

MOC Impact Workflow to Ensure Relief Systems Process Safety Information is Updated Based on Changes

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Agenda

I. Background

II. Observations

III. MOC Examples

IV. Proposed Workflow/Checklist

V. Conclusions

Background

- What is Management of Change (MOC)?
 - One of the 14 elements of Process Safety Management (PSM) per OSHA 29CFR1910.119

Background

- What is Management of Change (MOC)?
 - OSHA 29CFR1910.119(l)(1)

“The employer shall establish and implement written procedures to manage changes (except for “replacements in kind”) to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.”

Background

- Impact on Safety
 - Major accidents in industry are related to uncontrolled change

Background

- 29CFR1910.119(d) – Process Safety Information (PSI)
- 29CFR1910.119(d)(3)(i)(D) – Relief system design and design basis

Background

- 29CFR1910.119(l)(4)
 - “If a change covered by this paragraph results in a change in the process safety information required by paragraph (d) of this section, such information shall be updated accordingly.”
- 29CFR1910.119(o) – Compliance Audits at least every three years

Background

- 29CFR1910.119 Appendix C
 - “...3. Process Safety Information. Complete and accurate written information concerning process chemicals, process technology, and process equipment is essential to an effective process safety management program and to a process hazards analysis...”

Background

- 29CFR1910.119(d)(3)(i)(D) – Relief system design and design basis
- Safety Impact
 - Lack of accurate PSI may result in flawed PSM and Process Hazards Analysis (PHA) process
 - Unidentified Hazards

Background

- 29CFR1910.119(d)(3)(i)(D) – Relief system design and design basis
- Economic Impact
 - Major Refinery Incident in 2005
 - National Emphasis Program (NEP) in 2007
 - Non-compliance citations

Observations

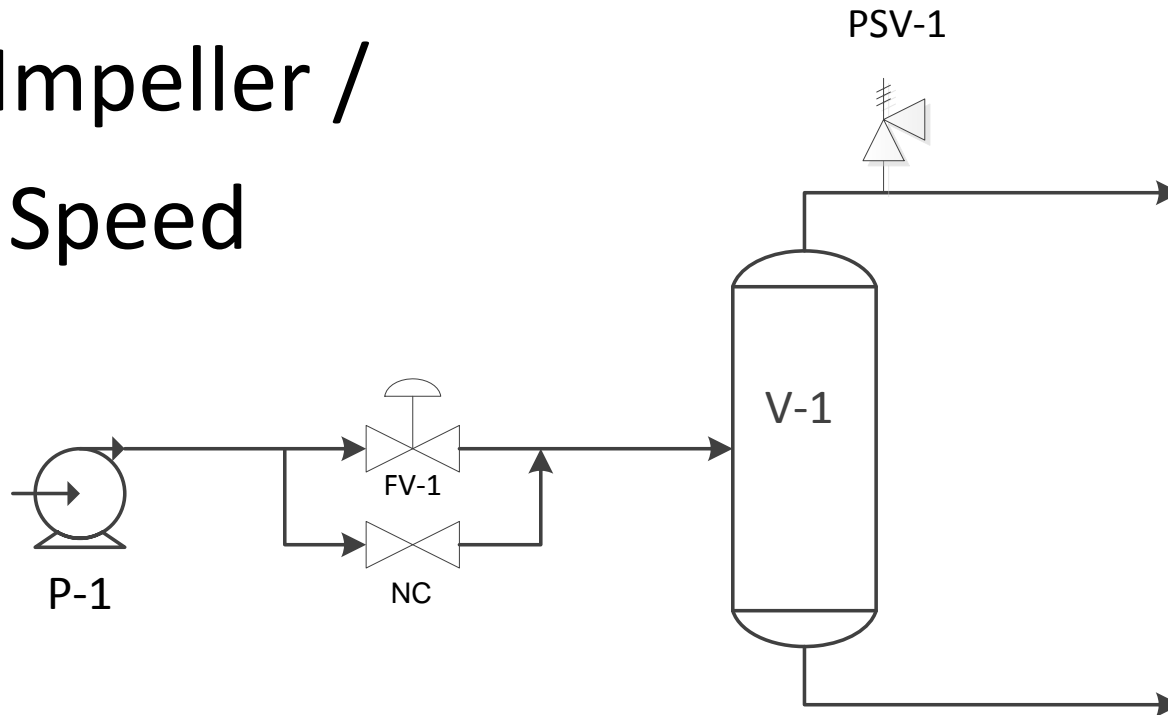
- MOC's ---> PSI ---> Relief Systems Design/Documentation
- Often, PSI is not updated
 - Refinery flare system example
- Why?
 - Lack of process safety resources or inefficient methods
 - Nuances in relief systems design esoteric

Observations

Where have you observed deficiencies in identifying the impact of MOC's on relief systems design/documentation?

MOC Examples

Pump Impeller / Motor Speed



Maximum Discharge Pressure

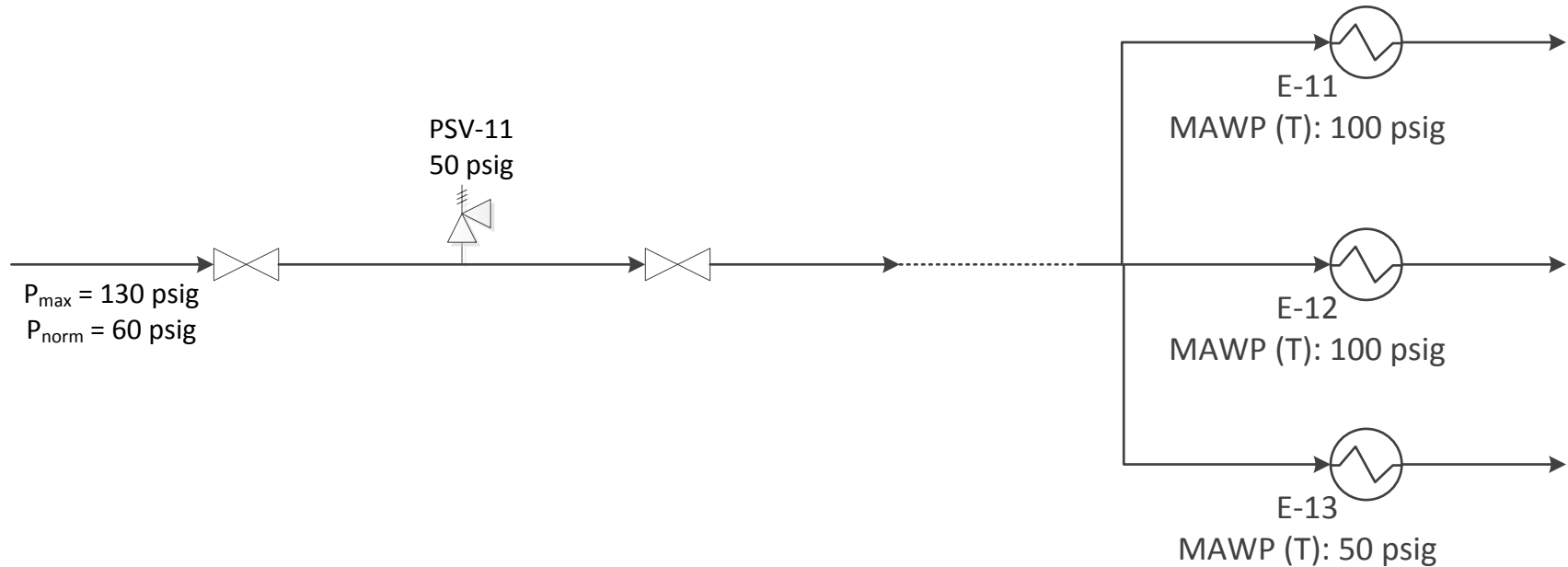
- Blocked Outlet Applicability & Relief Rate

