

1: Codes and Manuals

indian railway track machine manual government of india ministry of railways (railway board) disclaimer: this compilation is for reference only.

Narrow Gauge NG sections vary a lot, but the commonest spacing arrangement used on NG is sleepers per km 89cm spacing. Sleeper spacings are smaller in some cases on curves, near points, etc. The spacings are usually larger on bridges. Concrete sleepers are usually laid to the same spacings as wooden sleepers. Concrete sleepers are normally used only with long welded rail or continuous welded rail sections. Metal sleepers may in some cases be laid more sparsely than wooden sleepers. This notation is an old one. The additional number specified represents the excess of the number of sleepers over the number of yards for a rail. This was a convenient formulation, especially when rails were manufactured to sizes of 11, 12, or 14 yards. Before the days of mechanized track laying, it was common to see track laid where the sleeper density was not uniform, with some bunching up of sleepers towards the end of each rail, with adjacent sleepers at the ends of neighbouring rails being less than a foot apart in some cases. What dimensions of sleepers does IR use? Wooden BG sleepers dimensions are usually 2. MG wooden sleepers are 1. NG sleepers are usually of the same thickness as MG sleepers, and are often made by cutting MG sleepers sometimes discarded ones to size and adding a new seat for the track. What is the relationship between speed, turning radius, and track cant? Super-elevation, or cant, is provided to counteract the centrifugal tendency of trains on curves. On a canted curve where the outer rail is higher than the inner one of the curve, the weight of the vehicle provides a component that counteracts the centrifugal tendency. Cant excess refers to the condition where the cant or superelevation is too much for the permitted speeds on the curve, while cant deficiency refers to the condition where the track is not canted enough for the speed of the trains. On BG track, cant excess and cant deficiency tolerances are 75mm. The formula relating the maximum speed on a curve with the cant and cant deficiency is: What are the typical placement specifications for check rails or guard rails? Wheel flanges on IR are typically about 28mm thick new. The distance between the inner faces of wheels is typically mm BG. Check rails used to prevent wheels from climbing the rails at sharp curves are kept at a distance of about 44mmmm from the outer rail, allowing about 4mm tolerance for wear on the check rails. Check rails at level crossings intended to keep a gap in place for the wheels to pass through where the tracks cross the road surface are typically placed to provide a gap of 51mmmm. This allows sufficient lateral movement or play for the wheels, but is small enough not to trap the feet of cattle or cause other problems for the road traffic. Guard rails on bridges are usually placed to provide a gap of mm from the running rails. What kinds of ballast does IR use? For all high-traffic lines, IR uses machine crushed hard stone ballast, usually from locally quarried granite stone, or crushed basalt. In the past, broken brick, slag from metal processing, cinders, and waste construction material were also used. For most sections with wooden sleepers, the ballast is of a 6. In the past, ballast of 5cm nominal size was extensively used, and smaller ballast of 4cm - 2. The ballast layer is 0. The sides of the ballast layer generally slope at a 1. A few sections of IR have ballastless concrete bed track: What sort of sub-ballast, blanket, and subgrade layers are provided in the track formation? IR generally does not use a separate sub-ballast layer below the ballast layer. A blanket layer of coarse, granular material is usually provided directly below the ballast layer. Blanket layers are not provided for tracks on rocky beds, or on well-graded gravelly or sandy beds. A 1m-thick blanket is provided for silt, silty clay, or clay of low plasticity or in conditions where the underlying rocks are of a type known to be excessively susceptible to weathering. The blanket layer is generally composed of well-graded sandy gravel or crushed rock with specified distributions of size and curvature. Mixtures of fines metal, plastic, etc. The subgrade is generally built up from a mixture of soil and stone fragments, cobbles, and waste materials, crushed brick, etc. The blanket and subgrade are built up at a slope of about 2: The entire embankment may rise to 6m with most ordinary kinds of materials used for the blanket and subgrade. In case the subgrade is thicker than 1m or so, usually a 30cm layer of compacted soil is provided for every 1m-3m of the subgrade thickness. How does IR prevent soil erosion in the areas where track is laid? Erosion of the soil around a track formation can be quite dangerous as

