Technical Safety Authority of Saskatchewan

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Application for the Registration of a Pressure Relief Path Stop Valve Control Program

Information Paper IP-2016-07-07

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1. Scope

TSASK has expanded the opportunities for owners to use stop valves in the pressure relief paths (PRP) of pressure relief devices. This paper discusses the requirements for a Pressure Relief Path (PRP) Stop Valve Control Program in and the circumstances under which TSASK will accept the programs.

2. Background

Stop valve(s) are not permitted in pressure relief paths including pressure relief device (PRD) inlet and discharge piping unless provisions exist in the CSA and ASME Code for their installation (CSA B51, Part 1, 12 and ASME BPVC Section VIII, Division I, Appendix M-5, ASME B31.3) and a program describing the method of controlling the operation of these isolation valves has been registered by the Technical Safety Authority of Saskatchewan (TSASK).

A PRP Stop Valve Control Program shall include such measures as are necessary to ensure that the safety of pressure equipment and/or piping is not compromised by the installation and operation of these stop valves.

Please note: Stop valve(s) **are not permitted in boiler pressure relief device piping** (***ASME Section I Power Boilers and ASME Section IV Heating Boilers***)

3. Summary of Code Requirements

Clause (ASME BPVC Section VIII, Division I)[1]	Requirements			
	Administrative Control[2]	Valve Operation Control[2]	Valve Failure Control[2]	Mechanical Locking Elements[2]
M-5.5 Stop valves provided in systems for which the pressure originates exclusively from an outside source	√ (4)			
M-5.6 **Full area stop valves** provided upstream or downstream of the pressure relief device exclusively for maintenance of that device	√		√	√
M-5.7 Stop valves in the pressure relief path where there is normally process flow with the following conditions: (b) (1) Pressure due to closure of the valve ≤ 116% MAWP	√ (4)			
(b) (2) Pressure due to closure of the valve $\leq Documented\ Test\ Pressure \times \frac{S_{Design\ Temp}}{S_{Test\ Temp}}$ (2) & (3)	√			√
(b) (3) Pressure due to closure of the valve exceeds Clause 2)	√	√	√	√
M-5.8 **Full area stop valves** in the pressure relief path where there is normally process flow and where fire is the only potential source of overpressure	√ (4),(5)			

[1] The owner shall prove the design conditions of each PRP stop valve
[2] See Glossary of Terms for definition
[3] Multiplying ($t_{Nominal} - t_{Corrosion\ Allowance}$) / $t_{Nominal}$, when ASME BPVC Sec VIII, Division I UG-99(c) applied.
[4] Requirements of ASME B31.3, see Appendix III
[5] Shall indicate that equipment is depressurized and free of liquids during upset condition.

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4. PRP Stop Valve Control Program Submission Requirements

Prior to the installation of any PRP stop valve, the owner shall have a registered PRP Stop Valve Control Program with TSASK. Refer to *IP-2016-07-08 PRP Stop Valve Control Program Manual Requirements* for the detailed requirements of the program manual.

4.1. Program Registration

An owner shall submit a written request to TSASK for the registration of a PRP Stop Valve Control Program. The submission shall include:

- Submission of Application for the Registration of PRP SVC Program from TSASK's website under Quality Management Systems;
- One controlled copy of the PRP Stop Valve Control Manual (an electronic copy is acceptable, if provisions are in the manual to control electronic copies) be emailed to qualityprograms@tsask.ca; and
- The applicable fee shall be paid online during application.

4.2. Program Manual Requirements

The PRP Stop Valve Control Program manual shall include as a minimum the following items:

- General Information: Title Page, Table of Contents and Glossary of Terms
- Statement of Authority and design philosophy (why the stop valves are required)
- Stop Valve List and Mechanical Locking Elements Information, when necessary
- Implementation Procedure: Administrative Control, Valve Operational Control, Valve Failure Control and Mechanical Locking Information, when necessary
- Record: Manual Control and Record Retention

4.3. Quality Management Systems

Registered Quality Management System (QMS) holders may add a section on PRP Stop Valve Control Procedure to their existing QMS manual. To do this, check of "QMS Addition" for "Type of Submission" during application.

