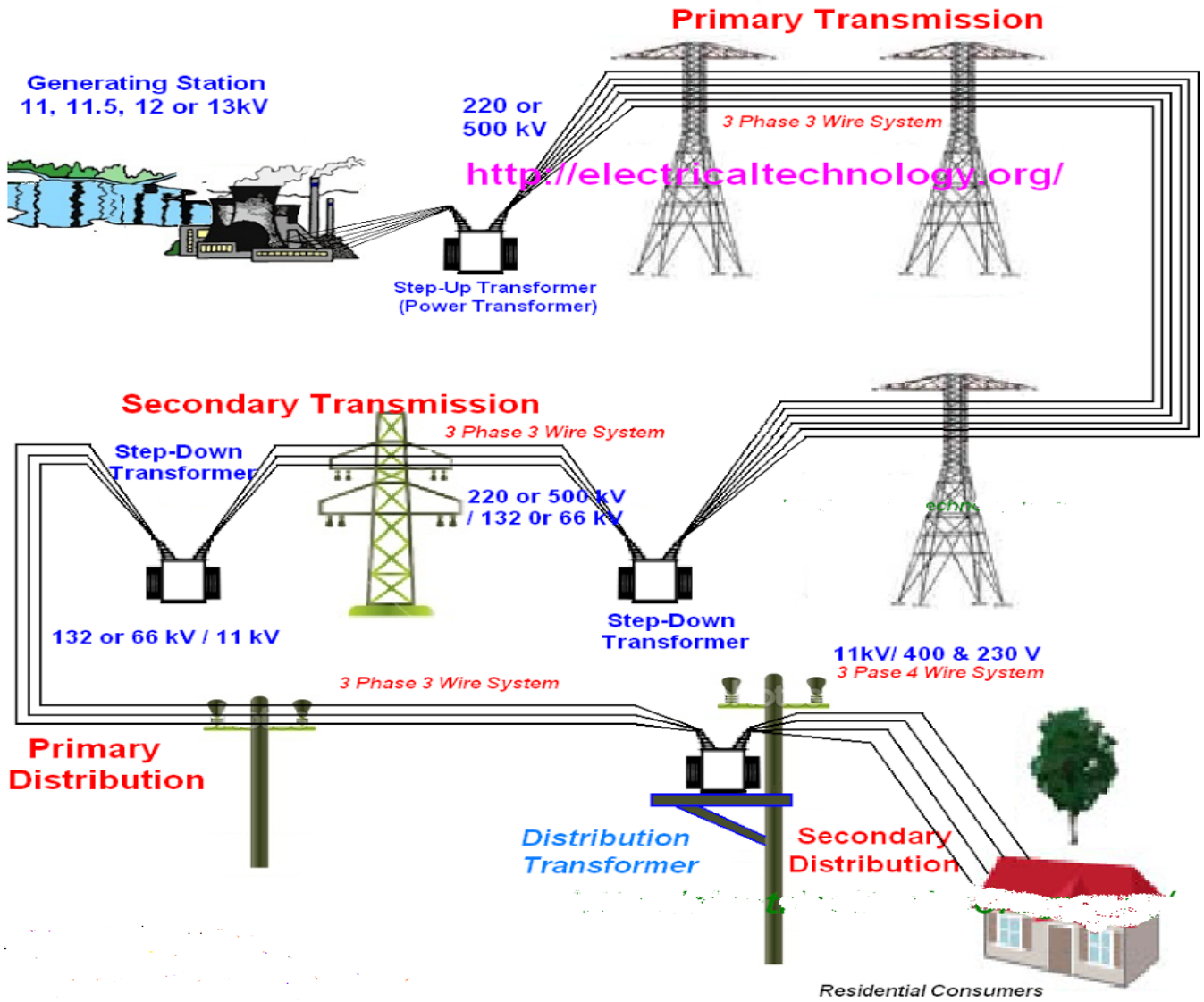
