



Limit, Fits & Tolerance

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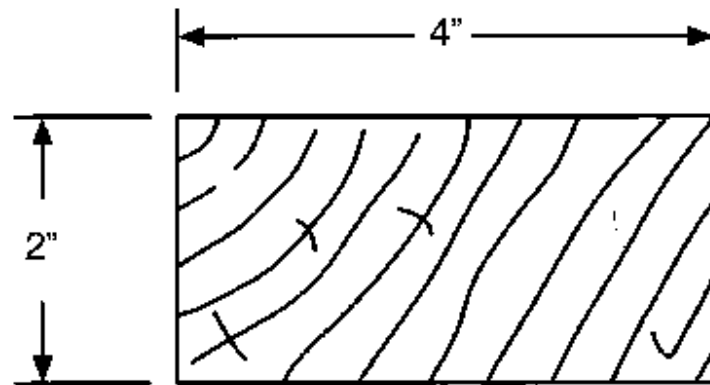
LIMITS AND FITS

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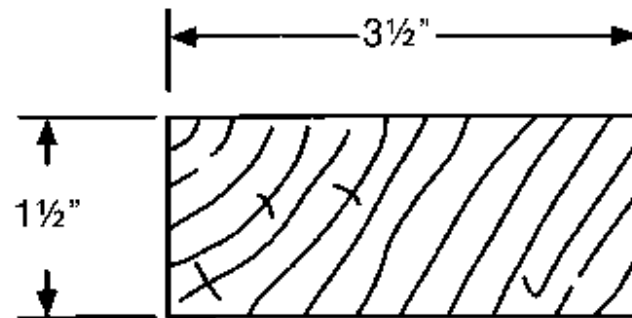
- LIMITS FITS AND TOLERANCES
- INSPECTION
- TYPES OF INSPECTION

TERMINOLOGY

- **NOMINAL SIZE:** It is the size of a part specified in the drawing.
- **BASIC SIZE:** It is the size of a part to which all limits of variation are determined.
- **ACTUAL SIZE:** It is the actual measured dimension of a part.
Nominal and basic size are often the same.



