Standard pipe fitting

Objectives : At the end of this lesson you shall be able to
- **identify the standard pipe fitting**
- **dismantling the pipe fitting**
- **assemble the pipe fitting**
- **explain the rain water harvesting.**

Standard pipe fitting: 'Pipe fittings' are those fittings that may be attached to pipes in order to:

– change the direction of the pipe

– connect a branch with a main water supply pipe

– connect two or more pipes of different sizes

– close the pipe ends

Long radius elbows have a radius equal to $1^1/_2$ times the bore of the pipe.

Short radius elbows have a radius equal to the bore of the pipe.

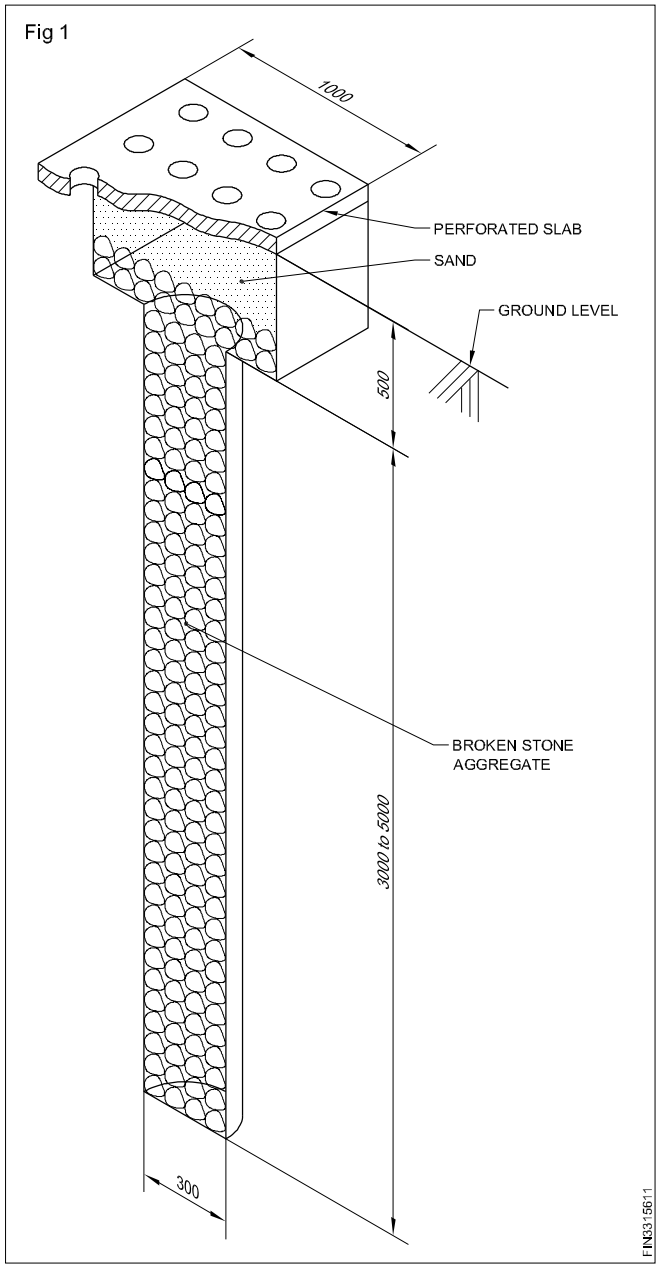
The 45^0 elbows allow pipe deviation of 45^0.

Tee branch: A tee branch helps the pipe line to branch off at 900. The branches may be equal in diameter or there may be one reducing branch.

Dismantling: The term dismantling implies carefully separating the parts without damage and removing. This may consists of dismantling one or more parts as specified or according to the usage.

Rain water harvesting: Collection of rain water when it rains for use during non monsoon months is called rain water harvesting. When rainfall occurs in heavy during a short spell if it is not collected, it floods the area or run off to sea. It is quite possible to put all the water into soil below with little effort and less expenditure so that rain water is not lost but goes to recharge ground water table. (Fig 1)

Fig 1



Benefits of harvesting

- Ground water table raises.
- Reduce the sainity.
- Avoid flooding.

Method of rainwater harvesting

- Percolators/ soakpit
- Percolation trenches
- Service well cum reckage well method

Maximum plot area to be kept as unpaved so that the rain water can percolate to ground.

The rain water from season 1st rain should normally not to be used for percolation to recharge structures. For such water, suitable arrangement for bypass in pipe system should be introduced.

