

## INTRODUCTION – DISC BEARINGS

Disc Bearings have now been in use for nearly 40 years. Originally Disc Bearings were a patented product produced by only one manufacturer, but in the last few years, Cosmec has begun to offer Disc Bearings to all of our bearing customers. Cosmec Disc Bearings are presently in use in many varied bridge structures throughout the USA.

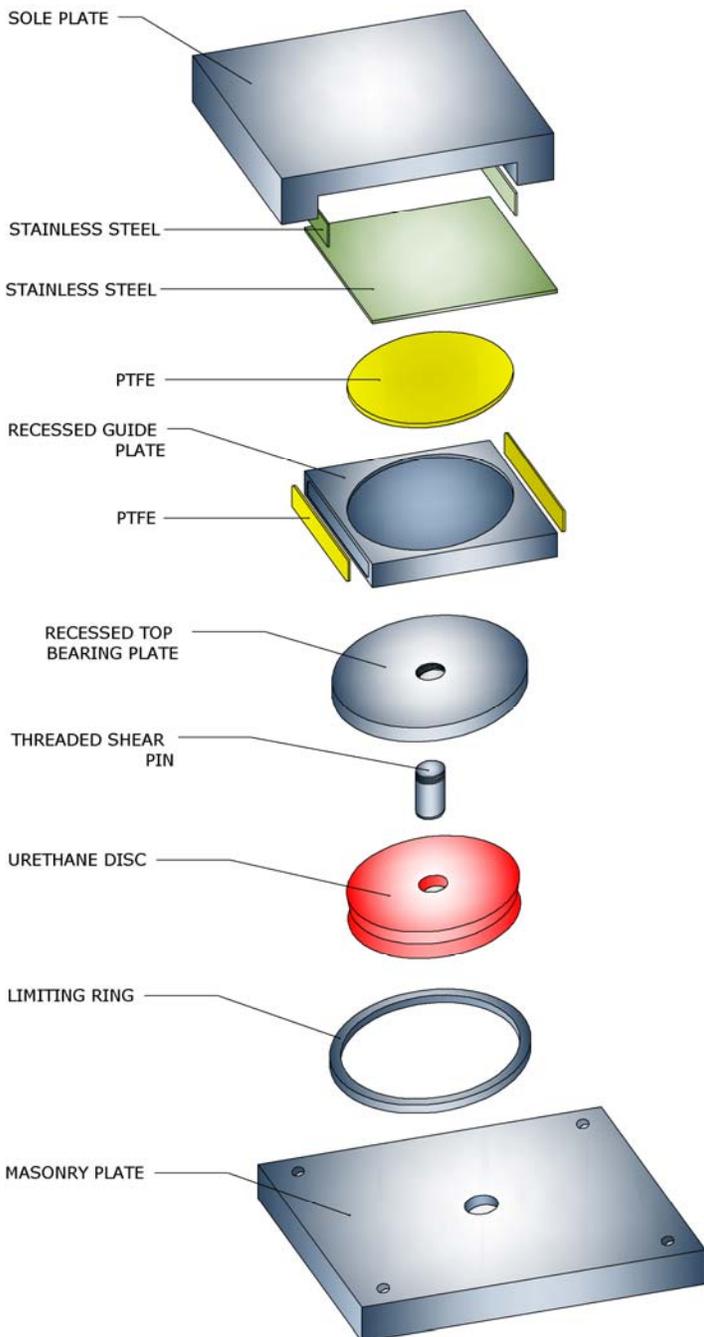


FIGURE 1: TYPICAL DISC BEARING

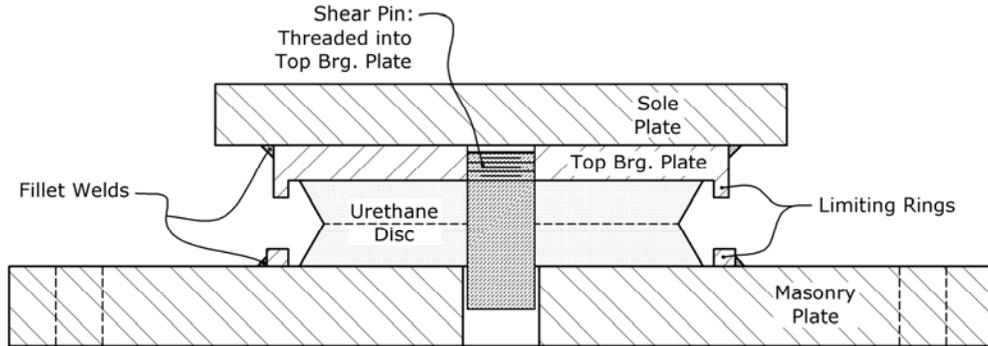
Disc Bearings offer lower profiles over other multi-rotational bearings such as Pot Bearings. This is due to the use of a polyurethane disc to accommodate rotation instead of a confined elastomer, a pot and a piston. Figure 1 illustrates the complete Disc Bearing system. However, unlike Pot Bearings, Disc Bearings DO exhibit compression in varying amounts under load and are, therefore, not as well suited for use where differential compression (vertical deflection) from bearing to bearing may be of some concern.

