Monokote
Field Application Manual

gcp applied technologies

To Our Valued Customers,

We at GCP Applied Technologies would like to welcome you to the most recent edition of the Monokote® Field Application Manual. The first edition of the Application Manual was published in 1975 with the goal of compiling, in one document, recommendations that provided for the most efficient application of Monokote Fireproofing products. While much has changed since the first edition, the goal remains the same; to provide a comprehensive resource dedicated to helping our customers succeed.

This Application Manual contains many ideas and practices that will be of value to your business. Some ideas may appear new while others will serve as reminders that could improve both safety and profitability. Most importantly, the information will serve as a guide for improving the overall performance of your field operations. We encourage you to review the contents of the manual and adapt the information to your operations. Furthermore, we suggest you view the manual as a reference tool that would remain on each of your job sites.

We are honored to be of service to you and the fireproofing industry. We trust the information contained in this updated edition of the Monokote Field Application Manual will be of value to your company.

Best Regards,

GCP Applied Technologies Inc.

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MONOKOTE® MK-6®, MK-6/HY® and MK-6s

Product data and application instructions

Product Description

Monokote® MK-6®/HY® and MK-6s are single component, spray applied, mill-mixed fire resistive plasters. MK-6/HY and MK-6s have approval for use on structural steel members and fluted decking to provide up to four hours of fire protection, and on flat plate cellular decking for up to three hours with Spatterkote® SK-3.

Note: Monokote MK-6/HY and MK-6s afford the same level of the fire protection at identical protection thicknesses. By simply specifying "Monokote MK-6" the fireproofing subcontractor can select the product that will provide the most efficient fire protection for the specific project conditions.

Features & Benefits

Monokote cementitious fireproofing offers many significant advantages to the architect, owner, applicator and building occupant. These include:

- Proven in-place performance
- Low in-place cost
- Fast, efficient application
- UL fire tested and factory inspected
- Building Code compliant

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper UL labels for fire hazard and fire resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

a. Prior to the application of Monokote MK-6, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel shall be free of oil, grease, rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.

b. The project architect shall determine if the painted/primed structural steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire resistance rating.

c. Many Fire Resistance Designs allow the use of painted metal floor or roof-deck in place of galvanized decking. Painted decking must be UL listed in the specific fire resistance designs and must carry the UL classification marking. Consult your local GCP sales representative for details.

d. Prior to application of Monokote MK-6, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive MK-6.

e. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to completion of concrete work on steel decking.

Performance Characteristics

Physical Properties	Recommended Specification	Laboratory Tested* Values	Test Method
Dry density, minimum average	15 pcf (240 kg/m³)	15 pcf (240 kg/m³)	ASTM E605
Bond strength	200 psf (9.6 KPa)	352 psf (16.9 KPa)	ASTM E736
Compression, 10% deformation	8.3 psi (51 kPa)	32 psi (220 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft² (0.00 g/m²)	0.000 g/ft² (0.00 g/m²)	ASTM E859
High velocity air erosion	No continued erosion after 4 hours	No continued erosion after 4 hours	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m² total, 20 kw/m² peak heat release	Less than 5 MJ/m² total, 20 kw/m² peak heat release	ASTM E1354
Impact penetration	Max 6 cm³ abraded	3.9 cm³	City of San Francisco
Abrasion resistance	Max 15 cm³ abraded	8.3 cm³	City of San Francisco

*Actual laboratory tested values meet or exceed GCP's recommended value. Test reports are available on request from your GCP sales representative.

g. Other trades shall not install ducts, piping, equipment, or other suspended items until the fireproofing is completed and inspected.

h. Other trades shall install clips, hangers, support sleeves, and other attachments that penetrate the fireproofing, prior to application of the fireproofing.

Mixing

a. Monokote Fireproofing shall be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer shall be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 40–45 pcf (640–720 kg/m^3) of material.

b. Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn. Mixing shall continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Target density of 43 ± 1 pcf (688 ± 16 kg/m^3) is most desirable. Overmixing Monokote will reduce pumping rate.

Application

a. Application of Monokote Fireproofing can be made in the following sequence:
   1. For thicknesses of approximately ½ in. (13 mm) or less, apply in one pass.
   2. For thicknesses of ⅝ in. (16 mm) or greater, apply subsequent passes after the first coat has set.

b. Spatterkote SK-3 shall be applied to all cellular steel floor units with flat plate on the bottom and to roof decking where required prior to application of Monokote. Spatterkote shall be applied in accordance with manufacturer's application instructions.

c. Monokote Fireproofing material shall not be used if it contains partially set, frozen or caked material.

d. The minimum average density shall be that required by the manufacturer, listed in the UL Fire Resistance Directory for each rating indicated, ICBO Evaluation Report, as required by the authority having jurisdiction, or minimum average 15 lbs/ft^3 (240 kg/m^3), whichever is greater.

e. Monokote shall be mixed with water at the job site.

f. Monokote Accelerator is to be used with Monokote Fireproofing* to enhance set character-istics and product yield. The Monokote Accelerator is injected into the Monokote Fire-proofing at the spray gun. Monokote Accelerator shall be mixed and used according to manufactur-ers recommendations.

g. Monokote is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 20 psi (38 KPa), will provide the correct hangability, density and appearance. NOTE: If freshly sprayed Monokote does not adhere properly, it is probably due to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature & Ventilation

a. An air and substrate temperature of 40°F (4.4°C) minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 24 hours after application of Monokote.

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate cautionary "SLIPPERY WHEN WET" signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote MK-6/HY and MK-6s are available on our web site at www.ggcpat.com or by calling

   866-333-3SBM.

Use of accelerator with MK-6s will provide rapid set but will not result in yield increase.

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MONOKOTE® MK-6®/HY® EXTENDED SET™ FIREPROOFING

Product data and application instructions

Description

Monokote® MK-6®/HY® Extended Set™ fireproofing is a single component, mill-mixed fireproofing plaster (cementitious) which has a delayed set feature. Extended Set is the same as MK-6/HY, except this product can be left unattended in the delivery system for up to 4 days. The Extended Set product requires the addition of water to form a consistent, pumpable slurry. To achieve proper setting time, Monokote Accelerator must be injected into Monokote MK-6/HY Extended Set.

fireproofing during product application. In addition, a dye marker material should be added when Extended Set is introduced per mixing and application instructions. This product can be used on structural steel columns, beams, joists, trusses and floors and roof decking.

Features & Benefits

Monokote MK-6/HY Extended Set fireproofing offers the following features and benefits to fireproofing applicators:

Feature	Benefit
Delayed set time	• Allows applicator to significantly reduce or eliminate time consuming pump-in/pump-out procedure • Allows applicator to increase daily productivity rate (bags/day) up to 20% • Allows applicator to reduce waste water disposal and material scrap • Allows applicator to complete fireproofing jobs in less time
Same in-place performance and fire rating performance as MK-6 HY	• Durable • UL listed (MK-6 HY) • Factory inspected to ensure product performance • Compliance IBC Building Codes

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire-resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

a. Prior to the application of Extended Set, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.

b. The project architect shall determine if the painted or primed structural steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire-resistance rating.

c. Many fire-resistance designs allow the use of painted metal floor or roof deck in place of galvanized decking. Painted decking must be UL listed in the specific fire-resistance designs and must carry the UL classification marking. Consult your local GCP sales representative for details.

d. Prior to application of Extended Set, a bonding agent approved by the fireproofing manufacturer shall be applied to all concrete substrates.

e. Apply fireproofing to the underside of roof deck assemblies only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to completion of concrete work on steel decking.

Performance Characteristics

Physical Properties	Recommended Specification	Laboratory Tested* Values	Test Method
Dry density, minimum average	15 pcf (240 kg/m^3)	15 pcf (240 kg/m^3)	ASTM E605
Bond strength	200 psf (9.6 KPa)	352 psf (16.9 KPa)	ASTM E736
Compression, 10% deformation	8.3 psi (51 KPa)	31.3 psi (215.8 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft^2 (0.00 g/m^2)	0.000 g/ft^2 (0.00 g/m^2)	ASTM E859
High velocity air erosion	No continued erosion after 4 hours	No continued erosion after 4 hours	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	ASTM E1354
Impact penetration	Max 6 cm^3 abraded	3.3 cm^3	Developed by City of San Francisco
Abrasion resistance	Max 15 cm^3 abraded	8.3 cm^3	Developed by City of San Francisco

*Actual laboratory tested values meet or exceed GCP's recommended value. Test reports are available on request from your GCP sales representative.

Temperature & Ventilation

a. An air and substrate temperature of 40°F (4.4°C) minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 24 hours after application of Monokote.

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate cautionary "SLIPPERY WHEN WET" signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote MK-6/HY ES is available on our web site at www.ggcpat.com or by calling 866-333-3SBM.

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MONOKOTE® MK-6® GF

Product data and application instructions

Product Description

Monokote® MK-6® GF is single component, spray applied, mill-mixed fire resistive plasters. MK-6 GF has approval for use on structural steel members and fluted decking to provide up to four hours of fire protection, and on flat plate cellular decking for up to three hours with Spatterkote® SK-3.

Features & Benefits

Monokote cementitious fireproofing offers many significant advantages to the architect, owner, applicator and building occupant. These include:

- Proven in-place performance
- Low in-place cost
- Fast, efficient application
- UL fire tested and factory inspected
- Building Code compliant

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper UL labels for fire hazard and fire resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

a. Prior to the application of Monokote MK-6 GF, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel shall be free of oil, grease, rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.

b. The project architect shall determine if the painted/primed structural steel to receive fireproof-ing has been tested in accordance with ASTM E119, to provide the required fire resistance rating.

c. Many Fire Resistance Designs allow the use of painted metal floor or roof-deck in place of galva-nized decking. Painted decking must be UL listed in the specific fire resistance designs and must carry the UL classification marking. Consult your local Grace sales representative for details.

d. Prior to application of Monokote MK-6 GF, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive MK-6 GF.

e. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to comple-tion of concrete work on steel decking.

g. Other trades shall not install ducts, piping, equipment, or other suspended items until the fireproofing is completed and inspected.

h. Other trades shall install clips, hangers, support sleeves, and other attachments that penetrate the fireproofing, prior to application of the fireproofing.

Performance Characteristics

Physical Properties	Recommended Specification	Laboratory Tested* Values	Test Method
Dry density, minimum average	15 pcf (240 kg/m³)	15 pcf (240 kg/m³)	ASTM E605
Bond strength	200 psf (9.6 KPa)	352 psf (16.9 KPa)	ASTM E736
Compression, 10% deformation	8.3 psi (51 kPa)	31.3 psi (215 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft² (0.00 g/m²)	0.000 g/ft² (0.00 g/m²)	ASTM E859
High velocity air erosion	No continued erosion after 4 hours	No continued erosion after 4 hours	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m² total, 20 kw/m² peak heat release	Less than 5 MJ/m² total, 20 kw/m² peak heat release	ASTM E1354
Impact penetration	Max 6 cm³ abraded	3.9 cm³	City of San Francisco
Abrasion resistance	Max 15 cm³ abraded	8.3 cm³	City of San Francisco

*Actual laboratory tested values meet or exceed GCP's recommended value. Test reports are available on request from your GCP sales representative.