Normal Discharge Pressure

- Control Valve Failure/Inadvertent Bypass Valve Operation
Applicability & Relief Rate

MOC Examples

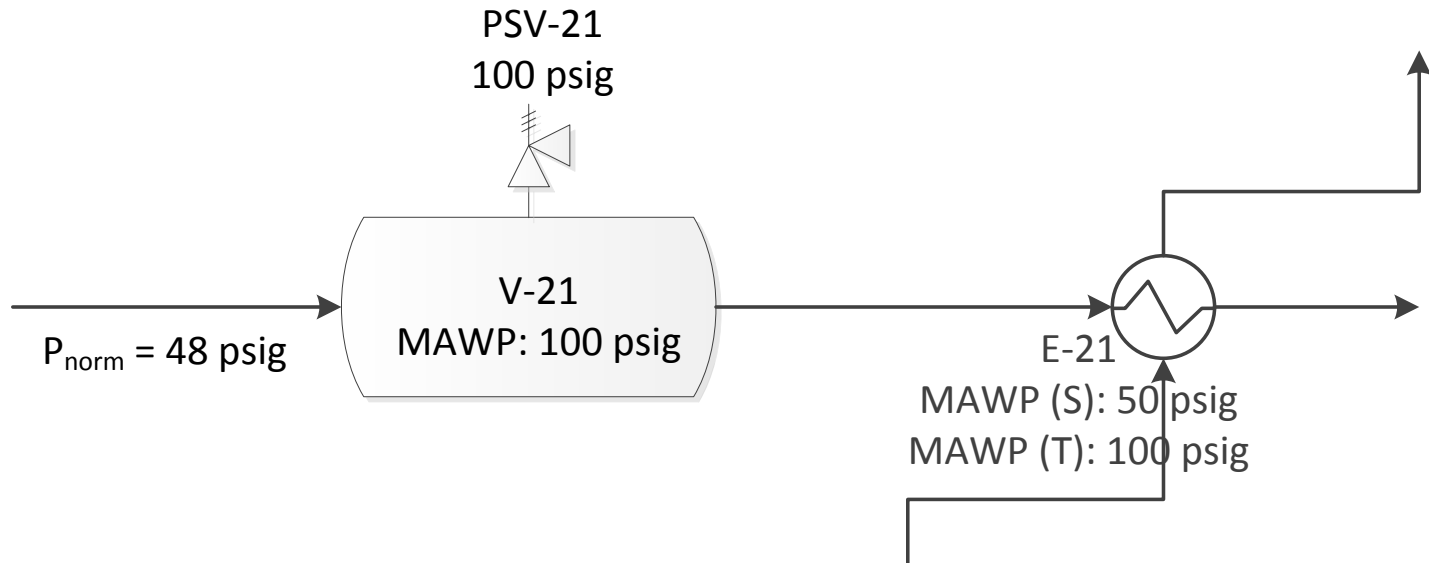
Set Pressure



Increase of PSV-11 set pressure from 50 psig to 70 psig
- No issue for piping protected by PSV-11 but results in unprotected E-13 (T)