Refer to information paper *IP-2016-07-08 Pressure Relief Path Stop Valve Control Program Manual Requirements* for more details.

5. Audits

An implementation audit including the manual and site inspection(s) shall be performed by TSASK on the PRP Stop Valve Control Program prior to full registration (Year 0). Once fully registered, the PRP Stop Valve Control Program shall be subject to periodic audits as indicated by **Table One: PRP Stop Valve Control Program Audit Cycle**. Selective audits will be performed during the Year 3 & Year 6 audit intervals. These selective audits shall be a sampling of sites, procedural documents or whatever the TSASK Auditor requires for that audit cycle.

In Year 9, a complete audit shall be performed. This audit will be much the same as the implementation audit and shall cover the program in more depth. The details of the audits shall be decided in advance so owners have time to prepare for the review.

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Table One: PRP Stop Valve Control Program TSASK Audit Cycle

Audit Cycle for the PRP Stop Valve Control Program		
Year 0	Implementation Audit of Program	• TSASK Auditors shall review manual & overall program • Field inspector(s) & TSASK Auditor shall do joint site inspections
Year 3 & Year 6	Selective Audits of Program	• TSASK Auditor shall review manual changes • Field Inspectors shall be given a sampling of sites to check for • Field Inspectors shall return findings to Auditor by preset date
Year 9	Full Audit of Program	• TSASK Auditors review manual & overall program • Field inspector(s) & TSASK Auditor shall do joint site inspections • Field Inspectors may be given a sampling of sites to check for • Field Inspectors shall return findings to Auditor by preset date

6. Responding to Audit Findings

Owners shall have 60 days to comply with any findings of an audit. A conditional registration may be granted depending on the types of findings. If an owner fails to comply within 60 days, the owner of the facility shall receive a notification from TSASK for non-compliance and to provide a response to the notification to TSASK within 30 days. If no response is received within the 30 day time interval, PRP Stop Valve Control Program registration may be cancelled and the owner of the facility maybe required to remove all stop valves in the relief path (including process valves) from the system.

7. PRP Stop Valve Control Program Revisions and Renewal

7.1. Program Changes between Audits

Owners shall not be required to notify TSASK of changes to the program manual **unless** the changes substantially affect the registered procedures or the program manual has been extensively rewritten. Otherwise, all program changes shall be highlighted and brought to the attention of the TSASK Auditor during the next audit cycle for review.

7.2. Additions or Removals of Sites

Should an owner add a new site to or remove an existing site from their registered program, a notification shall be sent to TSASK using form *TSK-0015 – Update to a Registered PRP Stop Valve Control Program*. Failure to keep TSASK up-to-date on the sites included in the program by using this form may result in the cancellation/suspension of the PRP Stop Valve Control Program.

7.3. Other Program Changes

Other additions such as valve(s) or valve number changes do not need to be submitted to TSASK but shall be highlighted for TSASK to review at the next audit.

7.4. Program Renewal

Program shall be renewed before expiring. At renewal an audit will be performed to access past conformance with the program.

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8. Property Ownership Change

In the case of an ownership change to a property with a PRP Stop Valve Control Program, the new owner shall either:

- Add the new location to their registered PRP Stop Valve Control Program; or
- Register a PRP Stop Valve Control Program with TSASK.

8.1. Owner with a PRP Stop Valve Control Program

In the case where the owner has an existing program, the owner shall notify TSASK of the addition of the new location under their registered program using form *TSK-0015 – Update to a Registered PRP Stop Valve Control Program*.

8.2. Owner does not have a PRP Stop Valve Control Program

When the owner who purchases a site with stop valves in the PRP does not have a registered program, the new owner has one of options:

- Develop a program; or
- Remove the stop valves.