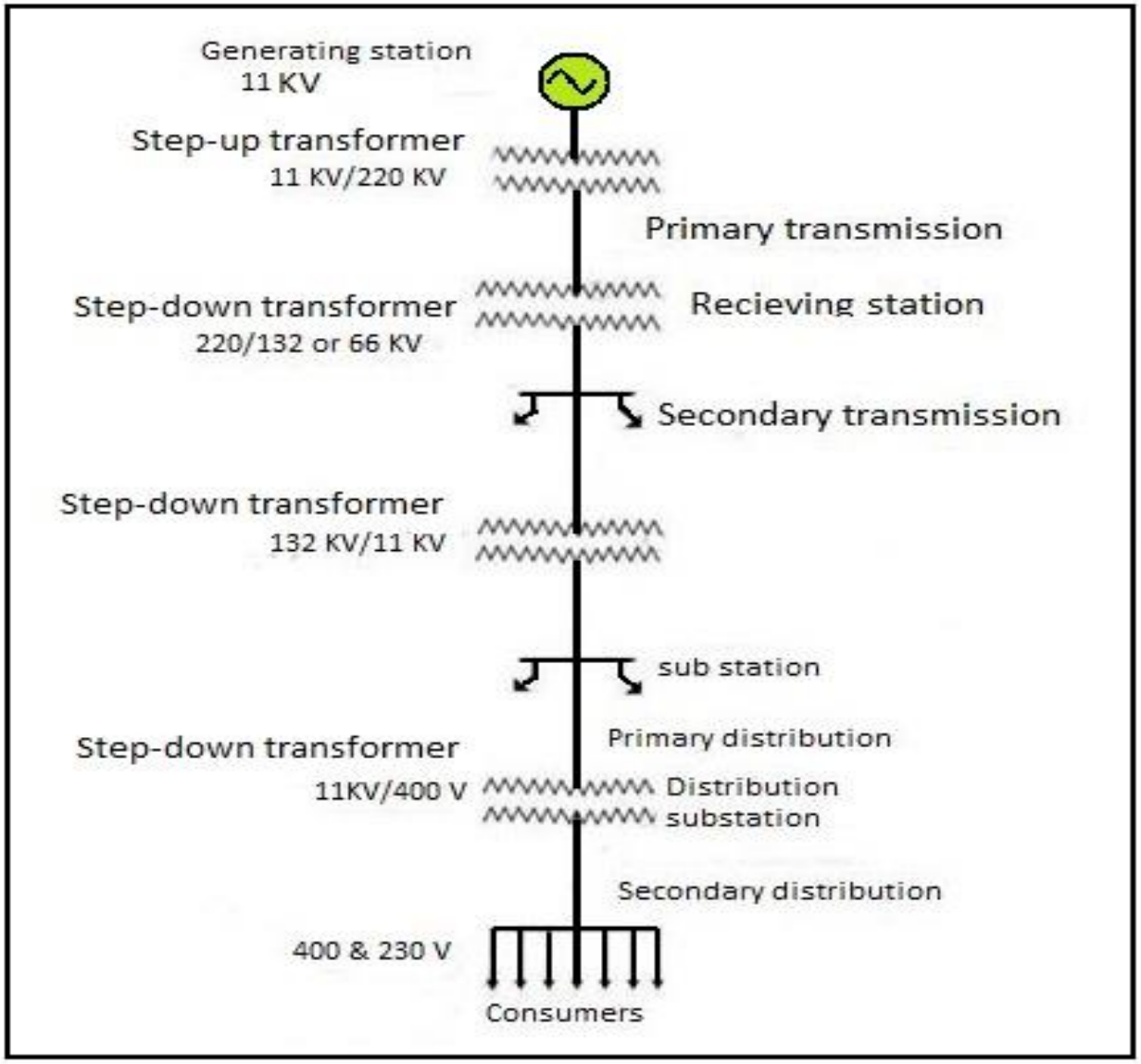
EEE