A suitable provision should be made if possible to allow rain water to percolate to ground water after passing it through settltment tank because suah rain water contain silt which is deposited on sand bed reduces the percolation rate.

The recharge structure should be made on a plot at the places of lower levels/ elevations so that rain water may flow towards it under normal gravitation flow.

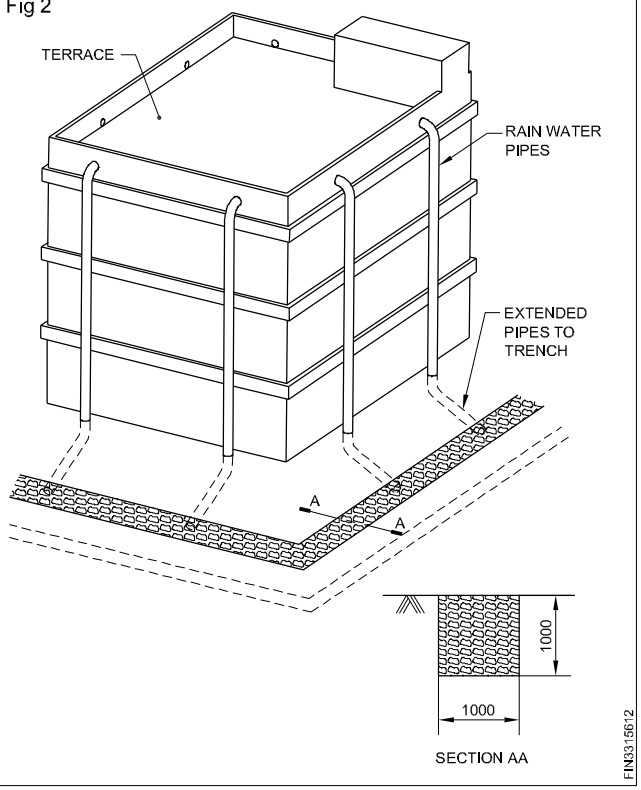
On a vast and sloppy land patch, the contour bunds preferably of mud with height varying from 15cm to 30cm should be made to store run off temporarily over the katcha land area, thus allowing more time for percolation of water to the ground water and arresting the flow of run off to the drains/ sewers.

For recharge of run off from roads suitable arrangements in the foot path by introducing some katcha area should be made.

In large residential and office complexes the drive ways, pucca path and areas should had some katcha area which may facilitate rain water to percolate to ground water. (Fig 2)

Ideal conditions for rain water harvesting and artificial recharge to ground water. Artificial recharge techniques

Fig 2



are adopted where:

- Adequate space for surface storage is not available specially in urban areas.
- Water level is deep enough (more than 8m) and adequate sub- surface storage is available.
- Permeable strata is available at shallow/ moderate depth upto 10 to 15mtr.
- Where adequate quality of surfac water is available for recharge to ground water.
- Ground water quaility is bad and our aim is to improve it.
- Where there is possibility of intrusion of saline water especially in coastal area.
- Where the evaporation rate is very high from surface water bodies.

The decision whether to store or recharge rain water depends on the rain fall pattern of a particular region.

- If the rainfall period between two spells of the rain is short i.e. two to four months, in such situation a small domestic size water tank for storing rain water for drinking and cooking purpose can be used.
- In other regions where total annual rainfall occurs only during 3 to 4 months of monsoon and the period between two such spells is very large i.e. 7 to 8 months, so it is feasible to use rain water than for storage which means that huge volumes of storage container are required.

Repair and maintenance of household water taps

Objectives : At the end of this lesson you shall be able to
- **name the parts of a water tap**
- **state the functions of each part**
- **state the constructional features of a water tap**
- **state the common defects in water taps, their causes and remedies.**

Repair and maintenance of household water taps

There are many old and new designs of taps in the market. It is advisable to read the manufacturer's instructions when repairing and replacing washers or packing materials.

