

Hazard Identification and Risk Assessment for Smaller Changes

Tips and Tools for Avoiding Misses and
Improving Quality

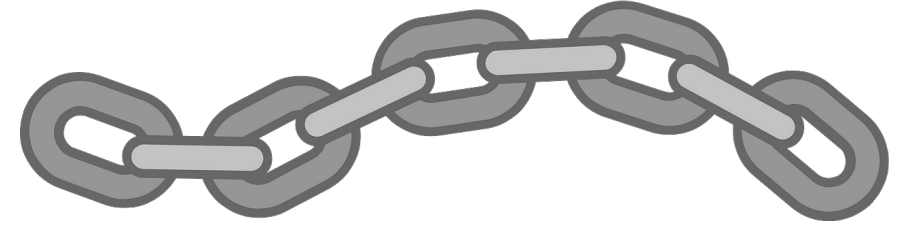
Jody E Olsen P.E.

JE Olsen Consulting LLC

jodyo@jeolsenconsulting.com



Key Points



- All MoCs require process safety review
 - All changes require process hazard review screening
 - All process changes require HIRA/PHA
 - All mechanical changes require MI assessment
- Skilled, trained functional representatives must:
 - Review and approve all process safety screenings
 - Lead all process safety hazard reviews
 - Complete mechanical design and maintenance assessments
- Apply the same HIRA methodology to changes of all sizes

Terminology

Personal Safety Reviews

Process Safety Reviews

Flare/Relief
Systems
Study

Mechanical Integrity
Review

Process Hazard Analysis

Facility Siting
Study

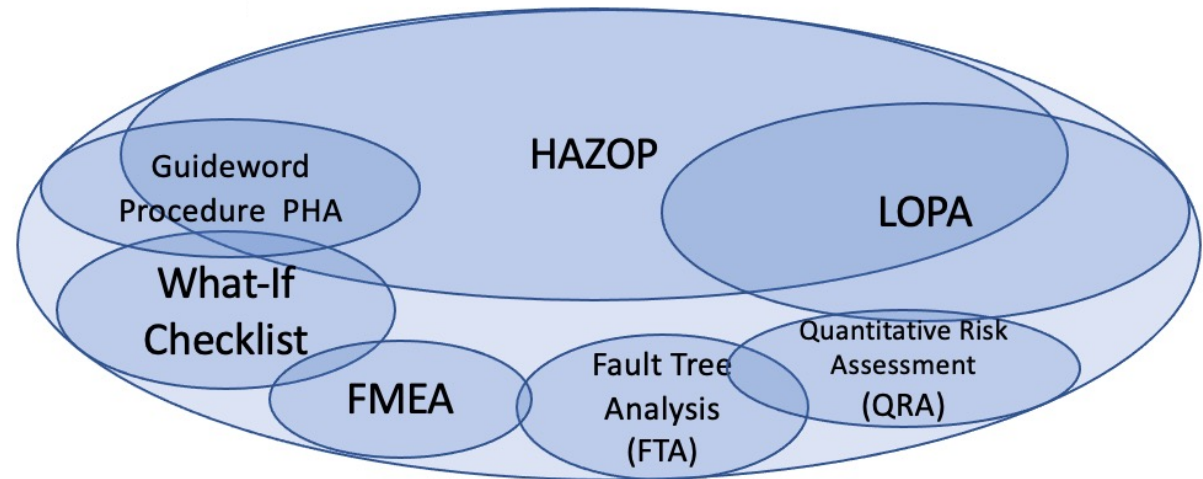
This talk/paper:

Process Safety Review = Process Hazard Review

Hazard Identification and Risk Assessment (HIRA) =
Process Hazard Analysis (PHA)

HIRA = PHA

HIRA or PHA Methods:



Part of the Problem . . .

Regulatory and guidance language?



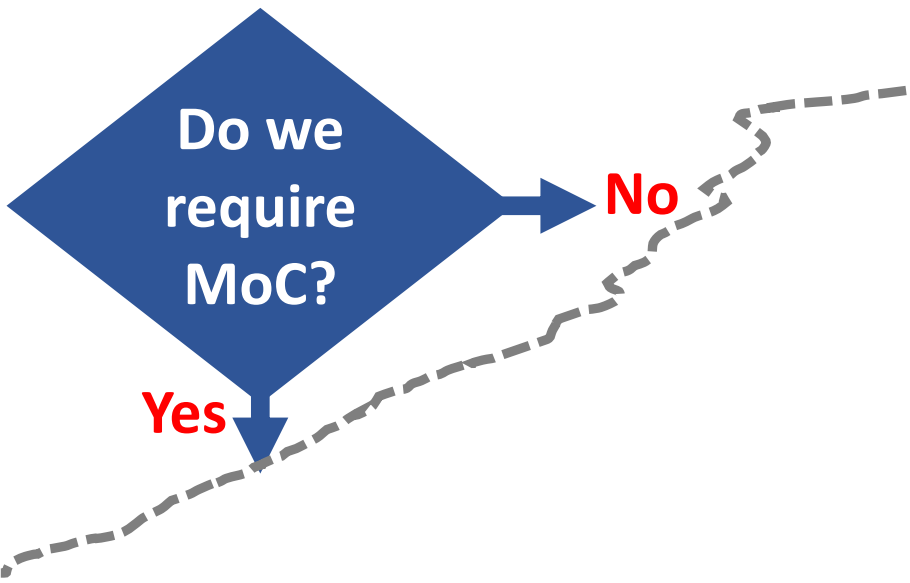
- Potential misperception that HIRA/PHA only applies to full plant process hazard review studies or large projects