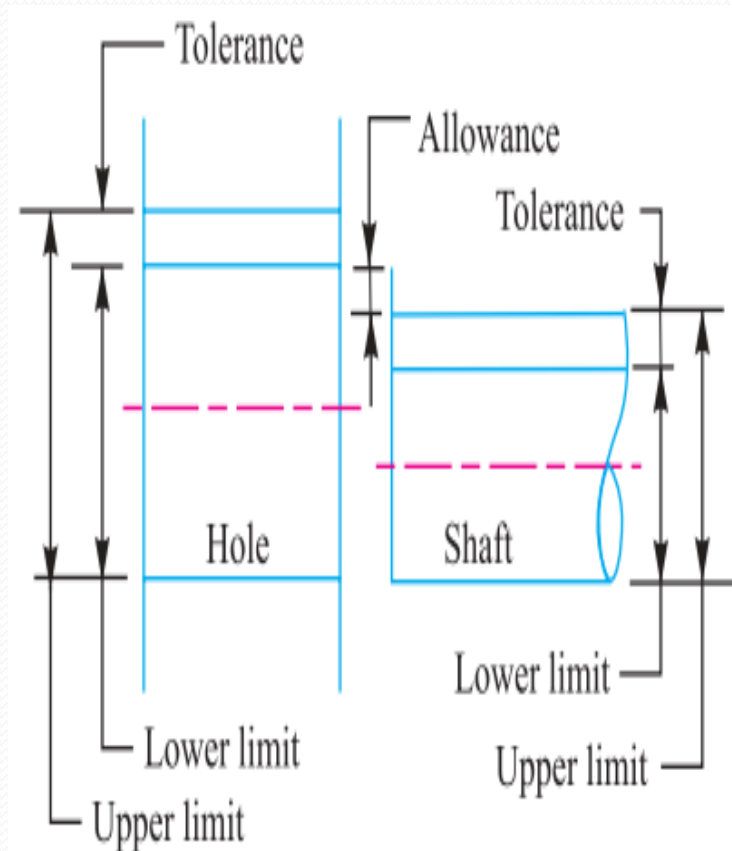
Nominal Size



Actual Size

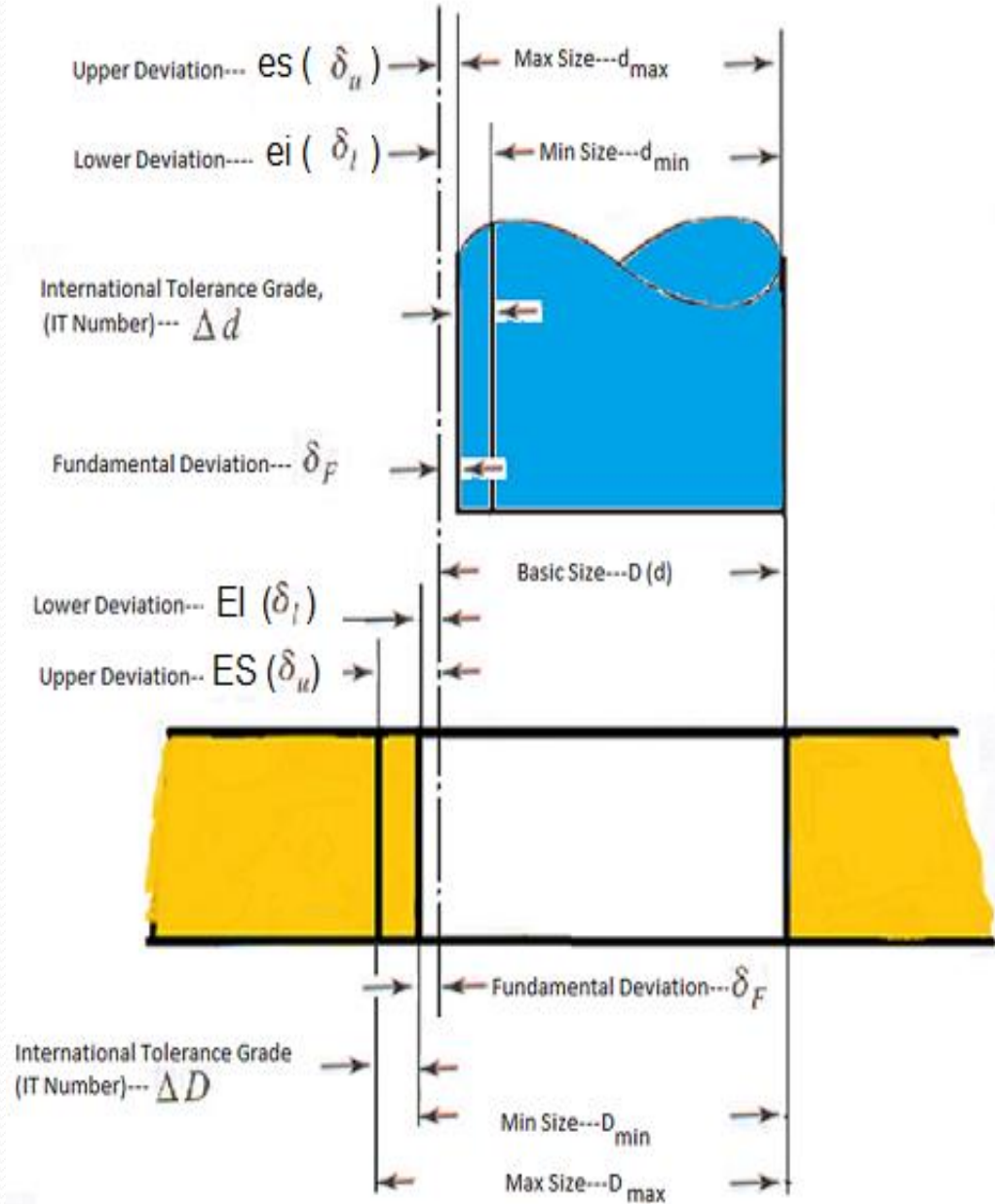
LIMIT OF SIZES

- There are two extreme possible sizes of a component.
- The largest permissible size for a component is called upper limit and smallest size is called lower limit.



DEVIATION

- It is the algebraic difference between any given size and actual size.
- **ACTUAL DEVIATION:** It is the algebraic difference between the actual size and the basic size.