MOC Examples

Operating Pressure



Change normal operating pressure from 48 psig to 60 psig

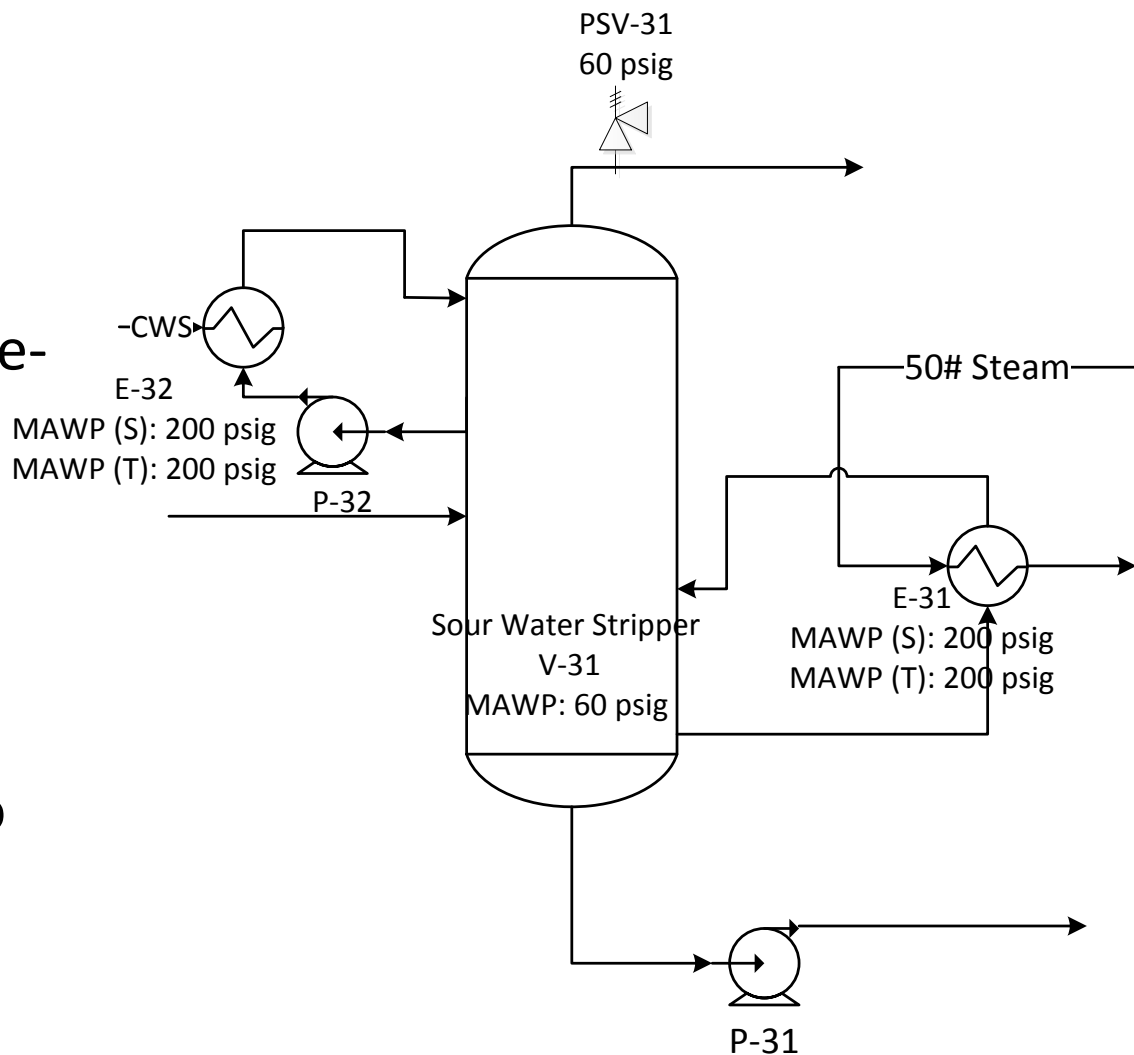
- No issue for PSV-21 system, but results in applicable tube rupture scenario for E-21 (S) (site-specific)

MOC Examples

Utility Line-up

Change of 50# Steam line-
up to 150# Steam

- Current applicability of cooling failure?
- Applicability of column relief scenarios switches from “Not applicable” to “Applicable”
- Tube rupture

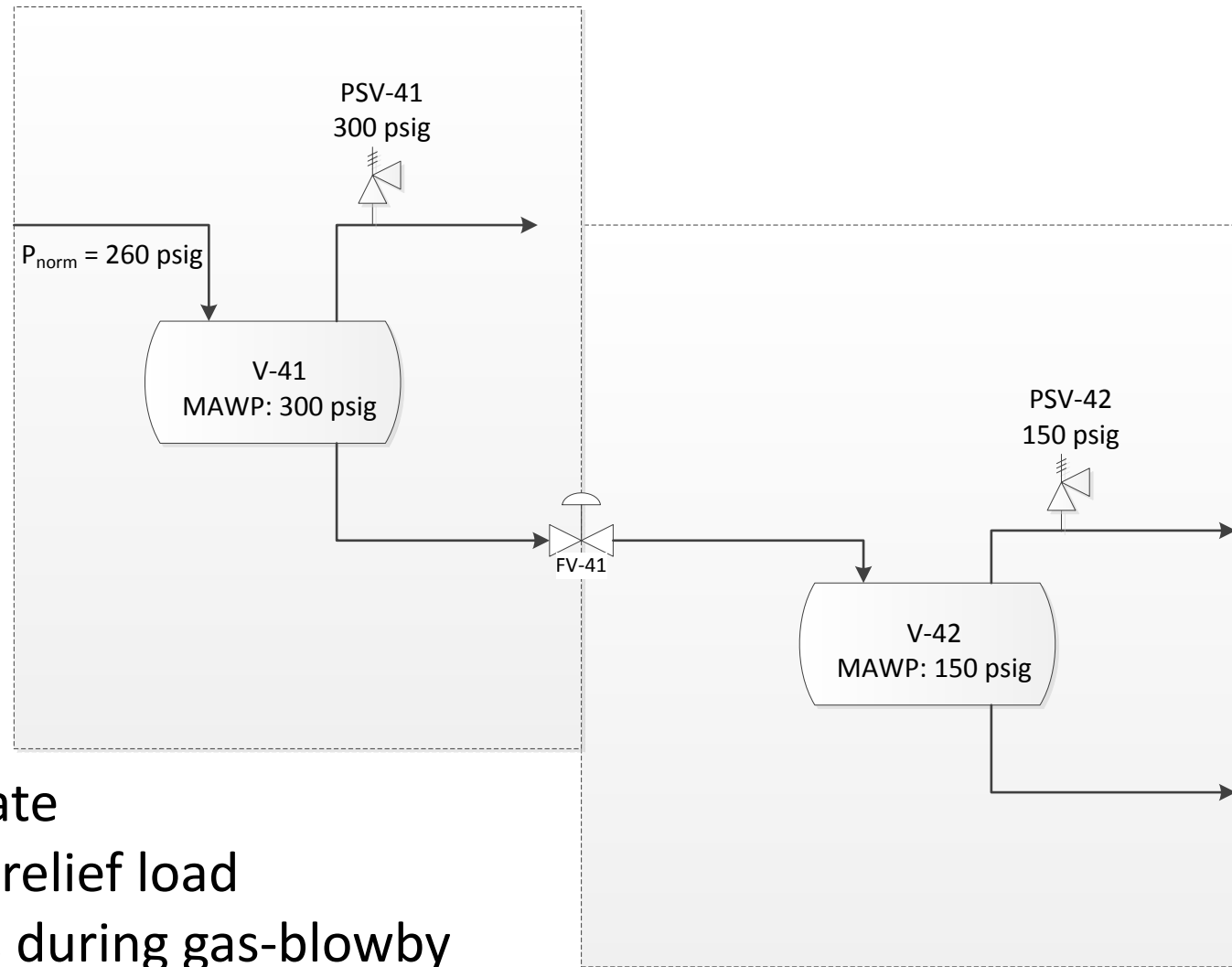


MOC Examples

Liquid Level

Increase LL in V-41

- Increase external fire required relief rate
- Possibly change relief load phase/dynamics during gas-blowby



