HISTORICAL DEVLOMENT IN INDIA :

The 1st rail in India was run in between Madras to Bangalore.

Year

1844 - The 1st proposal for the Construction of railway in India where submitted to east Indian Company.

1849 - A contract to Construction an Experimental line of 150 K.M from Kalkat to Marizapur was undertaken to east India Company.

1853 - 1st railway line between bombe to thani was open. (32mm). It have 14 coaches and it was driven by 3 engines.

1855-1860 - 8 railway Company is Eestby the India.

1) Great Indian Peninsunar
2) East Indian railway
3) Madras railway
4) Bombay, baroda and Central India railway
5) Scindia railway
6) Estern Bengal railway

7) South Indian railway
8) Kolkata and South Eastern railway

1879 - India hand a total of 14780 KM of railway line.

1923 - National Nation of railway started

1929-1930 - Total Kilometeng hand gone up to 66358 and capital Envestment hand increase to Rs: 850.75 Core.

1950 = Regroping the railways was done and six zones were formed.

New zones of Indian Railways:

Zone	Headquarters
East Coast	Bhubaneswar
East Central	Hajipur
North Central	Allahabad
North western	Jaipur
South western	Bangalore
west Central	Jabalpur

[ADVANTAGES OF RAILWAY] Engineering

Classification of Indian railway:

Indian railway were classified in basic of route, traffic carried and Maximum permissible of speed on the routs into the following three Main catagories.

i) Trunk route
ii) Mainline
iii) Brunch line

Trunk routs:

- The following 6 rules of BG & MG heaven classified were trunk routs. ON B.G:- i) Delhi - Mayleani, Howdra
ii) Delhi - Cofa - Mumbai

ON M.G:

i) Lakhnau, Gorakhpur - Guchuati
ii) Delhi - Jaypur - Hydrafad

Railway draainage:

Balast: Balast is granular material track under and around the sleeper to transfer load for sleeper the balast Is provied elasticity to the track.

Boring: The process of filling the ballast around the sleeper is called Boring of Ballast.

Broad gauge: The gauge of track in which the distance between is 1.6 m. is called Broad gauge.

Buckling of Rails:

The railway track gets out of the original position due to buckling if the expansion of rails due to rising temperature is prevented during hot weather.

Super elevation / Cant:

In curves to counteract the centrifugal force the level up outer rail is raised above the inner rail by suitable amount.

Check rails:

Check rails are provided on the opposite of the crossing location for guiding one wheel of the vehicle and Thus to the tendency of another wheel to climb over the crossing.

*Coning of wheels:

The wheels are cone at a slow curve 1:20 to prevent from rubbing the inside face on the rail end to prevent lateral movement of the excel with its wheels

Derailment:

It occurse when moving wheel of a train or bogi get out of the rail.

Fish Plate:

- These Plates resembling ~~m~~ side to face. One used to provied the continuity between the to rails at the rail zone
- There also provied the required gap for expansion and construction due to temperature variation.

* In Indian railways the standard length of the rail are 12.80 m. for B.G and 11.89 m for M.G.

WEAR

When the excel load ~~and~~ abnormaly end and the train moves the very 1st speed then the concentraty stresses exced the elastic limit resulting in Metal flow.

Method to reduce wear:

- When the wear excive the prescribed the rail must be replaced.
- Regular tamping of fish bolt and tamping on balast is nessecary to reduce the wear and tear.
- Maintainace of sleepers with special intension so the joint is nessecary to reduce the wear.
- Maintance of correct gauge wheel reduce the side wear.

Crip of wheels:

- Crip is defined as the longitudinal movement of rail with respect to sleepers in a track.
- Crip is common to all railway track but ~~veryone~~ very one magnitude considerable, the rail in some places moves by ~~Centeral~~ circle of cm in wheels in other location the movement of rails may be negligable.

Sleepers:

Sleepers are member generally laid transverse to the rails on which the rails are supported and wheel.

Function of sleepers :

- To whole the rail to correct gauge.
- To whole the rail's proper level.
- To distribute the load from the rail to the wider area of ballast under it.
- To support the rail at a proper level in straight track and at proper superelevation on curves.

