

Review on Monorail Technology

Dighe Onkar¹, Sayyad Asif², Gayakwad Shivaji³

(Mechanical Dept, Sharadchandra pawar college of engineering dumbarwadi, Maharashtra)

Abstract: *The historical backdrop of Monorail is an entrancing story of advancement by governments, organizations, business visionaries, transportation intrigue gatherings, scientists, and people. Today there are more than 100 establishments of different sorts and setups all through the world and a lot more are under development or are being considered. Taking a gander at the situation of India, if the plans take off, India will turn into the monorail capital of the world. In ongoing year Government of India's Ministry of Urban arranging and advancement had pronounced 100 brilliant urban communities everywhere throughout the India. This fantasy can't be finished without advancement of Maas Rapid Transit System (MRTS) in the city. For improvement of MRTS in the city, the viability of different MRTS must need to check economically, financially and earth. The contextual investigation of Mumbai Monorail checks the reasonability of framework in previously mentioned ways and it gives acceptable outcomes. The investigation indicates advantages of monorail in correlation of different MRTS. It likewise expounds the reason and solutions for time delay in undertakings In Mumbai Monorail study, it is seen that a few exercises like utility preoccupation, recovery and resettlement will complete before genuine execution of work will help in limiting time delay. This will be further valuable in development of MRTS in different urban communities in booked time.*

I. Introduction

Mass Rapid travel is a high limit open transport framework affectionate in urban territory. Mass Rapid travel framework (MRTS) assume a significant job in advancing urban improvement. All through India various mass quick travel frameworks have been actualized into the different metro urban communities that incorporates rural railroad, Metro rail, Light rail travel (LRT) in number of sorts, Monorail and BRTS. When one thinks back ever, one is overpowered by the phrasing, abbreviations and innovations that have advanced throughout the years. As a beginning stage, it is most likely proper to characterize a Monorail. "A solitary rail filling in as a track for traveler or cargo vehicles. By and large rail is raised, however monorails can likewise keep running at evaluation underneath grade or in tram burrows. Vehicles are either suspended from or straddle a tight guide way. Monorail vehicles are more extensive than the guide way that bolsters them. Train sets ought to have a base traveler limit of 40. PRT frameworks are prohibited. The significance of transportation on the planet advancement is multidimensional. It joins living arrangement with work, great maker with the clients. It likewise gives choice to work, shopping, entertainment, wellbeing, training, and different luxuries. Urban Transportation framework is gazing upward as transport request in most Indian urban communities. It has expanded because of increment in populace because of relocation from country zones and littler towns to urban communities. Transport in India must be an incorporated and differing framework with different methods of transport – transports, metro, monorail, private transport frameworks. For the most part transports running in blended rush hour gridlock can't keep up their timetable. In greatest piece of India there are no select transport paths. The transportation that really keeps running for development inside a city (railroad, transport, taxi, and so on.) must almost certainly give stable transportation administrations to clients without stressed accounts, while running productively in the meantime. Transportation where portability itself is one of the targets, transportation where venturing out to the goal is itself the goal, transportation that is pleasant, calm, and agreeable is point of view of transportation the traffic in the city is expanding step by step because of increment in populace and ill-advised town arranging which is making city not fit to live. We have to give an answer for this by giving enhanced transportation method. Monorail is an extraordinary mass travel framework which can be placed up in any blocked and swarmed city inside couple of years for straightforwardness and safe transportation, without loss of time.

As the name infers, monorail is a vehicle framework that keeps running on single rail as against metro rail that keeps running on 2 rails like every other train Mumbai is good to go to make history. India's budgetary capital will before long observe a spic and span method of transport – The Monorail. For as far back as few days, the charmingly shaded Monorail has been doing rounds at regular intervals among Chembur and Wadala; a lot to the fervor of Mumbaikars. The whole city has been anticipating the dispatch of this fresh out of the box new method of urban transport; which has just turned into all the rage. Both, the Mono and Metro Rails will share the weight of rural rails and will help give increasingly agreeable voyage inside the city. The East-West network offered by the Versova Andheri-Ghatkopar Metro hallway and the accessibility of a Monorail from

