TYPES OF BEARINGS

" DIFFERENT TYPES OF BEARINGS "

OF SUBJECT

BRIDGE DESIGN ENGINEERING

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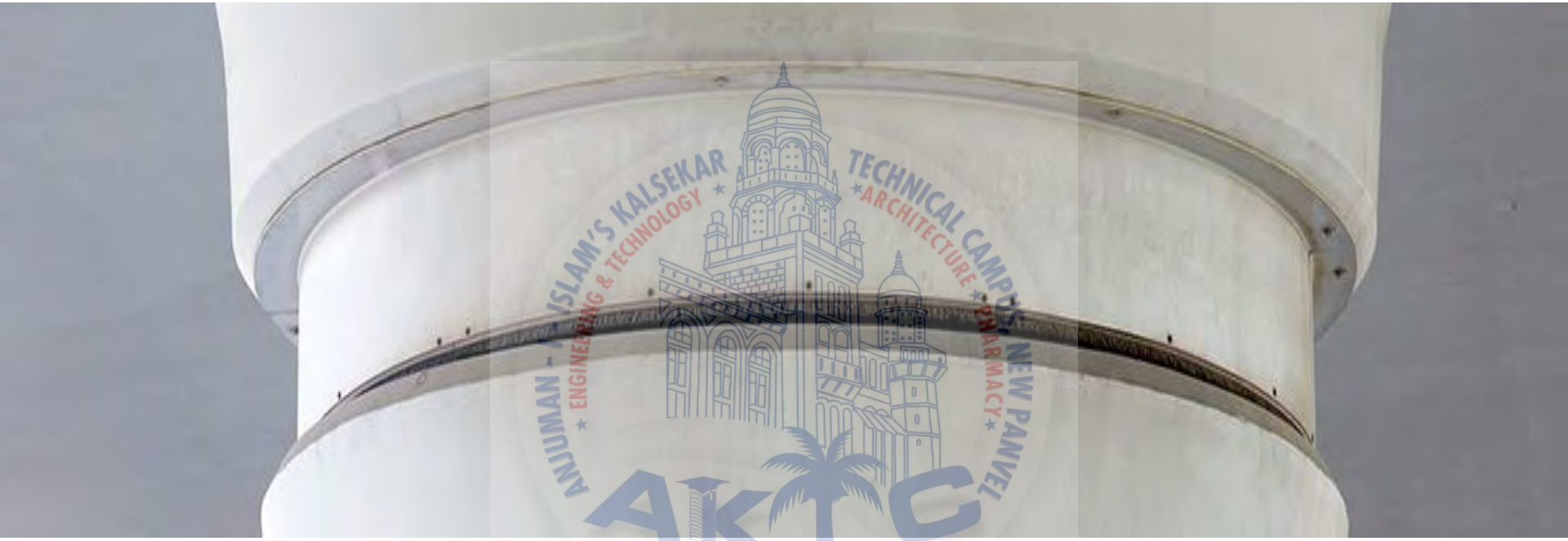
INTRODUCTION

- A **bridge bearing** is a component of a bridge which typically provides a resting surface between bridge piers and the bridge deck.
- Bearings are provided in bridges to transmit the load from the superstructure to the substructure in such a manner that the bearing stresses induced in the substructure are within permissible limits.
- For high-level brides with slab spans, no special bearings are usually provided.
- Girder bearings are provided with fixed and expansion joints.



BRIDGE BEARING

TYPES OF BEARINGS

FIXED BEARINGS

- Rocker bearings
- Steel hinge
- Steel rocker bearing
- R. C. rocker fixed bearing

