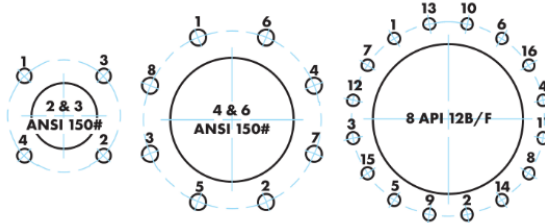


INTRODUCTION

This document summarizes the recommended practice for installing a PVRV, along with findings of Hawkeye in-house lab testing of 6" throat PVRVs against over-tightening and improper bolt sequencing.

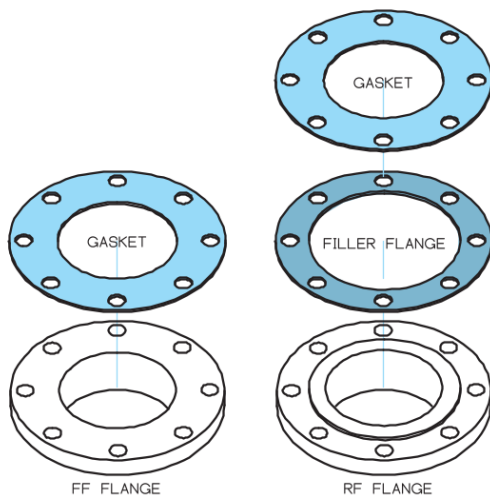
1 RECOMMENDED PRACTICE

When installing Hawkeye's Series 6000 PVRV (2"-6"), users should follow the Installation, Operation and Maintenance (IOM) guide. The following image depicts the correct bolting pattern and torque specification for the range of bolt patterns available with the 6" throat variant of the PVRV.



TORQUE RECOMMENDATION					
CXN	2 ANSI	3 ANSI	4 ANSI	6 ANSI	8 API
Torque	20 ft-lb	25 ft-lb	15 ft-lb	23 ft-lb	14 ft-lb

Hawkeye recommends using a flat-faced flange connection with all tank vents, which will provide an even force distribution across the base gasket. If a flat-faced connection is unavailable, a filler flange is required, as shown below.



Disclaimer: Tests were performed under ideal conditions in a clean shop environment. The small sample size means that test results are not statistically significant and should not be strictly relied upon. The torque limits outlined in Hawkeye's installation manuals are based on several factors, such as vibration, gasket material compression, and sealing performance, not just mechanical strength limitations. Not following the installation recommendations in the installation and operation manual could result in damage to property, production loss, or serious injury.

2 TESTING RESULTS

Hawkeye's Series 6000 PVRVs (6" throat variants) were tested to determine the resilience to overtightening and improper bolt-sequencing, specifically comparing performance across flat-faced and raised-face flange installation. The testing confirmed that the Series 6000 PVRV showcases excellent structural integrity, even when subjected to bolt torque far exceeding Hawkeye's recommended operational limits.

- **Mechanical Resilience:** When paired with the recommended flat-faced flange, the vents tested withstood a minimum of **4.4x the recommended limit**, with some cases reaching 150 ft-lb torque (6.5x recommended) without failure. With a raised-face flange, the vents reached a reduced minimum of **4.0x the recommended limit** before a failure was observed.
- **Failure Mode:** Failure occurred either by cracks appearing at the fillet where the nozzle meets the flange or at the bolt holes at the edge of the flange. Modes may differ depending on the flange size.
- **Sequence Tolerance:** Improper tightening sequences (non-cross-bolt patterns) did not result in detectable failures, which shows the PVRVs inherent tolerance to minor installation errors.

3 USER IMPLICATIONS

The comparison between these results and historical customer observations confirms that installation failures are most often caused by significant overtightening. Furthermore, the results show that using a raised-face flange without a filler reduces the factor of safety.

If damage to a PVRV flange is observed after installation, ensure installation was performed using the correct flange configuration, and following the procedure outlined in the IOM guide. To prevent overtightening, a calibrated torque wrench is recommended.