SHAPING FIXTURES

The work can be held on the table of a shaper by using the following ways:

• Clamped in a vise
• Clamped directly on the table
• Clamped on an angle plate
• Clamped over a V-block
CLAMPING IN A VISE

- The work is clamped between fixed and movable jaws
- The loose of the vise is bolted to table by means of bolts
CLAMPING DIRECTLY ON THE TABLE

(i) **Using a T-bolt and strap clamp**
- The workpiece is clamped to the surface of the table by a strap clamp
- The head of T-bolt fits into the T-slot
- The other end of the clamp is tightened by a step block
- The clamp rests on the step whose height is approximately equal to the height of workpiece
(ii) Using strip and stop pins

• Strip is a long piece of rectangular section having a lengthwise projection which fits into the T-slot of the table

• There are a number of holes in the strip using which the strip is clamped to the table by means of T bolts

• The stop pin screws are tightened to clamp the workpieces
(iii) Using a wedge strip and stop pin

- Used for holding long cylindrical pieces
- Wedge strip has a long projection which fits into the T-slot of table
- The workpiece is held tightly by using wedge block and stop pin on the other side
- A filler block is placed between stop pin and wedge block to avoid slippage
CLAMPING ON ANGLE PLATES

- Angle plates are used to clamp workpieces of irregular shape and having holes.
- Workpiece is clamped to the vertical face of the angle plate.
CLAMPING OVER A V-BLOCK

- Used for holding small cylindrical workpiece
- The workpiece is placed over the V-block, and it is clamped to the table by a clamp and T-bolts
- If workpiece is long, two V-blocks are used
INSPECTION FIXTURES

• Used to ensure that the workpiece meets a standard for size and shape
• The main requirement of an inspection fixture is accuracy
• Each inspection fixture should contain only those elements needed to check the specified sizes
• Two general types are:
  - Gauging fixtures
  - Measuring fixtures
(i) GAUGING FIXTURES

- Used to check a part against a preset standard size
  This setup is used to check the inside and outside diameters of a ring. If both are within the prescribed tolerance, the ring will drop into the fixture. However, if the outside diameter is too large or the inside too small, the ring will not fit.
If outside diameter is too big or inside too small, this fixture cannot be used.

An alternative for this would be to use separate gauges to check each diameter.
(ii) MEASURING FIXTURES

- Indicates where and by how much a part is out of tolerance.
- As shown in the following figure, the part is located by its center hole and rotated past a dial indicator to check the runout of the outside diameter.
In the inspection of the part shown above, the first requirement would be to ensure the proper relationship of the referenced datum to the measuring fixture and the dial indicator used to inspect the part. The requirement specified for the part is that the center section must be aligned with the two ends within 0.01 inch. The runout, which means that the indicator must be positioned to inspect the runout of the center section along a single circular path around the part.
OTHER TYPES OF GAUGES

- *Flush-pin Gauges* – are used mostly as depth indicators. A pin or rod is used to check the relationship of a surface to the top of the gauge. The figure below shows a flush pin checking the depth of a slot. If the slot is too deep, the pin will drop too far.
• **Fixed-limit Gauges** – are generally used to check the upper and lower limit of size and made to suit the specified maximum and minimum dimension size of the part.

The use of this gauge is shown in the figure. The smaller end (GO) is inserted into the hole. If it will not go in, the hole is too small and piece is rejected. If the larger end (NO GO) passes through a workpiece, the hole is too big and this part is also rejected. Hence the name “GO-NO-GO”
**Template Gauges** — are primarily used to check contours such as radii, angles, or threads. They compare a surface against a master of the exact shape. When used, they can easily detect any variation from the desired form.
MODULAR FIXTURES

Modular fixturing is a work holding system that uses a series of reusable standard components to build a wide variety of special purpose workholding devices. Modular fixtures are assembled with a wide variety of standards, such as, shelf tooling plates, supports, locating elements, clamping tools and other similar units.
Modular Fixturing Systems

They are classified into three based on the specific type/style:-

- Subplate systems
  it is basic type of modular fixture that employs flat grid plates, angle plates and multi sided locks as major components as shown in figure.
In addition to simple work holding device usages, subplates are used to hold/mount other work holders onto a tool. They can be used for almost any operation and are preferred for mounting large work pieces.
T-Slot System

These systems use a series of precisely machined base plates mounting blocks having machined and ground T-slots. Regardless to shape of base plates or type of component, T-slots are machined exactly perpendicular and parallel to each other.

Advantages
- Adaptability, strength
- Positional easiness of components
- More movements of components on base plate
- More comfortable in usage by operator

The principal disadvantage is 'Repeatability from one tool to the next'. Hence, more care is to be taken while a tool is made second/subsequent time.
Dowel Pin System

This system has lot of design similarities with T-slot systems; the major difference being the grid pattern of the holes used for location and mounting.

The min problem with this system is clamping. Because of spacing between holes, clamping arrangements are clumsy compared to...
Dowel pin systems have two hole making styles:
(i) Alternating holes  (ii) Combination holes

Alternating holes have alternating tapped holes separated by dowel pin holes.
Combination holes combine both location and mounting in the same hole by employing a dowel pin bushing.
STANDARD MODULAR ELEMENTS

The primary modular elements are:
- Locating and supporting elements
- Mounting blocks
- Clamps

Locating and supporting devices are available in different styles but are similar in most tool systems. Clamps are elements commonly and widely used with modular fixtures.
The different types of clamps are classified as:

(i) High rise clamps
(ii) Up thrust clamps
(iii) Screw edge clamps
(iv) Pivoting edge clamps
(v) Cam edge clamps
(vi) Ball elements clamps
High rise clamps

- A variation of the standard strap clamp, high rise clamps are now in widespread use.
- The high rise clamps is composed of a series of assembled parts like strap, the contact and extensions.
- It permits jobs of any sizes to be held only by simple addition of riser elements.
Up thrust clamps

- The up thrust clamps possess a unique design that holds a workpiece with pressure from below
- Useful for elevated platforms

The clamps are operated by pushing the cam handle down. Due to this the jaw rotates and has two clamping openings. Precise adjustments are made by rotation of screw.
Screw edge clamps

They combine the action of screw clamp and locator in a single unit. They are available in both fixed and adjustable configurations. In an adjustable clamp the adjustability of the clamp permitted usage for applications involving height variation using riser blocks.
Pivoting edge clamps

It uses a pivoting lever to apply holding force. These are used with a matching backstop unit to hold the workpiece between the two jaws. The pivoting lever applies the holding force in forward and downward directions. The clamp style uses a ball element in each member to equalize the clamping force and pressure.
Cam edge clamps

It uses a flat spiral cam design to generate the holding force against the workpiece. The nose element is mounted on the pivot and clamping forces are applied simultaneously in upper and lower directions. These clamps may be mounted on a base plate/adjustable positioner.
Ball element clamps

The design of ball element clamps permit the contact surface of the locators, supports and clamps to conform to the shape of workpiece eliminating all chances of component distortion.
MODULAR FIXTURING APPLICATIONS

Modular fixtures find usage

- In manufacture of small quantities of intricate parts
- In generation of prototype or experimental tool as replacement for tool holders that are to be removed for maintenance
- In construction of special purpose work holders and in conjunction with other work holders to produce special components
- In machining fixturing, welding fixturing, assembling
MERITS OF MODULAR TOOLING

• Wide range of feature and components which greatly reduce the cost of tooling area and saves money and job

• Modular fixturing have less lead time savings of 80% are common.

• Reusability by deassembly after use

• Versatility of applications.