

Engineering Mechanics
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Statics – 2.3

In the last clipping we looked at a link member or an axial member. Now we will look at a system that you can build out of this. The simplest system that you can build out of this. Thanks to Mr. Venkatesh Rao, he built a system here. If you notice each is a member, I am just going to take it out to show you. Each is a member where the forces are acting essentially at two points, the point here and the point here. Therefore, this is an axial member and each of these members are joined together. Give me a minute to join them together and there you go, you get a structure.

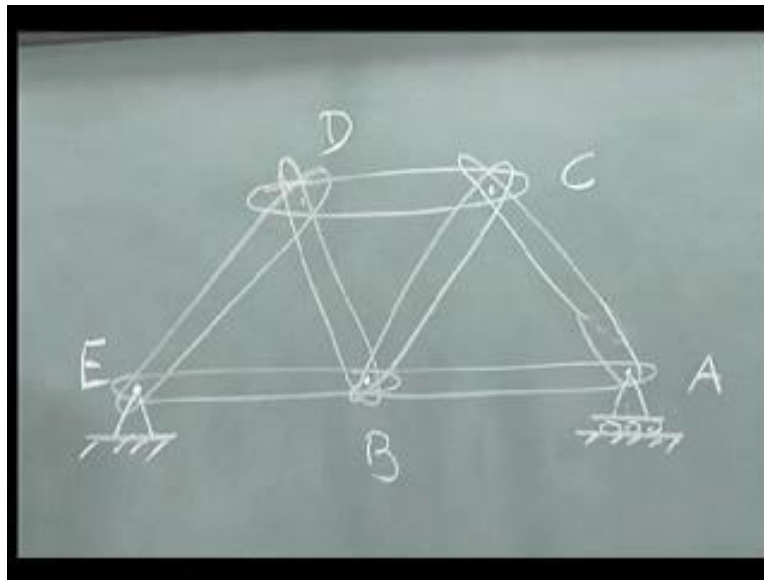
Remember every one of this, this one, this one, this one, this one, this one, this one, this one or this one are pinned together. You can see it here. We will have a closer view later. To form a structural system and it consists of one dimensional axial or linked members like this. Such a system is called a truss system. Please remember that we need to have forces acting only at these points and they have to be only forces and not moment resultants which means the only possibility of forming this particular structure is by using pins that joined each one of this. Are you able to see? Each one of these yellow pins, join the members. Also we have another requirement in this.

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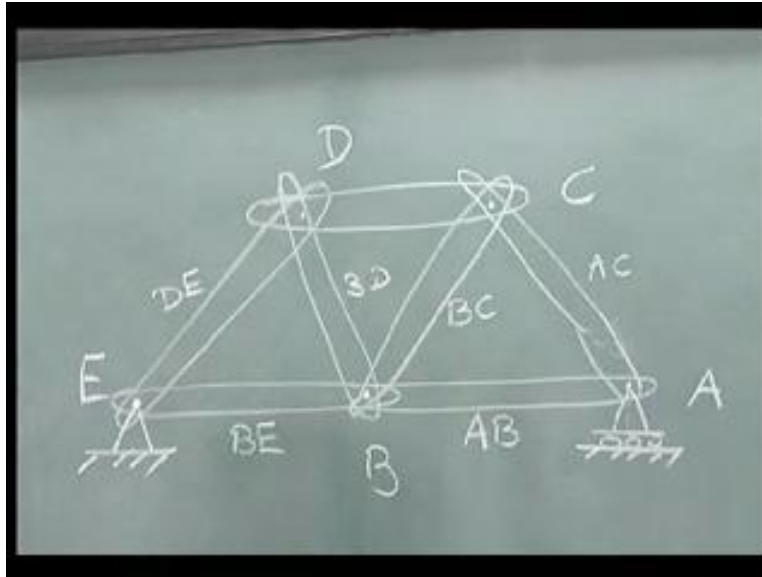
I cannot have forces in between which means that I should assume that the mass of these are negligibly small compared to the forces that act on this particular system. Supposing I apply a force or for example, I pull or push at any one of these joints. I have a structural system, I can use this structural system in order to take loads. One such example we will see it in detail and let's look at an example of this sort itself. Let me draw this. I have such members joined together, if you don't mind my drawing in a rough way. These are pinned together at these points and let's say I have to now fix it to a fixed frame. I will fix it on this board, at one point here, this is not enough because the entire... I am sorry I have to add one more here.

