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Dedicated Freight Corridor Corporation Of India Limited By Mechanised Track Construction

Machiraju Aditya

(IMRT)

Abstract: ***The rapid growth of Indian economy in the last few years has created demand for additional capacity of rail freight transportation, and this is likely to grow further in the future. This burgeoning demand led to the conception of the dedicated freight corridors along the Eastern and Western Routes.***

The development objectives are to provide additional rail transport capacity, improved service quality, and develop the institutional capacity of the dedicated freight corridor corporation of India Limited to build and maintain the dedicated freight corridor infrastructure network. This paper explains the mechanised construction phase of Eastern DFC.

I. INTRODUCTION

GENSIS OF DFCCIL

In April 2005, the Project was discussed at the Japan-India Summit Meeting. It was included in the declaration of co-operation signed between the Honourable Prime Ministers of India and Japan for a feasibility study and possible funding of the dedicated rail freight corridors by Japanese Government. The feasibility study report was submitted to Ministry of Railways in October 2007.

In the meanwhile, Ministry of Railways initiated action to establish a Special Purpose Vehicle for construction, operation and maintenance of the dedicated freight corridors. This led to the establishment of "Dedicated Freight Corridor Corporation of India Limited (DFCC)", to undertake planning & development, mobilization of financial resources and construction, maintenance and operation of the dedicated freight corridors. DFCC was incorporated as a company under the Companies Act 1956 on 30th October 2006.

Dedicated fright Corridor Corporation of India (DFCCIL) maintenance and operations of dedicated freight corridors. DFCCIL has been designated by government of India to undertake planning, maintenance, operations and development of dedicated freight corridors.

Details of dedicated freight corridor

DFCC is a freight corridor under construction in India by Indian Railways especially with the mechanized track laying mechanism; this entire length will serve only for freight carriers.

Golden quadrilateral: The golden quadrilateral (connecting four metro cities of Delhi, Kolkata, Chennai and Mumbai) and its diagonals, which constitute about 16% of route kms or 25% of running track kms carry 65% of the freight and 55% of passenger traffic of the IR. DFCC are planned for the entire golden quadrilateral and its two diagonals by laying two new parallel double lines exclusively for freight traffic there by making the existing system a passenger corridor.

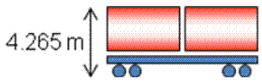
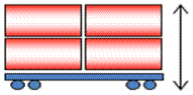
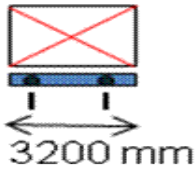
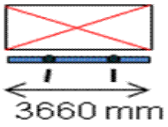
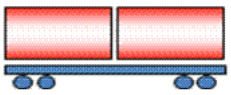
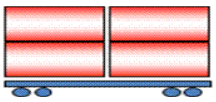
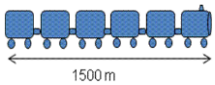
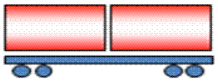
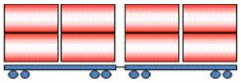
Once the freight corridors are completed, most of the existing IR track will be relieved from the freight traffic and it would enable the Indian railways to introduce more coaching services and increase in train speeds

STANDARDS OF CONSTRUCTION OF DFCC

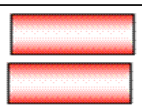
✓	Gauge : 1676mm
✓	Rails : 60kg 110 UTS, 260 m rail panel to be handled by mechanized track laying.
✓	Sleepers : 1660 Nos per km density for main line ,1540 Nos per km density for loop line
✓	Ballast : 300mm cushion (machine crushed) with RDSO specification.

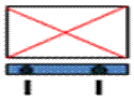
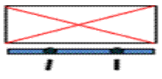
✓ Points and crossing: 60kg rail with 1 in 12 curved switches and CMS crossing on PSC sleepers and thick web switches
✓ LWR : 260 m rail panels are to be converted as LWR/CWR ,with mobile flash butt welding plant
✓ Fastenings: elastic rail clip MARK-V.
✓ Formation: top width of embankment – 7.5m with 2:1 side slope. track centre -5.3 m

UPGRADED DIMENSIONS OF DFCC

Feature	Existing	On DFC
Moving Dimensions		
Height		 7.1 m for Western DFC 5.1 m for Eastern DFC
Width		
Container Stack	 Single Stack	 Double Stack
Train length		
Train Load		

UPGRADED DESIGN FEATURES OF DFCC

Feature	Existing	On DFC
Heavier Axle Loads		
Axle Load	 **22.9t/2 5t**	 **32.5t/25t for Track Superstructure**

Track Loading Density		
Maximum Speed	 75 Kmph **Single Stack**	 100 Kmph **Double Stack**
Grade	**Up to 1 in 100**	**1 in 200**
Curvature	**Up to 10 degree**	**Up to 2.4 degree**
Traction	**Electrical(25 KV)**	**Electrical(2x25 KV)**
Station Spacing	**7-10 Km**	**40 Km**
Signalling	**Absolute/Automatic with 1 Km spacing**	**Automatic with 2 Km spacing**
Communication	**Emergency Sockets/Mobile Train Radio**	**Mobile Train Radio**

II. TRACK CONSTRUCTION MACHINE

A New track laying machine is a work train that consists of many units of machinery and materials required for new track laying projects.

