

Truss Analysis – Identifying Zero-Force Members

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Zero-Force Members in Trusses

Under certain truss geometries and loading conditions, there can be truss members that carry zero load.

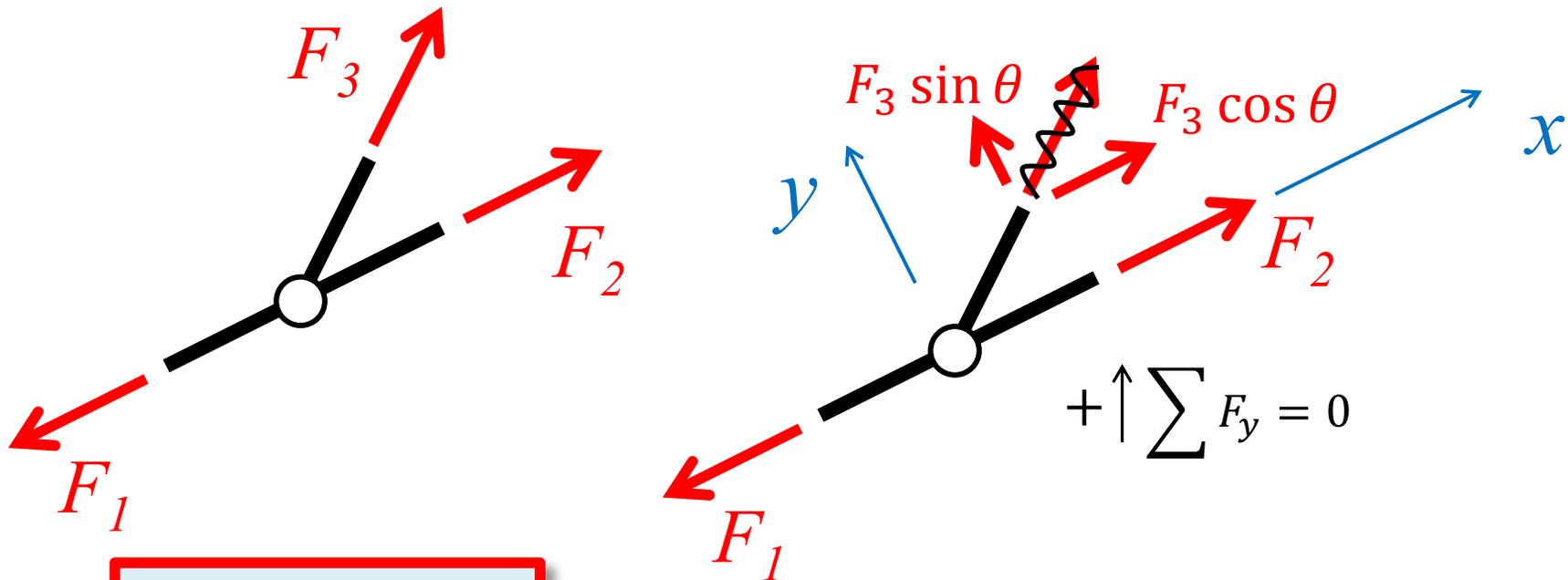
Identifying these zero-force members (ZFM) can make truss analysis more efficient

Identifying ZFMs consists of identifying a few special joint conditions illustrated in the following slides.

Case 1

Look for:

- An unloaded joint;
- Connecting exactly three members;
- Two of the members are collinear (lie along the same line).

