

NFPA 70E & Human Error



NFPA 70
2018
Update

What's in
Annex Q?

What now?

What's
required?

What is NFPA 70E?

Standard for Electrical Safety in the Workplace



History

OSHA

2018
Update



NEC

- 1882 - First commercial power system: Edison's Pearl Street Generating Station
 - Followed shortly by the first electric shock from a commercial power system.
 - By 1895 five different electrical codes
- 1896 - Committee was formed to create a single electrical code: National Electrical Code (NEC)
- First standard code published in 1897
- 1911- National Fire Protection Association becomes the sponsor of the NEC.

OSHA

- 1970 - Congress passes the Occupational Safety and Health Act
 - Initially OSHA borrowed language from NFPA for electrical regulations, but, congress...
- 1976 - OSHA requests NFPA develop standard
- 1979 - NFPA 70E Standard for Electrical Safety Requirements for Employee Workplaces published
- OSHA = federal law, references NFPA 70E
- NFPA 70E = define specific details

2018 Update

- Article 110 General Requirements for Electrical Safety-Related Work Practices
 - 110.1 (H)(2) "The risk assessment procedure shall address the potential for human error and its negative consequences on people, processes, the work environment, and equipment."
- Informative Annex Q "Human Performance and Workplace Electrical Safety"
 - Introduces the concept of human performance to electrical safety.

NFPA 70E & Human Error

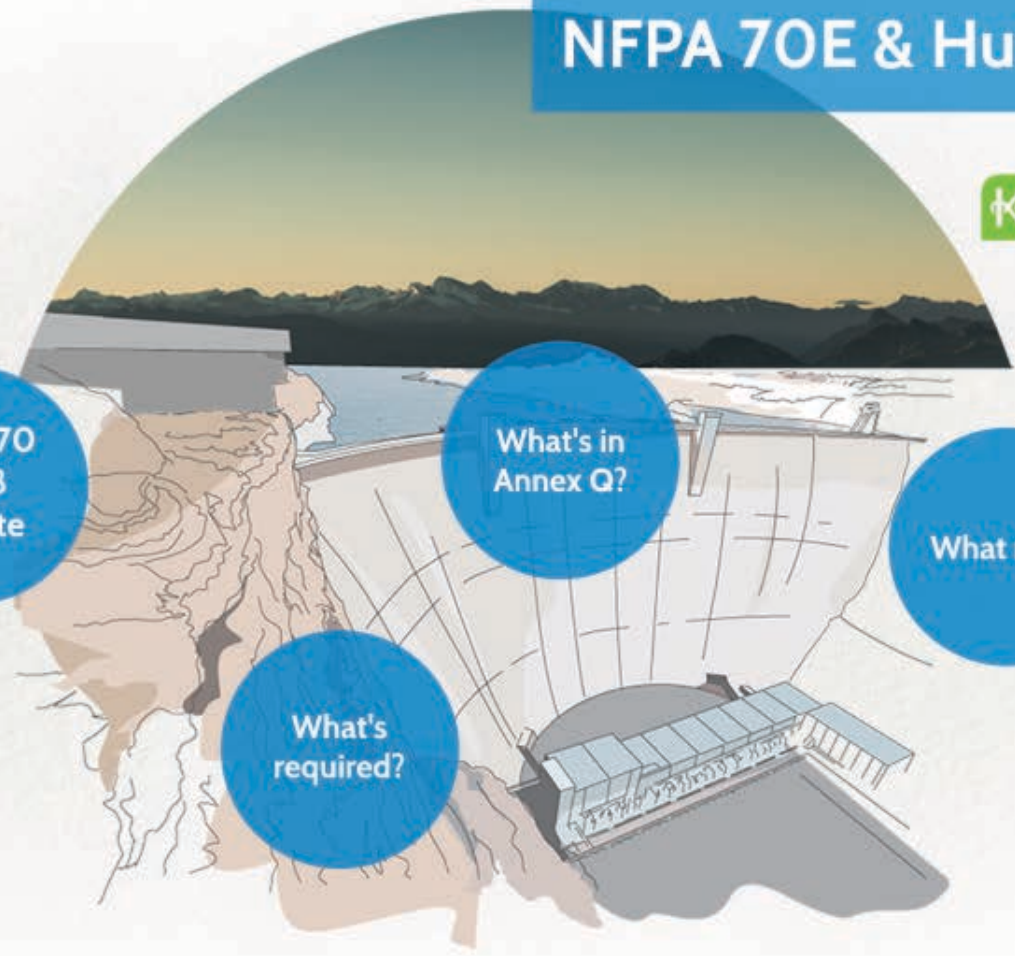


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What does NFPA 70E require?