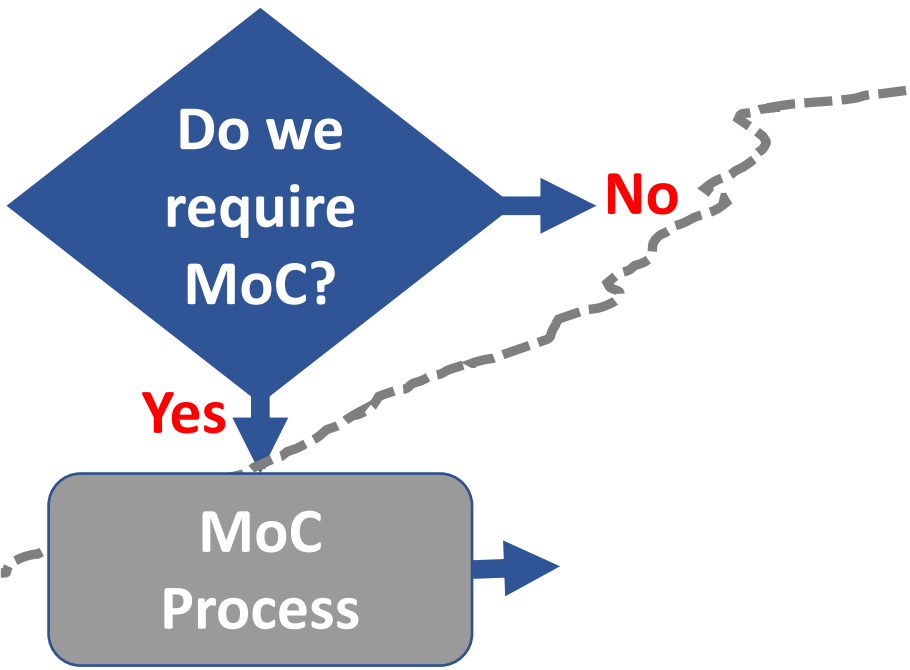


Steps

Hazards31

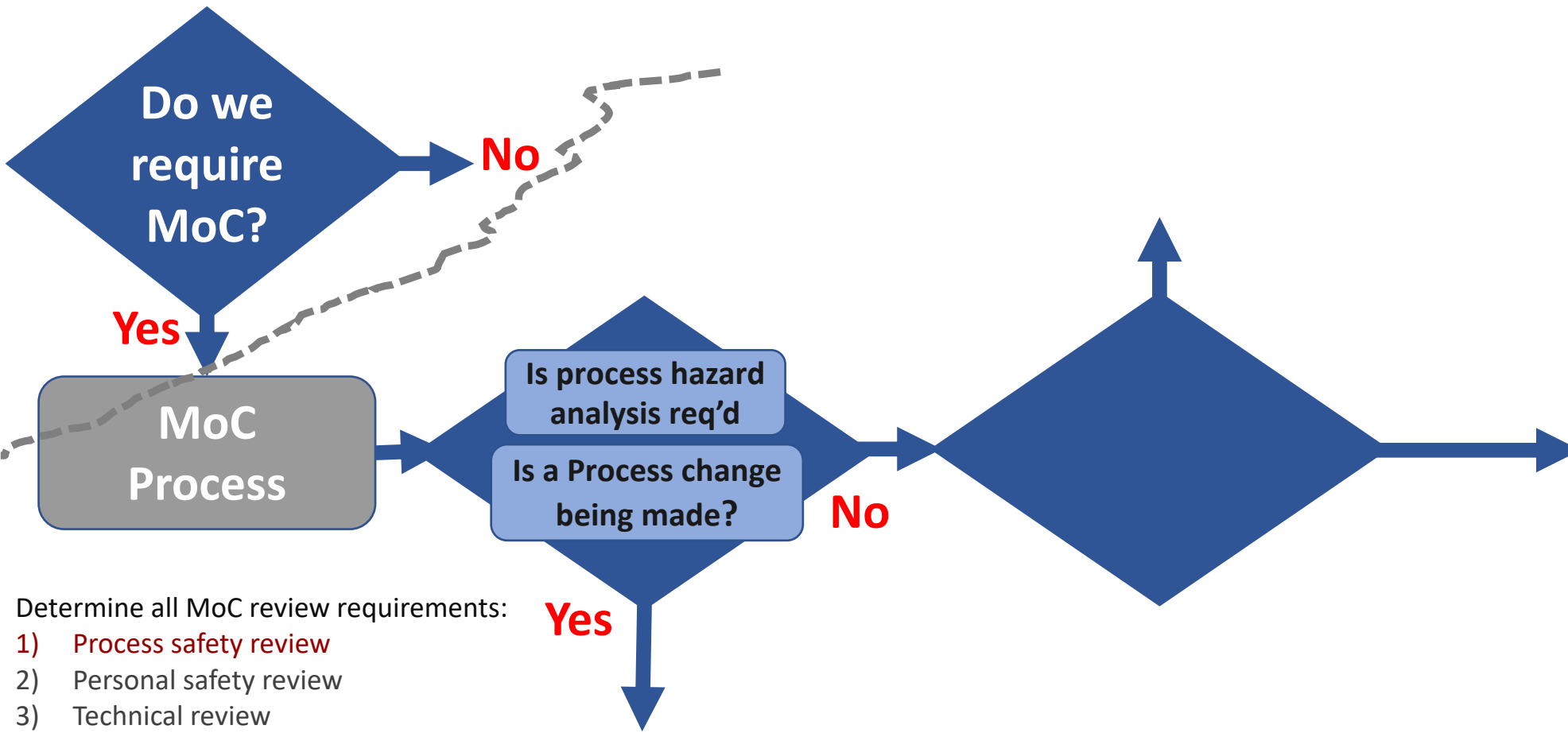






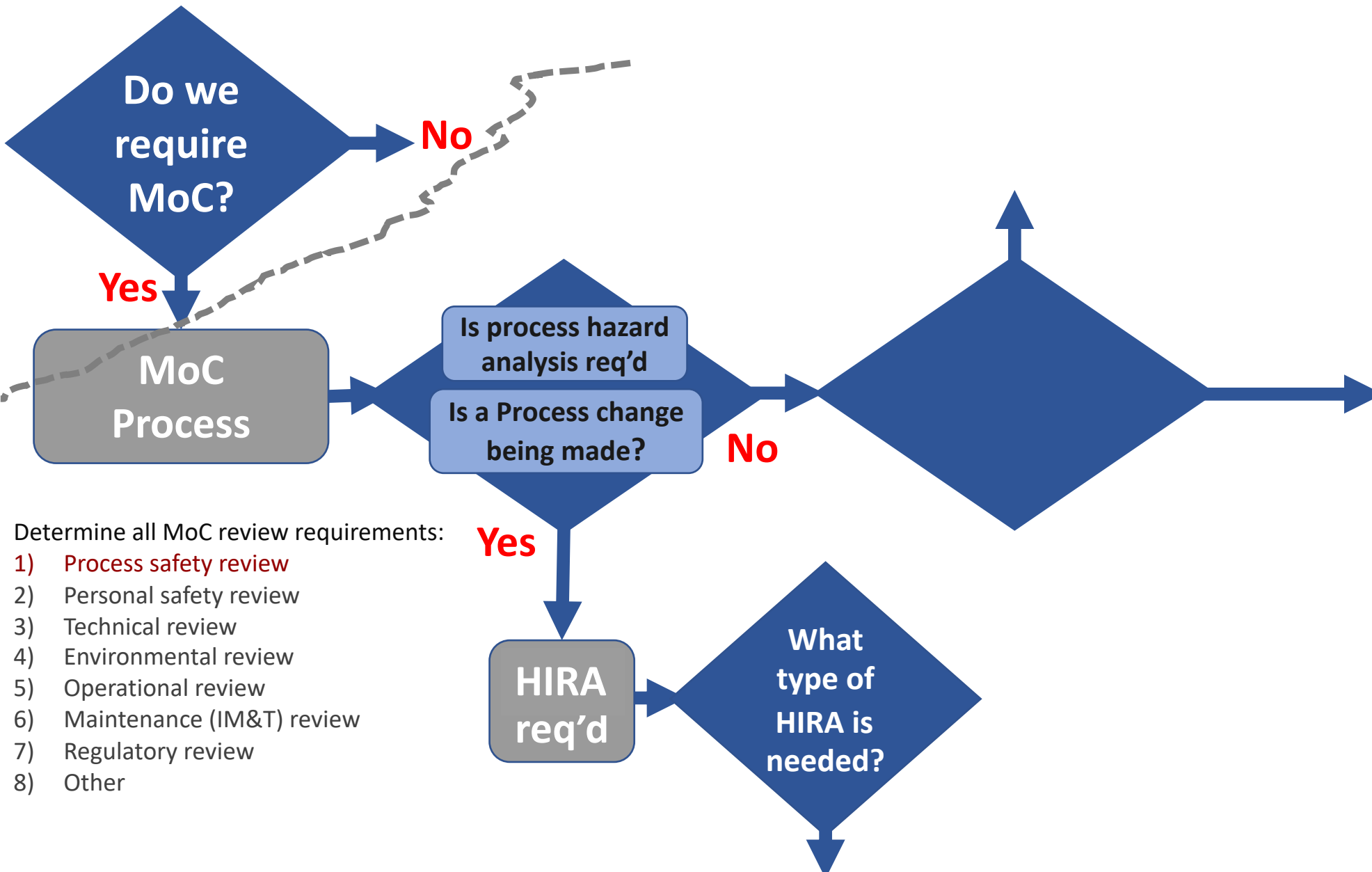
Determine all MoC review requirements:

- 1) **Process safety review**
- 2) Personal safety review
- 3) Technical review
- 4) Environmental review
- 5) Operational review
- 6) Maintenance (IM&T) review
- 7) Regulatory review
- 8) Other



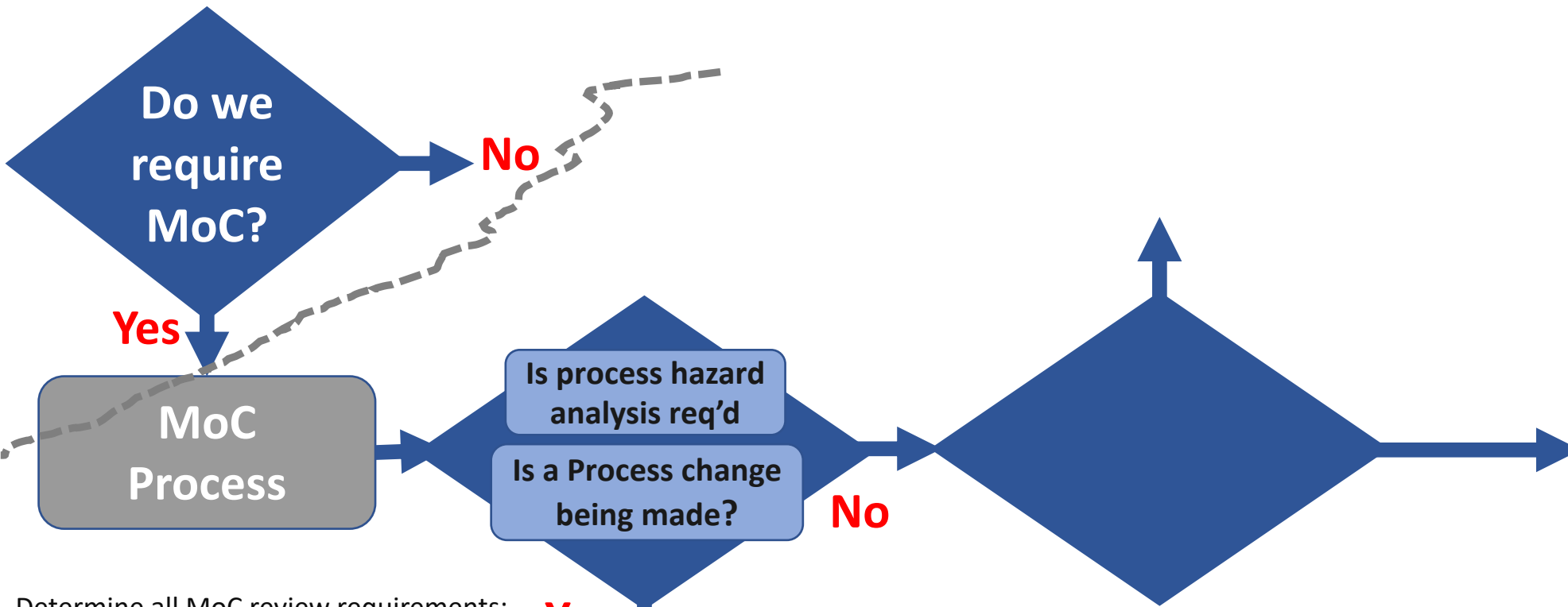
Determine all MoC review requirements:

- 1) Process safety review
- 2) Personal safety review
- 3) Technical review
- 4) Environmental review
- 5) Operational review
- 6) Maintenance (IM&T) review
- 7) Regulatory review
- 8) Other



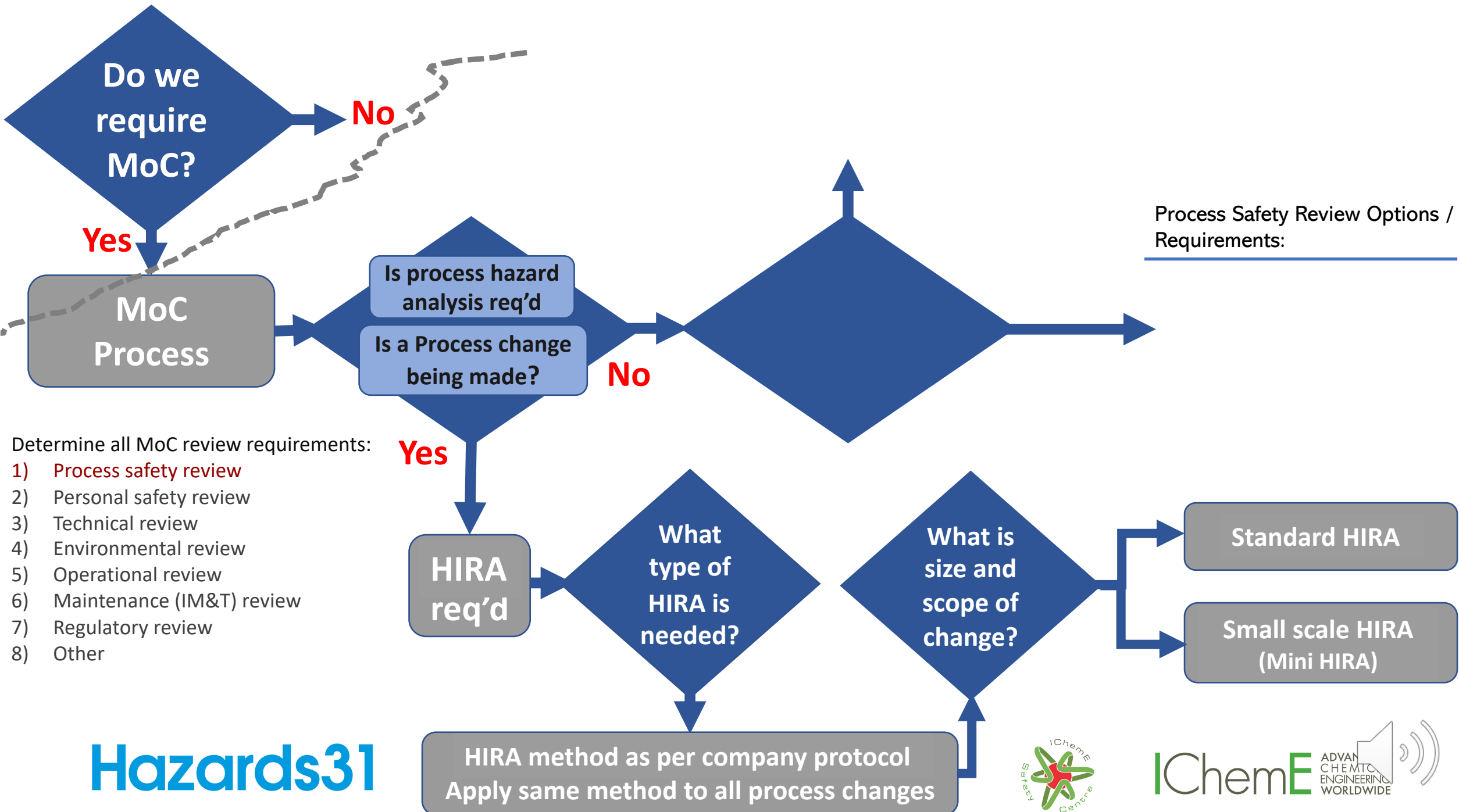
Determine all MoC review requirements:

- 1) Process safety review
- 2) Personal safety review
- 3) Technical review
- 4) Environmental review
- 5) Operational review
- 6) Maintenance (IM&T) review
- 7) Regulatory review
- 8) Other



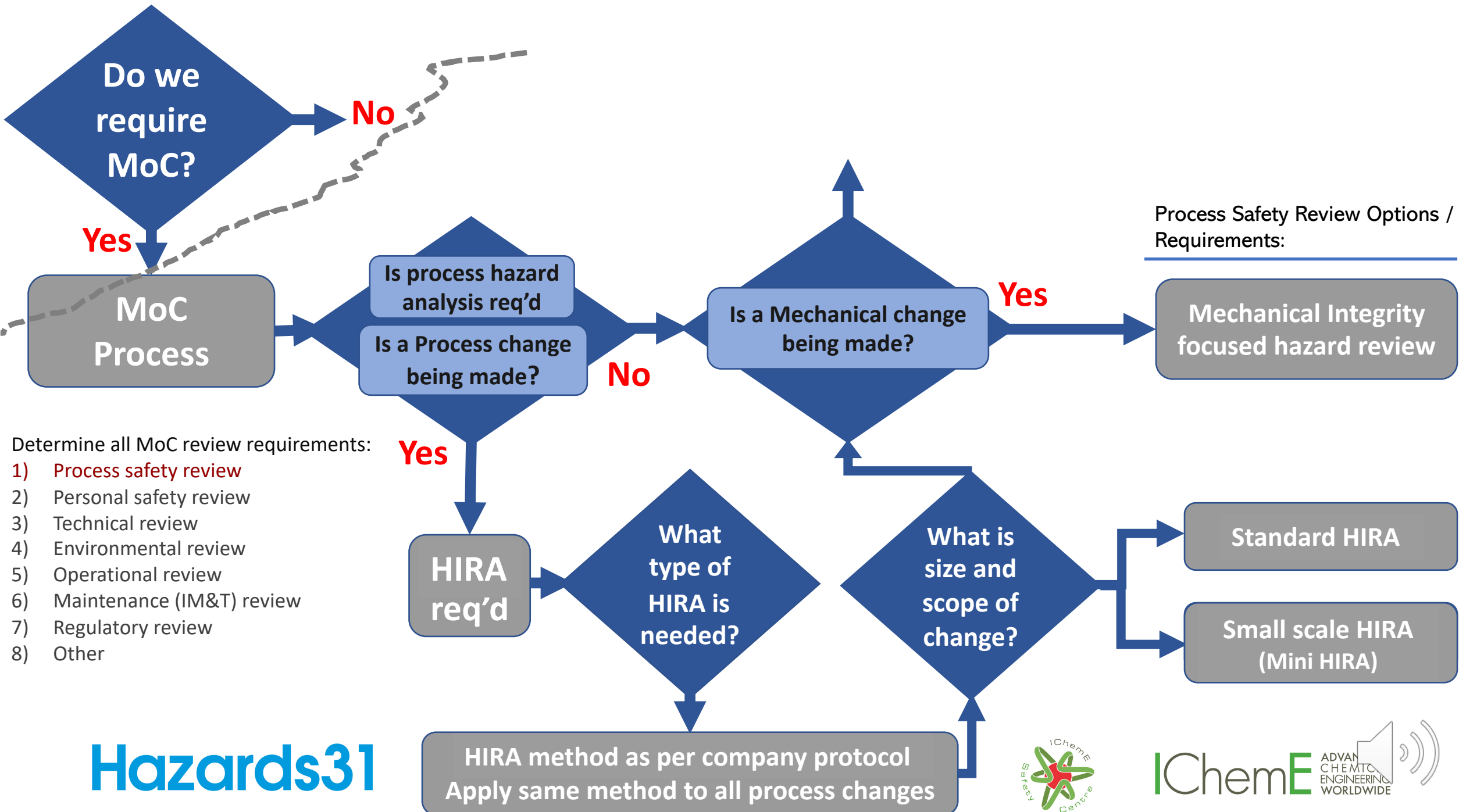
Determine all MoC review requirements:

- 1) Process safety review
- 2) Personal safety review
- 3) Technical review
- 4) Environmental review
- 5) Operational review
- 6) Maintenance (IM&T) review
- 7) Regulatory review
- 8) Other



Determine all MoC review requirements:

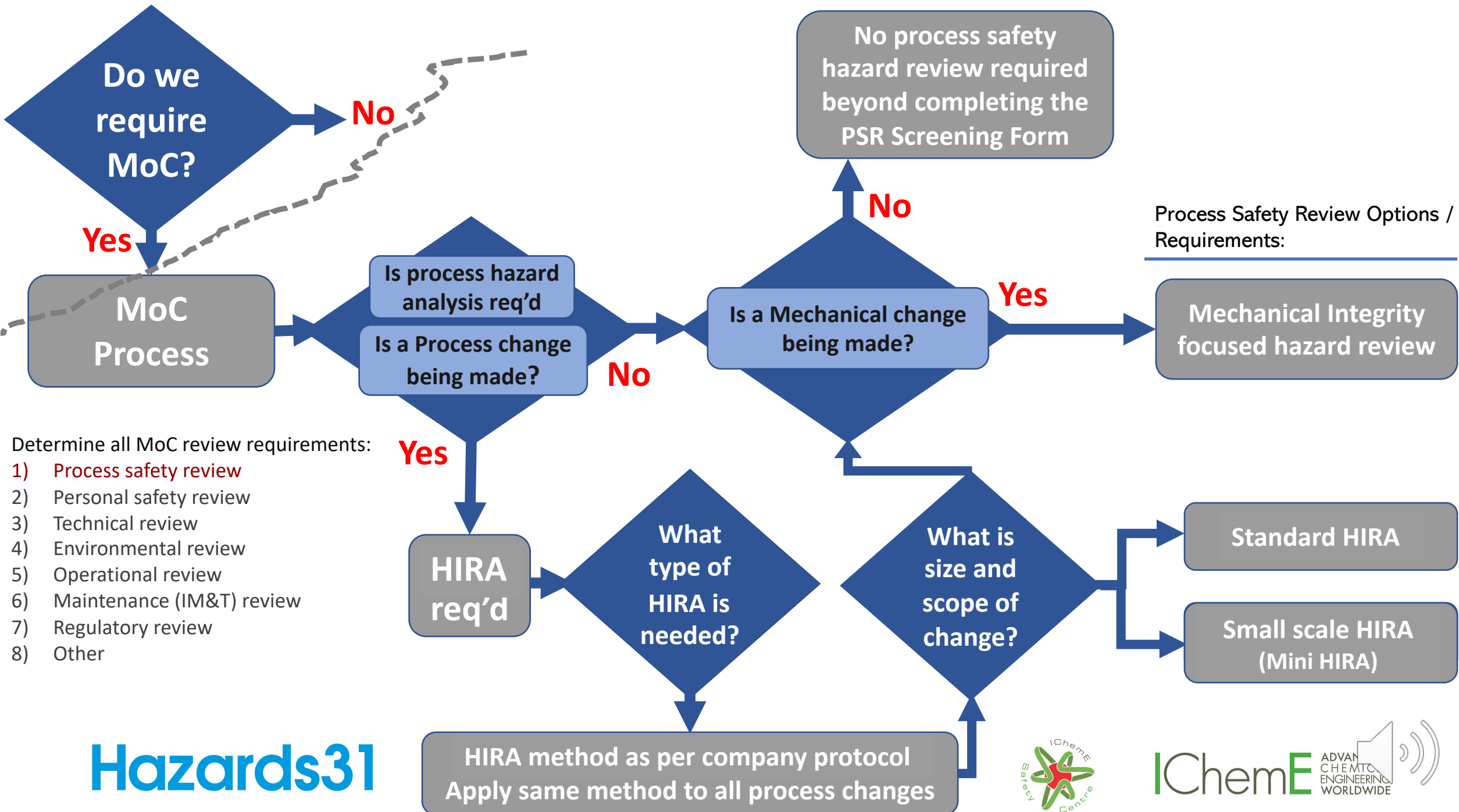
- 1) Process safety review
- 2) Personal safety review
- 3) Technical review
- 4) Environmental review
- 5) Operational review
- 6) Maintenance (IM&T) review
- 7) Regulatory review
- 8) Other



Process Safety Review Options / Requirements:

Determine all MoC review requirements:

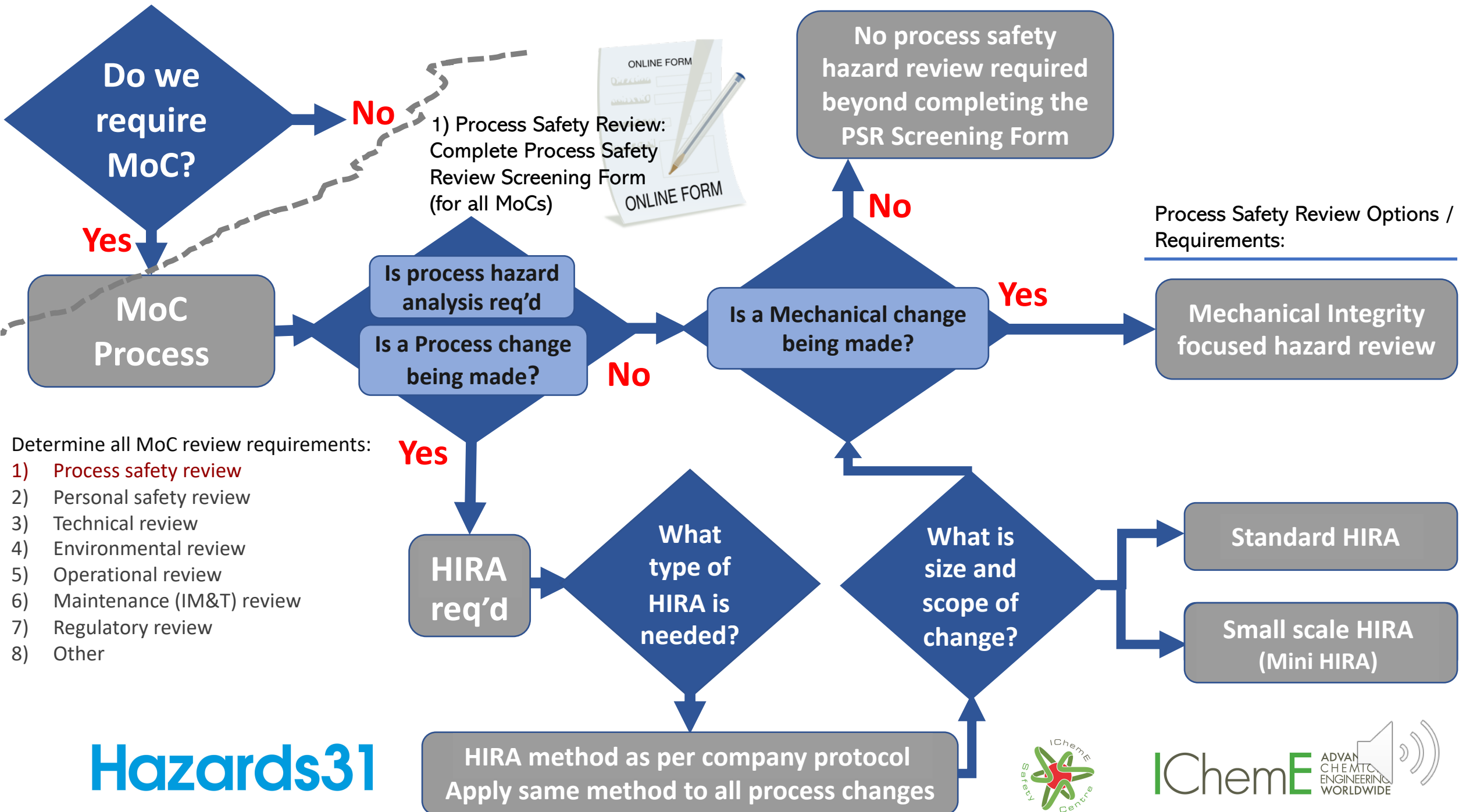
- 1) Process safety review
- 2) Personal safety review
- 3) Technical review
- 4) Environmental review
- 5) Operational review
- 6) Maintenance (IM&T) review
- 7) Regulatory review
- 8) Other