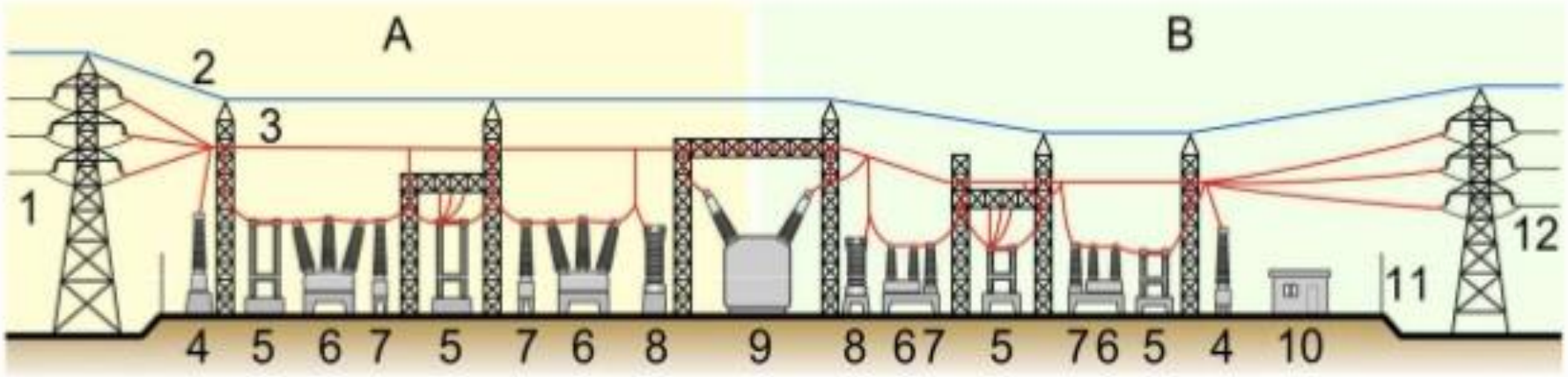
Introduction to Substation

- A substation is a part of an electrical generation, transmission, and distribution system. Substations transform voltage from high to low, or the reverse, or perform any of several other important functions.
- Between the generating station and consumer, electric power may flow through several substations at different voltage levels.
- A substation may include transformers to change voltage levels between high transmission voltages and lower distribution voltages, or at the interconnection of two different transmission voltages.


Primary Transmission
Generating Station
11, 11.5, 12 or 13kV
220 or
500 kV
3 Phase 3 Wire System
http://electricaltechnology.org/
Step-Up Transformer
(Power Transformer)
Secondary Transmission
3 Phase 3 Wire System
Step-Down
Transformer
220 or 500 kV
/ 132 0r 66 kV
132 or 66 kV / 11 kV
Step-Down
Transformer
11kV/ 400 & 230 V
3 Pase 4 Wire System
3 Phase 3 Wire System
Primary
Distribution
Distribution
Transformer
Secondary
Distribution
Residential Consumers


Generating station
11 KV
Step-up transformer
11 KV/220 KV
Primary transmission
Step-down transformer
220/132 or 66 KV
Recieving station
Secondary transmission
Step-down transformer
132 KV/11 KV
sub station
Step-down transformer
11KV/400 V
Primary distribution
Distribution
substation
Secondary distribution
400 & 230 V
Consumers

