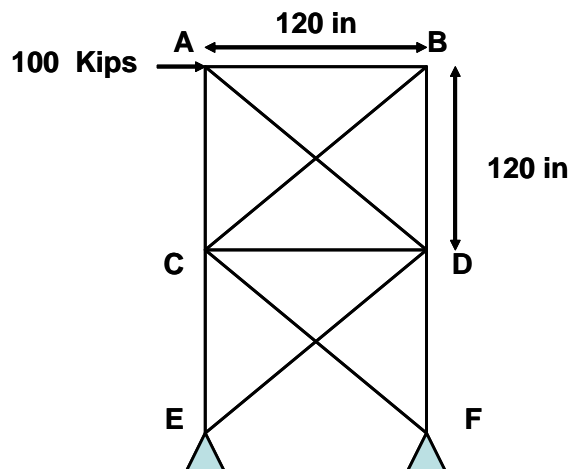


EXAMPLE 1-005

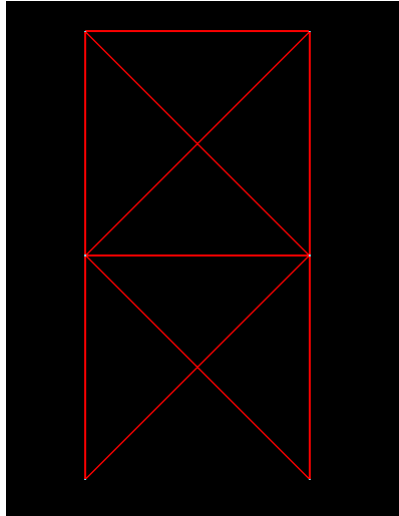
Analysis of a Truss with Tension-only Diagonals

1. EXAMPLE DESCRIPTION

Fig. 1 shows a cantilever truss, subjected to lateral of 100 kips load applied at its top. Dimensions and applied load are shown in Fig. 1.a., the ELS model is shown in Fig. 1.b. The diagonals of the truss are designed to carry only tensile forces. In ELS, these Diagonals are modeled with tension-only material, a material that carries only tensile stresses and can not carry compression forces.



(1.a) Problem geometry and loading.



(1.b) ELS model

Fig. 1 A Cantilever truss under lateral load.

2. MATERIAL PROPERTIES

All members are assumed elastic with Young's modulus of 30,000 kips/in². members AD & CF and area 8 inch² behave as tension only material with no compression allowed.

The applied element method follows a discrete crack approach, in which, the material is represented by a group of springs located at the surfaces of the element. The springs represent the axial and shear behavior of the material. For more details about material constitutive models refer to the ELS® technical manual.

3. RESULTS

a) Hand calculation

Solving this sample using virtual work method, the horizontal displacement at joint A = 0.683in.

b) ELS Results .

Fig. 2 shows the deflection of the truss predicted by AEM (ELS) where the horizontal displacement at joint (A) = 0.683 inch.

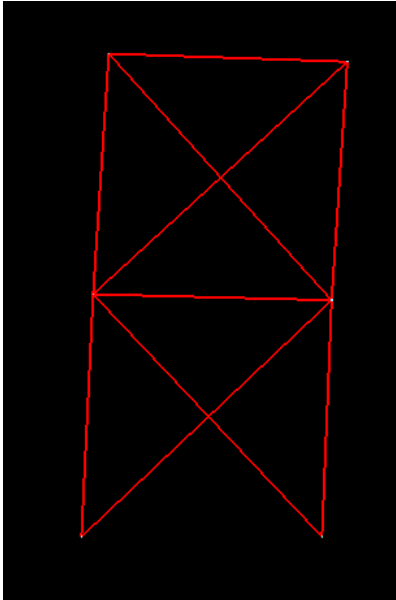


Fig. 2 Deflection predicted by AEM (ELS).

Table 1 Summarized comparison of hand calculation, FEM and AEM (ELS) results.

Tool	Deflection (in.)
Hand Calculation (Virtual Work Method)	0.683
AEM (ELS)	0.683

4. CONCLUSION

Based on the results obtained from numerical results of ELS®, the results from ELS are so close to the hand calculation and the FEM.

5. REFERENCES

- 1- Technical Manual of Extreme Loading for Structures.