



# Risk-Based Thinking (RBT): A Fundamental First Principle

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The Certified Performance Technologist (CPT) designation is awarded by the International Society for Performance Improvement (ISPI) to experienced practitioners in the field of organizational performance improvement whose work meets both the performance-based Standards of Performance Technology and application requirements.





# Risk-Based Thinking\*

Fundamental  
First Principle

- ▶ **Anticipate** – know what to expect
- ▶ **Monitor** – know what to pay attention to
- ▶ **Respond** – know what to do
- ▶ **Learn** – know:
  - ▶ what has happened (past)
  - ▶ what is happening (present)
  - ▶ what to change (future)



**Harm** to one or more assets (people, product, or property) due to an uncontrolled:

- ▶ *transfer of Energy* (various forms)
- ▶ *transport of Mass* (solids | liquids | gasses)
- ▶ *transmission of Information* (data, software, signals)

**Safety:** Asset's freedom from *unacceptable* risk of harm<sup>#</sup>

**Resilience:** The ability to succeed under *varying* conditions<sup>β</sup>

\* Adapted from Perrow, C. (1999), *Normal Accidents*, p.66.

# Reason, J. (1997), *Managing the Risks of Organizational Accidents*, p.107.

β Hollnagel, E., et al. (Eds.) (2013), *Resilience Engineering In Practice*, p.277.



# Video: Angel's Landing in Winter\*



# What Do You Do If...?

- ▶ Demands or tempo suddenly escalate
- ▶ Conflicting goals arise (safety vs. production)
- ▶ Resources are inadequate for task at hand
- ▶ Current plans won't work for current conditions
- ▶ You're surprised





# Workplace Realities

- ▶ Market Place – competition, various demands, many implicit, pressures, and resource constraints, goal conflicts: faster, better, cheaper, & safer
- ▶ Residual Risks – intrinsic hazards, dynamic, human fallibility (3-4 errors per hour)
- ▶ Error traps – local factors that provoke error, uncertainty, complexity, surprises, etc.
- ▶ Overconfidence in the System: underspecified design, procedures, resources, training, etc.
- ▶ Land mines – hidden sources of potential energy, mass, and information that could cause harm to assets; configuration
- ▶ Defenses – missing, faulty, and sometimes bypassed



# Risk in Human Performance

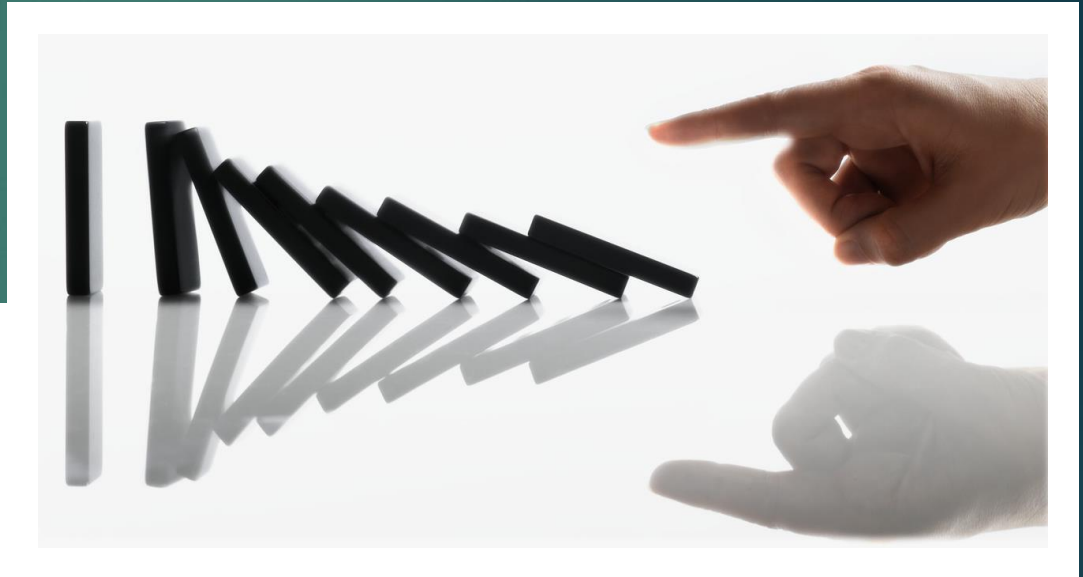


# TouchPoint

A human interaction with an object (asset) that changes the state of that object through work

