1. A sand loader for trucks is shown below. The hopper is loaded with sand by a conveyor and then trucks are filled from the hopper. The hopper is made from steel and is continuously welded to the top 6 ft of the support columns. You may assume that the columns are pinned at their bases. Do the following:

a. Discuss in detail how the loader may be analyzed as a single degree-of-freedom system. Be sure to clearly state all assumptions.

b. Determine the stiffness for N-S earthquakes. (Hint: To obtain column section properties, use Tables in Mechanics of Materials text, or AISC Manual)

c. Determine the stiffness for E-W earthquakes.

Notes:
- All columns are W8x21
- Weight of hopper: 2180 lb
- Weight of contents (full) 21000 lb