How does NFPA 70E impact organizations?

NFPA 70E
Function

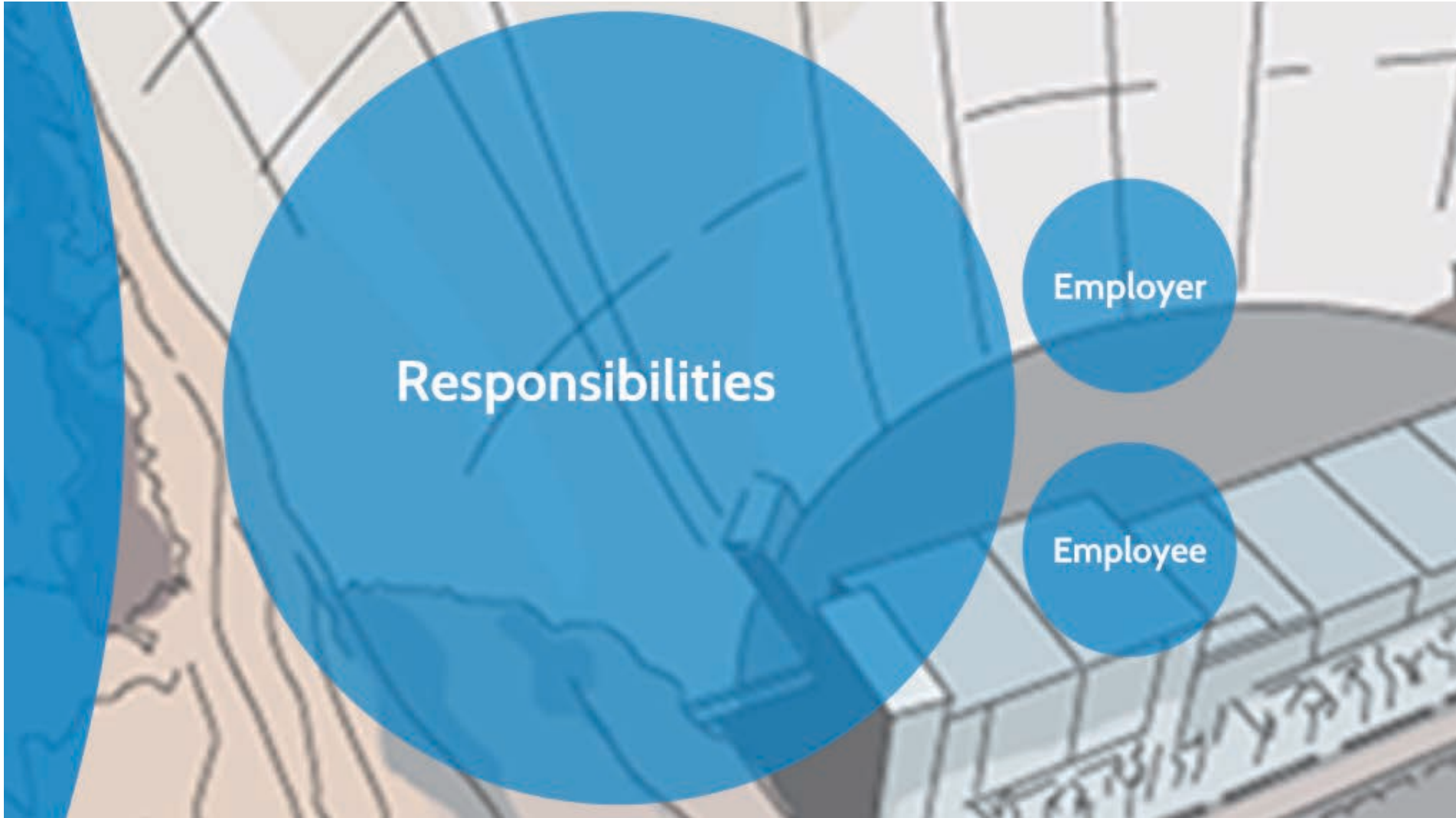
Responsibilities

Assessment



What does NFPA 70E Regulate?