8.2.1. Owner wants to develop a program

If the new owner does not have a program but wants to develop one, the owner shall notify TSASK of their intention to develop a program. The notification shall be received within 90 days of the sale of the property. Until the new owner's program is in place, **no PRP stop valves shall be operated**.

8.2.2. Owner does not want to develop a PRP Stop Valve Control Program

If the new owner does not want to develop a PRP Stop Valve Control Program, all the PRP stop valves shall be removed. A plan for the removal of the valves shall be submitted to TSASK within 90 days of the sale.

TSASK shall review the plan and provide the new owner with either a letter of acceptance for the removal plan which may include additional TSASK requirements or a rejection of the proposal with substantial changes required before the proposal is acceptable to TSASK.

Until the valves are removed, **no owner shall allow the operation of these valves under any circumstance**. All valves that are subject to removal shall be disabled so they cannot be operated and tagged or clearly identified that they are to be removed.

Once all the PRP stop valves have been removed, written confirmation of the removal of all stop valves in the PRP from the purchased sites shall be signed and dated by an official of the new owner's company and submitted to TSASK. TSASK shall confirm the removal of the stop valves at the next site visit.

9. Currently Registered Pressure Relief Device Stop Valve Program Holders

To continue using existing PRP stop valves, owners registered under the old Pressure Relief Device Isolation Valve Control Program shall either:

- Update and re-register the existing program following the new program requirements of the PRP Stop Valve Control Program; or
- Add the new PRP Stop Valve Control Program requirements into the registered QMS manual.

In both cases, existing PRP stop valve lists shall be updated to include (if not already part of the list):

- site locations;
- applied ASME BPVC Section VIII Appendix M-5 clause; and
- description of control requirement.

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10. Glossary of Terms

Administrative Control – Procedures that are intended to ensure that personnel actions do not compromise the overpressure protection of the equipment. It includes, as a minimum, Documented Operation and Maintenance Procedures, and Training of Operator and Maintenance Personnel.

ASME – American Society of Mechanical Engineers

ASME BPVC – ASME Boiler and Pressure Vessel Code

CSA - Canadian Standards Association

Full Area Stop Valve – A valve in which the flow area of the valve is equal to or larger than the inlet flow area of the pressure relief device.

Mechanical Locking Elements – Elements that provide a physical barrier to the operation of the stop valve, such that the stop valve is not capable of being operated unless a deliberated action is taken to remove or disable the element. Examples of mechanical locking elements include locks on the stop valve hand-wheels or levers and plastic or metal straps (car seals).

Pressure Relief Path (PRP) – It consists of all equipment, pipe, fittings, and valves in the flow path between any protected equipment and its pressure relieving device, and between the pressure relieving device and the discharge point of the relieving stream.

$S_{Design\ Temp}$ – Stress valve at the design temperature

$S_{Test\ Temp}$ – Stress valve at the test temperature

TSASK – Technical Safety Authority of Saskatchewan

TSASK Auditor - A person designated as an Auditor by the TSASK Chief Inspector for the purpose of administering the *Saskatchewan Boiler and Pressure Vessel Act and Regulations*.

TSASK Inspector or Field Inspector – A person designated as an Inspector by the TSASK Chief Inspector for the purpose of administering the *Saskatchewan Boiler and Pressure Vessel Act* and Regulations.

Valve Failure Control – Measures taken in valve design, configuration and/or orientation for the purpose of preventing an internal failure of a stop valve from closing and blocking the pressure relief path (i.e. the installation of gate valves with the stem oriented at or below the horizontal position).

Valve Operation Control – Devices used to ensure that stop valves within the pressure relief path are in their proper position. It includes mechanical interlocks, instrumented interlocks and three-way valves.

11. Additional Information & Questions

11.1. Design of Pressure Piping Systems Inquiries

If possible, applicants should contact their Design Reviewer directly with questions. Be sure to include the TSASK reference number or provide enough detail that the Design Reviewer will know which application is being referenced.

