

# **USE OF RUSSIAN TRT FOR CONSTRUCTION OF NEW TRACK/ RELAYING**

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## **Synopsis:**

This paper shows steps involved in Construction of New Track/ Relaying by using Russian TRT along with its advantages and limitations.

## **INTRODUCTION:**

Earlier most of the track construction work/ Relaying on Indian Railways used to be labour intensive. But now mechanization of track laying / relaying has become essential due to heavy track structure and slow progress of manual laying/ relaying of track. Also mechanization is attractive because PSC sleepers have much better amenability to machine working due to its uniform and regular geometrical shape.

## **CONSTRUCTION/ RELAYING OF TRACK BY MANUAL METHOD:**

- Difficulty in handling heavy sleepers weighing upto 286 kg (for 60kg rail).
- Long duration of work due to slow progress of work in a phased manner like manual TSR.
- Disruption to the traffic for a longer period by way of speed restriction.

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- Difficulty in ensuring good quality of layout regarding sleeper spacing, welding, etc as the work is done in-situ.
  - Safety at work site is required to be ensured for a longer duration as all work is done in situ.
- Most of the shortcomings are overcome in mechanized construction.

## **MECHANISATION OF TRACK LAYING/ RELAYING by Russian Track Relaying Train (RTRT)**

### **Salient Features:**

- Auxiliary track is not required.
- Track can be laid on both sides of Girder bridge (laid in advance) without break in working.
- Track can be laid along Platform if no obstruction in 5.8 m height from rail level.
- This machine is most suitable for laying of new track since it moves on the newly laid track.

<b>Main Units:</b>	<b>for single rake</b>	<b>for double rake</b>
• Track Relaying Crane:	1 Nos.	2 Nos.
• Motorised Flat Car:	2 Nos.	4 Nos.
• Ski Rail BFR:	1 Nos.	2 Nos.
• Special (Gantry) BFR:	10 Nos.	20 Nos.

### **TRACK RELAYING CRANE**



It is fitted on MFC (Motorised Flat Car). It is used for:

- Loading of fabricated panels on BFR.
  - Unloading of fabricated panels in block on leveled bed in place of released panels
  - Removal & loading of old released panels during block
  - Unloading of released panels in base yard.
- Each crane is equipped with two diesel engines of 190 HP, two generators and four traction motors
  - The main operation of the relaying system is to be done by this crane such as lifting of the crane truss and handling of panels for loading and unloading.
  - It can handle 13 M long rail panel.
  - Each crane is fitted with a hoist trolley. The trolleys are fitted with two clamps. Each clamp holds the pre fabricated/released panels at two locations by chain. Clamps are lifted with the help of hoist motors. The trolley is moved longitudinally by traversing motors.
  - The crane is provided with twelve hydraulic cylinders for lifting and lowering of the crane truss. Lifting and lowering of truss requires minimum two hours for each operation.
  - Except above, remaining functions are controlled by 20-250 V DC of 50-250 A current.
  - The crane is operated by one operator who sits on top of the crane or near the end of BFR to control movement of panels vertically as well as longitudinally.
  - Second operator sits at the side of BFR on detachable seat where he controls the movement of the crane BFR & transshipment of MBC/released panel bundle from gantry BFRs.
  - Two men on either side are required for tying MFC panel with chain.
  - Total 6 men are required on one crane including operator, driver, and helper.
  - One crane is used for removal and picking up old released panels and another is used for unloading and placing the new

panels on leveled bed in relaying work. (In Construction work only one crane is required)

### **MOTORISED FLAT CAR (MFC)**

- It is self propelled.
- It is equipped with two diesel engines of 190 HP, two generators of 100 KW and four DC motors of 53 KW each for propulsion.
- It can haul 5 to 7 loaded gantry BFR with panels. For this purpose provided with two winches for pulling of bundle of panel by the help of wire ropes in either direction.
- MFC assists the crane to haul the relaying train formation while laying the prefabricated panels. It also helps in hauling of rake in yard.
- The MFC is used for transshipment of bundle of panels from gantry BFR to crane BFR or vice-versa.

### **SKI RAIL & SKI RAIL BFR**



- SKI rails are 13M long (50/75 lbs FF rails), the ends are flared upwards for smooth transition from one roller to another roller and one BFR to another BFR.
- SKI Rail BFR is a special BFR for storing the SKI Rails. It is fitted with rollers like gantry BFR.
- SKI rail BFR are kept adjacent to the crane BFR.

- During loading of New/ Released panels, Two SKI rails from the SKI BFR is placed on Crane BFR rollers.
- Prefabricated panels/ Released panels in 4 tiers are kept on SKI rails placed on Crane BFRs by Crane and the SKI rails are pulled over the rollers along with the panels for loading.
- During laying/unloading of New/ Released panels when all the panels of a tier are lifted off from the crane BFR platform, the SKI rails placed under the panel bundle are removed and kept on the SKI rail BFR.
- Each such BFR is provided with 30 rails or as required

## **GANTRY BFR**



- These are ordinary BFRs, converted into gantry BFR by fixing rollers. 24 Nos. i.e. 12 Nos. on each side.
- Two gantries are provided on each BFR to support the MBC panels stacked in 4 layers. Chains are provided to lash the panel bundles.
- These BFRs are provided with brake control to avoid rolling of bundle of panels

