Dulles Airport

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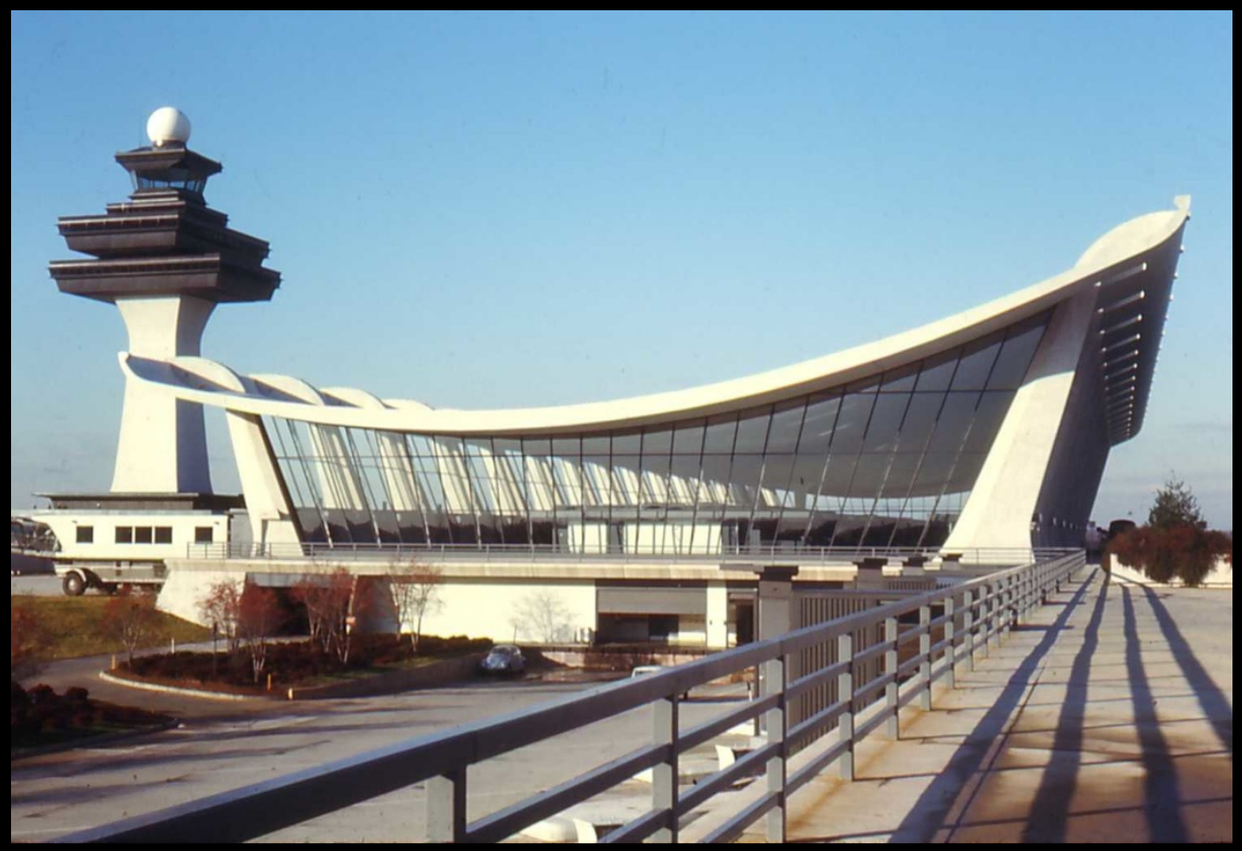
Dulles Airport

Located 26 miles outside of Washington D.C. in Chantilly, Virginia

Commissioned in 1958 finished in 1962



Eero Saarinen

Finnish born architect

Originally went to school to study sculpture at Cranbrook Academy of Art & Académie de la Grande Chaumière in Paris, France

Went on to study architecture at Yale University

Became interested in thin shelled concrete

Precedent Study

Design based on functionality and research

Approach that was influenced by:

- Father's Helsinski Railway Station
- Norman Bel Geddes

Building Precedents

J.S. Dorton Arena in Raleigh, NC

Hippodrome in Madrid, Spain

Problems

From research conducted came up with 3 critical problems

Distance and inconvenience of passenger travel

Money lost in plane taxiing

Flexibility in maintenance and operations of planes

Solutions

The Mobile Lounge

Eliminated need for loading “fingers”