Mixing

a. Monokote Fireproofing shall be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer shall be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 40–45 pcf (640–720 kg/m^3) of material.

b. Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn. Mixing shall continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Target density of 43 ± 1 pcf (688 ± 16 kg/m^3) is most desirable. Overmixing Monokote will reduce pumping rate.

Application

a. Application of Monokote Fireproofing can be made in the following sequence:
   1. For thicknesses of approximately ½ in. (13 mm) or less, apply in one pass.
   2. For thicknesses of ⅝ in. (16 mm) or greater, apply subsequent passes after the first coat has set.

b. Spatterkote SK-3 shall be applied to all cellular steel floor units with flat plate on the bottom and to roof decking where required prior to application of Monokote. Spatterkote shall be applied in accordance with manufacturer's application instructions.

c. Monokote Fireproofing material shall not be used if it contains partially set, frozen or caked material.

d. The minimum average density shall be that required by the manufacturer, listed in the UL Fire Resistance Directory for each rating indicated, ICBO Evaluation Report, as required by the authority having jurisdiction, or minimum average 15 lbs/ft^3 (240 kg/m^3), whichever is greater.

e. Monokote shall be mixed with water at the job site.

f. Monokote Accelerator is to be used with Monokote Fireproofing* to enhance set character-istics and product yield. The Monokote Accelerator is injected into the Monokote Fire-proofing at the spray gun. Monokote Accelerator shall be mixed and used according to manufactur-ers recommendations.

g. Monokote is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 20 psi (38 KPa), will provide the correct hangability, density and appearance. NOTE: If freshly sprayed Monokote does not adhere properly, it is probably due to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature & Ventilation

a. An air and substrate temperature of 40°F (4.4°C) minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 24 hours after application of Monokote.

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate cautionary "SLIPPERY WHEN WET" signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote MK-6 GF are available on our web site at www.ggcpat.com or by calling 866-333-3SBM.

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MONOKOTE® MK-10 HB

Product data and application instructions

Product Description

Monokote® MK-10 HB is single component, spray applied, mill-mixed fire resistive plasters. It has approval for use on structural steel members and fluted decking to provide up to four hours of fire protection, and on flat plate cellular decking for up to three hours with Spatterkote® SK-3.

The product has been designed to obtain bond strengths in excess of 430 psf making it an attractive material for meeting the 2009 IBC building requirements for bond strength for build-ings in excess of 75 feet tall but less than 420 feet tall. The capability of meeting the bond strength requirements with a high yielding spray applied fire resistant material makes Monokote MK-10 HB fire resistive plaster a cost effective option.

Features & Benefits

Monokote cementitious fireproofing offers many significant advantages to the architect, owner, applicator and building occu-pant. These include:

- Proven in-place performance
- Low in-place cost
- Fast, efficient application
- UL fire tested and factory inspected
- Building Code compliant

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper UL labels for fire hazard and fire resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

a. Prior to the application of Monokote MK-10 HB fire resistive plaster, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel shall be free of oil, grease, rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fire-proofing shall be the responsibility of the general contractor

b. The project architect shall determine if the painted/primed structural steel to receive fireproofing has been tested accordance with ASTM E119, to provide the required fire resistance rating.

c. Many Fire Resistance Designs allow the use of painted metal floor or roof-deck in place of galvanized decking. Painted decking must be UL listed in the specific fire resistance designs and must carry the UL classification marking. Consult your local GCP sales representative for details.

d. Prior to application of Monokote MK-10 HB fire resistive plaster, a bonding agent, approved by the fireproofing manu-facturer, shall be applied to all concrete substrates to receive MK-10 HB.

e. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to completion concrete work on steel decking.

g. Other trades shall not install ducts, piping, equipment, or other suspended items until the fireproofing is completed a inspected.

h. Other trades shall install clips, hangers, support sleeves, and other attachments that penetrate the fireproofing, prior to application of the fireproofing.

Performance Characteristics

Physical Properties	Recommended Specification	Laboratory Test* Values	Test Method
Dry density, minimum average	15 pcf (240 kg/m³)	15 pcf (240 kg/m³)	ASTM E605
Bond strength	600 psf (28.7 KPa)	970 psf (46.3 KPa)	ASTM E736
Compression, 10% deformation	31.0 psi (215 KPa)	35.7 psi (246.1 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft² (0.00 g/m²)	0.000 g/ft² (0.00 g/m²)	ASTM E859
High velocity air erosion	No continued erosion after 4 hours	No continued erosion after 4 hours	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m² total, 20 kw/m² peak heat release	Less than 5 MJ/m² total, 20 kw/m² peak heat release	ASTM E1354

*Actual laboratory tested values meet or exceed GCP's recommended value. Test reports are available on request from your GCP sales representative.

Mixing

a. Monokote Fireproofing shall be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer shall be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 40–45 pcf (640–720 kg/m^3) of material.

b. Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn. Mixing shall continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Target density of 43 ± 1 pcf (688 ± 16 kg/m^3) is most desirable. Overmixing Monokote will reduce pumping rate.

Application

a. Application of Monokote Fireproofing can be made in the following sequence:
   1. For thicknesses of approximately ½ in. (13 mm) or less, apply in one pass.
   2. For thicknesses of ⅝ in. (16 mm) or greater, apply subsequent passes after the first coat has set.

b. Spatterkote SK-3 shall be applied to all cellular steel floor units with flat plate on the bottom and to roof decking where required prior to application of Monokote. Spatterkote shall be applied in accordance with manufacturer's application instructions.

c. Monokote Fireproofing material shall not be used if it contains partially set, frozen or caked material.

d. The minimum average density shall be that required by the manufacturer, listed in the UL Fire Resistance Directory for each rating indicated, as required by the authority having jurisdiction, or minimum average 15 lbs/ft^3 (240 kg/m^3), whichever is greater.

e. Monokote shall be mixed with water at the job site.

f. Monokote Accelerator is to be used with Monokote Fireproofing to enhance set characteristics and product yield. The Monokote Accelerator is injected into the Monokote Fireproofing at the spray gun. Monokote Accelerator shall be mixed and used according to manufacturers recommendations.

g. Monokote is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 20 psi (38 KPa), will provide the correct hangability, density and appearance. NOTE: If freshly sprayed Monokote does not adhere properly, it is probably due to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature & Ventilation

a. The substrate temperature shall be a minimum of 40°F (4.5°C) for at least 1-hour prior to the application of the Monokote. Additionally, the air and substrate temperature during application and for a minimum or 24 hours after application shall be no less than 40°F (4.5°C).

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate caution-ary "SLIPPERY WHEN WET" signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote MK-10 HB firesistive plaster is available on our web site at www.gcpat.com or by calling 866-333-3SBM.

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gcp applied technologies

MONOKOTE® MK-10 HB EXTENDED SET™ FIREPROOFING

Product data and application instructions

Description

Monokote® MK-10 HB Extended Set™ fireproofing is a single component, mill-mixed fireproofing plaster (cementitious) which has a delayed set feature. Extended Set is the same as MK-10 HB, except this product can be left unattended in the delivery system for up to 4 days. The Extended Set product requires the addition of water to form a consistent, pumpable slurry. To achieve proper setting time, Monokote Accelerator must be injected into Monokote MK-10 HB Extended Set.

fireproofing during product application. In addition, a dye marker material should be added when Extended Set is introduced per mixing and application instructions. This product can be used on structural steel columns, beams, joists, trusses and floors and roof decking.

Features & Benefits

Monokote MK-10 HB Extended Set fireproofing offers the following features and benefits to fireproofing applicators:

Feature	Benefit
Delayed set time	• Allows applicator to significantly reduce or eliminate time consuming pump-in/pump-out procedure • Allows applicator to increase daily productivity rate (bags/day) up to 20% • Allows applicator to reduce waste water disposal and material scrap • Allows applicator to complete fireproofing jobs in less time
Same in-place performance and fire rating performance as MK-10 HB	• Durable • UL listed (MK-10 HB) • Factory inspected to ensure product performance • Compliance IBC Building Codes

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire-resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

a. Prior to the application of Extended Set, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.

b. The project architect shall determine if the painted or primed structural steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire-resistance rating.

c. Many fire-resistance designs allow the use of painted metal floor or roof deck in place of galvanized decking. Painted decking must be UL listed in the specific fire-resistance designs and must carry the UL classification marking. Consult your local GCP sales representative for details.

d. Prior to application of Extended Set, a bonding agent approved by the fireproofing manufacturer shall be applied to all concrete substrates.

e. Apply fireproofing to the underside of roof deck assemblies only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to completion of concrete work on steel decking.

Performance Characteristics

Physical Properties	Recommended Specification	Laboratory Test* Values	Test Method
Dry density, minimum average	15 pcf (240 kg/m^3)	15 pcf (240 kg/m^3)	ASTM E605
Bond strength	600 psf (28.7 KPa)	970 psf (46.3 KPa)	ASTM E736
Compression, 10% deformation	31.0 psi (215 KPa)	35.7 psi (246.1 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft^2 (0.00 g/m^2)	0.000 g/ft^2 (0.00 g/m^2)	ASTM E859
High velocity air erosion	No continued erosion after 4 hours	No continued erosion after 4 hours	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	ASTM E1354

*Actual laboratory tested values meet or exceed GCP's recommended value. Test reports are available on request from your GCP sales representative.

Temperature & Ventilation

a. An air and substrate temperature of 40°F (4.4°C) minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 24 hours after application of Monokote.

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate cautionary “SLIPPERY WHEN WET” signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote MK-10 HB ES is available on our web site at www.ggcpat.com or by calling 866-333-3SBM.

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MONOKOTE® MK-1000 HB

Product data and application instructions

Product Description

Monokote® MK-1000 HB is single component, spray applied, mill-mixed fire resistive plasters. It has approval for use on structural steel members and fluted decking to provide up to four hours of fire protection, and on flat plate cellular decking for up to three hours with Spatterkote® SK-3.

The product has been designed to obtain bond strengths in excess of 1,000 psf making it an attractive material for meeting the 2009 IBC building requirements for bond strength for buildings in excess of 420 feet tall. The capability of meeting the bond strength requirements with a high yielding spray applied fire resistant material makes Monokote MK-1000 HB fire resistive plasters a cost effective option.

Features & Benefits

Monokote cementitious fireproofing offers many significant advantages to the architect, owner, applicator and building occu-pant. These include:

- Proven in-place performance
- Low in-place cost
- Fast, efficient application
- UL fire tested and factory inspected
- Building Code compliant

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper UL labels for fire hazard and fire resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

a. Prior to the application of Monokote MK-1000 HB fire resistive plaster, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel shall be free of oil, grease, rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fire-proofing shall be the responsibility of the general contractor

b. The project architect shall determine if the painted/primed structural steel to receive fireproofing has been tested accordance with ASTM E119, to provide the required fire resistance rating.

c. Many Fire Resistance Designs allow the use of painted metal floor or roof-deck in place of galvanized decking. Painted decking must be UL listed in the specific fire resistance designs and must carry the UL classification marking. Consult your local GCP sales representative for details.

d. Prior to application of Monokote MK-1000 HB fire resistive plaster, a bonding agent, approved by the fireproofing manu-facturer, shall be applied to all concrete substrates to receive MK-10 HB.

e. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to completion concrete work on steel decking.

g. Other trades shall not install ducts, piping, equipment, or other suspended items until the fireproofing is completed a inspected.

h. Other trades shall install clips, hangers, support sleeves, and other attachments that penetrate the fireproofing, prior to application of the fireproofing.