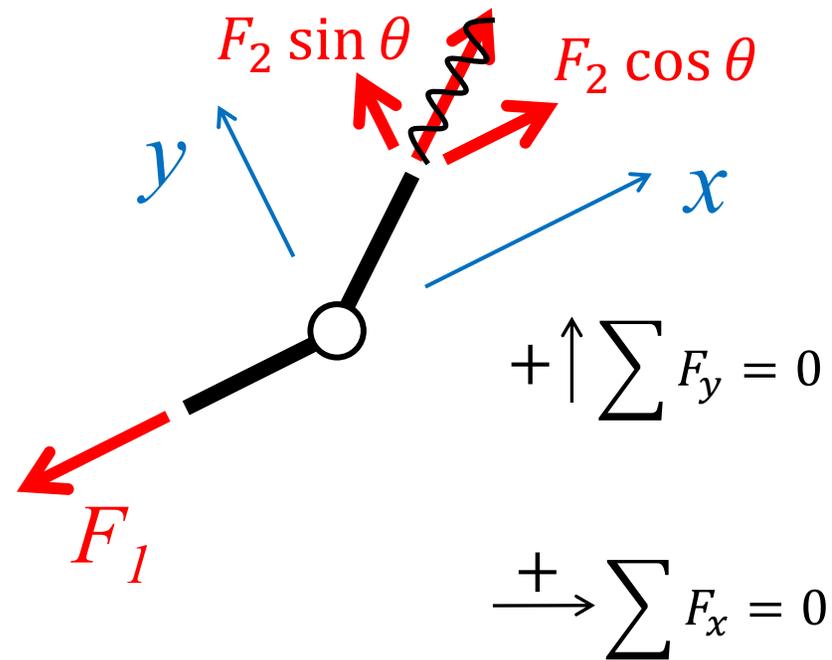
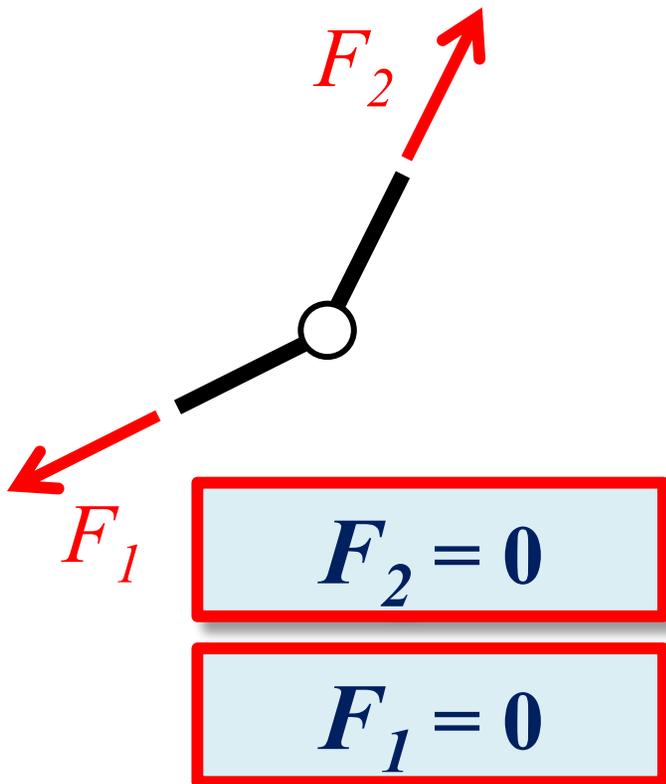


$$F_3 = 0$$

Case 2

Look for:

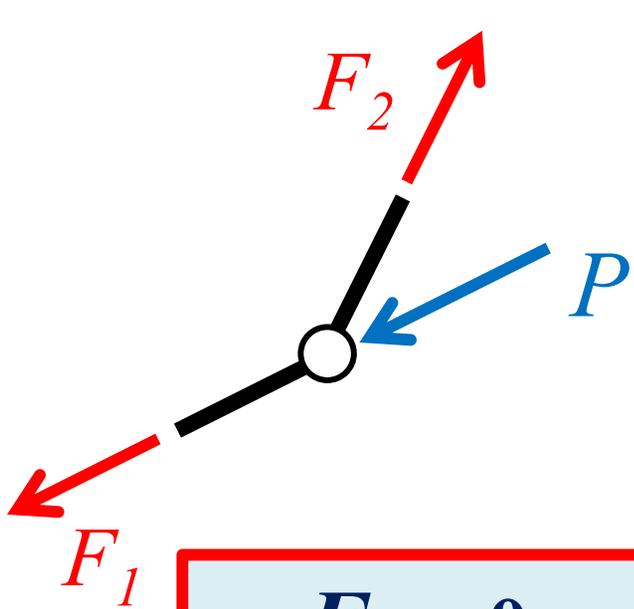
- An unloaded joint;
- Connecting exactly two members;
- The two members are not collinear.



