MEMORANDUM

May 30, 2019

TO: ME 4300 Students

FROM: Michael A. Latcha, PhD

SUBJECT: Design Project
Due date: June 25, 2019

The loading dock door of a small trucking and storage company faces a narrow alley between the trucking company and the building next door, severely restricting the size of the loads that the company can handle. They would like to install a chainfall above the alley, spanning the distance between the buildings, to allow them to load and unload heavy objects from their trucks. They intend to fabricate the supporting structure from an existing supply of low-grade steel tubes and would like the structure to be portable by two men, if possible.

For this project, you are to design a 2-dimensional simple truss, which is to support a 15,000-lb load over the center of a 14-ft span and 12-in higher than the tops of the buildings, as shown in the figure below. The truss cannot extend into the gap between the buildings and must be supported by the horizontal surfaces shown. The vertical deflection of the point of application of the force must not exceed 0.20 inch.

For simplicity, you need not be concerned with the weight of the truss when analyzing the forces, but the total weight is important and should be as small as possible. Use round steel (UNS G10100 CD steel) tubes only from Table A-8 (English units only) of the text and do not design the joint connections or the connections to the buildings. You must be concerned with buckling of the compression members. The factor of safety with respect to all forms of structural failure (yielding and buckling) must be at least 2.2.

Prior to manufacture and installation, a municipal engineer will inspect your report. For the report include: a dimensioned sketch (to scale) of your truss, a complete force analysis, a stress analysis for each member, buckling analyses for the compression members, specifications (sizes and lengths) of each member, your analysis of the deflection of the truss and the total weight of the truss. Summarize the results in a single table in your report.