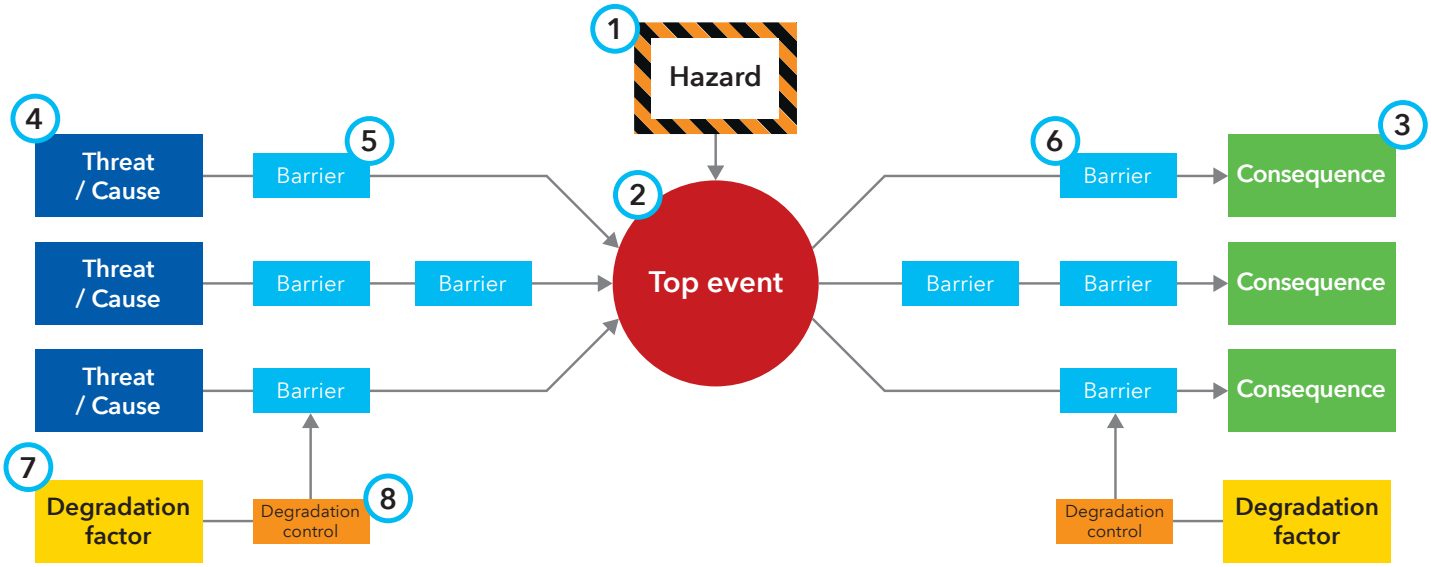
BOW TIE TERMINOLOGY AND RULES

Definitions of the parts in a bow tie diagram

There are 8 parts in a bow tie diagram which describe an undesired event, and how the risk of the event is managed.



The definitions of the parts are as follows:

1.	**Hazard**	An operation, activity or material with the potential to cause harm to people, property, the environment, business or other objectives and goals.
2.	**Top event**	An event in which control of the hazard is lost.
3.	**Consequence**	A direct undesirable outcome of an accident sequence that results in harm to people, property, the environment, business (assets, operations or reputation), or other objectives and goals.
4.	**Threat / cause**	An initiating event, circumstance or situation that can potentially release a hazard and produce a top event.
5 & 6.	**Barrier**	A risk reduction measure (devices, systems, or actions) which directly prevents the occurrence of, or mitigates the consequence of an undesired event.
5.	**Prevention barrier**	A barrier (to the left of the event on the diagram) which stop a threat(s) / cause(s) resulting in a top event.
6.	**Mitigation barrier**	A barrier (to the right of the event on the diagram) which stops a top event resulting in a consequence or reduces the severity of the impact of the consequence.
7.	**Degradation factor**	A situation, condition, defect or error that compromises the functionality of a barrier.
8.	**Degradation control**	A risk management measure to maintain the condition of a barrier (i.e. to prevent its impairment, failure or loss of effectiveness) not a barrier in its own right.

Quality rules summary

Rules by elements:

- **Hazard**
  - Is what you seek to control, in its controlled state.
  - Must link directly to the (top) event.
  - Should be specific not generic.
  - Can include other information, e.g. situational context and indication of scale.

  Note: one hazard can generate more than one top event.

- **Top event**
  - Is the moment when control over the hazard or its containment is lost releasing its harmful potential.
  - Should describe how / what control is lost.

  Note: Avoid common errors – Should NOT be a threat/cause (e.g. corrosion of the tank), a consequence (e.g. explosion) or a barrier failure (e.g. high level alarm fails).

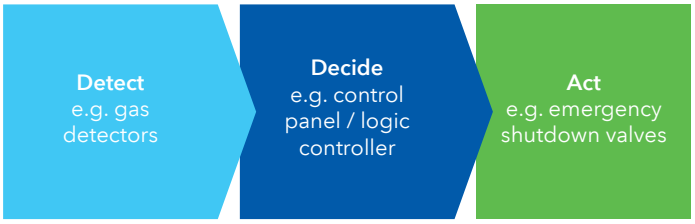
- **Consequence**
  - Good practice to define as; "Damage" due to "event", e.g. environmental damage due to liquid spill.
  - Any or all consequences could result (multiple routes from the top event).

  Note: Avoid common errors – Should NOT be defined at too detailed a level (e.g. separate minor injury, major injury and fatality consequences) as mitigation barriers are likely to be the same and the number of branches will be unnecessarily increased.

- **Threat / Cause**
  - Should be sufficient to lead to the top event.
  - They should be a specific direct cause.
  - Should potentially result in all of the consequences.
  - Should be credible.

  Note: Avoid common errors – Should NOT be a barrier failure (e.g. not wearing PPE). Should not be generic/non-specific (e.g. mechanical failure or human error).

- **Barrier**
  - Can be physical or non-physical measures made up of hardware, software and / or human actions.
  - Should be:
    - Effective / fully functional i.e. capable of completely stopping a threat / cause resulting in a top event or stopping or reducing the magnitude of a consequence resulting from a top event.
    - Independent of the threat / cause or other barrier on their branch.
    - Auditable.
  - Will deliver their function on demand in a passive (e.g. fire wall), or active (e.g. fire sprinkler system) manner or operate continuously to deliver their function (e.g. an anode).
  - Active barriers should be complete systems, which detect a condition, decide what action is needed and act to deliver their prevention or mitigation function.



  - Can recur across different parts of the bow tie, however they should only appear on either the prevention or mitigation side of the bow tie, and only once on a threat / cause or consequence branch.
  - Good practice is to place in time sequence of their effect.

  Note: Avoid common errors - Should NOT be degradation controls, i.e. should not include words such as "training", "competency", "policy", "procedures", etc.
  Should NOT be incomplete barriers (e.g. fire and gas detection).

- **Degradation factor**
  - Should be sufficient to lead to the impairment, failure or loss of effectiveness of the barrier(s) it is linked to – be specific.

- **Degradation control**
  - May follow rules for barriers, but current practice is less rigid.