Wadala to Chembur which zones are not associated with rail-based transport will doubtlessly be invited by the city. The principal period of the Monorail – from Wadala to Chembur, a 8.93-km extend – is currently prepared. The Mumbai Metropolitan Region Development Authority (MMRDA) is, hence, glad to grandstand the advancement accomplished up until this point. The development of the switch-deck at Chembur, specifically, was an achievement in itself as the region is too blocked combined with clamoring traffic and person on foot action. The development on RC Marg was one more test. Be that as it may, the help from the nearby inhabitants, neighborhood agents and incredible collaboration from the MCGM and Traffic Police made the undertaking simple. Presently, that the wellbeing authentication is prepared and without a doubt, the Monorail will be charged soon.

II. History

The principal monorail was made in Russia in 1820 by Ivan Elmanov. Endeavors at making monorail options in contrast to customary railroads have been made since the early piece of the nineteenth century. Around 1879 a "one-rail" framework was proposed freely by Haddon and by String individual, which utilized a rearranged "\/" rail. The framework was planned for military use, but at the same time apparently had nonmilitary personnel use as a "modest railroad." The principal half of the twentieth century saw many further proposed structures, that either never left the planning phase or stayed as fleeting models. One of the primary monorail frameworks arranged in the United States was in New York City in the mid-1930s. In any case, the monorail was cleaned rather for a raised train framework. Some trust that the underlying work on monorail started during the 1950s when General Motors was doing in-house inquire about on computerized interstates and different organizations were creating thoughts on frameworks utilizing driverless vehicles on discrete guideways. In the late 1950s, the New York City Transit Authority tried different things with mechanized activity for quick travel in a task called the "Bus Automatic Motorman" (SAM). In the late 1960s, WABCO engineers built up a completely robotized adaptation which was introduced at the Houston Airport in 1972. Amid this equivalent period, Charles Paine framed the American Crane Hoist Company and one of the targets of his organization was to build up a suspended monorail framework for the Los Angeles Fairgrounds in 1962 and the 1964-65 New York World's Fair. Out of his experience came the Braniff Airlines' Jetrail framework. It was a completely mechanized suspended monorail framework at Dallas Love Field Airport that associated a remote parking area with the terminal building. In the interim over the Atlantic, Habegger Limited, a little family claimed Swiss firm was autonomously building up a "straddle shaft monorail" for the 1964 Swiss National Exhibition in Lausanne. Various applications chased after the world and the framework was first mechanized for Expo'67 – the world composition in Montreal, Canada. The structure demonstrated sturdy and prevalent and was the beginning of monorails that are currently offered by a few organizations.

Feasibility Of Monorail On Proposed Corridor

What Is Monorail?

Monorail is a guided travel mode with vehicles riding on or suspended from a solitary rail, pillar, or cylinder. Vehicles typically utilize elastic tires support for direction wheels.

Why Monorail?

1. Intermediate capacity guided urban transit system
2. Requires less space / footprint
3. System uses 0.80m wide beam to guide the train
4. Allow Steeper Gradients & Negotiates Sharp Curves
5. Derailment proof
6. Feeder service to Metro and Suburban systems
7. Faster transit connectivity

Technology Option For Monorail System

There are two essential classes of monorail frameworks: "Upheld" and "Suspended". The expression "monorail" is utilized to portray practically any travel framework utilizing an overhead structure and vehicles with game plans of help and direction wheels. These vehicles keep running on the outside of a fairly substantial beam.

1. To identify various causes for time delay in Mumbai Monorail Project.
2. To find out period of time delay in project.
3. To suggest the effective sequence of activities to overcome time delay.
4. Comparative studies of time delay with the help at time delay in Mumbai Monorail Project

Types And Technical Aspects

Straddle-Beam Type

The most well-known sort of monorail being used today is the straddle-shaft monorail, in which the train straddles a steel or fortified solid pillar in the scope of 2 to 3feet (0.61 to 0.91 m) wide. An elastic tired carriage contacts the shaft on the best and the two sides for footing and to balance out the vehicle. At the point when the vehicle's traveler compartment is over the running bar, and the structure remains on mono-shaft, the framework is named a bolstered or straddle type monorail.

