

**The Chief Electrical Engineer,**

1. South Eastern. Rly, Garden Reach, Kolkata-700 043.
2. Eastern.Rly, Fairlie Place, Kolkata-700 001.
3. Northern.Rly, Baroda House, New Delhi - 110 001.
4. Southern Rly, Park Town, Chennai- 600 003.
5. South Central .Rly, Railnilayam, Secunderabad.
6. Western .Rly, Chuchgate, Mumbai -400 020.
7. Central .Rly. Stn Bldg. Mumbai CST – 400 001.
8. Central Organisation, Railway Electrification, Allahabad – 211001.
9. South West Railway, DRM's Office, Hubli.
10. West Central Railway , Jabalpur.
11. East Coast Railway, Bhubaneshwar.
12. East Central Railway, Hajipur.
13. North Central Railway, Allahabad.211001.
14. North Eastern Railway, Gorakhpur.
15. South East Central Railway, Bilaspur.

**Sub: Application of technology in the field of loading mechanism.**

**Ref: Board's letter No. 2006/Elect (G)/170/2 dated 18.12.08.**

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Railway Board vide letter referred to above (para 1), have communicated decision to adopt the following three schemes for loading mechanism sidings:-

**A. For hopper/chute loading:**

Scheme-I The typical arrangement to be adopted for this scheme is shown in drawing No. TI/DRG/OHE/Push/00001/09/0 along with the yard layout requirement, wherein a separate loco line for shunting purpose is indicated. In this arrangement, the loading area is shall be unwired.

Scheme-II The scheme is shown by drawing TI/DRG/OHE/hopper/00002/09/0 along with the necessary requirement for operation. The scheme is to be adopted with 27m span OHE, with all negative staggers (400mm).

In addition, the design of hopper/chute (loading tray) are also shown in RDSO sketch Nos. TI/SK/OHE/HOPPER/RDSO/00001/09/0 & TI/SK/OHE/CHUTE/RDSO/00002/09/0.

**B. For crane loading:**

- (i) 9 No. design drawings of collapsible OHE had been made for loco shed, etc. in 1999 for single stretch suitable up to maximum length 150m. Based on above drawings, the collapsible OHE erected for full tension length (double stretch) with overlap up to 300m at Obaidullaganj ballast sidings of WCR/BPL. Trials conducted in 2006 at 10 kmph speed. After gaining the field experience of Obaidullaganj, RDSO has revised two existing drawings out of nine & one new drawing for full tension length (lay out plan) has been prepared including design of overlap.

This OHE swivelling type, permits shunting with electric traction when in normal position and allow loading in wagons from the top, when pulled away from normal position. The OHE is pulled away from its normal position towards structures and pulled back to its normal position with the help of motorised arrangement.

The half length of OHE will have to be limited to 150m maximum up to overlap location or maximum span length 9.5m. This OHE including overlaps must be straight.

“When the OHE is not in normal position, it is earthed through isolator with earthing blade to ensure safety.” In new design following major modification have been carried out:

- (a) Capacity of motor has been increased 2.5HP to 5HP as erected by WCR/Bhopal in motorised arrangement.
- (b) BFB mast piece were shown on the pillar of electric loco shed. Location of Indicated pillar of loco shed for isolator connection drawing have been eliminated in the revised RDSO drawing.
- (c) Lay out plan with overlap is shown in drawing indicated at S.No.10.

A set of the drawings (including 7 existing, 2 modified and 1 new) is enclosed herewith for guidance.

