08 Method of Sections

Engineering Statics

Updated on: October 24, 2025

Trusses by the Method of Sections

- We have learned how to find the internal forces in truss members using the Method of Joints.
- An alternative approach is the Method of Sections, useful when we want to examine the forces in a grouping of truss members rather than the forces in every member.
- The method of sections can also be used to check results partway through a lengthy method of joints analysis.

Trusses by the Method of Sections

- There is nothing new in the Method of Sections; we use techniques that we are already familiar with.
- In particular, **if a truss is in equilibrium, it follows that each segment of the truss must also be in equilibrium**.
- If we draw a section through a truss, both portions of the truss – on each side of the section – is in equilibrium.
- A section through a truss 'cuts' through members, exposing the internal forces for analysis.

Trusses by the Method of Sections

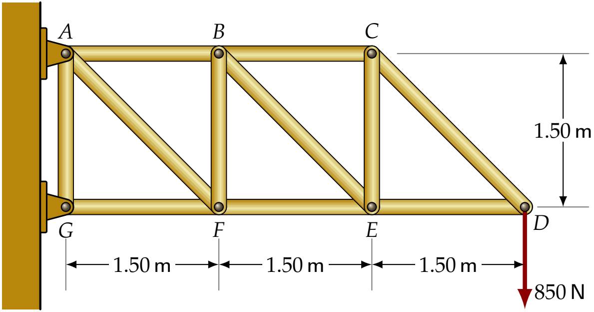
- We can solve for at most three truss members with a single section through the truss. It may be necessary to use multiple sections.

- Depending upon the truss and the members to be analyzed, it may be easier to take moments two or three times around carefully chosen points. Often of interest are points where the lines of action of the 'cut' members intersect.

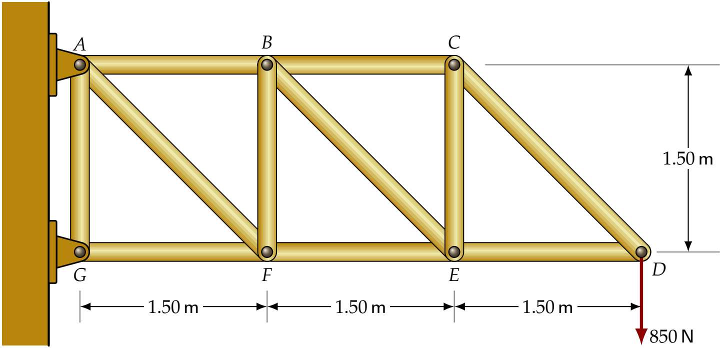
  If we take moments around such a point, the moments of the forces through the intersection point are zero.

- It may sound complicated but it is not. The following examples will illustrate how to use the method of sections efficiently.

Example 1

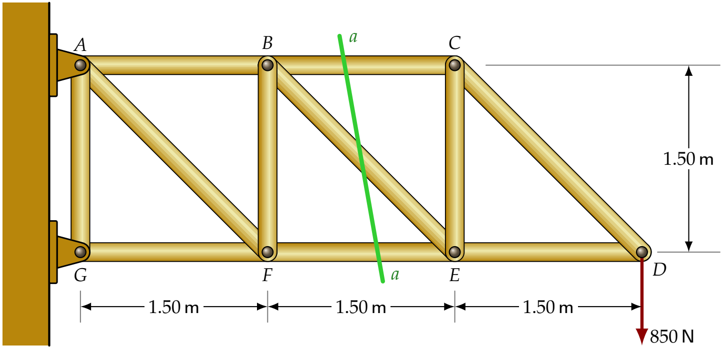


Use the method of sections to determine the internal forces in members BC, BE and EF.



The Method of Sections

- The method of sections technique is widely used in engineering.