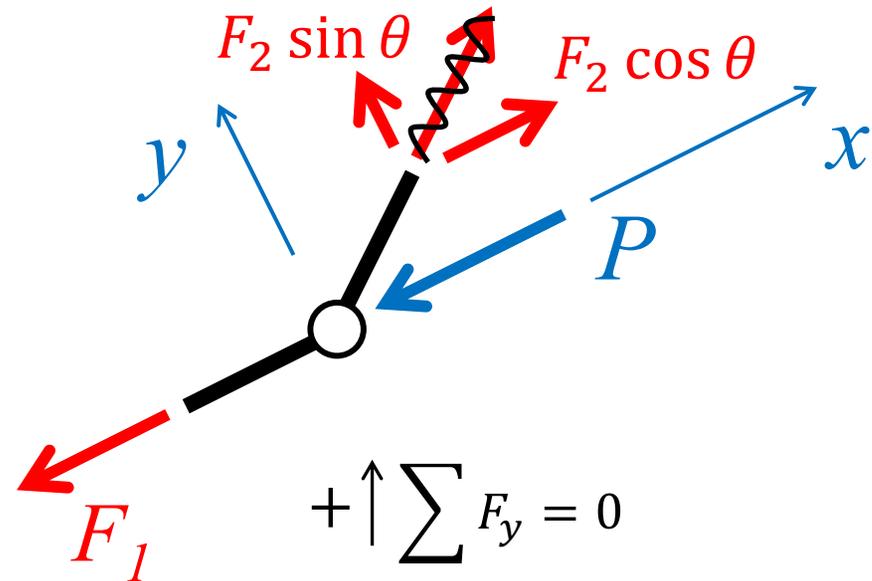
Case 3 (Similar to Case 1)

Look for:

- A loaded joint (the load can be due to an applied load or a support reaction);
- Connecting exactly two members;
- One member is in the same line as the load.