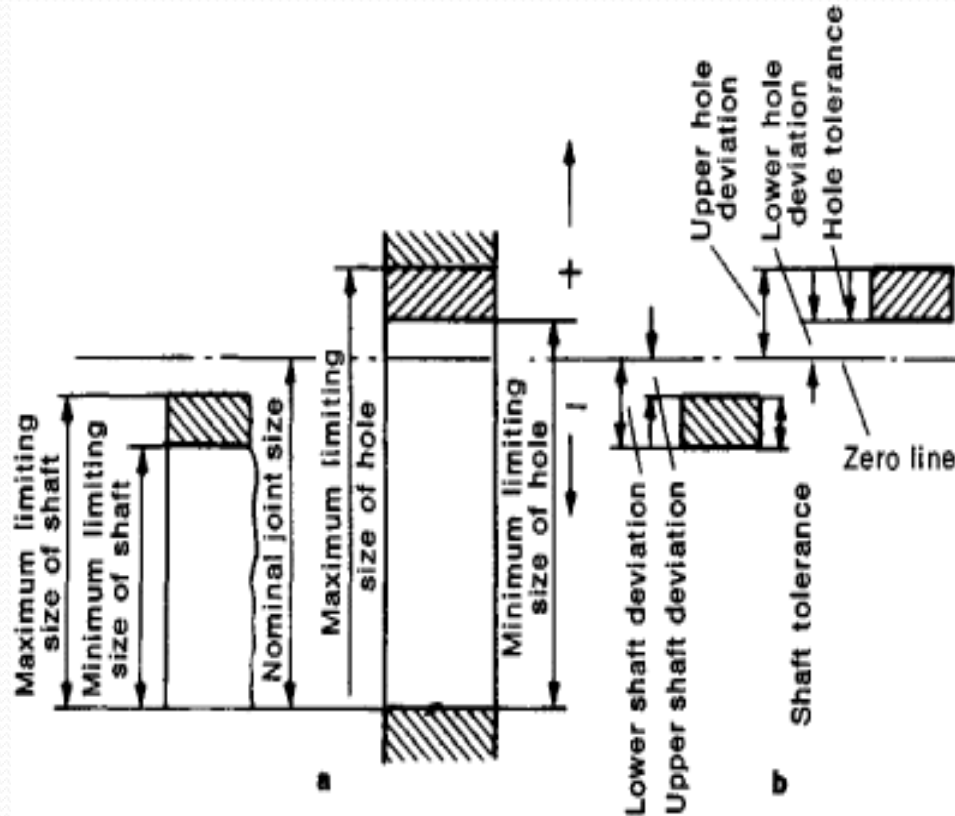


DEVIATION

- LOWER DEVIATION: It is the algebraic difference between the minimum limit of size and the basic size.
- UPPER DEVIATION: It is the algebraic difference between the maximum limit and the basic size.

