Definition

Accident: An undesired or unplanned event that results in a **loss**, including loss of human life or human injury, property damage, environmental pollution, mission loss, etc. [*Engineering A Safer World* p 181]

Losses are the outcomes we want to prevent.

Our task is to **write a list** of them, staying broadly general and covering all the areas of concern for our safety analysis to address.

Thermostat Example

	Losses
L1	Room gets too cold (2 or more degrees below target)
L2	Room gets too hot (2 or more degrees above target)
L3	Damage to facilities, property, or the heating equipment itself
L4	Waste of fuel
L5	Physical harm to humans or pets

Both *L1* and *L2* reflect the notion of *mission losses*, i.e. the system did not serve its core purpose.

Similarly, we could include something like:

L6 Unresponsiveness: The system is too slow to heat the room
L7 The system does not accept user input

From the perspective of a company manufacturing thermostats and furnaces, we might also choose to include other losses relevant to our business, such as:

L8 System is excessively costly to manufacture

Alternatively, we might have as a loss, “The heating system is financially unprofitable”, with “excessively costly to manufacture” as a hazard.

Desired Qualities

- Concise — We want a relatively short list (<20); these are our priorities.
- General — We don’t want to prematurely narrow our focus.

  Example: "Someone is injured" may be a more useful loss statement than "Someone is injured by hot equipment" because, overall, we want to prevent *any* injury.
- Good coverage — For any accident we can think up, we want it to be described by at least one of the losses on this list.
- Non-redundant — Overlap between losses is ok, but if one loss is entirely a subset of another, perhaps consider consolidating them.
- Relevant — They should be problems we actually consider important to prevent for our system.

  Example: "Civil war breaks out" is not a loss relevant to our thermostat example (except jokingly, or if there’s an allegory about climate change).

Strategic Approaches

Ask "what is *unacceptable*?" vs. "what is *risky but tolerable*?" to distinguish from hazards.

Toolkit: List of generic losses.

Relationship to other concepts

For each of these **losses**, we will identify hazardous system conditions that, in combination with environmental conditions, can result in an accident in which we experience the loss.

The relationship between **losses** and **hazards** lets us *prioritize* our safety efforts, focusing on preventing the system states that are relevant to producing these accidents— we don’t need to examine every combination of system states.