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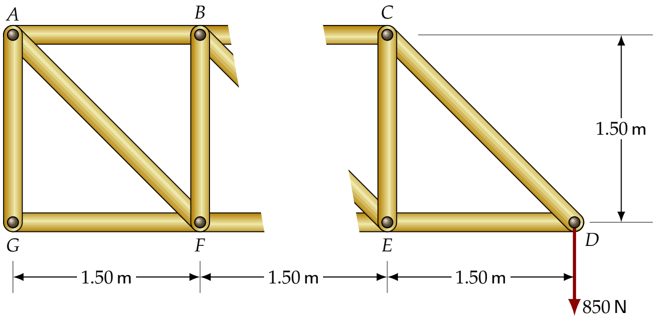

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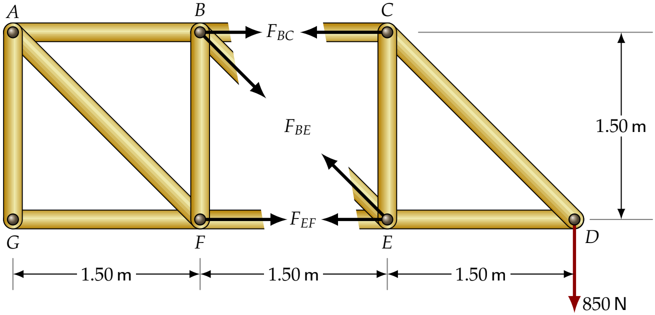
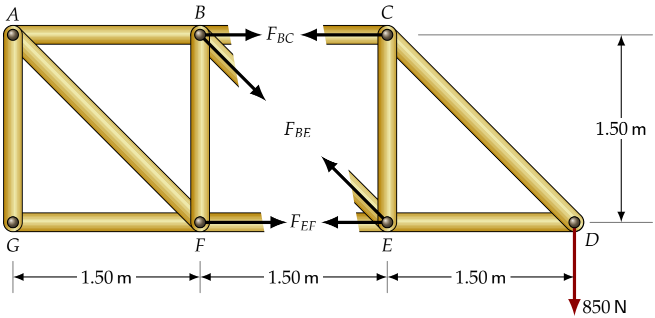
- Then the segments on each side of the section are also be in equilibrium.



The Method of Sections

- The method of sections technique is widely used in engineering.
- It involves drawing a section $a-a$ through a structure or member.
- Then the segments on each side of the section are also be in equilibrium.
- The section 'exposes' the internal forces in cut members.



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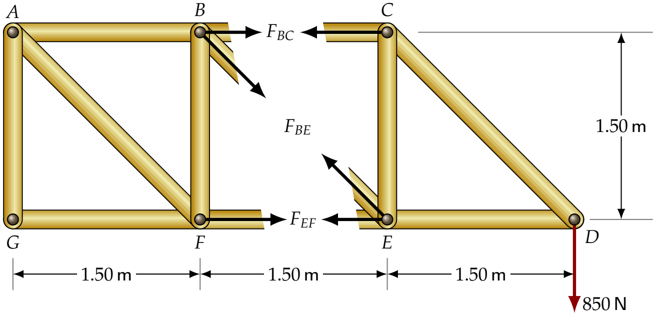

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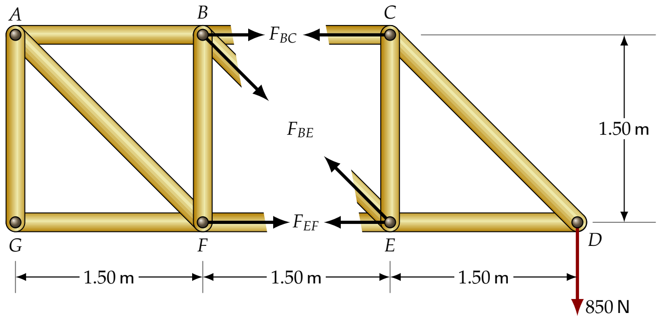
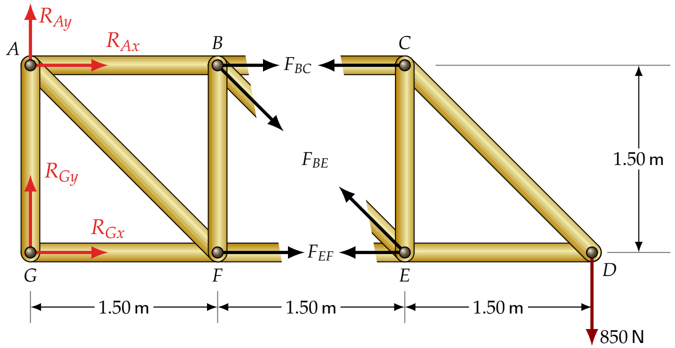
- We generally look for a section that 'cuts' the members we need.