"This standard addresses the safety of workers whose job responsibilities involve interaction with energized electrical equipment and systems with potential exposure to electrical hazards."



Employer

The employer shall have the following responsibilities:

- (1) Establish, document, and implement the safety-related work practices and procedures required by NFPA 70E.
- (2) Provide employees with training in the employer's safety-related work practices and procedures.



Employee

The employee shall comply with the safety-related work practices and procedures provided by the employer.

Risk Assessment Procedure

The electrical safety program shall include a risk assessment procedure and shall comply with 110.1(H)(1) through 110.1(H)(3).

1. Elements of Risk Assessment Procedure
2. Human Error *
3. Hierarchy of Risk Control Methods

Elements

Human Error

Hierarchy

The background of the slide is a stylized map showing various geographical features like rivers, roads, and buildings. A large, semi-transparent blue circle is centered on the map, containing the text. The word "Elements" is written in white, bold font at the top of the circle.

Elements

The risk assessment procedure shall include:

- (1) Identify hazards
- (2) Assess risks
- (3) Implement risk control according to the hierarchy of risk control methods



Human Error

The risk assessment procedure shall address the potential for human error and its negative consequences on people, processes, the work environment, and equipment. (references Annex Q)

Hierarchy

The risk assessment procedure shall follow this hierarchy:

- (1) Elimination
- (2) Substitution
- (3) Engineering controls
- (4) Awareness
- (5) Administrative controls
- (6) PPE

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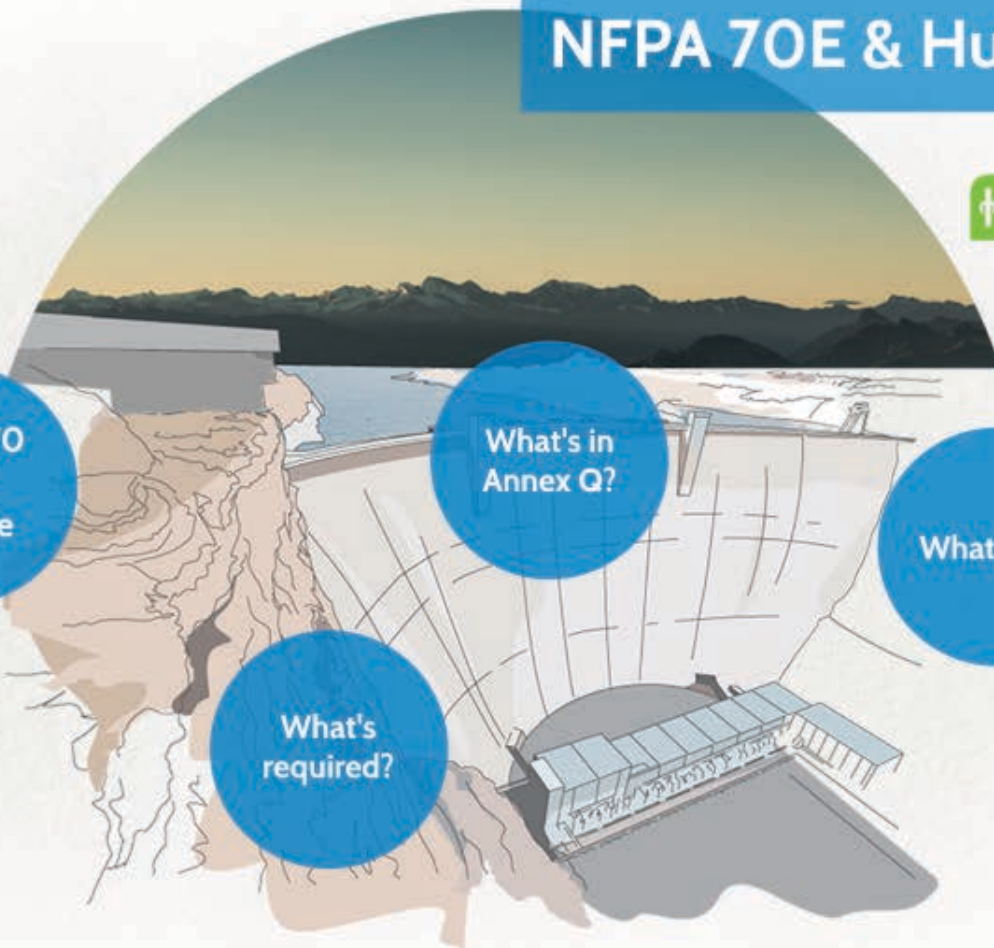


