ETHER

Engineering Educational Equipments

Cert. No. 4493

An **ISO 9001:2008** *Certified Co.*

STRUCTURAL ENGINEERING LAB EQUIPMENTS

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STRUCTURAL ENGINEERING LAB EQUIPMENTS

1551 APPARATUS FOR VERIFICATION OF CLERK'S MAXWELL RECIPROCAL THEOREM

Apparatus consists of a beam 100cm long and about 1.25cm x 4mm in cross section with graduations at every 10cm along the length. It is supported on knife edge supports 70cm apart with a 30cm overhang on one side. Reciprocal theorem can be verified by direct measurements of the deflections of various points with the help of a dial gauge due to a load placed at the reciprocal points. A dial gauge with 25mm travel (with a magnetic base) is supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.

1552 BEHAVIOUR OF COLUMN AND STRUTS APPARATUS

Apparatus consists of four spring steel columns which are put along a vertical wooden board. These four columns have different end conditions as below:

1. Both ends pinned
2. Both ends fixed
3. One end pinned and other fixed
4. One end fixed and other end free

Apparatus is supplied complete with a supporting stand and weights.

1553 CURVED MEMBER APPARATUS

Apparatus consists of a steel bar which is used to make the different curved members Viz. circle, semicircle with straight arm, a quadrant of a circle and quadrant of a circle with straight arm. The bottom ends of the members are fixed to the base. Under the application of load at free end, its horizontal and vertical deflection is measured with the help of dial gauges. A dial gauge with 25mm travel (with a magnetic base) is supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.

1554 DEFLECTION OF TRUSS APPARATUS

Apparatus consists of 4 panels of a PRATT truss, each panel being 40cm in horizontal direction and 30cm in vertical direction. Load can be applied on each panel point. All tension members are provided with detachable springs so as to obtain appreciable deformation of the member. Direction of the diagonal members may be changed. Apparatus can be used to illustrate visually the nature of forces set up in various members of the Truss. Apparatus is supplied complete with a supporting stand and a set of weights.

1555 ELASTICALLY COUPLED BEAM APPARATUS

Apparatus consists of a three parallel bar suspension system with elastic beam at their upper and lower ends. The upper ends of the two outer suspension rods are tied to a vertical wooden board while central suspension rod may be tied to the centre of another elastic beam supported at two outer ends only. Apparatus is supplied complete with a supporting stand and a set of weights.

1556 ELASTIC PROPERTIES OF DEFLECTED BEAM APPARATUS

Apparatus consists of a mild steel beam about 2.5cm x 3mm in cross section and 100cm long, pinned to two supports 70cm apart situated symmetrically. One of the ends can be fixed or given a known slope by applying a known moment at the end with the help of suspended loads. At the other end also a known moment can be applied. Vertical loads can be applied at various points along the span of the beam. A dial gauge with 25mm travel (with a magnetic base) is supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.

1557 PORTAL FRAME APPARATUS

Portal frame is made up of M.S. flat of rectangular section of about 6mm thick x 40cm wide. Frame is provided with a provision to achieve different end conditions viz. hinged, roller & fixed. The size of portal will be 40cm x 60cm. Portal is also having a provision for pulley arrangement and hook arrangement for horizontal loading at different positions. A dial gauge with 25mm travel (with a magnetic base) is supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.

1558 REDUNDENT JOINT APPARATUS

Apparatus consists of three suspension members (spring balances) of different stiffness which are jointed at a point to form the redundant joint. The upper end of the suspension members being tied in a position to a vertical wooden board. Arrangement is provided to apply a vertical load at the joint and to measure its horizontal and vertical displacement on a paper and also elongations and forces in the suspension members by the help of dial gauges. Two dial gauges with 25mm travel (with magnetic bases) are supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.

1559 THREE HINGED ARCH APPARATUS

The model has a span of 100cm and rise about 25cm, with hinges at supports and crown. One of the ends rests on rollers. Along the horizontal span of the arch various points are marked at equidistant for the application of load. This being a statically determinate structure, the horizontal thrust developed under the action of any load system can be theoretically calculated and will also be measured directly by neutralizing the outward movement of the roller end. A dial gauge with 25mm travel (with magnetic base) is supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.

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1560 TWO HINGED ARCH APPARATUS

The model has a span of 100cm and rise about 25cm. Both ends are hinged but one of the ends is also free to move longitudinally. A lever arrangement is fitted at this end for the application of known horizontal inward force for measuring the horizontal thrust. Along the horizontal span of the arch various points are marked at equidistant for the application of load. This being a statically indeterminate structure of the first degree. A dial gauge with 25mm travel (with magnetic base) is supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.

1561 UNSYMMETRICAL BENDING APPARATUS

Apparatus consists of an angle of size 1" x 1" x 1/8" or equivalent and of length 80cm is tied as a cantilever beam. The beam is fixed at one end such that the rotation of 45^0 intervals can be given and clamped such that the principal axis of its cross-section may be inclined at any angle with the horizontal and vertical planes. Also arrangement is provided to apply vertical load at the free end of the cantilever and to measure horizontal and vertical deflection of the free end. A dial gauge with 25mm travel (with magnetic base) is supplied with the apparatus. Apparatus is supplied complete with a supporting stand and a set of weights.