For all other design inquiries, please contact TSASK Codes & Standards Compliance:

- By email at CodesandStandards@tsask.ca;
- By phone at (866) 530-8599. Please ask to speak to either a TSASK Design Reviewer or the Manager, Codes & Standards Compliance; or
- Visit the TSASK website at www.tsask.ca for more information.

11.2. QMS/QCP and Inspection Inquiries

For additional information or if there are any further questions or concerns, please contact TSASK:

- By email at info@tsask.ca;
- By phone at (866) 530-8599. Please ask to speak to a TSASK inspector or the Manager, Boiler and Pressure Vessel Safety; or
- Visit the TSASK website at www.tsask.ca for more information

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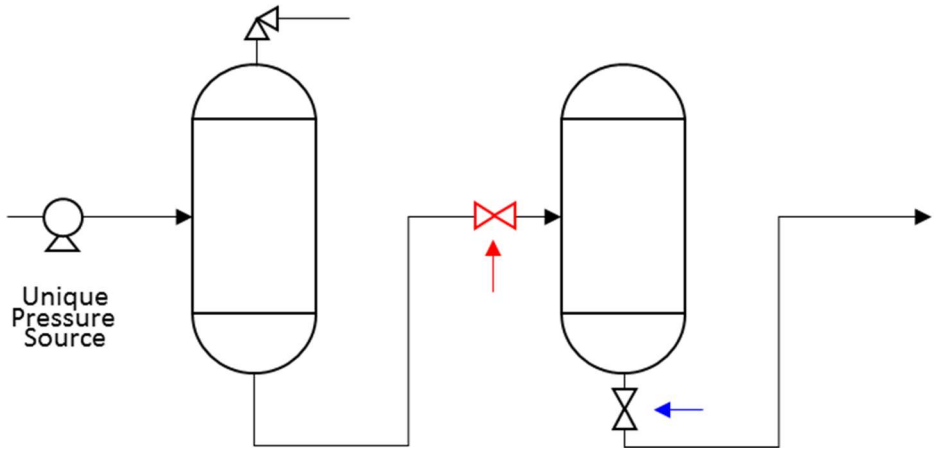
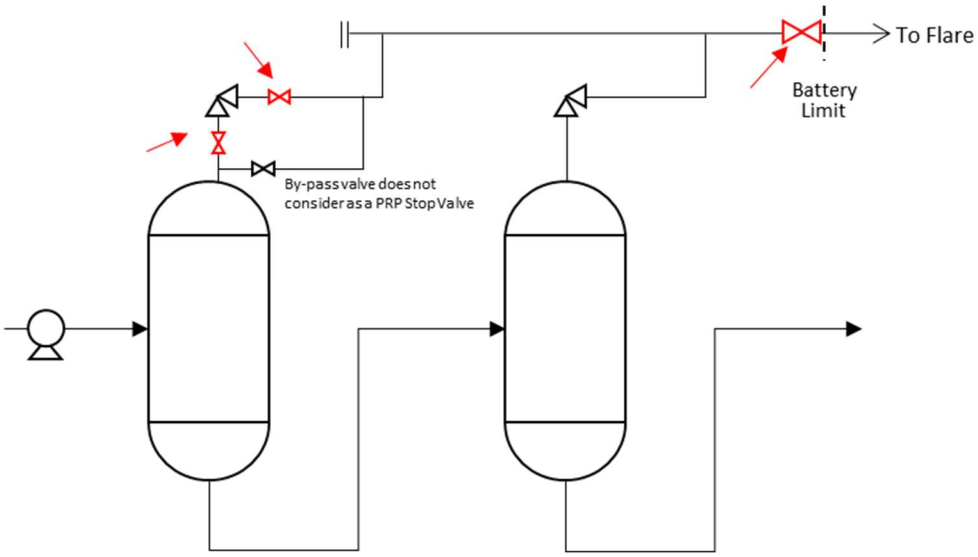
APPENDIX I. Example Diagrams of ASME BPVC Section VIII M-5

1. **M-5.5 Case: Stop valves provided in systems for which the pressure originates exclusively from an outside source. The stop valves shall also isolate the vessel from the source of pressure.**



The valve with the red arrow also isolate the vessel from the source of pressure
(*) The valve with the blue arrow is acceptable according to UG-133 (c).

