Chapter - 27

Electric Traction Distribution

Power Supply

25 kV, ac, 50 Hz single phase power supply for electric traction is derived from the grid system of State Electricity Boards through traction sub-stations located along the route of the electrified sections at distances of 35 to 50 km apart. The distance between adjacent sub-stations may however be even less depending on intensity of traffic and load of trains.

Sectioning of OHE:-

To ensure rapid isolation of faults on the OHE and to facilitate maintenance work the OHE is sectioned at intervals of 10 to 15 km along the route. At each such point a 'switching station interruptors' usually rated at 600A are provided.

The shortest section of the OHE which can be isolated by opening interruptors alone is called a 'sub-sector'. Each sub-sector is further sub-divided into smaller 'elementary sections' by provision of off-load type manually operated isolator switches.

Feeding Post (FP): It is a supply control post, where the incoming feeder link from grid substation are terminated. Each feeder supplies the OHE on one side of the feeding post through interrupters controlling supply to the individual lines. Thus, for a two track line, there will be four interrupters at each feeding post.

Sectioning and Paralleling Post (SP)

These posts are situated approximately midway between feeding posts marking the demarcating point of two zones fed from different phases a 'paralleling interrupter' is provided at each 'SP' to parallel the OHE of the up and down tracks of a double track section, 'bridging interrupters' are also

provided to permit one feeding post to feed beyond the sectioning post upto the next FP if its 25 kV supply is interrupted for some reasons. These bridging interrupters are normally kept open and should only be closed after taking special precautions as detailed in these rules.

Sub-Sectioning and Paralleling Post (SSP)

One or more SSPs are provided between each FP and adjacent SP depending upon the distance between them. In a double track section, normally three interrupters are provided at each SSP i.e. two connecting the adjacent sub-sectors of up and down tracks.

Sub-Sectioning Post (SS)

These are provided only occasionally. They are similar to SSPs with provision for sectioning of the OHE but not paralleling.

Neutral Section: It is a short section of insulated and dead overhead equipment which separates the area fed by adjacent substation or feeding post. Since the neutral section remains 'dead', warning boards are provided in advance to warn and remind the Loco pilot of an approaching electric locomotive/EMU to open locomotive circuit breaker (DJ) before approaching the 'neutral section', to coast through it and then switch 'on' on the other side.The following boards are provided in neutral section.

(i).500m(ii).250m.(iii). open DJ (iv). close DJ

A neutral section is provided to make it impossible for the pantograph of an electric locomotive or EMU train to bridge the different phases of 25 kV supply, while passing from the zone fed from one sub-station to the next one.

Other Important Equipment at Switching Stations.

1. Lightning arresters are provided to protect every sub-sector against voltage surges.

2. Auxiliary transformers are provided at all the posts and also at certain intermediate

points tosupply ac at 240 V, 50 Hz required for signaling and lighting purpose of

gate.

3. Potential transformers are provided at the various switching stations for monitoring

supply to each sub-sector.

OVERHEAD EQUIPMENT

1. The overhead equipment above the tracks comprises of the following: -

Catenary wire: A stranded cadmium copper wire of about 65 mm^2 section or stranded aluminiumalloy wire of about 116 mm^2 section for catenary.

2.Contact wire: A grooved hard drawn copper contact wire of 107 mm^2 cross-section (when new) supported from the catenary by means of droppers

3. Droppers: 5 mm diameter spaced not more than 9 m apart and first and last dropper 2.25m from the mast.

4.Encumbrance:Axial distance between catenary and contact wire near mast is called encumbrance It is normally 1.4m.

Jumper: Make current continuity in OHE.

The current normally permissible on a single track is 600Amps.

Height of Contact Wire above rail level:

The normal height of contact wire for regulated OHE is 5.60 m. (with 10 cm pre-sag for 72 m span). For

unregulated OHE in areas with a temperature range of 4°C to 65° C, this

figure is 5.75 m and in areas with a temperature range of 15 °C to 65 °C, it is 5.65 m. The height may be as low as 4.65 m on BG and 4.02 m on MG.

Span of Supporting Mast/Structures

The span normally used for supporting the OHE from masts/structure using the cantilever type bracket assembly varies from maximum 72 m on straight track to 27 m on curved track.

Stagger

This ensures a uniform wear of the current collecting strips of the pantographs.

The contact wire is staggered on strait track is 200 mm and 300 mm on curves.Overlaps: The OHE conductors are terminated at intervals of about 1.5 km with an overlap.

There are two types of overlap spans as under:-

i. Uninsulated overlap spans- where the distance of separation between two contact

wires is 200 mm and the two conductors are permanently connected together

electrically by suitable jumpers.

ii. Insulated overlaps, where the two OHE systems are kept apart at a distance of 500 mm. Normally the electrical discontinuity at insulated overlaps is bridged by interrupters or isolator except at neutral sections.

Automatic Tensioning Device(ATD):It is used in regulating OHE to keep OHE height constant irrespective of weather.

Regulated and Unregulated OHE

OHE with automatic tensioning called 'regulated OHE' is generally provided for all main lines.Tension length is 1500m

Unregulated OHE: No ATD is provided it is used inlarge isolated yard and unimportant lines.A length of 2000m

Section Insulator Assembly

Section insulators are provided to insulate the OHE of one elementary section from the OHE of the adjacent elementary section such as at cross-overs and turn out.

The boards provided in electrified section:1. Unwired turn out.2.Electric Engine stop.3.At neutral section 500m ,250m, open DJ and close DJ. 4.Pant lower and panto raise boards.