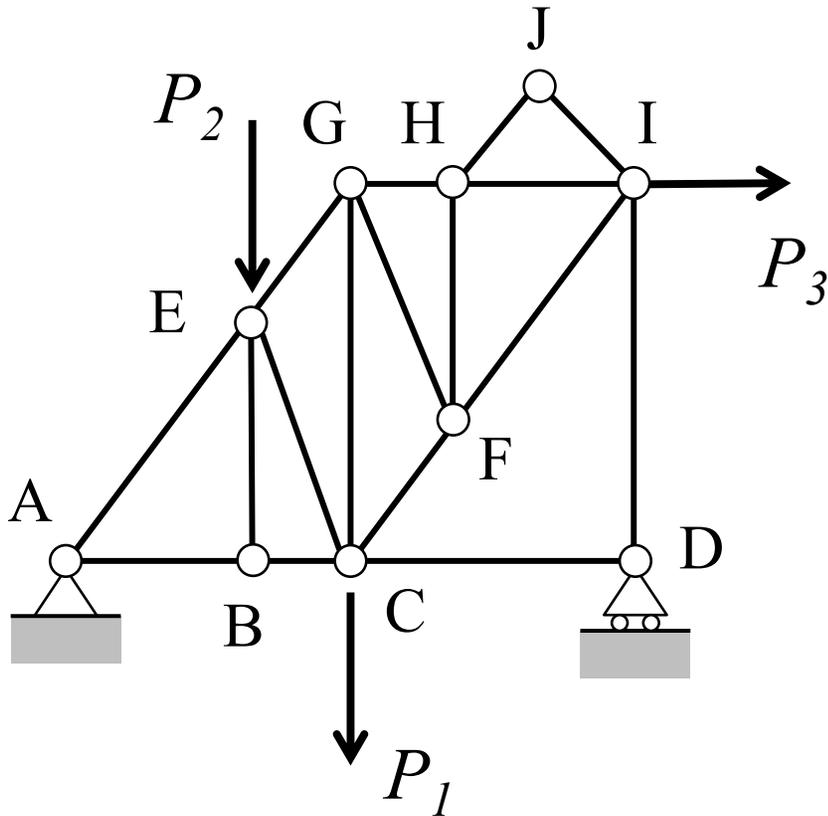
$$F_2 = 0$$



General Procedure for Identifying Zero-Force Members in Trusses

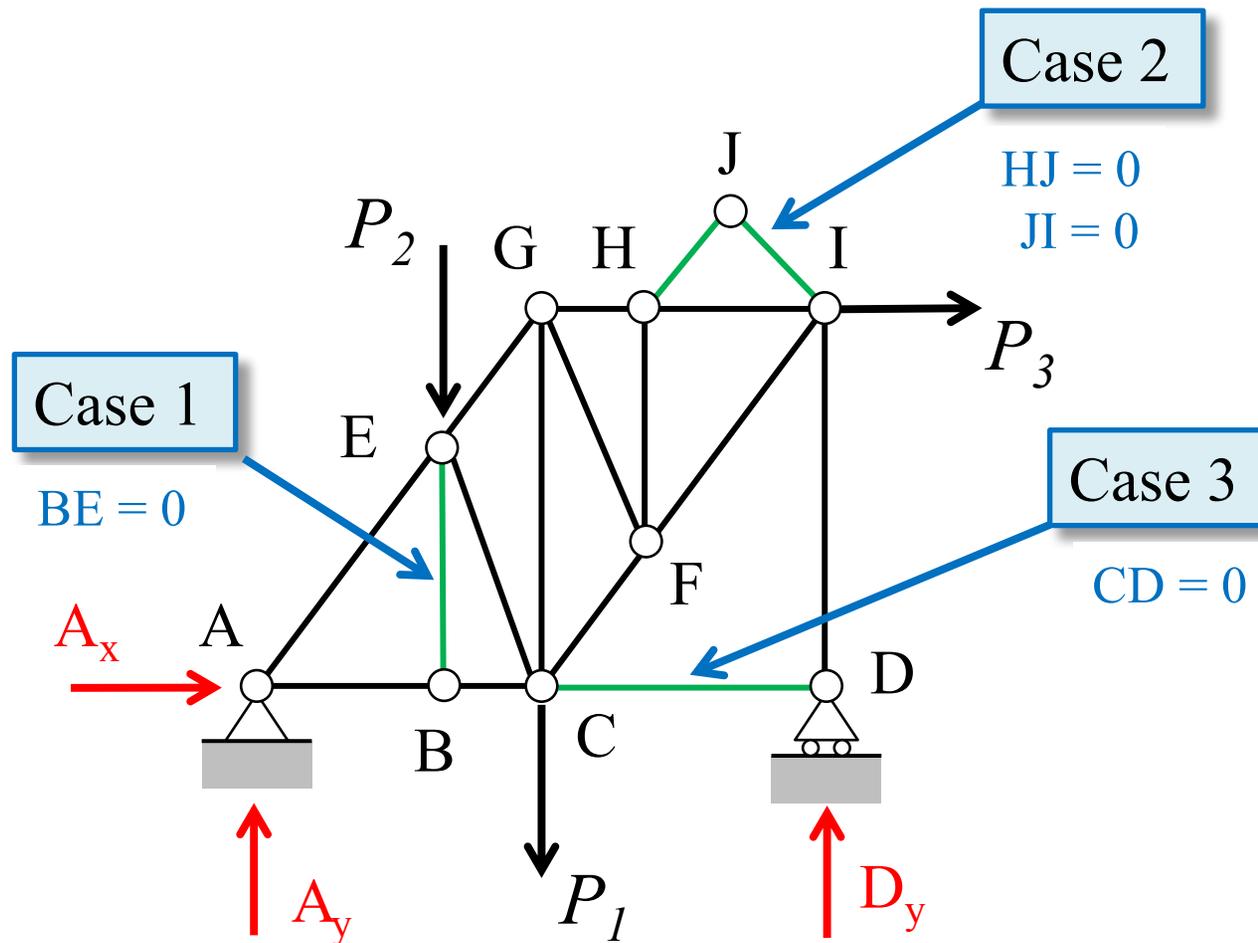
1. Check truss for Cases 1, 2, and 3 and identify each zero-force member (ZFM);
2. Considering ZFMs found in Step 1 as not being present, check for Cases 1, 2, and 3 and identify each ZFM;
3. Repeat Step 2 until all ZFMs are found.