Work ( $f \cdot d$ ) involving:

- Transfers of **Energy**
- Movements of **Mass**
- Transmissions of **Information**







# Defenses: Protecting Assets



## TouchPoints

### Controls (guide behavior):

- ▶ Procedures
- ▶ Supervisions
- ▶ Signs, labels, and banners
- ▶ Alarms
- ▶ Expertise
- ▶ Good Operating Practices
- ▶ Hu Tools

## Pathways

### ▶ Barriers (limit or impede):

- ▶ Lock Out/Tag Out (LOTO)
- ▶ Hard hat/Ear plugs/Gloves
- ▶ Passwords
- ▶ Machine guards
- ▶ Arc flash clothing

### ▶ Safeguards (mitigate):

- ▶ Sprinkler systems
- ▶ EMS
- ▶ Eye wash station



# Workers Create Safety\*

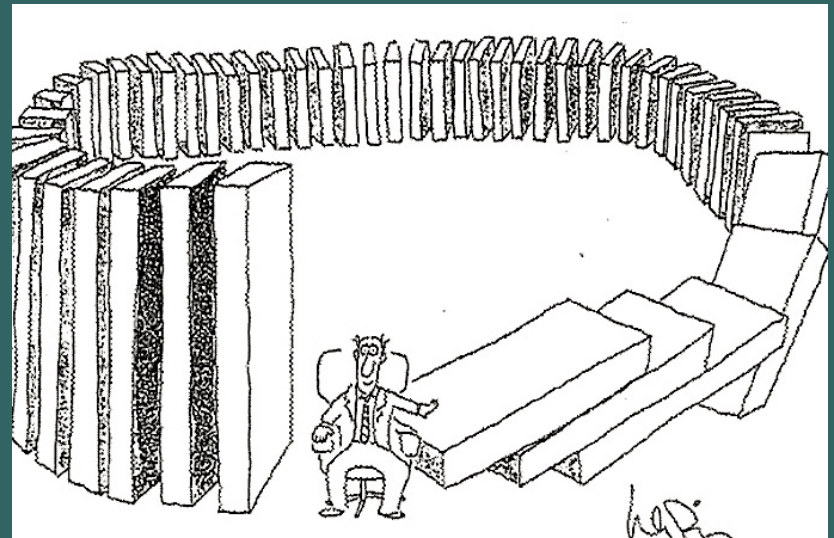
- ▶ Adjustments: responses to incomplete or inaccurate plans, procedures, policies, design, etc. in order to protect key assets during work (capacity to adapt as needed)
- ▶ Expertise: bedrock of risk-based thinking; in-depth technical know-how tempered with experience; knowledge of assets' limitations
- ▶ Chronic uneasiness: mindfulness of fallibility, uncertainty, and pathways for transfers of energy, movements of mass, and transmissions of information



# Anticipate

AMRL

- ▶ Know *what to expect*: assets / hazards
- ▶ Accomplishments: value additions (planned)
- ▶ Inherent risks:
  - ▶ Transfers of energy
  - ▶ Movements of mass
  - ▶ Transmissions of information
- ▶ What if...?



- ▶ **Know** *what to pay attention to*: TouchPoints
- ▶ TouchPoints: human actions that change the state of an asset through work ( $W=f(xd)$ )
- ▶ Critical steps and Risk-Important Actions
- ▶ Critical parameters: safety and quality
- ▶ Situation awareness
- ▶ Operational oversight

