Growing With the Times

KEEPING UP WITH SAFETY & EQUALITY CHANGES

By Stephanie Da Ponte

Shotcrete is a century-old method used in the construction industry, and along with it came a century of men dominating the field. While the vast majority of 21st-century construction industry professionals are still men, we're beginning to see an influx of women entering the field, and I am incredibly proud to be a part of this transformation. Encountering women in the industry has been a morale boost. It encourages other women who may feel intimidated, that they are not alone. It serves as a reminder that women can excel in every part of the construction industry. Seeing organizations such as ACI change their terminology from "Nozzleman" to "Shotcreter" is showing not only me but women all over that we are taking exponential steps in the right direction.

Although I'm very involved in the trades, I'm technically not a tradesperson — I work in Health and Safety. Over the years, I've observed significant safety changes within the shotcrete industry. People are taking safety more seriously and taking the initiative to make their work environment safer for themselves and their co-workers. In this article, I'll discuss the importance of ensuring that material delivery lines, reducers, clamps, and air supply lines are used properly and maintained effectively, as well as the ways we can reduce injuries associated with them.

Figs. 1 & 2: Whip checks installed on material and airlines to restrain them in the event of a disconnection.

COMMON HAZARDS

AIR SUPPLY LINES AND MATERIAL LINES

One of the most common hazards associated with air supply hoses is when the Chicago fittings disconnect from the end of a live air line. This could cause the fitting to become a projectile: The escaping air will cause the air line to whip around violently, posing a hazard to anybody nearby. The same can be said about the material delivery lines — the bell ends can come off or ruptures can occur due to a blockage or rubbing against a protruding object, causing a tear. It is crucial to ensure that inspections are being completed every morning as the crew is unrolling and setting up the lines, as damaged sections will have less resistance to pressure

It's important to keep an eye on the condition of the lines (cracks, cuts, abrasions, flexibility, kinks, and/or exposed wire), inspect the fittings and connections for tightness, rust, and corrosion, and check to make sure the pressure of the air line and material line can withstand the pressure from the compressor and concrete pump. It's also crucial to ensure whip checks are installed properly: Too many times, I have come across an air line with a whip check installed incorrectly, with the loop section on the fitting instead of the air line. Whip checks play a critical role in shotcreter safety

Fig. 3: 'Down line' hoses, which are connected to the reducer at the pump, are wire-braided to handle higher pressure. This particular hose shows a clearly worn area, likely caused by repeated contact with a soldier pile.

Fig. 4: This material line suffered a rupture; upon inspection it's noticed that this section was showing clear indentations. These were likely caused by repeated rubbing against rebar. This caused a weakened section in the line and ruptured during a plug.

by preventing the lines from whipping around freely in the event of a disconnected fitting.

ELBOWS

Elbows undergo more wear than any other component in the material line system. Since the elbow is directly connected to the pump, it is the point where it endures the full force of discharge from the concrete pump. Concrete, being an abrasive material, will wear down the elbows, reducers, and material lines over time. A visual indication of this wear is when an opening that was once 4 in. (100 mm) may expand to 5 in. (125 mm) or more. Using worn elbows, reducers, and material lines creates a risk of hose or pipe failure. As concrete wears down the walls of the pipes, they become thinner and weaker, particularly in high-pressure areas such as a reducer transitioning from 3 in. (75 mm) to 2 in. (50 mm). Since elbows endure the most pressure, it is in the workers' best interest to install a concrete discharge-end pump cover. We currently use the 'Python' cover, which prevents concrete from suddenly spraying upward in the event of a rupture, protecting both the pump operator and the concrete truck driver. Using heat-treated pipes enhances strength, durability, and resistance to abrasion, making them suitable for the rigorous demands of shotcrete applications. They also tend to have greater longevity compared to non-heat-treated pipes.

Fig. 5: Installing a 'Python' cover will confine concrete within the cover in the event of a rupture.

Figs. 6 & 7: When comparing the new and used pipes side by side, there's a noticeable difference in diameter. Upon measuring, it's clear that the used pipe is slightly larger.

INSPECTIONS

There are numerous components to consider when determining if a hose or pipe is nearing the end of its lifespan. Several key signs can help ensure timely replacement and prevent failures. These include visible wear and tear such as:

- Surface damage
- Deformation
- Increased internal diameter
- Leakage
- Increased vibration

All pipes, clamps, and material lines should be inspected "frequently", which is defined as monthly according to concrete pumping equipment standards including ASME B30.27 (USA) and CSA Z151 (Canada). It's a good idea to include this item in your monthly Health and Safety inspection.

Using an ultrasonic thickness gauge can help detect thinning and corrosion in your steel pipes. Measuring the openings of elbows, reducers, and material lines can indicate the extent of wear incurred. Typically, when the opening has expanded by 15%, they should be replaced. We developed an inspection tool to help determine when a pipe should be taken out of service, since there are no existing standards to guide this process.

When inspecting clamps, check for corrosion, excessive wear on the clamp edges, inspect the bolts, check the gasket for gaps and brittleness, and ensure the clamp aligns correctly with the material lines. Faulty elbows, reducers, clamps, and material lines are the leading cause of

Fig. 8: Consolidated Shotcrete designed an inspection tool to evaluate pipe condition and determine end-of-life criteria."

Figs. 9 & 10: Here we can see that the pipe that has been in service is now at the red marking, indicating no longer safe for use.

accidents in a typical shotcrete setup. Regular inspections, proper installation, and timely replacement are critical in ensuring a safe and efficient work environment.

PROTECT YOUR PEOPLE

Safety, at its core, is about protecting everyone on the job site — from proper inspection of material lines, elbows, reducers, and clamps to ensuring the correct installation of whip checks. Every step we take reduces the likelihood of injury and equipment failure. Simple yet essential actions, such as daily inspections, using ultrasonic thickness gauges, and replacing components when wear becomes visible, can prevent accidents.

As the industry continues to evolve, the integration of advanced materials like heat-treated pipes and the adoption of better safety standards reinforce the need for a proactive approach. By fostering a culture of accountability, vigilance, and continuous improvement, we can ensure that the shotcrete industry remains not only productive, but also safe and inclusive for all. Let us all take these lessons forward, recognizing that safety is not just a checklist: It is a shared responsibility that protects the lives and livelihoods of every worker on-site.

WE CAN GROW TOGETHER

The shotcrete industry has evolved tremendously: From the increasing presence of women to inclusive language changes and the recognition of the importance of safety, these steps undoubtedly signify progressive forward movement. This change not only encourages diversity but also sets a precedent for the industry to adapt and grow in all aspects, including safety practices.

I am proud to be a woman in shotcrete, and I hope to show the next generation of women that this is a field where they, too, can thrive. We will continue to strengthen and shape the industry for all.

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