Increased flexibility

Decreased plane taxiing

Decreased passenger walking distance

Dulles became one shallow space

Distance from entrance to boarding was substantially reduced

Plan

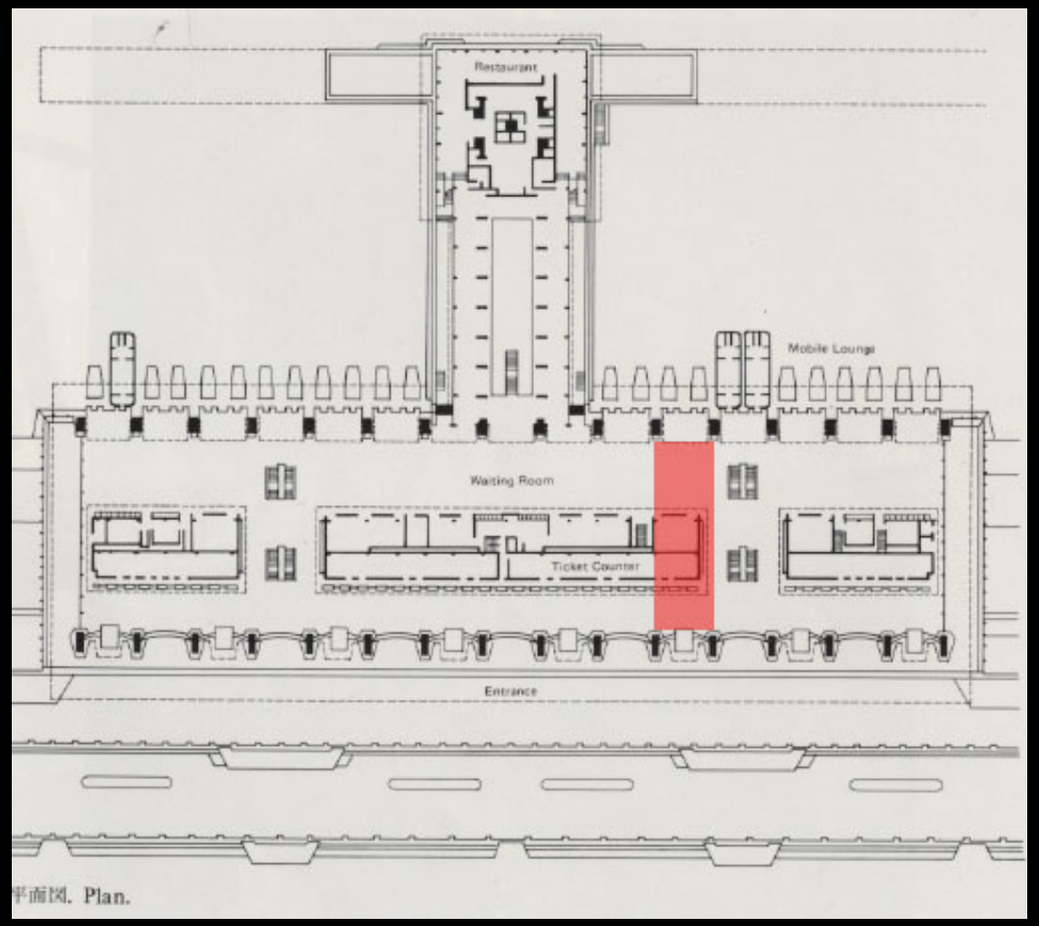
150 ft by 40 ft bays

3 level plan

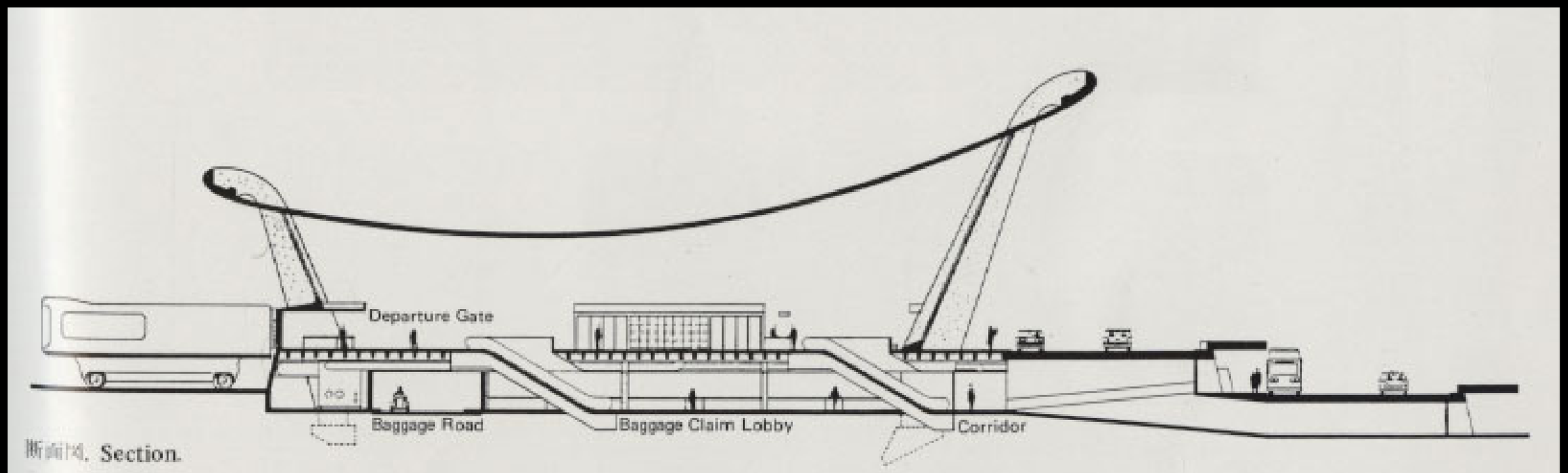
Top level – Passenger drop off and boarding