the track may subside or warp and move. In many cases IR simply encourages the local shrubby vegetation to grow in the areas near the track to stem the erosion. This is an ecologically safe material made of jute yarn with a coarse open mesh structure. This is placed on the affected portions of the embankment or cutting after removing clods, large stones, etc. The jute yarn is biodegradable and disappears after a while, but by that time the vegetation has had a chance to take root and grow firmly in the protected soil. In rare cases where vegetative root growth is thought to be insufficient to stem the erosion of the soil, a synthetic root matrix reinforcement system may be used. These GeoGrid polymers are non-biodegradable, and quite stable, resisting ultraviolet exposure and tolerant of very high and low temperatures. Boulder retention in some places is augmented by the deployment of bi-axially oriented GeoGrid meshes to anchor medium to large boulders. Self-stabilizing Track Konkan Railway has developed something they call self-stabilising track, which aims to reduce or even eliminate the problem of ballast being de-compacted and dispersing under the action of vibrations set up by moving trains. The effect is not only to prevent the ballast from spreading under the action of vibrations, but to improve ride quality by changing the vibration characteristics since the inertial mass responding to the impact from the train is larger. A thin sheet of rubber or polyethylene between the sleepers and the top of the track bed further modifies the vibration characteristics. The ballast elements are constructed of such a shape that the vibrations tend to wedge them more firmly together. The expectation is that ballast maintenance will be much reduced for such tracks. What tolerances of gauge does IR permit? Broad Gauge Deviations allowed from nominal gauge: The older specifications were: Meter Gauge Deviations allowed from nominal gauge: Narrow Gauge Deviations allowed from nominal gauge: What are the nets one sees on rockfaces or hillsides abutting railway lines in some areas? They act to trap and stop, or slow down falling or sliding rocks and boulders so that they either do not fall all the way down, or lose their kinetic energy and fall without infringing the tracks. Generally the nets are made of polypropylene ropes of 10mm diameter with high thermal, abrasion, and ultraviolet resistance. The mesh size is from mm to mm depending on the area, and the typical size of the fractured or falling rocks. In some areas steel nets made of high-strength galvanized steel wire ropes are used. These have a design life of over 20 years. What other methods does IR use to warn of landslides and rockfalls? It consists of a wire attached to sensors which can be tripped when the wire is moved excessively or snapped by a falling rock. The sensors when tripped activate lights and hooters. These are used in several stretches on the KR route in cuttings and in unlined tunnels. In addition, KR has pioneered the use of electronic inclinometers to detect earth slippages in areas prone to landslides, connected to a similar warning system as in the Raksha Dhaga. How is track maintained? Permanent way maintenance is largely done by gangs consisting of gangmen under the supervision of a gangmate. The gang goes down its assigned section of track the gang beat or beat section, inspecting track and performing normal routine maintenance. A patrolman may be separately deputed to perform visual inspections along the length of a section of track by walking alongside it two patrolmen in ghat or jungle areas. Typically the patrol may cover 6km - 10km of track. The schedule and track sections to be monitored by gangmen and patrolmen is specified in a Patrol Chart prepared by the Divisional Engineer. This chart also indicates when and where the drivers of trains running to schedule may expect to meet gangmen. Patrolmen and gangs carry Patrol Books in which they record the status of the track and any maintenance they perform on it. The gang is equipped to deal with minor problems such as fixing small deviations in gauge or elevation of the rails, rearranging ballast, etc. If problems are discovered with the permanent way that cannot readily be fixed by the gang, the details are reported to the station master of one of the adjacent block stations, and temporary engineering speed restrictions are put in place for the track. Trains going through that section are then subject to caution orders issued by the stations at either end. A bigger maintenance of way crew with appropriate tools and machinery then works on repairing the track while it is protected by being restricted. In some cases traffic on the line may have to be completely stopped. Replacing ballast or sleepers, adjusting the rail profile by grinding, joint lubrication, rail creep adjustment, replacing short sections of damaged rail, welding rails, etc. The regular patrolling of track is very important in order to maintain safe conditions for trains. The permanent way inspector PWI for a division has ultimate responsibility for the condition of the permanent way under his jurisdiction. The PWI and his staff undertake separate regular inspection tours of the various lines, often in a motor trolley or inspection car. In

the past manually pushed trolleys were used quite often, but their use is declining now. A few track maintenance machines are in use, for instance tie tamping machines, ballast cleaning machines, etc. What is included in the maintenance carried out by gangs commonly seen on the tracks? This includes the following steps: Opening of the road: Rails, sleepers, fastenings are carefully examined for signs of wear, corrosion, rust, dust and dirt, etc.

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9: Railway Track Engineering, Fourth Edition

*I B and I www.enganchecubano.com OF INSTRUCTIONS ON LONG WELDED RAILS Continuous Welded Rail (CWR)
is a LWR which would continue through station yards including points and crossings. are shown in Annexure.I A.
Provisions for laying and maintenance of SWR are contained in Chapter V. Part 'B' of Indian Railways Permanent Way
Manual (IRPWM). the.*

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