EXPANSION BEARINGS

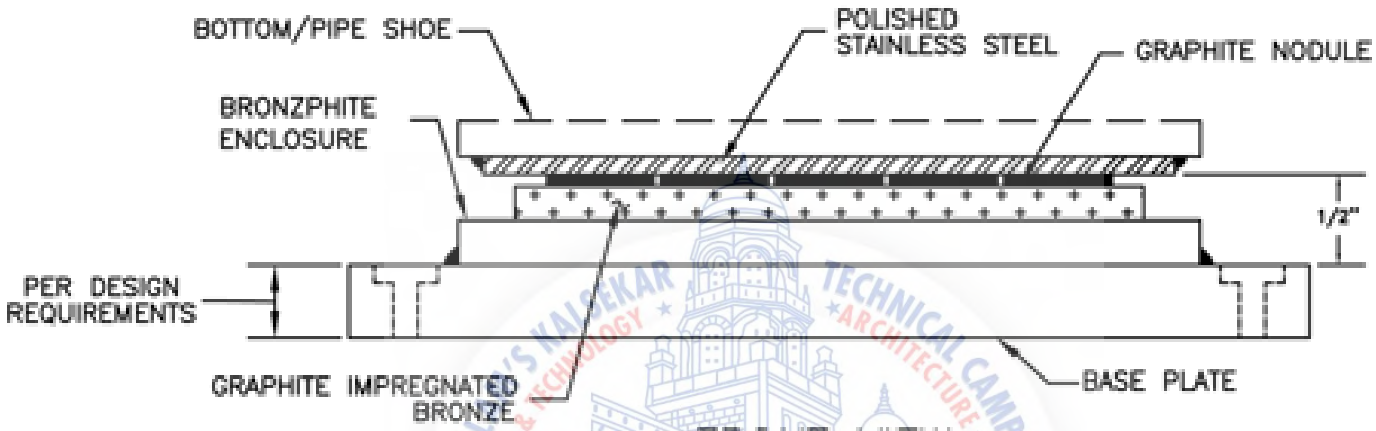
- Sliding plate bearings
- Sliding-cum-rocker bearing
- Steel roller-cum-rocker bearing
- R. C. rocker expansion bearing
- Elastomeric bearing

SLIDING PLATE BEARINGS

Sliding bearing is the simplest form of expansion bearings.

It consist of two metal plates, commonly stainless-steel plates, that slide relative to each other and hence makes room for translational movement and lubricating material between them.

APPLICATION - It is useful for girder bridges of spans up to 15 m.


BOTTOM/PIPE SHOE
POLISHED STAINLESS STEEL
GRAPHITE NODULE
BRONZPHITE ENCLOSURE
1/2"
PER DESIGN REQUIREMENTS
GRAPHITE IMPREGNATED BRONZE
BASE PLATE

FRONT VIEW


Stainless Steel panel
PTFE
Intmal Sealing Ring

SLIDING-CUM-ROCKER BEARINGS

Rocker is an expansion bearing composed of curved surface at the bottom, which accommodate translational movement and a pin at the top makes room for rotation movement

Rocker bearings are mainly employed in steel bridge structure. Rocker bearing should be considered when the bridge movement is adequately known and described, since such bearings can make rooms for both translational and rotational movements in one direction only.

These bearings are likely to suffer deterioration and corrosion, so it is necessary to conduct regular inspection and maintenance.