Process Safety Review Options / Requirements:

Determine all MoC review requirements:

- 1) Process safety review
- 2) Personal safety review
- 3) Technical review
- 4) Environmental review
- 5) Operational review
- 6) Maintenance (IM&T) review
- 7) Regulatory review
- 8) Other



Determine all MoC review requirements:

- 1) Process safety review
- 2) Personal safety review
- 3) Technical review
- 4) Environmental review
- 5) Operational review
- 6) Maintenance (IM&T) review
- 7) Regulatory review
- 8) Other

Process Safety Review Options / Requirements:

Process Safety Review Screening Form

- Process Safety Screening Form example sections:

- OUTSIDE/OFFSITE/ONSITE SITING ISSUES
- HIRA SCENARIO CAUSES/CONSEQUENCES
- HIRA SAFEGUARDS/IPLs
- PROCESS CHANGES
- MECHANICAL CHANGES



Process Safety Review Screening Form



- Process Safety Screening Form
 - Dos and Don'ts . . . PROCESS CHANGES:

 Do ask questions regarding physical properties and characteristics of the change

 Do not ask if the change is introducing a hazard or likely to impact process safety

Trigger event – a modification – regulation 10(2)(d)

195 You must review and, if necessary, revise your safety report before certain modifications are made. This is aimed at modifications to establishments, processes, and the nature or quantity of dangerous substances which could have significant repercussions on the major accident hazards. Changes which either increase or decrease hazard or risk are important. It is not intended to deal with trivial changes.

196 Whether a modification has significant consequences will depend on the degree to which it introduces a new major accident hazard, or increases or decreases the risk from an existing hazard. The overall goal is to ensure that major accidents are prevented and the consequences of any that do occur are kept to a minimum. Examples of the sorts of changes which may have significant consequences include:

- (a) a change in the quantity of a dangerous substance;
- (b) changes of phase of a dangerous substance, eg a change from liquid to gaseous chlorine;
- (c) the introduction of new, or removal of existing, dangerous substances;
- (d) new processes;
- (e) changes to storage facilities;
- (f) changes to a safety instrumented system;
- (g) changes to the mode of delivery or transport of dangerous substances, eg a change from daily road tanker deliveries to weekly ship deliveries;
- (h) changes to the design or location of control rooms and/or the number of people present within them;
- (i) changes to the location of occupied buildings and/or the number of people present within them;
- (j) changes to the original design parameters such as process operating conditions or practices, changed throughput, design life extensions or removal of safety-critical plant.

Process Safety Review Screening Form

© IChemE 2010. This document is the property of IChemE and is not to be reproduced without the permission of IChemE. It is intended for use by members of IChemE and is not to be distributed outside the IChemE membership. It is not to be used for any other purpose without the prior written consent of IChemE. IChemE is not responsible for any loss or damage arising from the use of this document.


Q No	Question	Answer	Comments
1	Has the change introduced a new or different hazard?	Yes/No	
2	Has the change introduced a new or different hazard?	Yes/No	
3	Has the change introduced a new or different hazard?	Yes/No	
4	Has the change introduced a new or different hazard?	Yes/No	
5	Has the change introduced a new or different hazard?	Yes/No	
6	Has the change introduced a new or different hazard?	Yes/No	
7	Has the change introduced a new or different hazard?	Yes/No	
8	Has the change introduced a new or different hazard?	Yes/No	
9	Has the change introduced a new or different hazard?	Yes/No	
10	Has the change introduced a new or different hazard?	Yes/No	
11	Has the change introduced a new or different hazard?	Yes/No	
12	Has the change introduced a new or different hazard?	Yes/No	
13	Has the change introduced a new or different hazard?	Yes/No	
14	Has the change introduced a new or different hazard?	Yes/No	
15	Has the change introduced a new or different hazard?	Yes/No	
16	Has the change introduced a new or different hazard?	Yes/No	
17	Has the change introduced a new or different hazard?	Yes/No	
18	Has the change introduced a new or different hazard?	Yes/No	
19	Has the change introduced a new or different hazard?	Yes/No	
20	Has the change introduced a new or different hazard?	Yes/No	
21	Has the change introduced a new or different hazard?	Yes/No	
22	Has the change introduced a new or different hazard?	Yes/No	
23	Has the change introduced a new or different hazard?	Yes/No	
24	Has the change introduced a new or different hazard?	Yes/No	
25	Has the change introduced a new or different hazard?	Yes/No	
26	Has the change introduced a new or different hazard?	Yes/No	
27	Has the change introduced a new or different hazard?	Yes/No	
28	Has the change introduced a new or different hazard?	Yes/No	
29	Has the change introduced a new or different hazard?	Yes/No	
30	Has the change introduced a new or different hazard?	Yes/No	
31	Has the change introduced a new or different hazard?	Yes/No	
32	Has the change introduced a new or different hazard?	Yes/No	
33	Has the change introduced a new or different hazard?	Yes/No	
34	Has the change introduced a new or different hazard?	Yes/No	
35	Has the change introduced a new or different hazard?	Yes/No	
36	Has the change introduced a new or different hazard?	Yes/No	
37	Has the change introduced a new or different hazard?	Yes/No	
38	Has the change introduced a new or different hazard?	Yes/No	
39	Has the change introduced a new or different hazard?	Yes/No	
40	Has the change introduced a new or different hazard?	Yes/No	
41	Has the change introduced a new or different hazard?	Yes/No	
42	Has the change introduced a new or different hazard?	Yes/No	
43	Has the change introduced a new or different hazard?	Yes/No	
44	Has the change introduced a new or different hazard?	Yes/No	
45	Has the change introduced a new or different hazard?	Yes/No	
46	Has the change introduced a new or different hazard?	Yes/No	
47	Has the change introduced a new or different hazard?	Yes/No	
48	Has the change introduced a new or different hazard?	Yes/No	
49	Has the change introduced a new or different hazard?	Yes/No	
50	Has the change introduced a new or different hazard?	Yes/No	




Process Safety Review Screening Form



- Process Safety Screening Form
- Dos and Don'ts . . . APPROVER:

 Do assure that the PSR Screening Form is reviewed and approved by a qualified member of the process safety group/department.

 Do not allow other department reps to sign off the PSR Screening Form regardless of training or background

Process Safety Review Screening Form

is covered under Temporary Detached Safety Device (TDDSD) Procedure, refer to that procedure for requirements and protocol. Completion of this form is not required if (MOC) not covered by TDDSD, including temporary facility modifications, construction project change orders, or changes to operating procedures, require completion of this form. The MOC is covered by items in Section 4. Items 5.1 thru 5.2 change is not covered by Temporary Detached Safety Device Procedure, refer to direction provided under Participants, Method, Outcome, & Approval.

Item	Yes/No/NA	Minimum Participants	Method	Outcome/Potential Outcome	Approvals Required
Potential for Broader Outside Impact					
1.1		PKS Facilitator, (for large scale minim. Facility being Operated), Operations Resp (Operator), Project Tech Lead Eng	PKS Study via Facility Siting Checklist	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
1.2		PKS Facilitator, (for large scale minim. Facility being Operated), Operations Resp (Operator)	PKS Study via Facility Siting Checklist	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
1.3		PKS Facilitator, Operator Resp, Project Tech Lead Eng, Operator Resp (2nd party), Project Tech Lead Eng (2nd party)	PKS Study	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
Impacts to P&H Scenario Cases / Consequences (Unmitigated)					
2.1		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng	PKS Study or Miss P&H Study (new/modified scenarios only)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
2.2		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng	PKS Study or Miss P&H Study (new/modified scenarios only)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
2.3		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng	PKS Study or Miss P&H Study (new/modified scenarios only)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
2.4		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng	PKS Study or Miss P&H Study (new/modified scenarios only)	Updated Documentation, Update P&H Tables, Communication of change and lower risk to Operations	
Impacts to P&H Scenario Safeguards/Protective Layers (Mitigated Consequences)					
3.1		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng, Possible participants: Process Engineer, Mechanical Engineer	PKS Study or Miss P&H Study (new/modified scenarios only)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
3.2		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng, Possible participants: Process Engineer, Mechanical Engineer	PKS Study or Miss P&H Study (new/modified scenarios only), SI Documentation/Calculations Review, Process Safety Team Calculations Review (as needed)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables, Update P&H Tables	
3.3		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng	PKS Study or Miss P&H Study (new/modified scenarios only)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
3.4		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng, Process Engineer	PKS Study or Miss P&H Study (new/modified scenarios only), Review: Alarm System Review	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables, Review Calculations, Update Alarm System Report, Update P&H Tables	
3.5		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng	PKS Study or Miss P&H Study (new/modified scenarios only)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
Process Changes (Potential New or Modified Scenarios)					
4.1		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng	PKS Study or Miss P&H Study (new/modified scenarios only)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	
4.2		PKS Facilitator, Operations Resp (Operator), Project Tech Lead Eng	PKS Study or Miss P&H Study (new/modified scenarios only)	Design changes, Additional Safeguards (preventative and/or mitigating), Update P&H Tables	

Process Safety Review Screening Form



- Process Safety Screening Form
- Dos and Don'ts . . . WORK GROUP:

 Do use the same PSR Screening Form for all changes

 Do not allow other groups or functions to use other screening tools

Procedure: refer to that procedure for requirements and protocol. Completion of this form is not required for modifications, construction project change orders, or changes to operating procedures, require completion of this form not covered by Temporary Interim Safety Change Procedures, refer to direction provided under Participants, Method, Outcome, & Approval.