Classification of sleepers :

- It can be classified according to the materials used in there construction are is follows.

i) Wooden sleeper
ii) Metal sleeper → a) cast iron
b) steel
iii) Concrete sleepers → a) Reinforced concrete
b) Prestressed concrete

~~Wooden sleepers :~~

Timber :

Advantage

- Timber is the easily available. It all parts of India.

- Fitting for wooden sleepers are low simple design.
- Wooden sleepers are easy to lay, track, lift and Handaring Handaring.
- The wooden sleepers are suitable for all type of balast.

Disadvantage:

- The sleepers are subjected wear to, decay, attack by Vidarnee whiteanee, warpid, Cracking etc.
- It is difficult to maintaine to gauge in case of wooden sleepers.

gauge = distance

- Trains is easily disturbe.
- Maintaine gauge is wooden sleeper is gauge to high.

* Metal sleepers:

Advantages:

i) Metal sleepers are uniform is strength and durability.

ii) In Metal sleepers the performance of fitting

is better.

iii) Metal sleepers are economical, as life is longer and materials are easy to ~~easier~~ easyare.

iv) Gauge can be easily adjusted.

v) Fitting required are greasing no, difficult to maintain the sleeper.

vi) Metal sleepers interface with track circuiting

vii) Metal sleepers are one suitable for bridges, level crossing etc.

Concrete Sleepers:

Advantages

i) These sleepers are free from natural decay and attack by vermin insides etc.

ii) They have maximum life when compared to other sleepers, the life under normal condition is 40 to 60 years.

iii) The is not affected by moisture, chemical reaction ballast and soil salt.

iv) There is no difficulty in the circuiting required electric line the track.

v) The sleeper ~~are~~ have high electric ~~resistance~~ resistance and hence can withstand

the stresses induced by ~~the~~ 1st and heavy traffic.

Disadvantages:

i) The weight of Concrete sleepr is as high 2.52 ~~times~~ three times as wooden sleepr.

ii) Their damage is a concrete sleeper is the very heavy in case of the railroment.

iii) The scarft value is ~~low~~ almost nill.

~~Train resistance:~~

B) Tractive resistance:

i) It is the force which is employed by ~~locomotive~~ weather steam, electric, should be adequate enough to overcome the resistance offered by the locomotive, trailing load and other engenery against it moment.

ii) It can be catagorised into 4 catagorise

a) Train resistance

b) Resistance due to track provide

c) Resistance due to gradient elevation

d) wind resistance

Train resistance:

It can be further classified into following categories:

i) Resistance independent of speed.
ii) " dipended " "
iii) Aerodynamic resistance

- Indipend of speed:

i) Rolling Resistance:-

- The resistance of the motion of the train running at a constant speed as caused by the friction between the metal surface of rail in the wheel and consist of following:

a) Journal friction:

It is the friction of locomotive bearings, compartment ~~resistance~~ it held.

b) Frictional Resistance:

It is the rolling friction which due to the resistance offered to the movement of steel wheel and unsteel wheel

c) Tract resistance:

It is cold into the wave action of rails.

d) Resistance between internal parts:

It consist of the resistance of between cylinder and rim of driving wheel, eg:

of other moving parts as resistance of
Corrective and ~~vibration~~ wagons.

e) Resistance depends on wheel:

a) Track Irregularity:

- If the track is not properly maintained due to Irregularities additional resistance has to be over come.

b) Due to vertical moment of wheels & rail:

- Due to improper joints and poor maintenance of track vertical moment of wheels on rail occured creating resistance to motion.

c) - Resistance due to vibration, swaying etc.

- Atmospheric resistance.
- Resistace due to curve & resistance due to gravity.

