★ Installation of transformers :-

(i) Transformers must be installed in an area that will minimize the possibility of physical damage and in an area where there is enough free circulation of air.

(ii) Dry-type transformers rated at less than 600 V & less than 112.5 KVA should be mounted on fire-retardant material.

(iii) Transformers rated at more than 112.5 KVA should be installed in a transformer room of fire-retardant construction.

(iv) Transformers mounted outdoors should have a water-proof enclosure and, if rated at more than 112.5 KVA, should be spaced at least 12 inches from the combustible materials of buildings.

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Protection of transformers:-

Use relays & fuses

Grounding of a Transformer:-

Detailed applicable documents must be consulted naturally available grounds, e.g. effectively-grounded metal water pipes, effectively-grounded metal in the nearby structure etc. can be used (via an electrode) to provide sufficient grounding to a transformer.

Q How do we decide the diameter of the 'Cu' wires used in primary & secondary windings?

Ans There are two standards used to specify wire-diameter:
(i) American wire Gauge (AWG)
(ii) Standard wire Gauge (SWG)

Q A 500 KVA, single-phase, 13.8/4.160 KV, 60 Hz transformer has primary resistance = 0.8 Ω and secondary resistance = 0.04 Ω. The iron loss (i.e. core loss) = 3000 watts. Calculate the Copper loss & efficiency at full-load.

Ans

$$\eta = \frac{\text{Output Power}}{\text{Input Power}}$$

$$= \frac{\text{Input Power} - \text{Cu loss} - \text{Iron loss}}{\text{Input Power}}$$

Teacher's Signature

'Cu' loss → $I_p^2 R_p + I_s^2 R_s$ (Because these are generating heating hence wire loss)

Assume $[\cos\phi = 1]$

$V_p I_p = V_s I_s$ = Power

$\Rightarrow 13.8 \times I_p = 500 = 4.160 \times I_s$

$I_p = \frac{500}{13.8}$ & $I_s = \frac{500}{4.160}$

$\Rightarrow I_p \simeq 36.23\ A$ $I_s = 120.19\ A$

'Cu loss = 1626 Watt

$\eta = 1 - \frac{(3000 + 1626)}{500 \times 10^3}$

$\equiv \simeq 99.3\ \%$