FIXTURES
DEFINITION

A fixture is a device used for holding workpiece during machining operations.

Why use a fixture?

- Ordinary work holders are uneconomical when number of parts are more.
- Used for holding and locating workpiece
Design Principles

- Decide on locating points and clamping.
- For mating parts, use corresponding locating points to ensure proper alignment.
- Try to use 3-2-1 location, with 3 to largest surface.
- Locating points should be visible so that operator can see if they are clean and replace it when needed.
- Provide clamps that are quick acting, easy to use and economical
- Clamps should be integral part of device.
Avoid complicated clamping arrangements can wear out or malfunction.

Locate clamps opposite to locators to avoid deflection during machining and springback.

Take the thrusting forces on locators and not on clamps.

Make the fixtures foolproof.

Consistent with strength and rigidity, make the work holder as light as possible.
Provide ample room for chip clearance and removal.
Provide accessibility for cleaning.
Provide path for cutting fluid which may carry off chips.
Provide four feet on all movable work holders.
Provide hold-down lugs for all fixed work holder.
Provide keys to align fixtures on machine table.
Safety of operators should be ensured.
Types of fixtures

- Milling fixtures
- Planning fixtures
- Lathe fixtures
- Boring fixtures
- Turning fixtures
- Broaching fixtures
Types of fixtures

- Grinding fixtures
- Shaping fixtures
- Assembly fixtures
- Inspections fixtures
- Welding fixtures
- Modular fixtures
LATHE FIXTURES

Many parts such as casting and forging cannot readily be mounted by any of the standard methods. There, it is necessary to manufacture special work-holding fixtures.
The basic principles of fixtures design apply to the lathe fixtures. However, there are additional considerations that apply to the lathe fixtures, since the fixture and the work piece revolve. They are as follows..
1. Clamps and other holding devices should be designed in such a way that they will not be loosened by centrifugal force.

2. The work piece should be gripped on its largest diameter. And whenever possible, the gripping diameter should be larger than the diameter to being machined.

3. Projection and sharp corners should be avoided.

4. The fixtures should be well balanced. Irregular shaped workpieces may have to counterweighed to prevent vibration.

5. The fixtures should be as light as possible as it is rotating.

6. This section of the work pieces may require support to resist the pressure of the lathe tool.
Soft top-jaw blank

Standard reversible top jaw

Chuck body

Special top jaw after machining and heat treating
Rocking jaw chuck

Using a set of rocking jaw chucks helps ensure a secure grip on the part regardless of the surface roughness in the gripping area. Two of the three jaws are solid with the third rocking.
Solid jaws

- Similar to rocking jaws but cost less than rockers to make.
- Suitable for use on two or three-jaw chucks.
- Two of the jaws on three-jaw chucks should have gripping areas on each end.
- Special top jaws may be designed for better fit to the gripping diameter.
Face plate fixture

- It is fastened to a standard clamping and locating devices.
- It rotates around the lathe axis.
- It is usually located on the face plate by means of two dowel pins and secured by cap screws inserted through the face plate by means of two pins in ti tapped holes in the fixture or by T bolts inserted in to T-slots in the face plate.
Magnetic lathe chuck

- It has the advantage of being able to hold thin gold parts during turning and boring operations without distortion.
- Only suitable for light turning operations.
Mandrel

- This is used for holding hollow work pieces between centres.
- Some of the common types of mandrel used in lathe work are discussed here.
Solid mandrel

- Also known as plain mandrel.
- Most commonly used in shops.
- Body has a slight taper.
- Taper is given for gripping of work piece.
- Difference in dia will be 1 to 2 mm per 100 mm length.

**Figure 3.10(a) Solid Mandrel**
Gang mandrel

- It has fined collar at one end other end has a threaded portion. At this threaded end there is a movable collar.
- A set of hollow work pieces can be held between the two collars.
Expanding mandrels

A bush is mounted over this arbor. This bush has a tapered hole and a cylindrical outer surface.

Three longitudinal slots are cut on the bush.

By this construction, it is possible to expand the split bushing within a limit. Therefore, various workpieces of different diameter holes can be held in this expanding mandrel.
Cone mandrel

- It has two conical ends. One end has a solid cone, the other end has got thread. At the threaded end, there is a sliding cone. This sliding cone can be adjusted by a nut.
- This is used for holding workpieces of different hole diameters.