

# A Review Paper on Western Dedicated Freight Corridor

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**Abstract** - To have the option to foster the western dedicated cargo Corridor (WDFC), India could look for new transportation routes along the corridor to best use its ability and productivity in the transportation of freight. For such a large-scale project, modern technologies are used. Dedicated Freight Corridor Corporation of India Ltd. (DFCCIL) was created in 2006 as part of the development of the DFC concept. Indian railroads have been one of the main drivers of the quickly developing Indian economy. The study analyses and interprets such technologies used and their future implications, the challenges that will be faced and conducted to face those challenges. It is to be noted however that the project being an ongoing phenomenon the details in this study are limited to the material available when the study was being conducted. It has been found out that the operations taken by the government are not only influencing the development of freight corridor but there is also focusing on sustainability and environment conservation.

**Key Words:** concrete sleeper<sup>1</sup>, Fastening clip (ERC)<sup>2</sup>

## 1. INTRODUCTION

Indian railways are constructing an extensive-gauge freight hall known as the western dedicated freight corridor (WDFC). It will connect Dadri close to India's capital, Delhi with India's monetary hub, Navi Mumbai. This corridor will cover a distance of 1504 km and would be electrified with double line operation. In the DFC, additional rail transport capacity will be created, operational efficiency will be improved, the cost of operations will be reduced, and the volume of freight traffic will increase. A Preliminary Engineering and Traffic Survey (PETS) has been undertaken by RITES Limited for the Ministry of Railway (MoR) on both the Eastern and Western corridors [1].

**Table- A.** Route passing through state's

Western DFC	
Haryana	177
Rajasthan	567
Gujarat	565
Maharashtra	177
Uttar Pradesh	18
Total	1504

In comparison to the existing axle load of 25t on Indian rail tracks, this track has a capacity of 32.5t. The trains going for walks on the western DFC could be 7.1 m-excessive, 3,660mm-huge, and someplace inside the variety of 700m and 1,500m-lengthy [2]. They will have a conveying limit of 15,000t each. Dfccil is an altogether possessed association of the service of railroads enlisted under the association act 1956 and was joined on 30th October 2006. The service of the rail line has set out upon a long-lasting period key intend to collect unreasonable usefulness, extreme speed, devoted cargo passages close by the brilliant quadrilateral and its diagonals. In the first phase of this plan dfccil has been entrusted with the obligation of production, maintenance, and operation of two corridors – Eastern Corridor from Ludhiana to Dankuni with Dadri-Khurja link and the Western Corridor from Dadri to Jawaharlal Nehru port - in favor of all connected framework, to permit Indian railways & distinct licensed operators to run their freight trains. The DFCCIL has adopted a Corporate Social Responsibility Policy, a Corporate Environmental Policy, and a Carbon Policy [2].

## 1.1 Genesis of DFC

The 10,122 km extensive brilliant quadrilateral, interfacing the four metropolitan towns of Delhi, Mumbai, Chennai, and Kolkata, alongside its diagonals (Delhi-Chennai and Mumbai-Kolkata) comprises 16% of the Indian rail line (IR) people group. It conveyed fifty-two% of the traveler guests and 58% of the cargo guests. Indian monetary framework is uncommonly subject to some center areas, in particular, coal mining, power, steel, manure, concrete creation, and oil. twice the GDP blast. Yet, inside the past, it has been limited, between nothing. 8 to one, because of capacity imperatives. This requirement for potential achieved the origination of DFC at the western and Japanese over-the-top thickness hallways. The task becomes presented inside the railroad spending plan for 2005-06. An exceptional thought process vehicle (SPV), "Devoted Freight Corridor Corporation of India Limited (dfccil), to attempt to make arrangements and advancement, Mobilization of monetary sources and creation, security, and activity of the committed cargo passages became consolidated as a business underneath the organizations acts 1956, on 30th October 2006." [1].

