



Edison Electric
INSTITUTE

EEI Safety Classification and Learning Model

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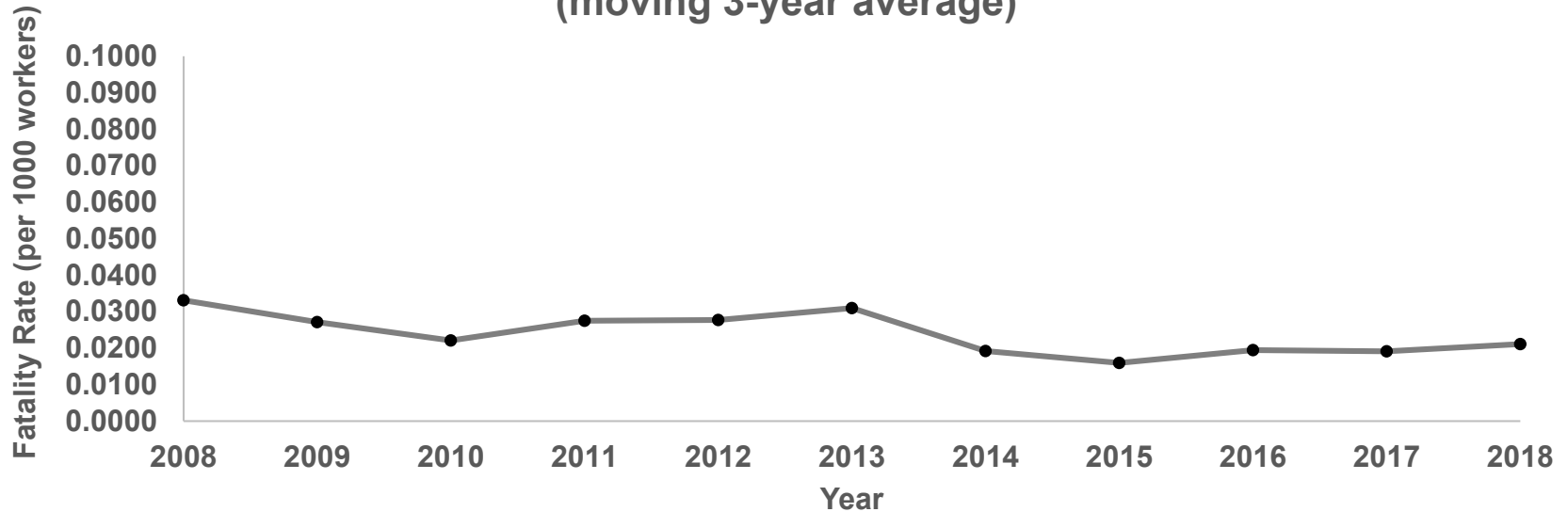
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Motivation

Fatality Trends in Electrical Power Generation and Delivery
(moving 3-year average)



Analogy for Current Practice



Mission and Objectives

- **Prevent Serious Injuries and Fatalities (SIF) as a community**
- Create a defensible approach to defining and categorizing safety learning opportunities
- Test the consistency and reliability of the approach on diverse cases in the electric utility sector
- Create a standardized set of definitions of safety incident and observation types (e.g., define P-SIF in the context of all learning opportunities)
- **There is no 'right answer' only what we can agree upon**

What is an event/incident?

Case 1

- Worker is at 70 feet of height with a 8 lb tool
- No protection below
- No lanyard on the tool
- Work is under way but the wrench has not been dropped
- No one is injured



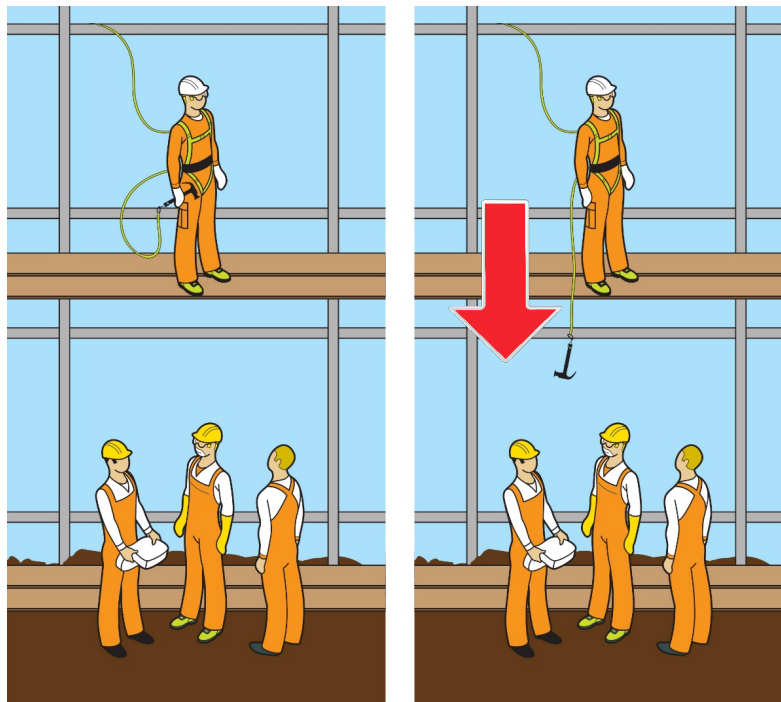
Case 2

- Worker is at 70 feet of height with a 8 lb tool
- No protection below
- No lanyard on the tool
- Worker drops the wrench and it falls to the ground
- No one is injured



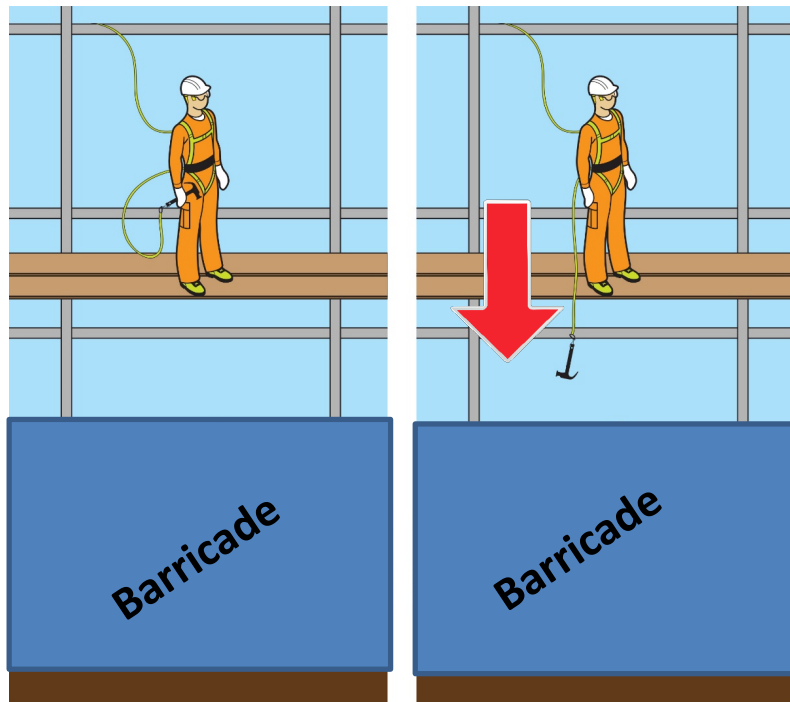
Case 3

- Worker is at 70 feet of height with a 8 lb tool
- No protection below
- Lanyard on the tool
- Worker drops the wrench and it is caught by the lanyard
- No one is injured



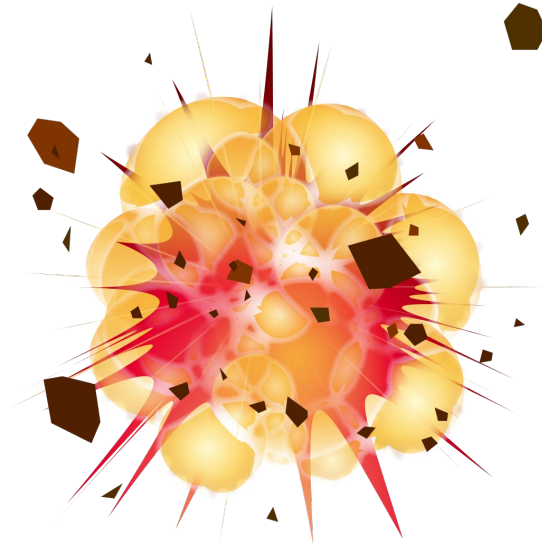
Case 4

- Worker is at 70 feet of height with a 8 lb tool
- Barricade below
- Lanyard on the tool
- Worker drops the wrench and it is caught by the lanyard
- No one is injured



Observed Problem

There is high variability in responses and high personal confidence.



What is the most likely severity?

Choices:

1. First aid
2. Medical Case
3. Lost-Work Time
4. Disabling/Fatal

What is the most likely severity?



A man working on a ladder on the soffit of his roof.

What is the most likely severity?



Carpenter works on an unsupported wall.

What is the most likely severity?



Workers stand underneath an untethered tool.