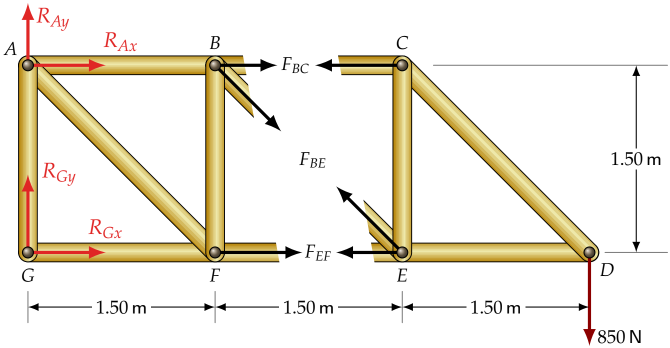
The Method of Sections

- We are free to place our section wherever is most convenient.
- We generally look for a section that 'cuts' the members we need.
- Then we choose whichever is the easier of the two segments to analyze.



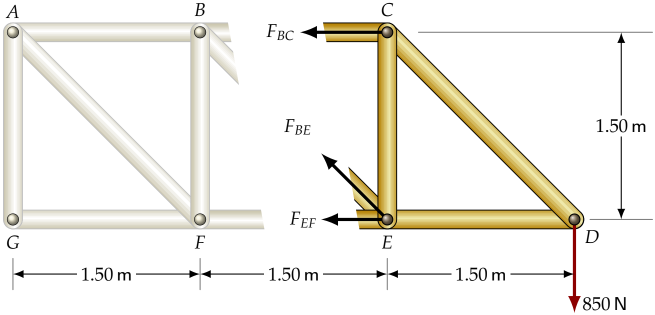
Example 1: Solution

- The right segment is the easiest to analyze since it only contains a single external force.



Example 1: Solution

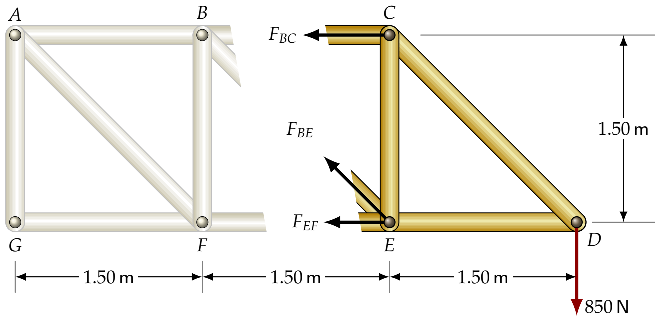
- The right segment is the easiest to analyze since it only contains a single external force.
- Note that in this case we only have the one choice since the reactions at A and G are '**statically indeterminate**.' (That is, we can't determine them using only the equilibrium equations. Why is this?)



Example 1: Solution

$$\Sigma M_E = F_{BC} \cdot (1.50\,\text{m}) - (850\,\text{N}) \cdot (1.50\,\text{m}) = 0$$

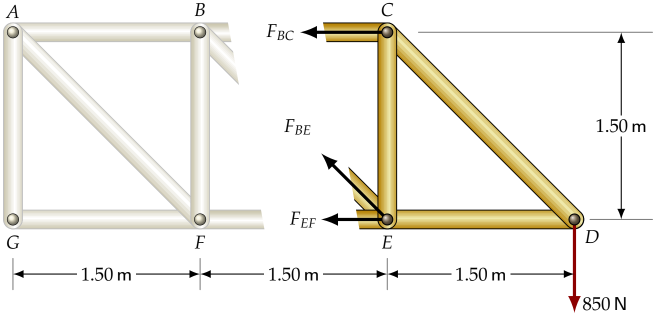
$$\Rightarrow F_{BC} = 850\,\text{N}$$



Example 1: Solution

$$\Sigma M_B = -F_{EF} \cdot (1.50\,\mathrm{m}) - (850\,\mathrm{N}) \cdot (3.00\,\mathrm{m}) = 0$$

$$\Rightarrow F_{EF} = -1700\,\mathrm{N}$$



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$$\Sigma F_y = -F_{BE} \cdot \sin 45^\circ - 850\,\text{N} = 0$$