Performance Characteristics

Physical Properties	Recommended Specification	Laboratory Test* Values	Test Method
Dry density, minimum average	18 pcf (288 kg/m^3)	18 pcf (288 kg/m^3)	ASTM E605
Bond strength	1,000 psf (47.9 KPa)	1,528 psf (73.1 KPa)	ASTM E736
Compression, 10% deformation	50 psi (344 KPa)	56 psi (385.0 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft^2 (0.00 g/m^2)	0.000 g/ft^2 (0.00 g/m^2)	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	ASTM E1354

*Actual laboratory tested values meet or exceed GCP's recommended value. Test reports are available on request from your GCP sales representative.

Mixing

a. Monokote Fireproofing shall be mixed by machine in conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer sh be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 43–53 pcf (690–850 kg/m^3) of material.

b. Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn Mixing shall continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Target density of 48 ± 1 pcf (770 ± 16 kg/m^3) is most desirable. Overmixing Monokote will reduce pumping rate.

Application

a. Application of Monokote Fireproofing can be made in the following sequence:
   1. For thicknesses of approximately ½ in. (13 mm) or less, apply in one pass.
   2. For thicknesses of ⅝ in. (16 mm) or greater, apply subsequent passes after the first coat has set.

b. Spatterkote SK-3 shall be applied to all cellular steel floor units with flat plate on the bottom and to roof decking where required prior to application of Monokote. Spatterkote shall be applied in accordance with manufacturer's application instructions.

c. Monokote Fireproofing material shall not be used if it contains partially set, frozen or caked material.

d. The minimum average density shall be that required by the manufacturer, listed in the UL Fire Resistance Directory for each rating indicated, as required by the authority having jurisdiction, or minimum average 15 lbs/ft^3 (240 kg/m^3), whichever is greater.

e. Monokote shall be mixed with water at the job site.

f. Monokote Accelerator is to be used with Monokote Fireproofing to enhance set characteristics and product yield. The Monokote Accelerator is injected into the Monokote Fireproofing at the spray gun. Monokote Accelerator shall be mixed and used according to manufacturers recommendations.

g. Monokote is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 20 psi (38 KPa), will provide the correct hangability, density and appearance. NOTE: If freshly sprayed Monokote does not adhere properly, it is probably due to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature & Ventilation

a. The substrate temperature shall be a minimum of 40°F (4.5°C) for at least 1-hour prior to the application of the Monokote. Additionally, the air and substrate temperature during application and for a minimum or 24 hours after application shall be no less than 40°F (4.5°C).

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate caution-ary "SLIPPERY WHEN WET" signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote MK-1000 HB firesistive plaster is available on our web site at www.gcpatcom or by calling 866-333-3SBM.

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MONOKOTE® MK-1000 HB EXTENDED SET™ FIREPROOFING

Product data and application instructions

Description

Monokote® MK-1000 HB Extended Set™ fireproofing is a single component, mill-mixed fireproofing plaster (cementitious) which has a delayed set feature. Extended Set is the same as MK-1000 HB, except this product can be left unattended in the delivery system for up to 4 days. The Extended Set product requires the addition of water to form a consistent, pumpable slurry. To achieve proper setting time, Monokote Accelerator must be injected into Monokote MK-1000 HB Extended Set.

fireproofing during product application. In addition, a dye marker material should be added when Extended Set is introduced per mixing and application instructions. This product can be used on structural steel columns, beams, joists, trusses and floors and roof decking.

Features & Benefits

Monokote MK-10 HB Extended Set fireproofing offers the following features and benefits to fireproofing applicators:

Feature	Benefit
Delayed set time	• Allows applicator to significantly reduce or eliminate time consuming pump-in/pump-out procedure • Allows applicator to increase daily productivity rate (bags/day) up to 20% • Allows applicator to reduce waste water disposal and material scrap • Allows applicator to complete fireproofing jobs in less time
Same in-place performance and fire rating performance as MK-1000 HB	• Durable • UL listed (MK-1000 HB) • Factory inspected to ensure product performance • Compliance IBC Building CodesM

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire-resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

a. Prior to the application of Extended Set, an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.

b. The project architect shall determine if the painted or primed structural steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire-resistance rating.

c. Many fire-resistance designs allow the use of painted metal floor or roof deck in place of galvanized decking. Painted decking must be UL listed in the specific fire-resistance designs and must carry the UL classification marking. Consult your local GCP sales representative for details.

d. Prior to application of Extended Set, a bonding agent approved by the fireproofing manufacturer shall be applied to all concrete substrates.

e. Apply fireproofing to the underside of roof deck assemblies only after roofing application is complete and roof traffic has ceased.

f. No fireproofing shall be applied prior to completion of concrete work on steel decking.

Performance Characteristics

Physical Properties	Recommended Specification	Typical Values	Test Method
Dry density, minimum average	18 pcf (288 kg/m^3)	18 pcf (288 kg/m^3)	ASTM E605
Bond strength	1,000 psf (47.9 KPa)	1,528 psf (73.1 KPa)	ASTM E736
Compression, 10% deformation	50 psi (344 KPa)	56 psf (385.0 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft^2 (0.00 g/m^2)	0.000 g/ft^2 (0.00 g/m^2)	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	Less than 5 MJ/m^2 total, 20 kw/m^2 peak heat release	ASTM E1354

*Actual laboratory tested values meet or exceed Grace's recommended value. Test reports are available on request from your GCP sales representative.

Temperature & Ventilation

a. An air and substrate temperature of 40°F (4.4°C) minimum shall be maintained for 24 hours prior to application, during application and for a minimum of 24 hours after application of Monokote.

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate cautionary "SLIPPERY WHEN WET" signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote MK-1000 HB ES is available on our web site at www.ggcpat.com or by calling 866-333-3SBM.

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MONOKOTE® Z-106/HY®

Medium Density Cementitious Fireproofing
Product data and application instructions

Product Information

Monokote® Z-106/HY® is Portland cement based cementitious fireproofing designed to meet specific commercial and industrial fire protection requirements on structural steel members, floor/ceiling and roof/ceiling assemblies.

Monokote Z-106/HY is hard, moisture resistant and suitable for interior areas where resistance to moisture and abrasion is needed. Formulated for use with GCP's patented Injection System, Monokote Z-106/HY offers high-yield and improved application characteristics while providing resistance to repeated physical contact and/or high humidity.

Applications

Monokote Z-106/HY can be used for interior, exposed applications where abrasion, high humidity and damage resistance are desired such as:

- Special use areas in commercial buildings
- Transportation terminals
- Convention centers
- Stairwells
- Parking garages
- Elevator shafts
- Light manufacturing areas and facilities
- Mechanical rooms
- Gymnasiums and pool areas
- Correctional facilities

Benefits

Monokote Z-106/HY offers the following advantages to the architect, owner, applicator and building occupant.

- **Durability**—100% Portland cement binder provides increased durability in interior environments where high-traffic resistance to physical abuse is required.
- **Moisture resistant**—Provides excellent resistance to high humidity and condensation.
- **Quick set**—HY formulation allows use with GCP's patented Injection System for high-yield and quick set.
- **Applicator friendly**—Low pumping pressures allow use of small diameter hoses for increased maneuver-ability and greater pumping distances.
- **Non-toxic**—The factory-mixed blend of common Portland cement and inert materials require only the addition of water for mixing and application.

Delivery and Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire resistance classifications.
b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel and Concrete Surfaces

a. Prior to the application of Z-106/HY Fireproofing, an inspection shall be made to determine that all steel and concrete surfaces are acceptable to receive fire-proofing. The steel to be fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, non-compatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the clean-ing of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.
b. Prior to application of Monokote Z-106/HY, a bonding agent approved by the fireproofing manufacturer shall be applied to all substrates to receive. Z-106/HY. There are two exceptions to this requirement;

1. no bonding agent is required when Monokote Z-106/HY is applied uninjected to bare steel and
2. no bonding agent is required when bond tests run in accordance to the Coatings Materials section of the Underwriters Laboratories Fire Resistance Directory Volume 1 indicate that a bonding agent is not required for Monokote Z-106/HY in conjunction with the specific primed or painted structural steel.N

Performance Characteristics

Physical Properties	Recommended Specification	Laboratory Test* Value	Test Method
Minimum density	22 pcf (350 kg/m^3)	See note below**	ASTM E605
Minimum bond strength	2,000 psf (94.5 kN/m^2)	2,691 psf (127 kN/m^2)	ASTM E736
Minimum compressive strength @ 10% deformation	100 psi (680 kPa)	118 psi (813 kPa)	ASTM E761
Deflection and bond impact	No cracking No delamination	Pass Pass	ASTM E759 ASTM E760
Air erosion	0.000 gr/ft^2 (0.000 gr/m^2)	0.000 gr/ft^2 (0.000 gr/m^2)	ASTM E859
Mold inhibitor	Yes	Pass/No growth	ASTM G21
Standard color	Gray	NA	

* Actual laboratory tested values meet or exceed GCP's recommended value. Test reports are available on request from your GCP Sales Representative.

** ASTM test methods modified where required, for high density, high performance products.

c. The project architect shall determine if the painted/primed structural steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire resistance rating.

d. No fireproofing shall be applied prior to completion of concrete work on steel decking.

e. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.

Mixing

a. Monokote Z-106/HY Fireproofing shall be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementi-tious fireproofing. The mixer shall be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 38–43 pcf (610–690 kg/m^3).

b. Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn. Mixing shall continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Target density of 38–43 pcf (610–690 kg/m^3) is most desirable. Overmixing Monokote Z-106/HY will reduce pumping rate and will negatively effect in-place density and mechanical properties.

Application

a. Application of Monokote Z-106/HY Fireproofing can be made in the following sequence:
   1. Required fire rating thickness will determine if a multi-pass operation is required. If the first pass can be applied at a thickness sufficient to obtain the required rating a second pass will not be required.
   2. Where the full required thickness can not be applied in a single pass, subsequent passes can be applied only after the first coat has set.

b. Monokote Z-106/HY Fireproofing material shall not be used if it contains partially set, frozen or caked material.

c. Monokote Z-106/HY shall have a minimum average dry, in-place density of 22 pcf (350 kg/m^3).

d. Monokote Z-106/HY is formulated to be mixed with water at the job site.

e. Monokote Accelerator may be used with Monokote 106/HY to enhance set characteristics and product yield. The Monokote Accelerator is injected into the Monokote Z-106/HY at the nozzle of the spray gun. Monokote Accelerator shall be mixed and used according to manufacturers recommendations.

f. Monokote Z-106/HY is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/ pump units. A spray gun, with a properly sized orifice and spray shield and air pres-sure at the nozzle of approximately 20 psi (0.14 MPa), will provide the correct hangability, density and appearance.

Temperature & Ventilation

a. The substrate temperature shall be a minimum of 40°F (4.5°C) for at least 1-hour prior to the application of the Monokote. Additionally, the air and substrate temperature during application and for a minimum or 24 hours after application shall be no less than 40°F (4.5°C).

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate caution-ary “SLIPPERY WHEN WET” signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote Z-106/HY is available on our web site at www.gcpat.com or by calling 866-333-3SBM.

