

## **FIXTURES AND FASTENINGS**

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Fixtures and fastenings are fittings requires for joining of rails end to end and also for fixing the rails to sleepers in a track.

### **FUNCTIONS OF FIXTURES AND FASTENINGS**

Rail fixtures and fastenings have the following functions:

- (i) To join the rails end to end to form full length of track.
- (ii) To fix the rails to sleepers.
- (iii) To maintain the correct alignment of the track.
- (iv) To provide proper expansion gap between rails.
- (v) To maintain the required tilt of rails.
- (vi) To set the points and crossings in proper position.

### **TYPES OF FIXTURES AND FASTENING**

Fixtures and fastenings commonly used in a permanent way are of following types:

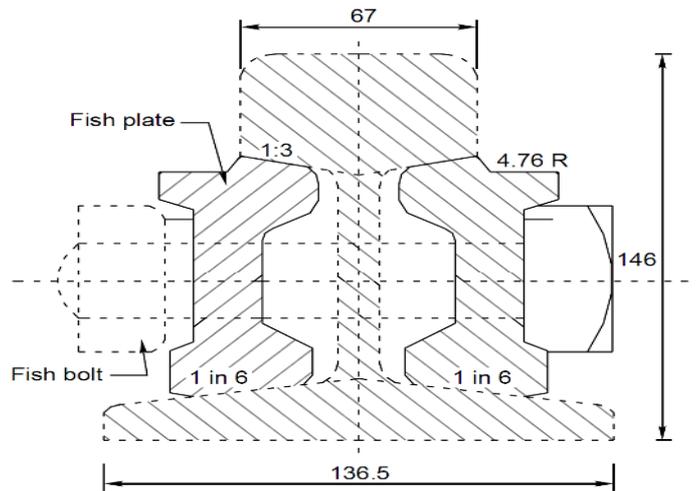
1. Fish plates
2. Bearing plates
3. Spikes
4. Chairs
5. Bolts
6. Keys
7. Anticreepers

### **FISH PLATES**

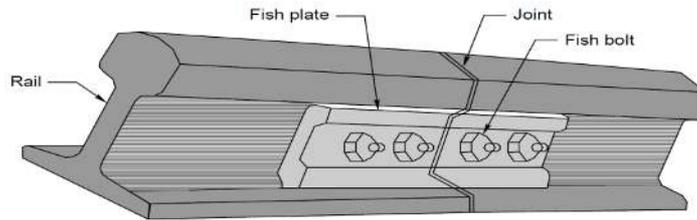
Fish plates are used in rail joints to maintain the continuity of the rails. Two types of fish plates are commonly used on Indian Railways for joining F.F. and B.H. rails. Each fish plate is 457 mm long and provided with four holes 32 mm $\phi$  at a spacing of 114 mm c/c. These are manufactured of steel and are so designed that they fit in between the head and foot of the rail. □

### **REQUIREMENTS OF FISH PLATES**

- (i) They should hold the adjoining ends of rails in correct horizontal and vertical plane.
- (ii) They should allow free longitudinal movements of rails due to temperature variation.
- (iii) They should be able to resist all types of wear.
- (iv) They should be able to bear the vertical and lateral stresses which come at joints without any distortion.
- (v) They should allow easy renewal and replacement of rails in case of wear and damage.



**Fig. 10.2** Fish plate for 90 R rails



**Fig. 10.1** Fish plate

## BEARING PLATES

Bearing plates are cast iron or steel plates placed in between the F.F rail and wooden sleepers of a railway track. F.F. rails if fixed directly on wooden sleepers sink in the sleeper due to the heavy loads of trains and thus loosen the spikes. To overcome this difficulty bearing plates are used under F.F. rails to distribute the load over a wider area and bring the intensity of pressure within limit. Bearing plates give the required 1 in 20 inward slope to the rail directly and no adzing is required in the wooden sleeper. These are fixed to sleepers by spikes.

## ADVANTAGES

Following are the advantages of bearing plates:

- (i) They distribute the loads to wider area and prevent sinking of the rail to the sleeper.
- (ii) They avoid adzing of sleepers.
- (iii) They enable the spikes to remain tight and require less maintenance.
- (iv) Bearing plates prevent the widening of gauge on curves.
- (v) Bearing plates increase the overall stability of the track.
- (vi) They prevent the destruction of the sleeper due to rubbing action of the rail.

## DISADVANTAGES

Following are the disadvantages of bearing plates:

- (i) When the bearing plates become loose due to settlement of ballast, moisture is likely to enter between the sleepers and plates, causing sleepers to wear.
- (ii) When any spike is damaged and it is required to be retrieve at another place, all other spikes of the bearing plates have to be removed, which will reduce the holding power of the spikes.

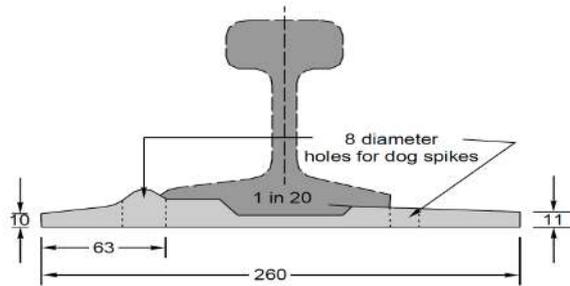


Fig. 10.7 Canted MS bearing plate for 90 R (dimensions in mm)

## SPIKES

Spikes are used to fix rails to wooden sleepers. Spikes are of following types:

- (a) Dog spikes
- (b) Round spikes
- (c) Screw spikes
- (d) Elastic spikes

### Dog spikes

Dog spikes are the cheaper type of spikes which hold the rails at correct gauge and can be easily fixed and removed. These are commonly used for holding F.F. rails. Four dog spikes are used per sleeper, two on either side of the rail. The disadvantage of dog spikes is that these become loose under the wave action caused by the moving train.