Geometry design of the track:

Necessity of geometry design:

Most of the train derailments at due to the following reasion -

a) Track defect

b. Vehicle
c. Operat

* Acci

track

a.
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i) Imp
ii) Imp
iii) Imp
iv) Une

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i) B
ii)
iii)
iv)

b. vehicular defect
c. Operational effect

* A Train may derail on the straight track due to the following
a.
b.
c. defective gauge
d. Low joints

In addition on curved tracks derailment occure due to:-

i) Improper superelevation
ii) Improper radious of the curve
iii) Improper speed
iv) unequal distribution of rail in the rail

The derailment over the turn outs or Crossing may occur due to following reasons:

i) Gapping points
ii) Lifting to switch due to inadequate fittings
iii) Excessive wave in switches
iv) Tight gauge and diffierence check rail clearance at the crossing.

a) Gradient and grad Compensation
b) Speed of train
c) Rating on degree of the Curve
d) Cant or Super elevation
e) Curves
f) widening gauge on curves

Gradient in road/grade Compesion :

- It is measure eather by the extend of rise or fall in 100 units. horizontal distan traveled by raise or fall in 1 unit.

Gradient are provided on the traces due to the following reasons :

a) To provied a uniform rate of rise or fall as far as possible.

b) To reach a variable station located at various elevation.

c) To reduce the cost of Earthworks.

d

Various gradent use on railway traces are

i) Rising gradient C. Graded / Station Yard
ii) Momentum // do
iii) Pusher / h.

Ruling Gradient:

- A Ruling gradient on a section may be define as the gradent which determine the maximum load that the engine can haul on the section.

- In Plandprand 1 in 150 to 1 in 200 and 'B' area 1 in 100 to 150 gradents are suffited

Momentum gradent:

Those gradent one section which though some sevier than the ruling gradend do not determine the maximum lode of the the tharn but on account of there favecable position on tharn, the tharn before approaching that Accured Sufficent momentum to negotiate time. is known as momentum gradent.

Pusher and hyper gradient.

- If the grade is Concentrate in a specific section such as momentum section.
- Inseted up climbing the tharn and assent engine are Pusher engine

is use to compensate the load.

Gradient ~~on~~ ~~in station yard~~ :

Gradon in station yard :

i) To prevent the moment on stationary on the track due the effect of Privatey, Combine with strong cond and / bore a gentel Push.

ii) To Prevent additinal resistance due to Grade on the stationy vechidge which is about the ice yet the stant then vechil in reaction.

(iii)

Grade Compations :

→ In order to avoid Resistance beyond allowed to limit degredents are reduces one curve and this reduction is gradient is known as Grade compattion for Curves.

→ The Curve this expressed as a Percentage Per degree of the curve. The curve resistance is greater

→ In India Compation for culvertion is given at 0.04% for degree of Curve for b.g 0.03% for meter m.g and 0.02% for Narrow (N.g). In term of Radius of Curve

In metal is $\frac{70}{R}$ for b.g, $\frac{52.5}{R}$ (M.g)

and $\frac{35}{R}$ for ~~[illegible]~~ (S.g)

Safe Speed on Curve :

- Safe speed for all Practical Purposes means a speed which is safe from the hazard of over turning and derailment with a certain margin of safety.

- It depends

i) The Gauge of tram

ii) The reading of the Curve

iii) Amount of superelevation provided

iv) The presence and absence of transition Curve.

→ When transition Curve of exist

$$V = 4.35\sqrt{R-67}$$

or

For B.G & M.G $= 4.4\sqrt{R-70}$

For N.G $= 3.6\sqrt{R-6}$ (Maximum of the 50 m)

When transition Curves are absent

For B.G & M.G $= V = \frac{64}{5}$ of speed Calculated in AI

for N.G

$V = \frac{4}{5} \times$ speed calculated in A(II)

In India max. speed of the train of transition curve is calculated by the following formulas

On B.G $V = 0.27 (C_A + C_D) \times 1$

On M.G $V = 0.347 (C_A + C_D) \times R$

On N.G $V = 3.65 \sqrt{R}$

Where,

V = Speed of the train

C_A = Actual Cant in mm

C_D = Cant deficiency / mm

R = Radius in meter

Airport Engineering:

Any mechanics which finds it support in the atmosphere due to reaction of the air is defined as an Aircraft. It can be heavier or lighter the air may be power or non power

Airport Site Selection:

The Selection is for an airport depends upon the class or airport under consideration. Some of the factor for the selection of suitable site for a major airport installation are:

1) Regional Plan
2) Airport layout
3) Ground accessibility
4) Topography
5) Obstruction
6) visibility
7) wind
8) Noise Nuysence
9) Grading Gridering