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MONOKOTE® Z-106/G

Medium Density Gypsum-based Cementitious Fireproofing
Product data and application instructions

Product Description

Monokote® Z-106/G is a gypsum based cementitious fireproofing designed to meet commercial and industrial fire protection requirements on structural steel members, floor/ceiling and roof/ceiling, and wall assemblies.

Z-106/G is designed to meet interior exposed product requirements where the superior durability and water resistance of Portland cement based products is not required.

Applications

Z-106/G can be used for interior, exposed applica-tions where light abrasion, and damage resistance are desired:

- Elevator shafts
- High bay light manufacturing areas
- High bay mechanical rooms

Benefits

Monokote Z-106/G offers the following advantages to the architect, owner, applicator and building occupant.

- **Low cost**—Z-106/G is a low cost, medium density product for interior, dry environments subject to intermittent traffic and physical contact.
- **Durability**—Higher gypsum binder content improves damage resistance and helps maintain the fire resistance for the design life of the building.
- **Quick set**—May be used with our patented Injection System for quick set and fast double on multiple pass applications.
- **Applicator friendly**—Low pumping pressures allow use of small diameter hoses for increased maneuverability and greater pumping distances.
- **Aesthetics**—Can be spray applied to a fine texture finish.
- **Non-toxic**—The factory-mixed blend of common gypsum, Portland cement and inert materials requires only the addition of water for mixing and application.

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire resistance classifications.

b. The material shall be kept dry until ready for use. Packages of material shall be kept off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use shall be discarded. Stock of material is to be rotated and used before its expiration date.

Steel & Concrete Surfaces

a. Prior to the application of Monokote Z-106/G Fire-proofing, an inspection shall be made to determine that all steel and concrete surfaces are acceptable to receive fireproofing. The steel to be fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhe-sion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the general contractor.

b. Prior to application of Monokote Z-106/G, a bonding agent approved by the manufacturer shall be applied to all concrete surfaces to receive 106/G.

c. The project architect shall determine if the painted/ primed structural steel to receive fireproof-ing has been tested in accordance with ASTM E119, to provide the required fire resistance rating.

d. No fireproofing shall be applied prior to completion of concrete work on steel decking.

e. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete and roof traffic has ceased.

Performance Characteristics

Physical Properties	Recommended Specifications	Laboratory Tested* Value	Test Method
Dry density	Min. 22 pcf (350 kg/m^3)	See note below**	ASTM E605
Bond strength	Min. 500 psf (23.6 kN/m^2)	2,051 psf (98.2 KPa)	ASTM E736
Compressive strength @ 10% deformation	50 psi (340 KPa)	60.8 psi (413.6 KPa)	ASTM E761
Deflection and bond impact	No cracking or delamination	Pass Pass	ASTM E759 ASTM E760
Air erosion	0.000 gr/ft^2 (0.000 gr/m^2)	0.000 gr/ft^2 (0.000 gr/m^2)	ASTM E859
Resistance to mold growth	No mold growth after 28 days	Pass/No growth	ASTM G21

* Actual laboratory tested values meet or exceed Grace's recommended value. Test reports are available on request from your GCP Sales Representative.

** ASTM test methods modified where required, for high density, high performance products.

Mixing

a. Monokote Z-106/G Fireproofing shall be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer shall be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 38–43 pcf (610–690 kg/m³).

b. Using a suitable metering device and a conven-tional mixer, all water shall be first added to the mixer as the blades turn. Mixing shall continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Target density of 38–43 pcf (610–690 kg/m³) is most desirable. Overmixing Z-106/G will reduce pumping rate and will negatively effect in-place density and mechan-ical properties.

Application

a. Application of Z-106/G Fireproofing can be made in the following sequence:
   1. For thicknesses of approximately ½ in. (13 mm) or less, apply in one pass.
   2. For thicknesses of ⅝ in. (16 mm) or greater, apply subsequent passes after the first coat has set.

b. Z-106/G Fireproofing material shall not be used if it contains partially set, frozen or caked material.

c. Z-106/G shall have a minimum average dry, in-place density of 22 pcf (350 kg/m³).

d. Z-106/G is formulated to be mixed with water at the job site.

e. Monokote Accelerator may be used with Monokote Z-106/G to attain fast set and speed multiple pass application. The Monokote Accelerator is injected into the Monokote Z-106/G at the nozzle of the spray gun. Monokote Accelerator shall be mixed and used according to manufactur-ers recommendations.

f. Z-106/G is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/ pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 20 psi (0.14 MPa), will provide the correct hangability, density and appearance.

Temperature & Ventilation

a. The substrate temperature shall be a minimum of 40°F (4.5°C) for at least 1-hour prior to the application of the Monokote. Additionally, the air and substrate temperature during application and for a minimum or 24 hours after application shall be no less than 40°F (4.5°C).

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate caution-ary “SLIPPERY WHEN WET” signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote Z-106G is available on our web site at www.gcpat.com or by calling 866-333-3SBM.

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gcp applied technologies

MONOKOTE® Z-146

High Density Cementitious Fireproofing
Product data and application instructions

Product Description

Monokote® Z-146 high density cementitious fireproofing has been developed by GCP Applied Technologies to meet specialty, commercial and industrial fireproofing requirements.

Z-146 is a Portland cement-based, factory-mixed material requiring only the addition of water on the job for application. It is spray applied directly to structural steel (beams and columns), providing up to 4 hours of fire resistance. Its physical characteristics are excellent for areas exposed to environmental or climatic conditions.

Z-146 may be used in areas where high durability is required such as parking garages. This product is ideal for use in clean room environments where issues such as particle emissions and off gassing are critical to the interior environment within the building.

Features & Benefits

Z-146 offers the following advantages to architects, engineers, and applicators:

- **Factory pre-mixed**—Ready to use. No job site proportioning required. Simply add water in a standard paddle-type plaster mixer and apply with conventional plastering equipment.
- **Non-toxic**—The factory-mixed blend of common Portland cement and other inert materials requires only the addition of water for mixing and application.
- **Attractive finishes**—Z-146 may be sprayed or hand troweled after spraying to achieve a lightly textured appearance.
- **Equipment versatility**—Z-146 can be mixed in standard plaster mixer. After mixing, Z-146 may be spray-applied with commonly available pumping and spraying equipment.
- **Moisture resistant**—The Portland cement base affords excellent fire protection characteristics in areas subjected to high humidity.
- **Durable**—Hardness and durability help resist accidental physical damage.
- **Weatherable**—Able to withstand freeze/thaw, wind, rain and other climatic conditions.

Uses

Z-146 may be used in parking garages, exterior areas, mechanical rooms and other areas where a highly durable product is required.

Delivery & Storage

a. All material to be used for fireproofing should be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire resistance classifications.

b. The material should be kept dry until ready for use. Keep packages of material off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use should be discarded. Stock of material is to be rotated and used before its expiration date.

Performance Characteristics

Physical Properties	Recommended Specifications	Laboratory Tested* Value	Test Method/Notes**
Dry density	Min. 40 pcf (640 kg/m³)	See note below***	ASTM E605
Bond strength	Min. 10,000 psf (478 kPa)	16,727 psf (800 kPa)	ASTM E736
Compressive strength @ 10% deformation	500 psi (3.45 MPa)	561 psi (3.87 MPa)	ASTM E761
Hardness	40	49	ASTM D2240
Yield	—	16.7 board feet (1.55 m² at 25 mm) per bag	Theoretical maximum
Color	—		Natural concrete gray
Volatile Organic Content (off gassing) at 122°F (50°C) organic compounds C6-C28	Less than 1 PPMW (part per million by weight)	Less than 1 PPMW (Below detectable limits)	Dynamic headspace (Thermal desorbtion gas chromatography—mass spectrometry)
Leachable ammonia	Less than 50 PPB, 50 nanograms/mg	Less than 50 PPB (Below detectable limits)	Leachable ion by ion chromatography

* Independent laboratory tested value. Report available upon request.

** ASTM International test methods modified for bond strength and compressive strength, where required for high density, high performance products.

*** All in-place performance tests should be conducted at or below the minimum recommended specification density.

Steel & Concrete Surfaces

a. Prior to the application of Z-146, an inspection should be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be fireproofed should be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing will be the responsibility of the general contractor.

b. Prior to application of Z-146, a bonding agent, approved by the fireproofing manufacturer, should be applied to all concrete substrates to receive Z-146.

c. The project architect will determine if the painted/primed steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire resistance rating.

Mixing

a. Z-146 should be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer should be kept clean and free of all previously mixed material. Adjust the mixer speed in a conventional mixer to the lowest speed which gives adequate blending of the material and a mixer density of 50 to 60 pcf (800 to 961 kg/m^3) of material.

b. Using a suitable metering device and a conventional mixer, add all water to the mixer as the blades turn. Mixing should continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Overmixing Z-146 will reduce pumping rate and will negatively effect in-place density and mechanical properties.

Application

a. Z-146 material should not be used if it contains partially set, frozen or caked material.

b. Z-146 should have a minimum average dry, in-place density of 40 lbs/ft^3 (640 kg/m^3).

c. Z-146 is formulated to be mixed with water at the job site.

d. Z-146 is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 20 psi (0.138 MPa), will provide the correct hangability, density and appearance.

Note: If freshly sprayed Z-146 does not adhere properly, it is most likely due to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature & Ventilation

a. The substrate temperature shall be a minimum of 40°F (4.5°C) for at least 1-hour prior to the application of the Monokote. Additionally, the air and substrate temperature during application and for a minimum or 72 hours after application shall be no less than 40°F (4.5°C).

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing. Note: No recognized field bond strength test procedure exists for sprayed fireproofing materials with bond strengths greater than 1,000 psf (4,882 kg/m2) such as Monokote Z-146. Where bond strength specifications exceed 1,000 psf (4,882 kg/m2) it is recommended that independent laboratory test data based upon a modified version of ASTM E736 be submitted to verify specification compliance..

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate caution-ary “SLIPPERY WHEN WET” signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote Z-146 is available on our web site at www.gcpat.com or by calling 866-333-3SBM.

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gcp applied technologies

MONOKOTE® Z-156

Ultra High Density Cementitious Fireproofing
Product data and application instructions

Product Description

Monokote® Z-156 ultra high density cementitious fireproofing has been developed by GCP Applied Technologies to meet specialty, commercial and industrial fireproofing requirements.

Z-156 is a Portland cement-based, factory-mixed material requiring only the addition of water on the job for application. It is spray applied directly to structural steel (beams and columns), providing up to 4 hours of fire resistance. Its physical characteristics are excellent for areas exposed to environmental or climatic conditions.

Z-156 may be used in areas where superior durability is required such as parking garages. This product is ideal for use in clean room environments where issues such as particle emissions and off gassing are critical to the interior environment within the building.

Features & Benefits

Z-146 offers the following advantages to architects, engineers, and applicators:

- **Factory pre-mixed**—Ready to use. No job site proportioning required. Simply add water in a standard paddle-type plaster mixer and apply with conventional plastering equipment.
- **Non-toxic**—The factory-mixed blend of common Portland cement and other inert materials requires only the addition of water for mixing and application.
- **Attractive finishes**—Z-146 may be sprayed or hand troweled after spraying to achieve a lightly textured appearance.
- **Equipment versatility**—Z-156 can be mixed in standard plaster mixer. After mixing, Z-156 may be spray-applied with commonly available pumping and spraying equipment.
- **Moisture resistant**—The Portland cement base affords excellent fire protection characteristics in areas subjected to high humidity.
- **Durable**—Hardness and durability help resist accidental physical damage.
- **Weatherable**—Able to withstand freeze/thaw, wind, rain and other climatic conditions.