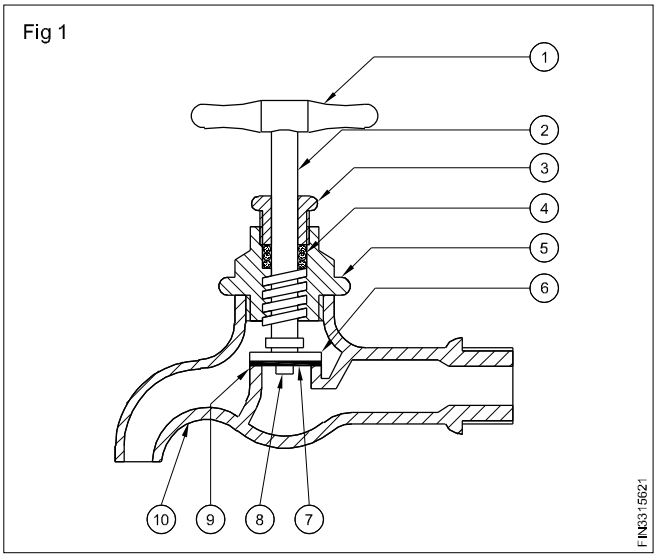
All types of screw-down water taps have two parts which must be maintained.

The packing of the stuffing box for the spindle or shaft.

The washer (rubber,leather or fibre) on the metal disk-holder or valve disk.

Fig 1 shows the inside parts of a screw-down type water tap.

Fig 1



1 Handle

2 Spindle/ shaft

3 Gland nut

4 Stuffing box/ packing

5 Bonnet

6 Metal disk-holder/ valve disk

7 Washer (rubber/ leather/ fibre)

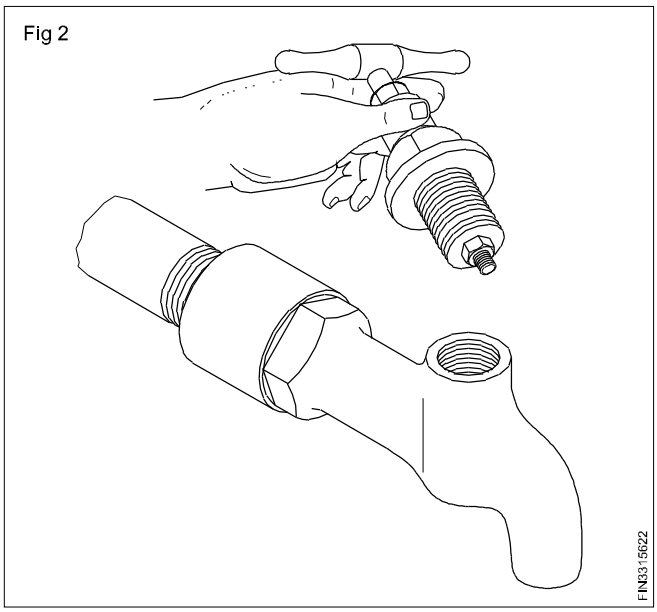
8 Retainer nut/ washer nut

9 Valve seat

10 Body of the tap.

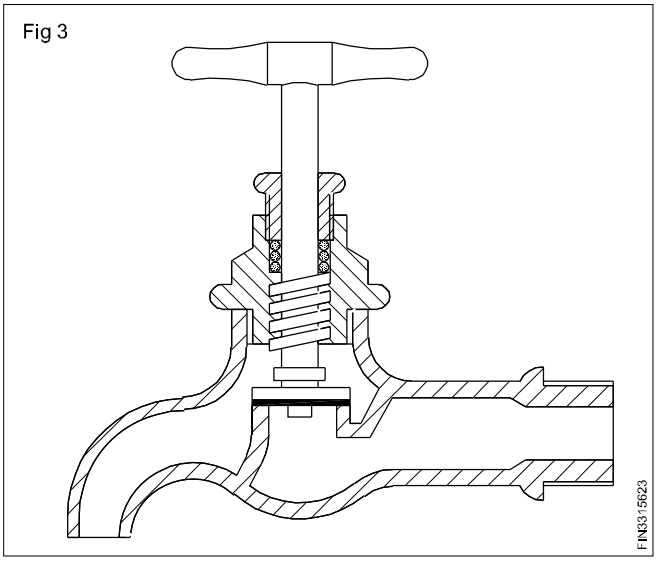
The body of the water tap contains the seat. The bonnet which holds the working parts is screwed on to the body. (Fig 2)

Fig 2



When the water tap is screwed down, the washer is squeezed between the two metal faces and this makes the joint watertight. (Fig 3)

Fig 3



The spindle has a handle at the upper end and a threaded screw at the other end.

Resting in the bottom of the spindle is the metal disk-holder containing the rubber washer which is held in position by a nut underneath.

The stuffing box at the top of the water tap has a soft graphite grease hemp packing. As the stuffing box screw is tightened, this packing is compressed, thus making a watertight joint.