Yes/No/NA	Potential for broader Outside Impact	Minimum Participants	Method	Outcome/Potential Outcomes	Approvals Required
1.1	Does the change involve modifications to occupied spaces including adding new occupied building, removing occupied building, or modification of an existing occupied building? Are occupied spaces in the scope of the process involved in the change?	PKA Facilitator; (for large scale minims, Facility Safety Specialist); Operations Resp (Operator); Project Tech Lead Eng	PKA Study via Facility Safety Checklist	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
1.2	Are there minims (public or non-controlled) within () of process equipment or a process through involved in this change?	PKA Facilitator; (for large scale minims, Facility Safety Specialist); Operations Resp (Operator)	PKA Study via Facility Safety Checklist	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
1.3	Does the change involve process streams that feed or are fed by adjacent downstream/upstream facilities (internal or external)? Consider potential process changes as defined in Section 4 that feed downstream facilities or receive flow paths from these facilities (consider shared infrastructure, utility transfer, etc.)	PKA Facilitator; Operations Resp; Project Tech Lead Eng; Operations Resp (Operator); Project Tech Lead Eng (3rd pt.)	PKA Study	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
2	Impacts to PKA Scenario Cases / Consequences (Unmitigated)				
2.1	Does the change add, impact/modify, or remove a cause for an existing scenario or add, impact/modify, or remove equipment/components that are a cause for an existing scenario?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng	PKA Study or Mini-P&H Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
2.2	Does the change impact an existing scenario by increasing the maximum potential pressure that may be introduced into a node? Or does the modification change the source of that pressure?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng	PKA Study or Mini-P&H Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
2.3	Does the change impact an existing scenario by altering (lowering) the node design pressure (i.e. the pressure rating of modified components or equipment is less than the pressure rating of the existing equipment or component for the existing node). Does the change involve equipment that limits the node design rating?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng	PKA Study or Mini-P&H Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
2.4	Does the change impact PKA scenario documentation by lowering the maximum potential pressure source that may be introduced into a node? Or by raising the node design pressure (i.e. any/all equipment or components which limit the node pressure rating are being replaced, modified, and/or rated to a higher pressure rating. Risk is lowered due to these changes or other similar changes).	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng	Updated Documentation; PKA Documentation updates (approved only)	Updated Documentation; Update P&H Tables; Communication of change and lower risk to Operations	
3	Impacts to PKA Scenario Safeguards/Protective Layers (Mitigated Consequences)				
3.1	Does the change add, modify, or remove any mechanical safety device (such as pressure safety valves (PSV), rupture discs, check valves, etc.) or have any potential to affect probability of failure (as defined) of the device (including changes to components, changes to test frequency, changes to process media, setpoints, etc.)?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng; Possible participants: Process Engineer; Mechanical Engineer	PKA Study or Mini-P&H Study (new/modified scenarios only); Possible participants: Process Engineer; Mechanical Engineer	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables; Device Calculations; Update P&H Tables	
3.2	Does the change add, modify, or remove any safety instrumented function (SIF) or have any potential to affect probability of failure (as defined) of a component of an SIF including changes to burner management systems (BMS), changes to reset queues, final elements, logic solvers, control logic/programming, communications equipment (cabling, lines), components, test frequency, setpoints, etc.)	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng; Possible participants: Instrumentation Engineers	PKA Study or Mini-P&H Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
3.3	Does the change add, modify, or remove any credited independent protection layer (IPL) or credited safeguard?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng	PKA Study or Mini-P&H Study (new/modified scenarios only); Project Tech Lead Eng	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables; Device Calculations; Update P&H Tables; Update P&H Tables	
3.4	Does the change have potential to impact the design or sizing basis for the flare system?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng; Possible participants: Process Engineer	PKA Study or Mini-P&H Study (new/modified scenarios only); Project Tech Lead Eng	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables; Review: Flare System Review	
3.5	Does the change add, modify, or remove any safeguard (including mitigating safeguards and/or safeguards not credited as independent protection layers such as gas detection systems, fire suppression, H2S, operator response to alarms, etc.)?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng; Possible participants: Eng resp (discipline from H2S, Fire & Gas, etc.)	PKA Study or Mini-P&H Study (new/modified scenarios only); Possible participants: Eng resp (discipline from H2S, Fire & Gas, etc.)	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
4	Process Changes (Potential New or Modified Scenarios)				
4.1	Does this change add a new node to the existing facility P&H study?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng	PKA Study or Mini-P&H Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	
4.2	Does the change add, modify, or remove process equipment, (i.e. vessels, tanks, pumps, compressors, exchangers, piping, etc.)?	PKA Facilitator; Operations Resp (Operator); Project Tech Lead Eng	PKA Study or Mini-P&H Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update P&H Tables	

Process Safety Screening Form



Process Safety Review Screening Form

If change is covered under Temporary Defered Safety Device (TDSD) procedure, refer to that procedure for requirements and protocol. Completion of this form is not required.
 All changes (MOC) not covered by TDSD, including temporary facility modifications, corrective project change orders, or changes to operating procedures, require completion of this form.
 If Answer Yes or Unsure for items in Section 1 thru 5 (and change is not covered by Temporary Defered Safety Device Procedures), refer to direction provided under Participants, Method, Outcome, & Approval.

Enter X below
 Yes/Unsure/No

Line	Yes/Unsure/No	Potential for broader Outside Impact	Minimum Participants	Method	Outcome/Potential Outcomes	Approvals Required
1.1		Does the change involve modifications to occupied spaces including adding new occupied building, removing occupied building, or modification of an existing occupied building? Are occupied spaces in the vicinity of the process involved in the change?	PHA Facilitator; (for large scale reviews, Facility Siting Specialist); Operations Rep (Operator); Project Tech Lead Eng	PHA Study via Facility Siting Checklist	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
1.2		Are there roadways (public or non-controlled) within () of process equipment or a process flowpath involved in this change?	PHA Facilitator; (for large scale reviews, Facility Siting Specialist); Operations Rep (Operator)	PHA Study via Facility Siting Checklist	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
1.3		Does the change involve process streams that feed or are fed by adjacent downstream/upstream facilities (internal or external)? Consider potential process changes as defined in Section 4 that feed downstream facilities or reverse flow paths to these facilities. (Consider shared infrastructure, custody transfer, etc.)	PHA Facilitator; Operator Rep; Project Tech Lead Eng; Operator Rep (Int party); Project Tech Lead Eng (Int party)	PHA Study	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
Impacts to PHA Scenario Cases / Consequences (Contingency)						
2.1		Does the change add, impact/modify, or remove a cause for an existing scenario or does it impact/modify, or remove an equipment/component that is a cause for an existing scenario?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
2.2		Does the change impact an existing scenario by increasing the maximum potential pressure that may be introduced into a vessel? Or does the modification change the source of that pressure?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
2.3		Does the change impact an existing scenario by altering (lowering) the node design pressure (ie. pressure rating of new or modified components or equipment is less than the pressure rating of the weakest equipment or component for the existing node). Does the change involve equipment that limits the node pressure rating?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
2.4		Does the change impact PHA scenario documentation by lowering the maximum potential pressure source that may be introduced into a node or by raising the node design pressure (ie. any/all equipment or components which limit the node pressure rating are being replaced, modified, and/or re-rated to a higher pressure rating. Risk is lowered due to these changes or other similar changes.)	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Documentation updates required (only)	Updated Documentation; Update PHA Tables; Communication of change and lower risk to Operations	
Impacts to PHA Scenario Safeguards/Protective Layers (Mitigated Consequences)						
3.1		Does the change add, modify, or remove any mechanical safety device (such as pressure safety valves (PSVs), rupture disks, check valves, etc.) or have any potential to affect probability of failure on demand of the device (including changes to components, changes to test frequency, changes to process media, setpoints, etc.)?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng; Possible participants: Process Engineer; Mechanical Engineer	PHA Study or Mini PHA Study (new/modified scenarios only); NO Documentation/Calculations Required; Process Safety Time Calculations Review (as needed)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
3.2		Does the change add, modify, or remove any Safety Instrumented Function (SIF) (or Interlock or Instrumented Protective Function (IPF)) or have any potential to affect probability of failure on demand of a component of an SIF including changes to burner management systems (BMS), changes to sensing devices, final elements, logic solvers, control logic/programming, communications equipment (wiring, fiber), controllers, test frequency, setpoints, etc.)	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng; Process Engineer; SIS/Instrumentation Engineer	PHA Study or Mini PHA Study (new/modified scenarios only); NO Documentation/Calculations Required; Process Safety Time Calculations Review (as needed)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
3.3		Does the change add, modify, or remove any credited independent protection layer (IPL) or credited safeguard?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
3.4		Does the change have potential to impact the design or sizing basis for the flare system?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng; Process Engineer	PHA Study or Mini PHA Study (new/modified scenarios only); Relief Device Calculations; Review: Flare System Review	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
3.5		Does the change add, modify, or remove any safeguard including mitigating safeguards and/or safeguards not credited as independent protection layers such as gas detection systems, fire suppression, H2S, operator response to alarms, etc. (1)?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng; Possible participants: Eng Rep from H2S, Fire & Gas, etc.	PHA Study or Mini PHA Study (new/modified scenarios only); Technical Review (discipline specialist)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
Process Changes (Potential New or Modified Scenarios)						
4.1		Does this change add a new node to the existing facility PHA study?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
4.2		Does the change add, modify, or remove process equipment, (ie. vessels, tanks, pumps, compressors, exchangers, piping, etc.)?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	

