

TECHNICAL GUIDANCE

Car Seals

May 19, 2016




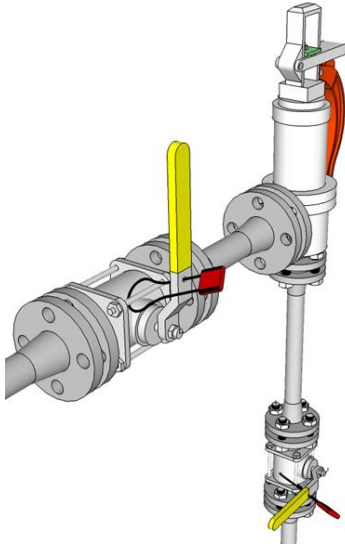
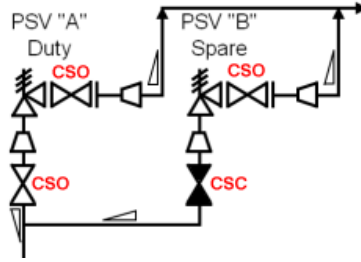
DEFINITION

A metal or plastic cable used to fix a valve in the open position - Car Seal Open (CSO), or closed position - Car Seal Closed (CSC)

APPLICABILITY

Car seals work much like a plastic cable tie. For valves, you pass the cable around the wheel or lever, then around the body of the valve or nearby steel work, push the end of the cable into the seal body. The cable is now locked in place and cannot be removed. The valve is now 'sealed'. To restore operation of the valve, the seal has to be cut.

Car seals are a relatively low cost, consumable item and are available in different cable lengths and colors. The seals can be uniquely marked with serial numbers for documentation purposes. See below of an example of a car seal, a car seal being utilized and an excerpt of a Piping and Instrumentation Diagram (P&ID) where car seals are identified.

Example Car Seal with Serial Number for Documentation	Car Seal In Use Locking Valve in Closed Position	Example Piping and Instrumentation Diagram (P&ID)
		

Car seals are generally used to seal a rail car, truck, cargo container or other openings to prevent/indicate tampering are also used in industry processes. A car seal is typically placed on a valve but it can be placed on any type of physical equipment to prevent unauthorized operation.

A common installation of a car seal is on an isolation valve under a Process Safety Valve (PSV) or Pressure Relief Valve (PRV) that must be inspected frequently without shutting down the entire process each inspection. It is important to note that in the aforementioned installation, redundant Process Safety Valves (PSVs) or specific protocols are in place to ensure safety in the event of an over pressure situation while the isolation valve is in use. Car seals may also be used for valves that periodically or in special instances are open or closed but must not remain open or closed during normal operations. These valves are noted on Piping and Instrumentation Diagrams (P&IDs) as Car Seal Open (CSO) for a valve that must remain open, and Car Seal Closed (CSC) for valve that must remain closed.

CASE STUDY

In 2008, a tube and shell heat exchanger catastrophically failed when workers accidentally closed two different valves at two different times between the vessel and its relief valve. On June 10, 2008, operators closed an isolation valve between the heat exchanger shell (ammonia cooling side) and a relief valve to replace a burst rupture disk under the relief valve that provided over-pressure protection. Maintenance workers replaced the rupture disk on that day; however, the closed isolation valve was not reopened. On the morning of June 11, an operator closed a block valve isolating the ammonia pressure control valve from the heat exchanger. The operator then connected a steam line to the process line to clean the piping. The steam flowed through the heat exchanger tubes, heated the liquid ammonia in the exchanger shell, and increased the pressure in the shell. The closed isolation and block valves prevented the increasing ammonia pressure from safely venting through either the ammonia pressure control valve or the rupture disk and relief valve. The pressure in the heat exchanger shell continued climbing until it violently ruptured at about 7:30 a.m.

