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A REVIEW ON HIGH SPEED TRACKS

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ABSTRACT

This paper presents that currently, a lot of high-speed tracks are being constructed. Despite the continued popularity of ballasted tracks, more and more slab tracks are being built. They offer several benefits such as low maintenance requirements, high availability, short construction heights, and light weight. This study places a lot of focus on using non-ballasted principles for high-speed operation. The interaction of the slab with the soil and its optimization in terms of bearing capacity are given special consideration.

KEYWORDS: High-speed tracks and classic rails

INTRODUCTION

India's first high-speed rail corridor, was initiated in 2017 and is expected to be completed by 2028. The foundation stone ceremony was held on 14 September 2018 when Japanese Prime Minister Shinzo Abe and the Prime Minister of India, NarendraModi, flagged off the construction work in Ahmedabad. The JR East/Hitachi E5 Series Shinkansen trains will be used in this line. It will have a maximum operational speed of 320 km/h and an average speed of 260 km/h.

It requires specialized ground infrastructure that is expensive to install and maintain but greatly aids in effective land utilization. The guiding system is provided by the rails. They enable the train to move very quickly by directing the direction of the railway. However, this prevents trains from passing one another. A steel wheel contacting a steel rail is referred to as having low grip. Although the train glides along the track, it is exceedingly challenging to stop, brake, or handle severe hills. This makes it possible to carry very big goods with little environmental impact. Rail can only be a commercially viable and financially feasible mass transit system due to the enormous investment needed. This is fortunate because it is often a heavy item.

Factors like life cycle cost, construction time, availability, and durability become more crucial while designing railway lines. Non-ballasted track ideas have good prospects in this regard. Especially with high-speed operation wave propagation under train velocity is an important factor, in delta areas with relatively weak sub grades.

Fig-1: High-speed track

When compared to normal or classic rails, the requirements of classic rail system is similar to high speed rail i.e.,

- Ability to accommodate various contexts and cultures.
- Interoperability
- Capacity
- Reliability
- Safety and security
- Sustainability

DESIGN OF HIGH-SPEED RAIL RACKS

The speed at which a train can travel is limited by the type of rack it travels on. Bringing high-speed rail to north America will requires new high-speed lines that can accommodate frequent 200+ mph service. These new high-speed segments connect to and enhance our existing rail network. Modern trains can transition smoothly from slower tracks to faster tracks. On regular track, they simply move more slowly. At most, the standard freight lines that currently crisscross the United States can carry passengers at 90 mph. On tracks used by freight trains, trains are often restricted to 79 mph or less and cannot reliably travel faster than 90 mph.

Passenger and freight tracks ought to be segregated if the speed limit is higher than 90 mph. Diesel-powered trains may go up to 125 mph on a dedicated passenger track (with sporadic passing sidings). Now, this is how Amtrak service through Michigan works.

Safety laws demand the removal of grade crossings for speeds more than 110 mph, and overhead electric power should be used for speeds greater than 125 mph. The only factors that can affect speed are the degree of tightness of curves and the steepness of hills on dedicated passenger tracks that are grade-separated and electrified. As a result, high-speed lines are frequently straight and level.

We can start to see the substantial savings in travel time that make high-speed rail competitive with flying and driving by developing segments of high-speed line that are long enough to let trains travel at a high speed for major sections of their voyage.

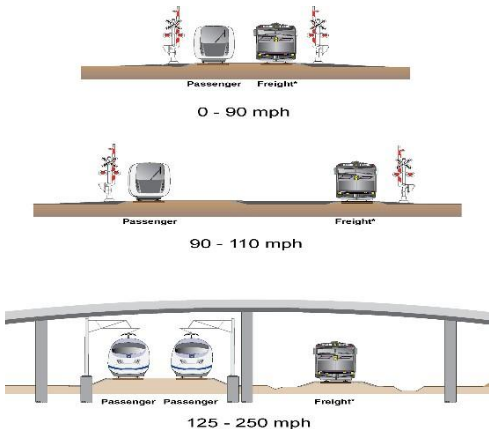

Fig-2: Design of speed track

According to the Ministry of Railways, a route which has trains operating between 160 and 200 km/h (99 and 124 mph) is considered as a higher speed or semi-high speed rail line, while the routes operating at less than 160 km/h (99 mph) are considered to be conventional rail lines.According to the UIC definition, a commercial speed of over 250 km/h (160 mph) for a new build line or 200 km/h (120 mph) for an upgraded line is considered to be high-speed.

Speed	**Type**	**Length**
<160 km/h (99 mph)	Conventional rail	60,077 km (37330 mi)
< 160 and < 200km/h (99 and 124 mph)	Semi-high-speed rail	403 km (250 mi)
>200 km/h (120 mph	High-speed rail	508 km (316 mi) (under construction)

Table-1: Comparison of different rail system speeds

NETWORK OF HIGH-SPEED RACK

The networks are proposed to have top speeds of 300–350 km/h, and are envisaged to run on elevated corridors to isolate high-speed train tracks and thereby prevent trespassing. The current conventional line between Amritsar-New Delhi and Ahmedabad-Mumbai runs through suburban and rural areas, which are flat and have no tunnels. The Ahmedabad-Mumbai line runs near the coast and therefore, has more bridges, and parts of it are in backwaters or forests. The 1987 RDSO/JICA feasibility study found the Mumbai-Ahmedabad line to be the most promising.

The world's longest network high-speed rail networks are:

On feb-2020, kilometers of high-speed rail track in operation by country wise,

- **China --- 35388 km**
- **Spain ----3330 km**
- **Japan ---- 3041 km**
- **France --- 2734 km**

CONSTRUCTION OF HIGH- SPEED TRACK

- **Germany--- 1571 km**
- **Finland--- 1120 km**
- **Italy---- 921 km**
- **South Korea---- 893 km**
- **United states ---735 km**
- **Turkey ---594 km**

Finland has no dedicated high- speed rail lines but sections of its rail network are capable of running speeds of 200 km/h (124 mph).

There is different machine are used to construct the railway tracks. They are:

- Mega carrier
- Launcher machine or transporter
- Gantry
- Full spam launcher machine

Fig-3: Construction of rail rack

- By moving along an already-launched girder while positioning the following girder, these vehicles may carry an entire girder. Compared to India's prior girder launching mechanism, the speed was seven times faster.
- The prior Indian girder launching system launched one and a half girders per week, compared to the Chinese machine's two girders per day.
- The NHSRCL had posed a challenge to build such machines for L&T which is currently constructing the 325 km stretch of Mumbai-Ahmedabad line.
- Each of these machines would cost around ₹70-80 crores, and 30 such machines would be required to construct 237 km stretch within next four years as told by managing director of NHSRCL, AchalKhare.

ADVANTAGES OF HIGH-SPEED RAIL

- Building high-speed rail will create hundreds of thousands of jobs.
- It increases economic activity.
- It reduces the congestion and increases productivity.
- It reduces the nation’s dependence on foreign oil.
- It expands the travel choices and improves mobility

CONCLUSION

Nowadays the development of quality and precise design documentation is not possible without computer technology using 3D variant solutions. The project design documentation contains many complex structural objects required for the railway operation and crossing with other modes of transport (bridges, tunnels, railway stations, terminals, intermodal terminals, humps, and others.

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