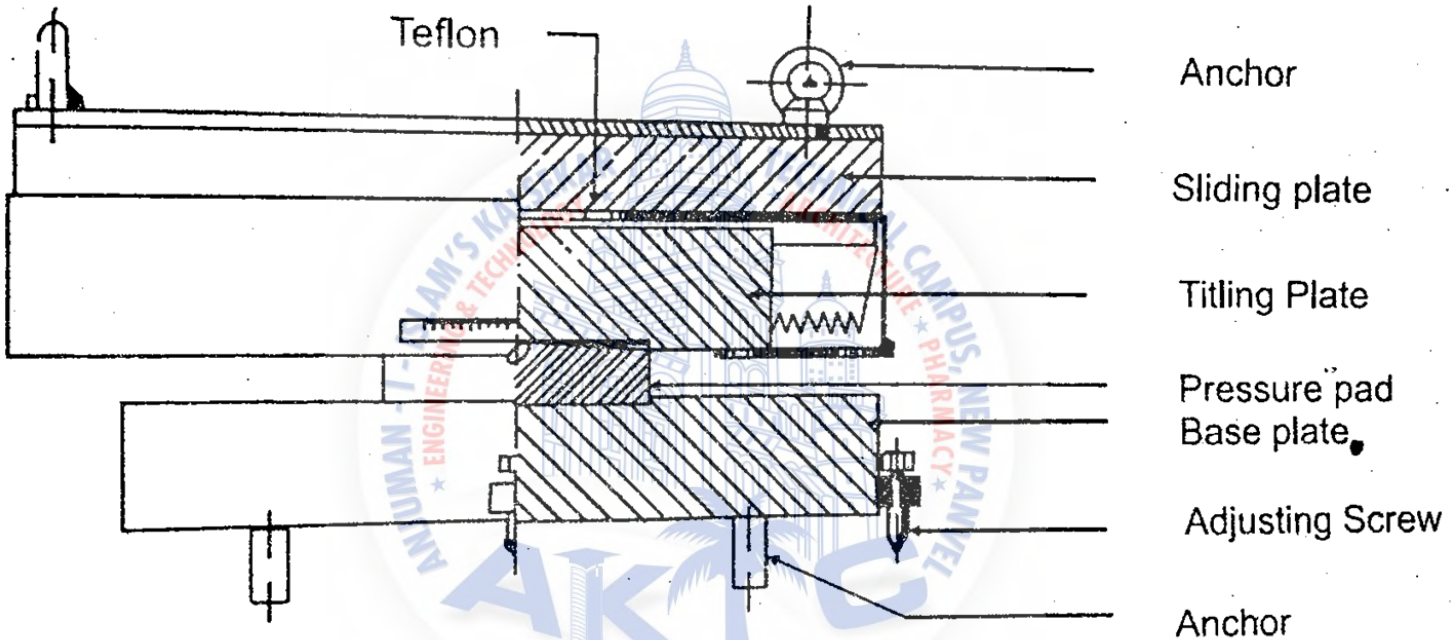


Figure 14.3 Sliding-cum-Rocker Bearing.

STEEL ROLLER-CUM-ROCKER BEARINGS

- Roller bearing can be used in the construction of reinforced concrete and steel bridge structure.
- There are two main configurations including single roller bearing which is composed of one roller placed between two plates and multiple roller bearing that consist of several rollers installed between two plates.
- The former as shown in Figure-5 can accommodate both rotation and translation movement in longitudinal direction and it is cheap to manufacture but its vertical load capacity is limited.
- In contrary, the latter as shown in Figure-6 can make room for translation movement only and rotation movement can be accommodated if rollers are combined with pin bearing.
- Multiple roller bearings are expensive and support considerably large vertical loads.
- Regular inspection and rehabilitation should be conducted since roller bearing are susceptible to corrosion and damages.

