Fireproofing Yield Parameters and Checklist

**Yield** is the volume of fireproofing delivered through the nozzle to the spray target. Yield is governed by three major factors.

1. **Quality of the mix** - the amount of water and entrained air in the mix as it enters the pump. Higher water content increases yield. Increased mixer speeds and mixing time also increase yield. These parameters are determined at the mixer.

2. **Treatment of material as it leaves the nozzle** – forcing the mix through the orifice and breaking it into a spray of fine particles. This process decreases yield by eliminating part of the entrained air. Larger orifices and lower air stem pressures reduce the loss of yield.

3. **The pumping operation** – the mechanical movement of the mix through the pump and hoses to reach the nozzle. Well maintained piston leathers, check balls and ball seats are required to avoid breakdown of the mix and consequent yield loss.

**Quality of the Mix**

Southwest Fireproofing will produce its most cost effective yield when the proper mix cycle and water ratio are used. A mix that allows hanging 5/8” of material in a single pass without sliding on bare flat steel surfaces is the best compromise between spraying rate and yield.

Mixer speeds between 35 and 40 rpm in most paddle mixers are effective in activating the air entraining agent to lower the mix density to acceptable levels. This is adjusted by engine speed or gear ratio changes as necessary. Lower mixer speeds will wet out the mix effectively, but will not give the additional yield afforded by proper air entrainment.

Mixing time needs to be controlled closely to about two minutes. Uniformity in mix from batch to batch is necessary to provide a consistent mix to the nozzle. The mixer blades should be stopped after mixing is complete if the pump hopper is not ready to receive the batch. The blades should be restarted for three to five seconds before dumping.

Water use per bag of fireproofing should be controlled with an automatic measuring device for consistency and to assure that the mixing operation is using the
maximum water tolerated by the job conditions. The best starting point to
determine water requirement is 11 ½ gallons per bag.

Maximum yield is obtained by zeroing in on the maximum water per batch that
permits spraying 5/8” of material, using low atomizing air pressure, to bare flat
steel without sliding. Less water will permit hanging greater thicknesses, but yield
will be sacrificed.

**Treatment of the Material as it leaves the Nozzle**

Proper nozzle adjustment is required to maximize yield. A 9/16” to 3/4” orifice is
recommended, depending on the pumping rate. Experience is required to achieve a
workable spray pattern with the least yield loss. The extent of yield loss caused by
spraying can be determined by comparing mix density at the nozzle with the air off
to that with the air on. Spraying with air on always causes some increase in
density, but it is necessary to develop a spray pattern. However, if can be
minimized. Improper orifice and air adjustments can cause nozzle yield reductions
of over twenty percent.

Air pressure at the gun is regulated by both stem position and the air-control valve.
The gun head chosen should have a recessed seat in which the orifice is placed and
centered. The air stem should be perfectly centered in the gun orifice assembly. The
air stem is to be pulled back and the air pressure adjusted to the lowest possible
level. A high-pitched whistle sound at the nozzle indicates improper adjustment and
yield loss. The stem and pressure need to be adjusted until a dull “buzz” is
produced.

A better looking coating with a smooth surface can be produced with smaller
orifices and higher air stem settings but with a significant yield loss.

**The Pumping Operation**

Most fireproofing is pumped with piston pumps using ball check valves. Many have
modifications such as “Marvel Kits” to pump highly air entrained mixes more
efficiently. These kits are designed to more completely empty the pump cylinder on
each stroke and avoid recycling material through subsequent piston strokes. Their
proper function reduces product breakdown by minimizing the work done on the
mix by the pistons. They are recommended to maintain yield and increase
throughput.

The condition of the piston leathers and cups, which act like piston rings, and the
ball check components, including the ball valve seats, ball stops and the check balls
are extremely important factors in obtaining good yield and efficient pumping
operations.

Worn leathers cause mix bypass around the pistons and decreases pumping rate as
well as yield. Worn check valve components cause leakage from the pressurized
pumping hose back into the cylinders and simply beat up the material by recycling under high pressure and velocity. Regular inspection and repair is required to avoid conditions that reduce yield and pump efficiency.

Yield Optimization Checklist

Maintaining good yield is necessary to optimize profits from fireproofing operations. The following checklist is provided to help this effort by routine job set-up reviews.

1. How much water is used per bag? ____________________________
2. Is the water metering device calibrated? ____________________________
3. What is the mixer blade speed? ____________________________
4. Are blade rubbers in good shape and scraping bowl sides? ____________________________
5. How is the mixing time controlled? ____________________________
6. What thickness can be sprayed on flat bare steel without sliding? ____________________________
7. What orifice size is in use? ____________________________
8. What is the pumping rate in bags per hour, with steady running? ____________________________
9. Is the nozzle air stem & air pressure adjusted to produce a low buzz? ____________________________
10. Is a “Marvel Kit” or equivalent installed? ____________________________
11. When were the leathers, cups and check valves inspected? ____________________________
12. Are any items in # 11 above known to be worn? ____________________________
13. What is the measured density at the mixer? ____________________________
14. What is the measured density at the nozzle with air off? ____________________________
15. What is the measured density at the nozzle with air on? ____________________________

End of document 2/2005