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1562 SUSPENSION BRIDGE APPARATUS

Apparatus is supplied complete with a supporting stand and a set of weights.

DEMONSTRATION MODELS

1601 INTERCONNECTED BRIDGE GIRDER MODEL

In case of bridges which have several longitudinal beams connected by cross girders or continuous slab, a load any where on the bridge effects all the beams of the bridge even if a load is placed exactly on one of the beams, other beams also share the load and the loaded beams is not required to bear the full load. The problem of sharing of the load by all the beams is known as the load distribution problem in bridges. Theoretically it is a highly complicated problem whose exact solution has not been given so far. However experimentally the load shared by each beam can be found every easily. The load shared by each beam will be in the ratio of the maximum deflection suffered by each beam. Hence if vertical deflection of all the beams is measured at the same transverse section passing through the load, the load supported by each beam can be easily estimated. Thus influence surfaces for each beam of the bridge can be experimentally traced.

1602 INTERNAL REACTION IN A RING MODEL

The model of the closed ring demonstrates the Muller Breslau's principle and thus to obtain the influence lines experimentally. If an angular rotation 'q' is given by moving the two arms while the vertical moment of the point diametrically opposite is 'a' then a/q represents the moment at the hinged point due to a unit load applied at the opposite point. Results can be verified theoretically.

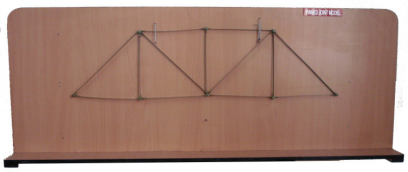
1603 LINEAR ARCH MODEL

It is a simple device to draw the line of thrust in arches for a given system of loading. A flexible string is taken whose one end is tied to a pin on a vertical board, the other end of the string passes over a smooth pulley fixed to the same vertical board. The distance between the pulley and pin can be adjusted. The free end of the rope coming over the pulley has a pan attached to it, in which known weights can be put. There is an arrangement to suspend any given load from the string between the pin and the pulley, for any given values of the loads on the string as well as on the pan, the string will

maintain equilibrium in a certain deflected form. The deflected form of the string will then represent the linear arch for a given system of loading. The linear arch will change its shape if the load in pan is changed. The load in the pan is equal to the tension in the string at pulley end. The vertical component of this tension in the string is always the same and only depends upon the magnitude and location of the load applied to the string. However its horizontal component changes with the weight in the pan. Thus linear arches with the different horizontal reactions at the end can be constructed with same system of loading.

16045 PINNED JOINT MODEL

Pinned joint model consists of hinged joints. Model demonstrates the qualitative behaviour of the truss under load. As the members are very flexible, a compression member will easily show it's buckling i.e. it will curve out of plain. The tension member however remains straight and tight. The student can therefore have a visual picture of the type of stresses i.e. compressive or tensile that each member of truss will carry under various position of the load. In the case of pinned joint truss, the student may observe that angle between members at each joint undergo a small change.



1605 PORTAL FRAME MODEL

Model demonstrates the behaviour of portal frame under vertical loading placed at different points of this span. Under a central point load, the deflected form of the portal will illustrate the presence of hogging moment near the top corner and sagging moment under load as well as in the two legs of portal. There will be no side sway. If the load is placed eccentrically the frame sways to the opposite side and there will be some change in curvature of the members indicating changes in the size of the moment.

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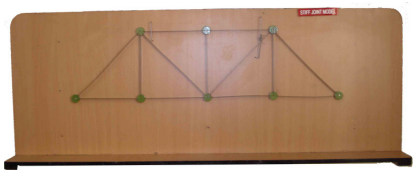
1606 STIFF JOINT MODEL

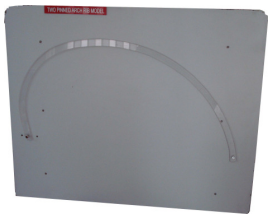
Stiff joint model consists of fixed joints. Model demonstrates the qualitative behaviour of the truss under load. As the members are very flexible, a compression member will easily show its buckling i.e. it will curve out of plain. The tension member however remains straight and tight. The student can therefore have a visual picture of the type of stresses i.e. compressive or tensile that each member of truss will carry under various position of the load.



In the case of stiff joint truss, the student may observe that there is a slight curvature caused in the member near the joint indicating the presence of joint moments in the truss.

1607 TWO PINNED ARCH RIB MODEL

The model of the arch demonstrates the Muller Breslau's principle. The influence lines of horizontal thrust can be obtained by moving one end horizontally and measuring the vertical deflection of the arch rib. The vertical deflection gives the influence line ordinates of horizontal thrust in the arch. Results can be verified theoretically.



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