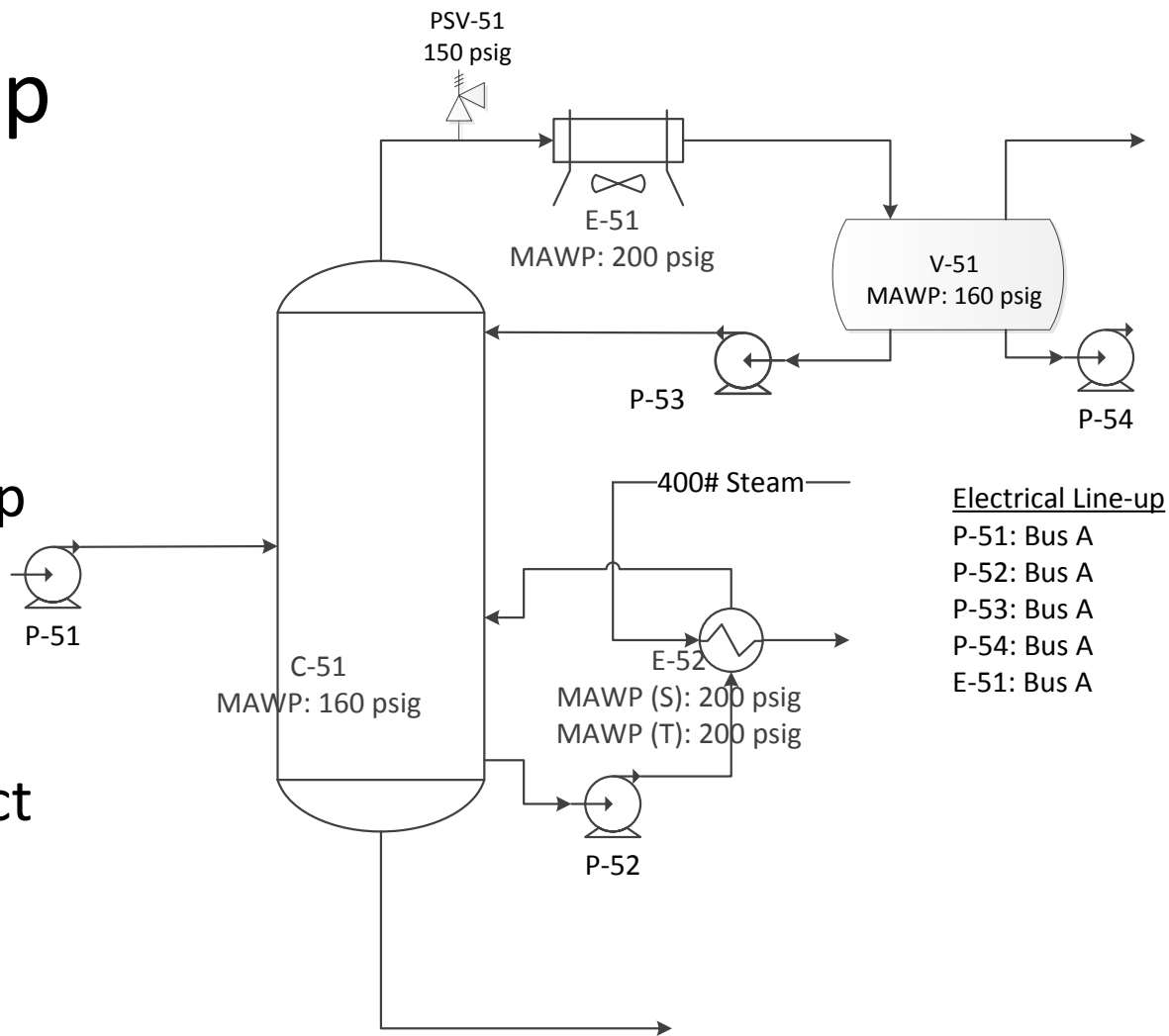
MOC Examples

Electrical Line-up

Current applicability of Bus A Partial Power Failure (PPF)?

Change electrical line-up of P-52 to Bus B

- Applicability of Bus A PPF?
- How might this impact your flare system design?



Electrical Line-up

P-51: Bus A

P-52: Bus A

P-53: Bus A

P-54: Bus A

E-51: Bus A

MOC Examples

Is it possible your facility has not captured the impact of some of the MOC's on relief system design and documentation?

What are your plans to improve your Process Safety Management systems?

Proposed Workflow/Checklist

- Identifies when relief systems documentation needs to be updated
- Compiled based on input from relief systems experts
- Contains lesser-known changes that may impact relief systems design

Proposed Workflow/Checklist

- Includes auditing process steps
- Includes steps to check commonly missed impacts to relief systems documentation in other systems

Proposed Workflow/Checklist

- Advantages to Workflow & Checklist
 - Intuitive screening method
 - Reduces (but does not eliminate) reliance on relief systems experts
 - Efficient
 - Systematic

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Proposed Workflow/Checklist

Relief and Disposal System MOC Impact Checklist

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Equipment/Facilities

Relief System Equipment

Addition, modification, or demolition of relief device (not including replacement in-kind)
Change in relief device capacity (orifice size, etc.)
Change in relief device discharge location
Change in relief device manufacturer or model
Change in relief device sub-type (i.e. conventional to bellows)
Change in relief device set pressure or blowdown setting
Change to relief device piping
Change in sparing of relief devices
Addition, modification, or demolition of flares, knockout drums, seal drums, and other disposal system equipment

Process Equipment

Addition, modification, repurpose, relocation, or demolition of process equipment (not including replacement in-kind)
Rerate of vessel design code
Rerate of hydrotest pressure / MAWP or change in design pressure / temperature
Change in piping connections to machinery that could affect alignment or pressure profile
Increased/Decreased heat transfer surface area of heat exchanger
Reduction/addition of fixed trays in tower
Change in tube metallurgy, tube size, or tube length
Movement of internal weir in a vessel
Removal/installation of fireproof insulation
Change of restriction orifice plate size
Change floating roof on a tank
Changes to location of equipment

Rotating Equipment

Addition, modification, or demolition of rotating equipment (not including replacement in-kind)
Changes to machinery component design, materials or manufacturer (pumps, compressors, etc.)
Changes of performance capability of equipment
Changes of driver size (motor, turbine, engine)
Change to the pump impeller size
Change in electric or steam driver for a pump, compressor, etc.