Uses

Z-156 may be used in parking garages, exterior areas, mechanical rooms and other areas where a highly durable product is required.

Delivery & Storage

a. All material to be used for fireproofing should be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire resistance classifications.

b. The material should be kept dry until ready for use. Keep packages of material off the ground, under cover and away from sweating walls and other damp surfaces. All bags that have been exposed to water before use should be discarded. Stock of material is to be rotated and used before its expiration date.

Performance Characteristics

Physical Properties	Recommended Specifications	Laboratory Tested* Value	Test Method/Notes**
Dry density	Min. 50 pcf (800 kg/m^3)	See note below***	ASTM E605
Bond strength	Min. 10,000 psf (478 kN/m^2)	20,680 psf (990 kPa)	ASTM E736
Compressive strength @ 10% deformation	850 psi (5.86 MPa)	874 psi (6.03 MPa)	ASTM E761
Hardness	40	91	ASTM D2240
Yield	—	13.3 board feet (1.24 m^2 at 25 mm) per bag	Theoretical maximum (Target 12.0 bdf per bag)
Color	—		Natural concrete gray
Volatile Organic Content (off gassing) at 122°F (50°C) organic compounds C6-C28	Less than 1 PPMW (part per million by weight)	Less than 1 PPMW (Below detectable limits)	Dynamic headspace (Thermal desorbtion gas chroma-tography—mass spectrometry)
Leachable ammonia	Less than 50 PPB, 50 nanograms/mg	Less than 50 PPB (Below detectable limits)	Leachable ion by ion chromatography

* Independent laboratory tested value. Report available upon request.

** ASTM International test methods modified for Bond Strength and Compressive Strength, where required, for high density, high performance products.

*** All in-place performance tests should be conducted at or below the minimum recommended specification density.

Steel & Concrete Surfaces

a. Prior to the application of Z-156, an inspection should be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be fireproofed should be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, excess rust, noncompatible primer, lock down agent or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing will be the responsibility of the general contractor.

b. Prior to application of Z-156, a bonding agent, approved by the fireproofing manufacturer, should be applied to all concrete substrates to receive Z-156.

c. The project architect will determine if the painted/primed steel to receive fireproofing has been tested in accordance with ASTM E119, to provide the required fire resistance rating.

Mixing

a. Z-156 should be mixed by machine in a conventional, plaster-type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer should be kept clean and free of all previously mixed material. Adjust the mixer speed in a conventional mixer to the lowest speed which gives adequate blending of the material and a mixer density of 65 to 70 pcf (1040 to 1120 kg/m3) of material.

b. Using a suitable metering device and a conventional mixer, add all water to the mixer as the blades turn. Mixing should continue until the mix is lump-free, with a creamy texture. All material is to be thoroughly wet. Overmixing Z-156 will reduce pumping rate and will negatively effect in-place density and mechanical properties.

Application

a. Z-156 material should not be used if it contains partially set, frozen or caked material.

b. Z-156 should have a minimum average dry, in-place density of 50 lbs/ft3 (800 kg/m^3).

c. Z-156 is formulated to be mixed with water at the job site.

d. Z-156 is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continuous mixer/pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 20 psi (0.138 MPa), will provide the correct hangability, density and appearance.

Note: If freshly sprayed Z-146 does not adhere properly, it is most likely due to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature & Ventilation

a. The substrate temperature shall be a minimum of 40°F (4.5°C) for at least 1-hour prior to the application of the Monokote. Additionally, the air and substrate temperature during application and for a minimum or 72 hours after application shall be no less than 40°F (4.5°C).

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is substantially dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing. Note: No recognized field bond strength test procedure exists for sprayed fireproofing materials with bond strengths greater than 1,000 psf (4,882 kg/m2) such as Monokote Z-156. Where bond strength specifications exceed 1,000 psf (4,882 kg/m2) it is recommended that independent laboratory test data based upon a modified version of ASTM E736 be submitted to verify specification compliance.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Monokote is slippery when wet. The general contractor and applicator shall be responsible for posting appropriate caution-ary “SLIPPERY WHEN WET” signs. Signs should be posted in all areas in contact with wet fireproofing material. Anti-slip surfaces should be used on all working surfaces.

b. Material Safety Data Sheets for Monokote Z-156 is available on our web site at www.gcpat.com or by calling 866-333-3SBM.

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gcp applied technologies

MONOKOTE® SPATTERKOTE® SK-3

Product data and application instructions

Product Information

Description

Monokote® Spatterkote® SK-3 is a mill-mixed Portland cement based cementitious spray applied fireproofing accessory product. It is designed to be used with Monokote MK-6®, Z-106/G, MK-10/HB, MK-1000/HB and Retro-Guard® RG Replacement Fireproofing on cellular steel decking with flat plate on the bottom and some roof-ceiling designs. Cement based Spatterkote bonds tenaciously to flexible galvanized flat plate steel surfaces used in many of today's most advanced structural steel deck designs. When used in conjunction with Monokote MK-6, Z-106/G, MK-10/HB, MK-1000/HB and/or Retro-Guard Fireproofing, Spatterkote provides the most reliable fireproofing systems available to the spray fireproofing industry.

Uses

Spatterkote SK-3 shall be applied to all cellular steel floor units with flat plate on the bottom before the application of Monokote MK-6, Z106/G, MK-10/HB, MK-1000/HB or Retro-Guard Replacement Fireproofing. Spatterkote is also required in some roof-ceiling and concrete floor-ceiling designs and is optional on other steel surfaces. The thickness of Spatterkote is included in the total final fireproofing thickness.

Materials

a. Material shall be Spatterkote, Underwriters Laboratories designation "Type SK-3", as manufactured by Grace Construction Products, W. R. Grace & Co.–Conn. or its processing distributors.

b. Mixing water shall be clean, fresh and suitable for domestic consumption and free from such amounts of minerals or organic substances as would affect the set of the fireproofing.

c. Retarder material shall be Red Top Plaster Retarder as manufactured by United States Gypsum or approved equal.O

Application

Application procedure shall conform to the mate-rial manufacturer's application instructions. Spatterkote shall be spray applied at the approxi-mate rate of 1 lb/20 ft² (1 kg/4.9 m²) [nominal 960 ft²/46 lbs (100 m²/21 kg) bag]. Spatterkote should be sprayed as its name suggests. After application, the deck areas should look lightly textured and when viewed directly from below, 10–30% of the galvanized surface should remain exposed. A continuous coverage with no deck showing through is NOT acceptable.

Surface Preparation

All surfaces to receive Spatterkote shall be free of oil, grease, paints/primers, loose mill scale, dirt or other foreign substances which may impair proper adhesion of the fireproofing to the substrate. Spatterkote is not intended for application over alkali sensitive primers.

Job Set-Up, Equipment & Spray Instructions

General

Spatterkote can be pumped through the main system directly from the main pump to a smaller pump on the floor or can be applied using a separate mixer/pump set up on the floor. The use of only a main system is considered most cost effective.

For simplest application, start with Spatterkote first thing in the morning before application of Monokote has begun. Pumping will begin with Spatterkote and be immediately followed with retarded Monokote (see caution for "sandwich" Monokote-Spatterkote-Monokote alternate). Predetermine the number of bags of Spatterkote needed to spray the entire floor and place near the mixer. UL requires a minimum waiting period of 30 minutes after Spatterkote application before overspraying with Monokote or Retro-Guard. A single floor or several floors may be sprayed with Spatterkote at one time.

Job Set-Up

Set-up detailed below is based on pumping through the main Monokote system to an FM-9 (2L4 Rotor Stator) pump on the floor.

A large plaster pump, TM-30, A-3.75 or other (presently being used for Monokote application) is used to pump Spatterkote through main system to the hopper of a small pump (FM-9 or other 2L4 Rotor Stator Pump) placed on spray floor. FM-9 is fitted with 100 ft (30.5 m) max of 1¼ in. (31 mm)

plaster hose with 6 ft (1.8 m) pole gun. Pole gun to be 1 or 1¼ in. by 5 ft (25 or 31 mm by 1.5 m) aluminum pipe with hose swivel and nozzle fitted with ⅜ in. (10 mm) "tough boy" orifice. The ⅜ in.(10 mm) "tough boy" orifice is essential to obtain best pattern and throw to the steel surface, FM-9 to be fitted with front wheel to increase floor mobility. Monokote floor (main system) hose to be fitted with 2 in. (50 mm) KamLoc Brass (quick fit) fitting at the 2 in. x 1½ in. (50 mm x 38 mm) reducer. 2 in. (50 mm) hose to be disconnected and placed near hopper of FM-9. Large pump must be able to be shut off from spray floor, 10 gal (38 L) of water should be brought to the spray floor to allow for cleanout of the floor pump.

Mixing Procedures

Spatterkote is formulated to be mixed with water in a mechanical plaster mixer to form a cohesive, uniform slurry of 44–55 lb/ft^3 (700–880 kg/m^3). Water nominal 8¼–8¾ gal (31.2–33.1 L) per bag should be added to the mixer followed by addition of Spatterkote. Mixing should continue and water adjusted to create a wet, creamy mix with the consistency of medium thick tomato/rice soup. Mixing a wet mix at 35 rpm for a period of
1½–3 minutes will produce proper consistency. Mix will be significantly wetter than Monokote.

Pumping

a. Large plaster pump (TM-30, A3.75 or equal) and hoses should be primed with a small amount of water. Pump should be placed in a low gear and when the hopper is empty the mixer can be dumped and Spatterkote pumping begun. When all the Spatterkote has been mixed and dumped into the pump hopper, the mixer must be dumped and allowed to empty completely. The first 3 bag batch of Monokote MK-6 can then be mixed with the addition of 2.5 oz (74 mL)
[one half of a 5 oz (148 mL) dixie cup] of plaster retarder. Retarder must be added or fast setting will occur. When all the Spatterkote has been pumped and the hopper is empty, the retarded Monokote can be dumped and regular Monokote mixing/pumping can continue.

b. On the spray floor the 2 in. (50 mm) hose (open mouth with quick fit) should be held in the hopper of the FM-9 and the SpatterkoteO allowed to flow into the hopper. The FM-9 (soap the night before, see section c, which follows) should be placed in third gear. When the hopper of the FM-9 is approximately ½ full, start the pump and immediately begin Spat-terkote application. Experience will dictate the proper speed of the large main pump to match the output of the FM-9 floor pump.

c. When Monokote appears at the mouth of the 2 in. (50 mm) hose, the main pump can be shut off and the 1½ in. (38 mm) Monokote floor hose attached with the quick fit and laid aside until completion of Spatterkote application. When all the Spatterkote has been pumped, 5 gal (19 L) of water can be used to wash down the pump and clean the hoses. When this is complete, an additional 5 gal (19 L) of water pumped through the system will complete the cleanout. When the system is clean, a small amount of liquid dish soap can be "dribbled" over the end of the turning stator tube in hopper. This will lubricate the stator and prevent sticking of the tube and rotor during start up at a later date.

