# How to apply the new CCPS/EI Bowtie book to existing bowties

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# CCPS / Energy Institute Concept Book

- CCPS/EI decided to develop a Concept Book to capture best practice and define a methodology for bow ties.
- Energy Institute joined the project with a special emphasis on human factors
- "Bow Ties in Risk Management: A Concept Book for Process Safety"
- Proposes standardized bow tie terminology and definitions
- Explains how to:
- Construct bow ties of high practical value, avoiding common pitfalls
- Treat human and organizational factors in a sound and practical manner
- Apply bow tie can be used to create high value organizational learning from incidents and audits
- Practical application and value of bow ties in plant management and active risk management, from the control room to the board room
- Based on current best barrier management knowledge and approaches
- Draws on a wealth of industry experience from well-known experts





## Making bowties better



Hazard





**Risk Management Solutions** 

**Hazard** is an operational activity or materials with the potential to cause harm

"What you are trying to control"

Hazards should

Be specific

For the hazard in its controlled state

Can also include:

Situational context

Indication of scale

Not always possible to define all in the box – use description field







**Top event** is the moment when control over the hazard is lost releasing harmful potential Top event

Describe how / what control is lost Can give an indication of scale (e.g. leak vs rupture)

Do not define as:

A threat (corrosion of the tank) A consequence (e.g. tank overflow and major dike fire) A barrier failure is not a top event



- **Consequences** direct outcome of an accident sequence that results in harm ...
- Recommend defining before "threats" this can help ensure that threats defined are those that lead to the significant consequences
- Should be defined as:
  - "Damage" due to "Event", e.g. environmental damage due to liquid spill
  - Do not be too specific in defining the
  - consequences (e.g. differentiating injury outcomes from fatality outcomes) as the barriers are likely to be the same and the number of branches is increased









**Threats** initiating event that can potentially release a hazard and produce the top event Should be sufficient to lead to the top event by itself – be a *specific direct* cause Should be credible Should NOT be a barrier failure







Prevention barrier is effective if it is capable on its own of preventing a threat developing into the top event Avoid generic titles like training or competency









Use specific Degradation factors directly associated with why a barrier can fail to operate as intended

Avoid generic ones

Have guidance on when to use Degradation factors, DO NOT USE IT EVERYWHERE!







#### BowTie analysis in 8 steps







### **Rule for Barriers**

No rules can lead to image of many barriers and perception of great risk control

Rules help present more realistic image





# **Barrier rules**

#### • Effective

 Capable on its own of preventing a threat developing into the top event or capable of completely mitigating the consequences or reducing its severity

Independent

 A barrier is independent if is has no common failure modes with other barriers

Auditable

 A means to check that it works / delivers its functionality on demand. Barriers can have performance standards for their functionality







### Making bowties better







# Come and visit our booth for more information

Or contact me at <a href="mailto:p.mcculloch@cgerisk.com">p.mcculloch@cgerisk.com</a>