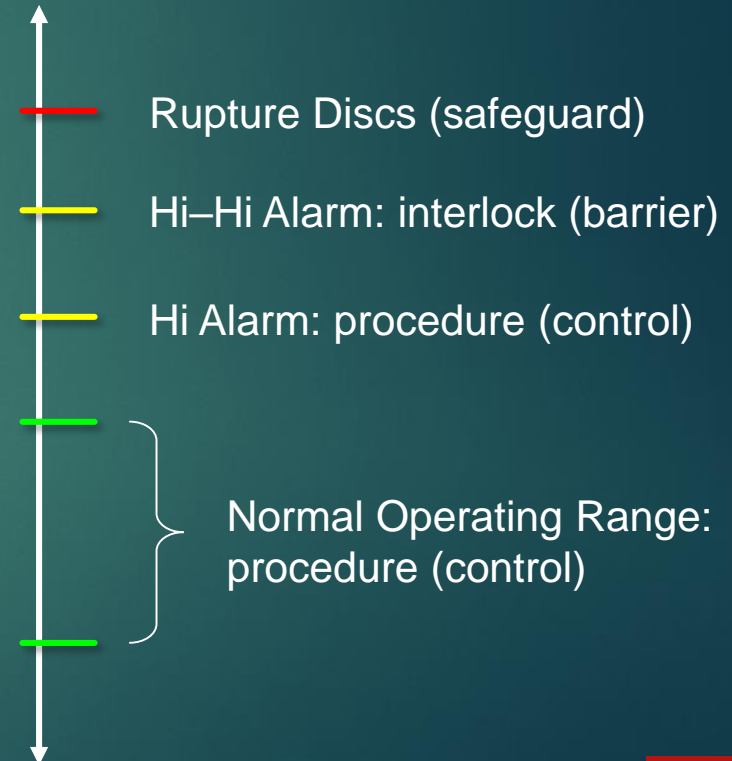




# Respond

AMRL

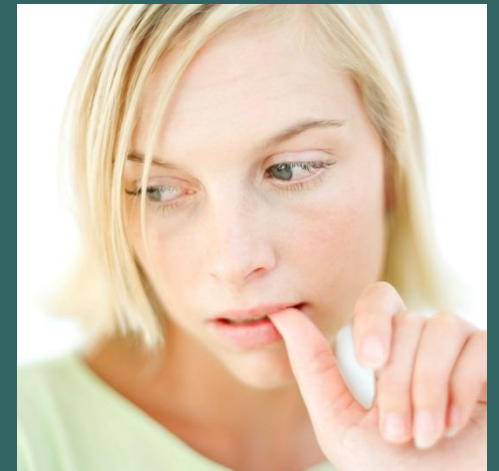
- ▶ Know what to **Do**: Positive Control
- ▶ Eliminate, Prevent, Catch, Detect, Mitigate
- ▶ Hu Tools
- ▶ Stop when unsure
- ▶ Conservative decision-making
- ▶ Pre-positioned resources, reserves
- ▶ Engineered safeguards







- ▶ **Know** *what has happened* (past): operating experience and personal experience
- ▶ **Know** *what is happening* (present): situation awareness; relentless pursuit of truth; facts; thinking ahead
- ▶ **Know** *what to change* (future): system-level improvements, personal development, protection of assets for future tasks





# Chronic Uneasiness\*

A deep-rooted respect for the technology

## Mindfulness

to protect assets  
against *uncontrolled*:

- 1) Transfers of energy
- 2) Movements of mass
- 3) Transmissions of information



how you perceive, feel, and think  
about assets and their hazards

A Preoccupation with Failure: Value Addition vs. Value Extraction

\* Reason, J. (2008), *The Human Contribution*, p.274.

A vertical silhouette of a worker on the left side of the slide, holding a tool and working on a structure. The background is a blurred blue and white image of a construction site.

# Key Points to Remember!!!

1. Top performers naturally practice **RBT**:
  - ▶ Anticipate
  - ▶ Monitor
  - ▶ Respond
  - ▶ Learn
2. Workers create safety by *adapting*, which is prompt **RBT** – preservation of defenses.
3. **RBT** is triggered by appearance of *pathways*.
4. **Chronic uneasiness** is mindfulness of impending:
  - ▶ Transfers of energy
  - ▶ Movements of mass
  - ▶ Transmissions of information
5. Technical *Expertise* is the bedrock for **RBT**.



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Operating  
Philosophy





# Building Blocks of HOP\*



\* HOP: Human and Organizational Performance

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# Live Long and Prosper\*



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\* Popularized by actor Leonard Nimoy as the character Mr. Spock in the television show, *Star Trek*, but is actually an variation of a blessing by Jewish rabbis in worship services.

