

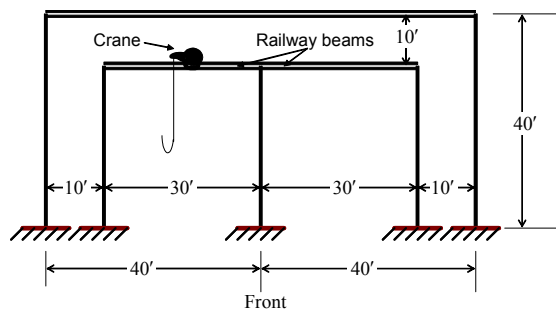
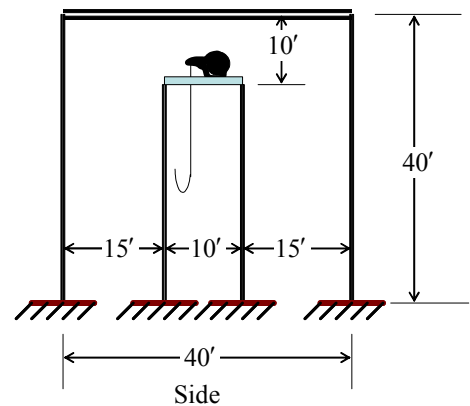
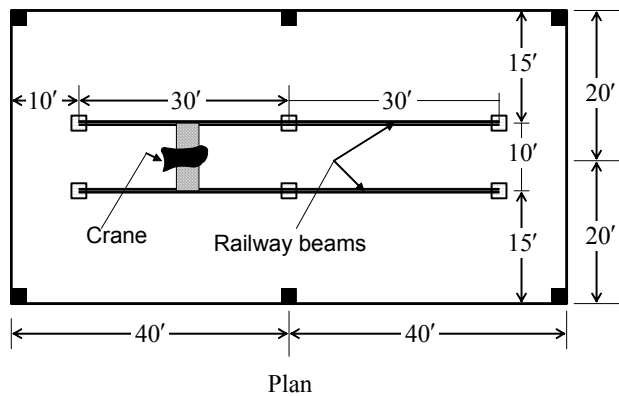
# DESIGN OF CRANE-SUPPORT STRUCTURE

## ENCE 454 – Design of Concrete Structures

SPRING 2004

The design and analysis of a crane-support reinforced concrete structure must adhere to the following general requirements:

1. Each team (if applicable) will design a full-scale reinforced concrete, two-bay warehouse as well as a supporting structure for a crane according to the ACI-318-02 Code.
2. The structure layout must adhere to the following set of dimensions (see figure):
  - a) Overall length of warehouse: 80 ft
  - b) Overall width of warehouse: 40 ft
  - c) Overall height of warehouse: 40 ft
  - d) Column spacing along length of railway beams: 30 ft
  - e) Overall height of crane railway beams from floor: 30 ft



3. Design details should include, but are not limited to, the following main items:
  - a) Design of reinforced concrete beams in each bay of the warehouse– shape, maximum stress, and maximum deflection.

- b) Design of reinforced concrete columns of the warehouse– shape and maximum stress.
  - c) Design of reinforced concrete railway beams for the crane- shape, maximum stress, and maximum deflection.
  - d) Design of reinforced concrete support columns for the crane- shape and maximum stress.
  - e) Buckling of columns for both the warehouse and the crane.
  - f) Design of the warehouse roof slab – shape, maximum stress, and maximum deflection
4. Specify material type for all components. Material property data (i.e. elastic modulus, yield strength, ultimate strength, etc.) should be obtained from appropriate tables.
  5. Design gravity loads should be estimated accurately for the warehouse roof, and must include snow as well as rain loads. Maximum load capacity of the crane is **50 tons**.
  6. Structural members should be sized to support the specified loads with the appropriate partial safety factor according to ACI Code.
  7. Create drawings of the entire structure as well as individual components, including assembly details. All drawings should be generated with a computer (preferred) or NEATLY by hand.
  8. The final report\* will be due on the last day of class – **Tuesday, May 11, 2004**.

\*NOTE: Detailed guidelines and contents of your final report will be provided in a separate handout.