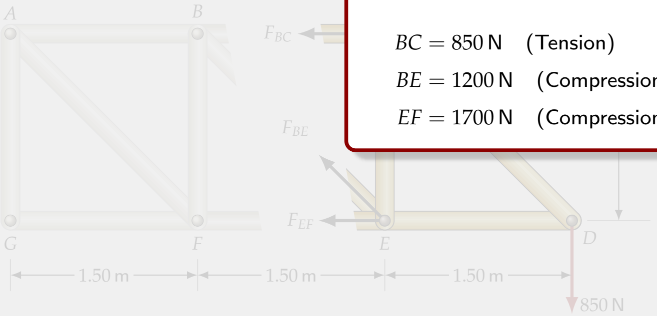
$$\Rightarrow F_{BE} = -1202.1\,\text{N}$$

The Answers

$$BC = 850\,\text{N} \quad \text{(Tension)}$$

$$BE = 1200\,\text{N} \quad \text{(Compression)}$$

$$EF = 1700\,\text{N} \quad \text{(Compression)}$$



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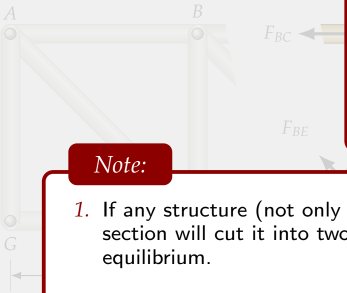

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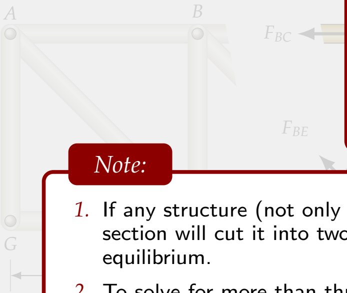

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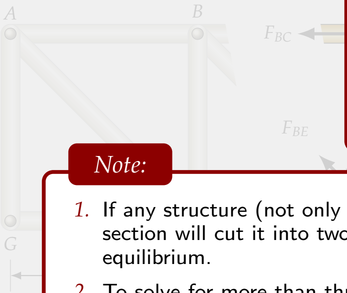

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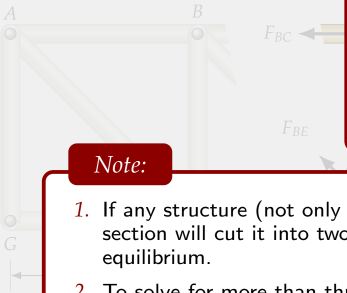

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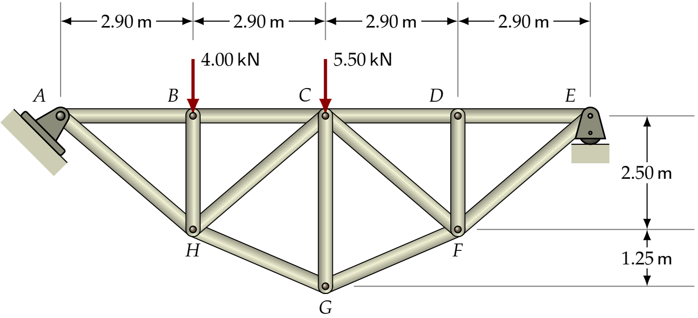
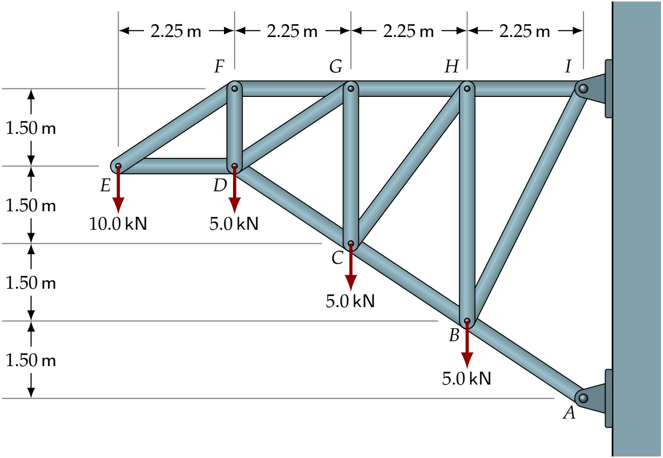
4. It is not necessary to take moments using joints in the 'active' segment. Moments can be taken about anywhere on the truss – or even anywhere on the plane in which the truss is situated. If a structure is in equilibrium, its moments about any point in the plane still sum to zero.

Example 2



Use the method of sections to determine the internal forces in members BC, CH and GH.