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NFPA's take on Human Performance 101

*not a requirement,
informational
purposes only

Principles

Modes

Traps

Tools

Culture



Principles of Human Performance

1

2

3

4

5



Principle 1

People are fallible, and even the best make mistakes.



Principle 2

Error-likely situations and conditions are predictable, manageable, and preventable.

The background of the slide is a scenic landscape featuring a calm lake in the foreground, a range of mountains in the middle ground, and a clear sky. A large, semi-transparent blue circle is centered over the image, containing the text for Principle 3.

Principle 3

Individual performance is influenced by organizational processes and values.



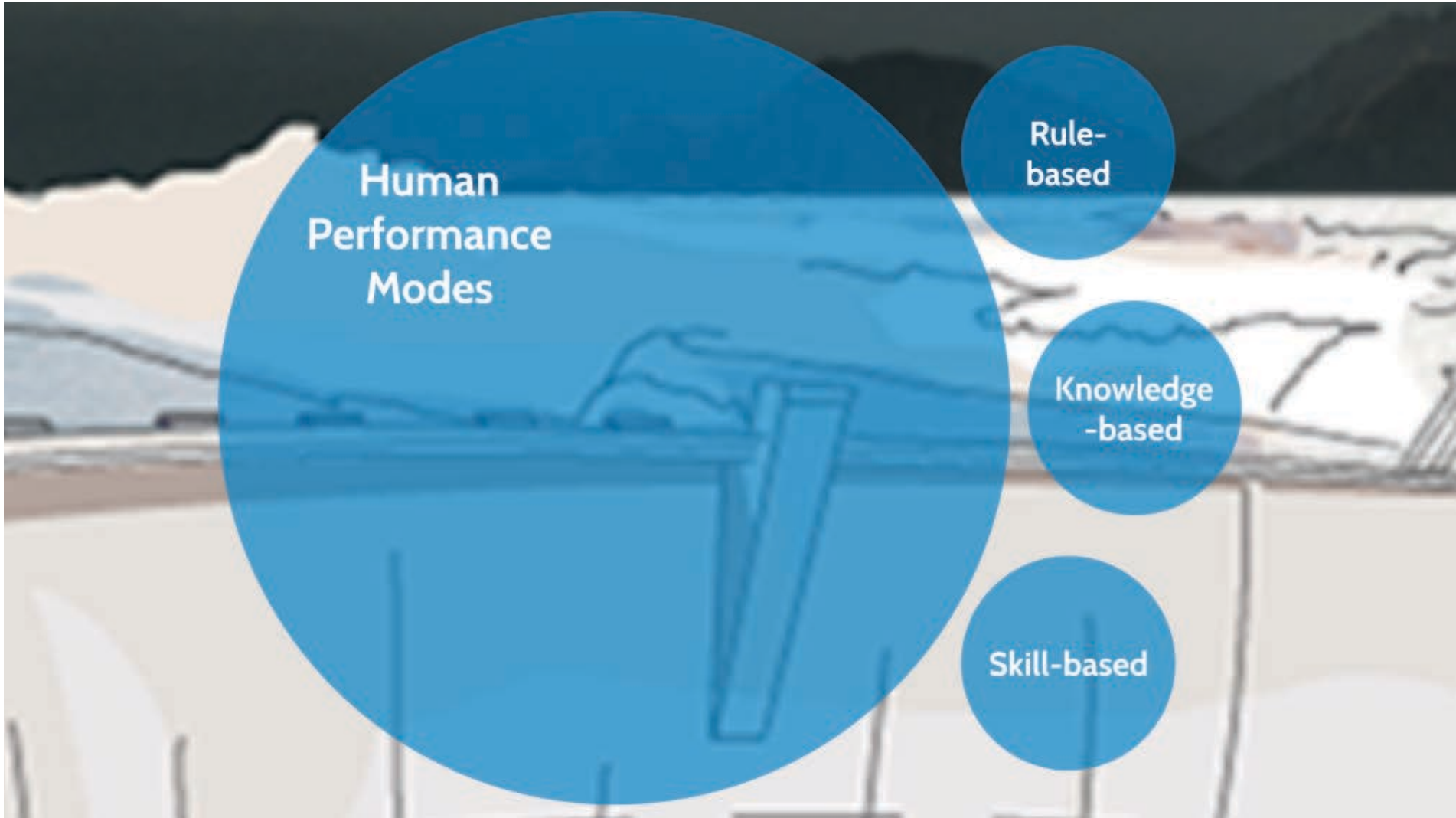
Principle 4

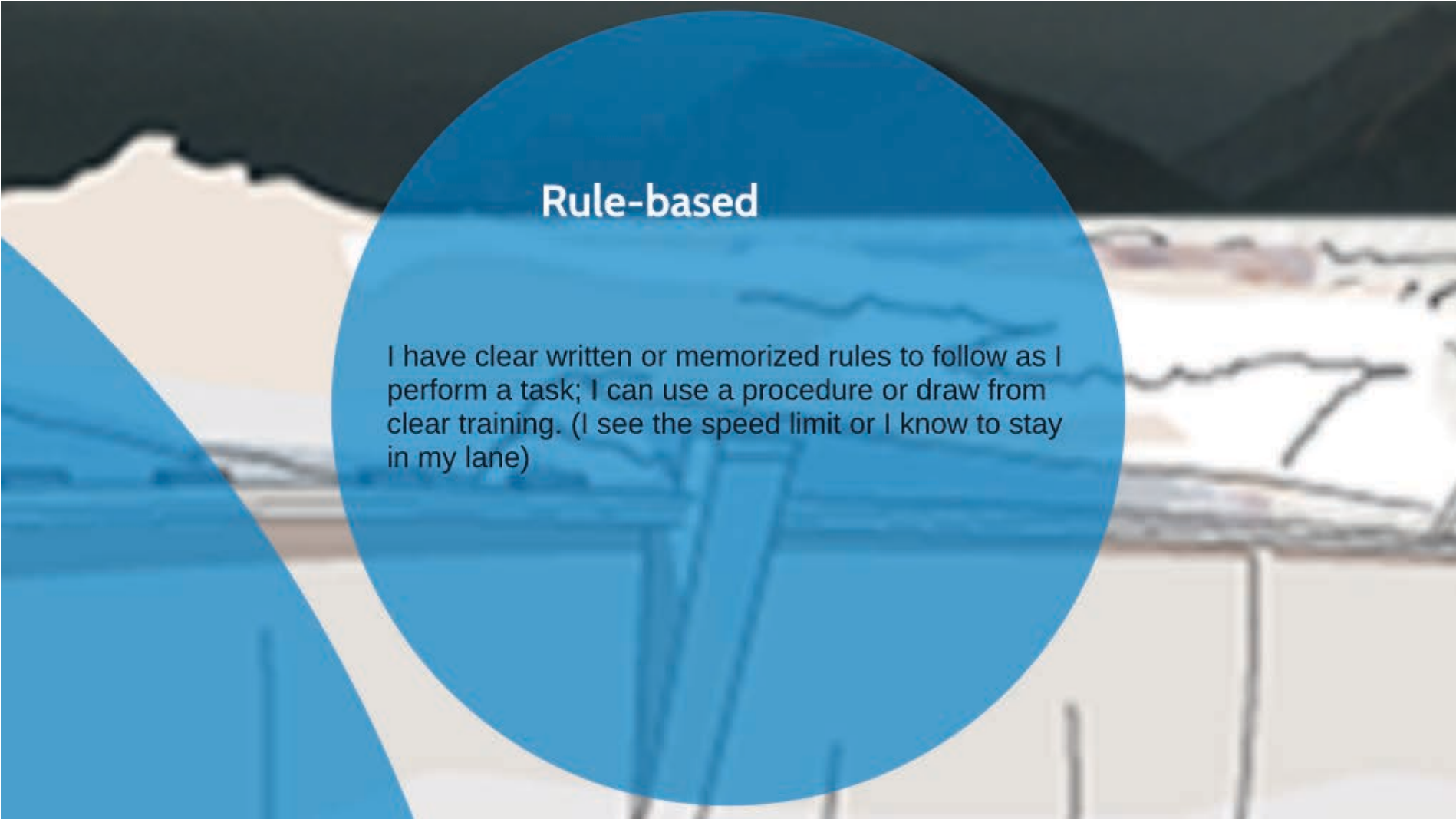
People achieve high levels of performance through positive reinforcement received from leaders, peers, and subordinates.



