
RUSSTECHNICAL NOTES

RUSSTECH CSF HANDLING & STORAGE

DISCUSSION:

RUSSTECH CSF, densified silica fume, is handled similarly to bulk Portland cement in a ready mix plant. It can be stored in normal cement or flyash storage silos with some minor changes. Densified silica fume does not pump off bulk trailers as easily as Portland cement, nor does it occupy the same volume as cement. This document has been designed to assist in the correct material handling and storage preparations to avoid potential problems.

STORAGE SILOS:

Optimum silo storage capacity is 2,800 cubic feet, allowing for two bulk deliveries of densified silica fume (20 tons each), and to minimize scheduling problems due to limited storage volume. The loose fill bulk density of silica fume is roughly three times lighter than cement, densified silica fume being 30-40 pounds per cubic foot versus the traditional 94 pounds per cubic foot for cement. The result is densified silica fume occupies three times the silo volume as would a given weight of cement. A good starting point is to assume a silo capable of holding 3 loads of cement will hold only 1-1 ½ loads of densified silica fume. All storage silos must be vented with a minimum bag house dust collection system of 150 square feet. Clean all dust collection systems before delivery of densified silica fume, eliminating all silo back-pressures. Silo must be equipped with heavy grounding straps for bulk trailers. This will help minimize static problems that would delay bulk pump-off time.

DISCHARGING:

The discharge line from the bulk transfer tanker is provided by the bulk carrier. Input lines to plant silos should be of the same wire reinforced rubber hose as used by the bulk delivery tankers. Steel lines should be avoided due to "packing" of silica fume when

transferred under pressure. Eliminate as much of the steel lines and connections as possible, they will be sites for possible line *packing*. Ideally, a 6 in. wire reinforced rubber hose can be used to discharge trucks and fill silos. The hose should have a smooth internal surface without corrugations or reinforcing ridges. The hose should be fastened to the silo or fixed support at maximum 5 ft. intervals between clamps. This support will prevent excessive *snaking* of the line while under discharge pressure. More frequent bracing may be needed if silo heights are excessive. Some hose vibration is helpful to the cleaning process while transferring into the silo.

Avoid all 90 degree angles in discharge/fill lines. Long radius of discharge lines at ground level and the top of the silo will keep the densified silica fume from packing while traveling through the bend. Large looping bends of 4-5 ft radius have proven quite successful. Center discharge into the top of the storage silo is recommended. This will allow the densified silica fume to be discharged directly into the silo center without hitting obstructions. **NOTE:** Never use deflector plates in the silo. Densified silica fume will pack against deflector plates until the input line becomes fully blocked. Long bends also help to reduce line friction that disturbs the ideally constant material flow rate.

Vibrators can be used to assist this transport, but should be used intermittently. Vibration will help prevent the densified silica fume from packing at hose to steel connections, and other low flow areas such as line bends, etc. The use of vibrators will be different for every silo setup as every silo/discharge situation presents different friction variables from plant to plant.