Observed Problem

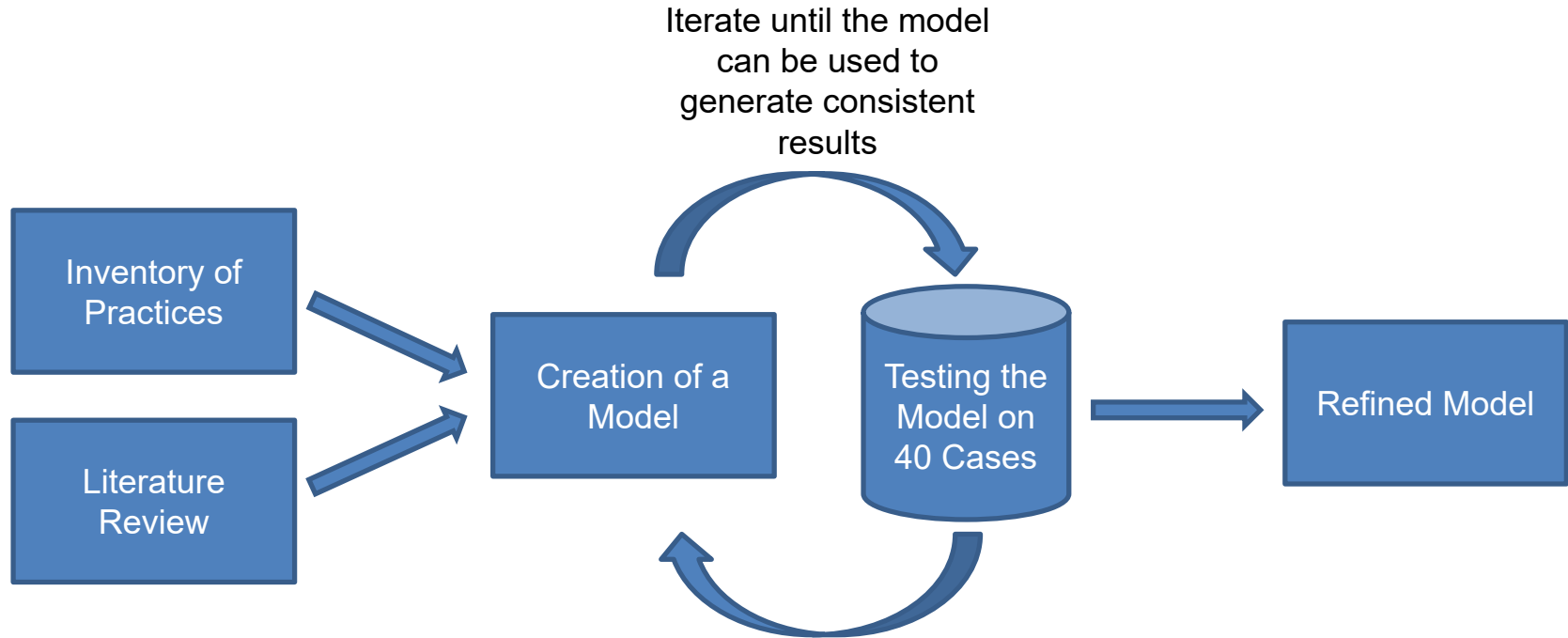
There is high variability in responses and high personal confidence.

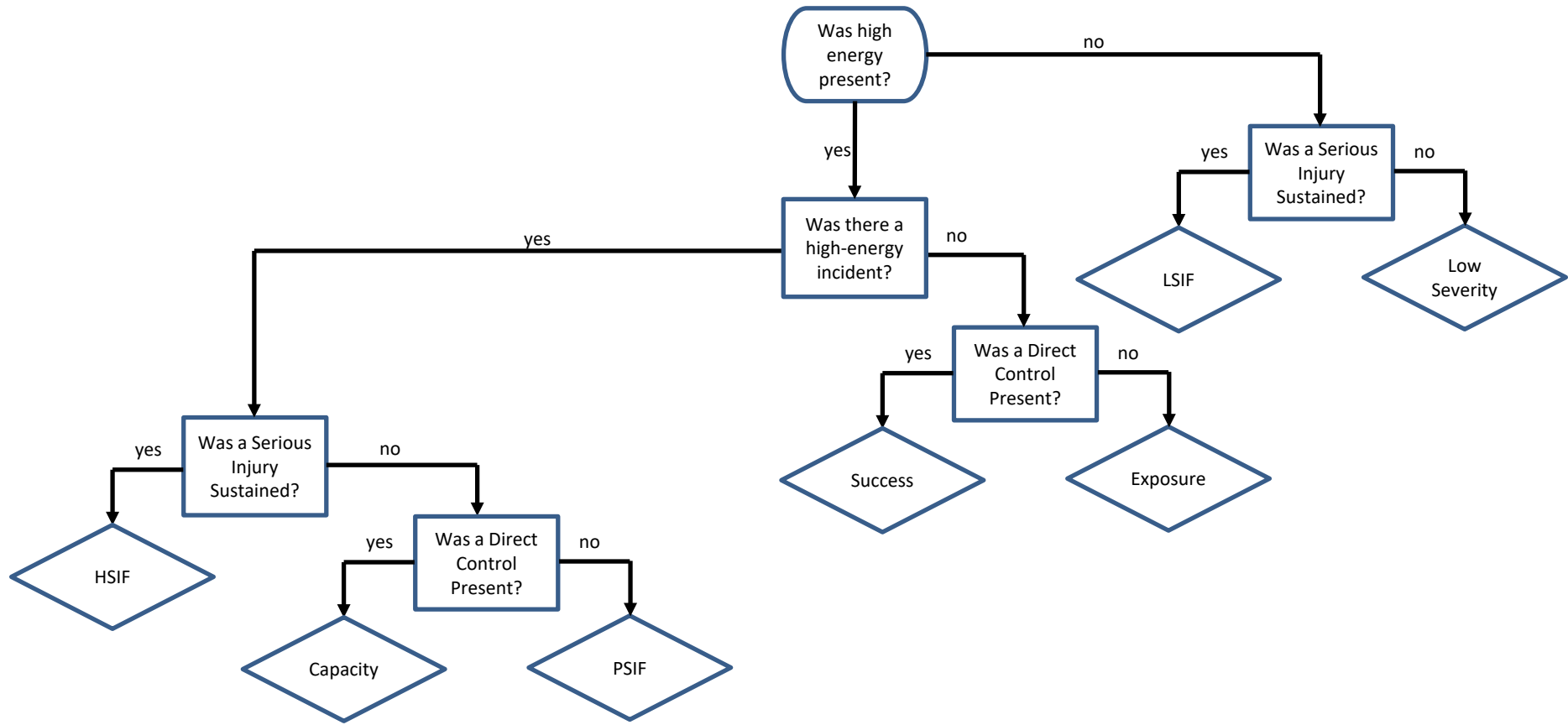


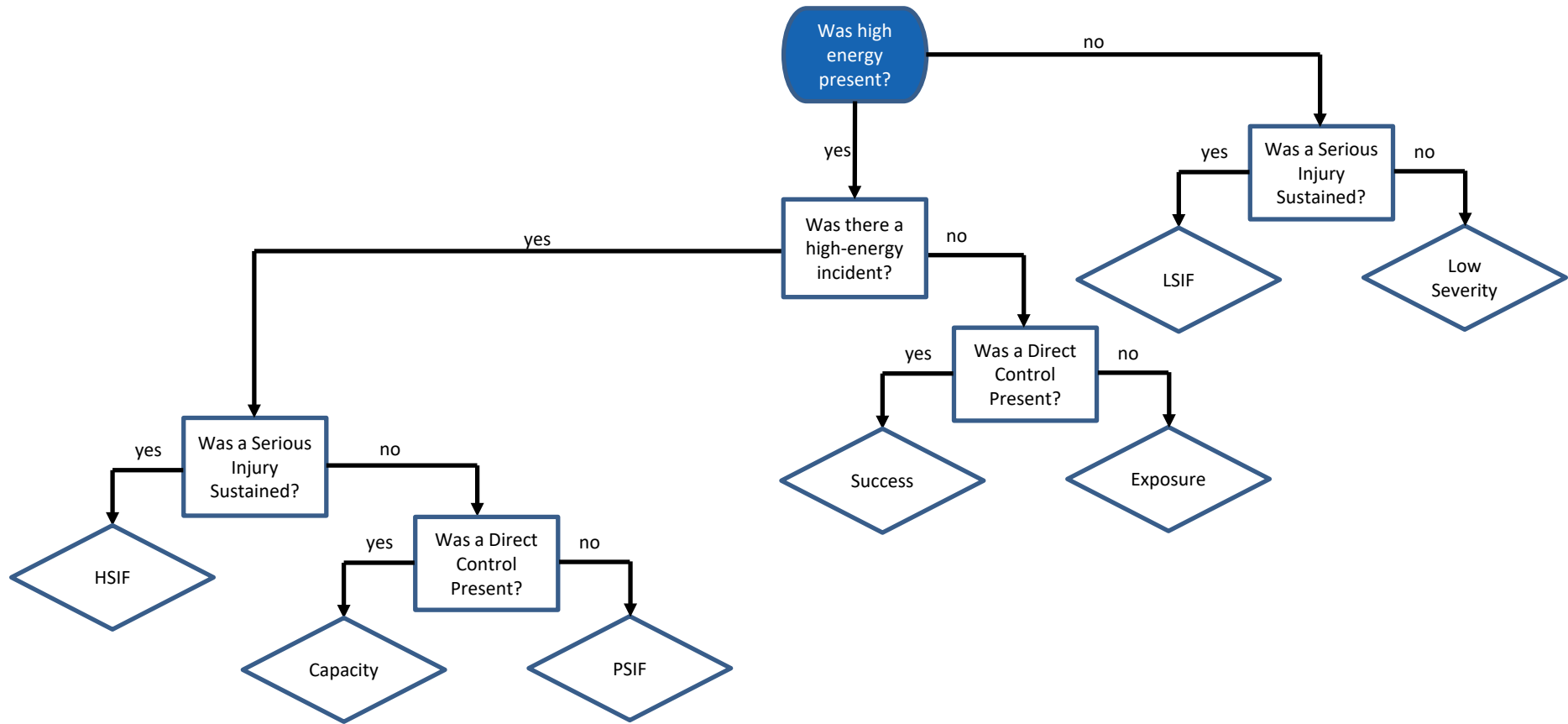
Why is this so important?