2. **M-5.6 Case: Stop valves provided upstream or downstream of the pressure relief device exclusively for maintenance of that device.**



The valves with the red arrow shall be full area stop valves and closed only for test, repair, and or replace the pressure relief device.
Please note that discharge piping may be run to a common header for pressure relief devices of a single fluid, provided the protected systems are at the same pressure based on the CSA B51 requirement.

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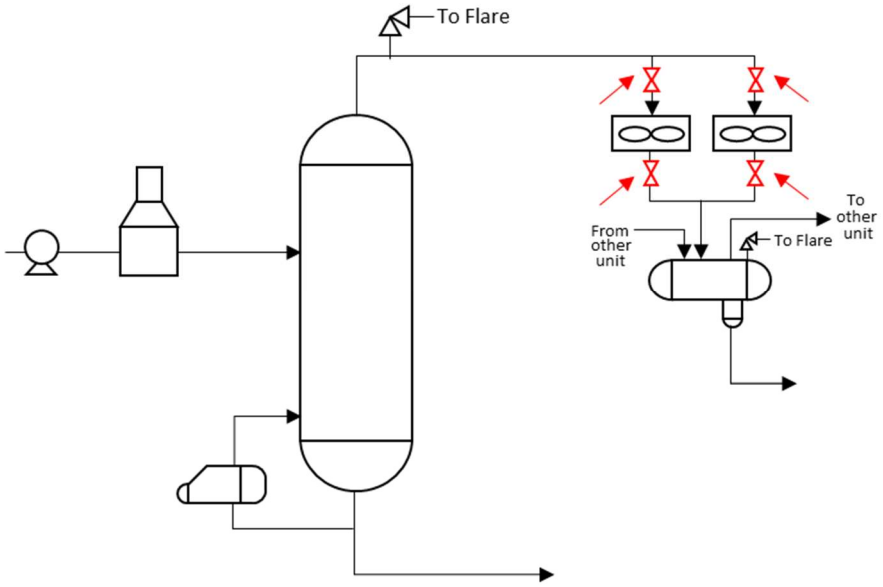
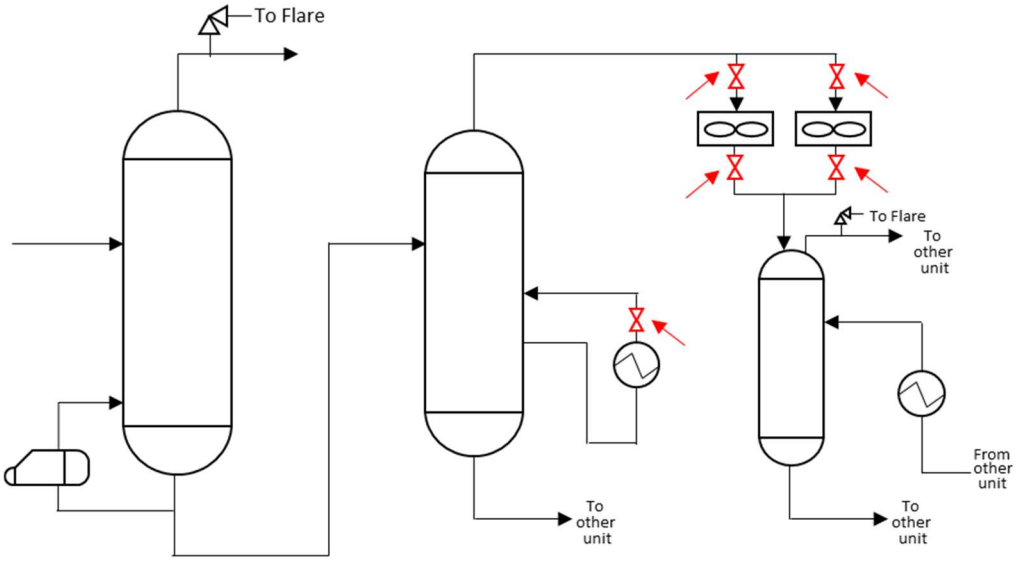
3. M-5.7 (b) (1) Case: Stop valves provided in the pressure relief path where there is normally process flow and the pressure due to closure of the valve cannot exceed 116% of MAWP.