Cautions

1. If Spatterkote is sandwiched between Monokote MK-6, Z-106/G, MK-10/HB, MK-1000/HB or Retro-Guard (i.e., Monokote pumping-change to Spatterkote-change back to Monokote) the Monokote batches in front of and following Spatterkote MUST BE RETARDED. One half of a 5 oz (148 mL) dixie cup of plaster retarder added to the mixing water of a 3 bag batch of Monokote MK-6, MK-10/HB, MK-1000/HB or Retro-Guard is sufficient.
2. Whenever changing products, the pump hopper should be allowed to completely empty and the sides scraped clean. Where mixing blades do not clean the mixer, a small amount of water should be added to the mixer and dumped into the full pump hopper to help empty the mixer completely.
3. Caution: Spatterkote is cement-based. It will stain aluminum curtain walls, car finishes, and other surfaces which are attacked by alkali (lime).
4. Always review the information on the bag and in the MSDS before using the product. This product is manufactured for professional use only.OO

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MONOKOTE® Patching Compound

Fireproofing Patching Material for Repairing Monokote MK-5, MK-6 and MK-10 Products

Description

Monokote® Patching Compound is the **only** UL approved patching material for patching Monokote MK-5, MK-6 and MK-10 products that when applied as directed, will maintain the original fire rating of the steel membe . It has been developed by GCP Applied Technologies to meet specialty, commercial and industrial fireproofing patching requirements. Monokote® Patching Compound is a mill-mixed plaster, (cementitious) fireproofing material that can be hand mixed and trowel applied as required for patching and repairs to surfaces. Monokote® Patch Compound is hand-applied directly to the steel and/or well-bonded material using standard plastering tools and techniques. It has excellent bonding characteristics; it can be applied up to one inch per pass.

Monokote® Patching Compound is classified for use in all UL designs associated with Monokote MK-5, MK-6 and MK-10 products. References to Monokote® Patching Compound can be found at Database.UL.com by searching for UL File number R4339. Per UL patching guidelines, Monokote® Patching Compound can only be used to patch individual areas of 144 square inches or less. It will provide the same hourly fire resistance of the material being replaced as long as the thickness of the Monokote® Patching Compound is equivalent to or greater than the required thickness of the material being replaced.

Features & Benefits

Monokote® Patching Compound offers the following advantages to applicators:

- **UL Classified –** Monokote® Patching Compound is the **only** UL approved patching material for patching Monokote MK-5, MK-6 and MK-10 products that will maintain the original fire rating of the steel member
- **Convenient** – Conveniently packaged in 5 gallon pail. Mix in 1 ½ gallons of water and begin patching.
- **Easy to Mix** – Simply add water and mix with a hand-held drill mixer.
- **Easy to Apply –** Apply using a trowel. No spray equipment is needed.
- **Excellent Bond Characteristics** – Up to one inch thickness per pass

Uses

Monokote® Patching Compound is ideal for patching damages resulting from typical jobsite installation or renovation activities:

- Duct hangers
- Electrical pipes
- Drywall
- Sprinklers
- Heating
- Ventilation

As IBC requirements for increased SFRM inspections for occupied buildings are implemented, Monokote® Patching Compound will be an ideal product for maintenance repairs.

Delivery & Storage

a. All material to be used for fireproofing should be delered in original unopened pails bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard and fire resistance classifications

b. The material should be kept unopened until ready for use.

Surface Preparation

a. Surfaces to which fireproofing is applied must be thoughly cleaned of all foreign material which might impair adhesion. All loose material, including dirt, loose rust, mill scale and any other foreign material, that would impair adhesion of the patching material must be removed prior to patching. Where damaged material extends to the steel or concrete substrate, removal should be to the steel or concrete substrate.

b. Where well-bonded material exists below the damaged material, removal of the damaged material should extend to the well-bonded firm material. There is no requirement to remove well-bonded material that lies immediately beneath loosely bonded or poorly adhered material.

c. The patching material is keyed into the material surrounding the patch. It should be understood that the integrity of the surrounding material shall not have been impaired. If the surrounding material has been damaged it should be removed prior to patching.

d. When applying new material over in place material that has dried, it may be necessary to dampen or pre-wet the in place material sufficiently to prevent premature drying of the newly applied patching material.

Mixing

a. Monokote® Patching Compound can be hand mixed or mechanically mixed depending on the amount of material being mixed. When mixing full pail quantities, mechanical hand-held mixers, such as a drill with portable mixing blade, are recommended.

b. When mixing full pails of Monokote® Patching Compound, add 1 ½ gallons of potable water to the pail of Monokote® Patching Compound Mixture. When mixing less than full pails of material, add 1 quart cup of water to 4 quart cups of Monokote® Patching Compound.

c. Mix for 1-3 minutes until the mix is a lump-free, cohesive uniform slurry. All material is to be thoroughly wet.

d. When properly mixed, Monokote® Patch Compound has a potlife between 2 to 4 hours.

Application

a. Monokote® Patching Compound is hand-applied directly to the steel and/or well-bonded material using standard plastering tools and techniques. An individual patched area should not exceed 144 square inches.

b. Maximum 1 inch thickness can be applied in a single pass. Anything above 1 inch requires multiple coats. Allow material to become stiff but not completely dry before applying the next coat.

c. When patching over in-place material that has dried, immediately before application it may be necessary to pre-wet the in-place material sufficiently to prevent premature drying of the newly applied patching material.

d. One pail of Monokote® Patching Compound can cover 7¾ sq ft of area at a thickness of one inch.

e. Monokote® Patching Compound should not be used if it contains partially set, frozen or caked material.

f. Monokote® Patching Compound should not be retempered if the material has started to stiffen or set.

Environment

An air and substrate temperature of 40°F (4.5°C) minimum should be maintained for 8 hours prior to application, during application and 24 hours after application of Monokote® Patching Compound.

Provide ventilation to achieve a minimum fresh air exchange rate of 4 times per hour until the material is substantially dry

Safety

A Material Safety Data Sheet for Monokote® Patching Compound is available on our web site at www.gcpat.com or call toll free at 866-333-3SBM.

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RETRO-GUARD® RG

Replacement fireproofing

Designed to meet all IBC Bond Strength Requirements

Product Description

Retro-Guard® RG replacement fireproofing is a single component, mill-mixed gypsum plaster based product which requires only the addition of water on the job site to form a consistent, pumpable slurry. RG can be used on structural steel columns, beams, joists, trusses, flat plate cellular and fluted decking.

Features & Benefits

Retro-Guard Cementitious Fireproofing has been specifically developed by GCP Applied Technologies to meet the needs of the fireproofing respray contractor. Retro-Guard offers the following advantages:

- **Adjustable Bond Strengths** - can be applied to reach over 1,000 psf when applied at densities at or above 18 pcf.
- **Quick set**—in 7 to 10 minutes with the use of Monokote® Accelerator and Injection System
- **Less overspray**—work close to steel, less cleanup
- **No noxious fumes** or irritating particulates released during or after application
- **Hard** durable surface
- **Fully UL fire tested** and classified for use with the most post-removal lock downs in the industry
- **Dries to a light blue color**—easily identified and differentiated

Materials

a. Material shall be Retro-Guard RG replacement fireproofing as manufactured by GCP Applied Technologies.

b. Mixing water shall be clean, fresh and suitable for domestic consumption, and free from such amounts of mineral or organic substances as would affect the set of the fireproofing material.

c. Lock down agents shall be UL Classified for use with Retro-Guard RG. Refer to the ULI Fire Resistance Directory current edition for products listed with Retro-Guard under Classification Category CBUI.

Delivery & Storage

a. All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and the proper Underwriters Laboratories Inc. identification.

Mixing

a. Retro-Guard shall be mixed by machine in a conven-tional plaster type mixer or a continuous mixer specifically modified for cementitious fireproofing. The mixer shall be kept clean and free of all previously mixed material. The mixer speed in a conventional mixer shall be adjusted to the lowest speed which gives adequate blending of the material and a mixer density of 40–45 pcf (640–720 kg/m³) of material.

b. Using a suitable metering device and a conventional mixer, all water shall be first added to the mixer as the blades turn. Where possible, the mixer blades shall then be stopped and all the Retro-Guard fire-proofing added. The mixer blades shall then be restarted. If the mixer blades are left running, Retro-Guard should be added to the mixer as quickly as possible. Mixing shall continue only until all material is thoroughly wet and no lumps remain. Target density of 43 ± 1 pcf (688 ± 16 kg/m³) is most desir-able. Overmixing Retro-Guard will reduce pumping rate and will adversely affect final in-place density and hangability. Undermixing Retro-Guard will nega-tively affect in-place density and yield.

Steel Surfaces

a. Prior to the application of Retro-Guard an inspection shall be made to determine that all steel surfaces are acceptable to receive fireproofing. The steel to be

Performance Characteristics

Physical Properties	Recommended Specification	Typical Values	Test Method
Dry density, minimum average	15 pcf (240 kg/m³) 18 pcf (288 kg/m³)	15 pcf (240 kg/m³) 18 pcf (288 kg/m³)	ASTM E605
Bond strength	430 psf (20.6 KPa) at 15 pcf 1,000 psf (47.9 KPa) at 18 pcf	883 psf (42.3 KPa) at 15 pcf 1,527 psf (73.1 KPa) at 18 pcf	ASTM E736 ASTM E736
Compression, 10% deformation	1,200 psf (51 KPa)	1,440 psf (68.9 KPa)	ASTM E761
Air erosion	Max 0.000 g/ft² (0.00 g/m²)	0.000 g/ft² (0.00 g/m²)	ASTM E859
High velocity air erosion	No continued erosion after 4 hours	No continued erosion after 4 hours	ASTM E859
Corrosion	Does not contribute to corrosion	Does not contribute to corrosion	ASTM E937
Bond impact	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E760
Deflection	No cracking, spalling or delamination	No cracking, spalling or delamination	ASTM E759
Resistance to mold growth	No growth after 28 days	No growth after 28 days	ASTM G21
Surface burning characteristics	Flame spread = 0 Smoke developed = 0	Flame spread = 0 Smoke developed = 0	ASTM E84
Combustibility	Less than 5 MJ/m² total, 20 kw/m² peak heat release	Less than 5 MJ/m² total, 20 kw/m² peak heat release	ASTM E1354
Impact penetration	Max 6 cm³ abraded	3.3 cm³	City of San Francisco
Abrasion resistance	Max 15 cm³ abraded	8.3 cm³	City of San Francisco

fireproofed shall be free of oil, grease, excess rolling compounds or lubricants, loose mill scale, rust or any other substance that will impair proper adhesion. Where necessary, the cleaning of steel surfaces to receive fireproofing shall be the responsibility of the abatement contractor, or general contractor.

b. The project architect shall determine if the painted/primed steel or lock down agent on the steel to receive fireproofing have been tested in accordance with ASTM E119, to provide the required fire resistance rating.

c. Many Fire Resistance Designs allow the use of painted metal floor or roof deck in place of galva-nized decking. Painted decking must be UL listed in the specific fire resistance designs and must carry the UL classification marking. Consult your local GCP sales representative for details.

d. Prior to application of Retro-Guard, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive Retro-Guard.

e. In advance of the application of the fireproofing, a bond test shall be conducted on all painted/primed steel surfaces or steel that has been covered with a lock down agent to determine if the paint or lock down agent will impair the ambient bond of the fireproofing.