Vehicles are upheld by vertically-arranged tires rolling a best the shaft way, with evenly situated tires squeezing against either side of the pillar approach to give solidness and direction (about 2 m high and 1 m wide). Guide ways must be grade isolated to oblige elastic tire mono-shafts and safe activity with Power rail Traction framework. At-level intersection and in-road activity are not plausible. High stages must be given at all stations. Trains are enunciated, 2 to 6 vehicle units, each can be around 15 m long and 3.00 m wide, with around 60 seats and an all-out situated and standing limit of around 200 travelers. With driverless activity, commonsense working degrees of progress can be as short as 1.25 minutes, yielding an "extreme" limit of the request of 20,000 pphpd. Mentors with lower limit (125-150) are likewise utilized by same frameworks. Monorails are characterized into straddle and suspended-type frameworks. Since the straddle-type goes by straddling the track, its focal point of gravity is arranged over the track. The suspended-type, then again, is arranged suspending from the track, with its focal point of gravity under the track. Upside on the beam two wheel for each mentor back wheel load haggle wheel drive wheel.

Hitachi has near 40 years of involvement in creating and providing straddle-type monorail frameworks as medium-limit travel frameworks to increase the customary bigger limit train and metro frameworks in urban zones. Beginning with Tokyo Monorail that went into administration in 1964, various straddle-type monorail frameworks have been sent all through Japan incorporating Kitakyushu Urban Monorail in 1985, Osaka-Monorail in 1990, and Tokyo Tama Intercity Monorail in 1998, and most as of late Okinawa Urban Monorail that started working on August 10, 2003. Swinging to the abroad market, Hitachi was likewise picked to manufacture Sentosa Express (new monorail framework) interfacing Singapore to Sentosa Island. This article features the primary highlights of Hitachi's straddle-type monorail frameworks and DTO (driverless train activity) framework.

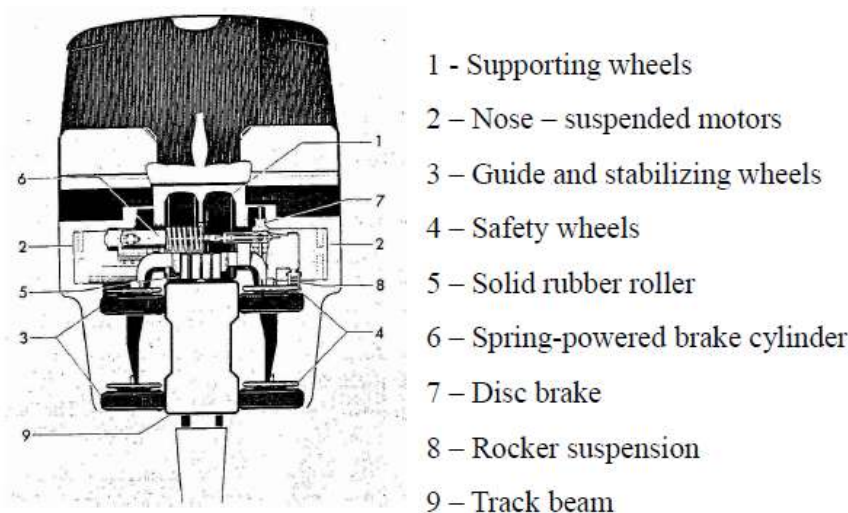


Fig: wheel arrangement of monorail with straddle beam type

Features Of Straddle-Type Monorail Systems

- 1) The development time frame to convey a monorail is far shorter than to fabricate a tram, and the development costs are more affordable; that is, about 33% for building an extensive monorail framework and one-sixth for a little scale monorail framework.
- 2) Three sizes of monorail framework with various conveying limits are accessible: the little straddle type monorail framework has a conveying limit of 79 travelers for each vehicle, the standard framework is equipped for conveying 100 travelers for every vehicle, and the extensive monorail framework can convey up to 173 travelers for each vehicle. Having a vehicle limit of 2,000 (little framework) to 25,000 travelers/h (substantial framework), they can adaptably suit a wide scope of city arranging needs.
- 3) Monorail vehicles with elastic tires can arrange soak grades (6%) and little sweep bends (40-meter bends for the little monorail). Elastic tires likewise give a calm, agreeable ride for travelers.

