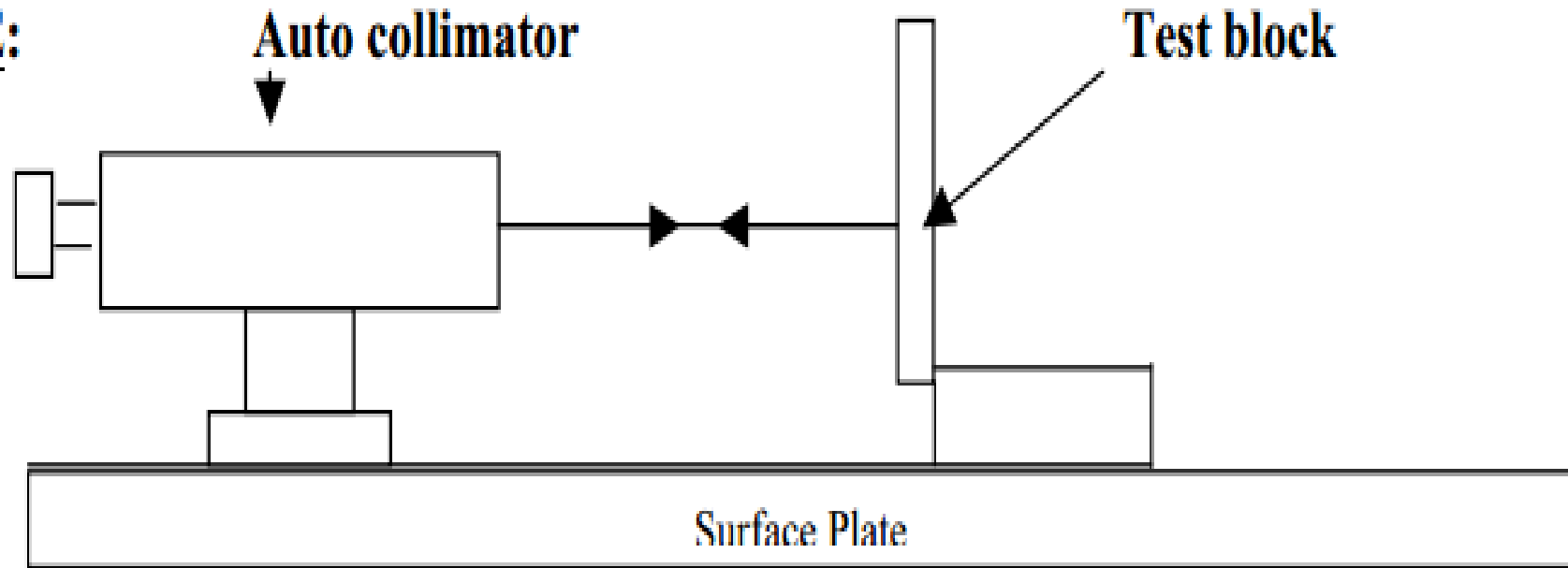# EXPERIMENT - 12
FLATNESS TEST

- 1. **AIM:** Measurement of straightness / flatness of a surface by auto collimator

- 2. **APPARATUS:** Surface plate and Test block.

- 3. **THEORY AND DESCRIPTION:**

- The simplest form of flatness testing is possible by comparing the surface with an accurate surface.

- Spirit level is used in special cases and called Clinometers, precision micro-optic clinometers

- Leveling helps in the coincidence of the 2 images. The least count of precision spirit level is 0.01 mm.

- Auto-collimator is basically a telescope permanently focused for infinity. This is a sensitive extremely accurate optical instrument which is used in work shops for inspecting straightness, squareness and parallelism.

- The instrument uses the basic principle of reflection.

- A plane parallel beam of light projected on to a plane reflecting surface placed normal to the beam is reflected back along the same path.

- When the surface is slightly tilted the reflected beam returns but in deviated path. The angle of direction is taken as a measure to check the straightness.

Let 'l' be the length of the test block and h be the vertical deviation of the surface over a length 'l' then

$$h = l \tan \theta$$

FIGURE:

Experimental setup

PROCEDURE:

- 1. The surface to be checked is cleaned and made free of dust and grease.
- 2. Auto-collimator is mounted on a rigid stand. So that the axis of Auto-collimator is parallel to the test surface.
- 3. As per the length of the test block distances are marked on the test surface parallel to the axis collimator.
- 4. The points are marked with numbers starting from '0'.
- 5. The test block is placed on the test surface at 0-1 marks with its reflecting surface normal to the collimator axis.

- 6. The collimator is adjusted until the cross wire and its reflected image are coincident as seen through the eye piece.
- 7. The test block is then moved to another position 1 –2 on the test surface keeping its reflecting surface perpendicular with the direction of movement.
- 8. The non coincidence of cross wire and image will confirm that the test surface is uneven. The scale in collimator will give the direct measure of angle of deviation of the reflected surface of the test block (i.e.$\pm \theta$).
- 9. Repeat the procedure along the entire length of the test surface and angles at every point are noted down.
- 10. The deviation from straightness or flatness at every point with reference to the 1st point is found by h = l tan θ and are plotted to find the error in straightness.

	1'	2'	3'	4'	5'
a					
b					
c					
d					

Dividing the surface plate into sections.

RESULT:

- The Flatness of a surface plate is determined.