Defects in the working of screw-down water taps

Defects	Causes	Remedy
Water flowing or dripping from the tap even when firmly closed.	Worn out or defective washer. Piece of grit, rust or other foreign matter on the washer. Defective seating.	Replace washer. Remove foreign matter. Reseat tap.
Water flowing from around the spindle or stuffing box screws. screw.	Defective packing in stuffing box. Screw of stuffing box not screwed down tightly.	Replace packing with greased hemp. Tighten stuffing box
Spindle continuously slipping when turned and tap will not shut off.	Spindle thread worn out.	Replace tap.
Tap hard to turn on and off.	Stuffing box packing dry. Spindle bent.	Renew packing with greased hemp of some oil into the stuffing box. Renew tap.
Loud noise in the tap when turned on.	Valve loose on the spindle. Washer loose on valve.	Renew tap. Renew the valve of the washer.

Visual Inspection

Objectives : At the end of this lesson you shall be able to
- **explain visual inspection and its need**
- **state advantages and disadvantages of visual inspection.**

Testing

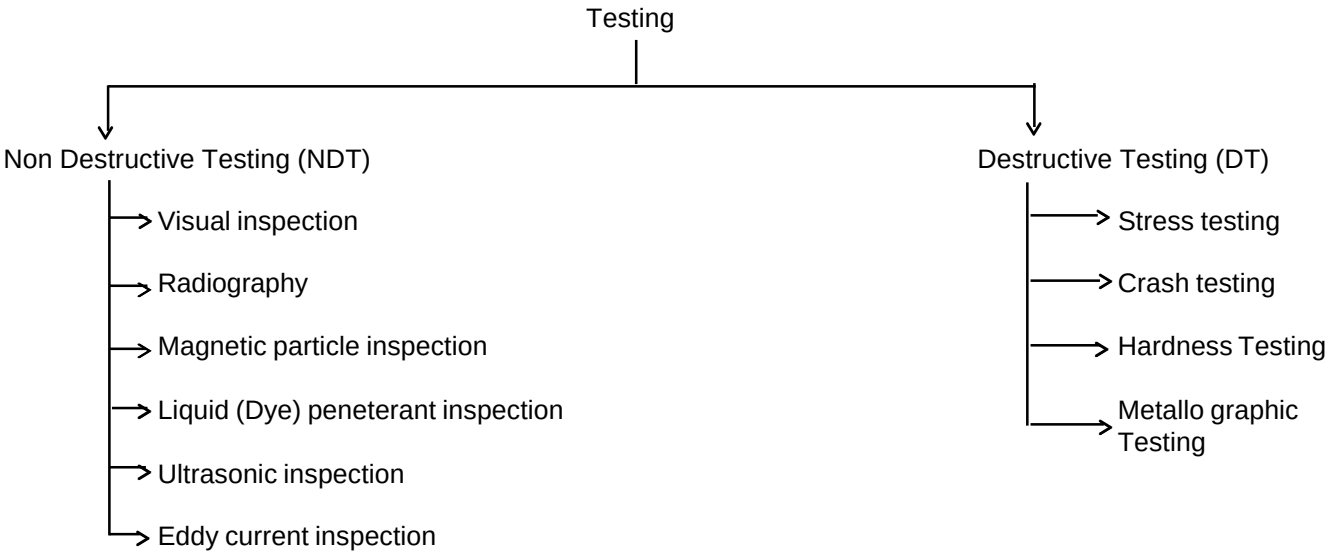
The method by which the presence, quality, genuiness of anything is determined is called testing

Testing is trial of the quality of something

in our industry or project management testing is done for mechanical properties such as

1 Strengh
2 Ductility
3 Hardness
4 Elasticity
5 Toughness
6 Shape
7 Surface finish
8 Colour etc.

Testing is two types



Visual inspection

Visual inspection is a non destructive testing method used to evaluate the item, by just observation. Visual inspection is used to inspection is used to inspect the

- Surface condition of the item
- Alignment of mating surfaces
- Dimensions and settings as per design

Visual inspection is usually the first method employed for locating defects

Visual inspection is the outlet & most common NDT method

Mechanical and optional aids may be necessary to perform visual inspection such as

Optical AIDS	Mechanical AIDS
Magnifying glass	Vernier calliper
Microscopes	Micrometer
Fibro scopes	Depth gauges
Video cameras	Feeler gauges

Types of visual inspections

a Direct visual testing

b Remote visual testing

c Translucent visual testing

Direct visual testing

It may usually made when access is suffiecient to place the eye within 600mm on the surface to be examined and angle between plane of vision & surface shall not be less than 30**°.**

Translucent visual inspection

It is a supplement of direct visual inspection. The method uses the help of artificial lighting which is contained in illuminator that produces directional lighting. The lighting must be so that there are no surface glares or reflections from surface under examination.