Wdfc transformed into as a matter of first importance proposed to utilize a diesel foothold machine, later it transformed into changed to an electric balance machine later the jica take a gander at contemplated that it was more critical moderately unobtrusive inside the long stretch. This is expected to lessen the co2 emission by 457 mt in a duration of 30 years wdfc might have moving dimensions made for double-stacked bins (7. 1 meter). Transferring passengers to excessive-pace traces permits typical railways to keep several freights, which is lots worthwhile for railway [2].

By using constructing an HSR system, the Republic of India will broaden partner autochthonous excessive-velocity railroading alternate. HSR is positive to adorn monetary usefulness and battle about the long haul through the utilization of expanding the vehicle capacity of rail lines and connecting work markets [3].

## 1.2 Concrete Sleepers

Substantial sleepers are fake by means of the use of cement with inward support. Concrete sleepers are utilized in many nations due to their excessive balance and small maintenance. These are more suitable for high-speed rails. The greater part of the substantial sleepers is created from pre-anxious cement in which internal tension is welcomed onto the sleeper prior to the project. Consequently, the sleeper withstands properly in opposition to excessive external strain [4].

The sleepers to be utilized should be spending plan well disposed, i.e., They ought to have the least reasonable beginning and insurance costs. They should have moderate weight, for the simplicity of making do. The setup of sleepers should be so much that the action, game plan of the track, and levels of the rails can be without inconvenience changed and kept up with. The remarkable masses present strain waves in the sleeper, the speed increment of the sleeper presents inertial powers, and the extreme pressure rate changes the surface homes of the significant [5]. Sleeper normal span of 2750 mm and has a trapezoidal cross-segment having a width at top of 154mm, at the rear of 250 mm, and the pinnacle of 210 mm on the rail seat. The gifts which may be required from a present-day sleeper are utilized in rail course tracks nowadays.

- Spread wheel loads to the ballast
- Hold rails to gauge and inclination
- Transmit lateral and longitudinal forces
- Insulate rails electrically
- Provide a base for rail seats and fastenings

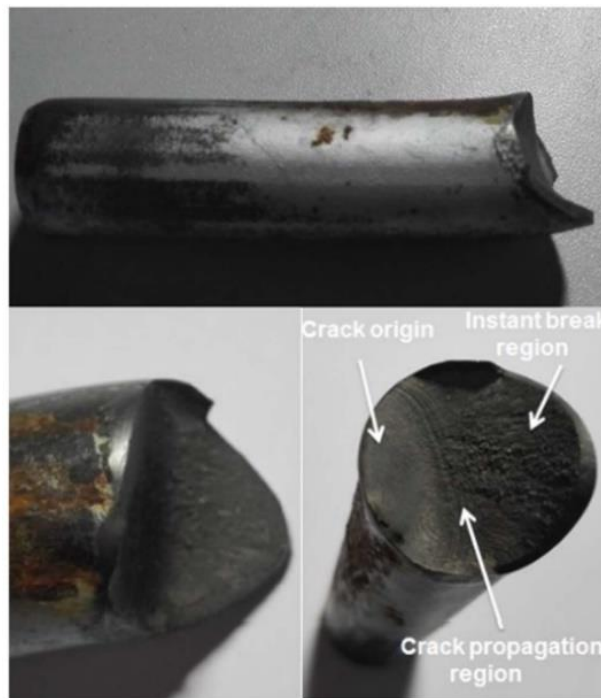
The layout assessment of the SGCI rail insert used in concrete sleepers through the Indian railways has been finished. The pressure evaluation of the insert underneath its running conditions for extraordinary powerful load cases has been achieved [3].

## 1.3 Rail clips

The greater part of the substantial sleepers is created from pre-anxious cement in which internal tension is welcomed onto the sleeper prior to projecting Rail clips are designed with excessive precision and made up of premium-grade spring metallic. Rail anchor and rail brace are designed to preserve metal rail in the vicinity and make sure rail protection. The static assessment is utilized to examine the strain and stress by means of the utilization of the non-direct touch thought, and the powerful examination is utilized to break down the vibration mode and consonant reaction in the supplier country. A huge examination was completed for skill in the lead of rail latches [4].