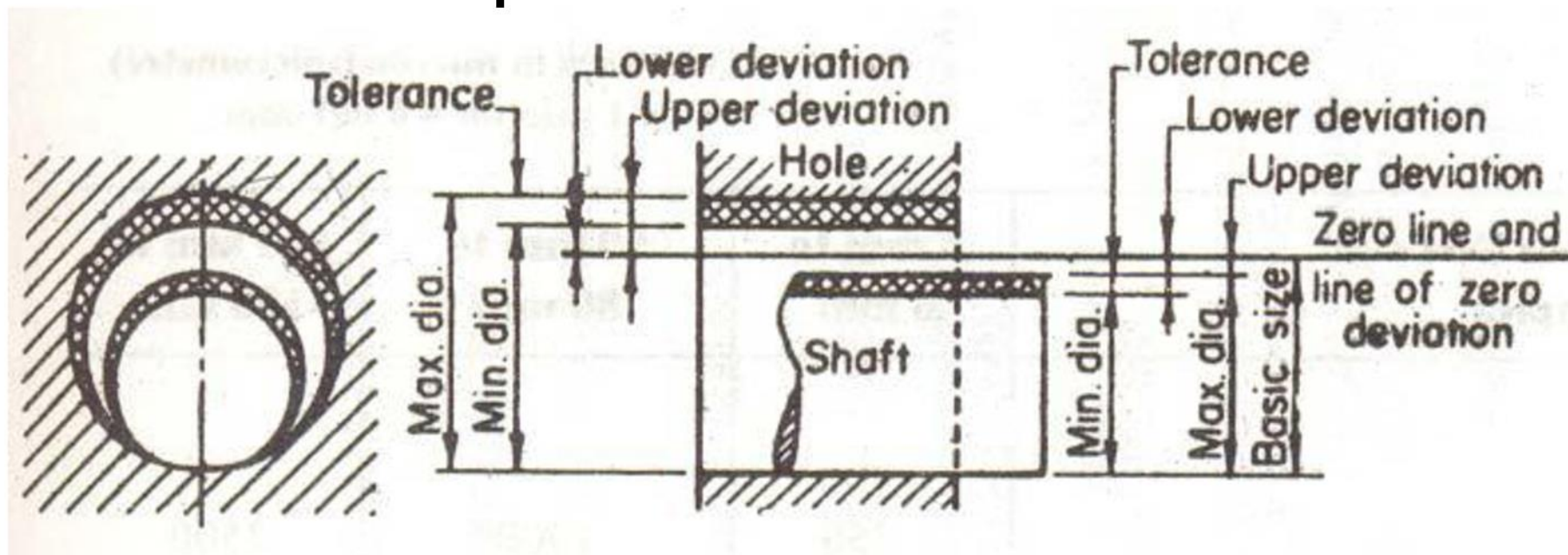
ZERO LINE

- It is the straight line corresponding to the basic size. The deviations are measured from this line.



Tolerance

- A tolerance is the total permissible variation from the specified basic size of the part.

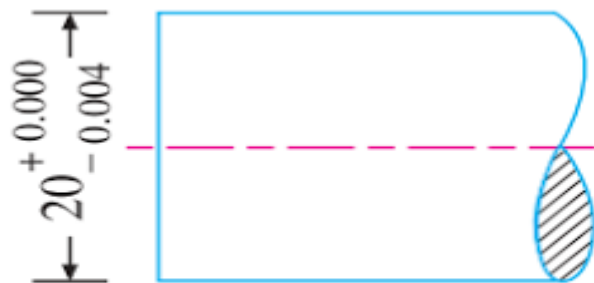


NATURAL VARIABILITY OF PROCESS

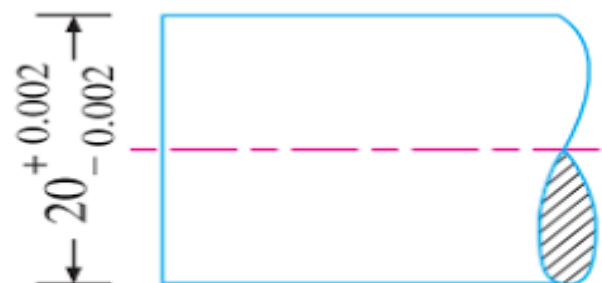
- It is the variation occurred in the size due to natural conditions like variations in material, environmental fluctuations, vibrations, human variability etc. It is an unavoidable process.

POSITIONAL TOLERANCES

- Two types of positional tolerances are used:
 1. Unilateral tolerances
 2. Bilateral tolerances
- When tolerance is on one side of basic size, it is called unilateral and if it is both in plus and minus then it is known as bilateral tolerance.



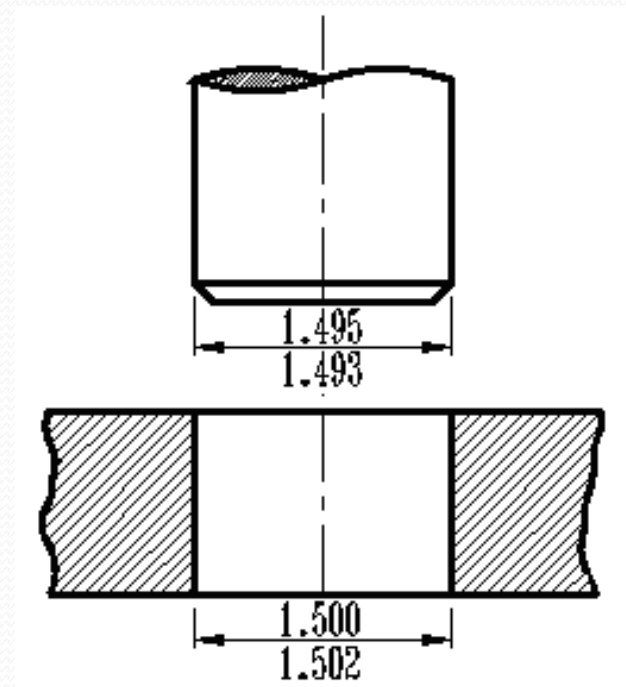
(a) Unilateral tolerance



(b) Bilateral tolerance.