4.3		Does the change add, modify, or remove a process flow path for any process stream, auxiliary stream, or utility stream (ie., new tie-in, change tie-in location relative to other flow paths, new potential blocked flow or trapped pressure locations, size change (pipe, valve, or flow orifice), control valve or shut-down valve location changes, changes to valve sizing, tagging, or vents, etc.)	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
4.4		Does the change modify process variables such as pressure; temperature; flowrate; velocity; fluid composition; heat/material balance, etc.) Includes primary process streams and auxiliary or utility process streams.	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only) possible PHA Documentation updates (only if all changes are as to 2.4 above)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
4.5		Does the change add, modify, or remove a Basic Process Control System (BPCS) (including changes to sensing devices, final elements, control logic/programming, communications equipment, components, test frequency, setpoints, etc.)?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
4.6		Does this change involve reactive chemicals? Does this change involve chemicals or materials that may auto-ignite?	PHA Facilitator; Operations Rep (Operator); Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
4.7		Does this change involve materials and/or process fluids that are considered highly hazardous or toxic, such as H2S, or potential fire/explosion, such as nitrogen.	PHA Facilitator; Operations Rep (Operator); Process Engineer; Project Tech Lead Eng	PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
4.8		Does the change involve processes where dust may be accumulated or processed?	PHA Facilitator (specialist in Dust Hazards, PHA); Operations Rep (Operator); Project Tech Lead Eng	PHA/PHA Study or Mini PHA Study (new/modified scenarios only)	Design changes; Additional safeguards (preventative and/or mitigating); Update PHA Tables	
Other Equipment/Device Mechanical Changes						
5.1		Does the change introduce a new deadleg or change an existing deadleg?	Discipline Engineering Group (Mechanical/Corrosion) Consult with Process Engineering Group	No PHA; Technical Review (Mechanical/Technical Review (Corrosion) IM&T Review	Design changes; Inspection, Maintenance, and Testing (IM&T) Program updates; Update Deadleg Register	
5.2		Does the change affect mechanical components, (rating/mechanical integrity of components (ie., replacement of tubes), replacement of valve components (including elastomers), material changes; corrosion resistance changes; change of pipe specification, etc.)	Discipline Engineering Group (Mechanical/Corrosion)	No PHA; Technical Review (Mechanical) IM&T Review	Design changes; IM&T program updates; Update PHA Tables	
5.3		Does the change affect instrumentation components including rating/mechanical integrity of instruments (ie., replacement of sensing device, transmitter, gauge, including elastomers); materials; connections; sensing range or span, etc.)	Discipline Engineering Group (Instrumentation)	No PHA; Technical Review (Mechanical) Tech Review (Instrumentation) IM&T Review	Design changes; IM&T program updates; Update PHA Tables	
No Process Changes Identified						
6.1		No Process changes or Mechanical Integrity related changes identified	Project Tech Lead Eng; Process Safety Engineer	No formal or semi formal process hazard review required	Statement below completed, reviewed, and approved	
Process Safety Review Method:						
Method of Process Safety Review Chosen (If Required):			* Indicate Not Applicable (N/A) if one not used and complete Section 8 Statement below			
Approve PHA Facilitator (large studies) / Approve PHA Facilitator (small studies) / Other / N/A			Select/Circle One			Required
Operator (Unit or Facility)			Yes / No / Optional	Select/Circle One		
Operations Lead Rep			Yes / No / Optional	Select/Circle One		
Project Technical Lead Eng			Yes / No / Optional	Select/Circle One		
Plant Eng / Facility Eng			Yes / No / Optional	Select/Circle One		
Process Engineer			Yes / No / Optional	Select/Circle One		
SIS/Instrumentation Engineer			Yes / No / Optional	Select/Circle One		
Mechanical Engineer			Yes / No / Optional	Select/Circle One		
Head/Party Rep			Yes / No / Optional	Select/Circle One		
Maintenance Rep/Technician			Yes / No / Optional	Select/Circle One		
Operator (Control Room/Plant)			Yes / No / Optional	Select/Circle One		
Other:			Yes / No / Optional	Select/Circle One		
Statement / Completion Sign-off						
* If No Process Safety Review is required beyond completing this form, include Statement below explaining rationale and considerations.						
Statement:	Name (Printed):	Signature	Position / Title	Date		
Form Completed By: (Typically Project Technical Lead Engineer)						
Name (Printed): Signature Position / Title Date						
Approvals (As required/defined by company based on company procedures)						
Process Safety Approval: (Process Safety representative sign off on all Process Hazard Review Decision Forms. Specific positions, as set by company procedure based on size of project.)						
Process Safety Engineer or Specialist:	Name (Printed):	Signature	Position / Title	Date		
Process Safety Lead or Supervisor:						
Additional Management Approvals: (As required, based on assessment above and company defined approval requirements.)						
Plant/Change Lead or Supervisor:	Name (Printed):	Signature	Position / Title	Date		
Plant Operations Supervisor:						
Area Operations Manager:						
Manager (Other):						

Trigger event – a modification – regulation 10(2)(d)

195 You must review and, if necessary, revise your safety report before certain modifications are made. This is aimed at modifications to establishments, processes, and the nature or quantity of dangerous substances which could have significant repercussions on the major accident hazards. Changes which either increase or decrease hazard or risk are important. It is not intended to deal with trivial changes.

196 Whether a modification has significant consequences will depend on the degree to which it introduces a new major accident hazard, or increases or decreases the risk from an existing hazard. The overall goal is to ensure that major accidents are prevented and the consequences of any that do occur are kept to a minimum. Examples of the sorts of changes which may have significant consequences include:

- a change in the quantity of a dangerous substance;
- changes of phase of a dangerous substance, eg a change from liquid to gaseous chlorine;
- the introduction of new, or removal of existing, dangerous substances;
- new processes;
- changes to storage facilities;
- changes to a safety instrumented system;
- changes to the mode of delivery or transport of dangerous substances, eg a change from daily road tanker deliveries to weekly ship deliveries;
- changes to the design or location of control rooms and/or the number of people present within them;
- changes to the location of occupied buildings and/or the number of people present within them;
- changes to the original design parameters such as process operating conditions or practices, changed throughput, design life extensions or removal of safety-critical plant.

Better MoC Practices for Better MoC PHA



- Require the following for MoCs and MoC PSRs:
 - Use an accurate, descriptive MoC titles
 - Provide complete descriptions of MoC project scope
 - Break down scope into each individual change
 - Assess each change based on criteria in PSR screening form

Better PHA Practices for Better MoC PHA

- Require the following in PHAs to support MoC PSRs:
 - For each scenario, include limiting component tag and rating and include worst case deviation value and source (including tags)
 - Include all components of automated functions in nomenclature describing all causes and/or safeguards
 - Conduct MoC PSRs ahead of design and purchasing commitments
 - Complete all follow-up items identified



Anecdote . . .