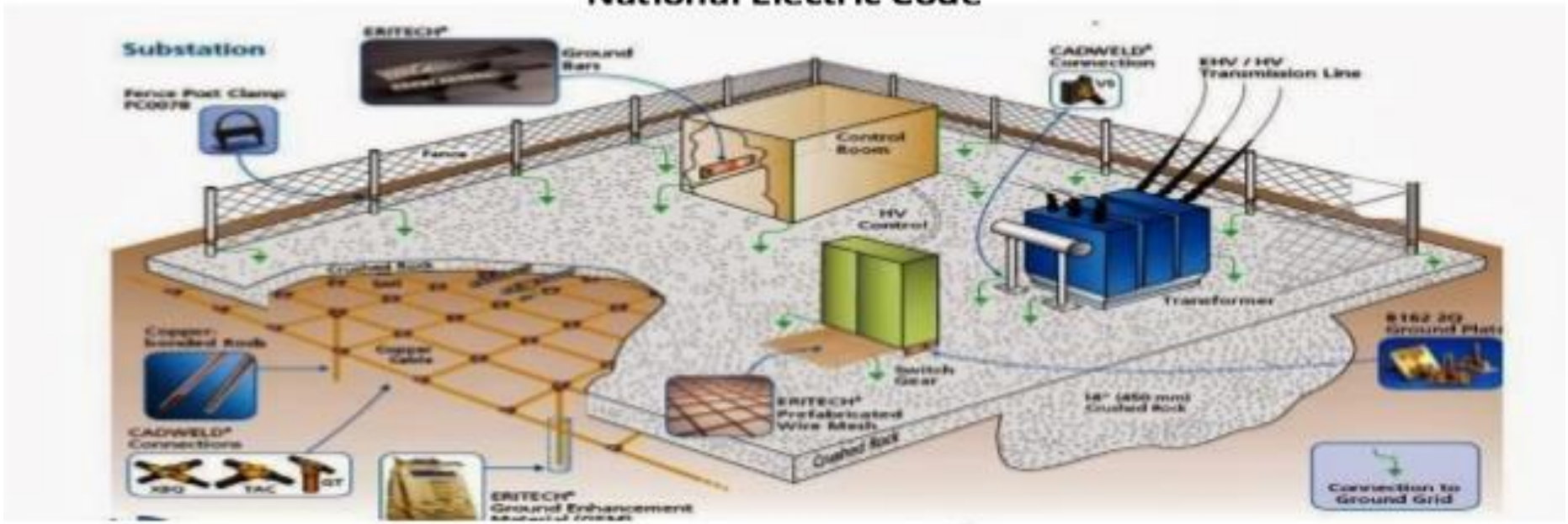
Components of A Sub-Station

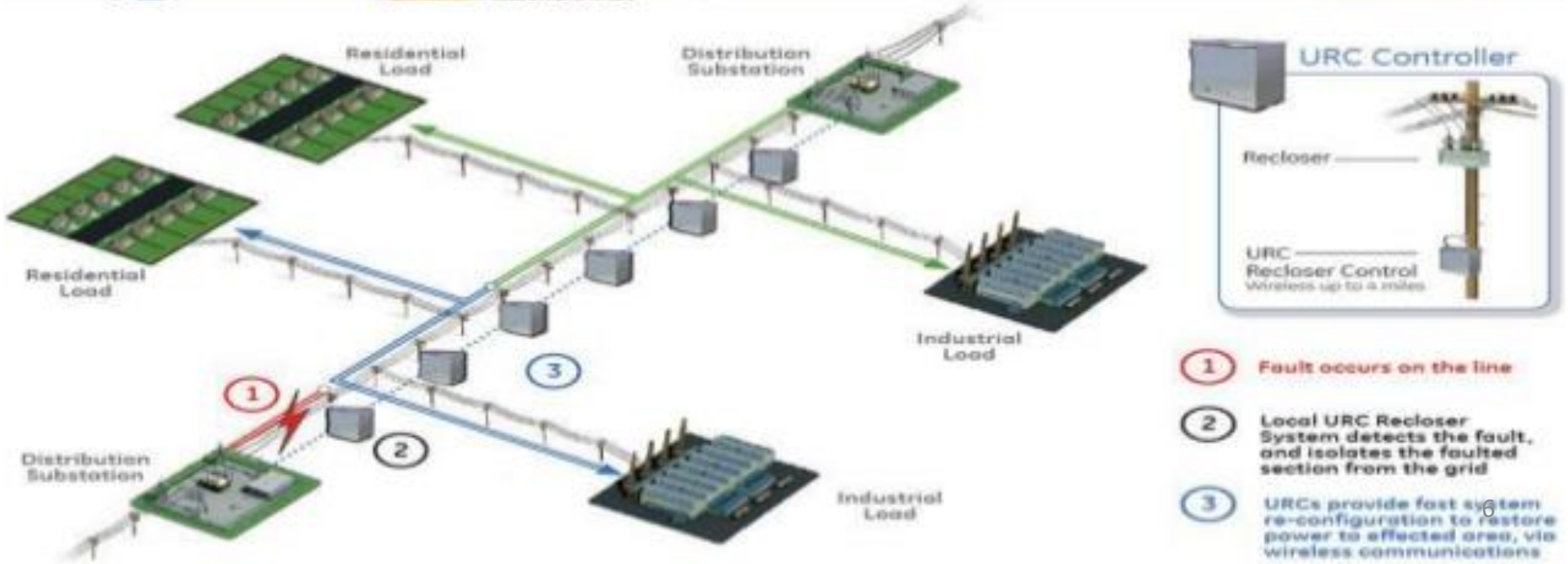


1.Primary power lines 2.Ground wire 3.Overhead lines 4.Transformer for measurement of electric voltage 5.Disconnect switch 6.Circuit breaker 7.Current transformer 8.Lightning arrester 9.Main transformer 10.Control building 11.Security fence 12.Secondary power lines

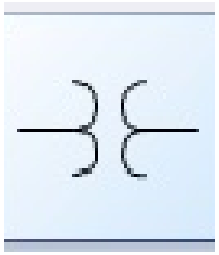
Follow Electrical Safety by LAW IEEE80/IEEE998/IEC and

