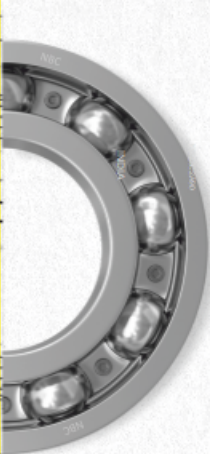
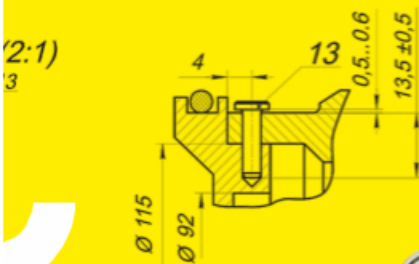
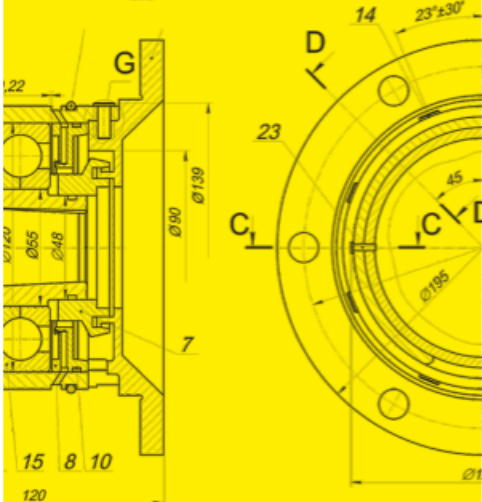




CK BIRLA GROUP



ROLLING BEARINGS

Bearing Selection And Arrangement



2 WHEELERS



3 WHEELERS



4 WHEELERS



TRACTORS



LCV, HCV



INDUSTRIES



RAILWAYS



About National Engineering Industries Ltd. (NBC Bearings)

A symbol of dependability and flexible engineering solutions, NBC Bearings is the brand of National Engineering Industries. Founded in 1946, National Engineering Industries Ltd (NEI) is India's leading bearings manufacturer and exporter, renowned for excellence in quality and delivery. In 2021, NBC bearings completed 75 years of its incorporation.

Headquartered in Jaipur, Having started with 30,000 bearings in 19 sizes in 1946, NBC has evolved to manufacture over 200 million bearings each year offering in 2300+ variants to serve a host of customers in India and over 30 other countries across five continents in automotive, railways and industrial segments. NBC also serves the Indian aftermarket through a countrywide network of 550+ authorized stockists and thousands of retailers.

Award & Recognitions :

NBC has been the recipient of several award and accolades for its quality consciousness and manufacturing prowess. Most prominent being the coveted Deming Grand Prize which is the highest honour in quality awarded to a company for excellence in Total Quality Management (TQM). NBC bearings is the only bearing manufacturer to win both - The Deming Application Award and The Deming Grand Prize Award.

The award is given by the Japanese Union of Scientists and Engineers (JUSE) to companies for demonstrating practicing TQM in the areas of production, customer service, safety, human resource, corporate social responsibility, environment, etc. NBC stands committed to an endless journey of continuous improvement through TQM.

3.1 Bearing Selection Process

The bearing selection is primarily dependent on application to which they are subjected to. A detailed study considering load magnitude, misalignment, rotational speed, fit, preload, operating and environmental conditions etc. at location and equipment to which bearing to be installed will in fact suggest the proper bearing to be selected. Other factors playing vital role in bearing selection includes housing & shaft parameters and service life of equipment. The lubricant and sealing also plays a critical role. This is important as cleanliness has effect on bearing life. As a general guideline basic steps can be followed for selecting appropriate bearing as shown in the flow chart.