Hazards31

Small MoC PHA - Pitfalls

- **Don't . . .**

- Assume recommendations from HIRA, audits, or investigations are vetted and approved
- Assume that utility or auxiliary systems are exempt from process safety review requirements
- Presuppose the level of risk associated with a change before conducting the HIRA



Small MoC PHA - Barriers

- HIRA/PHA Software – expensive, specialty
 - Use mark-ups of HIRA/PHA tables in PDF format
 - Use a simple spreadsheet, but include all deviations, criteria, and checklists per company protocol



Small MoC PHA - Barriers

- HIRA/PHA Software – expensive, specialty
 - Use mark-ups of HIRA/PHA tables in PDF format
 - Use a simple spreadsheet, but include all deviations, criteria, and checklists per company protocol
- Skilled, trained HIRA/PHA leaders
 - Qualify wider pool of skilled HIRA/PHA leaders
 - Create two-tiered facilitator qualifications

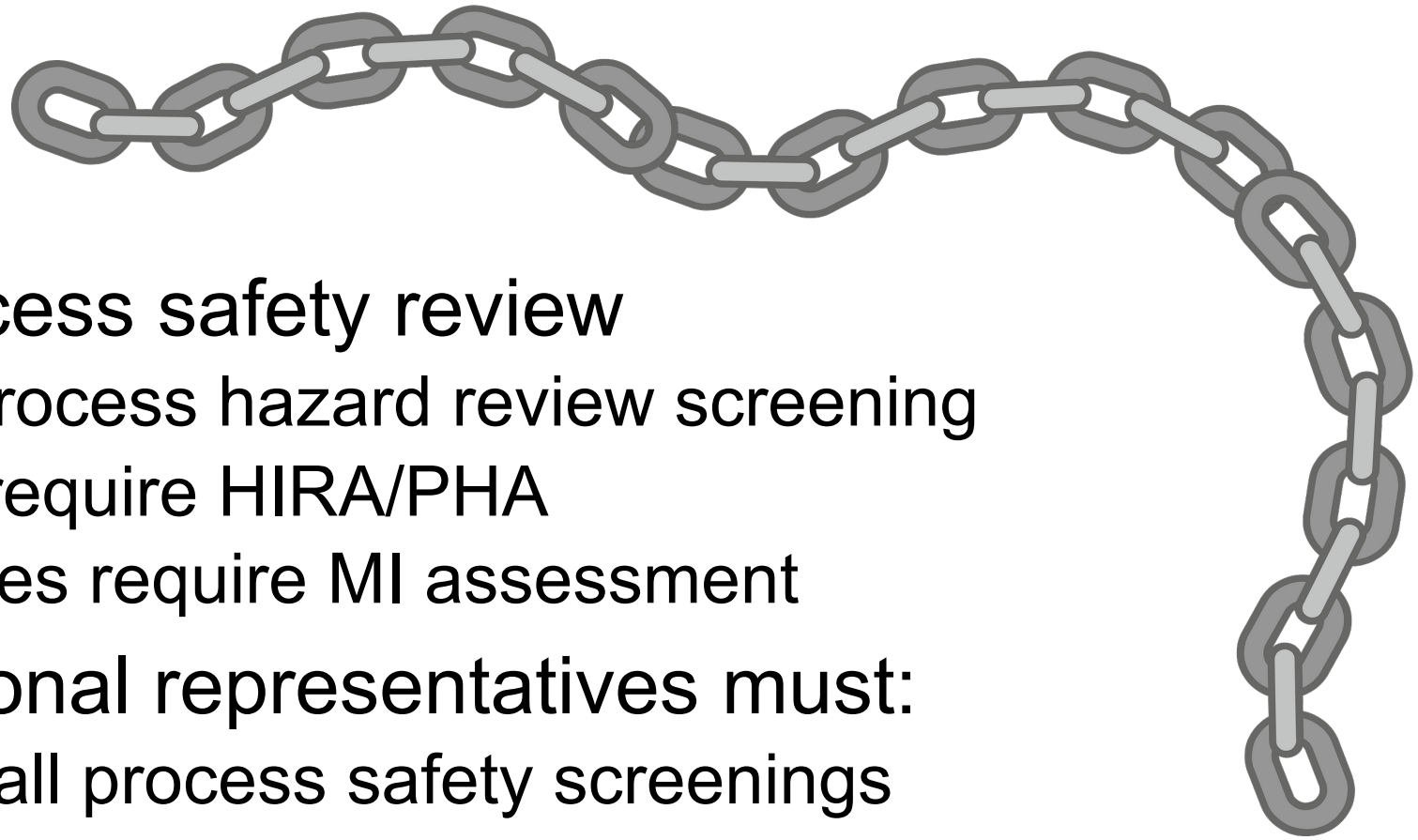


Small MoC PHA - Perceived Barrier

- HIRA/PHA is often perceived is equating to:
 - Complex
 - Long duration
 - Large team; costly
- In fact, a mini-HIRA/PHA on a small change can require less than a couple hours with a couple participants

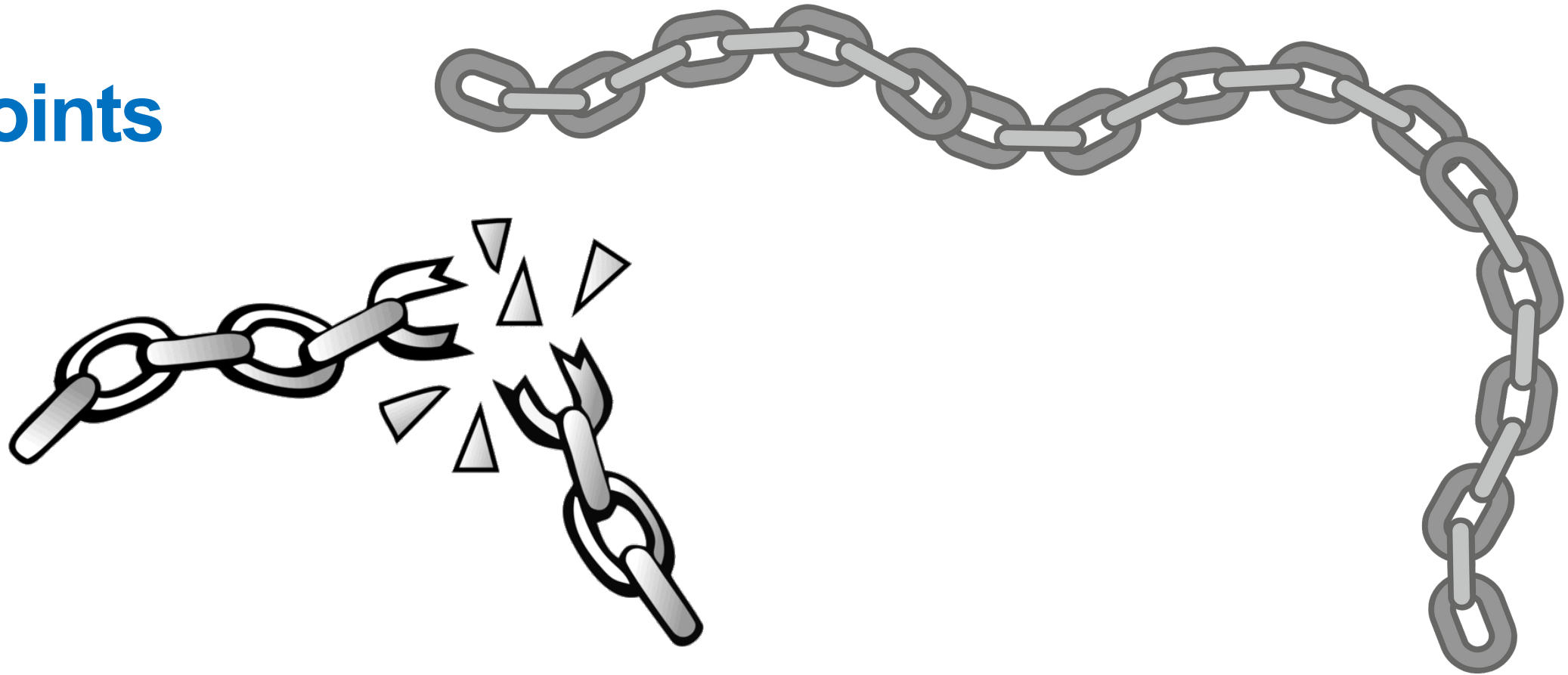


Key Points



- All MoCs require process safety review
 - All changes require process hazard review screening
 - All process changes require HIRA/PHA
 - All mechanical changes require MI assessment
- Skilled, trained functional representatives must:
 - Review and approve all process safety screenings
 - Lead all process safety hazard reviews
 - Complete mechanical design and maintenance assessments
- Apply the same HIRA methodology to changes of all sizes

Key Points



- Apply the same HIRA methodology to changes of all sizes
- **A chain is only as strong as its weakest link!**

Questions?

- Any questions or comments?

Jody E Olsen P.E.
JE Olsen Consulting LLC
jodyo@jeolsenconsulting.com

Hazards31