Example 3



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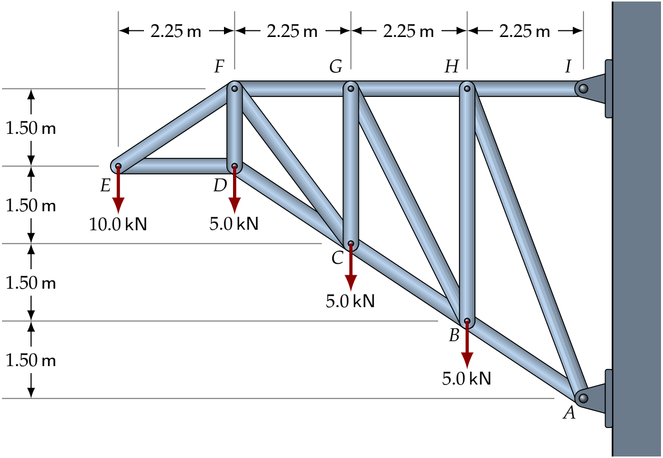
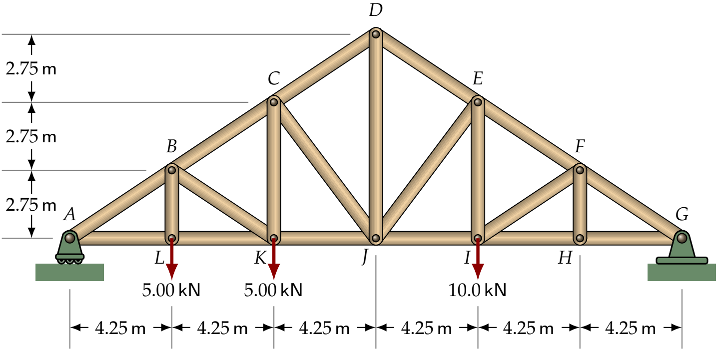
Exercise 1



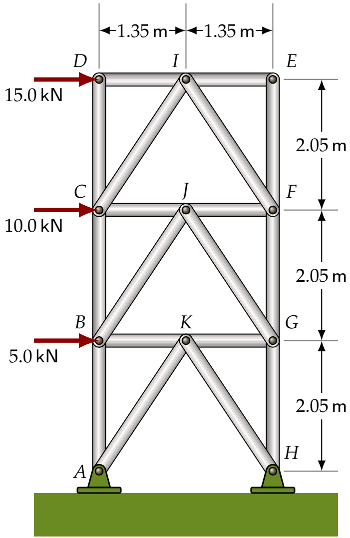
An alternative design is being considered for the previous example. Use the method of sections to determine the internal forces in members BC, BG and GH. How do they compare to the previous results?

Example 4



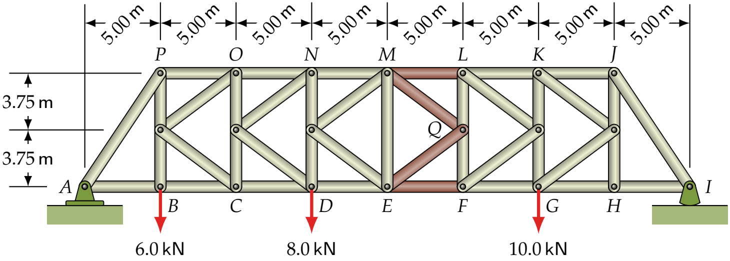
Determine the internal force in DJ.

Example 5



Determine the forces in members AB and GH.

Example 6



Use the method of sections to determine the internal forces in members EF, EQ, LM and MQ.

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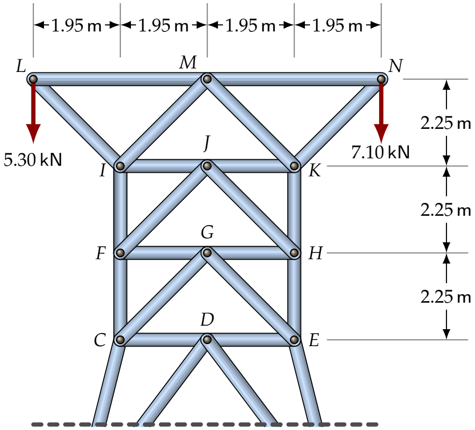

Determine the forces in members CF, CG,EG and EH.