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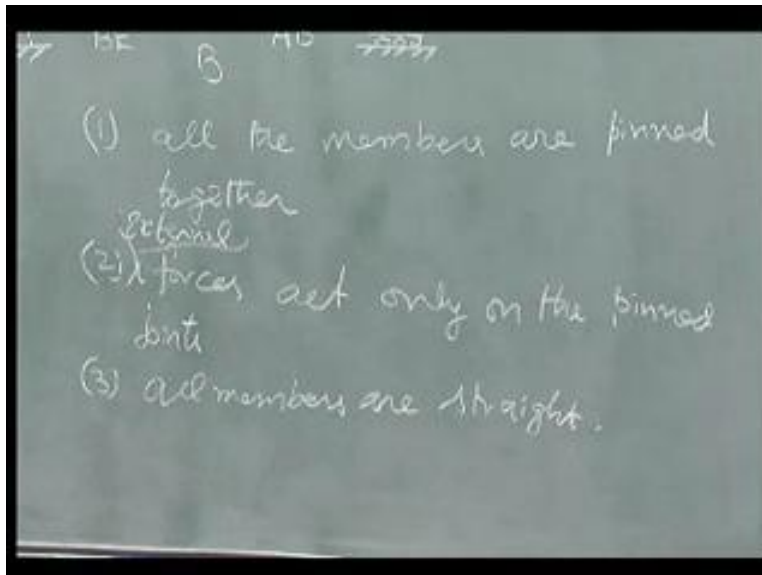
The entire thing can only move, it cannot remain stationary. In order to make it stationary, I have to at least have one more here that makes it stationary. Let me apply that also. I will put a roller support at this point. Let me name them as A, B, C, D and E. What have we named? Each of these pins I have named now, so that every one of these members can get a name. For example this member can be called as A C. This member can be called as A B or B A. What we will do is we will make sure that we go alphabetically one after the other. I will call this as AB. How about this? It is B E, D E, B D and B C. If you joined these two, you would have had AD as well as EC. Now we have BC at least.

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If you notice carefully, it is possible to name every one of these members depending on where each ends of the members are joined. In all if you look at this particular truss structure, all the members are joined by pins so are pinned together. The other condition that we already imposed is forces or external forces. External forces act only on the pinned joints.

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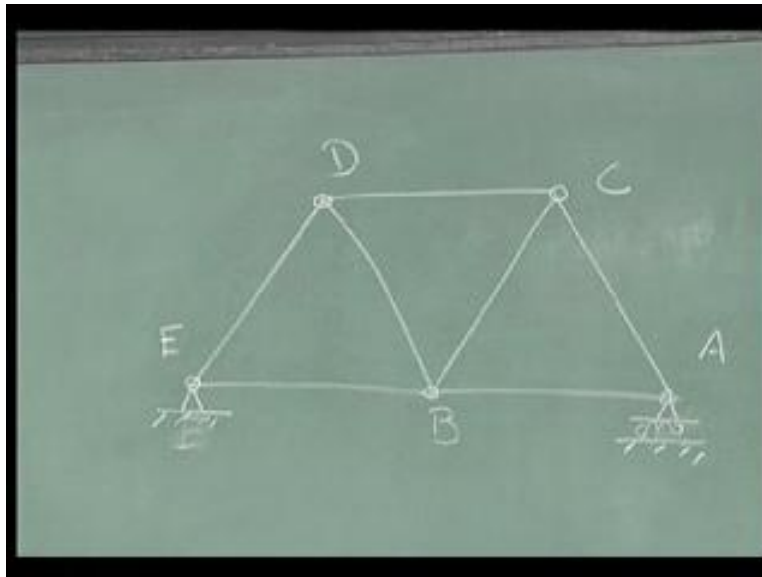


- (1) all the members are pinned together
- (2) ^{external} forces act only on the pinned joints
- (3) all members are straight.

We can also impose one more condition but that's not a necessary condition. That is all members are straight. We will examine what happens if it is not straight at a later stage. I will give that as an exercise for you. If they are straight, I know very well I can use all the results that I have from this particular notion. Given that these conditions are satisfied and it is pinned to a particular fixed frame, we have a structure now called the truss system. Forces can act for example like I can have a force over here. Another important thing here that I have not added is every one of these members as we already know are one dimensional members. I will just add over here, all members are one dimensional.

One of the easiest things that we looked at earlier of drawing a one dimensional member is instead of drawing like this, I could have drawn just a single line joining each one of these points. Let's do that particular exercise next. Let me do that pretty fast, its easier to draw also. Looking at this, I can now write A, B, C, D and E and all these are one dimensional or line members. I can now insert the support over here. This is the same thing that I have drawn here. Just to make sure I denote that these are pins, I am just going to insert nice circles in the form of pins.

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Now I have drawn the same truss structure in a very simple way. Now one more important thing that I have forgotten here which I mentioned when I was talking about this is each of these members are assumed to have weight less than or negligible compared to the forces applied on them. We will write that members have negligible weight, I will write that straight way.