S. No	Description	Drawing no.
01	Special bracket for collapsible OHE	TI/DRG/OHE/COLLAP/RDSO/0001/99/0
02	General arrangement of fixing the special bracket assembly & suspension of contact wire	TI/DRG/OHE/COLLAP/RDSO/0002/99/0
03	General arrangement of suspension of contact wire (s) from existing bracket assembly of tram-way OHE	TI/DRG/OHE/COLLAP/RDSO/0003/99/0
04	Motorised arrangement for collapsing the OHE	TI/DRG/OHE/SWL/RDSO/00004/08/0
05	General arrangement for collapsing the OHE	TI/DRG/OHE/COLLAP/RDSO/0005/99/0
06	General arrangement of fixing of conduit pipe on special bracket assly & connection of wire rope.	TI/DRG/OHE/COLLAP/RDSO/0006/99/0
07	General arrangement of Isolator connection to Collapsible OHE	TI/DRG/OHE/SWL/RDSO/00007/08/0
08	Special stay arm insulator for collapsible OHE	TI/DRG/OHE/COLLAP/RDSO/0008/99/0
09	Special Jumper Clamp	TI/DRG/OHE/COLLAP/RDSO/0009/99/0
10	General arrangement (LAY OUT PLAN) for the swivelling OHE	TI/DRG/OHE/SWL/RDSO/00010/08/0

This is for your information please.

**(Girraj Kishore)**  
**Assistant Design Engineer/TI**  
**for Director General/TI**

Encl: As above.

**Copy to: ED/EEM/Rly.Bd.-for kind information please.**

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**Guidelines for overhead hopper/chute/crane loading/unloading of rakes in electrified sidings**

1. **OBJECTIVE** :

- To provide a solution for overhead loading at freight terminals in electrified territory.
- To minimize the rake loading time thereby improving wagon turnaround time.
- To ensure safety of personals involved in loading
- Improvement in system as a whole.
- To optimise utilization of the crew.

2. **Background**: At most of the existing overhead freight loading points (using hopper/tray for loading the wagons),no uniform way of placement of wagons, its loading & withdrawal after loading exists. In fact, it is not possible to place empty wagons for loading under hopper with the incoming rake due to non availability of OHE near the loading area. Most of the loading at such points attract multi mode systems with dependency on each other. In addition, manual system (winch) is adopted to place the wagon right under the loading point (Hopper/tray), thus it takes lot of time for entire rake loading.

With the increase in the number of sidings and electrification of yard lines in the vicinity of loading lines, it has become imperative to introduce a system by which smooth placement, safe loading & speedy withdrawal of freight rake is possible. Though, there are few systems already in use over Indian Railways, no standard arrangement exists, which can be straight way adopted after carrying out clearance study.

To standardise the loading arrangements in the electrified sections, guidelines for overhead hopper loading of freight trains in electrified sidings are being issued.

- 3.0 **Layout of the siding**: The placement of rake shall depend upon the layout of the yard lines in the vicinity of loading area. Generally, three types of layouts, as shown in Fig 1, 2 & drawing No TI/DRG/OHE/SWL/RDSO/00010/08/0 have been considered and these systems call for separate methods of OHE layout for placement of empty rake in loading area & its withdrawal after loading. These are covered under Schemes-I,II & III.

4.0 **Scheme -I**

- 4.1 **Issues involved**: The major issues involved in finalising the arrangement in this scenario are :

- a) To maintain the statutory clearance between the contact wire and fixed structure.

- b) To ensure adequate vertical electrical clearance from lowest part of the loading arrangement (hopper/tray) to the top of the contact wire of tram way type OHE.
- c) To avoid direct falling of loading material on the contact wire.

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- d) To provide signal (audio-visual) to alert the personnel's working in the loading area, on energisation of OHE.
- e) To provide electrical isolation to loading area including hopper/tray.

4.2 **Layout of siding:** Tentative layout to be adopted for such a siding shall be as shown in the drawing given in Fig 1.0 with focus on the loading area arrangement.