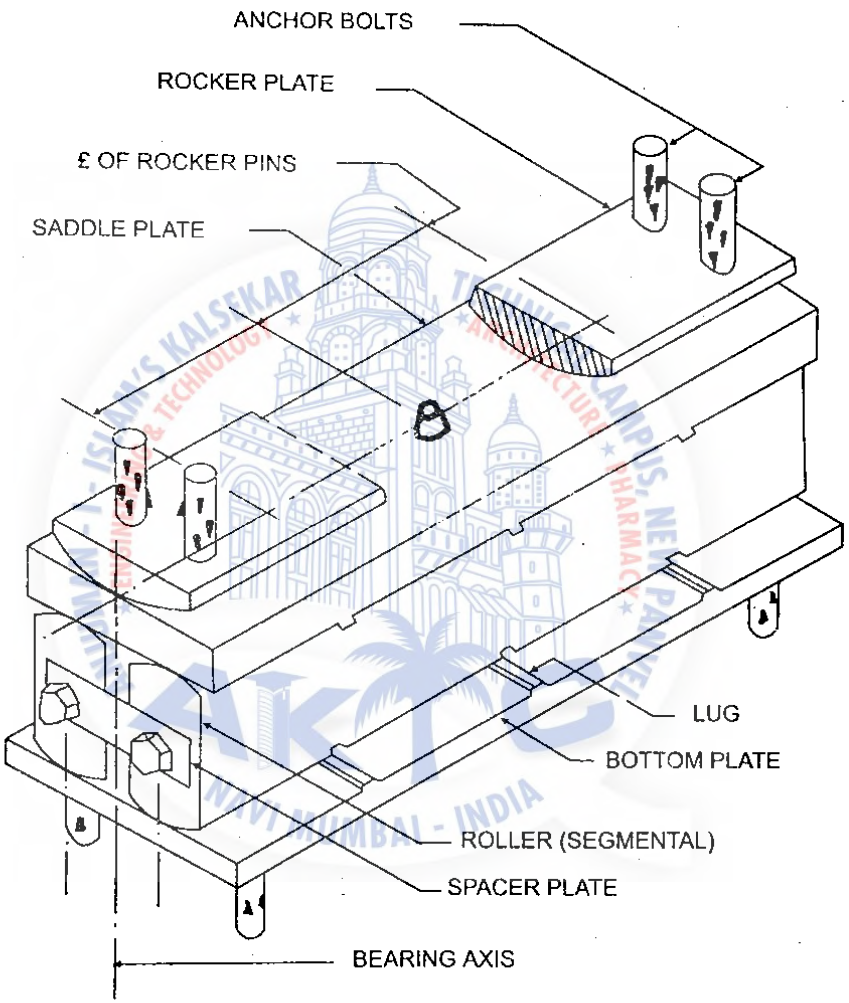
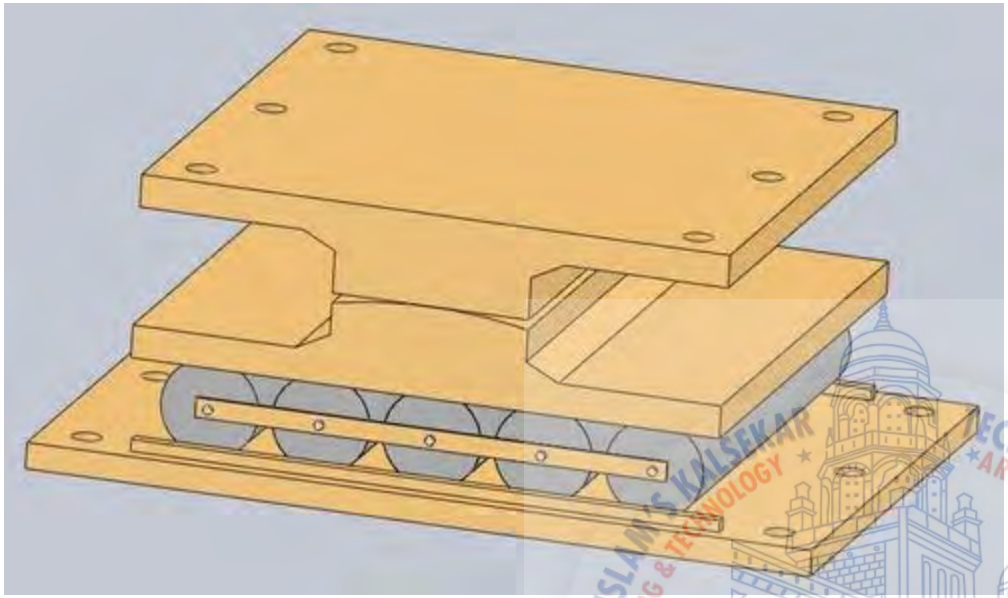
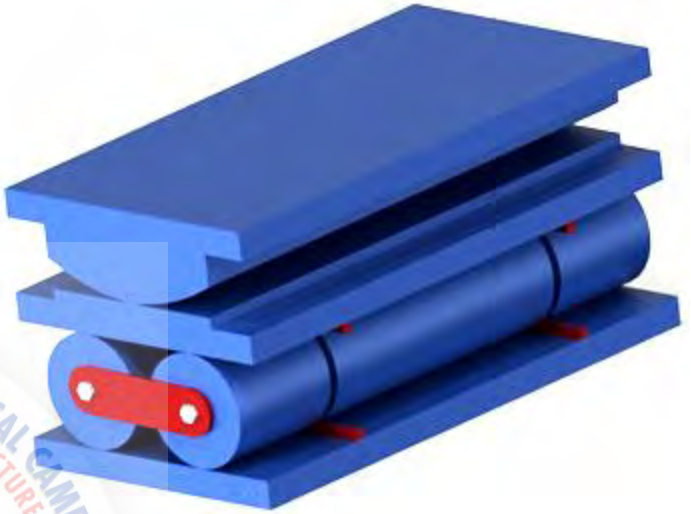


Figure 14.4 Roller-Rocker Bearing (with Segmental Roller).





MULTIPLE ROLLERS

SINGLE ROLLER

ELASTOMERIC BEARINGS

- It consists of elastomer manufactured from synthetic or natural rubber and can take both translation and rotation movements through elastomer deformation.
- The ability of elastomer to carry large vertical loads is because of reinforcement provision that prevents lateral bulging of elastomer.
- There are number of elastomeric bearing pads classified based on types of reinforcements used. For example, steel reinforced, plain, fiberglass reinforced and cotton duck reinforced elastomeric bearing pads.
- Strength and response of each type is different, steel reinforced elastomeric bearing is the strongest one and plain elastomeric pad is the weakest.
- Elastomeric bearing is neither expensive nor requires considerable maintenance, that is why it the most desired bearing type.