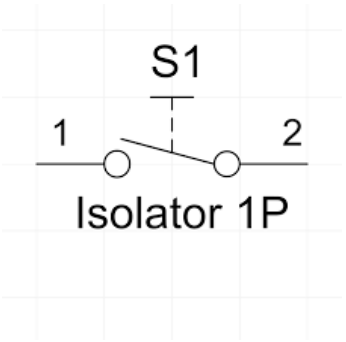
National Electric Code

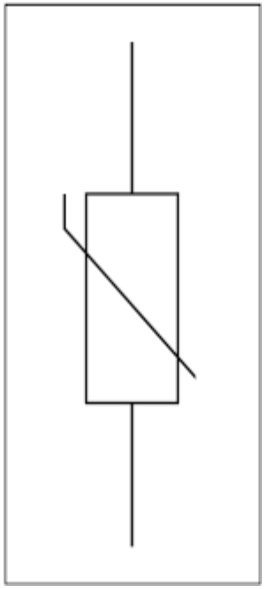
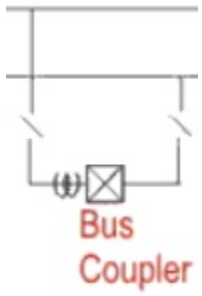





Incoming Subtransmission Lines
Electric power path through substation
34 KV in
Lightning Arresters
Air-break Switches
Outgoing Distribution Lines
Step-down Transformer
Distribution Bus
7.2 KV out
Cutout Switches
Oil Circuit Breakers
Voltage Regulators
Metal-clad Switchgear
Control House

Sl. No	Component Name	Practical Image	Standard Symbol
1	Current Transformer- CT		
2	Potential Transformer- Pt		

Sl. No	Component Name	Practical Image	Standard Symbol
3	Isolator- I	 	
4	Oil circuit Breaker- OCB		

Sl. No	Component Name	Practical Image	Standard Symbol
5	Lightning arrester	 	 Fig. 40: Graphic symbol of a varistor
6	Bus Coupler		

Bus bars

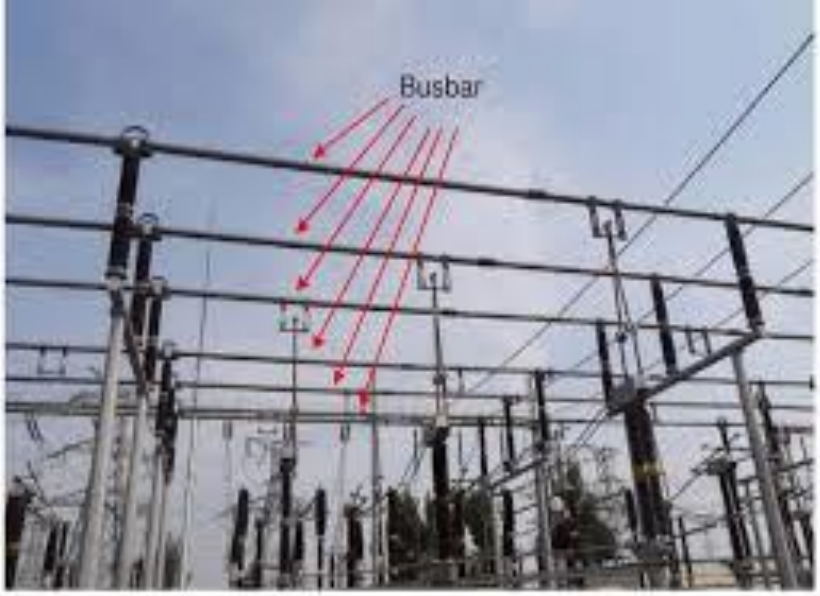
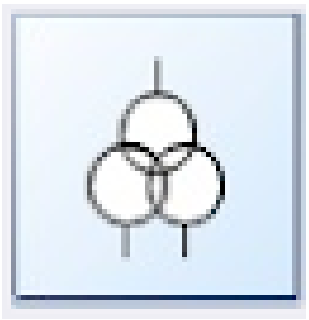


Fig. 1: An image of bus

2 winding transformer

3 winding transformer



Example : 1

Draw the key diagram or line diagram of a typical 66KV/11KV sub–station. 92/A (NC) 3rd year

Solution Fig. 11.8.