- A common understanding of P-SIF and other event types is needed to support the learning process
- Example: Is Pluto a planet?
- What is the definition of a planet?
- A common understanding lays the foundation for how we learn about an issue, how we communicate and share, or whether we see something as relevant at all.
- **There is no 'right answer' only what we can agree upon**

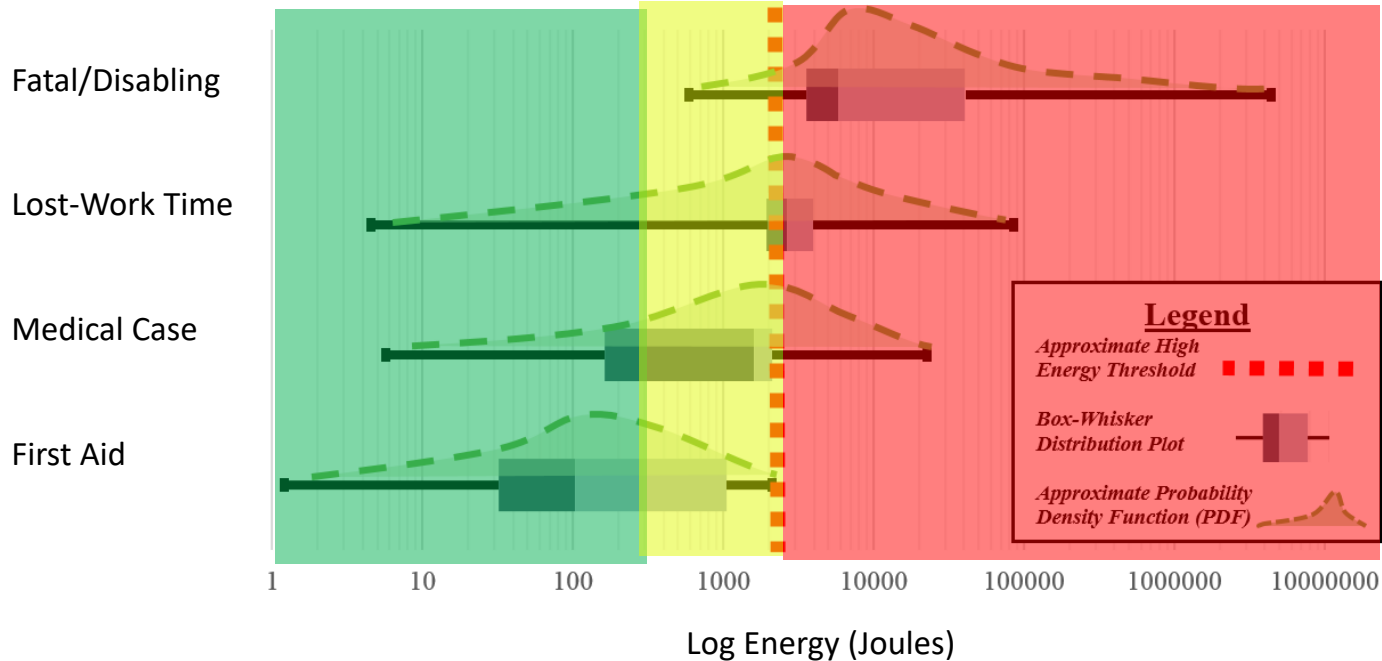
Our Process







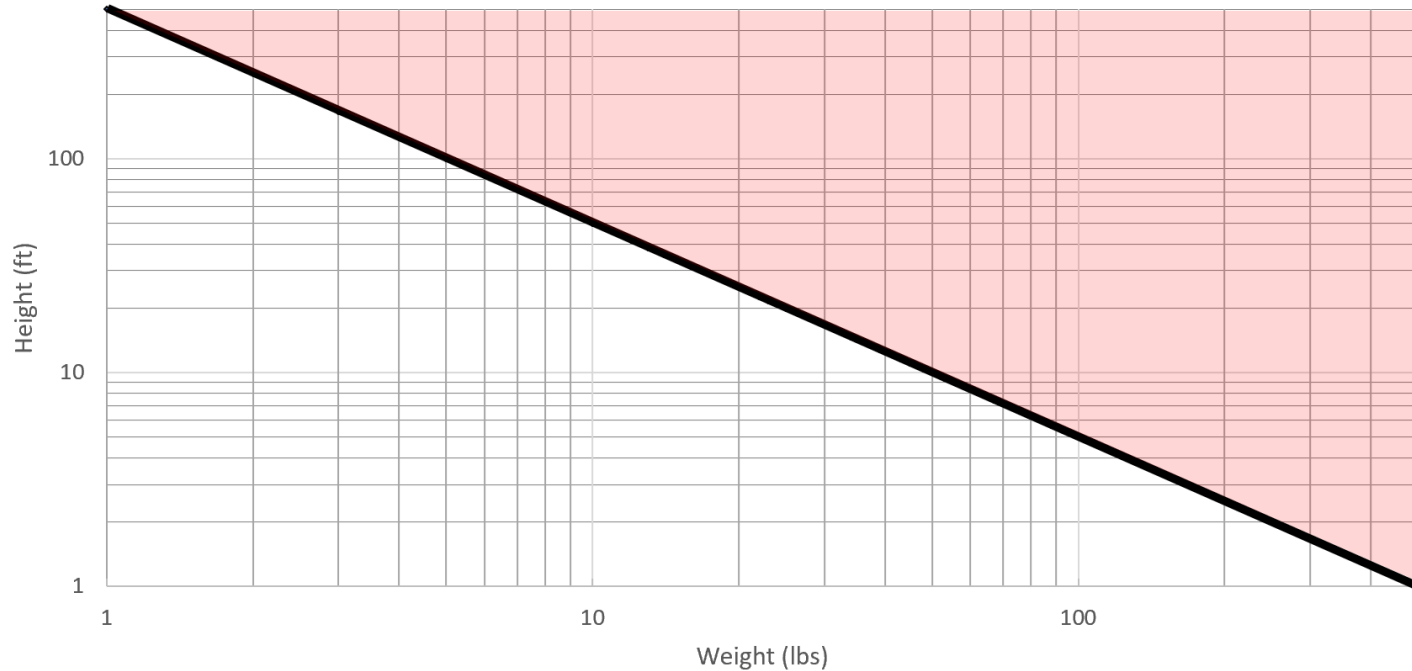
Background Knowledge



Hallowell, M.R., Alexander, D., Gambatese, J.A. (2017). "Energy-based safety risk assessment: Does magnitude and intensity of energy predict injury severity?" *Construction Management and Economics*, 1-14.

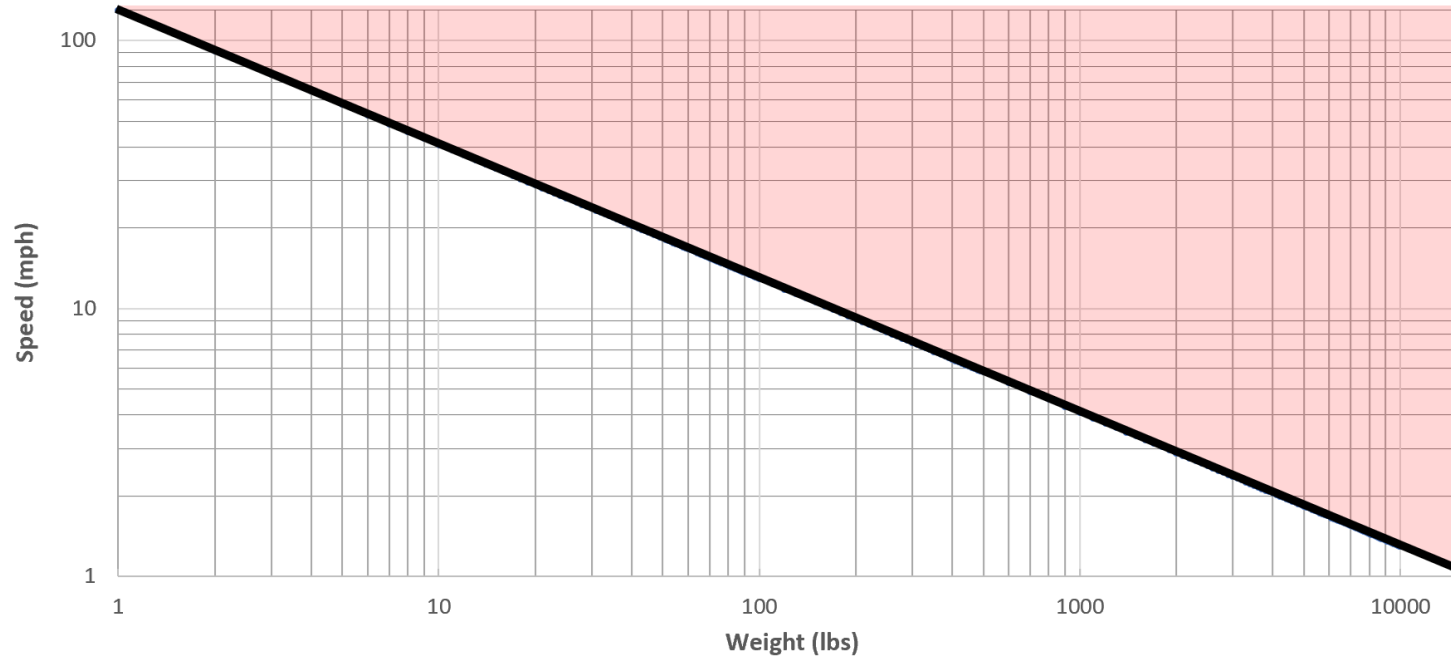
What is “High Energy?”