Middle - Baggage claim and bus pick-up

Lower- Car parking



平面図. Plan.



断面図. Section.

Structure

Roof

- 1 inch thick precast with 8 inch deep stiffeners.
  #8 rebar.
- Inverted arch gives distinct catenary shape.
- 65 feet high on the entry and 45 feet high on the tarmac side.

Foundation

- At the ground, the load is then dispersed out into the soil via massive foundations. These splay outward similar to the roots of trees to resist the moment force implied by the load at this base point.

Vertical Elements

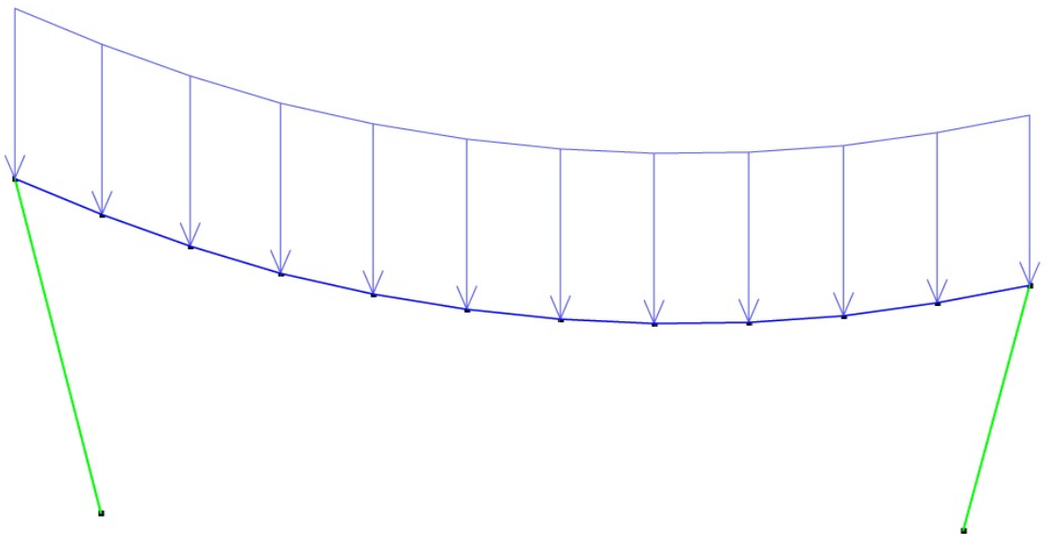
- 14 tons of steel and 100 tons of concrete (14% steel) in each pier.
- Acts as cantilevered Beam

Construction

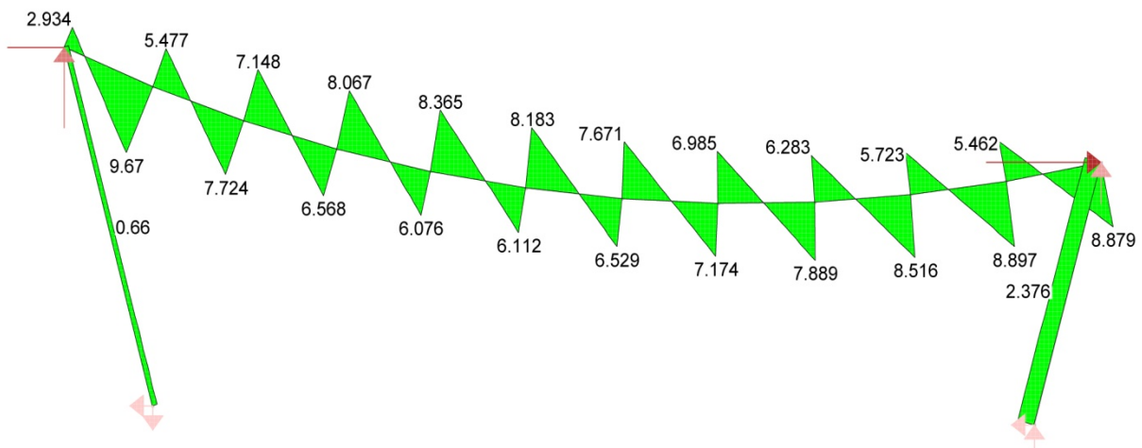
Cast in place framework for canted columns