Zhao et al. Dissected the effect of the securing model at the over-the-top recurrence dynamic touch powers at solitary rail surface deformities [4].

J. Smutny et al. Developed a brand-new approach to the use of time and frequency-associated changes to evaluate the response signals acquired with the aid of rail fastening evaluation. They accomplished research center estimations and dynamic and acoustic boundary investigations of bendy affixing. The fractured floor will be certainly divided into three areas inclusive of crack starting, crack propagation region, and instant damage place [4].



**Fig - 1:** The fractured fastening clip

J. A. Casado et al. Executed a weariness test at the latch structures and proposed a model for the character of the fundamental circumstances dependent on the advancement of various boundaries during the exhaustion way, along with removal, solidness, and temperature [2].

D.J. Thompson et al. Estimated the vertical and parallel unique solidness of rail latch frameworks under preload inside the scope of 100-1000 Hz and explained the effect vibration at higher frequencies at the firmness of clasp structures [2].

Shang. Brokedown the impact of rail grooves on the most identical strain of rail affixing cut [2].

Luo. Investigated the powers of e-kind attaching cuts with the use of the limited detail approach and concentrated on the outcomes of hardness and leftover disfigurement at the clasping tension of the affixing cut [2].

Yu et al. Alluded to the static and weakness execution of securing cut x2 under one-of-a-type cinching powers and found the pressure conveyance example of the attaching cut. He moreover examined the weakness life of the affixing cut and the area of basic weariness disappointment factors under exhaustion stacking. Likewise, keeping up within view the material nature, the compound synthesis examination and sem (checking electron magnifying lens assessment) affirmation, metallographic investigation, and hardness discovering had been executed via a few specialists and they believed that the break of an affixing cut is fundamentally due to the microstructure insufficiencies [2].

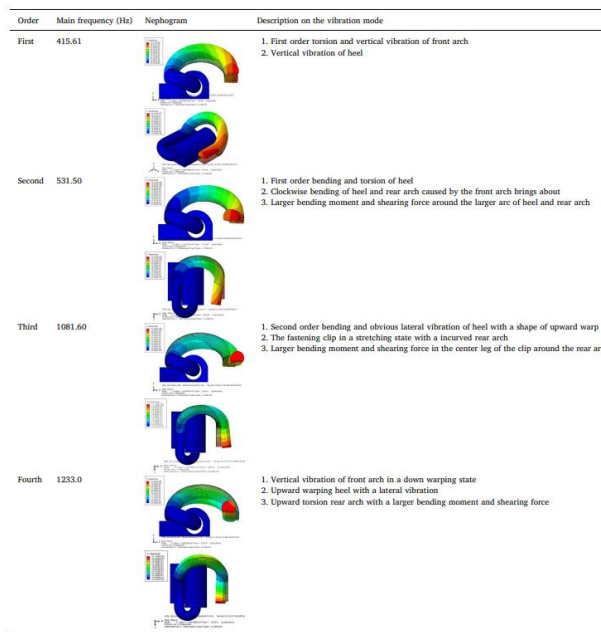


Fig -2: Analysis of the vibration mode of fastener

## 2. RESULT

Diminish the unit cost of transportation through accelerating cargo train tasks and better efficiency. Create extra rail infrastructure to cater to excessive ranges of shipping demand. WDFC will use an electrified traction system that's why the reduce CO2 emissions. It will load 32.5 tons of increase from 22.9 tons of axle load on DFCs. The modern most pace of seventy-five km in line with hour will go as much as a hundred km consistent with hour. Most of 5,000 heaps are carried on the current rail course tracks. A train on DFC can pass on 13,000 tons [5].