Based on UG-133 (c), the air cooler inlet and outlet valves are considered as M-5.7 (b) (1) case as the air cooler is protected by upstream or downstream vessel's PSV.

4. M-5.7 (b) (2) Case: Stop valves provided in the pressure relief path where there is normally process flow and the pressure due to closure of the valve cannot exceed $\boldsymbol{Documented\ Test\ Pressure \times \frac{S_{Design\ Temp}}{S_{Test\ Temp}}}$



Owners shall calculate the pressure due to the closure of the valve to determine whether the pressure exceeds: *Documented Test Pressure x* $\frac{S_{Design\ Temp}}{S_{Test\ Temp}}$ when the nearest vessel does not have a PRD.

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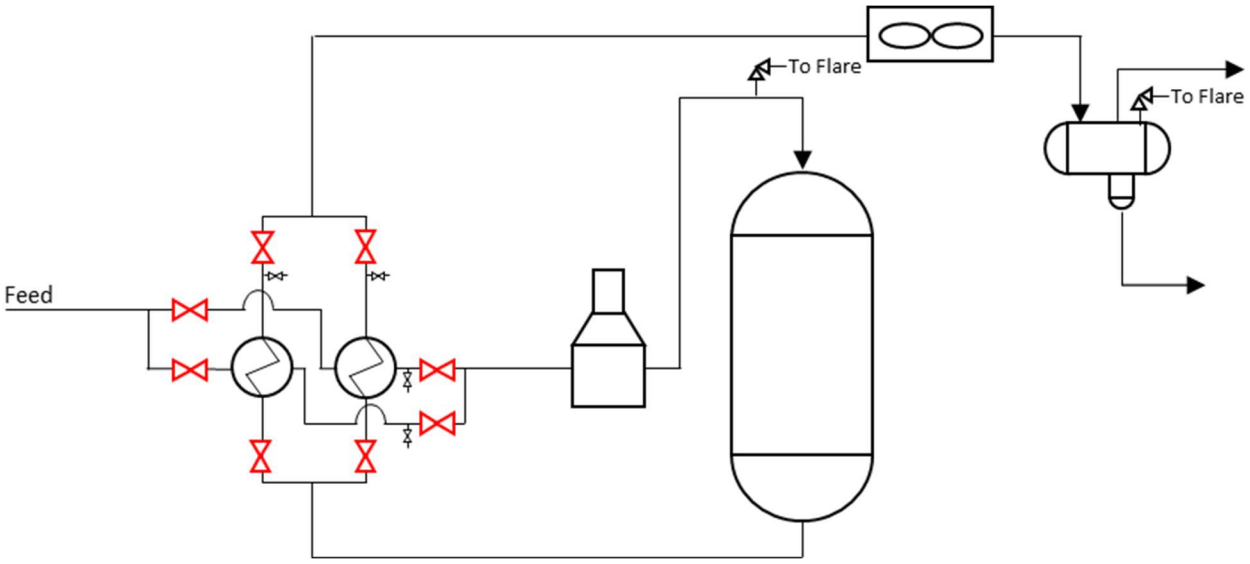
5. M-5.8 Case: Stop valves provided in the pressure relief path where there is normally process flow and where fire is only potential source of overpressure



M-5.8 case is only for fire relief case. Typically only used for heat exchangers or strainers in normally flowing line. M-5.8 requires that equipment shall be depressurized and free of liquids during isolation from its pressure relief path.