Example



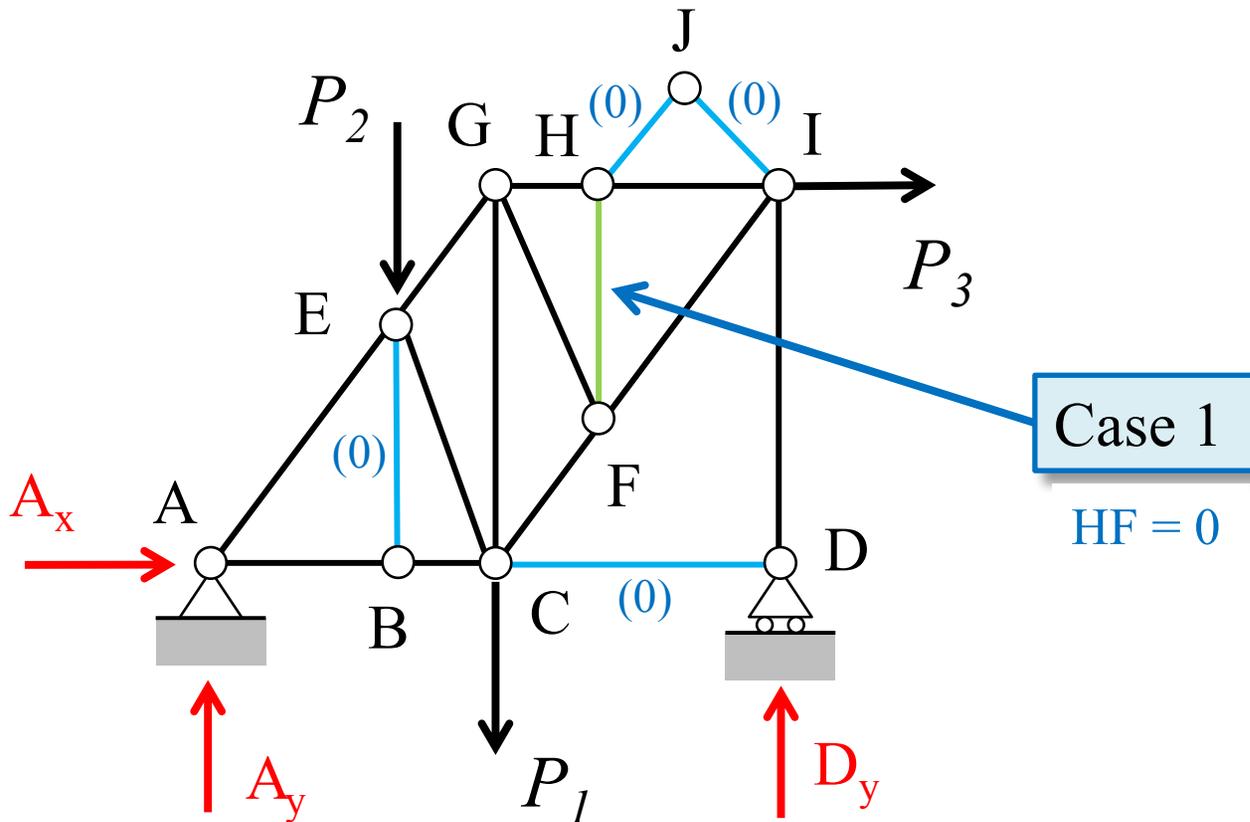
For the truss, find all zero-force members (ZFMs).