f. Where cellular steel decking is present, both cellular and fluted decking requires the application of Spatterkote® SK-3 before application of Retro-Guard RG. The thickness of SK-3 is incorporated into the total fireproofing thickness.

g. Fireproofing to the underside of steel roof deck assemblies shall be done only after roofing applica-tion is complete and roof traffic has ceased

Application

a. Application of Retro-Guard Fireproofing can be made in the following sequence:
   1. For thicknesses of approximately ½ in. (13 mm) or less, apply in one pass.
   2. For thicknesses of ⅝ in. (16 mm) or greater, apply second passes after the first coat has set.
      The use of the Monokote Accelerator Injection System is required to obtain optimal job site appli-cation performance. The use of the Monokote Accelerator Injection System will provide quick set material (usually seven to ten minutes after appli-cation), greater in-place yield, and the ability to spray an area in essentially one continuous opera-tion. Second coat can be applied as soon as first material applied has set.

b. Prior to application of Retro-Guard, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive Retro-Guard.

c. Spatterkote SK-3 shall be applied to all deck areas when flat plate cellular steel decking is present, and as specified in some roof deck designs. Consult current UL Directory for specific use. Spatterkote shall be applied in accordance with manufacturer's application instructions.

d. Retro-Guard Fireproofing material shall not be used if it contains partially set, frozen or caked material.

e. Retro-Guard shall have a minimum average dry in-place density of 15 lbs/ft^3 (240 kg/m^3).

f. Retro-Guard shall be mixed with water at the job site.

g. Monokote Accelerator when used shall be mixed and used according to the manufacturers recommendations.

h. Retro-Guard is applied directly to the steel, at various rates of application which will be job dependent, using standard plastering type equipment or continu-ous mixer/pump units. A spray gun, with a properly sized orifice and spray shield and air pressure at the nozzle of approximately 20 psi (38 KPa), will provide the correct hangability, density and appearance. NOTE: If freshly sprayed Retro-Guard does not adhere properly, it is probably due to a too wet mix, poor thickness control, or an improperly cleaned substrate.

Temperature & Ventilation

a. An air and substrate temperature of 40°F (4.5°C) minimum shall be maintained for 24 hours prior to application, during application and for a minimum or 24 hours after application of Retro-Guard.

b. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided to achieve a minimum total fresh air exchange rate of 4 times per hour until the material is dry.

Field Tests

a. The architect will select an independent testing laboratory (for which the owner will pay) to sample and verify the thickness and density of the fireproofing in accordance with the the applicable building code.

b. The architect will select an independent testing laboratory (for which the owner will pay) to randomly sample and verify the bond strength of the fireproofing in accordance with the provisions of ASTM E736.

c. Results of the above tests will be made available to all parties at the completion of pre-designated areas which shall have been determined at a pre-job conference.

Safety

a. Retro-Guard is SLIPPERY WHEN WET.
   The General Contractor and Applicator shall be responsible for posting appropriate cautionary "SLIPPERY WHEN WET" signs.

b. A Material Safety Data Sheet for Retro-Guard is available on our web site at www.gcpat.com or call toll free at 866-333-3SBM.

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MONOKOTE® Z-3306

Thermal Barriers

Product data and application instructions

Product Description

Monokote® Z-3306 Thermal Barrier is a cementitious fire protective coating specifically formulated for application over rigid, urethane and polystyrene foam plastics. Spray applied to interior foam surfaces on walls and ceilings, Z-3306 forms a hard, durable, monolithic thermal barrier against heat and fire.

Z-3306 is a mill-mixed product requiring only the addition of water. It can be easily applied to required thickness in a single pass resulting in an efficient, low cost method of meeting building code and insurance requirements.

In developing Z-3306, GCP Applied Technologies has utilized its experience and technology as the producer of Monokote spray applied fireproofing products—the most widely used structural steel fireproofing brand in North America. Sales and technical personnel located throughout the United States and Canada provide close technical support to contractors, owners and specifiers.

Benefits

While specific requirements differ from locality to locality, the use of foam plastics for most building occupancies is permitted only when they are protected by an approved thermal barrier. Z-3306 has been successfully fire-tested and listed by Underwriters Labora-tories Inc. and Factory Mutual. Z-3306 has a proven field and laboratory record of performance, reliability, ease of application and low in-place cost.

- **Proven fire test performance**—Z-3306 has successfully passed UL requirements as a thermal barrier over foam plastics.
- **Economical**—Ease of installation makes Z-3306 a low cost way to protect foam plastics.
- **Workable**—After being spray applied, Z-3306 may be lightly trowelled.
- **Damage resistant**—Z-3306 dries to a hard, durable surface which resists damage.

Testing Agency	Test Method	Substrate	Thickness of Z-3306	Test Result
Underwriters Laboratories Inc. (ULI) (USA)	UL 1715 (Room fire test)	Urethane foam	⅜ in. (10 mm)	Z-3306 approved
	(UBC 26-3)	Styrene foam	⅜ in. (10 mm)	Z-3306 approved
ULI (USA)	ASTM E119 Exposure (UBC 26-2) CAN/ULC-S101*	Urethane foam	¾ in. (19 mm)	15 minute rating
			1⅛ in. (29 mm)	30 minute rating
ULI (USA)	ASTM E84 (Tunnel test)	Urethane foam	½ in. (13 mm)	Flame spread 10 Smoke developed 0
		Styrene foam	½ in. (13 mm)	Flame spread 5 Smoke developed 0
ULC (Canada)	CAN4-S124M	Urethane foam	⅞ in. (21 mm)	Classification A
		Urethane foam	1 1/16 in. (16 mm)	Classification B
		Urethane foam	1 3/16 in. (20 mm)	Classification C
		Urethane foam	1 1/16 in. (16 mm)	Classification D
Factory Mutual System®	FM 4975	Urethane foam	⅞ in. (21 mm)	Delay ignition 10–15 minutes
		Styrene foam	1⅛ in. (29 mm)	Delay ignition 10–15 minutes

*Test results are based on ASTM E119 testing. CAN/ULC-S101 is equivalent to ASTM E119.

- **Humidity resistant**—Z-3306 can be used in high humidity conditions and reduces sweating often experienced in vegetable storage areas.
- **Washable**—When trowelled and painted, Z-3306 can be washed and cleaned.

Physical Properties

- **Bond strength**—500 lbs/ft^2
- **Color**—Grey or off-white
- **Theoretical yield**—25 bd ft/bag (50 ft^2 at ½ in. thickness)

Installation

Z-3306 is packaged in poly-lined bags for easy handling and storage.

Firebond Concentrate (bonding agent) must be applied to all surfaces before application of Z-3306.

Z-3306 is mixed with water in a plaster-type mixer to form a consistent, pumpable slurry. This slurry is then spray applied.

Where desired, the natural sprayed texture of Z-3306 can be lightly trowelled to form a semi-smooth, paintable surface. A thin (nominal 1⁄16 in.) latex stucco overspray may be applied to form a hard eggshell finish, capable of withstanding significant physical contact and surface abrasion.

Typical Applications*

Z-3306 may be used to protect foam plastics in many types of buildings. The following is a brief list of typical applications:

- Breweries, freezers and coolers
- Controlled atmosphere apple, potato and vegetable storage
- Ice arenas and recreation centers
- Indoor tennis courts and swimming pools
- Pig and dairy barns
- Seed storage and processing
- Water treatment plants

* **NOTE:** Many food processing applications require local inspection agency approvals in advance of installation.

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MONOKOTE® Z-3306/G

Thermal Barriers

Product data and application instructions

Product Description

Monokote® Z-3306/G Thermal Barrier is a gypsum based fire protective coating specifically formulated for application over sprayed polyurethane foam plastics (SPF) with a nominal density of 0.5 pounds per cubic foot (pcf). Spray applied to interior foam surfaces on walls and ceilings, Z-3306/G forms a well adhered, monolithic thermal barrier against heat and fire.

Z-3306/G is a mill-mixed product requiring only the addition of water. Prior to application of Monokote Z-3306/G, the application of Firebond® Concentrate at a nominal rate of 500 ft^2/gal is required to all foam surfaces. For maximum yield benefit and set character-istics, Z-3306/G can be applied using Monokote Accelerator.

With Monokote Accelerator, Z-3306/G can be applied to the required thickness in a continuous uninterrupted operation. This results in an efficient, low cost operation that meets build-ing code and insurance requirements.

In developing Z-3306/G, GCP Applied Technologies has utilized its experience and technology as the producer of Monokote spray applied fireproofing products – the most widely used structural steel fireproofing brand in North America. Sales and technical service personnel located throughout the United States and Canada provide close technical support to contractors, owners and specifiers.

Benefits

While specific requirements differ from local-ity to locality, the use of minimum 0.5 pcf SPF for most building occupancies is permitted only when they are protected by an approved thermal barrier. Z-3306/G has been success-fully fire-tested for performance, reliability, ease of application and low in-place cost.

- **Proven fire test performance**—Z-3306/G has successfully passed the International Building Code requirements for code compliant use as a thermal barrier over minimum 0.5 pcf urethane foam plastics.
- **Economical**—High application rate makes Z-3306/G the low cost way to protect foam plastics. The use of Monokote Accelerator adds more savings by maximizeing yield and set charcteristics reducing labor and time to complete the project
- **Damage resistant**—Z-3306/G dries to a hard, durable surface which resists damage.Z

In Place Performance: Physical Properties

- **Bond Strength (ASTM E736)**— min 200 lbs/ft^2
- **Compressive Strength (ASTM E761)**— 1,200 psf
- **Density (ASTM E605)**—minimum 15 pcf average; minimum 14 pcf individual
- **Color**—Gray
- **Theoretical yield**—max 44.5 bd ft/bagZ

Test Method	Thickness of Z-3306/G	Test Results
ASTM E84 (Surface Burning Characteristics)	N/A	Flame Spread = 0 Smoke Developed = 0
NFPA 286/UL 1715 – Corner Room Test	¾ in. (19mm)	Passed

Installation

Z-3306/G is packaged in kraft poly-lined bags for easy handling and storage.

Firebond Concentrate (Bonding Agent) must be applied to all foamed surfaces at a rate of 500 ft^2/gal prior to application of Z-3306/G. Firebond should be allowed to become tacky or dry prior to application of Z-3306/G.

Z-3306/G is formulated for machine application in standard gypsum plaster type equipment. Z-3306/G is mixed with water in a paddle plaster-type mixer to form a consis-tent, pumpable slurry which is then spray applied to foamed plastic previously treated with Firebond Concentrate.

Where desired, the natural sprayed texture of Z-3306/G can be lightly troweled to form a semi-smooth, paintable surface. After completely dry, Z-3306/G may be painted with acrylic and other paints formulated for interior use conditions over gypsum plaster based materials. Thin latex modified surface coatings may also be applied to Z-3306/G to increase surface hardness. All coatings must meet exposed interior use code requirements and surface burning characteristics (ASTM E84 of smoke < 450, Flame Spread < 200) Contact your GCP representative for guidance prior to application of coatings to Z-3306/G. So called “waterproofing coatings” of any kind will not prevent water penetration of Z-3306/G and may not be used.

Typical Application and Limits of Use

Z-3306/G may be used to protect foam plas-tics in many types of buildings. Monokote Z-3306/G is gypsum plaster based and is designed for interior use only. Z-3306/G should not be used for exterior applications or exposure to continuous unconditioned high humidity environments or where free water may condense For high humidity or damp applications, GCP recommends the use of Monokote Z-3306 Portland Cement based Thermal Barrier.