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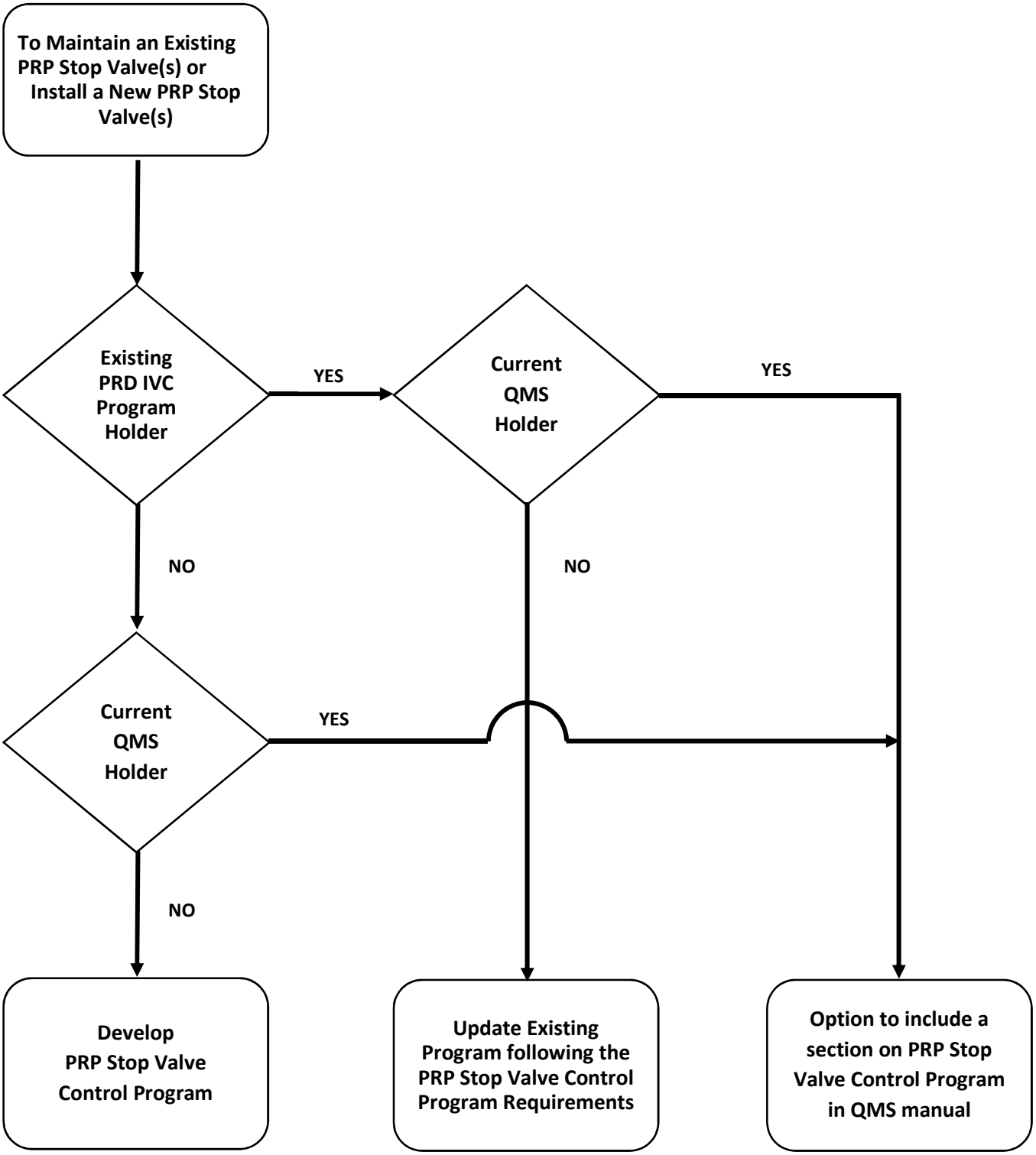
APPENDIX II. Flow Chart