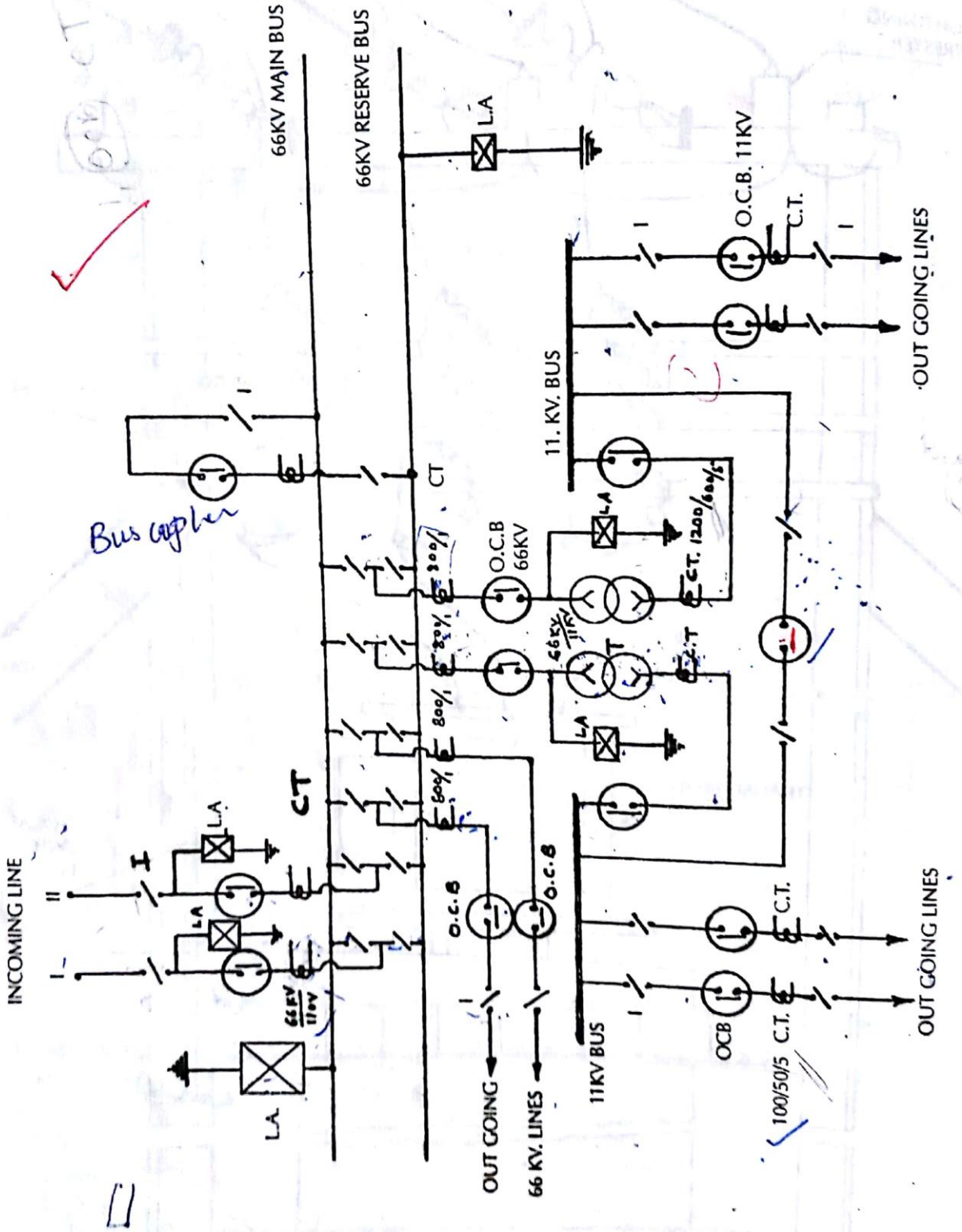


Fig. 11.8

