1.3 TRACK STRESS

Stresses on the track due to the various kinds of forces applied on it are discussed in the following sections.

Lateral forces:

The lateral force applied to the rail head produces a lateral deflection and twist in the rail. Lateral force causes the rail to bend horizontally and the resultant torque causes a huge twist in the rail as well as the bending of the head and foot of the rail. Lateral deflection of the rail
is resisted by the friction between the rail and the sleeper, the resistance offered by the rubber pad and fastenings, as well as the ballast coming in contact with the rail.

Longitudinal forces:

Due to the tractive effort of the locomotive and its braking force, longitudinal stresses are developed in the rail. Temperature variations, particularly in welded rails, result in thermal forces, which also lead to the development of stresses. The exact magnitude of longitudinal forces depends on many variable factors.

Contact stresses between rail and wheel:

Hertz formulated a theory to determine the area of contact and the pressure distribution at the surface of contact between the rail and the wheel. As per this theory, the rail and wheel contact is similar to that of two cylinders with their axes at right angles to each other.

Stresses on a sleeper:

The sleepers are subjected to a large number of forces such as dead and live loads, dynamic components of track such as rails and sleeper fastenings, maintenance standards, and other such allied factors.

Stresses on ballast:

The load passed onto the sleeper from the rail is in turn transferred to the ballast. The efficacy of this load transmission depends not only on the elasticity of the sleeper but also on the size, shape, and depth of the ballast as well as the degree of compaction under the sleeper.

Pressure on formation or subgrade

The live as well as dead loads exerted by the trains and the superstructure are finally carried by the subgrade. The pressure on the subgrade depends not only on the total quantum of the load but also on the manner in which it is transferred to the subgrade. The spacing between the sleepers; the size, depth, as well as compaction of the ballast under the sleeper; and the type of subgrade play an important role in the distribution of pressure on the subgrade.

CONING OF WHEELS

The Surface of wheels are made in cone shape at an inclination of 1 in 20, and the same slope is provided in the rails (see fig), this is known as coning of wheels. The diameter of wheel is different at different cross section of the wheel, when the train running on the straight track try to move in any direction, the diameter of the wheel increases over one rail and the wheel assembly is automatically forced to move back in its original central position due to difference of distances moved over two rails.

Purpose:

1. To keep the train its central position of the rails, coning does not allow any sidewise movement on a straight track.
2. To allow the wheels to move different distances on a curved track and thereby reduce wear and tear.