Gravity Energy Severity Analysis

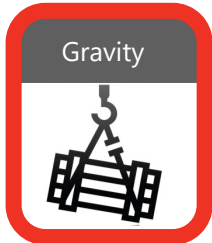


What is “High Energy?”

Motion Energy Severity Analysis



What is “High Energy?”



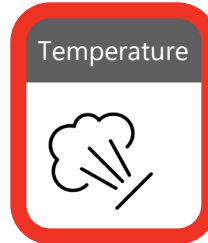
Suspended Load



Mobile Equipment
and Workers on Foot



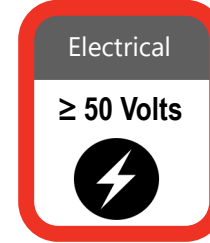
Heavy Rotating
Equipment



Steam



Explosion



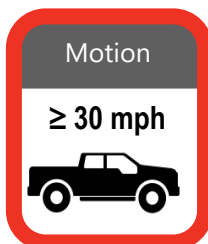
Electrical Contact
with Source



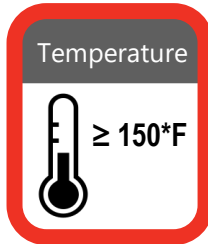
High Dose of Toxic
Chemical or
Radiation



Fall from Elevation



Motor vehicle
incident (occupant)