ELASTOMERIC BEARING

ROCKER BEARINGS

- This bearing is similar to the sliding plate bearing with the difference that the longitudinal movement is prevented by the rocker pins along the axis of the bearing .

- The line contact tilting between the tilting plate and the base plates permits tilting of superstructure in longitudinal axis of bridge only.

- If a fixed bearing allowing rotation in all direction is desired, the design will be modified with the omission of the sliding plate.

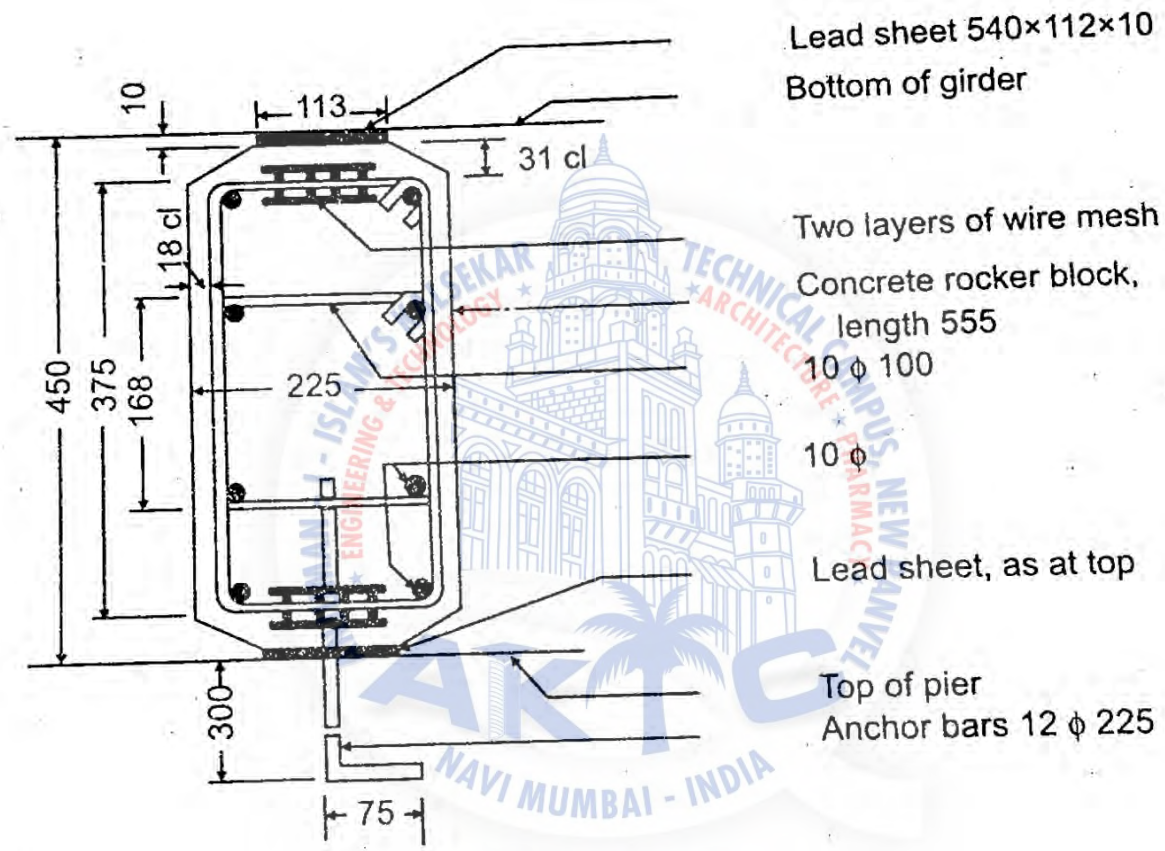


Figure 14.6 R.C. Rocker Bearing of Dimni Bridge.

CAST STEEL HINGE

- Cast steel hinges have been used in older steel brides as fixed bearings.
- The bearings consists of a top saddle casting bolted to the underside of the main girders and resting on a knuckle pin held in position by the bottom casting which is bolted securely to the pier or abutment.
- The pin is designed to resist the shear due to the maximum longitudinal force acting on the bearing.
- This type of bearing is often adopted in modern bridges.