Check Cases for ZFMs



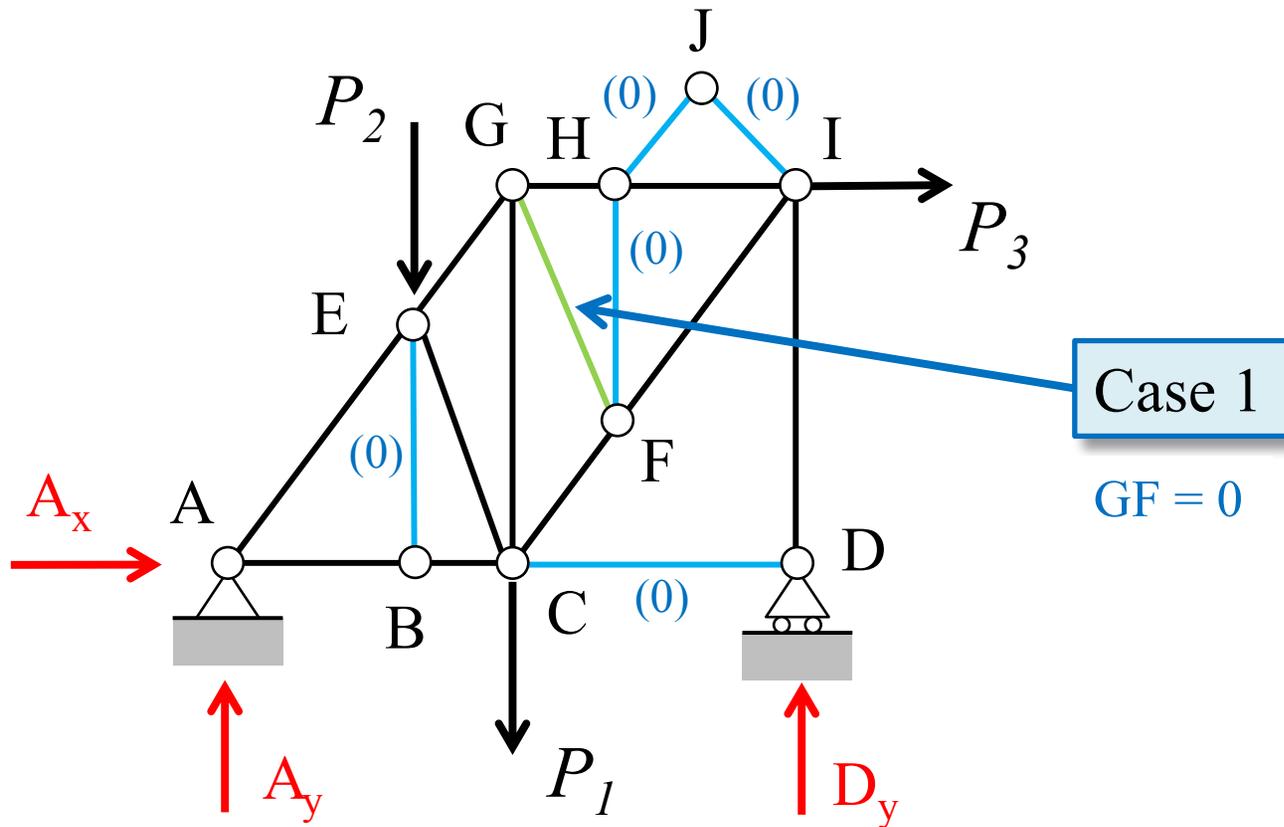
1. Check truss for Cases 1, 2, and 3 and identify each zero-force member (ZFM);

Step 2



2. Considering ZFMs found in Step 1 as not being present, check for Cases 1, 2, and 3 and identify each ZFM;

Repeat Step 2



3. Repeat Step 2 until all ZFMs are found.

All ZFMs Shown in Blue