To minimize the manual track laying time in a project, NTC is used to automate the laying process. The NTC is designed to lay sleepers and rails on a newly constructed track bed. A self-contained gantry, travelling at top these wagons, transports new sleepers from trailing supply wagons to conveyor belt and help put sleepers on conveyor of NTC. Supply wagons carry 260m rail panels and sleepers from the depots and deploy them on to the track.

NTC

A. Truss beam
B. Reception wagon
C. Transition wagon
D. Supply wagon

Truss Beam reception wagon transition wagon supply wagon
64.5' (19.6m) 60' (18.25m) 75' (22.85m)
45730 lbs (20.75 ton)
Total length of Truss + Reception + Transition – 199.5' (60.7m

NTC KEY COMPONENTS

✓ Conveyors,
✓ Rail delivery hoists,
✓ Rail guide rollers,

- ✓ Rail pullers,
- ✓ Tie layer,
- ✓ Tie spacer,
- ✓ Bissel + Crawler,
- ✓ Gantries,
- ✓ Power unit (Reception wagon),
- ✓ Jupiter operating system

TRUSS BEAM

Truss beam comprised of sleeper mechanism (sleeper conveyors to deliver sleepers, tie layer, tie spacer), rail handling mechanism (rail rollers, rail clamp, rail gauging, and rail liners to position the new rails on top of the sleepers).

RECEPTION WAGON

Reception wagon consists of a power house, rail handling roller to thread the rails on to the truss beam.

TRANSITION WAGON

Transition wagon consists of rails pullers and rail handling rollers to deliver the new rails on to the reception wagon.

SUPPLY WAGON

Supply wagon carries set of sleepers and panel of rails, sleepers and rails are loaded on to the supply wagon from depot in advance.

PROCEDURE FOR TRACK LAYING

The formation and ballast bed of 200mm thickness in two layers of 100mm each duly compacted on formation is laid in advance according to the track geometry, as per the track geometry the centre line of horizontal alignment at 20m distance (for straight) & 10m (for curved) as per approved track coordinates is marked as a reference line with a paint lime on ballast bed.

The NTC machine is guided by the crawler at the front. Using the alignment pointer, the truss beam is guided along the alignment line. Crawler can be raised/ lowered and steered using the omnex remote. The gantry car is attached to the top of the NTC, these cranes run along the special side rails on the train. These special rails (bridges) are connected between wagon cars allowing operators to travel along the entire length of the train. The cranes are used to transport the new sleepers into the working area.

Sleepers and rails are loaded on to the supply wagon with a Maximum of 2580 sleepers and 12 LWR's from depot in advance. Rail stoppers are provided at both the ends to ensure safety. Using rail pullers at the end of transition wagon, rails are pulled from supply wagon and are guided to reception wagon and to truss beam through rail handling rollers and rail clamps. Rail clamps are manually controlled through omnex remote.

Rails on either side at one end are clamped to the dozer. The dozer is made to move forward for a distance on 260m (one panel) and rollers are placed at every 6m distance under the rails for protection of rails, At the other end the rail is fish bolted with parent rail with a temporary fish clamp.

The new sleepers which are delivered by the cranes feed into the machine through conveyor belts. The conveyor belt is operated through the Jupiter operating system. manual control is accomplished by omex remote. The sleeper laying mechanism centres the sleepers and roles down through the rollers on to ballast. Before dropping of sleepers, rubber pads are placed on the sleepers from pad installation station.

Tie layer lifts the sleepers from conveyor belt and places on to the ballast bed. Tie spacing is controlled by the operating system Jupiter, and the specifications are already encrypted. When the sleeper is placed on the track surface, the sleeper spacer mechanism will lower the square-up (Tie Spacer) and pull the sleeper along the surface until its desired spacing position. Then square-up is raised and sleeper is released.

Rail clamps are used to set the line and gauge the rails as they are lowered to the sleepers. The liners can be made to move right / left, up / down using a gauge liner joystick.

The rails are temporarily fastened to the sleepers at every 6^{th} sleeper by hand applicators. After the complete movement of NTC, ERC clips are fastened completely by clip applicator.

Ballasting of track is done with BRM (ballast regulating machine) after completion of skeleton track as per parameters. Small lengths 260m panels are converted into LWR with mobile flash butt welding. Corrections for vertical and horizontal alignment, spacing of sleepers, ballast quantity, gauge corrections are done with Tamping Machine. After achieving complete track parameters, all the ERC clips are removed fastened again at de-stressing temperature.