Instrumentation

Addition, modification, or demolition of control valves, alarms, interlocks and other instrumentation
Change of control valves or bypass valves (including valve size, trim, or failure position)
Change in actuator mechanism/motive fluid (i.e. instrument air to nitrogen)
Change to safety-critical instrumentation

Utilities

Addition, modification, or demolition of electrical equipment
Changes to electrical line-ups
Change in utility line-up (i.e. switching a LP steam user to a HP steam user)
Changes to utility equipment (cooling water systems, steam systems, etc.)

Process Chemicals/Technology/Procedures

Process

Change in the unit charge rate
Change in the feed stock composition
New chemistry, or changes to chemistry of existing process
Introduce new feedstocks, catalysts, chemicals, product streams, or new process sequence
Changes to the process that could affect flows, pressures, compositions or changes involving the erosive, corrosive or toxic nature of the stream
Set point change (level, pressure, temperature, flow)
Change material in tank or increase tank throughput
Change in flare system seal gas pressure

Operation

Change to the basic mode of unit operation (including new or modified feed to the unit)
Changes to equipment operating or maintenance procedure
Change to safe operating limits or require operating outside of the approved operating envelope
Change in inventory of any vessel or exchanger
Changes to car-seal/lock valves
Change in electric or steam driver for a pump, compressor, etc.
Change in minimum turndown for the unit
Change in sparing of equipment (i.e. pumps/compressors)
Change in operation of control valve bypass valves
Change in flare line-ups

Instrumentation

Addition, modification, or demolition of control valves, alarms, interlocks and other instrumentation
Changes to instrumentation operating or maintenance procedure
Change in actuator mechanism/motive fluid (i.e. instrument air to nitrogen)

Utilities

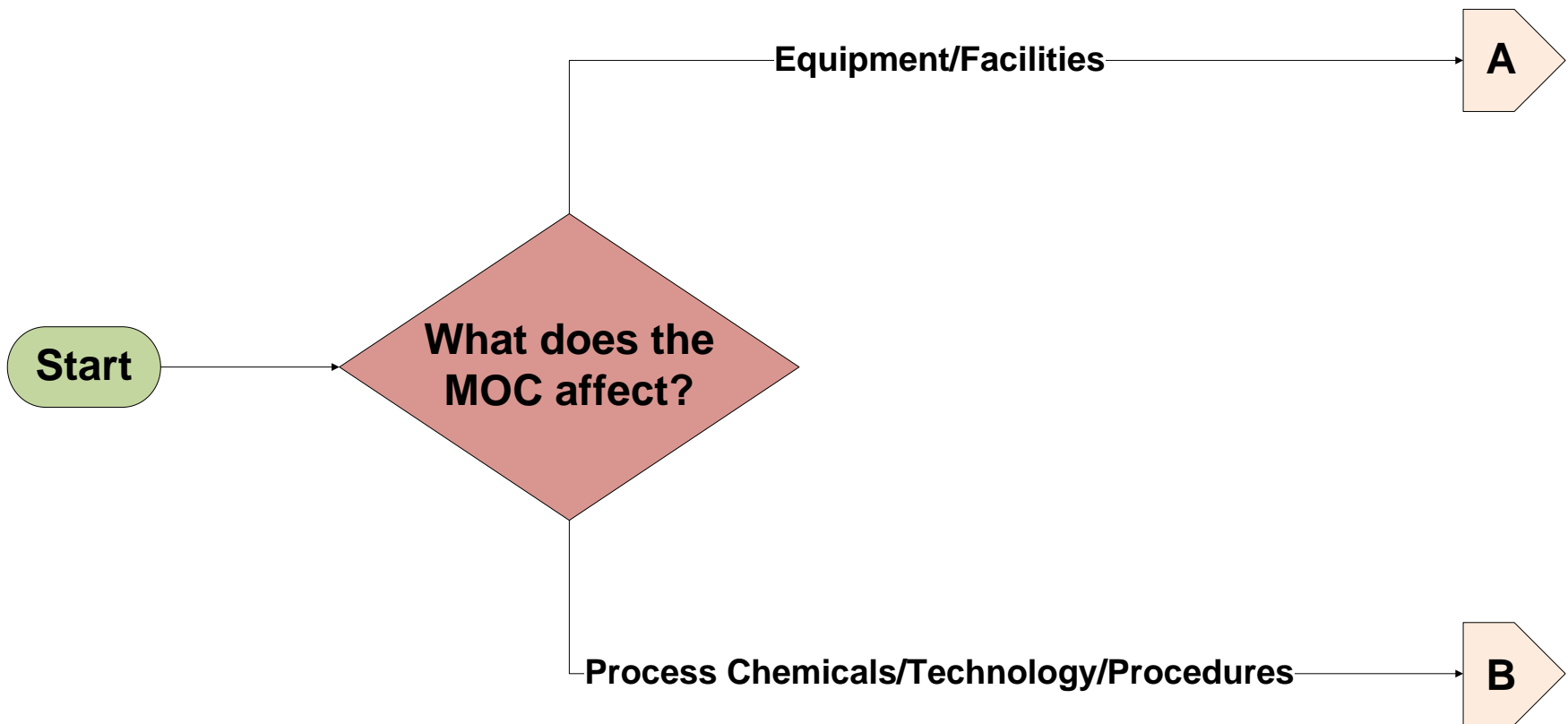
Utility operating condition changes
Change in utility line-up (i.e. switching a LP steam user to a HP steam user or CW user to BFW user)
Addition/upgrading of firefighting equipment and/or drainage
Electrical changes (one-line information)