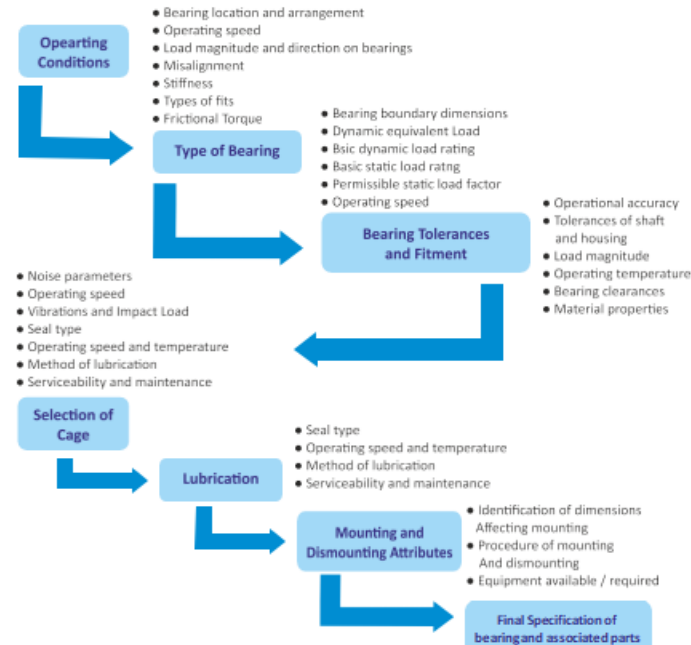


Figure 3.1 Flow Chart for Bearing Selection

3.1.1 Selection of type of bearing (Allowable installation space for bearing)

The limit of space available for bearing installation is a major factor according to which the type and size of bearing must be selected. Generally design of shaft initiates with fixing of shaft diameter followed by checking other parameters for feasible design. The bore of bearing is selected on the basis of shaft parameters. The wide variety of dimensions available in dimension series of rolling bearings provides the basis for selection of feasible bearing. The figure 3.2 shows the different types of bearing and dimension series of rolling bearing

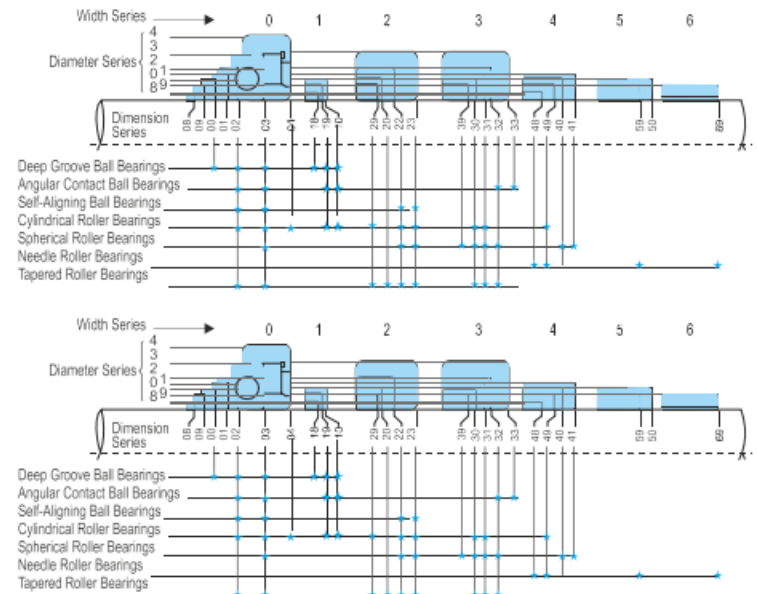


Figure 3.2 Different types of bearing and dimension series of rolling bearing

3.1.2 Load capacity and direction

Direction of load, magnitude of load and direction of application plays a vital role in selection of bearings. Apart from these vibration and impact also contributes significantly in bearing selection. It is seen that for shock / impact loads roller bearings have higher load capacity than ball bearings when bearings of the same dimension series are compared. The figure 3.3 shows the load capacity of different type of bearings.