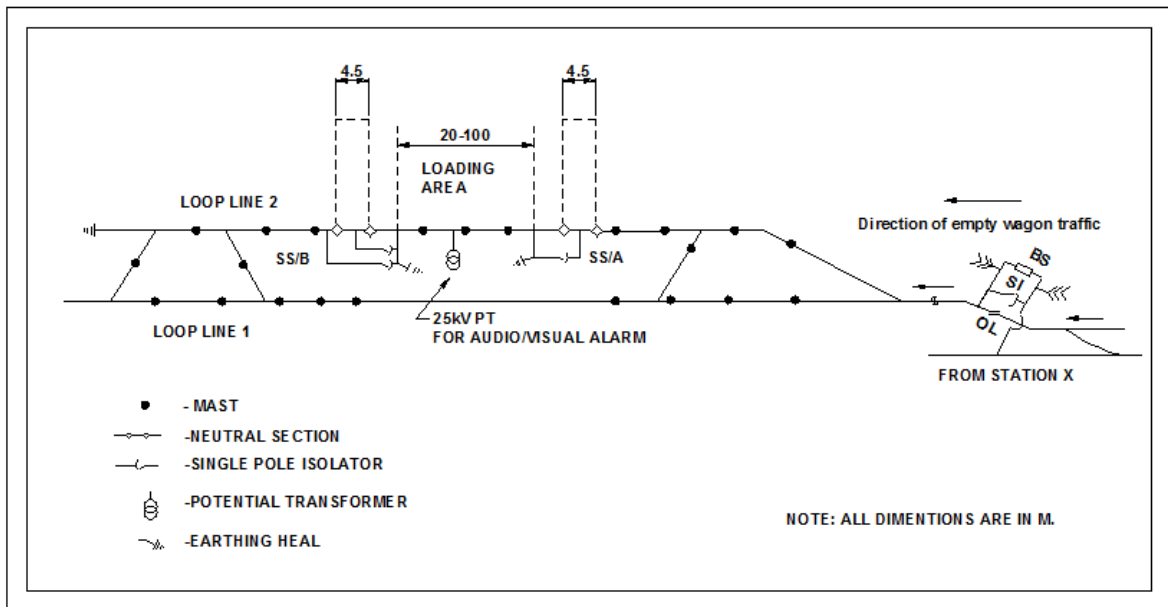


Fig1.0(Drawing No. TI/DRG/OHE/Push/00001/09/0)-Yard layout & location of electrical equipments in case of Scheme-I

4.3 **Methodology:** Basic methodology for streamlining the placement of rake, its loading & withdrawal shall consist of following:

- a) Tram way type OHE to be adopted
- b) 27 mts span may be adopted under the loading area with one mast erected near the loading point to minimise the effect of contact wire push up.
- c) Stagger of contact wire in the loading area to be kept as 400mm to avoid obstruction of falling material to OHE.
- d) Vertical electrical clearance from lowest part of the loading arrangement (hopper/tray) from the top of the contact wire of tram way type OHE to be kept as minimum 250mm.
- e) To further improve the electrical clearance, Fibre Reinforce plastic (FRP) lining shall be provided on the surfaces of the hopper, which are near to contact wire.

Siding owners may even be perused to use insulating material like FRP for the entire loading tray/hopper.

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4.4 **Electrical equipments:** OHE layout in loading area is shown in Fig 2.0(Sketch No. TI/SK/OHE/CHUTE/RDSO/00002/09/0) minute details of OHE under loading area are shown in Fig 3.0.( Sketch No. TI/SK/OHE/HOPPER/RDSO/00001/09/0) Following electrical equipments shall be used:

- Section insulators** for isolating the OHE under the loading area.
- Single pole isolator with earthing heal** shall be provided in the direction of empty traffic movement for isolating the area under the loading zone & feed the OHE between section insulators.
- Double pole isolator with earthing heals** to be provided on the other end of loading point to isolate the loading area & feed the OHE in loading area.
- Potential transformer** shall be connected with the OHE of the loading area & on OHE energisation, it shall provide 100V output to operate 100/230V relay, whose output shall be supplied to the audio-visual system i.e hooter & flashing lights, to warn the staff present in the loading area.
- Earth pits** shall be provided for grounding of various fixed structures.
- Structure bond for earthing of the mast.
- Traction mast.
- Tram way type OHE.