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A

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B

Proposed Workflow

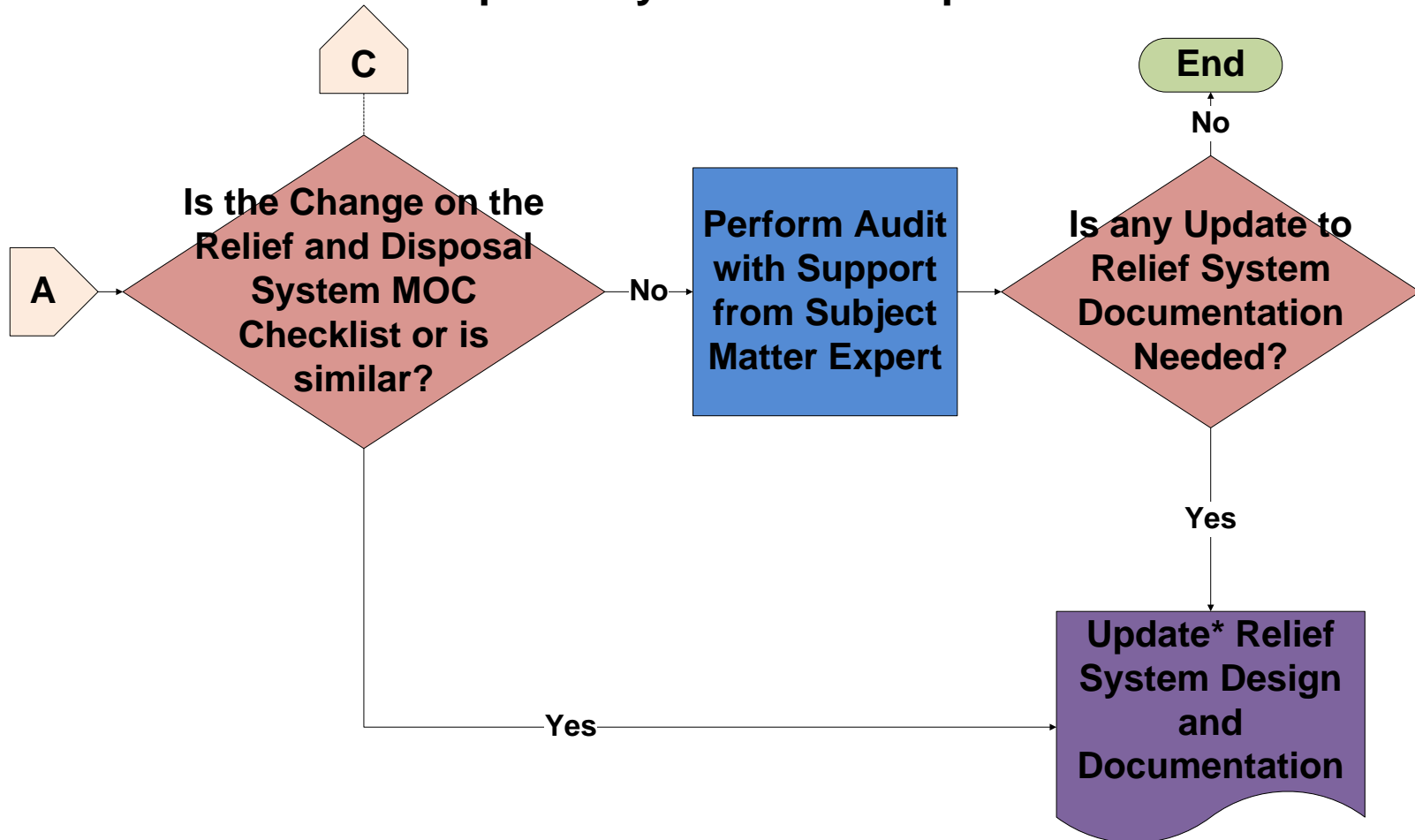
Relief and Disposal System MOC Impact Workflow



Proposed Workflow

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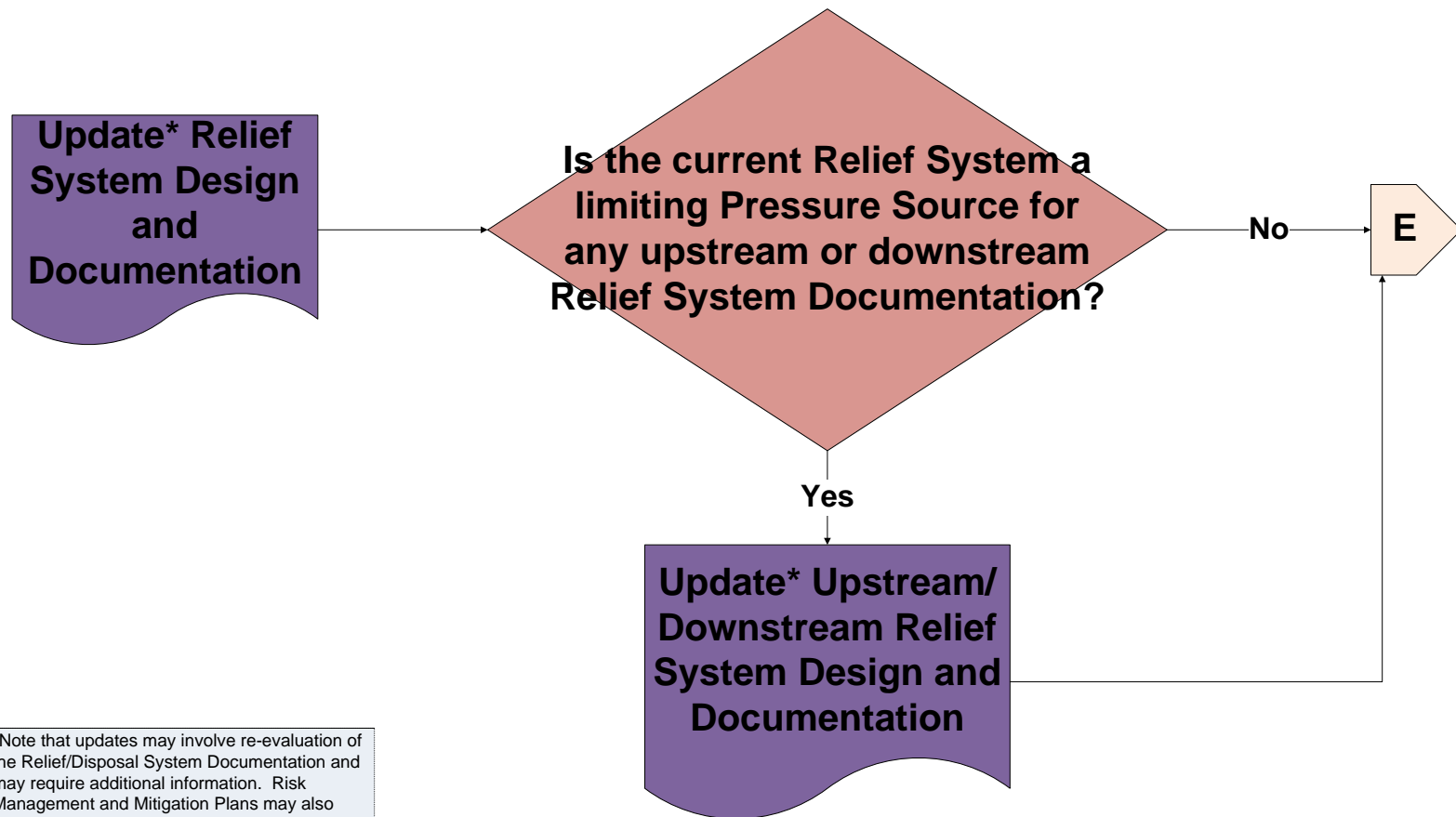
Relief and Disposal System MOC Impact Workflow