High Temperature



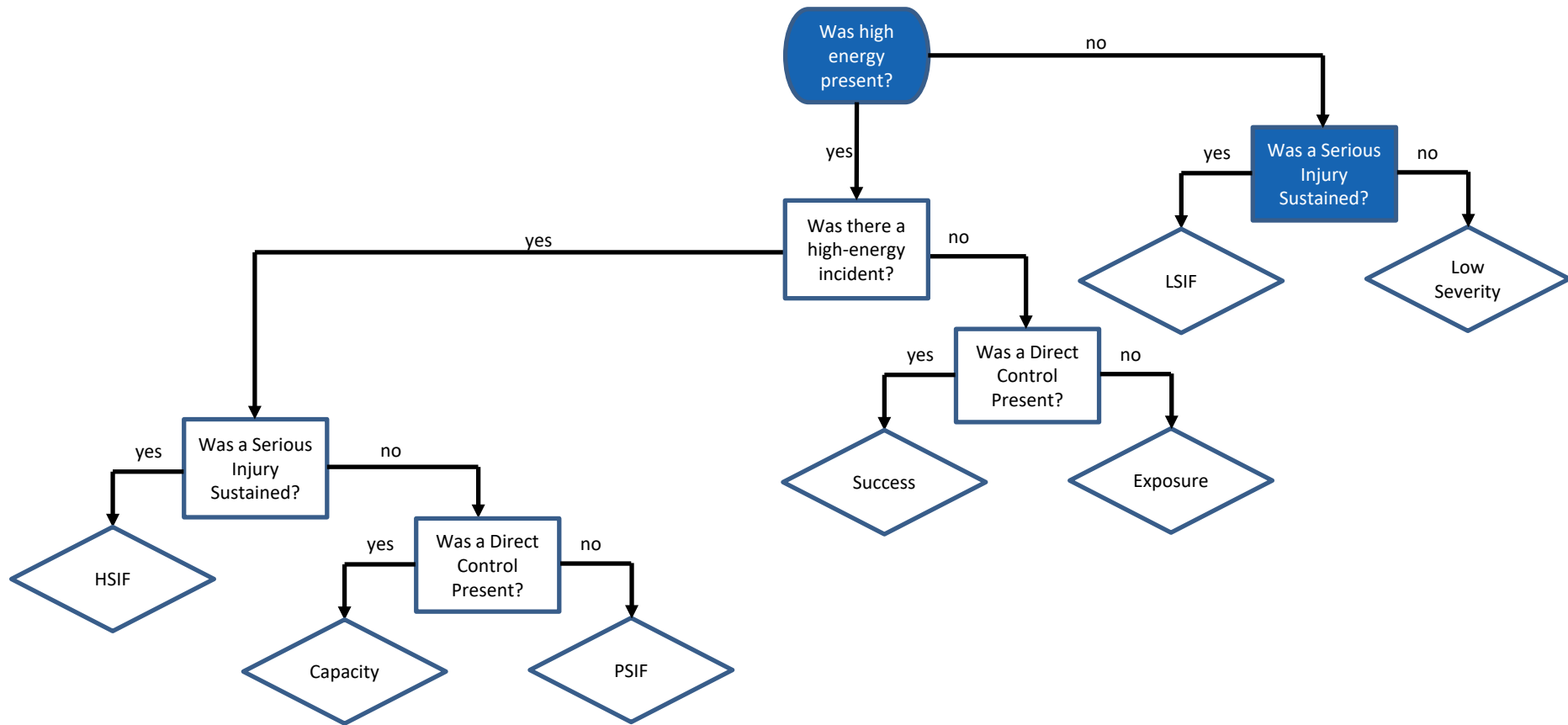
Fire with Sustained
Fuel Source



Excavation
or Trench

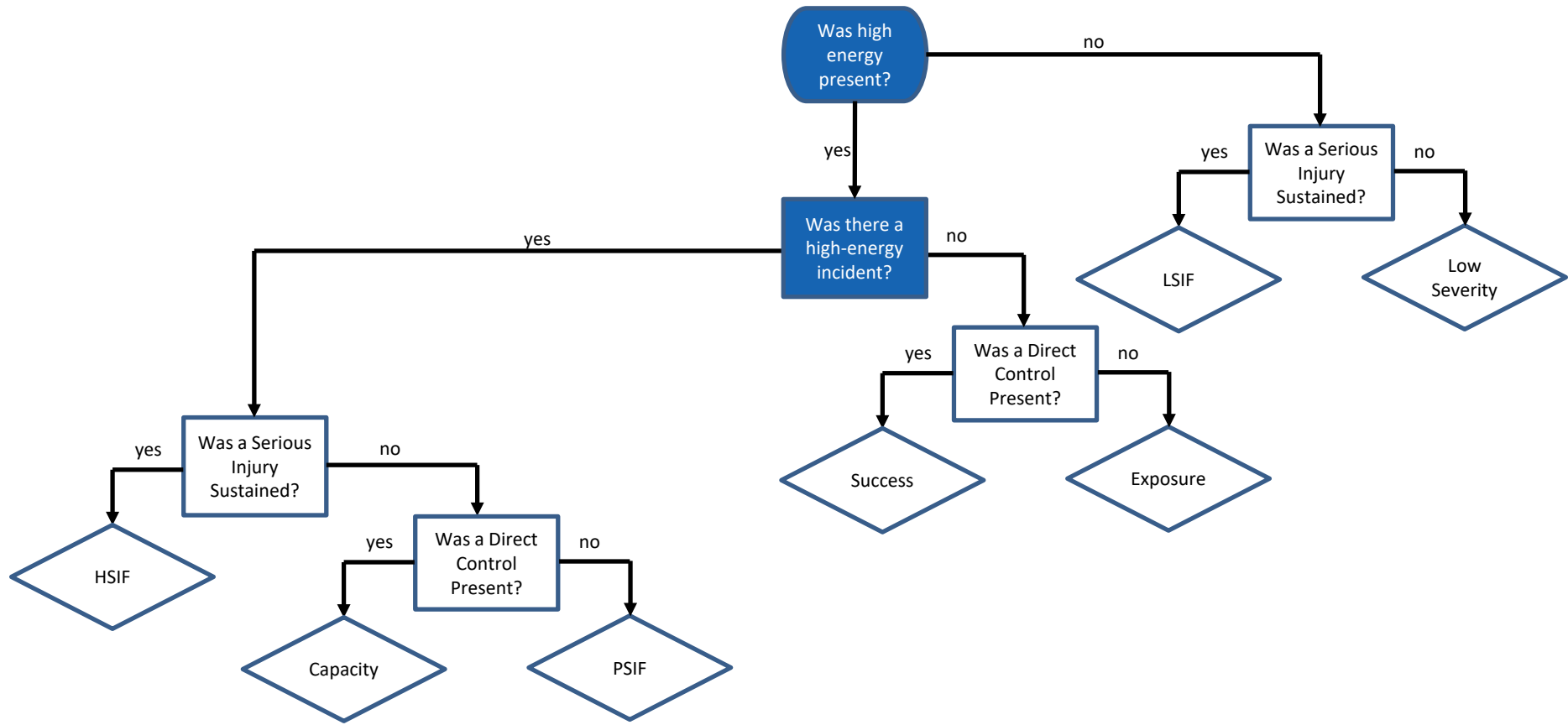


Arc Flash



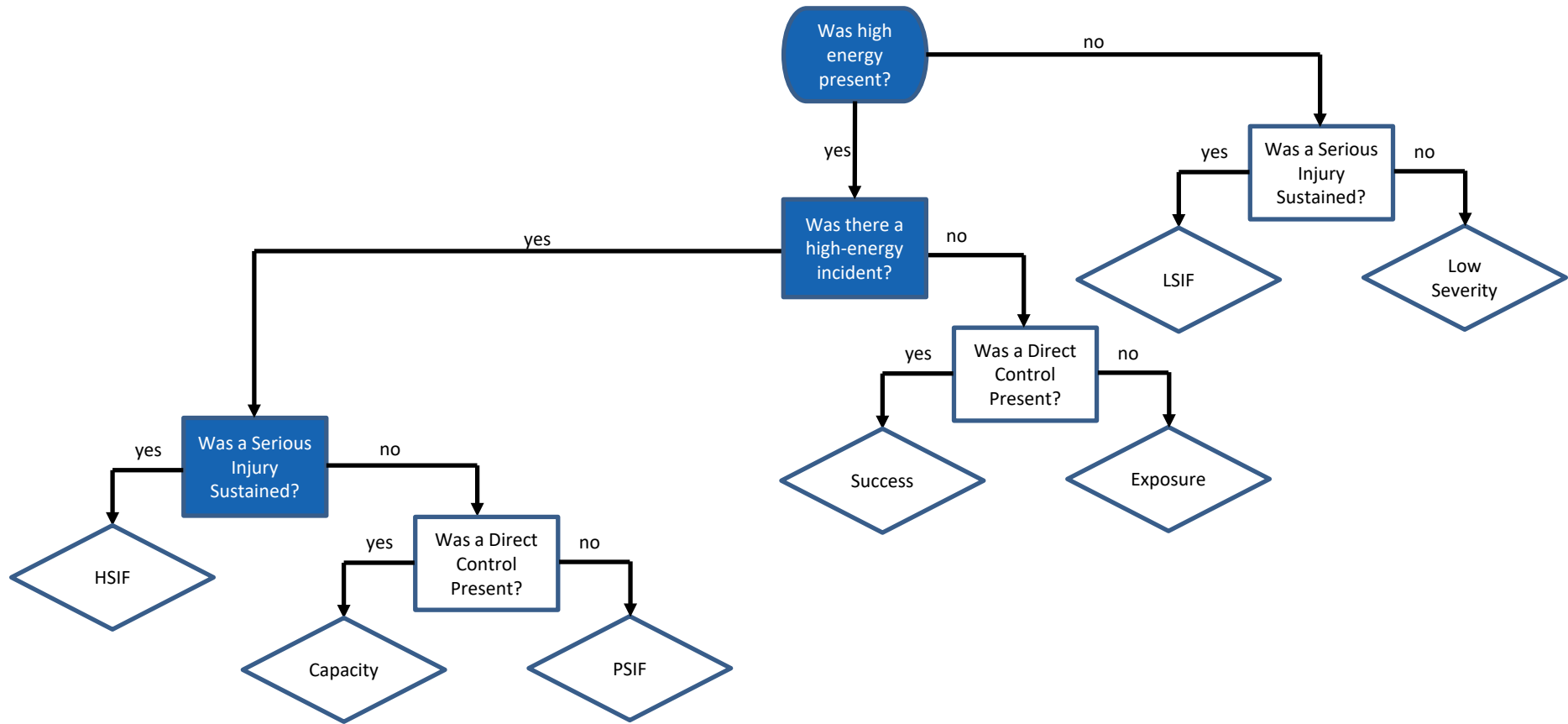
Was a Serious Injury Sustained?

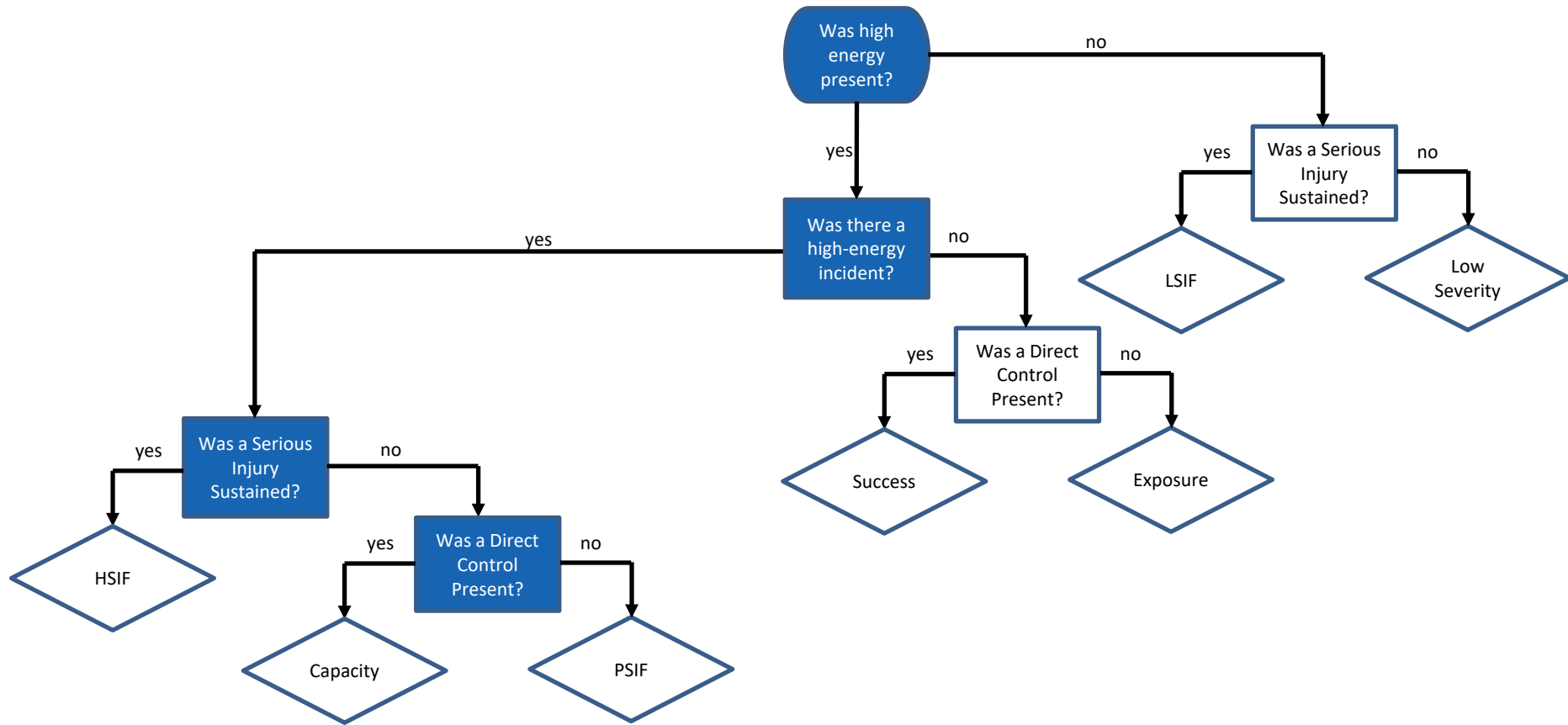
- We defer to the EEI SIF criteria.



Was there a high-energy incident?

- **An instance where the high-energy source was released and where the worker came in contact with or proximity to the high-energy source**
- “Released” is defined as:
 - Instance where energy source changes state while exposed to the environment
- “Contact” is defined as:
 - Instance when high energy is transmitted to the human body
- “Proximity” is defined as:
 - A hazardous circumstance where the boundary of the high energy exposure is within 6 feet of a worker who has unrestricted egress
 - Any distance to a high energy source when there is a confined space or situation with restricted egress where a worker cannot escape the energy source





Was a Direct Control Present?