REGULATORY REQUIREMENTS / BEST MANAGEMENT PRACTICES (BMP)

- A procedure or Car Seal Program is simply a valve management program that contains the following:
 - A list of safety critical valves
 - Their safe position (Could be either open or closed)
 - A description of their location (e.g. serial numbers), and
 - Some type of seal that will prevent the valve from being deviated from its safe position. This seal can be a plastic tie wrap, chain, or some type of metal banding. Some facilities even use color coding for their seals (e.g. green is for open and red is for closed valves). The physical seal should have suitable mechanical strength to prevent unauthorized valve operation.
- The program should also include updating your Piping and Instrumentation Diagrams (P&IDs) to reflect which valves are in this program. Most Piping and Instrumentation Diagrams (P&IDs) will use the designations Car Seal Open (CSO), and Car Seal Closed (CSC) to show the valves in the Car Seal Program.
- The program (an administrative control) is only as good as the workers who use it and rely on it. Some facilities build the Car Seal deviation procedure into their Management of Change procedure, which means anytime a valve in the program needs to be deviated from its safe position, a temporary Management of Change (MOC) will be completed and this temporary Management of Change (MOC) will always require a Pre-Start Up Safety Review (PSSR). The Pre-Start Up Safety Review (PSSR) is not required by the Occupational Safety and Health Administration (OSHA) however it is a best management practice to ensure this valve is returned to the safe position before returning the Highly Hazardous Chemical (HHC) and/or Extremely Hazardous Substance (EHS) to that part of the process.
- Some facilities will have a very basic board and tagging program where each sealed valve will be tagged with a weather resistant tag that is in two parts. The tab on the end of the tag is the permission tab. This is the one that is removed and is signed by the appropriate personnel granting permission to deviate the valve. On the back of the tab there is a matching number that also appears on the part of the tag that is attached to the valve. The removed tab is hung on a Valve Deviation Board in plain sight in the control room and the action should be entered into the shift log book. Workers then go back to the valve and with the signatures and the tag hung on the board and the action communicated to all workers on shift (can be via radio announcement, but then all workers must acknowledge they received the transmission) they will now deviate the valve. The program will also require an entry into either a paper log book that is used to communicate shift change data or an electronic method, but it is critical that any and all valve deviations be communicated to all workers, including contractors whose work will involve any deviated valve.
- Some facilities will even work valve deviations into their safe work permitting process to provide another layer of communication.
- The next critical path is returning the valve(s) back to its safe position. This should be done as soon as possible. Some facilities will even have a policy that no car sealed valve can be deviated longer than a single shift. Putting the valve back into its safe position will entail a new tag and a new seal, as well as another entry into the log book and communication to the workers on shift about the new status of the valve.

- The final step may be the most critical of all. The program needs to be audited to ensure its integrity. This auditing begins as part of a Pre-Start Up Safety Review to act as another layer of assurance that the valves have been placed back into their safe position before the process is started up. Some facilities will also include these critical valves in their Start-Up Standard Operating Procedures (SOPs) to ensure they are inspected before start-up. At some point, the facility will need to do a full audit of the program and this will include a physical inspection of each valve to ensure it is in its proper position, tag is in place, and seal integrity intact.
- Locks are sometimes used in the process for similar restrictions. If locks are used, a procedure should be in place for proper controls and authorized key access, even if it is not noted on the Piping and Instrumentation Diagram (P&ID). The process locks should differ from locks placed on sample ports to prevent access to the contents of the process and locks used in the Lockout/Tag out program.

SUMMARY

There are many different variations of Car Seal Programs, some very basic and some very advanced, but they all serve a critical role in process safety. The first place to consider using a car seal program would be on all valves that are between a pressure vessel and its relief protection or even downstream of relief valves. If your facility falls under Occupational Safety and Health Administration's (OSHA's) Process Safety Management (PSM) standard and the Environmental Protection Agency's (EPA's) Risk Management Plan (RMP) rule, you could be cited for not having some form of a car-seal program if you have situations where this program would be a necessity (e.g. ASME Section VIII UG-135(d)). Occupational Safety and Health Administration (OSHA) has recently included car-seal programs in their Process Safety Management (PSM) audits. It made its first official appearance in the Refinery Process Safety Management (PSM) Compliance Directive and it is making its way into the Process Safety Management (PSM) Covered Chemical Facilities Compliance Directive (CPL) as well.