The von mises same pressure of 1212 is not really set in stone inside the little back curve, which is more noteworthy than the yield energy of fabric:1176 MPa.The von mises identical tension pointedly increments to 1200 Mpa at the clasp relocation of 7 mm later which scarcely will develop with an expansion in cut dislodging. That is because of the reality while the clasp removal is > 7 mm, the von mises equivalent strain surpasses the yield power, because of this, the tension solidifying of substances arises. It's far referred to that inside the instance of d > 2 mm, the clasp cinching power scarcely diminishes, and the von mises same pressure nearly stays strong with the expanding distance. If d < 2 mm, more modest d closures in a diminished clasp bracing pressure and a superior von mises same tension, that is because of the strain center inside the little curve of the securing clasp and addition of iron posterior plates [4].

Table- B. The statistical results of rail corrugation tests.

	Wavelength range (mm)			
	10-30	30-100	100-300	300-1000
Mean depth ( $\mu\text{m}$ )	2.4	22.9	15.6	102.6
Out of limit (%)	0	93	10	25

Later the entertainment, for the 3 sorts of embankment soil kind and five extraordinary heights, the outcomes have been integrated with the negligible security part of 1. 30 as a kind of perspective. Outcomes got in pressure examination of supplement sooner than and later streamlining for the 3 burden examples. For the primary load case, the most vonmises (s-equal) pressure within the insert has been determined as 17. 3e 7 n/m<sup>2</sup> (tensile). For the second load case, the maximum vonmises (s-equal) strain inside the insert has been located as 604. 0e 7 n/m<sup>2</sup> (tensile). For the primary load case, the maximum von mises (s-equal) pressure within the insert has been determined as 183. 0e 7 n/m<sup>2</sup> (tensile). The contrast of stress evaluation results in an assessment of stresses has been shown within the following tables from table 1 to Table 3 for the insert version embedded within the sleeper model thinking about all the 3 effective load instances [3].

**Table- 1.** for load case 1

Maximum Principal stress (N/m <sup>2</sup> )	Minimum Principal stress (N/m <sup>2</sup> )	Maximum Vonmises stress (N/m <sup>2</sup> )	Minimum Vonmises stress (N/m <sup>2</sup> )
11.3E 7(T)	2.09E 7(C)	17.3E 7(T)	11.13E 3(T)

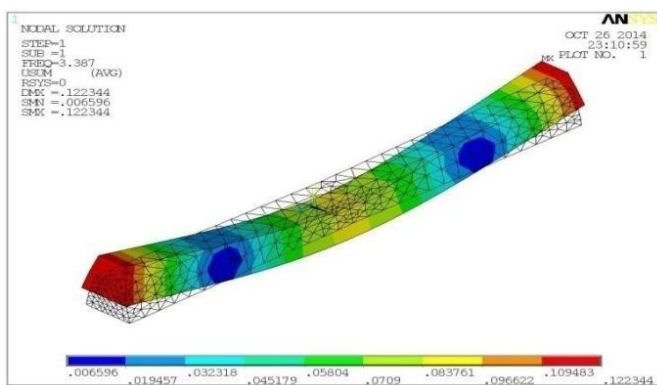
**Table- 2.** for load case 2

Maximum Principal stress (N/m <sup>2</sup> )	Minimum Principal stress (N/m <sup>2</sup> )	Maximum Vonmises stress (N/m <sup>2</sup> )	Minimum Vonmises stress (N/m <sup>2</sup> )
609.8E 7(T)	58.6E 7(C)	604E 7(T)	42.091E 3(T)

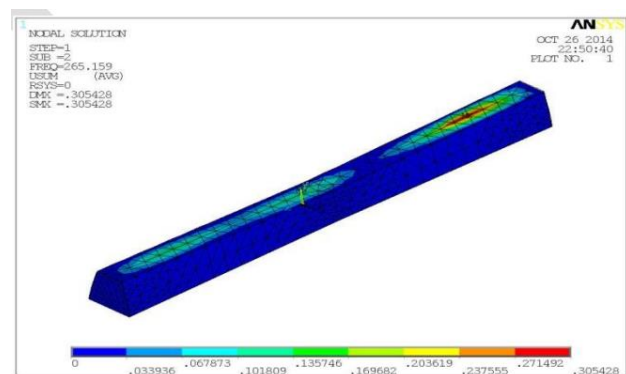
**Table- 3.** for load case 3

Maximum Principal stress (N/m <sup>2</sup> )	Minimum Principal stress (N/m <sup>2</sup> )	Maximum Vonmises stress (N/m <sup>2</sup> )	Minimum Vonmises stress (N/m <sup>2</sup> )
195.0E 7(T)	26.1E 7(C)	183.0E 7(T)	15.638E (T)

