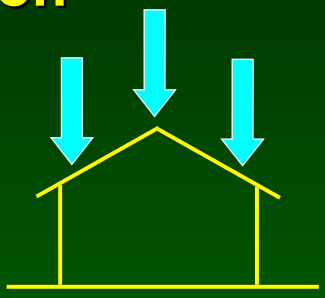
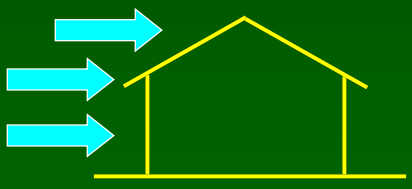
Basics of Wind Forces

Introduction

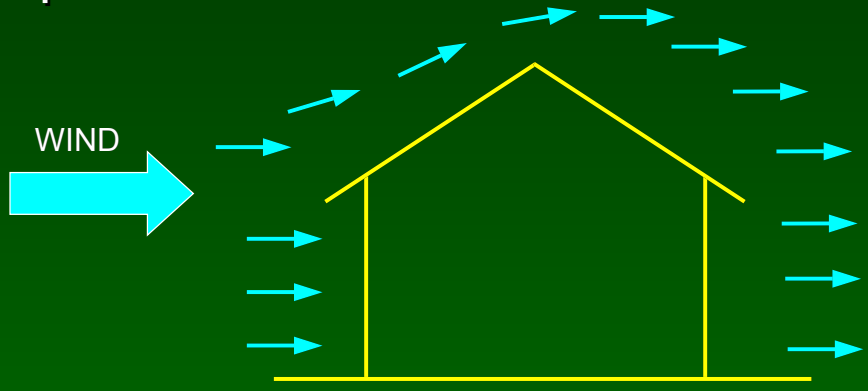
- Basic types of loads:
  - gravity induced loads
    - dead, roof live, floor live, snow
  - lateral loads
    - wind, seismic