Disc Bearings can be confidently used where all anticipated rotations of the bearings do not exceed 0.030 radians. In addition, Disc Bearings may be the product of choice when large vertical load-carrying capacity is needed, but the available room is at a premium. Also, due to their simplicity, durability and their minimum number of parts, Disc Bearings are very low maintenance.

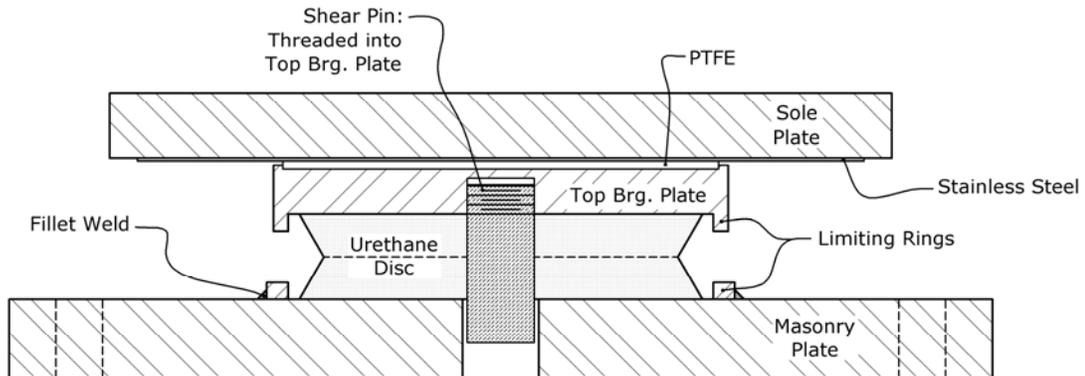
Expansion Disc Bearings feature slide interfaces of PTFE/stainless steel. This sliding interface offers a low coefficient of friction and thus the ease of movement for the structure. Guided Expansion Disc Bearings use guides also employing slide interfaces of PTFE and stainless steel.

## STANDARD BEARINGS — DISC BEARINGS

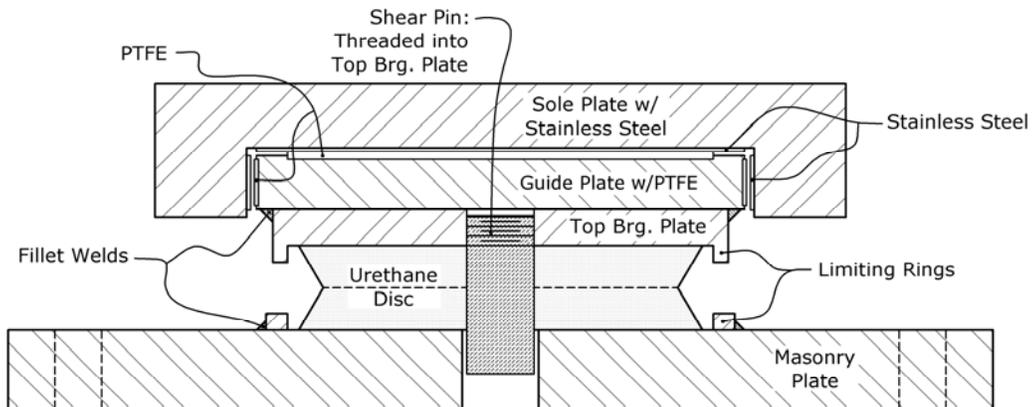
The bearings detailed in the following examples represent a typical range of economical Disc Bearing units. Included are Fixed, Non-Guided Expansion and Guided Expansion Bearing Units.