- 4) Monorail vehicles keep running on a straightforward guide way structure that can be conveyed in limited, restricted spaces. The restricted guide way likewise enables lighter to achieve road level than the ordinary section structures, and fits pleasantly with urban situations. The track shaft width is moderately thin extending from 700 mm for the littler monorail to 850 mm for the huge monorail, so measures to keep harm from snow are anything but difficult to execute and ordinary activity is commonly unaffected by the climate.
- 5) Cars are associated by walkthroughs as a standard wellbeing highlight, and a salvage train is accessible that can react quickly in crisis circumstances.
- 6) With near four many years of field-explicit mastery, Hitachi can bolster each part of an effective monorail organization from arranging and plan to assembling and support. Hitachi can supply the moving stock, transport the board frameworks, stage doors, and each component of an all-out transportation framework that addresses the issues of travelers and working organizations alike.

Suspended Type

The French organization safege offers a framework with vehicles suspended underneath the wheel carriage, and the wheels ride inside the single pillar. The Chiba Urban Monorail is the world's biggest suspended system. There is additionally a recorded sort of suspension monorail created by German designer's nicolaus Otto and eugenic during the 1880s. It was worked in the twin urban communities of barmen and elberfeld in wupper valley, Germany, opened in 1901, is still in task. The FAMUR offering highlights a wide scope of suspended monorail tracks for both links driven and self-propelled monorails. We offer total directing gear including straight inward, bend, change, rail capels for steel backings and rooftop catapulting, chains, rail stabilizers, switches and guards. The rails are made of standard profile I 155 (I 140E acc. to DIN) or strengthened profile PIOMA DT 175. The rails have chamfered rail joints that diminish the wear of the trains' drive wheels. In courses P-130 and P-140HD the lower rail joints are furthermore strengthened. Suspended monorail autos have 2-pivot intruders. Every bogie has four air-channel elastic tires for voyaging and direction. Helper wheel are likewise accommodated each wheel as a wellbeing insurance in the event that a tire loses air. The suspension framework utilizes air springs. The suspension joins the intruders to the body, and is made out of suspension joins, security cableways, oil dampers and plugs. the electric framework is 1500v. Suspended railroads are not a typical method of transportation. In Europe, the best-realized precedent is the Wuppertal suspension railroad opened in 1901; two models exist in Japan which is all the more eager to try different things with nonstandard rail innovation. With basically simply these three models in typical urban rail utilization, it is difficult to make speculations. In any case, I trust that the innovation is underestimated, and more urban areas ought to think about utilizing it in lieu of progressively regular raised or underground trains.

The motivation behind why suspended trains are superior to anything ordinary ones is basic: radial power. Train autos are not flawlessly unbending – they have a suspension framework, which endures some edge between the intruders and the vehicle body. Affected by divergent power, the body inclines a couple of degrees to the outside of each bend: If the train is moving far from you, and is turning left, at that point the outside of the bend is on your right side; this is the place the body inclines in the picture on the right. This is on the grounds that radiating power pushes everything to one side, incorporating into specific the vehicle body. This builds the radiating power felt by the travelers – the opposite a tilt framework does. A train is said to have delicate suspension if this level of lean is expansive and inflexible suspension in the event that it is little. It's practically indistinguishable, then again, actually now the floor of the train inclines toward within the bend, as opposed to the outside. So the suspension framework diminishes the horizontal quickening felt by the travelers, instead of expanding it. By mellowing the suspension framework, it's conceivable to give a discretionarily substantial level of tilt, restricted just by the most extreme track wellbeing estimation of horizontal increasing speed, which isn't the constraining component in urban rail.