Advantages of visual inspection

1 Does not require any special equipments other than good eyesight.

2 It is very inexpensive from other methods of non destructive testing

3 It provides immediate results.

4 It requires minimum training to the inspector

5 Visual inspection is highly portable as less accessories to inspect are needed.

Disadvantages of visual inspection

1 The accuracy of the visual inspection depends largely on the experience and knowledge of the inspector

2 Only large defects, discontinuities can be detected.

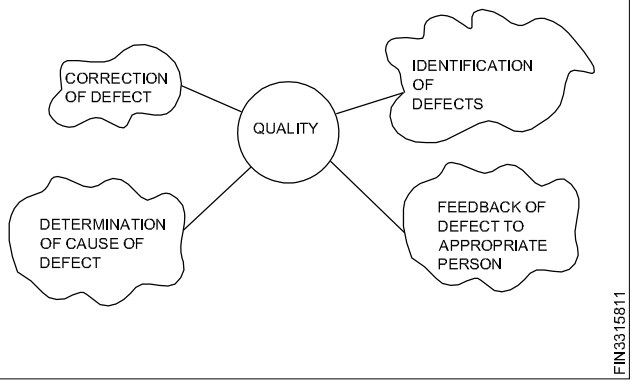
3 Possibility of misinterpretation of scratches as cracks.

4 It may be limited to detection of surface dimensional defects only.

Quality control & inspection

Objectives : At the end of this lesson you shall be able to
- **define inspection, its types**
- **define qualiy and its characteristics**
- **explain quality control and its need**
- **define SPC (statistical process control).**

Fig 1



Inspection and quality control

An inspection is most generally an organised examination or formal evaluation exercise. which may include measurement, testing, gauging, comparision of materials or items.

An inspection determines if the material or item is in proper quantity and quality

Inspection can be done

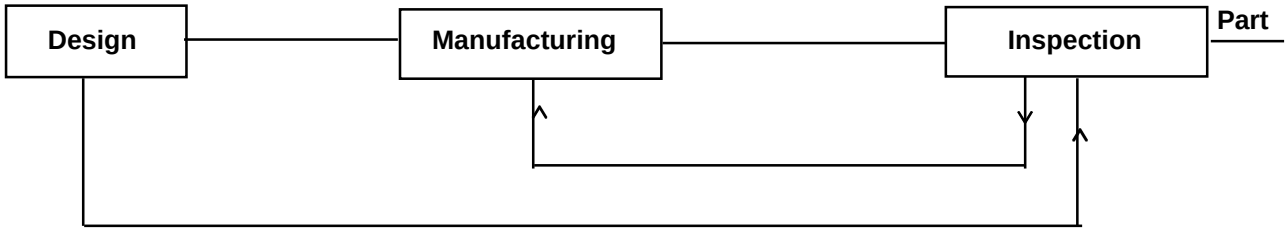
1. Individually
2. Lot by lot

Inspection is generally divided into three categories

1. Recieving inspection
2. Inprocess inspection
3. Final inspection/ product quality control

Inspection:

Inspection can be termed as the watch dog of manufacturing process



Inspection process is mostly manual

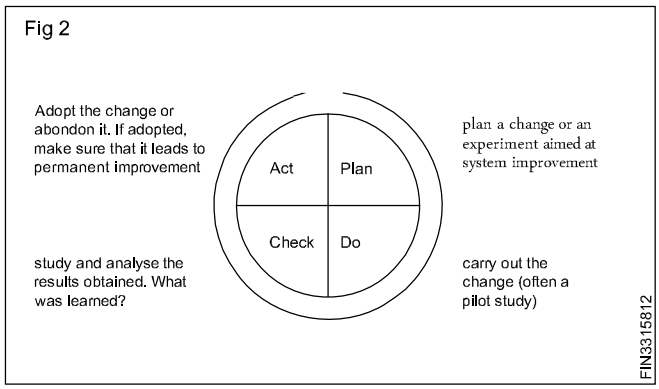
The role of inspection is to verify and validate the VARIANCE DATA and it does not involve separating the good from bad.

PDCA cycle model

PDCA cycle model is also known as DEMING CYCLE/ STEWHART CYCLE, CONTROL CYCLE.