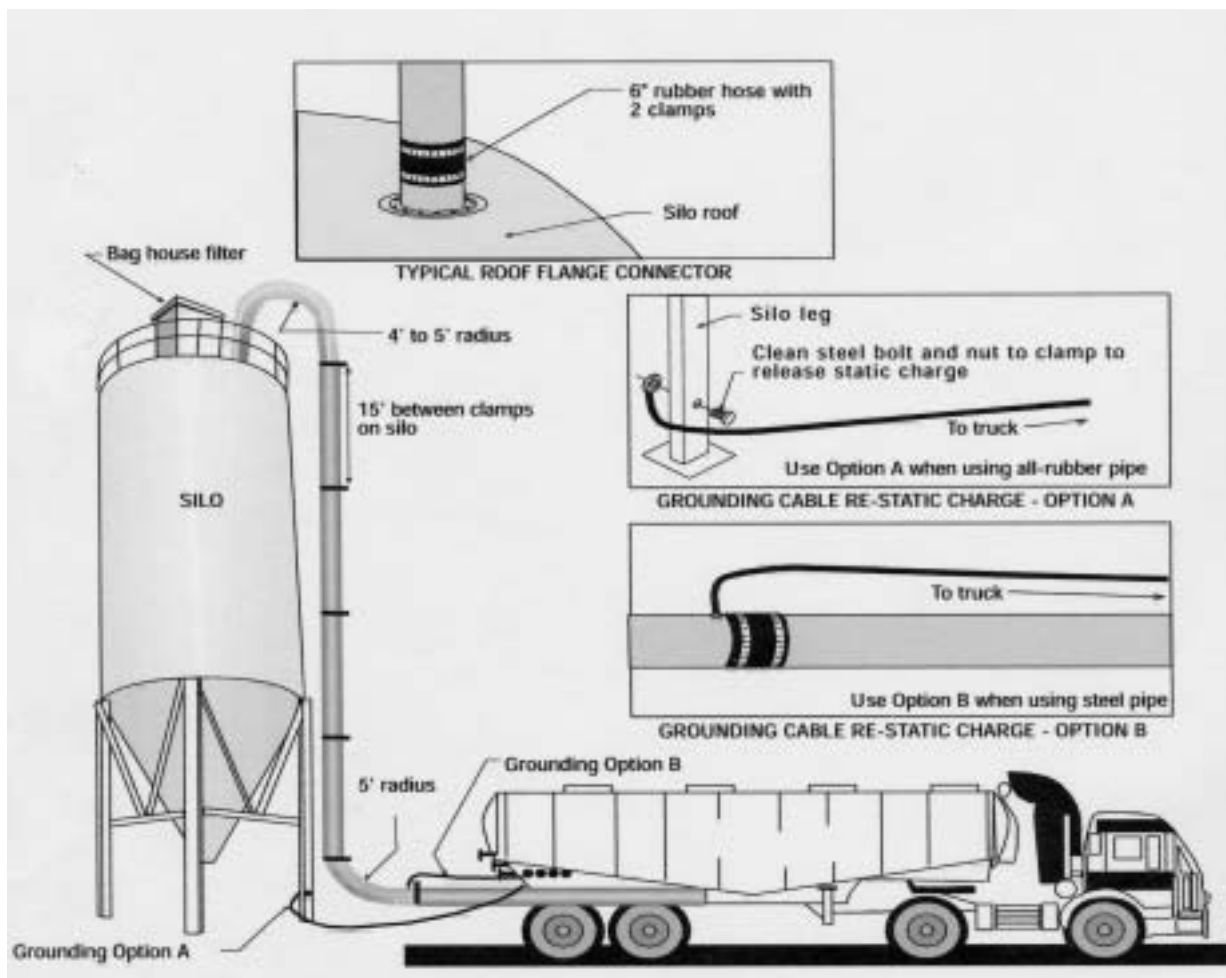
Densified silica fume must be unloaded at pump-off pressures less than 9 psi. Attempting to transfer at higher cement discharge pressures (15 psi) will immediately pack-off the transport tank and eventually the transfer lines. You cannot rush the discharge time of densified silica fume, all transport vessels can be unloaded within a normal 3 time frame. Care must be exercised, and only trained carriers familiar with the unloading procedures of densified silica fume should be used.

BATCHING:

Densified silica fume does not pump vertically as well as cement but flows vertically downward with much less cling. To assist discharge/batching the silo should be equipped with aerators in the cone discharge section of the silo bottom. The material will flow easily in a gravity or an air slide direct to the cement weigh hopper. If auguring or screw feeding cement into the batching process, the densified silica fume gate opening must be adjusted to restrict flow, as densified silica fume will flow faster than cement and possibly clog the feed screw. Optimize feed rates by restricting the gate size accordingly.

CHECKLIST:

- ✓ Clean bag house filter, adequately vented.
- ✓ Eliminate silo back pressure(s).
- ✓ Rubber hose (6 in) wire reinforced.
- ✓ Ground truck transport with heavy grounding strap before unloading.
- ✓ Eliminate all short radius bends, 5 feet minimum radius when changing line direction.
- ✓ Rubber discharge line fastened to silo support preventing line snaking under pressure.
- ✓ Eliminate all steel transport lines and connections as practical.



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