Curvilinear upturned edge beams

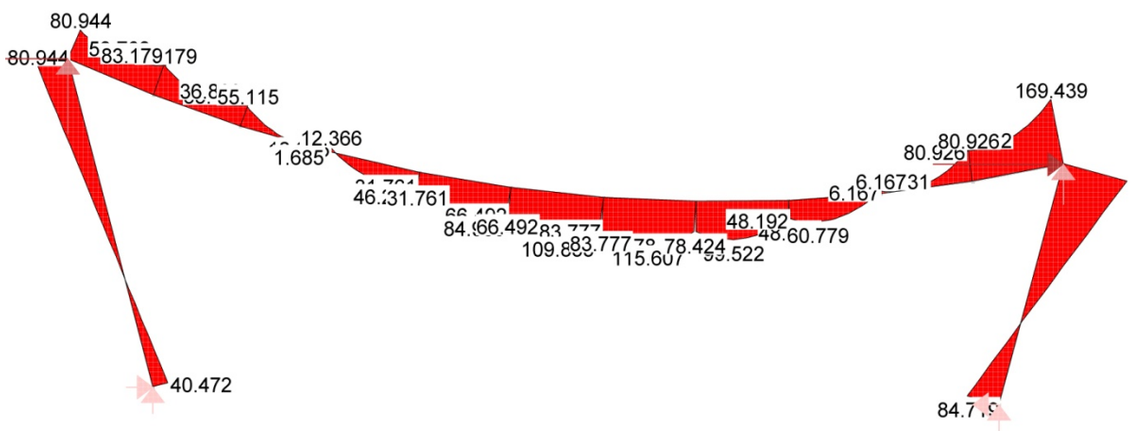
Strung cables by sandbags



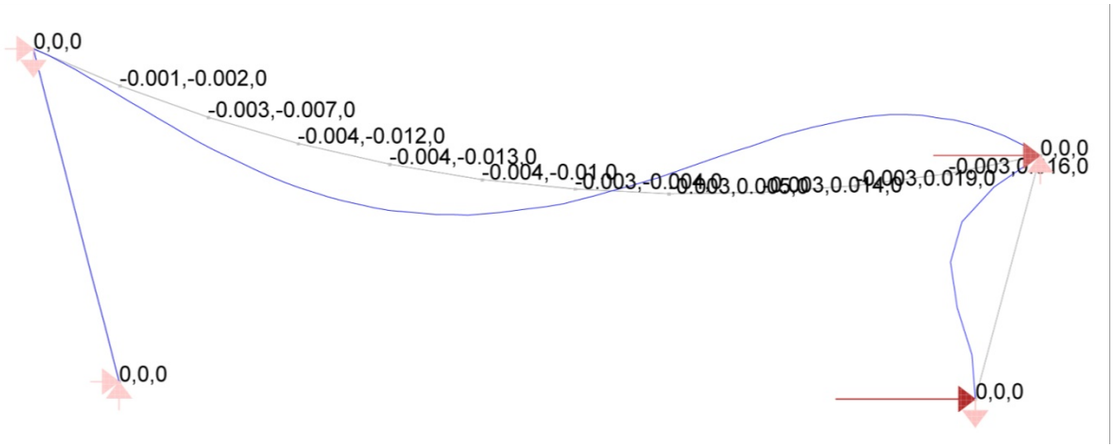
Vertical Loading



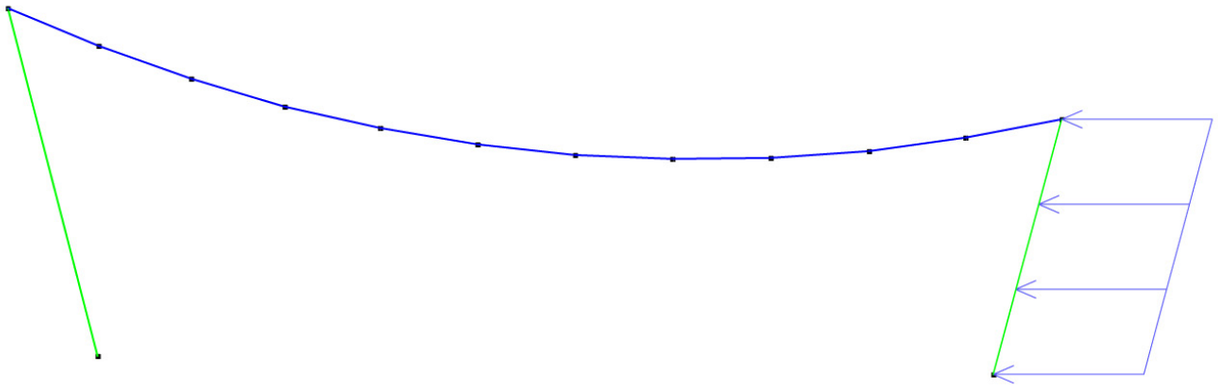