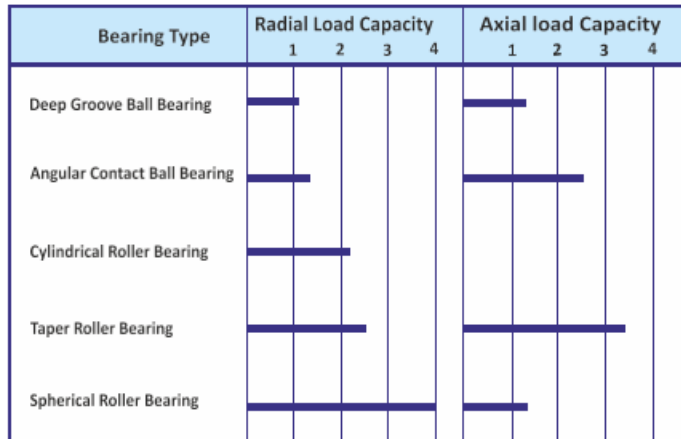


Figure 3.3 Load capacity of different type of bearings

3.1.3 Speed of rotation

Speed of rotation of particular type of bearing which in fact is allowable speed of bearing depends upon Bearing Size, Cage, Running accuracy, load magnitude and lubrication. It has been seen that generally ball bearings (both deep groove and angular contact) and cylindrical roller bearings are widely used in applications with requirement of high speed of rotation. The figure 3.4 shows the speed of rotation of different types of bearings with respect to each other.

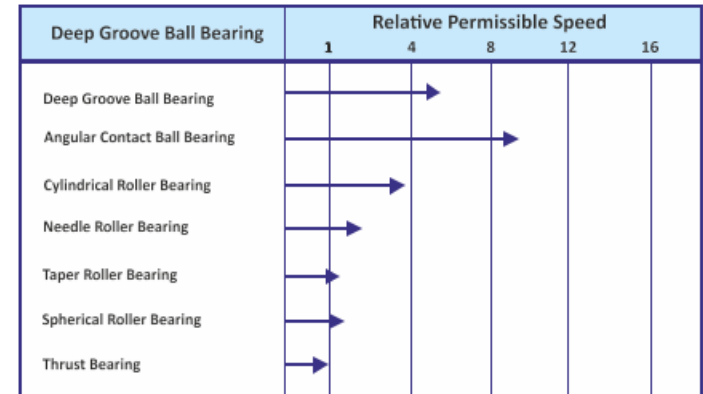


Figure 3.4. Speed of rotation of different types of bearings

3.1.4 Running accuracy

As bearings are designed for different applications which may consist of high running accuracy equipment such as rotary devices, spindle for machine tools etc. The tolerance class of 'class 5 or higher' is recommended in such type of applications. Deep groove ball bearing, Angular contact ball bearing and cylindrical roller bearings are precisely designed for applications with high accuracy requirement.

3.1.5 Rigidity

At the point of contact wherein rolling elements are in contact with bearing raceways under load, elastic deformation appears. This is known as rigidity of bearing. Elastic deformation in roller bearings in comparison to ball bearing is less under same loading conditions. It becomes essential for bearings to have sufficient rigidity for better performance as well to reach target life.

Ratio of bearing load to elastic deformation determines the rigidity of bearing. The rigidity of bearing can be enhanced by preload which gives bearing a negative clearance prior to operation. Mostly taper roller bearing and angular contact bearings are preloaded.

3.1.6 Misalignment of races and types of bearings

The shaft and housings plays a vital role in alignment particularly during operating conditions. Under the circumstances which causes accuracy in alignment such as shaft deflection under loads can leads to misalignment of inner and outer ring of bearing.

Misalignment which is excessive in nature can significantly damage the bearings involved. There is availability of bearings that can accommodate misalignments up to certain extent. It is always recommended to select such bearings in those conditions. Generally criteria for selection of bearings says higher the self-aligning capability of bearing, more is the misalignment it can accommodate.

Spherical roller bearings and self-aligning ball bearings can accommodate high misalignments followed by deep groove ball bearings and angular contact ball bearings. Cylindrical roller bearings can least accommodate misalignments.

3.1.7 Mounting and dismounting of bearings

Another way of classifying bearings depends upon their nature of separation based on which they are categorized into separable and non-separable types. Here separable type of bearings can offer ease of mounting and dismounting. Applications which require periodic inspections the separable type of bearings are recommended. The roller bearings such as taper roller bearings, cylindrical roller bearings and needle roller bearings are basically recommended for applications which require periodic mounting and dismounting. Also in case of spherical roller bearings with tapered bore and self-aligning ball bearings with tapered bore the use sleeve can ease the mounting of bearings.

3.1.8 Noise and torque

It is the level of precision to which the bearings are manufactured contribute to noise and torque outcomes. Here at NBC bearings high precisions are kept while manufacturing all types of bearings. Noise levels are many a times specified based on applications to meet the requirements as seen in the case of deep groove ball bearings and cylindrical roller bearings. Generally for very low noise and torque Deep groove ball bearings are recommended.