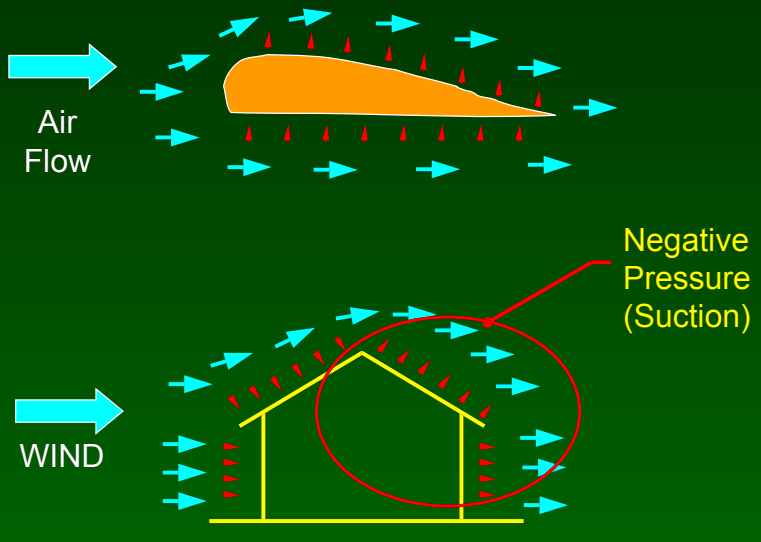


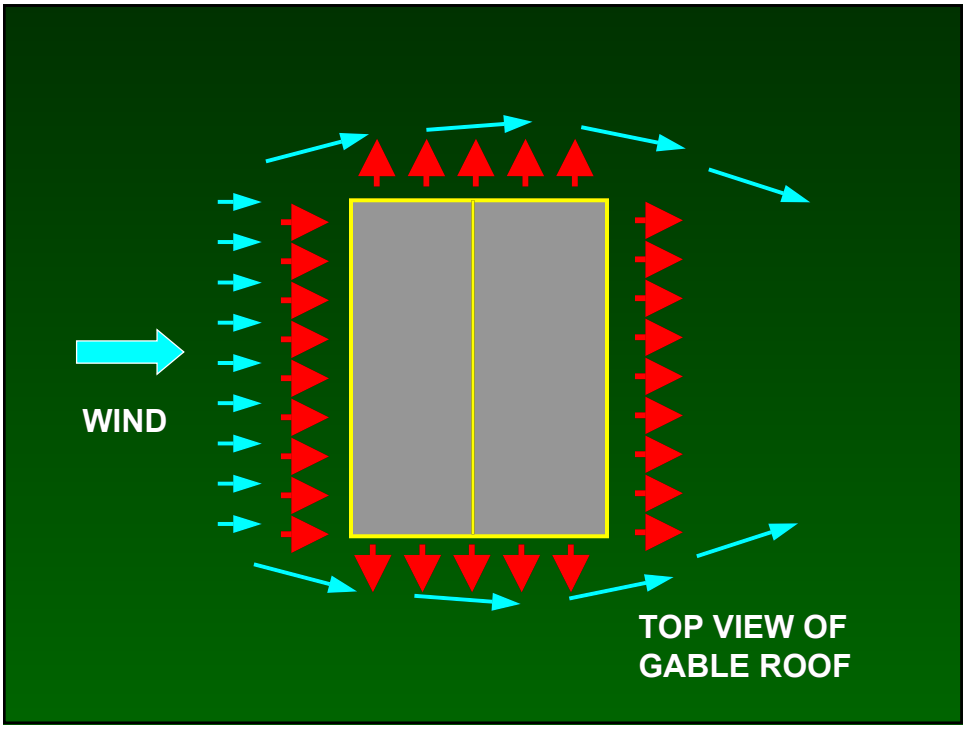


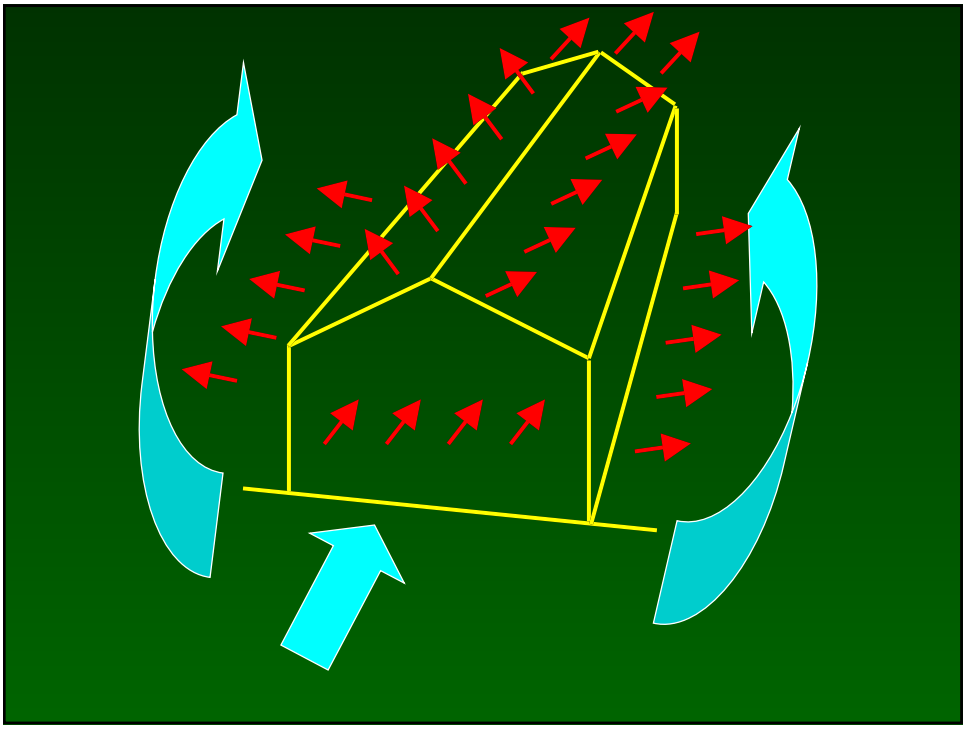
Background

- **Basic fluid mechanics govern how wind pressures influence structures**






WIND
TOP VIEW OF
GABLE ROOF



Wind damage from tornado

- **Hurricane Andrew**
  - wind engineers estimated "fastest-mile" wind speeds of 115-120 mph
  - meteorologists estimated 140-150 mph gusts
  - 25,000 homes demolished
  - 50,000 additional homes damaged
  - 175,000 people homeless
  - 65 people killed
  - $ 25 billion damage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- **Lessons from Hurricane Andrew**
  - see article: http://www.alpeng.com/alpine/hurrican.htm
  - lack of proper connections
    - improper nail spacing - didn't account for interior and exterior zones of building (for roof sheathing)
    - improper staple spacing and orientation (for roof sheathing)

