

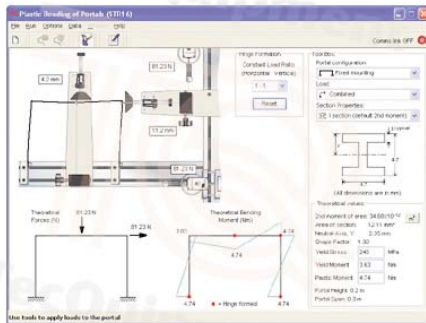


## Structures

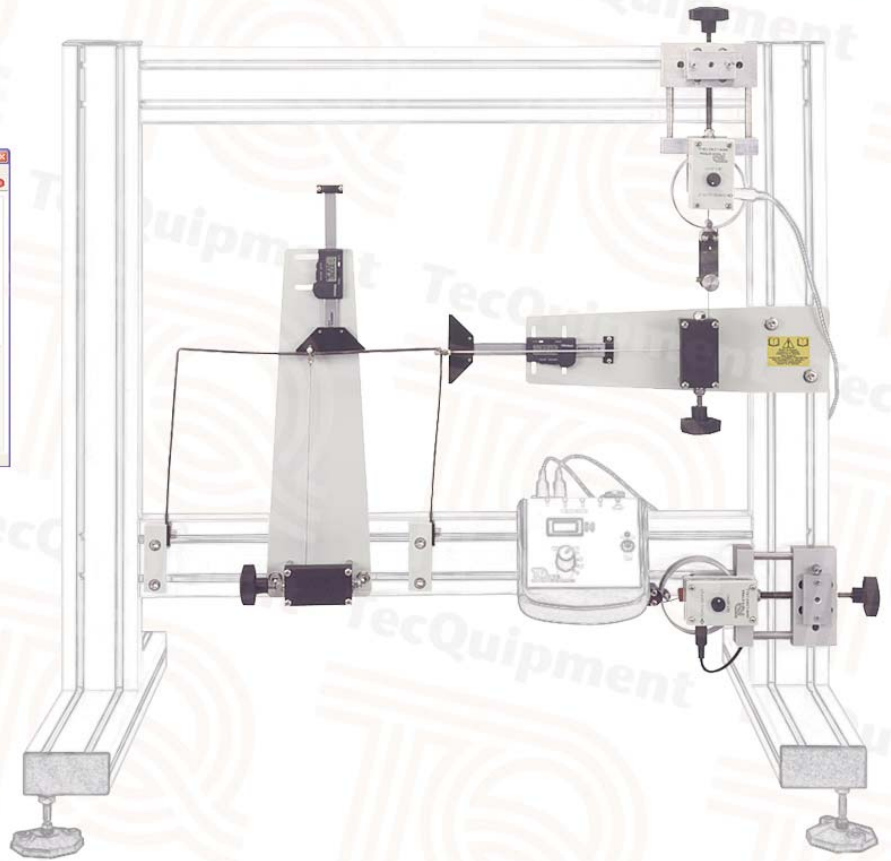
## STR16

## Plastic Bending of Portals

**For studying plastic theory and limit state design in portal frames**



A screenshot of the optional Structures Software



- High-quality structures teaching module for students of mechanical, civil and structural engineering
- Allows safe and practical experiments into plastic bending of portals
- Realistic and verifiable experiment results
- Optional TecEquipment's Structures Software package for extra, 'virtual' experiments, that simulate and confirm the results from your hardware and allow extended experiments
- Optional STR2000 unit with TecEquipment's Structures Software package for automatic data acquisition **and** virtual experiments
- One of many interchangeable experiment modules from TecEquipment's modern, flexible and cost-effective structures teaching system
- Ideal for classroom demonstrations, or students working in pairs or small groups

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- An ISO 9001 certified company

# STR16

## Plastic Bending of Portals

### Description

The experiment hardware fits onto a Structures Test Frame (STR1, available separately). Students fix a specimen portal frame (two uprights with a cross-beam at the top) to the bottom cross-piece of a test frame. The test frame also holds horizontal and vertical screw mechanisms with electronic load cells for loading the portal frame.

Students set the portal frame load conditions by arranging the load cell screw mechanisms to provide either single or combined loads. They then load the portal frame manually by adjusting the screw mechanisms. The electronic load cells connect to a Digital Force Display (STR1a, available separately) that shows the horizontal and vertical loads as the portal frame deforms. Two long-travel digital deflection indicators measure the portal frame deformation.

Students continue to load the portal frame until it is in the fully plastic condition, that is, it has undergone plastic collapse. They monitor the collapse load, deformations, and note where plastic hinges formed during collapse. Packs containing 12 extra specimen portal frames are available separately (STR16a).

Ideally, students should use the Plastic Bending of Beams experiment (STR15) before progressing to Plastic Bending of Portals. The Plastic Bending of Beams experiment provides a basic understanding of underlying principles, such as plastic deformation and form factor.

The lecturer guide provides details of the equipment including sample experiment results. The student guide describes how to use the equipment and gives experiment procedures.

For extra 'virtual' experiments, TecEquipment can supply the optional TecEquipment Structures Software (STRS), for use on a suitable computer. The virtual experiments simulate the tests you can perform with the hardware. They also extend the choice of tests beyond that available using only the hardware, for example: higher loads, uniform loads or different test specimens. This extends the student's learning experience.

For automatic data acquisition of your experiment results, TecEquipment can supply the optional Automatic Data Acquisition Unit (STR2000). Supplied as standard with the STR2000 is TecEquipment's Structures Software that displays and logs your experiment results and gives the extra virtual experiments.

### Standard Features

- Supplied with Lecturer Guide and Student Guide
- Five-year warranty
- Made in accordance with the latest European Union directives

### Experiments

- Relationship between load and deflection for portal frames loaded to the plastic condition
- Introduction to limit state design
- Relationship between maximum loading and plastic hinge formation in portal frames loaded vertically from the centre, horizontally from one corner, and equally from both positions
- Interaction between horizontal and vertical loading in terms of plastic hinge position and mode of collapse

### Essential Base Unit

- Structures Test Frame (STR1)

### Essential Ancillary

- Digital Force Display (STR1a)

### Recommended Ancillaries

- Specimen Portal Frame Pack (STR16a)
- Automatic Data Acquisition Unit (STR2000) for automatic data acquisition and virtual experiments

### Operating Conditions

*Operating environment:*  
Laboratory

*Storage temperature range:*  
-25°C to +55°C (when packed for transport)

*Operating temperature range:*  
+5°C to +40°C

*Operating relative humidity range:*  
80% at temperatures < 31°C decreasing linearly to 50% at 40°C

### Specifications

*Nett dimensions and weight:*  
880 x 450 x 70 mm and 6 kg

*Packed dimensions and weight:*  
Approximately 0.12 m<sup>3</sup> and 8 kg

*Specimen portals:*  
Three (nominally 200 mm x 300 mm, cross-section 12.5 mm x 3 mm)

*Specimen beam material:*  
Fully annealed mild steel

*Load application:*  
Two 500 N electronic load cells

*Accessories:*  
Vernier, rule, two leads to connect to a Digital Force Display

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