3.2 Selection of bearing arrangement

Generally, two or more bearings are used in various application for the purpose of supporting the shafts. The following factors plays a vital role in bearing mounting arrangements.

- (a) Location of bearings in arrangement for ease of mounting and dismounting.
- (b) Variations in temperature leading to expansion and contraction of shaft.
- (c) Deflection of shaft as well as errors during mounting (if any) causing misalignment in bearing.
- (d) Bearings ability to sustain loads at their mounting position.

Usually, bearing arrangement on shaft happens in way that a bearing is mounted on fixed side followed by other bearing mounted on free side.

Fixed side bearing:

The bearing which prevents axial movement of the shaft relative to housing is fixed bearings. Fixed side bearing is able to support radial and axial loads. A bearing that can fix the axial movement in both the direction must be selected.

Floating side bearing:

The bearing which allows axial movement of shaft relative to housing is floating bearing. The floating side bearing has more freedom of movement to help compensate for misalignment

and thermal expansion or contraction. Floating bearing arrangements are common with self-aligning ball bearings, deep groove ball bearings and spherical roller bearings.

Table 3.2 Some Bearing arrangements and their applications

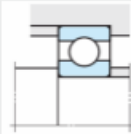
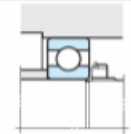
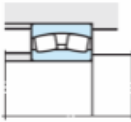
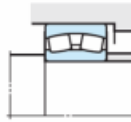
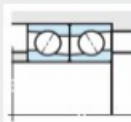
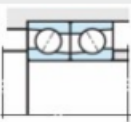
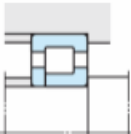
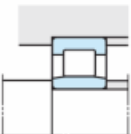
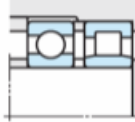

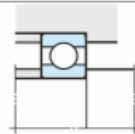

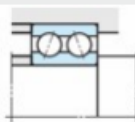
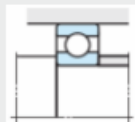
Application	Fixed side	Free Side	Remarks
Transmissions and Pumps			Arrangement capable of accommodating partial radial load as well axial loads.
Overhead crane wheels			Arrangement suitable in cases where there is possibility of errors due to mounting and deflection of shafts.
Machine tool spindles			Arrangement suitable for cases where under the action of light load high speed of rotation and high accuracy is desired.
Traction Motors			Arrangement is suitable for applications involving requirement to withstand heavy loads and shock loads. This arrangement up to some extent can take axial load also. Additionally it helps when interference is desired for both the rings.

Table 3.2 Some Bearing arrangements and their applications

Application	Fixed side	Free Side	Remarks
Diesel Locomotive Transmission			Arrangement is application with high speed and high radial load in presence of axial load.
Blowers and medium sized electric motors			Arrangement is recommended for high speed operating conditions but not suitable in case of shaft deflections.
Worm gear reducers			Arrangement is suitable for high axial load acting in both the directions.

3.3 Input required for bearing selection:

Our Engineers will be pleased to recommend the most suitable bearing and best method of mounting for any specified conditions. If you wish to use this service you should send all relevant information on the following basis.

1. Provide a drawing or sketch showing layout of the parts involved and position in which the bearings are to be fitted, giving size of shaft and any dimensions limiting the space available.
2. Include a brief description of the mechanism if this is not clear from the drawing.
3. Provide the data for the speed, load on each bearing and operating temperature.
4. Indicate any unusual features such as the possibility of shock or vibration, unbalanced load, high temperature, or the presence of dirt, moisture or fumes.
5. Give the bearing life requirements and indicate whether the duty is continuous for 24 hours a day or only intermittent. If intermittent, give periods of running and stand by.
6. If the working conditions vary considerably, give the normal duty and also the peak conditions with the frequency and duration of peaks. Say whether oil or grease lubrication is to be used. Say whether the bearings can be lined up accurately or bearing with alignment features are required.

Please consult NEI technical cell :

- If bearings are required in corrosion-resisting or in other special materials.
- If two bearings are mounted close together, special pairing of the two bearings may be necessary to ensure that they share the load.
- If the speed and temperature conditions are not provided for the information contained in this catalogue