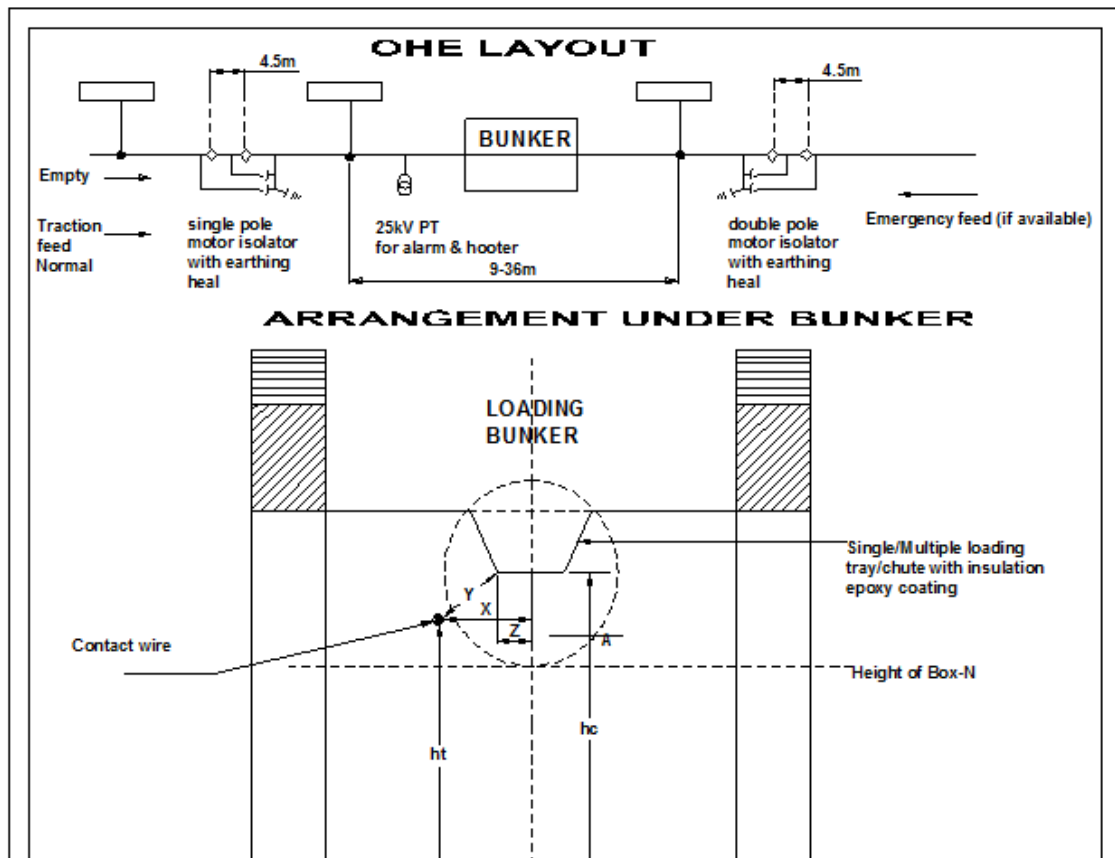


Fig 2.0 OHE layout for loading siding & arrangement under the loading area

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4.5 **Earthing** :Following shall be ensured:

- All metallic structures shall be connected to the earth pit.
- Both the isolators should be provided with earthing heel & each earthing heel should be connected to a separate earth pit.
- Corresponding mast should also be connected directly to earth.
- Track under the loading area shall be connected to separate earth pit.
- Hoper/tray should also be connected to earth.