For each high energy source, a direct control is present if:

1. The control is specifically targeted to the high-energy source
2. The control effectively mitigates exposure to the high energy source when installed, verified, and used properly (i.e., a SIF event cannot reasonably occur)*
3. The control is effective even if there is unintentional human error during the work period (unrelated to the installation of the control)

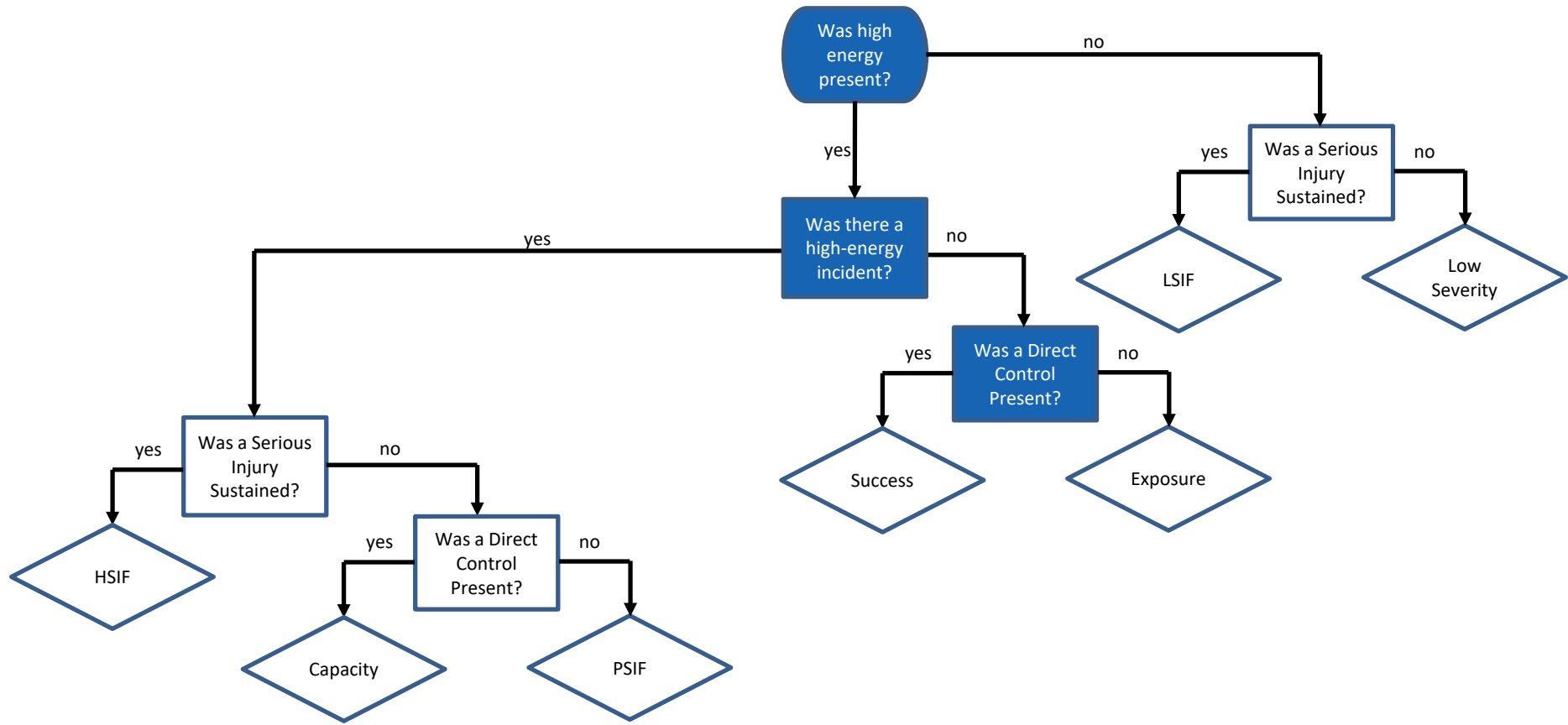
Examples of direct controls:

- LOTO/De-energization
- Machine guarding
- Hard physical barriers
- Fall protection
- Cover up on conduit

Examples that are NOT direct controls:

- Training
- Warning signs
- Hard hat
- Rules
- Cones
- Experience

*reduced to below 500 ft-lb threshold



Definitions

- **H-SIF:** Incident with a release of high energy in the absence of a direct control where a serious injury is sustained
- **L-SIF:** Incident with a release of low energy in the absence of a direct control where a serious injury is sustained
- **P-SIF:** Incident with a release of high energy in the absence of a direct control where a serious injury is not sustained (**Lucky**)
- **Capacity:** Incident with a release of high energy in the presence of a direct control where a serious injury is not sustained (**Prepared**)
- **Exposure:** Condition where high energy is present in the absence of a direct control (**Stop Work**)
- **Success:** Condition where high energy is present but is not released because of a direct control (**Ideal**)

Revisit the Example Cases

Case 1

Worker is at 70 feet of height with a 8 lb tool

- No protection below
 - No lanyard on the tool
 - Worker drops the wrench and it falls
 - Worker is seriously injured
-
- **Was the condition dangerous enough that someone could have been killed? YES**
 - **Was there a release a high-energy incident? YES**
 - **Was a serious injury or fatality sustained? YES**
 - **Was a direct control present? NO**



**Classification:
H-SIF**

Case 2

Worker is at 70 feet of height with a 8 lb tool.

- No protection below
 - No lanyard on the tool
 - Worker drops the wrench and it falls
 - No one is injured
-
- Was the condition dangerous enough that someone could have been killed? **YES**
 - Was there a release a high-energy incident? **YES**
 - Was a serious injury or fatality sustained? **NO**
 - Was a direct control present? **NO**



Classification:
P-SIF

Case 3

Worker is at 70 feet of height with a 8 lb tool.

- No protection below
 - Lanyard is on the tool
 - Worker drops the wrench but it is caught by a tool lanyard
 - No one is injured
-
- **Was the condition dangerous enough that someone could have been killed? YES**
 - **Was there a release a high-energy incident? YES**
 - **Was a serious injury or fatality sustained? NO**
 - **Was a direct control present? YES**



**Classification:
CAPACITY**

Case 4

Worker is at 70 feet of height with a 8 lb tool.

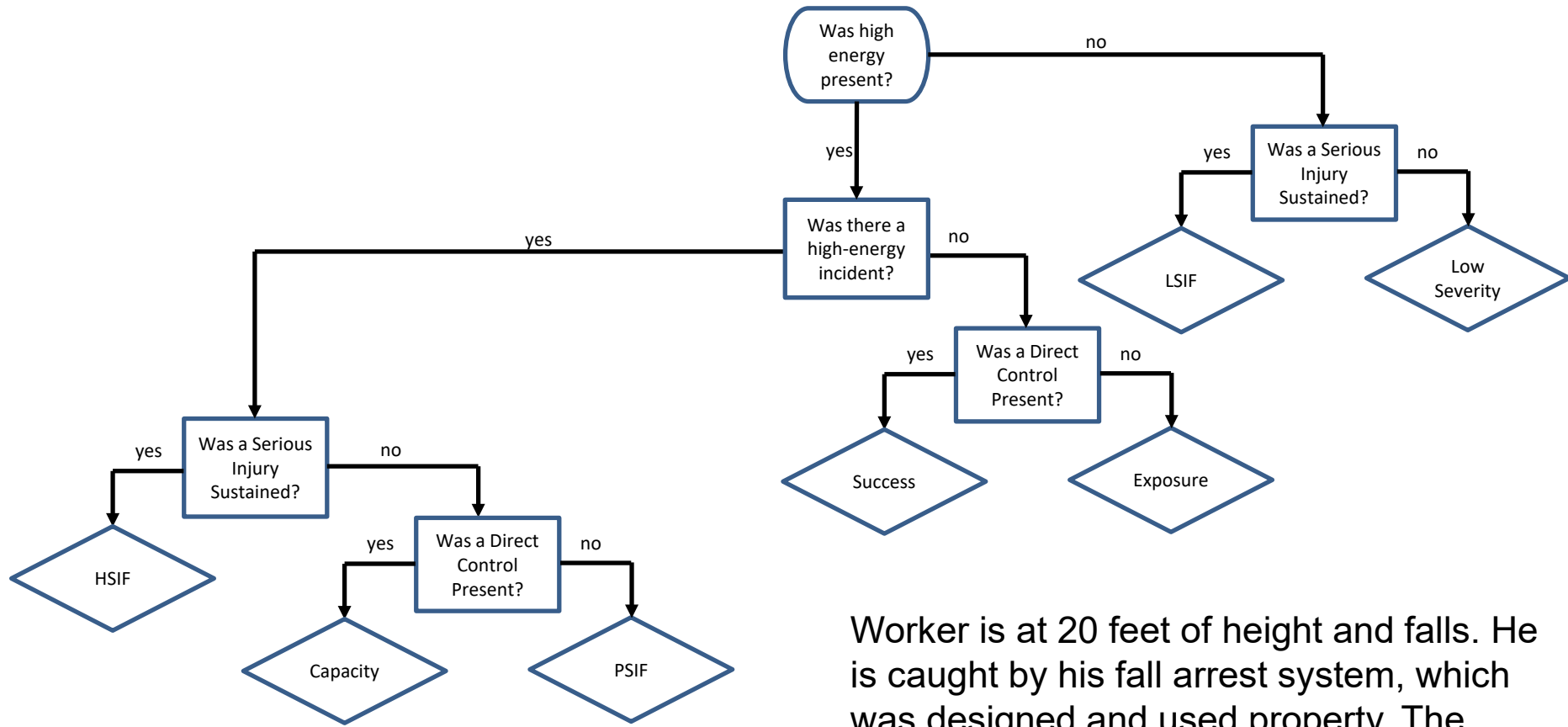
- No protection below
 - No lanyard on the tool
 - Work is under way but the wrench has not been dropped
 - No one is injured
-
- **Was the condition dangerous enough that someone could have been killed? YES**
 - **Was there a release a high-energy incident? NO**
 - **Was a serious injury or fatality sustained? NO**
 - **Was a direct control present? NO**



