

Don't Pull the Pin!

SNAP COUPLINGS IN SHOTCRETE APPLICATIONS

By Michael Cetnar

Shotcreting is changing; not only where it's used, but in how it's delivered. Today's projects demand longer reach, tighter schedules, and more consistent placement. Crews are pushing concrete farther by hose — often hundreds of feet — into areas that are harder to access and less forgiving. At the same time, the concrete mixtures are denser, production rates are higher, and placement windows are tighter. Shotcrete delivery systems must maintain pressure over longer distances and for longer durations.

Pumps are working harder to overcome friction, elevation, and distance. As hose runs get longer and output increases, backpressure rises. The delivery system must remain stable under load throughout the entire placement cycle, because sustained pressure differs from peak pressure. It exposes weak points, magnifies wear, and puts more demand on every connection in the system.

Couplings sit at the center of that risk. They carry the load and absorb vibration. They experience the full effect of pressure, movement, and material flow. When they're selected, installed, or maintained incorrectly, the consequences can appear quickly and catastrophically.

While two-bolt couplings should be used whenever possible due to their more secure locking method, snap couplings are often used in portions of the laydown system that may need to be moved or detached frequently. However, snap couplings have one of the highest rates of employee injury in our industry.

This is not something to be taken lightly. Poor quality, damaged, and worn-out couplings can fail, resulting in severe injury and property damage. Anyone on the job site could open the coupling (intentionally or accidentally) without knowing the system is still under high pressure.

Safety pins must be installed on all snap couplings — they are the most effective, and least costly, safety tools in your truck.

Couplings are manufactured using two methods: Cast and forged. Forged couplings offer greater strength and ductility than comparable cast designs. Ductility is the measure of a metal's ability to stretch without breaking. Forged couplings will stretch and deform at failure, resulting in a gradual pressure drop. However, when a cast coupling fails, it can crack, resulting in a violent eruption that endangers anyone working near the system. All couplings should be carefully inspected before and after use to ensure that cracked or damaged couplings are removed from service.

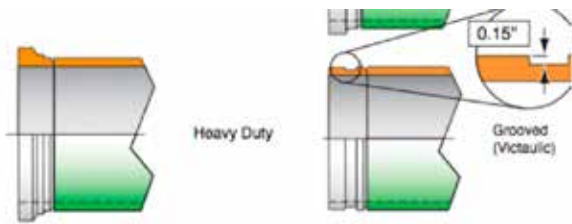


Fig. 1: CF snap coupling

GROOVED COUPLINGS DO NOT HAVE SUFFICIENT PRESSURE RATING

Grooved end clamps (Victaulic) should not be used when shotcreting or concrete pumping. Today's pumps, especially trailer pumps, can exceed 1200 psi (8.3 MPa) of working pressure in the delivery system. Using rubber hoses in the delivery system increases pump pressure due to increased friction within the hoses. Grooved end couplings are generally rated at 500 – 750 psi (3.4 – 5.2 MPa). These clamps do not approach the working pressure of today's shotcrete pumps. Both ASME (American Society of Mechanical Engineers) and CSA (Canadian Standards Association) have prohibited their use for concrete pumping applications. The ASA (American Shotcrete Association) also "strongly discourages" their use, particularly in high-pressure systems.

The use of grooved-end connections in the shotcrete industry has persisted because grooved-end clamps and connections are lighter than their raised-end, heavy-duty (HD) counterparts. Users of these grooved-end connections are prioritizing lighter weight over safety. The groove is cut into the hose body or pipe, thinning the engagement area where the clamp connects. As the hose body/pipe wears from pumping material, this area becomes progressively



thinner. Thinning in this area can cause the clamp's engagement area to detach or fail when a plug or blockage occurs in the delivery system.