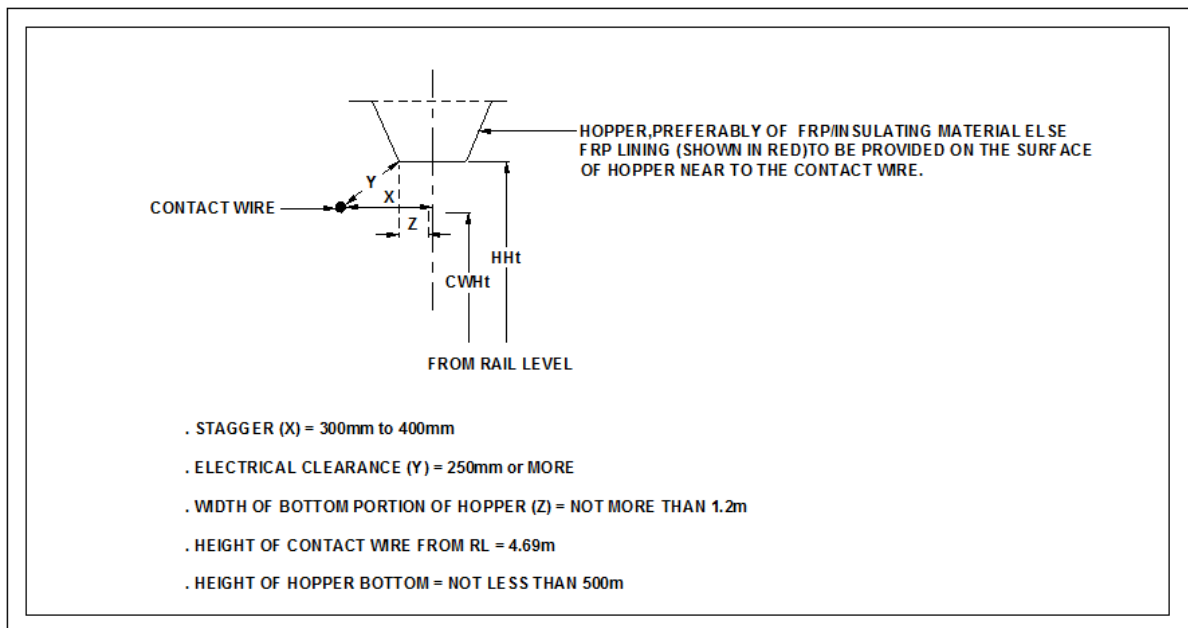


Fig 3.0 Details of critical dimensions of OHE arrangement under bunker

4.6 **Safety:**

- For the safety of personnel's working in loading area, audio visual signal's functioning at the instant on energisation of the loading area shall be ensured.
- Protective screen covering the loading area to be provided on both the sides to prevent falling of loading material or any other foreign material on the OHE.

4.7 **Scheme of operation**

After entering into loading line at the loading point, train must be stopped near “engine stop board” provided near isolator SS-A.

- a) It must be confirmed from loading in-charge that nobody is available near loading pit for unloading the material or any other work inside the loading pit.
- b) Both the isolator (First SS-A & then SS-B) shall be closed after which loading pit shall be

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energized by 25kV a.c.

- c) As soon as loading pit is energized an audio visual signal shall indicate the energisation of loading pit.
- d) The train shall be moved through loading pit with the help of electric locomotive.
- e) After the engine crosses the loading area, & on entering into the loading yard, Isolator SS-B & SS-A must be opened in sequence.
- f) Thereafter, permission to loading pit incharge for loading of material in empty wagon lying underneath the hopper shall be granted.
- g) Once loading is complete, engine shall be detached, moved through crossover & attached on the loaded rake from the station “X” end, to proceed toward station “X”.
- h) SSE/OHE/of the section or his authorized representative must give training for operation of isolators to all guards, who shall be working on the loading area section.

## 5.0 Scheme-II

**5.1 Issues involved:** The major issues involved in finalising the arrangement in this scenario is to maintain the minimum clearance of 2.0 mtr. between OHE & fixed structure and take safety precautions, as per site requirement.

**5.2 Layout of siding:** Tentative layout to be adopted for such a siding shall be as shown in the drawing given in Fig 2.0 below.