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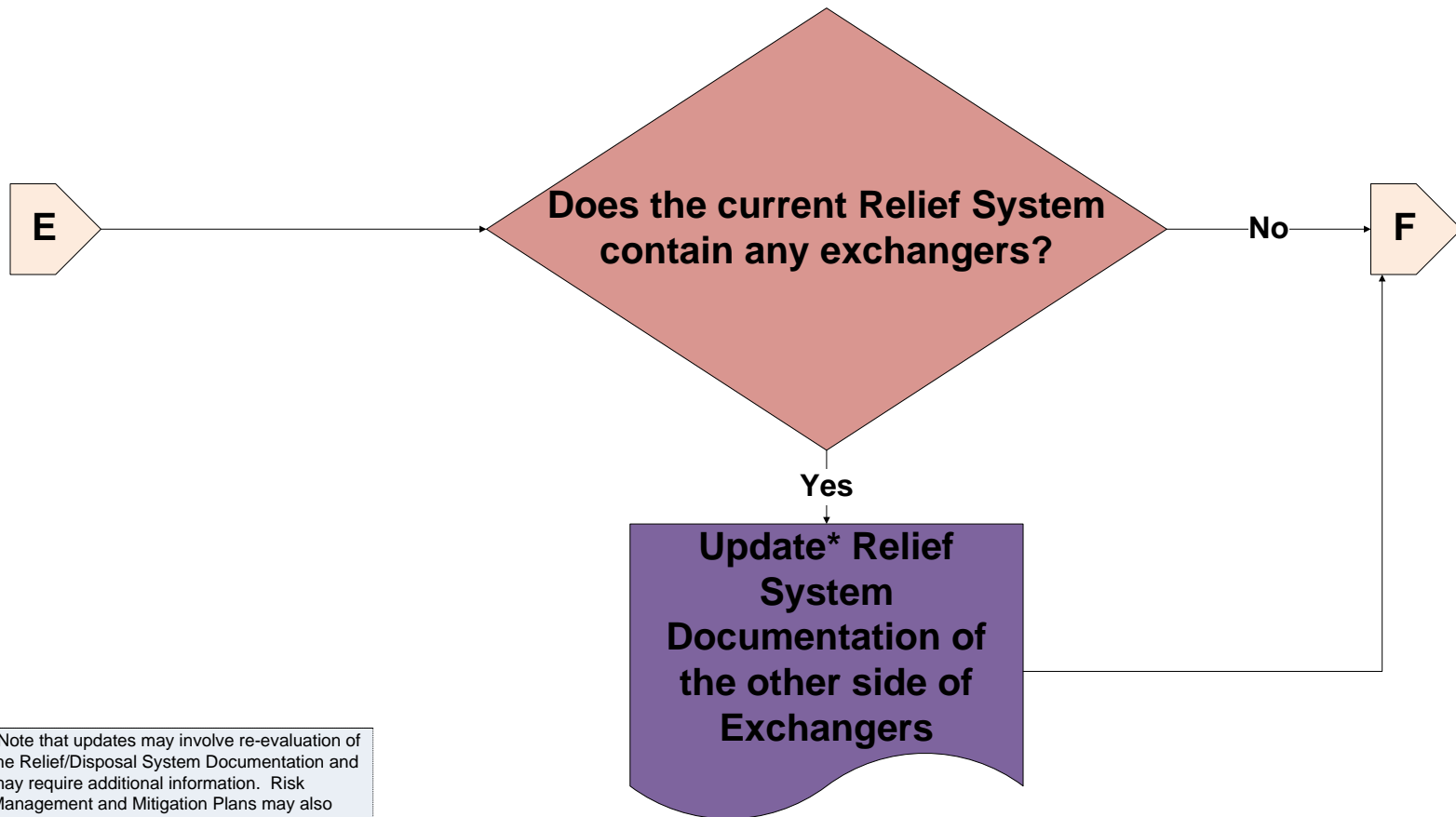
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Proposed Workflow

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Relief and Disposal System MOC Impact Workflow