Vertical Sheer



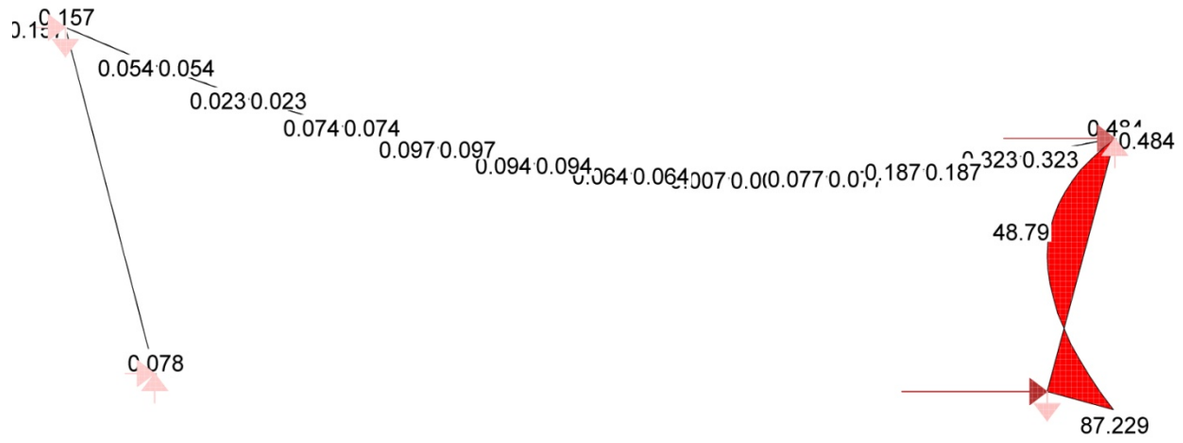
Vertical Moment



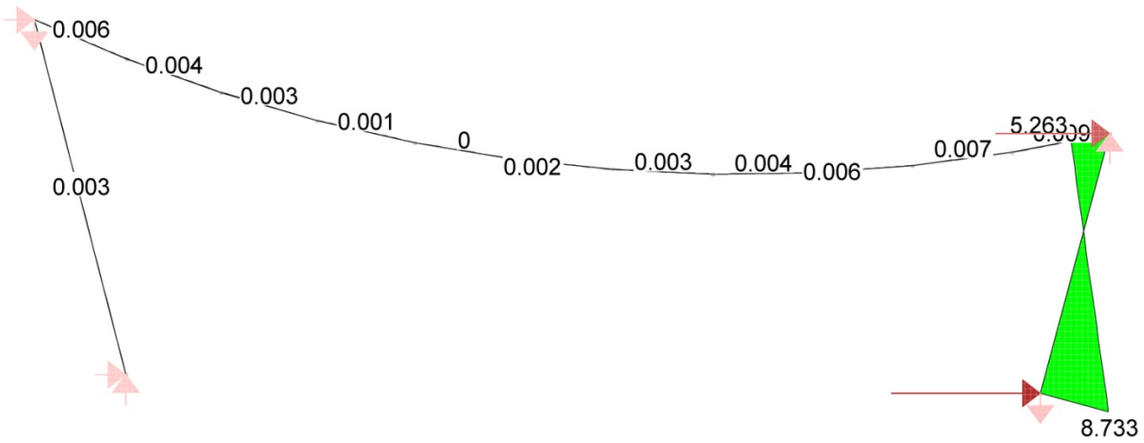
Vertical Deflection



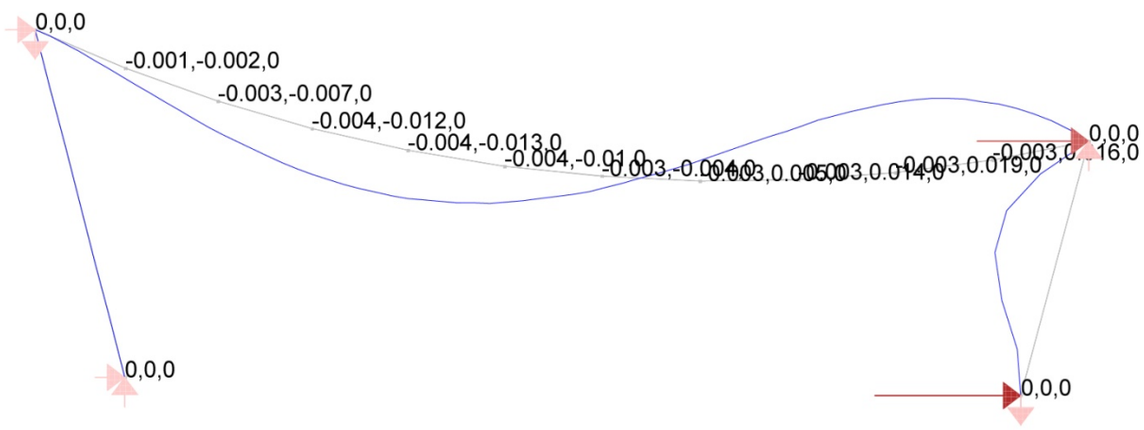