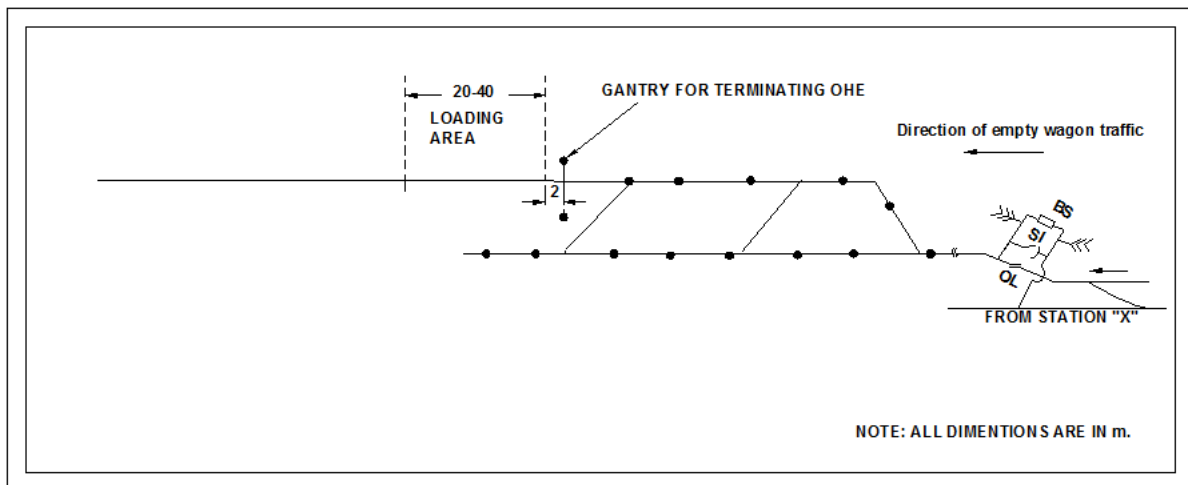


Fig 4.0 (Drawing No. TI/DRG/OHE/hopper/00002/09/0)-Yard layout & location of electrical equipments in case of Scheme-II

**5.2 Methodology:** Basic methodology for streamlining the placement of rake, its loading & withdrawal in this case shall consist of following:

- a) Tram way type OHE to be adopted
- b) OHE shall be terminated 2.0 m (working clearance) away from the nearest fixed

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structure of the loading area, by using gantry.

**5.3 Electrical equipments:** As shown in the layout of the scheme in Fig 2.0 , following equipments shall be required in the vicinity of the loading area:

- a) Gantry for terminating the OHE head on.
- b) Earth pits shall be provided for grounding of the loading area.
- c) Structure bond for earthing of the gantry.

d) Tram way type OHE

**5.4 Earthing :**Following shall be ensured:

- a) All metallic structures shall be connected to the earth pit.
- b) Both the isolators should be provided with earthing heel & each earthing heel should be connected to a separate earth pit.
- c) Corresponding mast should also be connected directly to earth.
- d) Track under the loading area shall be connected to separate earth pit.

**5.5 Safety:** Protective screen covering the loading area to be provided on both the sides

**5.6 Scheme of operation:**

- a) The empty rake with electric locomotive shall be stopped short of fouling mark of the last crossover near the loading area. Locomotive shall be detached from the empty rake & moved through the crossover. It shall thereafter be attached to the rear of the rake so that movement can be done in pushing mode.
- b) Once the first empty wagon reaches just below the hopper/tray, guard shall give permission to loading pit incharge for loading of material in empty wagon lying underneath the hopper.
- c) By putting locomotive in creeping mode at 3 kmph continuous loading shall be carried out so that entire rake is loaded in about 2-2.5 hours, the loading time shall however depend upon the hopper discharge rate.
- d) Once the loading is complete, the train can be moved straight way toward the station "X", without wasting any more time in shunting.

**6.0 Scheme-III:**



**6.1 Issues involved:** The major issues involved in finalizing the arrangements in this scenario is to ensure the complete swings of bracket assemblies with conductors towards structures up to 70 degree parallel to the track from center line of the structures with the help of motorizing arrangement, so that top loading with the help of cranes/lifter is possible.

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**6.2 Methodology:** Basic methodology for streamlining the placement of rake, its loading & withdrawal shall consist of following:

- a) Conventional OHE to be adopted between overlaps for minimizing the sag in contact wire. Tramway OHE shall be merged with conventional swiveling OHE at the either ends of loading areas.
- b) 9.5 mts span may be adopted under the loading area
- c) Stagger of contact wire in the loading area to be kept as maximum 300mm.
- d) Vertical/horizontal electrical clearance from lowest part of the loading arrangement (crane arm) from the top of the conduit pipe bolt of OHE bracket to be kept as minimum 250mm.