Principle 5

Incidents can be avoided through an understanding of the reasons mistakes occur and application of these lessons learned.





Rule-based

I have clear written or memorized rules to follow as I perform a task; I can use a procedure or draw from clear training. (I see the speed limit or I know to stay in my lane)

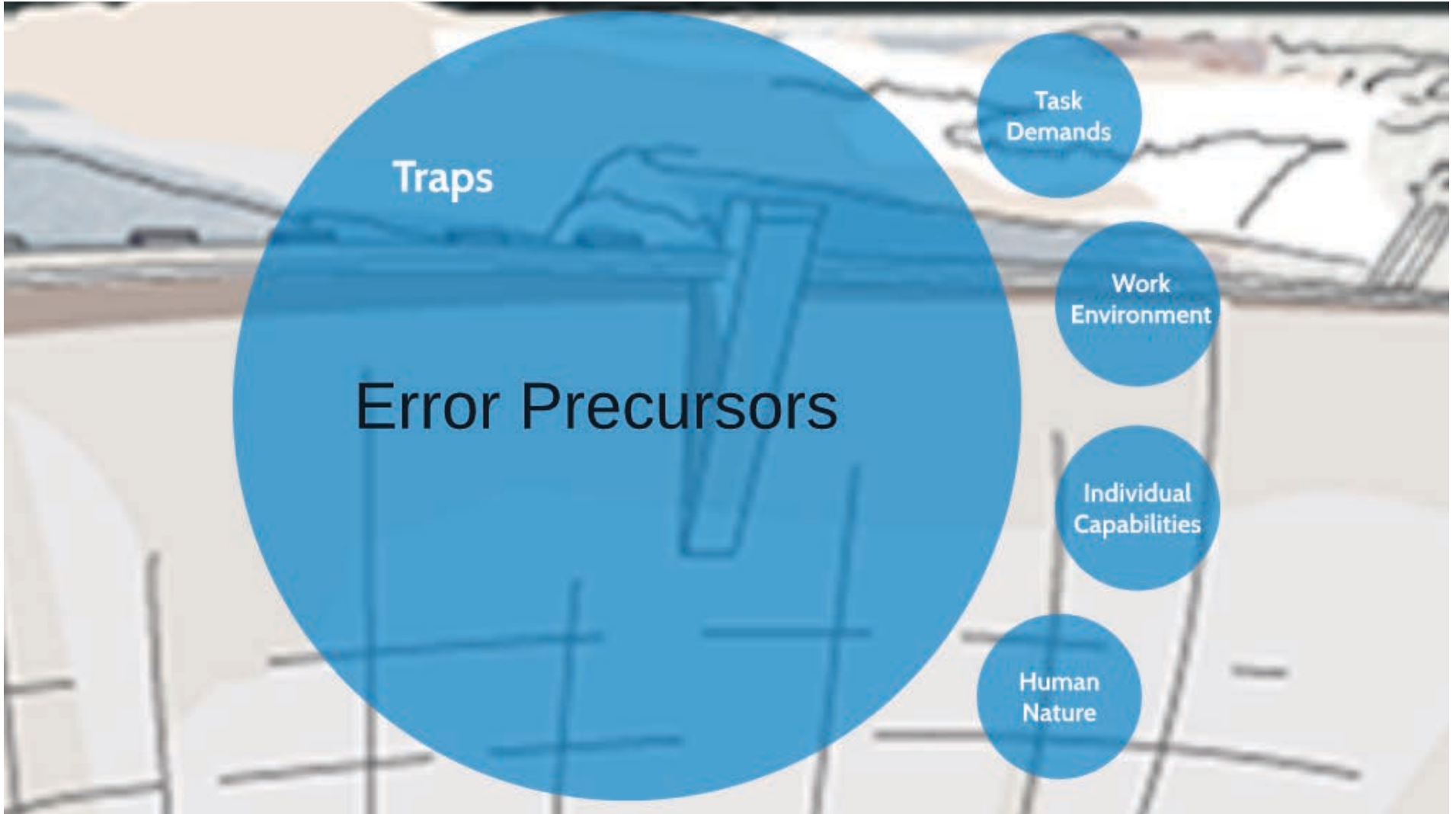
Knowledge-based

There is some uncertainty about what to do (no skill or rule is available) and I must rely on my understanding of the situation and my existing knowledge and skills. There is either some guesswork or more effort to gain a better understanding. (Driving into a fogbank or on icy roads)



Skill-based

Executing a task that is highly practiced, frequent, and very familiar; I'm on "auto-pilot". Very little attention and effort is required. (Making small adjustments to speed or lane position)



Task Demands

- Time pressure
- High workload
- Multiple tasks
- Repetitive actions
- Critical steps
- Vague guidance



Work Environment

- Distractions/Interruptions
- Changes from routine
- Confusing controls/displays
- Workarounds
- Unexpected equipment conditions
- Lack of alternative indication
- Personality conflicts

Individual Capabilities

- Unfamiliar with task
- Lack of knowledge
- Imprecise communication habits
- Lack of proficiency or experience
- Indistinct problem-solving skills
- Unsafe attitudes
- Inappropriate values



Human Nature

- Stress
- Habit patterns
- Assumptions
- Complacency/overconfidence
- Inaccurate risk perception
- Biases

Tools

1. Pre-Job Briefing