Lateral Loading



Lateral Sheer

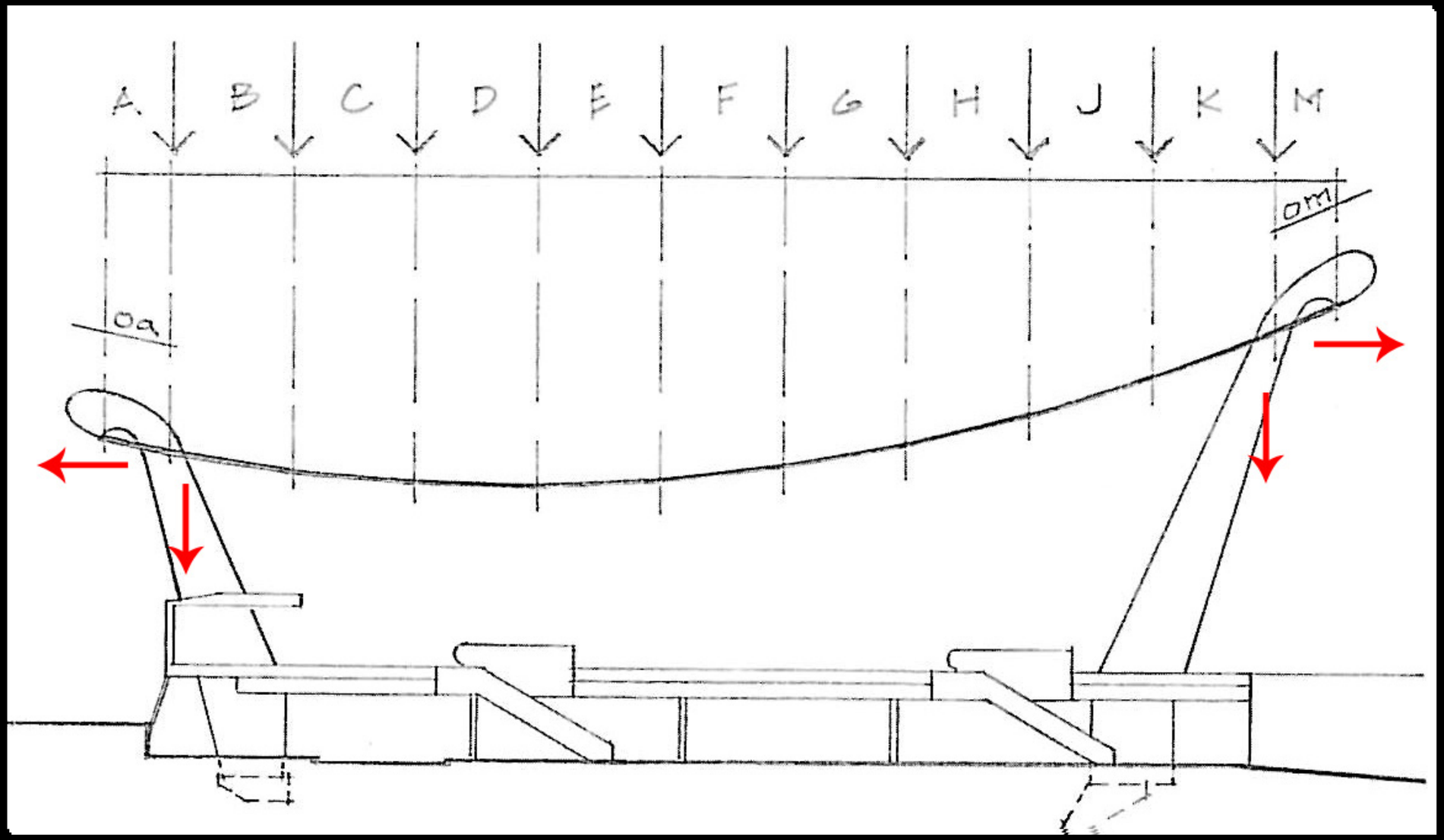


Lateral Moment



Lateral Deflection

Loading



Distributed Load: Roof dead and live load- 80 pounds per sq. ft.

