**Force Diagrams: External Forces, Internal Forces and Stress**

Brainstorm the external forces that act on the structure of a house.

A diagram of one those forces is below:

**Example:**

*External = Gravity*

*Internal = Force exhibited by the structure itself (internal)*

Notice that:

* gravity and the force exhibited by the structure itself are equal and thus balanced.
* force diagrams usually show pairs of forces.

Now imagine that it snows overnight. **Add the weight of a heavy snowfall** onto the house.

*What size would the arrow for gravity be now (longer or shorter) in relation to the previous*

*diagram?*

*Why?*



**Example:**

External = *Gravity (weight of snow on roof)*

Internal = *Force exhibited by the structure itself*

Answer the following questions:

1. If the snow-covered house represented in the second diagram were to remain standing, what would the force exhibited by the structure of the house (internal force) have to be in relation to the force of Gravity (external force)?
2. What would happen if there was too much snow on the house?
3. How would you picture this using a force diagram? (draw one)

**Structural Stress, Fatigue and Failure: Background Information**

* ***Structural stress***occurs when a combination of external and internal forces act on a structure at one time.
* ***Structural fatigue***occurs when a combination of external and internal forces weakens components of a structure (e.g.,weakening of beams or concrete).
* ***Structural failure***occurs when the structure itself collapses.

Example: Leaning tower of Pisa – see handout.

**Structural Fatigue Mini-Project**

Working in groups or individually:

* research print and electronic multimedia resources to **find examples of structures** in the media that show signs of structural fatigue and/or failure
* **identify the internal and external forces** adding to the structural stress causing fatigue or failure, and **explain what happened**
* present information in a **labelled poster** to be displayed in a gallery or bulletin board display