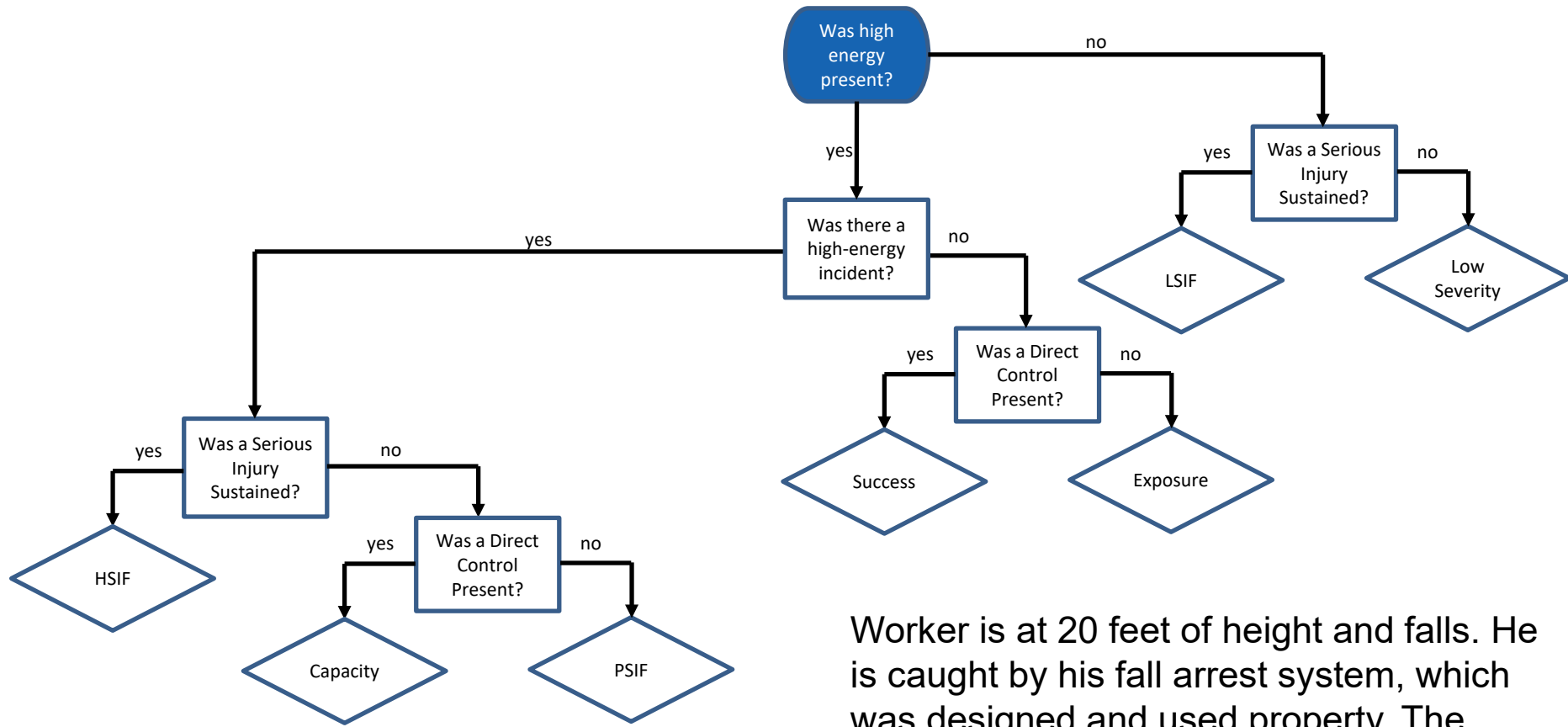
**Classification:
EXPOSURE**

Controversial Case

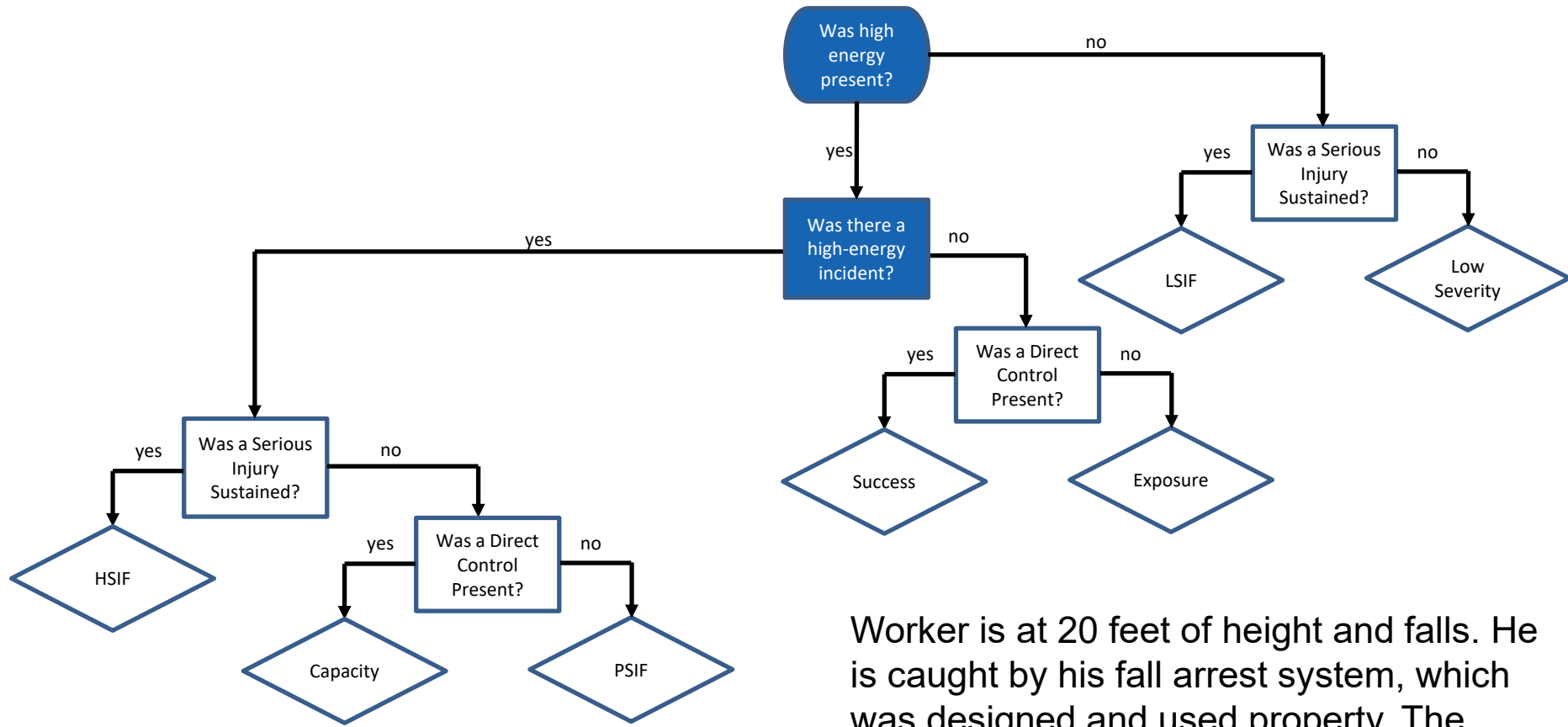
- Worker is at 20 feet of height and falls. He is caught by his fall arrest system, which was designed and used properly. The worker is not injured.