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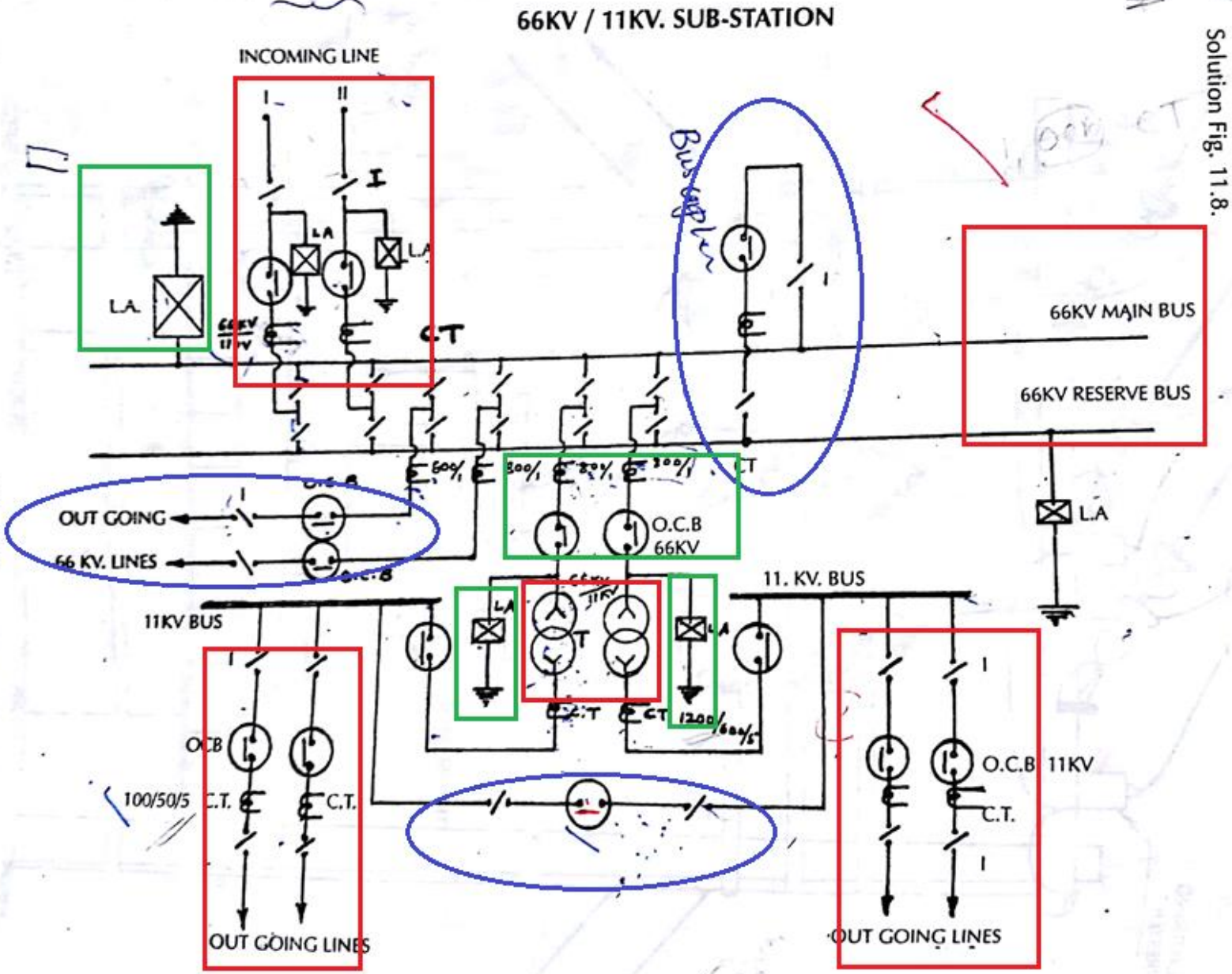