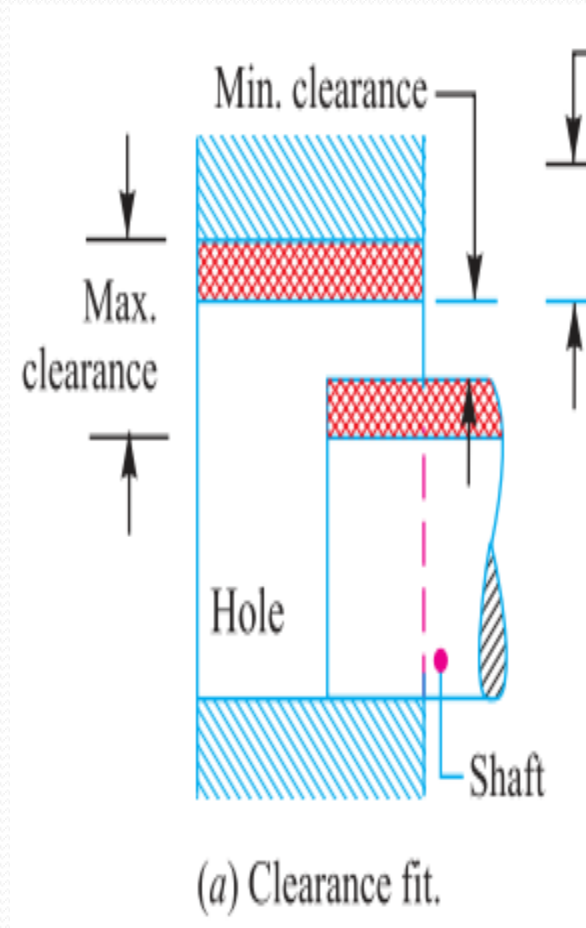
FITS

- The degree of tightness or looseness between two mating parts is called a fit.



TYPES OF FITS

- **CLEARANCE FIT:** There is a clearance or looseness in this type of fits. These fits maybe slide fit, easy sliding fit, running fit etc.

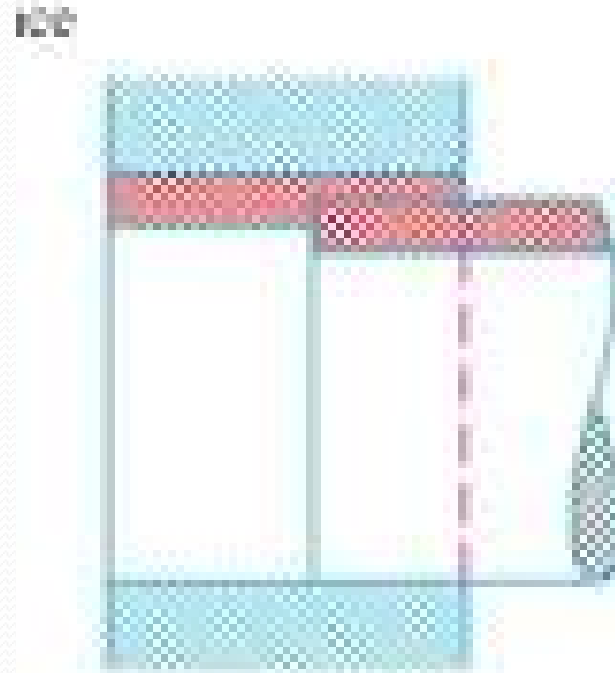


TYPES OF FITS

- INTERFERENCE FIT: There is an interference or tightness in these type of fits. E.g. shrink fit, heavy drive fit etc.

TYPES OF FITS

- **TRANSITION FIT:** In this type of fit, the limits for the mating parts are so selected that either a clearance or interference may occur depending upon the actual size of the mating parts.



(c) Transition fit.

BASIS OF LIMIT SYSTEM

1. **HOLE BASIS SYSTEM:**
In this system, the hole is kept as a constant member and different fits are obtained by varying the shaft size.

BASIS OF LIMIT SYSTEM

- **SHAFT BASIS SYSTEM:**
In this system, the shaft is kept as constant member and different fits are obtained by varying the hole size.

DIFFERENT LIMIT SYSTEMS

1. The Newall system
2. British Standard system
3. International Federation of National Standardization Association (ISA) system
4. ISO system
5. ISI system

INSPECTION

- Inspection is defined as a process used for controlling and checking the quality of a product to the laid quality standards.