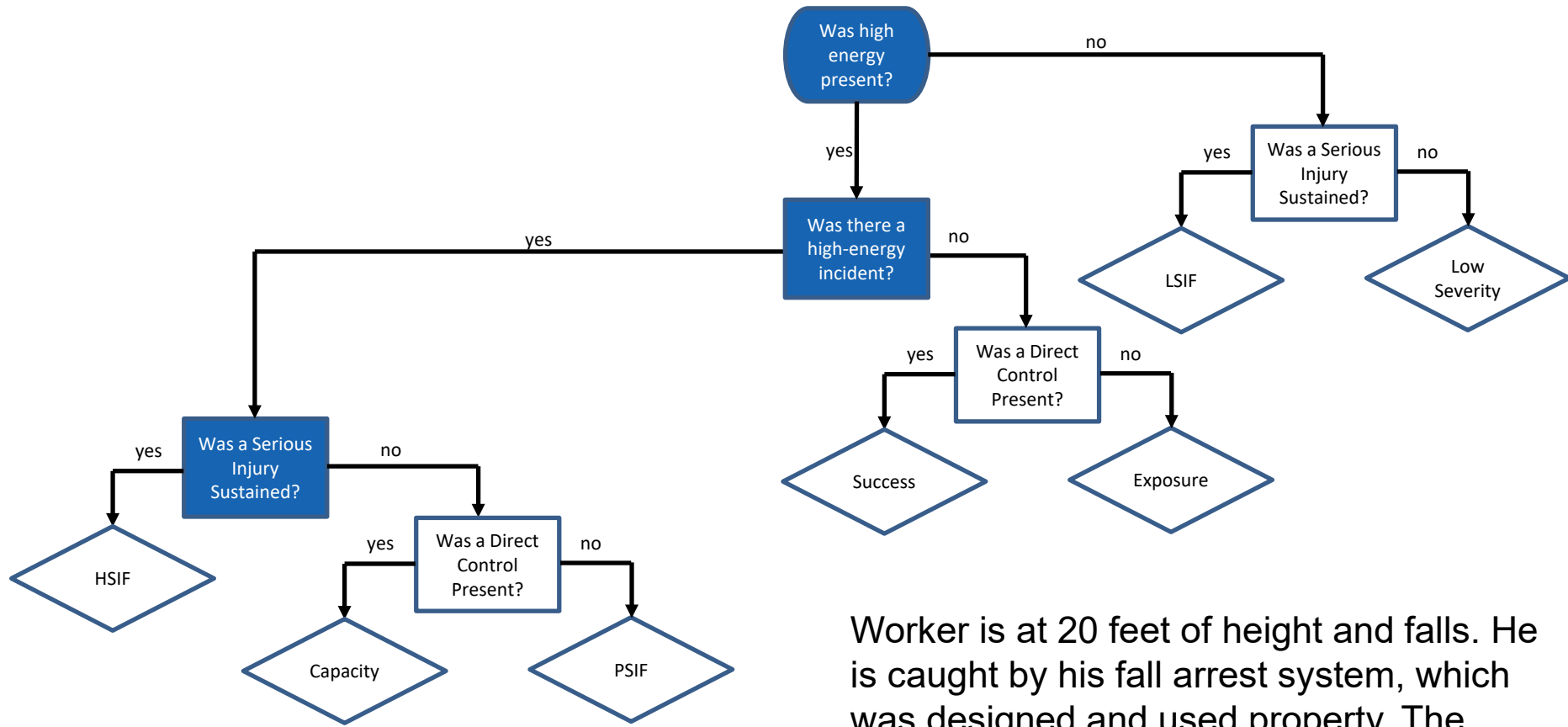
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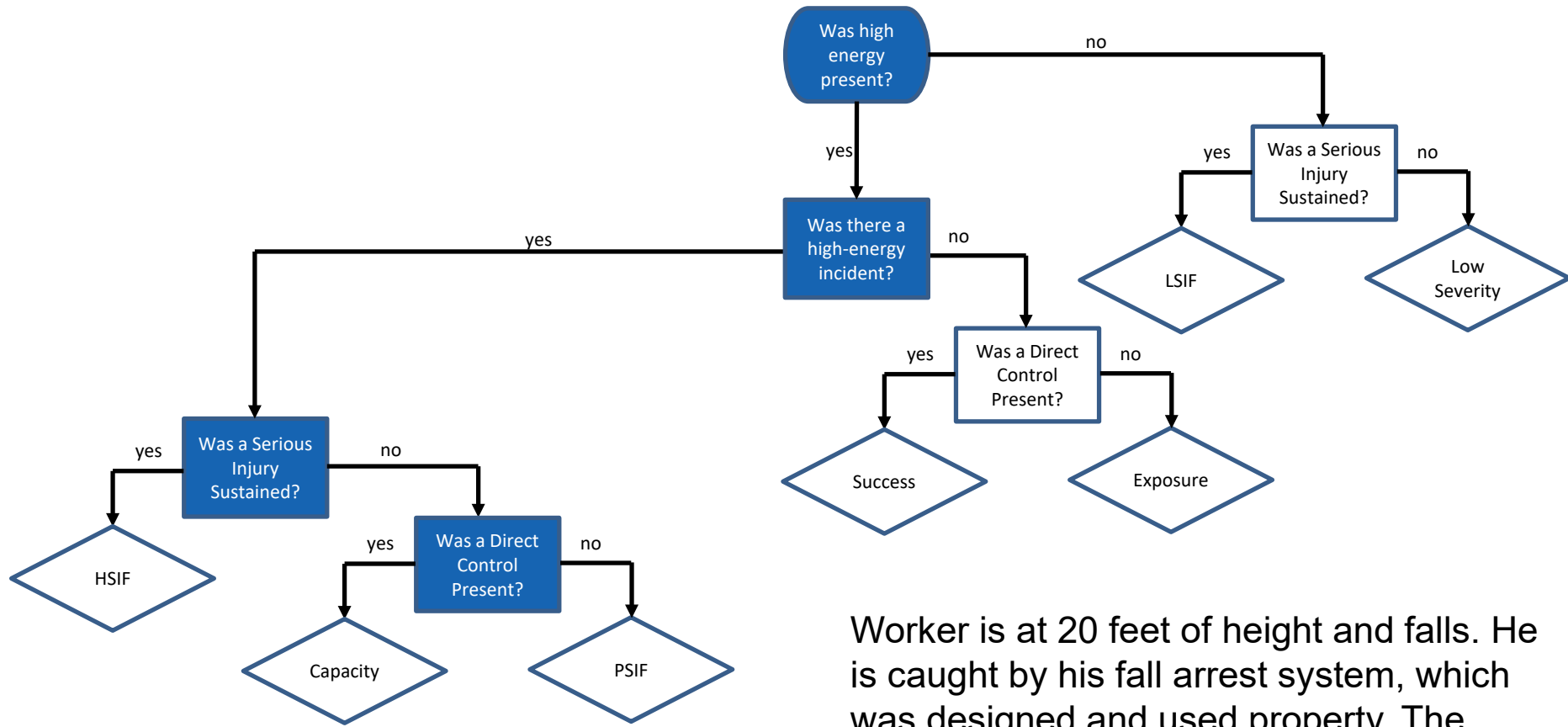
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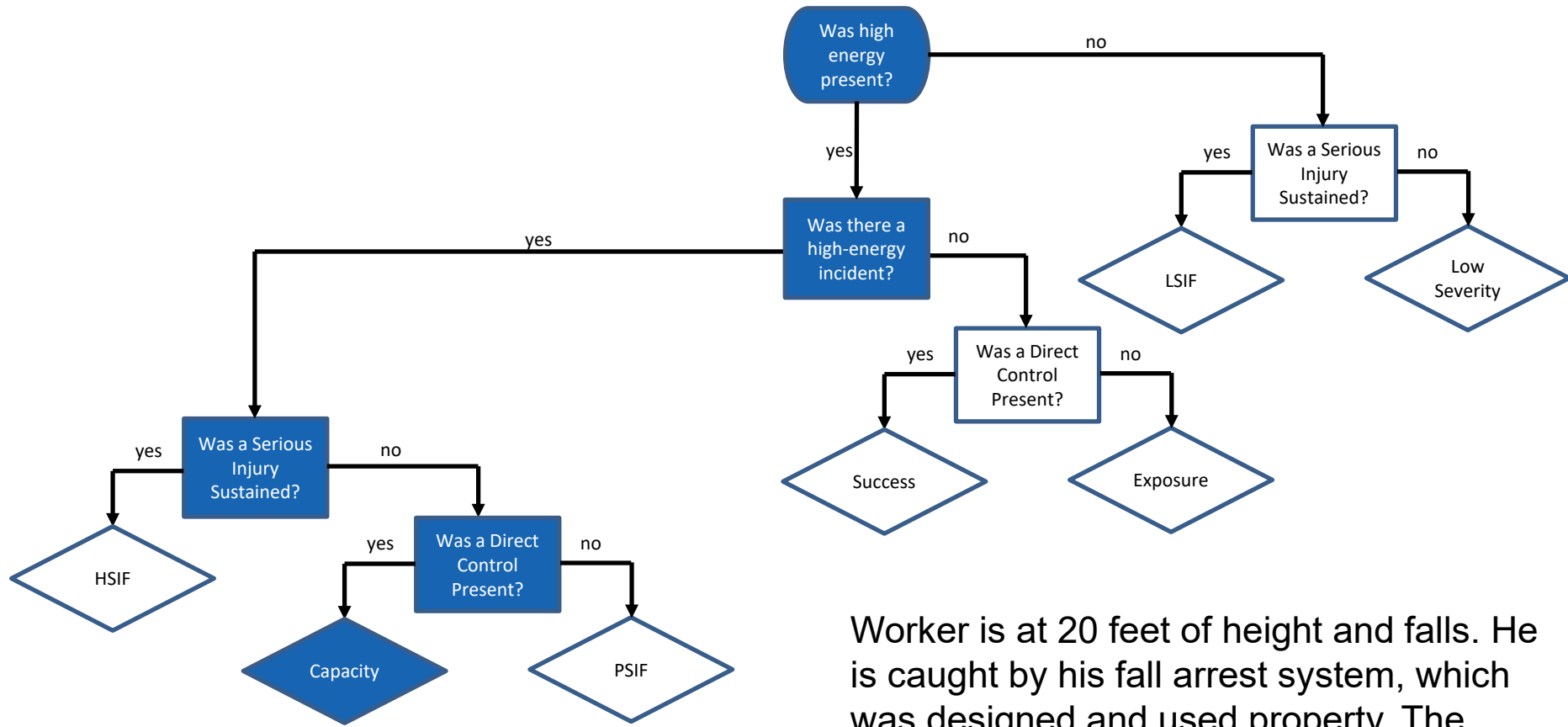
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Worker is at 20 feet of height and falls. He is caught by his fall arrest system, which was designed and used properly. The worker is not injured.

Yet Another Layer...

- Worker is at 20 feet of height and falls. He is caught by his fall arrest system, which was designed and used properly. However, the worker falls within the minimum approach distance of an unprotected energized system.
- This is a two-energy case.
- **Capacity for the gravity**
- **P-SIF for the electrical**



SAFETY FUNCTION

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The **Edison Electric Institute** (EEI) is the association that represents all U.S. investor-owned electric companies. Our members provide electricity for about 220 million Americans, and operate in all 50 states and the District of Columbia. As a whole, the electric power industry supports more than 7 million jobs in communities across the United States.

In addition to our U.S. members, EEI has more than 60 international electric companies, with operations in more than 90 countries, as International Members, and hundreds of industry suppliers and related organizations as Associate Members.

Organized in 1933, EEI provides public policy leadership, strategic business intelligence, and essential conferences and forums.

For more information, visit our Web site at www.eei.org.



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