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APPENDIX III. Comparison of ASME BPVC Section VIII AND B31.3 Requirements

<table>
<tr><th>B31.3 Clauses and Requirements</th><th>Relating Sec. VIII Clauses</th><th>Note</th></tr>
<tr><td>322.6.1(a) Full-area stop valve installed on inlet and/or outlet of PRD
• Stop valve will not reduce the PRD capacity; NOR
• Adversely affect the proper operation of the PRD

Additionally, F322.6 requires monitoring of authorized person during stop valve operation</td><td>M-5.6 Full area stop valve at upstream or downstream of the PRD exclusively for maintenance</td><td>M-5.6 requirements may cover 322.6.1(a)</td></tr>
<tr><td>322.6.1(b) Stop valve to be used in pressure relief piping
• Stop valve shall be installed or controlled such that the closing of the block valves will not reduce the PRD capacity</td><td rowspan="2">M-5.5 Stop valves for pressure originates exclusively from an outside source

M-5.7 Stop valves where there is normally process flow

M-5.8 Stop valves where there is normally process flow and where fire is the only potential source of over pressure</td><td rowspan="2">M-5.7 (b) (2) & (3), M-5.8 requirements may cover B31.3 322.6.1 (b), (c) requirements as it requires administrative control and/or mechanical locking.

However, M-5.5, M-5.7 (b) (1) do not conform to B31.3 requirements as they don’t require any procedures or mechanical locking.</td></tr>
<tr><td>322.6.1(c) As an alternative to (b)
• Stop valve shall be installed and arranged such that they can be locked or sealed in either the open or closed position</td></tr>
</table>

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APPENDIX IV. Frequently Asked Questions

Q: We already have a Car-Seal Program in the Quality Management System. Can we use this program instead of PRP Control Program?

A: Yes. Your Car-Seal Program, however, has to satisfy the requirements of the new PRP Stop Valve Control program.

Q: How can I determine whether administrative control, valve failure control or mechanical locking are required?

A: The owner is responsible for the classification of the PRP stop valve according to the code requirements. ASME BPVC Section VIII M-5.1 clearly indicates this: "Stop valve(s) located within the relief path is not allowed except as provided for in M-5.5, M-5.6, M-5.7, and M-5.8, and **only when specified by the user**". Therefore, the owner should review the process design and the PRD capacity to determine what kind of controls and mechanical locking devices are required. TSASK may ask the owner to prove design condition of PRP stop valve.

Q: What's the different between M-5.5 and M-5.8 cases other than a drain line?

A: The PRP Stop Valve shall isolate the equipment from the source of pressure when it is closed for M-5.5 Case. M-5.8 Case, however, the PRP Stop Valve cannot isolate the equipment from the all source of pressure as the fire is the potential source of overpressure.

Q: What's the different between M-5.5 and M-5.7 (b) (1) cases?

A: Again, the PRP Stop Valve shall isolate the equipment from the source of pressure when it is closed in M-5.5 Case. In a process chemical plant, equipment and units are connected to each other so overpressure may be from either way during upset condition (i.e. example diagram of M-5.7 (b) (1), there is a line from another unit to a receiver (horizontal vessel)). This is the difference between M-5.5 and M-5.7 (b) (1) cases.

Q: What's the different between M-5.7 and M-5.8 cases?

A: It is hard to tell the difference between M-5.7 and M-5.8 until the review of process design philosophy. However, in many cases, it is not necessary to consider external fire case for air coolers as many air coolers are located above the maximum fire height.
(See API 521 4.4.13.2.8 for further information)

Q: Is an isolation valve in a PSV by-pass line a PRP Stop Valve?

A: No. Generally, a PSV by-pass line is for operational purposes only during start up and shutdown.
M-5.7 and M-5.8 cases should be applied only where there is normally process flow.