FIXED DISC BEARING

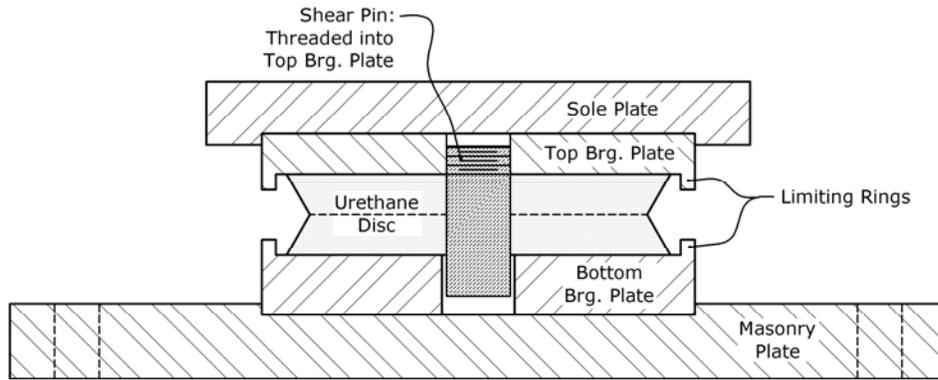


NON-GUIDED EXPANSION DISC BEARING

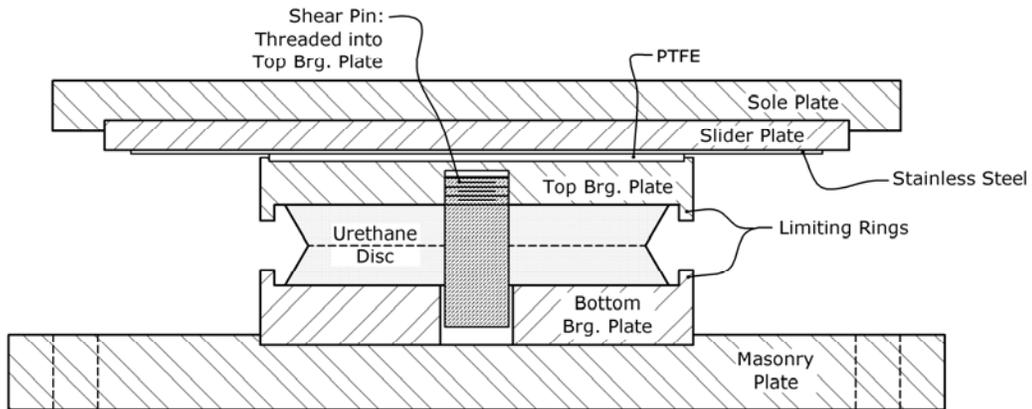


GUIDED EXPANSION DISC BEARING

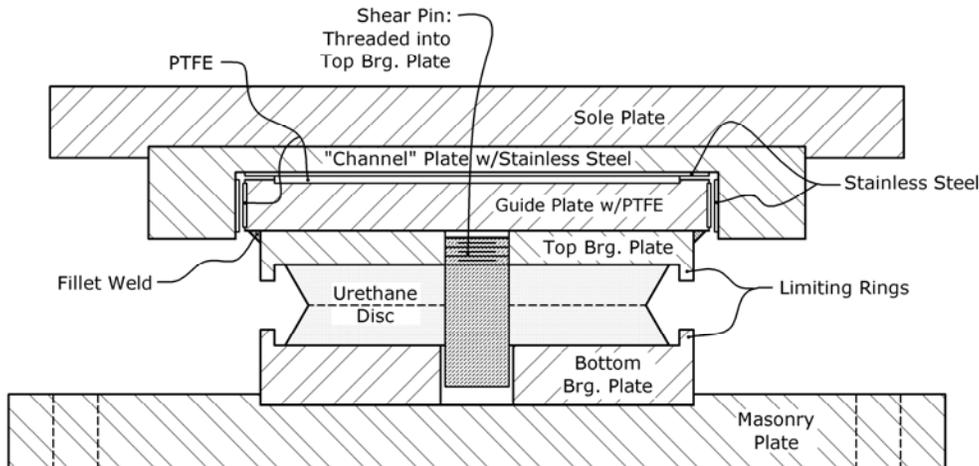
Where replaceability is an issue, the following Disc Bearing units with removable lower bearing plates are recommended:



FIXED DISC BEARING



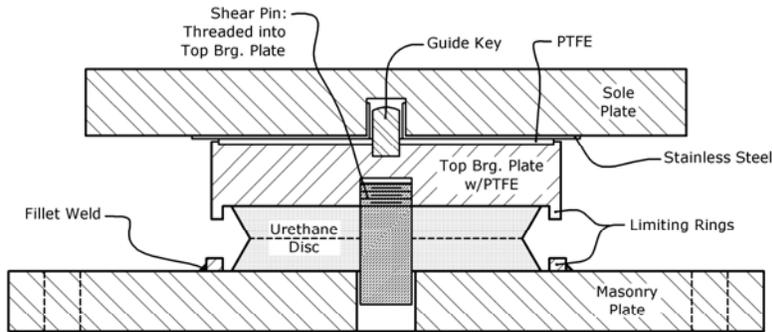
NON-GUIDED EXPANSION DISC BEARING



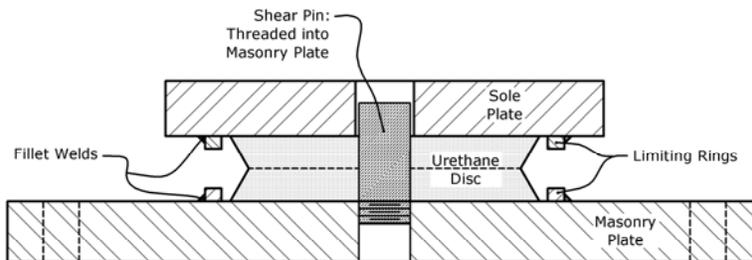
GUIDED EXPANSION DISC BEARING

## DESIGN ALTERNATIVES—DISC BEARINGS

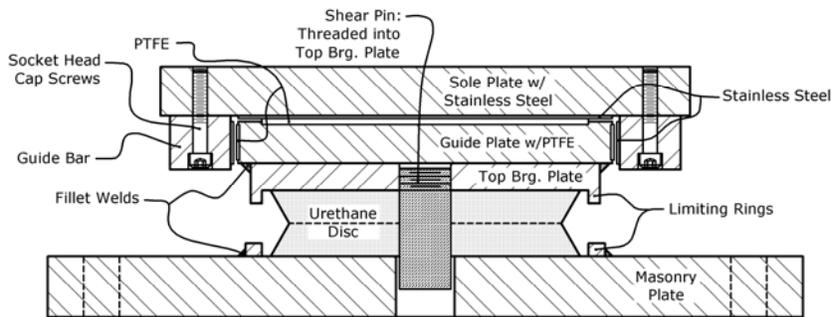
The bearings detailed in the following examples are alternative Disc Bearing configurations that are produced by Cosmec and may be used for specialized applications or special requirements:



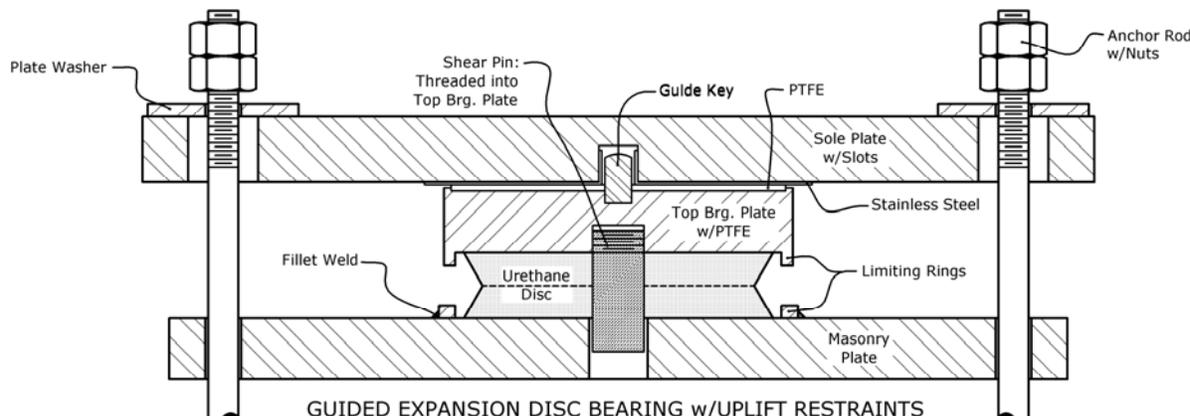
CENTER-GUIDED EXPANSION DISC BEARING



"INVERTED" FIXED DISC BEARING (Pin Upward)



GUIDED EXPANSION DISC BEARING w/BOLTED GUIDE BARS



GUIDED EXPANSION DISC BEARING w/UPLIFT RESTRAINTS

### CENTER-GUIDED EXPANSION

**DISC BEARING:** May be used when a lower profile is required. Is used best when horizontal loads are relatively small (less than 20% of vertical Load). Many different low-coefficient of friction surfaces are possible and different configurations are possible for the guide key.

### "INVERTED" DISC FIXED BEARING:

Can be used when the height of the bearing must be kept as low as possible – such as for rehabilitation projects. Also, should be used when the location of the axis of rotation must be kept as low as possible on the bearing assembly.

### GUIDED EXPANSION DISC

**BEARING WITH BOLTED GUIDE BARS:** These can be used when removable guide bars are desired.

### DISC BEARINGS WITH UPLIFT RESTRAINTS:

Cosmec can design Disc Bearings with uplift restraints when some uplift is anticipated. One possible configuration is shown, however many differing configurations are possible. We can customize bearings as required. Please contact our Engineering Staff for suggestions.

## DESIGN and MATERIALS — DISC BEARINGS

Cosmec's Disc Bearing designs draw from experience, full size bearing testing and the latest technology. Our team has total design and manufacturing experience in excess of 50 years and we participate in creating the very latest specifications.

Our designs are based on using ASTM A709 Grade 50 (AASHTO M270 Grade 50) steel, and ASTM A709 Grade 50W (AASHTO M270 Grade 50W) weathering steel. ASTM A709 Grade 36 (M270 Grade 36) will be considered on demand.

The urethane discs are made from polyether urethane compound formulations that meet present AASHTO requirements or requirements mandated by specific State DOT Specifications. These compounds are formulated to accommodate all design rotations without lift-off. However, with these urethane formulations, the urethane disc will bulge under vertical load and will also exhibit "creep" over time, therefore, we find it advantageous to provide limiting rings (see Figure 2) to prevent excess slip of the disc which can result in larger vertical deflections.