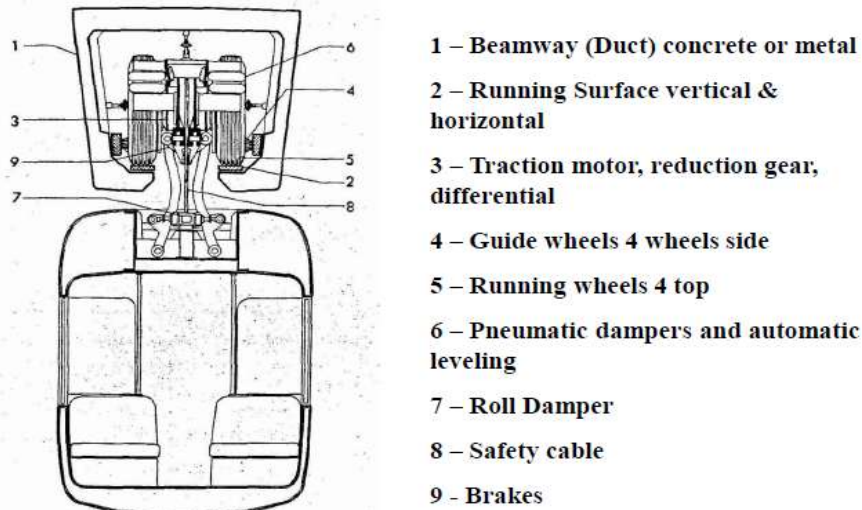


Fig: wheel arrangement of suspended system

III. Construction

Base Path

Present day monorails depend on a solitary strong shaft that backings and aides the train; the carriages are either suspended underneath the track, or sit to finish everything. Monorail is raised at least stature of 2 to 3 feet meters from ground level on segments. Present day monorails depend on a solitary strong pillar that backings and aides the train; the carriages are either suspended underneath the track, or sit to finish everything. A steel or fortified solid bar in the scope of 2 to 3 feet (0.61 to 0.91 m) wide is utilized as track. The straddle-shaft style was promoted by the German organization ALWEG. Conductive shoes on the carriages at that point

Transmit the current to the train. Monorail is raised at least stature of 5.5 meters from ground level on segments. The carriages have pneumatic elastic tires, which drive along the highest point of shaft. Elastic tired carriage contacts the pillar on the best and the two sides for footing and to balance out the vehicle and to avoid side-to-side influencing of the train, and furthermore directing the carriages.

Wheel Mounting

A solitary rail – Truly a monorail (4 wheels/vehicle) Steel wheels-Double flanged Car body dangles from trucks Double vehicle bodies explained with stroll through Almost level stroll in, autos swing somewhat Station stage height lower than Alwen Elementary flag framework driver controlled. The carriages have pneumatic elastic tires, which drive along the highest point of shaft

Driving Electric Motor

Practically all cutting edge monorails are controlled by electric engines bolstered by double third rails, contact wires or jolted. Channels joined to or encased in their direction shafts. Be that as it may, diesel-controlled monorail frameworks additionally exist.

Interior Facilities

The interior is designed with the comfort and safety of passengers in mind. Its spacious, minimalist concept maximizes the flow of passengers and minimizes obstruction in and around the doorways. Rail and stanchions are designed to assist safe boarding, on-board circulation, seating and standing assistance, and alighting by persons with disabilities. Handrails and handgrips are placed within easy reach of all standing passengers. Air conditioned passenger's saloon with ergonomic mass transit seats enhances comfort. The number and location of the seats have been selected to optimize the standing area for passengers. Disabled wheelchair area is combined with 2 adjacent flappable seats per coach. Slip-resistant flooring keeps passenger footing firm and stable.

IV. Summary

The upsides of monorail innovation are colossal. For overpopulated Indian urban territories, it is by all accounts the best answer for sheltered, quality, and reasonable mass open transportation. After effective keep running in Mumbai, this innovation, will turn into the answer for urban open transportation in 21st century for

India. This audit comprise the investigation of philosophy for Monorail as an elective mass travel framework. Monorail is well reasonable for the urban transportation in Indian level II urban areas having less space. With the assistance of Technology and high traveler limit choice it is achievable to build monorail. The framework can beat issues mishaps, blockage, and contamination. Open transport must be given need consideration regarding evade further exacerbating of air quality, traffic wellbeing, clog, and clamor in Indian urban communities.

Monorail is best reasonable for Indian level II urban areas where the urban areas have least urban space and populace around 5 million. What's more, for Metro urban areas, a coordination of Metrorail and Monorail ought to be favored for ideal execution. The best case of this joining is Chongqing. It has 107 kms in general framework length. It comprising of 56 kms of Monorail and remaining Metrorail. Indian urban areas are confronting indistinguishable issue from the urban communities in China are confronting. The issue is to move large numbers of individuals in less time with utilizing least urban space

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