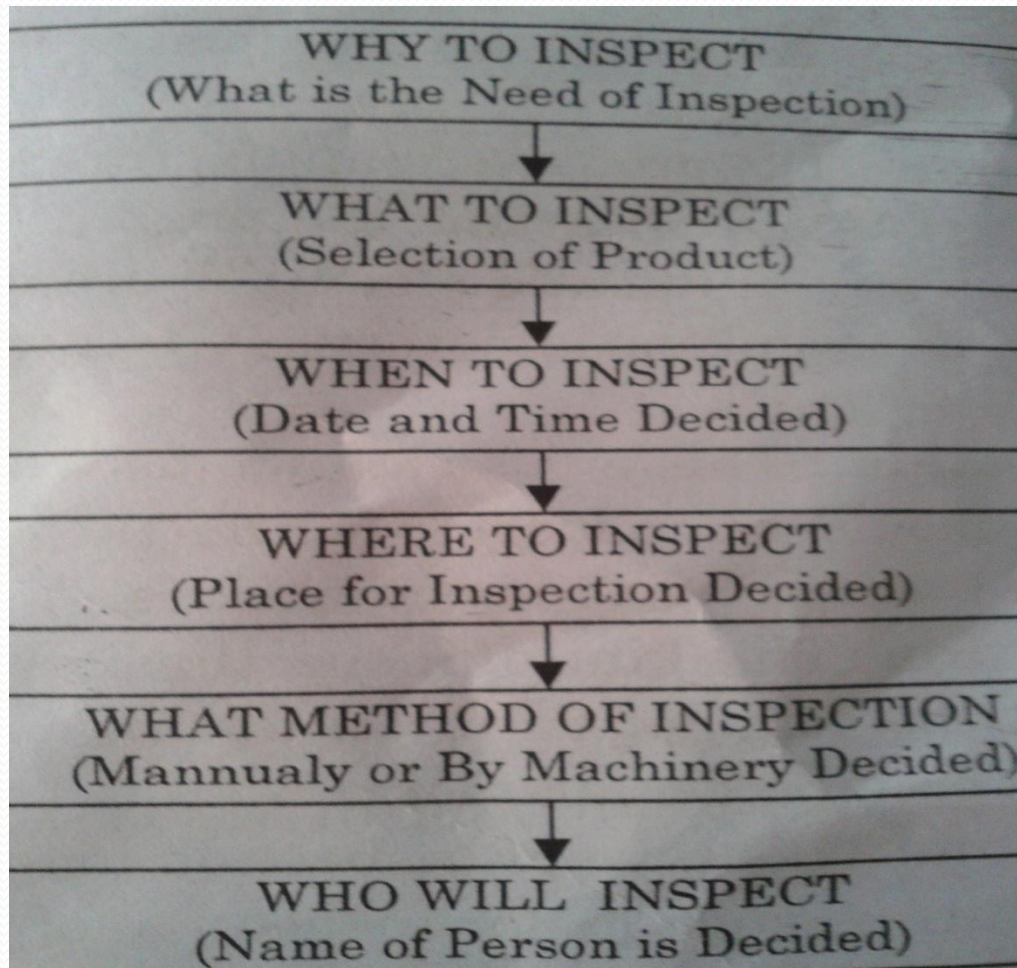
OBJECTIVES OF INSPECTION

1. It separates the defective components from non-defective ones.
2. By doing so, a defective product is rejected before reaching to the customer.
3. It prevents the further work to be done on the defective product.
4. It helps the companies to sustain their reputation by maintaining quality standards.
5. To find out the defects in raw materials and errors in workmanship.

FUNCTIONS OF INSPECTION

1. Inspection of incoming material
2. Inspection during manufacturing
3. Mechanical and metallurgical inspection
4. Tool inspection
5. Finished goods inspection

DECISIONS ABOUT INSPECTION



TYPES OF INSPECTION

- Based upon method of inspection

1. Remedial inspection
2. First-off inspection
3. In-process inspection
4. Operation inspection
5. Sampling inspection
6. Final inspection
7. Pilot-piece inspection
8. Final assembly inspection

TYPES OF INSPECTION

- BASED UPON LOCATION
 1. Centralized or crib inspection
 2. Floor inspection

Thank you