### Round spikes

Round spikes are used for fixing chairs of B.H. rails to wooden sleepers and also for fixing slide chairs of points and crossings. These have either cylindrical or hemispherical head and blunt end.

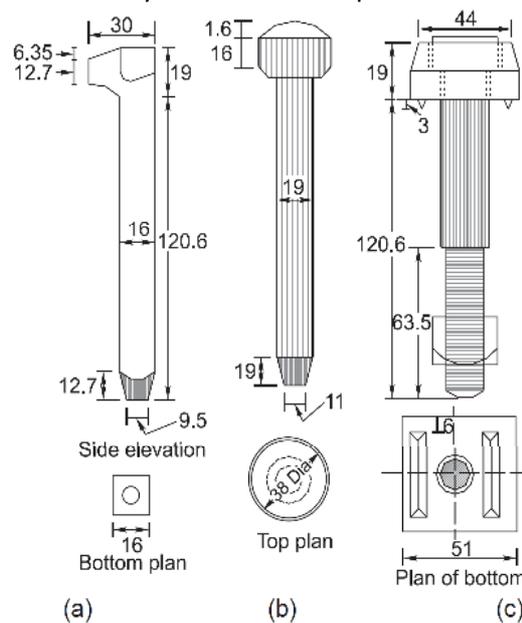
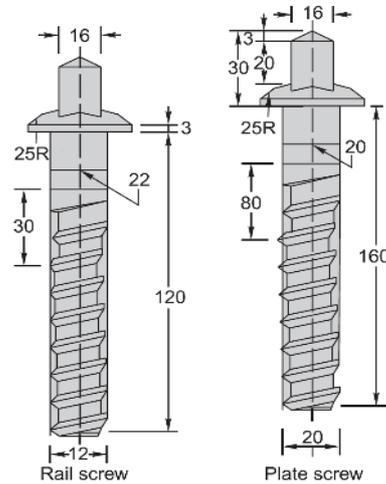


Fig. 10.5 (a) Dog spike, (b) round spike, (c) fang bolt

## Screw spikes

Screw spikes are tapered screws with V-threads. Their head is circular with a square projection and are used to fasten rails with wooden sleepers. The holding power of these spikes is more than double to that of dog spikes and can resist the lateral thrust better than the dog spikes.



**Fig. 10.6** Screw spikes

## Elastic spikes

Elastic spikes are used for fixing F.F. rails to wooden sleepers. These give better grip and result in reduction of wear and tear of rail. The advantage of this type of spike is that it is not pulled up by the wave action of the moving train.

### **REQUIREMENTS OF A GOOD SPIKE**

- (i) It should be easy in fixing or removing from the sleepers.
- (ii) It should hold the rails and bearing plates in proper position.
- (iii) It should be cheap. (iv) It should require minimum maintenance.
- (v) It should not come out of the sleepers under vibrations.

## **BOLTS**

Different types of bolts used in Indian Railway are described below.

### **FISH BOLTS**

Fish bolts are used for connecting fish plates with the rails. Four bolts are required for each pair of fish plates. These bolts are inserted from outside the track and bolted on the inside of the track. Fish bolts have to withstand shear due to heavy transverse stresses, hence they are manufactured of medium or high carbon steel. The length of fish bolt depends on the type of fish plate used. For 45kg rail, the fish bolts of 25 mm dia and 127.6 mm length are used. These bolts get loosened due to vibration of moving train and hence these are to be tightened time ot time. Too much tightening of bolts is prohibited as it prevents free expansion or contraction of rails due to temperature vibrations.

### **HOOK BOLTS**

Hook bolts are also known as dog bolts due to the shape of their heads. These bolts are used to fix sleepers which rest directly on a girder. Two bolts per sleeper are used. Dog bolts are of two types.

- (i) Sloping lips- for fixing sleepers to plate girder spans.

(ii) Straight lips- for fixing sleepers to joist spans.

#### **FANG BOLTS**

Fang bolts are used for fixing side chairs to sleepers. These are alternative to screw or round spikes. The fang bolts are found to be more effective but are not generally used, because fixing and removal of these bolts are difficult.

#### **KEYS**

These are small tapered pieces of timber or steel used to fix rails to chairs on metal sleepers.

Keys are of two types

(i) wooden keys

(ii) Metal keys

Wooden keys are small straight or tapered pieces of timber. These are cheap and Easily prepared.

These are not strong and become loose under vibrations. These require frequent maintenance.

Wooden keys are not used now-a days in Indian Railways.

Metal keys are small tapered or spring like pieces of steel. These keys are much more durable than wooden keys. Metal keys are of two types.

(i) Stuart`s key and

(ii) Morgan key

#### **ANTI-CREEPERS**

Anti-creepers are used to prevent creep in a railway track. Different shapes of anti-creepers are available and are fixed to the foot of rail.