2. Job Site Review
3. Post-Job Review
4. Procedure Use and Adherence
5. Self-checking with Verbalization
6. Three-way Communication
7. Stop When Unsure
8. Flagging and Blocking

1

2

3

4

5

6

7

8

Pre-Job Brief


A job plan to help focus on the task:

- (1) Summarize the critical steps of the job.
- (2) Anticipate error-likely situations.
- (3) Foresee the consequences.
- (4) Evaluate controls or contingencies.
- (5) Review previous experience and lessons learned.



Job-Site Review

A review, at the worksite, to identify any hazard not addressed in the pre-job brief. A job site review can be performed any time prior or during work.



Post-Job Review

Taking the time to capture "what went right" and how we can improve for the next time. Positive Reinforcement and Corrective Actions.



Procedure Use and Adherence

Adhering to a written step-by-step process.
Thinking compliance.

Self-Checking with Verbalization

STAR — Stop, Think, Act, and Review. Before, during, and after performing a task.

Verbalizing permits the individual's brain to slow down to their body speed.

Three-Way Communication

1. Message sent
2. Message repeated
3. Message confirmed

Stop When Unsure

When a worker is unable to follow a step, something unexpected occurs or if the worker has a "gut feeling" that something is not right, then the worker should stop and obtain further direction. Maintain a questioning attitude at all times.

Flagging and Blocking

Flagging: marking the correct component.

Blocking: physically preventing access components or areas.