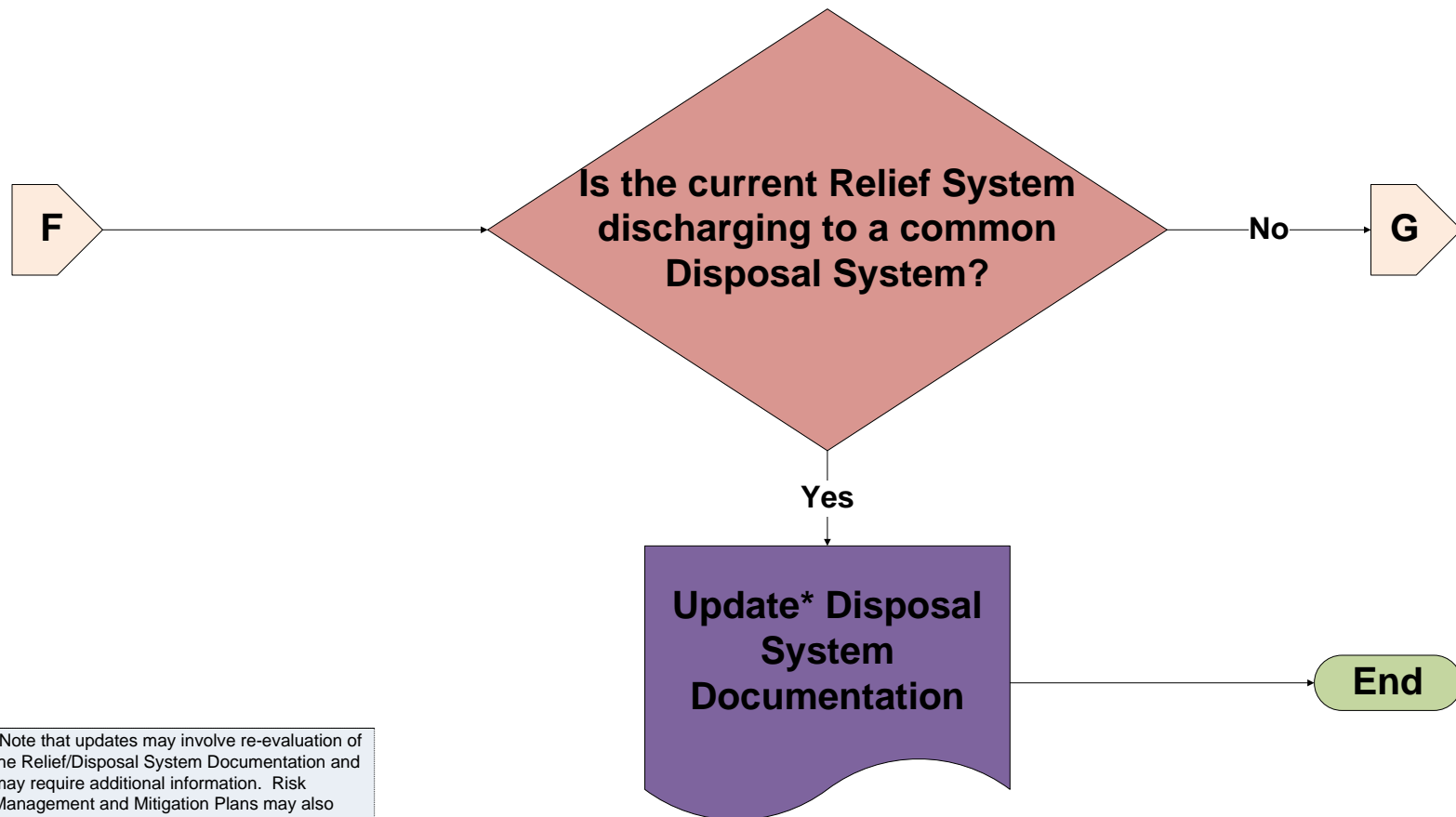


*Note that updates may involve re-evaluation of the Relief/Disposal System Documentation and may require additional information. Risk Management and Mitigation Plans may also need to be developed.

Proposed Workflow

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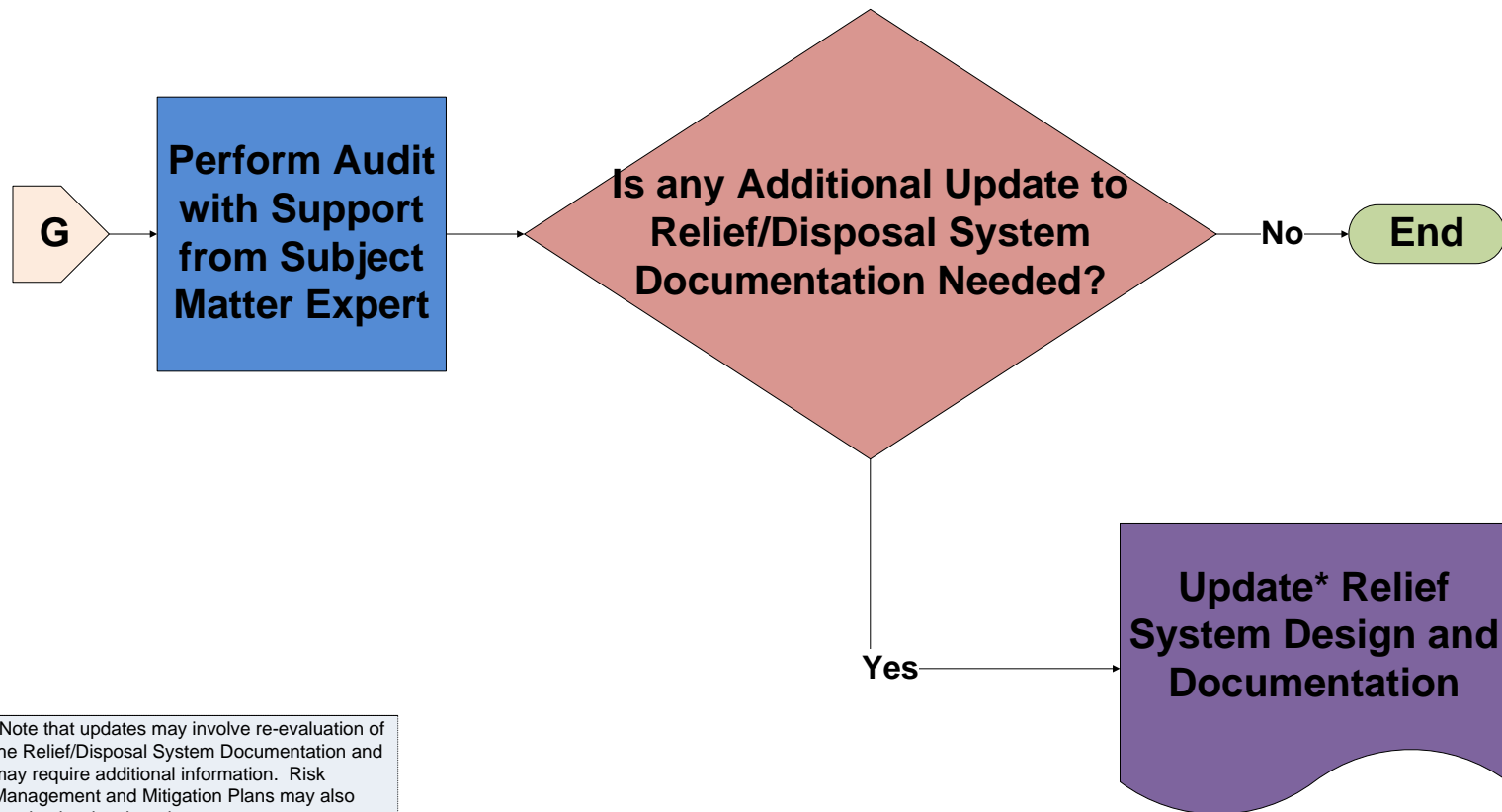
Relief and Disposal System MOC Impact Workflow



Proposed Workflow

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Relief and Disposal System MOC Impact Workflow



*Note that updates may involve re-evaluation of the Relief/Disposal System Documentation and may require additional information. Risk Management and Mitigation Plans may also need to be developed.

Conclusions

- Importance of evergreen PSI
- Difficulty of identifying impact of MOC's on relief system design
- Proposed workflow to improve PSM
- Questions?