Parameters of track alignment are.
Minimum thickness of ballast bed: 200mm -20mm
Sleeper spacing: 600mm +/- 10mm
Squaring of sleepers: +/- 5mm
Track gauge: 1676mm

III. CONCLUSION

New track construction projects are being implemented in many regions of the world. The dfcc will contribute the Indian economic development by freight transportation and can also accelerate the economic development of the country. This method of construction is very fast compared to manual track laying, these machines can lay a track of 1.5 km in a day. Mechanised construction is helpful in reduce of man power with increase in efficiency and higher quality can be achieved. Laying tracks using the continuous action assembly line method has proven to be the most cost efficient method of work. Accuracy and high working speed are outstanding features.

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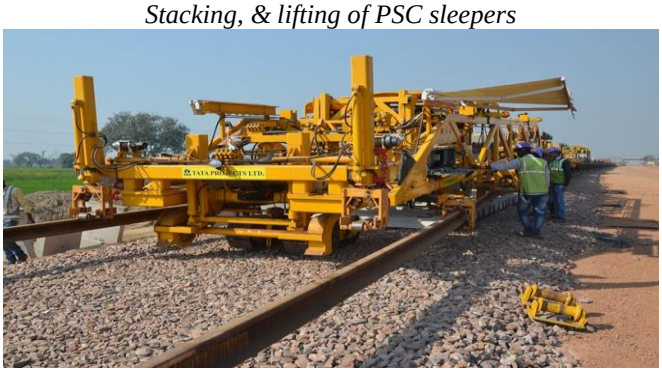
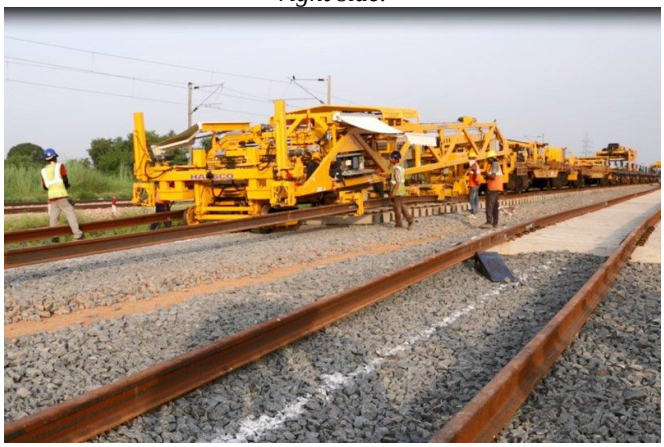
PORTRAITS

Stacking, & lifting of PSC sleepers



New track laying machine

New Track Laying machine with Jupiter control system on right side.



NTC track laying

Track laying with the help of centre line

Tamping machine

Ballast regulating machine

Mobile flash butt weld machine

RAIL PULLING ACTIVITY BEFORE WELDING PROGRAMME

Weld management system

Track handling tools

Omex remote for operation and control of NTC machine.

NEW ABBREVIATIONS

NTC	New Track construction machine
CWR	Continuous Welded Rail – LWR strings having been welded together to form a continuous welded track
FBW	Flash butt Weld – An automated method of fusing rails end to end using electrically generated heat
Formation	The top layer of the earthworks foundation inclusive of Sub-ballast (Blanket) on which 200mm ballast is laid. The skeleton track is laid over this ballast bed.
LWR	Long Welded Rail – Lengths of rail made up by Flashbutt welding a number of short rails end to end to form over 260/261 M string of rail. Short rails to be welded can vary from 13 m to 87m to form 260/261 m rail panel.
Neutral Temperature	The range of rail temperatures at which the rail is considered to be in a stress-free state.
NTC	New Track Constructor - A machine that places sleepers onto the formation than threads rail onto the sleepers and has the capability of pulling 260 m rail panel from attached material train.
Railhead	The leading edge of the skeleton track.
RRV	Road Rail Vehicle
Set Normal	Indicates that turnout points are set for the straight through direction
Short Rails	12/13 m maximum length of standard UIC 60kg/m rail. Length can be as long as 87 m single piece
Skeleton Track	Rail laid on sleepers placed on the formation/ballasted bed clipped or unclipped prior to placement of further

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	crib and shoulder ballast
Proceed Authority	An Authority issued by the Traffic Controller allowing a Train or Track Machine to proceed from the specified point to another within Train Control Territory.

REFERENCES

[1] Genesis of DFCCIL http://dfccil.gov.in/dfccil_app/About_Us.
[2] Upgraded Dimensions of DFCC http://dfccil.gov.in/dfccil_app/Salient_features.
[3] Track Construction Machine components HORSCO NTC MANUAL.
[4] Photographs at Tata Aldesa (JV) site.