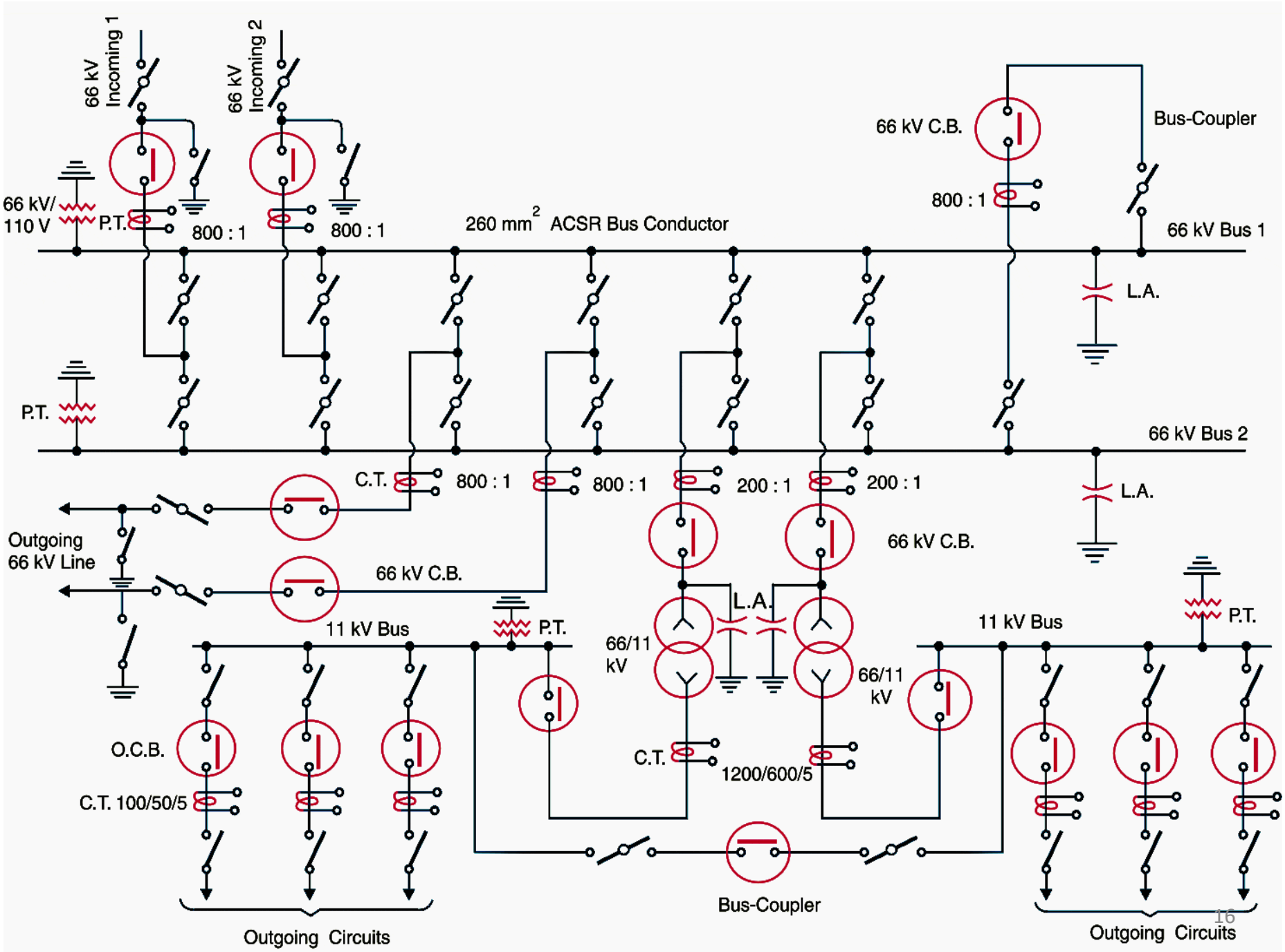
Fig. 11.8

EXAMPLE : 4

Draw the single line diagram of a 66/11KV M.U.S.S. with the following details.

1. 66KV, in coming line–2 Nos.
2. Line OCB's 66KV–2 Nos.
3. Step down transformer 66 KV/11KV–2 Nos.
4. OCB's for transformer Bank on L.T. side–2 Nos.
5. Duplicate bus bars for H.T. and L.T. to be provided.
6. Bus coupler for H.T. side only.
7. Feeders, 11KV radiating from L.T. bus 4 Nos.
8. L.T. circuit breakers for feeders– 4 Nos.
9. Position of lightning arresters, isolaters, CT'S and PT'S are to be indicated.

Refer example 1 and 2.


66 kV Incoming 1
66 kV Incoming 2
66 kV/ 110 V
P.T.
800 : 1
800 : 1
260 mm² ACSR Bus Conductor
66 kV C.B.
800 : 1
Bus-Coupler
66 kV Bus 1
L.A.
P.T.
66 kV Bus 2
C.T.
800 : 1
800 : 1
200 : 1
200 : 1
L.A.
Outgoing 66 kV Line
66 kV C.B.
66 kV C.B.
L.A.
11 kV Bus
P.T.
66/11 kV
66/11 kV
11 kV Bus
P.T.
O.C.B.
C.T. 100/50/5
C.T.
1200/600/5
Bus-Coupler
Outgoing Circuits
Outgoing Circuits