## **MODE OF WORKING**

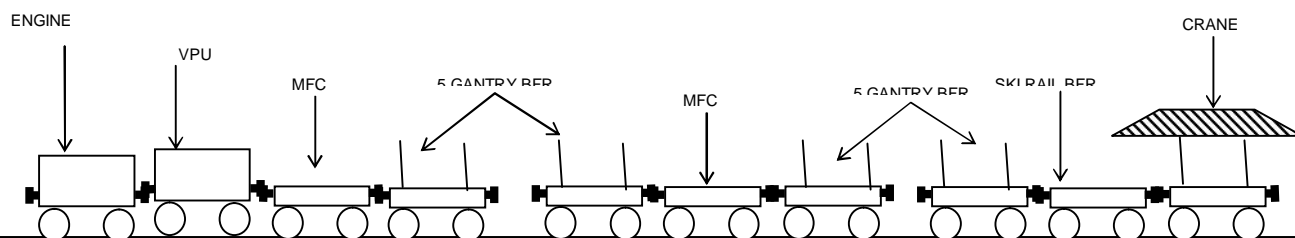
RTRT has two modes of working:

- Single Rake System
- Double Rake System

### **SINGLE RAKE SYSTEM**

- It requires only one locomotive.
- Removal of released panels is to be done manually.

- Only laying of pre fabricated panels will be done by RTRT.
- Released material cannot be picked up by RTRT.
- The rails of 13 M length can be picked up by RTRT.
- This will require only one rake with MFC, gantry BFR etc.
- This is suitable for Construction of New Lines.



**SINGLE RAKE SYSTEM**

### DOUBLE RAKE SYSTEM

- It requires two locomotives and crew.
- Removal and picking of released panels will be done by one rake and laying of new panels will be done by other rake in the same block.
- The LWR of SWR should be converted into 13M panels in advance.
- It will require two separate rakes equipped with crane, MFC, BFR etc.

### PRE- REQUISITES for RTRT working:

- Base depot is a main activity centre. It should be selected and developed with due care to provide facility of road approach, electricity, water, restroom for staff and store room. It should not create any interference with running traffic. Minimum obstruction to movement of RTRT and other vehicle during shunting etc.
- Base Depot should be of 3 sidings of 500m connected to a shunting neck of 350m.
- Initially, 350m track is laid manually for stabling RTRT rake.

## **MAIN ACTIVITIES IN BASE DEPOT**

- Unloading of PRC sleepers and rails by Railway or contractor's portals.
- Fabrication and stacking of new panels.
- Loading of new panels into gantry BFRs with help of crane and MFC.
- Unloading released panels and rails etc.
- Dismantling of released panels, stacking and disposed of released material.
- Maintenance of machines.
- Loading of ballast if ballast depot is also developed at base.

## **SEQUENCE OF OPERATION**

- After formation of rake and loading of new panels in gantry BFRs the RTRT will proceed into block section for relaying operation taking proper traffic block. The activities in block section will be as under for single rake system.
- The RTRT having crane at far end of rake, will stop at the location from where actual work is to be started. Crane will be just at the work spot.
- Locomotive will be idle during working of RTRT. All the movement will be done by MFC and crane.
- The reference pegs for alignment should be fixed in advance out side the track.
- The existing track will be unfastened, dismantled and removed manually. It will require min. 40 work men.
- 15 men will be deployed for leveling ballast bed at desired level.
- Meanwhile the set of new panels will be brought into the crane BFR from gantry BFR with the help of bundle pulling winch, fitted on crane itself. It will require 4 men for carrying wire ropes from crane to gantry BFR. Two men will be deputed on the crane for locking the panels, two men will be needed for unlocking the set the panels of G/BFR, two men for unlocking chain of the unloaded panel on newly

prepared ballast bed. Total 10 men will be needed for whole of this activity.

- The crane will lift the new panel and keep this panel on uniformly leveled ballast bed.
- The newly laid panel will be fish plated to existing track, aligned and packed. This activity needs about 15 to 20 men.
- The RTRT rake will move on newly laid track with the help of crane and MFC power.
- This process will continue till the last panel is laid.
- The new and old track will be linked, if required rail closer of standard length will be provided.
- The track will be aligned, packed to get desired safe parameter of track to pass the traffic with restricted speed.
- RTRT rake will move to the base station with the help of locomotive and the block will be cleared.

#### **Manpower Requirement:**

- 4 men to carry wire ropes from Crane to Special BFR
- 2 men on the Crane for locking the Panels
- 2 men for unlocking the set of Panels on Special BFR
- 2 men for unlocking the chain of the unloaded Panel
- 15-20 men for aligning and fish-plating newly led panel
- 15 men for leveling Ballast Bed at desired level.
- 40 workmen will be required for unfastening/ dismantling and removing of existing track during relaying.

#### **Ballast Bed Preparation in Advance:**

- Before laying, ballast bed may be prepared either manually or mechanically by using JCB and Dumpers.

#### **Output of the machine:**

14 to 18 panels in one effective hour of working



## **Limitations of RTRT:**

- It cannot work in electrified sections.
- In case of through girder bridge with height of girder less than 5.8m, the lowering and lifting of crane truss is necessary, which takes 2hrs in each operations.
- Traveling speed is limited to 25 kmph due to overhung portion of truss.
- Since, the Crane is kept at far end of rake, no vehicle can be attached.
- It requires most alert, cautious Operators because rake moves on newly laid panels, where safety margin is hardly 2 to 2.5m to stop the rake.
- In sharp curves, new Panels go out of alignment due to cant. Manual effort is required to bring them back to desired alignment.
- There is no safety device to hold the panel in lifted condition in case of breakage of wire rope.
- At present there is no AMC / technical support from OEMs or their authorized representatives.
- The pegs for alignment are fixed outside on cess, that are disturbed frequently causing misalignment after laying.