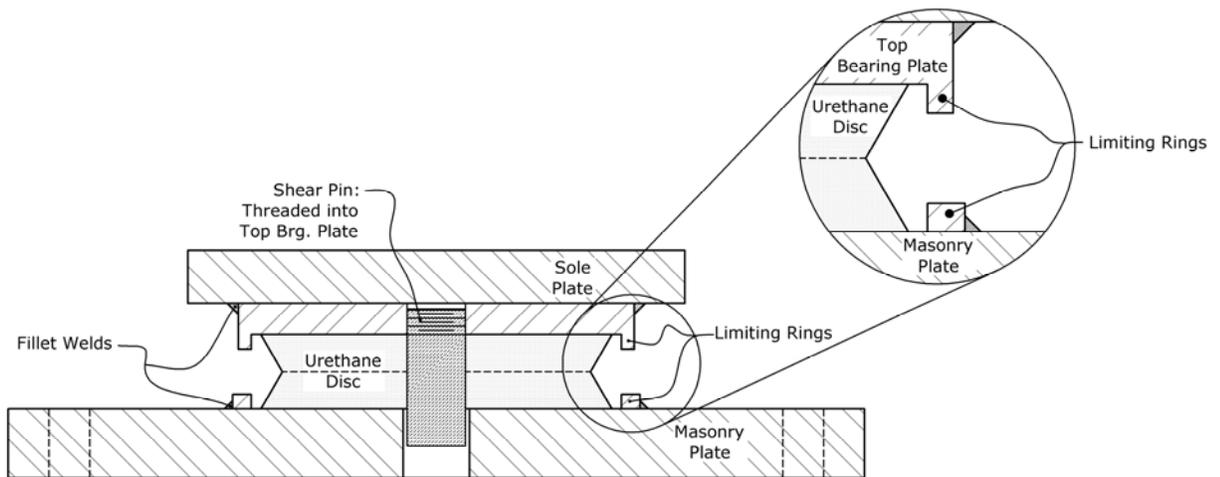


FIGURE 2: SHOWING LIMITING RINGS

Some Disc Bearing manufacturers provide bearings without these limiting rings and are depending solely on friction between the disc and the mating steel surfaces to control the urethane disc deformation. Cosmec does NOT recommend this variation of a Disc Bearing design due to the lack of consistent control of the disc deformations from bearing to bearing.



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All materials for all US bearings will be certified domestic material manufactured and fabricated in the USA in accordance with the "buy American" requirements for all Federally funded work.

Other material specifications include ASTM A240 Type 304 and Type 316 stainless steel with a #8 mirror finish; ASTM D4894 PTFE. Special high-strength shear pin material is used to insure a smaller pin diameter and thus a smaller bearing.

Testing can be undertaken to fulfill all requirements of the AASHTO Specifications and any other specialized testing as may be required. Most testing can be performed in our own testing facilities.

Coating on the bearings can be the latest high performance paints, including high-solids zinc primers, or the bearing assemblies can be metallized (zinc or zinc/aluminum thermal spray coatings). Galvanizing of the carbon steel components can be considered on demand. Coating recommendations can be made to insure a long-lasting product no matter what the environment.



## **STRUCTURAL DESIGN CONSIDERATIONS — DISC BEARINGS**

Expansion Bearings should be mounted with the primary stainless steel sliding surface facing down so as to avoid the accumulation of dirt and debris that can affect the sliding performance of the bearing over time. However, Cosmec has provided Expansion Bearings with the stainless sliding surface upwards and special debris brushes were provided to insure that the sliding surface was kept clean. Please contact our Design Team if such bearings may be required on your project.

Fixed Bearings may be mounted any face up.

Slide plate offsets can be provided when specified.

Disc Bearings are not designed to take bending moments. They must be provided with even, flat seats. High-strength grout or rubber or fabric pads are recommended. Leveling blocks or bolts must be removed after erection. Shims, when used, must cover the entire bearing area.

Formwork may be constructed around a bearing for poured-in-place concrete structures. Seal between bearing and formwork to prevent contamination by laitance or concrete. Offsets should be established in advance.

Disc Bearings can accommodate many anchoring systems. While we do not cover those systems here as they are considered to be part of the structural engineering design, suggestions for best compatibility with our bearings will be offered on request.



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## **INSTALLATION — DISC BEARINGS**

Cosmec Disc Bearings are manufactured to close tolerances in a controlled environment. Care must be taken in the handling and installation to ensure they start their service life in a clean undamaged condition. They should be stored under cover and off the ground. Retainer clips or strapping are used to hold bearing parts together for shipping and erection; they must be removed to allow the bearing to function, but not before final positioning and only at the Engineer's direction. Slide plate offsets should be set in the shop, but they may be re-set on site.

Bearings should not be disassembled on site without direct supervision by qualified personnel. We will not be responsible for the subsequent non-performance of a bearing if disassembly occurs without our supervision and written approval. In case of inadvertent disassembly, call us immediately.

Lift bearings by their bases only. Do not rely on transportation straps or brackets to carry the bearing's weight.

Do not specify paint or coatings on the PTFE or on the urethane disc or the steel surfaces in contact with the urethane disc. The steel areas in contact with the urethane disc are intentionally made rough in order to help confine the disc through friction. Paint on these surfaces will defeat this.

Specialized lifting "lugs" or setting fixtures can be designed and fabricated by Cosmec to meet special needs for the erection, installation and/or setting of the bearings. These items will be considered on demand. Please contact our Engineering staff with any such requirements before the final design of the bearings.



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