RISKS OF WORN-OUT CLAMPS

While many of these safety considerations must be observed by operators on the job site, there is a vital safety policy that must come from the leadership at any pumping contractor: **The proactive removal of worn components should be emphasized as a vital, approved practice.**

The longer a clamp, pipe, or hose is in service, the greater the cumulative wear and damage. This damage compounds when excessive force is required to install the clamp, increasing unnecessary risk. It's crucial to remove worn-out components from service and replace them with new ones at the first sign of problems. The cost of a new clamp is minimal compared to the potential costs of failure in use. Failure of just one clamp can result in severe injury to nearby personnel, costly litigation, damage to nearby objects, significant material losses, and downtime at the job site for everyone who depends on the pump's delivery.

The operational philosophy of "run to failure" must be addressed and discouraged by the highest levels of your organization.

SAFE USE OF SNAP CLAMPS

Snap clamps are ideal for system locations where rapid changes are needed or where the clamps are frequently opened and closed. However, even when installed properly, snap clamps are more likely to open than their bolted counterparts. External forces acting upon the handle, such as snags or blows from moving objects, can create accidental disengagement. Several safety considerations must be addressed when using snap couplings.

COUPLING CHOICE AND SYSTEM DESIGN

- Use bolted couplings whenever possible; snap couplings are not as strong as two-bolt couplings.
- Snap couplings must be regularly inspected, maintained, and adjusted properly.
- External mechanical loading will reduce working pressure. Proper use of supporting brackets can reduce bucking and pulsing stresses at your coupled connections.



Fig. 3: Hose caddy



Fig. 4: Skid pan

- Use hose caddies and skid pans. These low-cost accessories offer significant benefits that should be considered for all laydown systems, particularly when snap couplings are in use. Both items protect your clamps from accidental disengagement and from wear caused by the operating system's friction and vibration. The skid pan is very helpful for jobs where a coupling connected to pipe or hose is moved over steel bar reinforcement. It improves safety and efficiency for your team operating that portion of the pumping system.

VISUAL INSPECTION

Each coupling should be inspected prior to installation. If any of the following conditions are found, the coupling should be removed from service.

- Excessive wear on the body of the coupling: Cracks or dents are visible in the body of the coupling, or the embossed pressure rating is too worn to be read.
- The coupling shows bent, broken, or distorted links or pins in the handle: A damaged coupling reduces the system's safe operating pressure. Repeated usage and opening/closing can damage or bend the coupling, requiring great force to close and putting a large strain on the handle.

- The safety pin cannot be properly inserted due to alignment, debris in the hole, or damage to the handle.
- Excessive wear, affecting the contact surfaces of the coupling with the lip of the pipe's weld end: This can increase local stresses on portions of the coupling.
- For adjustable snap couplings, damaged threads or concrete build-up: These can prevent the coupling from closing properly.
- Although not part of the clamp, dirty, dented, or damaged connection points (pipe end and hose body ends) should not be used.: Make sure the edges are also not rolled or thinned on these ends.

INSTALLATION AND OPERATION

- Ensure gaskets are free of concrete residue and properly lubricated, and that the coupling cavity is clean with no residual concrete that may impede its engagement with the weld end.
- Examine the coupling and gasket for cracks or tears that may prevent a proper seal.
- ALWAYS WEAR EYE PROTECTION. Eye injuries are among the most common on job sites and can lead to serious long-term complications for an injured team member.
- ALWAYS INSERT THE SAFETY PIN. Due to the possibility of accidental opening, every snap coupling

must be fitted with a safety pin at installation. Only safety pins designed for the job should be used with snap clamps. Pins should be removed only after confirming that the system is not under pressure.

If you choose to use snap couplings, be mindful of the risks, be alert for signs of wear and tear, and take all recommended safety precautions.



Michael Cetnar has more than 30 years of experience in the concrete and shotcrete pumping industry and has been with Con Forms for over 10 years. His career includes roles as a pump operator, fleet manager, and project leader on a wide range of challenging construction projects. Michael is actively involved in industry safety and certification efforts. He is a member of the American Shotcrete Association (ASA), American Concrete Pumping Association (ACPA), and Canadian Standards Association (CSA), and supports concrete pump operator certification initiatives through the Crane Certification Organization (CCO). His combination of hands-on operational expertise and commitment to industry safety provides a practical perspective on concrete and shotcrete pumping applications.