MILD STEEL ROCKER BEARING

- Steel rocker bearings are used only for long span bridges in view of their cost.
- These consist of two parts : the top portion with a curved contact surface rocking over the bottom with a flat contact surface.
- A typical mild steel rocker bearing suitable for a reaction of 1250 kN is shown in figure.

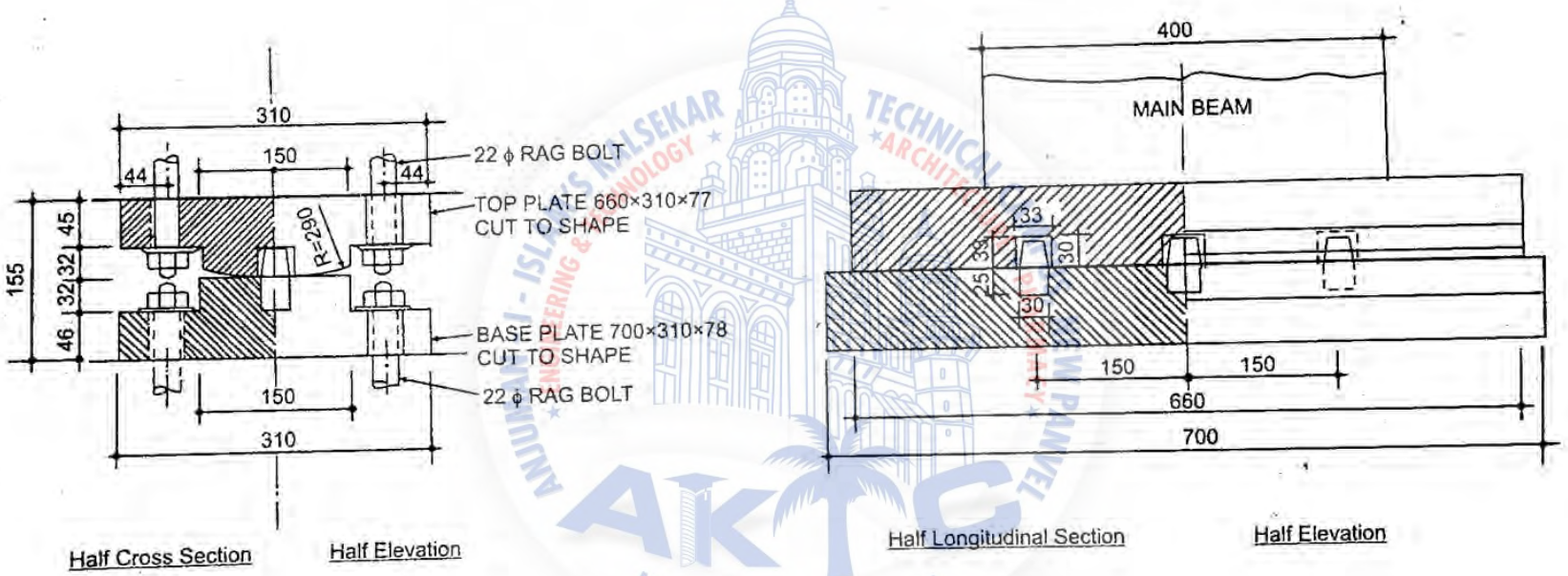


Figure 14.7 Mild Steel Rocker Bearing of 1250 kN Capacity.

R. C. ROCKER FIXED BEARING

- As steel rockers are expensive, concrete rockers are used sometimes.
- r. c. rocker usually consist of R.C. pedestal to make up for the height above bed block and a 10mm thick lead sheet placed in between the top of pedestal and the bottom of girder.
- Length of lead sheet is made equal to girder width while its breadth is made sufficient to bring the stress on the sheet within permissible limit.
- The lead sheet allows girder to rotate while the dowels restrict longitudinal movement.
- This type of bearing is not popular now.

PIN BEARINGS

- A pin bearing is a type of fixed bearings that accommodates rotations through the use of a steel.
- Translational movements are not allowed.
- The pin at the top is composed of upper and lower semi-circularly recessed surfaces with a solid circular pin placed between.
- Usually, there are caps at both ends of the pin to keep the pin from sliding off the seats and to resist uplift loads if required.
- The upper plate is connected to the sole plate by either bolting or welding.
- The lower curved plate sits on the masonry plate. Rotational Movement is allowed.
- Lateral and Translational Movements are Restricted

PIN BEARING


THANK YOU