Organizations

- (1) Promote open communication
- (2) Foster a culture that promotes human performance
- (3) Identify and prevent error-likely situations
- (4) Support continuous improvement and learning
- (5) Establish a blame-free culture

Managers

- (1) Promote open communication
- (2) Encourage teamwork to eliminate error-likely situations
- (3) Seek out and eliminate organizational weaknesses
- (4) Positively reinforce desired workplace culture
- (5) Recognize the value of human performance

Workers

- (1) Speak the language
- (2) Anticipation of error-likely situations
- (3) Desire to improve personal capabilities
- (4) Reports on all incidents ("near-misses")
- (5) Committed to human performance tools and principles

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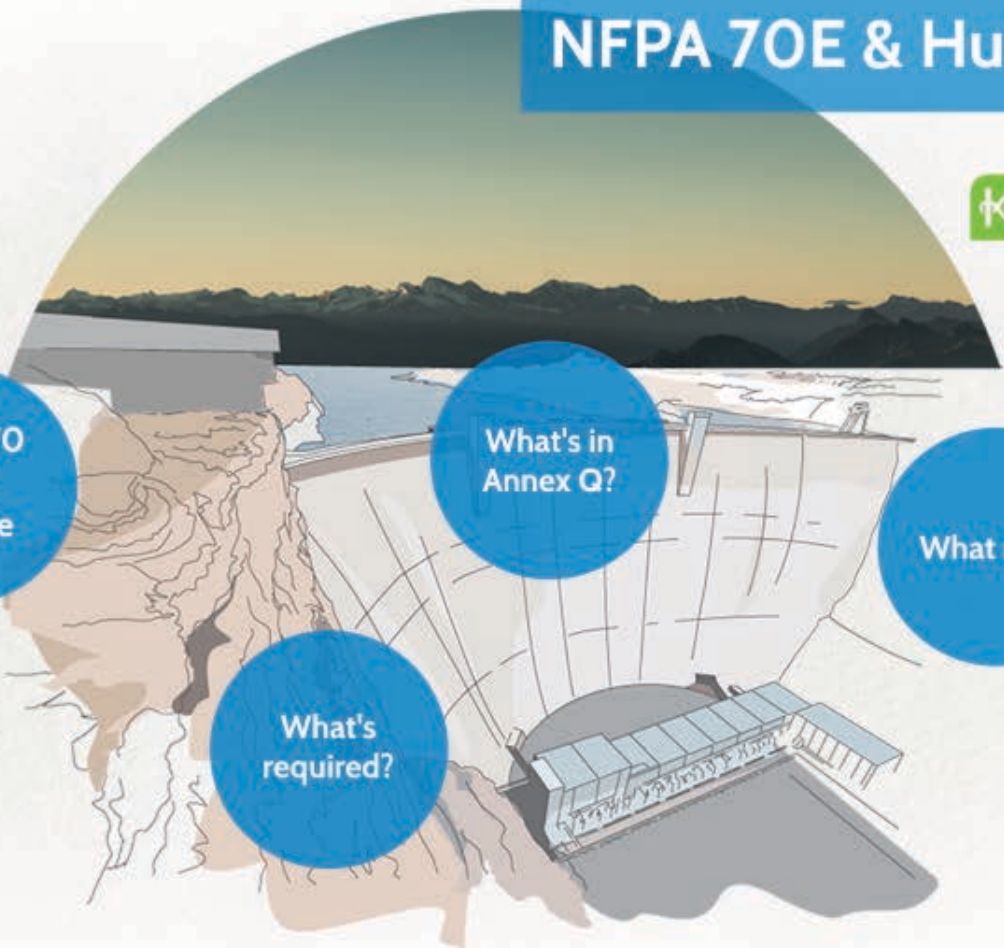


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Call to Action

Where are you?

I have a
process

I need
ammo

I need
help

My Organization has a Human Performance Process

- Breathe a sigh of relief; you're ahead of the game
- Inform your organization about the 2018 NFPA 70E update
 - Annex Q is informational; validate your process is generally aligned.
- Consider 3rd party to assess your process
- Take a victory lap
 - Positive Reinforcement

I've been telling them for years...

- Inform those on the fence about the new NFPA requirement.
 - This could get their attention and spur some action.
- NERC and NATF also recommend Human Performance processes.

Where can you get help?

- NERC, WECC, DOE, Annex Q
- Read, read, read
- Conference Workshops
- Third-party Assistance
- Network for peers and industry best practices

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