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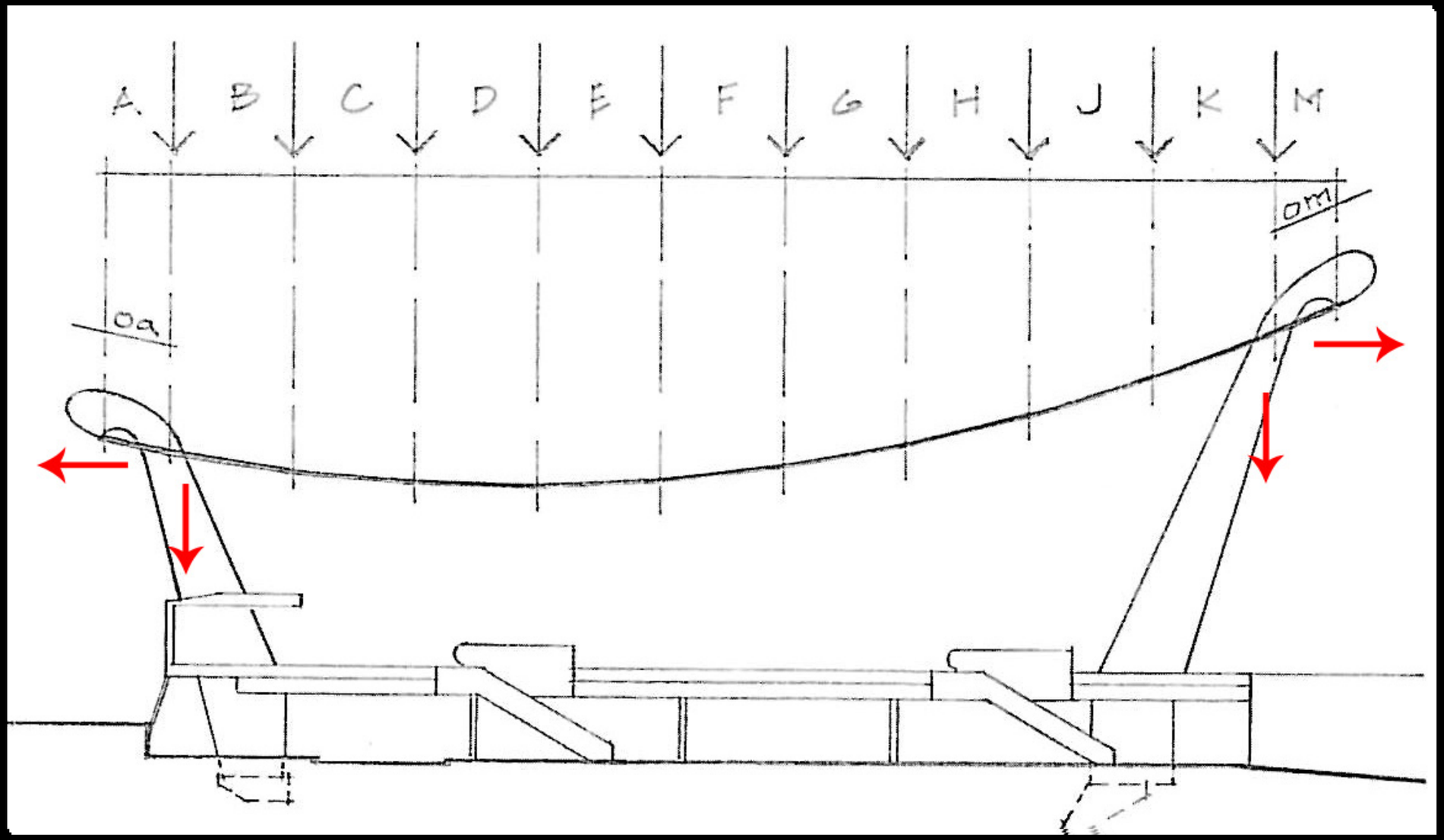

Point Load-Breakdown into the 10ft x 200ft roof sections equals to (10x200x80). 160,000lbs of point load for the roof on each section.