This model is implement to improve the quality and effectiveness of process with in product life cycle management and project management.

Fig 2



It contains of 4 steps

- Plan
- DO
- Check
- Act

Objective of inspection

- Acess conformity with design specifications
- Improve product quantity and reliability

Elements of inspection process

- Interpretation of quality requirements
- Sampling of the material to be inspected.
- Examination of the material from the sample to be inspected.
- Decision and action against the inspection of sample weather to pass or reject.

Quality

- Quality is in conformance to the requirements or specifications
- Quality is fitness for use

The quality of product or service is the fitness of that product or service for meeting or exceeding its intended use as required by the customer.

- Quality of a product or a service defined by one or more elements. These elements are knwon as quality characteristics
- Quality characteristics can be classified into these categories

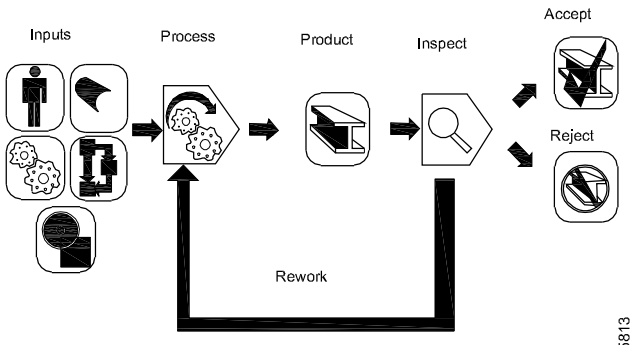
1 Structural charcteristics (Length of part, weight of can, strength of beam, viscosity of fluid, etc)

2 Sensory characteristics (taste of good food, beauty of model, smell of fragnance, etc.)

3 Time oriented charcteristics(warrenty, reliability, maintainablity etc.)

4 Ethical charcteristics (Honesty, courtsey, friendliness, etc).

Fig 3



PROCESS OF QUALITY CONTROL AND INSPECTIION

Quality control

Quality control is a short process by which entities review the quality of all factors involved in production

ISO 9000 design quality control (QC) as:

" A part of quality management focussed on fulfilling quality requirements"

This approach emphasisies on three aspects.

1 Elements such as controls, job management, degined well managed process, performance and integrety. Criteria, identification of records.

2 Competence such as knowledge, skills, experience & qualifications

3 Soft elements such as personnel, integrity, confidence organizational culture, motivation, team spirit & quality relationship.

Inspection is a major component of quality control, where physical product is examined visually (or the end results of service are analyzed). Product inspectors will be provided with list of descriptions of un acceptable product defects such as cracks or surface blemishes.

****ED of quality control**

Every operation is connected with the quality of the product it is important that quality requirements be statisfied and production schedules are met. The satisfaction of end user mainly dependednt on quality

Quality control is needed for

1 Encourage quality conciousness

2 Satisfication of consumers

3 Reduction in production cost

4 Effective utilisation of resources

5 Increased good will among the consumers

6 Reducing inspection cost

7 Increase in sales

8 Best quality in avialable resources

SPC (Statistical process control)

If a product is to meet or exceed customer expectations, generally it should be produced by a process that is stable or repeatable. More precisely, the process must be capable of operating with little variability around the target or nominal dimensions of the product's quality characteristics. Statistical process control (SPC) is a powerful collection of problem-solving tools useful in a achieving process stability and improving capability through the reduction of variability.

SPC is one of the greatest technological developments of the twentieth century because it is based on sound underlying principles, is easy to use, has significant impact and can be applied to any process. Its seven major tools are

1 Histogram or stem-and-leaf plot

2 Check sheet

3 Pareto chart

4 Cause-and-effect diagram

5 Defect concentration diagram

6 Scatler diagram

7 Control chart

Although these tools, often called "the magnificent seven," are an important part of SPC they comprise only its techinical aspects. The proper deployment of SPC helps create an environment in which all individuals in an organization seek continuous improvement in quality and productivity. This environment is best developed when management becomes involved in the process. Once this environment is established. Routine application of the magnificent seven becomes part of the usual manner of doing business, and the organization is well on its way to achieving its quality improvement objectives.

Of the seven tools, the shewhart control chart is probably the most techincally sophisticated. It was developed in the 1920s by Walter A. Shewhart of the Bell Telephone Laboratories. To understand the statistical concepts that from the basis of SPC we must first describe Shewhart's theory of variability.