**6.3 Electrical equipments:** 5 HP motor as shown in drawing No TI/DRG/OHE/SWL/RDSO/00004/08/0 to collapse the OHE and isolators shown in drawing No. TI/DRG/OHE/SWL/RDSO/00007/08/0 to isolate the loading area.

**6.4 Earthing :** Following shall be ensured:

- e) All metallic structures shall be connected to the earth pit.
- f) Both the isolators should be provided with earthing heel & each earthing heel should be connected to a separate earth pit.
- g) Corresponding mast should also be connected directly to earth.
- h) Track under the loading area shall be connected to separate earth pit.

**6.5 Safety:** (i) Ensure that the drum of motors is locked after swiveling the OHE.  
(ii) Protective screen, covering the loading area to be provided on both the sides.  
(iii) A.C. Traffic movement shall be restricted to 10kmph.  
(iv) The OHE must be dead when the wind velocity is more than 75kmph.  
(v) Isolator must be open before OHE is to swing, by operating the motors.  
(vi) Loco with raised pantograph in the overlap zone is not allowed during operation of earthing heel isolator.

**6.6 Scheme of operation:**

- (i) This swiveling OHE permits shunting with electric traction when in normal position and allow loading in wagons from the top, when pulled away from normal position. The OHE is pulled away from its normal position towards structures and brought back to its normal position with the help of motorized arrangement.
- (ii) when OHE is in energized condition, loco with the entire rake shall be moved under the OHE. The Single Pole isolator with earthing heels shall be switched off after switching off DJ of locomotive and lowering of the pantograph.
- (iii) The OHE is then swiveled with the help of motorized arrangement. When the switch of motorized arrangement with limit switch No. 1 is 'ON' the bracket which is

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connected by the steel rope is pulled causing subsequent pulling of all brackets till OHE

is Swiveled at 70 degree from the normal position. At the other end, SS wire rope which is connected to bracket is released during pulling of bracket assembly as the motorized arrangement No.2, is decoupled from speed reducer.

- (v) Same way, when OHE is required to bring its normal position, motor no 2 is operated and motor No. 1 is decoupled from the speed reducer by releasing the rope and brackets are pulled back to their normal position by motorized arrangement No.2. Thus , for taking the locomotive out the swivel OHE, the swiveled bracket assemblies shall be pulled in the opposite direction with the help of motorized arrangement till they are in normal position and the isolator shall then be switched on to make the swivel OHE live at 25 kV.
- (vi) The scheme to be adopted for in this scenario is elaborated in the drawings listed below:

S. No	Description	Drawing no.
01	Special bracket for collapsible OHE	TI/DRG/OHE/COLLAP/RDSO/0001/99/0
02	General arrangement of fixing the special bracket assembly & suspension of contact wire	TI/DRG/OHE/COLLAP/RDSO/0002/99/0
03	General arrangement of suspension of contact wire (s) from existing bracket assembly of tram-way OHE	TI/DRG/OHE/COLLAP/RDSO/0003/99/0
04	Motorised arrangement for collapsing the OHE	TI/DRG/OHE/SWL/RDSO/00004/08/0
05	General arrangement for collapsing the OHE	TI/DRG/OHE/COLLAP/RDSO/0005/99/0
06	General arrangement of fixing of conduit pipe on special bracket assly & connection of wire rope.	TI/DRG/OHE/COLLAP/RDSO/0006/99/0

07	General arrangement of Isolator connection to Collapsible OHE	TI/DRG/OHE/SWL/RDSO/00007/08/0
08	Special stay arm insulator for collapsible OHE	TI/DRG/OHE/COLLAP/RDSO/0008/99/0
09	Special Jumper Clamp	TI/DRG/OHE/COLLAP/RDSO/0009/99/0
10	General arrangement (LAY OUT PLAN) for the swivelling OHE	TI/DRG/OHE/SWL/RDSO/00010/08/0

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