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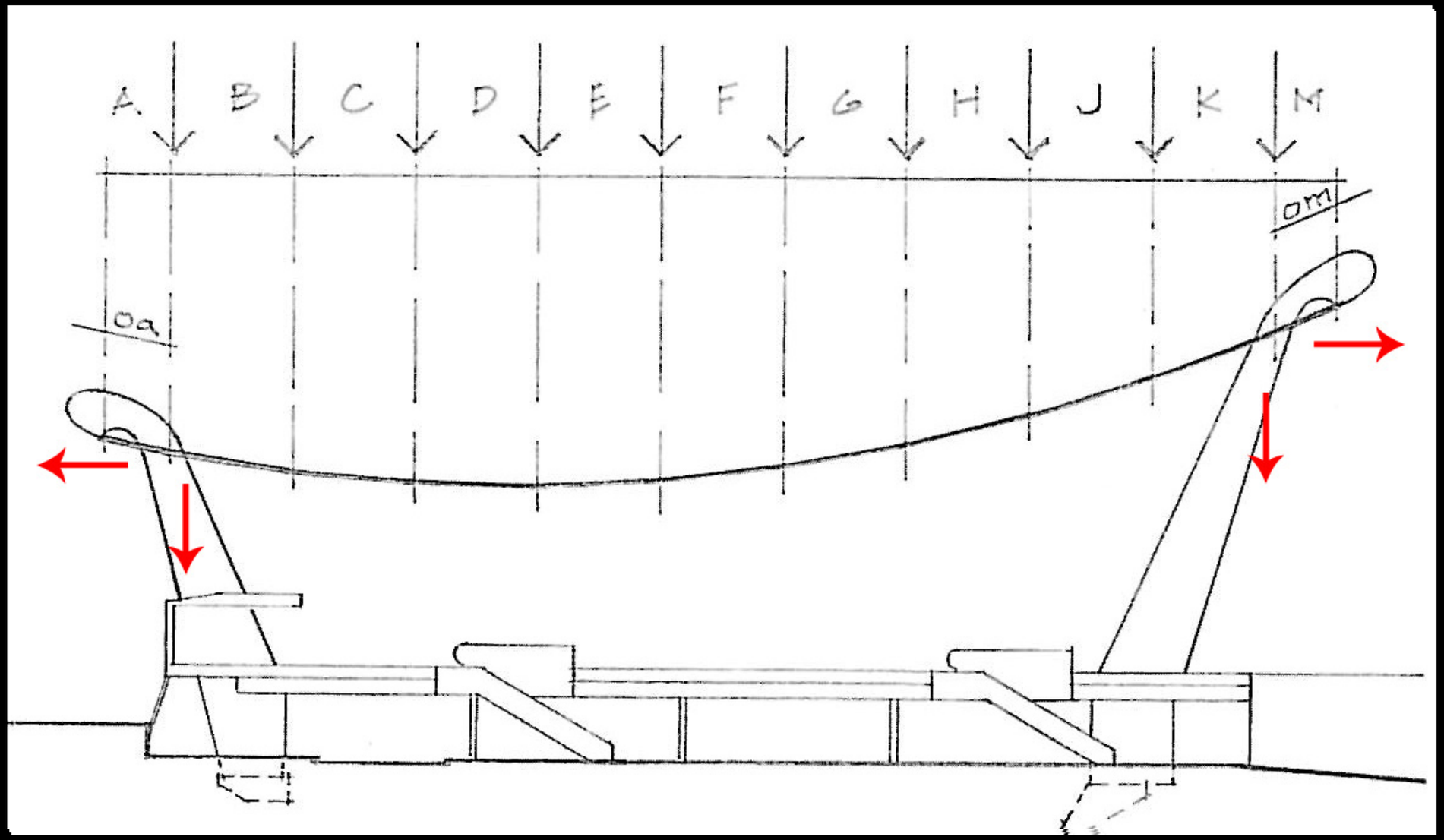

Loads are then distributed to the columns as vertical and horizontal loads, then to the footings.

Resources

- J.S. Dolton Arena Photo: Troxler, Steve. North Carolina Department of Agriculture and Consumer Services. Visited November 2008. http://www.ncstatefair.org/dorton.htm

- Hippodrome Photo: R.E. Schaeffer. Reinforced Concrete, Preliminary design for Architects and Builders. McGraw-Hill Inc. 1992 . Visited November 2008. http://www.arch.mcgill.ca/prof/sijpkes/abc-structures-2005/concrete/timeline.html

- http://darkwing.uoregon.edu/~struct/resources/case_studies/case_studies_suspension/saarinen_dulles/saarinen_dulles.shtml

- Saarinen, Eero. *Eero Saarinen*: *Shaping the Future*. New York: Yale University, 2006.