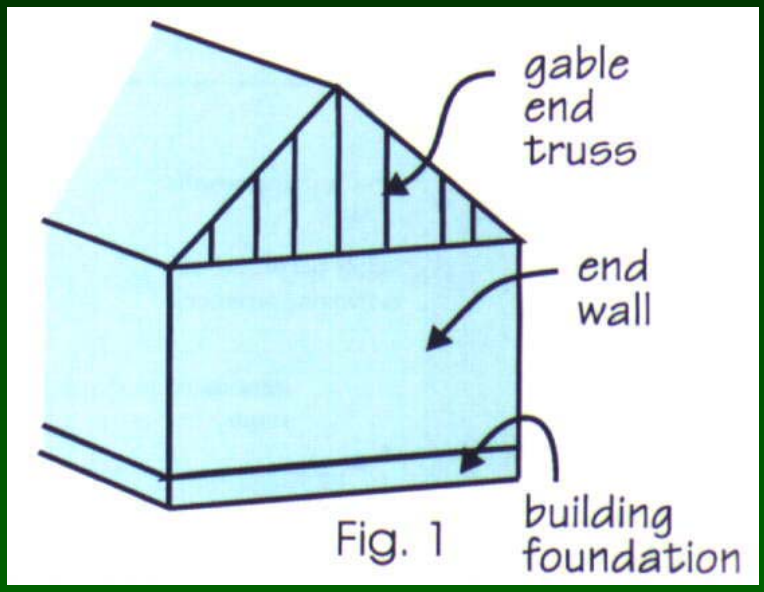
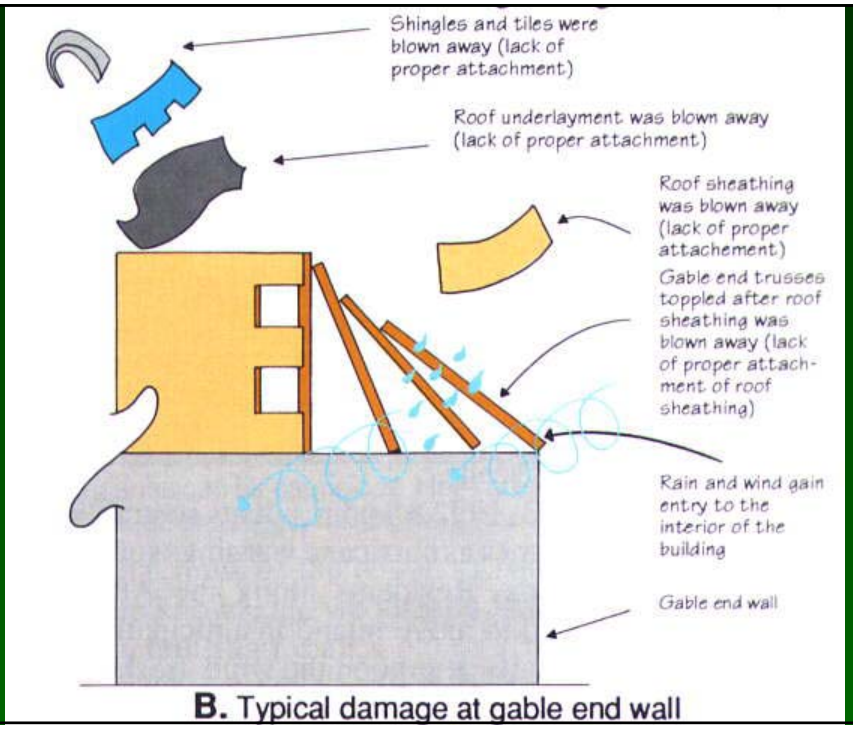


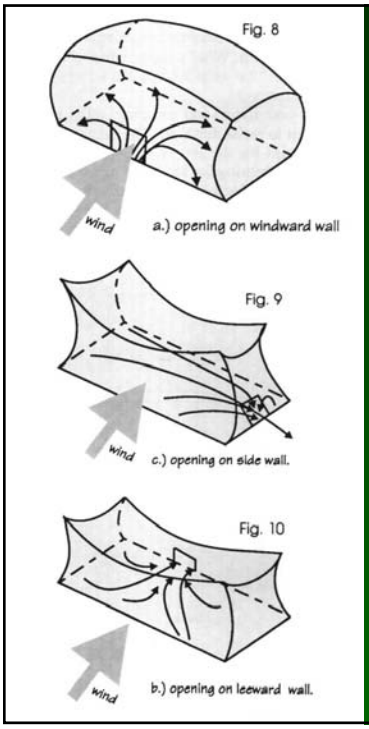
Fig. 1



B. Typical damage at gable end wall

- **Lessons from Hurricane Andrew**
  - **wind blown debris and missiles caused much of the damage**
  - **when an enclosed building is breached it becomes "partially enclosed," and the forces on the structure change**

- **Wind-blown debris punctures roof sheathing**



- **Breach of building envelope**

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- **Question:**
  - What was deadliest US hurricane?
- **Answer:**
  - September 8, 1900
  - more than 6,000 dead
  - Galveston, Texas hurricane
  - most deaths due to storm surge


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