The 3 load times it is able to be located that in load case 2, the rail insert is subjected to the most quantity of stresses in comparison to the opposite effective load instances. For this reason, load case 2 can be used because of the worst nation of stress circumstance for improvement within the design of the rail insert. This load case can also be taken into consideration for the layout optimization of the rail insert. The upward dislodging is most extreme on the rail seat with a cost of 21.165 mm. The most extreme equivalent pressure cost is 4839 n/mm<sup>2</sup> which is not set in stone on the rail seat. The lowest essential frequency acquired in the sleeper in unfastened-unfastened circumstance this situation is 3. 3871 Hz with the most displacement of zero. 122344 mm on the rail seat ends [4].



**Fig -3:** Sleeper in Free-Free criteria



**Fig -4:** Sleeper in In-Situ criteria

The least essential recurrence got in Sleeper In-situ condition this condition is 261.65 Hz with a most extreme Displacement of 0. 308046 mm near the center of gravity of the highest level of the sleeper.

The responsibility case recommends that the absolute last places of the sleeper's show seat are impacted. The sleeper form found the confounded cooperation among the sleeper and the fundamental weight and showed that the impact of the instruct wheel on the sleeper and the internal balance happens as it goes through the sleeper. The vibration attributes of the railroad significant sleeper are fundamental for the progression of sensible special styles of rail course tracks similarly as considerable

sleepers, which may be prepared to depend on its dynamic reaction. It has been seen that the full recurrence helps limit circumstances identified with the lower method of vibration of the precast substantial sleeper are impressively impacted [5].

The herbal frequency of in-situ situations had a sizable impact on modal damping. Two kinds of conditions were considered, and it has been observed that the natural frequency inside the free-variety function is a good deal decrease than inside the in-situ circumstance which is considered a ballast help function [2].

### 3. CONCLUSIONS

The Eastern and Western devoted freight corridors include 22% of general IR traffic.

The length of trains will be extended from 700 m to 1500 m and passing on breaking point will increase from 5000 tons to 13,000 tons/train. The constructions on Western Corridors are planned to pass on two overlay Stack Containers. The unit cost of shipping is also anticipated to lower by way of 40%.

Most cargo between Delhi to Mumbai or Delhi to Kolkata, which takes a few days to arrive at its goal currently will take under 24 hours when the DFCs come on the web. Further, the study gives us an idea of how the DFC would change the freight transport scenario of our country and its role in the logistics of India.

This project will definitely be beneficial for me, and I am grateful that I got to experience so many things.

### REFERENCES

- [1] Agarwalla, S. K., & Raghuram, G. (2012). Structuring the Dedicated Freight Corridor Project, A Lost Opportunity.
- [2] Chinna, P Rajan & Karthikeyan, Aravindaraj. (2019). A Contemporary on Recent Development Activities and Challenges in Logistics Sector in India.
- [3] Nag, B., Singh, J., & Tiwari, V. (2012). Choosing the appropriate project management structure, project financing, land acquisition, and contractual process for Indian railway mega-projects: a case study of the Dedicated Freight Corridor project. *Journal of Project, Program & Portfolio Management*,
- [4] Pangotra, P., & Shukla, P. R. (2012). Infrastructure for Low-Carbon Transport in India: A Case Study of the Delhi-Mumbai Dedicated Freight Corridor. *Low Carbon Transport in India Project*.
- [5] Dhar, S., & Shukla, P. R. (2015). Low carbon scenarios for transport in India: Co-benefits analysis.