



SILICA FUME ASSOCIATION

USING BAGGED SILICA FUME

BACKGROUND

Silica fume was originally available in 50 lb (23 kg) bags, which were not particularly user friendly. In an effort to make the bags easier to work with, suppliers of silica fume began supplying the material in 25 lb (12 kg) “repulpable” or “shreddable” bags. Since the introduction of these bags, more than one million cubic yards (765, 000 m³) of concrete have been produced using silica fume added as unopened bags.

These bags are intended to be added directly to a central or truck mixer without opening. The bags are designed to disintegrate through a combination of wetting and grinding the paper during concrete mixing. Since their introduction, these bags have gone through several modifications aimed at making them more readily repulpable. These modifications have included reducing the number of layers of paper and modifying the design of the corners and filling spouts to reduce the thickness of these areas.

As might be expected there is a trade-off between making the bags easier to disintegrate and strong enough to protect the silica fume during shipment and handling. The bags that are currently available are believed to be about as weak as is prudent.

PROBLEM

The Silica Fume Association is aware of several instances in which the bags have failed to disintegrate as intended. The result is the appearance of fragments of paper in the surface of the concrete. This problem seems to be particularly persistent during construction of flatwork such as bridge decks.

We believe that the problem is caused by inadequate wetting and grinding of the paper during concrete mixing. The problem is particularly evident in concrete mixtures that have a very low water-cementitious materials ratio, that contain a small maximum sized coarse aggregate such as 1/2 inch (13 mm), or that contain rounded aggregates. Pan-type concrete mixers are also very prone to problems with these bags.

SUGGESTED REMEDY

The remedy for this situation is really very straight forward: if you have any doubts about the performance of the bags, conduct testing to determine whether the bags will disintegrate under the conditions and materials that will be used on your project. Testing should follow these steps:

- Make concrete using project materials and project mixers (for truck-mixed concrete, test all trucks to be used). Follow the batching and mixing instructions given on the back of this sheet.
- Simulate haul time that will be expected.
- Discharge the concrete and look for paper fragments.

If fragments are seen or if there is any question, **DO NOT** add the bags directly. Instead, simply empty the bags into your mixer.

For additional information, please contact your silica fume supplier or the Silica Fume Association.



BUILDING A DURABLE FUTURE INTO OUR NATION'S INFRASTRUCTURE.

RECOMMENDATIONS FOR BATCHING BAGGED SILICA FUME

LIMIT YOUR LOAD SIZE

We recommend limiting load size for all types of plants to 63% of truck drum volume. While this limit is more restrictive for central mix plants than the limit imposed by ASTM C 94, we believe it is appropriate. Additional mixing may be required once the concrete is in the truck to ensure that the silica fume is dispersed and that the bags disintegrate.

If testing shows that a larger volume of concrete may be produced, increase load size based on your judgement.

1. USING UNOPENED BAGS

1.1 Central Mix Plant — Adding bags to central mixer with other ingredients

- Limit the load size — see note above.
- Select the appropriate number of bags for the volume of concrete being produced. If necessary, round up to the nearest whole number of bags.
- Add unopened bags to central mixer simultaneously with other mix ingredients.
- Drop concrete into truck.
- Thoroughly mix concrete in truck, at least 100 revolutions at mixing speed.

1.2 Central Mix Plant or Truck Mixers — Adding bags into truck after concrete is dropped into truck

- Limit the load size — see note above.
- Select the appropriate number of bags for the volume of concrete being produced. If necessary, round up to the nearest whole number of bags.
- **Central mix:** Batch and mix in central mixer as you normally would. It may be necessary to hold back some HRWRA if the mixture is too wet without the silica fume. Drop concrete into truck.
- **Truck mix:** Batch as you normally would. Drop ingredients into truck.
- Add unopened bags of silica fume on top of concrete in truck.
- Thoroughly mix concrete in truck, at least 100 revolutions at mixing speed.
- Adjust slump as necessary to the level desired.

2. USING OPENED BAGS

2.1 Central Mix Plant or Truck Mixers — Adding silica fume through the plant

- Limit the load size — see note at left.
- Select the appropriate number of bags for the volume of concrete being produced. If necessary, round up to the nearest whole number of bags.
 - Empty bags of silica fume onto the coarse or fine aggregate. Adjust aggregate batch weights to account for the weight of the silica fume. OR:
 - Empty bags of silica fume into the cement weigh hopper.
- **Central mix:** Batch and mix in central mixer as you normally would. Drop concrete into truck.
- **Truck mix:** Batch as you normally would. Drop ingredients into truck.
- Thoroughly mix concrete in truck, at least 100 revolutions at mixing speed.
- Adjust slump as necessary to the level desired.

2.2 Central Mix Plant or Truck Mixers — Emptying bags into truck after concrete is dropped into truck

- Limit the load size — see note at left.
- Select the appropriate number of bags for the volume of concrete being produced. If necessary, round up to the nearest whole number of bags.
- **Central mix:** Batch and mix in central mixer as you normally would. It may be necessary to hold back some HRWRA if the mixture is too wet without the silica fume. Drop concrete into truck.
- **Truck mix:** Batch as you normally would. Drop ingredients into truck.
- Empty bags of silica fume on top of concrete in truck.
- Thoroughly mix concrete in truck, at least 100 revolutions at mixing speed.
- Adjust slump as necessary to the level desired.

REMEMBER MIXING!

Regardless of how the silica fume is supplied, don't forget that your concrete will require thorough mixing to disperse the silica fume. Typically, only about 50 lb (23 kg) of silica fume are being added to 4,000 lb (1,800 kg) of other ingredients. Mixing is critical at all times when producing silica-fume concrete. Mixing is even more critical when the silica fume is supplied in unopened bags to ensure that the bags disintegrate as intended.

HOW TO CONTACT THE SFA

THE SILICA FUME ASSOCIATION

38860 Sierra Lane, Lovettsville, VA 20180

Tel: (703) 444-2153 ■ Fax: (703) 444-6518

E-mail: info@silicafume.org