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Section 2: Planning

Pre-setup Planning

1. Review the specifications and drawings and be sure the general contractor and inspectors have the same interpretation as you do.
2. Arrange with the general contractor's representative to meet and walk the site to establish the location of your permanent pumping station.
    a. Select a primary and an alternative setup location. Where possible, pump up the outside or through the core of the building from a single site. During the winter, the core will provide some heat and help prevent line freeze-up.
    b. Be sure of adequate space for unloading and handling of material for the duration of the job. Space and access routes often change as the project progresses.
    c. Find a water source with adequate volume and pressure. Also check on washout procedures and local water regulations. For example a settling tank may be required.
3. Determine if any protection of interior surfaces (exposed floors) is required.
4. Check to see if tarps are necessary for overspray protection outside the building.
5. With the general contractor, carefully plan the means for maintaining proper temperature and ventilation for your phase of the work in all weather conditions.
6. Be certain steel and concrete are sufficiently clean for the proper fireproofing application. Remove loose rust or mill scale with a burlap rag, heavy brush, or high pressure compressed air. Oil on steel or concrete must be removed with trisodium phosphate or other cleaners. On concrete, check closely for form oils and curing compounds. A bonding agent is required on all concrete surfaces.
7. Arrange your application schedule with the job superintendent.
    a. Insist that you be on the floor as soon as the concrete is poured but before the plumbing and ductwork have begun.
    Working around obstacles such as stacked wall boards, pipes, and hanging ducts can cut your application rate in half and drastically increase labor cost and material waste.
    b. When fireproofing steel roof decks. the roof system (insulation and membrane) must be 100% complete and water tight. All roof traffic must be prohibited during and after the Monokote application and until the fireproofing has dried and full bond strength is attained.

Items 7a and 7b should be included in your bid and production commitment. Tell the superintendent that clear work areas mean you will be out of the way a lot faster and scheduling of other trades will be easier.


The Monokote Tool Box
Flexible — Lightweight — High Production
Deluxe Simplified High Yield Kit
3/4" Lightweight Pole Gun
Inline Injection
Full Flow Quick Fits
1" Hose
3/4" Whip
1500 psi Goodyear Gauntlet
Reversible 45° Fitting
Articulating Swivel
1 1/4" Hose
3/4" Lightweight Flexible Nozzle
Caps, Shields & Orifices
Quickfits & Swivels
Photo 5

Preparation and Clean Up

The fireproofing operation should start shortly after the concrete has been poured, before other trades begin stocking materials and cluttering up the work space. Working around material that has been stocked prior to the fireproofing operation hinders production and increases labor cost. This is costly and becomes even more expensive if installations by other trades have started before the completion of the fireproofing. Additional cost such as extra "over-spray" protection, additional material waste and overspray, and lower daily production rates can be expected due to these obstacles. Particular attention should be paid in the preplanning phase of the job to eliminate these conditions.

If this happens, normally materials are moved to one side of the floor, that area is sprayed and cleaned, and then material is shifted back releasing the remainder of the floor to the spray crew.

Floor clean up

Scraping floors is the traditional method of clean up. In this section we will discuss this and alternate methods which have been proven successful with some of our applicators. Covering floors before the application starts and methods such as prewetting floors have aided in the clean up process and has been a proven method of minimizing cost.

Scraping Floors

Scraping floors is one method of clean up. Different types and sizes of scrapers are available. A sharp metal blade mounted with bolts to a handle frame is common. The blades are replaceable and it is advisable to keep them straight and sharp to ease the cleaning process. The key to cleaning floors and not leaving material behind when scraping are:

1. Observe the finish of the concrete. Smooth concrete finish can be easily scraped clean with a new/sharp blade. Rough unfinished floors will require additional attention. Cleaning overspray off of unprotected rough surfaces can be very costly and may require the use of mechanical washers. Preplanning the proper cleanup procedures or protection methods can be vital to job profitability.
2. The correct size (width) scraper for person scraping is recommended, to large of scraper for a person to physically scrape correctly results in leaving the floors in an unacceptable condition. The most common size scrapers used are 18", 24" and 48". Scraping the product while it is still wet, fresh and unset (before drying or setting) is recommended.
3. Properly manning the crew is also important. Normally the person moving the scaffold for the sprayer cleans the floor during the application process. Some jobs may require an additional person cleaning behind the application. This occurs in cases such as thin thickness job, or beam only applications, where the focus is to move the scaffold quickly and doesn't allow ample time for proper clean up. All overspray should be at least scraped into piles by the end of the working day and best if removed from the spray area and discarded before wind and other trades spread the debris.

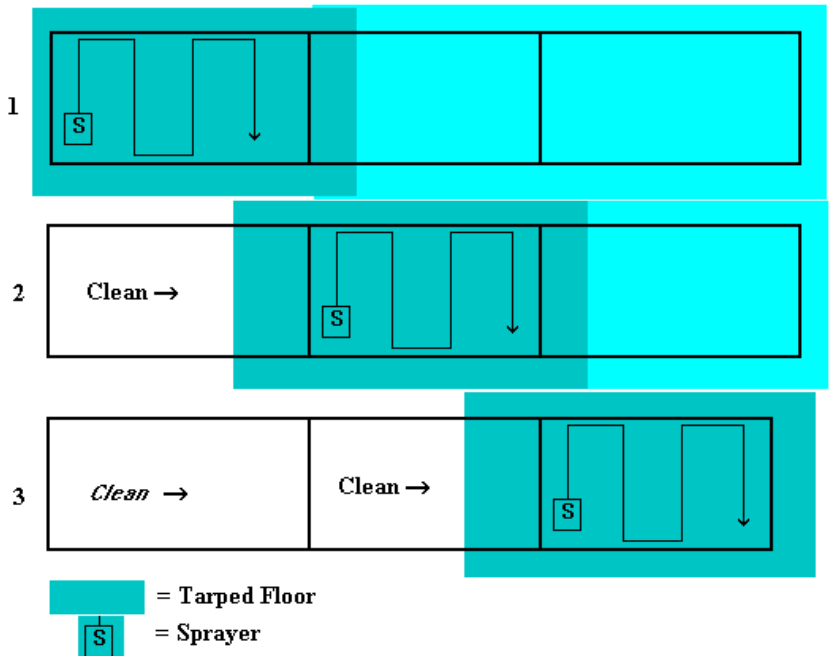
Covering Floors

Covering floors is highly recommended for multiple pass operations, rough concrete finishes and when floor cleanup cannot be scraped before it dries. When covering floors on new construction jobs a 7ml reinforced poly is highly recommended. This can be bought in many different sizes. The most common sizes range in width from 20' to 40' wide x 100' length.

The cost is approx. $0.12 per square foot. The advantages of the 7 ml reinforced poly are:

1. It can be reused many times which cuts the cost down by 50% every time it is reused.
2. It is very durable and hard to tear.
3. It is not as slippery as smooth poly, better traction for scaffold pusher or the wheels of a mechanical lifts.

The amount of poly needed for a job is normally estimated at 25% of floor area being sprayed. This allows the overspray to dry on the poly before it has to be moved ahead to the next area and makes cleanup of the dry overspray much easier. (see diagram below)



The covering is done on a quantity -vs.-quality type. This means there will be some miscellaneous scraping. When starting with new poly it is rolled out the full length which is 100'. The edges should be over lapped approx. 2' with the next roll. After the initial use it is best to cut the 100' roll into 3 pieces each approx. 33' in length. The 33' section is then moved by grabbing the two corner ends walking toward the other ends of the poly which rolls the overspray into a narrow row when it reaches the end of the poly. The piece is now empty can be moved to prepare the next area to be sprayed. The poly is then laid out with each piece overlapping the next by approx. 2'. This is a continuous cycle moving poly forward ahead of the spray operation

Abatement and Re-spray

In Abatement and re-spray work, covering of floors is normally done with a 6 ml unreinforced poly and requires quality protection and covering. Normally all seams are overlapped and duct taped or spray glued to aid in containment. When spraying is completed it is rolled up and thrown out. The poly is not normally reused. If over spray is excessive it usually is swept off the poly first into piles and picked up before poly is rolled and thrown out.

Pre-wetting

Pre wetting floors to aid in clean up with scrapers can be used on some jobs when wetting the floors is not an issue. Caution should be used as water damage can be costly. The concrete floor is pre-wet and kept wet in the immediate spray area the concrete floor should have a thin layer of water prior to the spray operation. This breaks material bond, and creates easier scraping conditions. It also gives you more time to scrape by delaying the drying and setting of the fireproofing. This can be done by using your delivery system. Initially while pumping in at the start of each days application, use the pump in water to pre-wet the floor. By using the spray nozzle with the cap & orifice installed and the air turned on, wet down the area to be sprayed for that day. Additionally, use a garden hose with spray nozzle and keep the area ahead of the spray operation wet as needed. If normal density product has dried on the floor you can wet it down, let soak for a while, then scrape clean.

Medium and high density products must be scraped while wet or the floor should be protected by covering. See covering section.

Protection of Walls & Pre-installed Products

It is recommended to review the specifications and finish schedules for walls and exposed floor finishes, to help identify areas where additional protection may be required. A job may only require scraping while others may require poly protection on everything except what is getting sprayed. In these cases a light weight poly (1 to 2 mil in thickness) is normally used. In most cases the cost of the poly is less than cleanup cost and normally does a good job. Spray glue is a very fast and effective method for installing poly on walls, ducts, piping, units, etc. Some glue's will leave a residue so be sure you spray directly on the poly, or above ceiling heights on walls that won't require any cleaning. Depending on the installation of the poly each manufacture of spray glues have their own recommended application procedures, which determines the amount of glue necessary for different types of installations. Other methods that are also used to install poly are: duct tape, wire, magnets, rope, wood slats with nails, etc.

Heating

A minimum air and substrate temperature of 4.4 degrees C (40 degrees F) shall be present before application of spray-applied fireproofing and must be maintained during and for 24 hours after application of the spray-applied fireproofing. When temperatures are near or below freezing an enclosure must be provided to maintain this heated temperature.

Caution: When spraying deck in extremely cold weather, if the floor above is not heated the concrete will make the decking too cold to begin spraying. You must heat 24 hours prior to spraying, during application and 24 hours after spraying.

Note: For Monokote MK 6HY application in marginal cold conditions, please refer to the Frequently Ask Questions section.

Ventilation

Provisions must be made for ventilation to properly dry the fireproofing materials after application. In enclosed areas that lack natural ventilation and proper air circulation; mechanical ventilation must be provided to achieve a minimum total air exchange rate of 4 times per hour until the material is substantially dry.

Note: Fans may be needed to circulate air. Enclosures used to maintain the floor temperature may need to be opened up to provide the proper amount of air exchanges per hour. When heating the floor areas with propane gas, you must remember that when you burn propane gas for heating it gives off water vapor and will add to the drying time if the area is not properly ventilated.

Caution: If the air exchanges are not sufficient during the heating process, you will need to heat for a longer period of time.

Material Storage

All material to be used for fireproofing shall be delivered in original unopened packages bearing the name of the manufacturer, the brand and proper Underwriters Laboratories Inc. labels for fire hazard, fire resistance classification and GCP expiration dates with identification lot numbers.

Material must be kept dry until ready for use. Material must be stored off the ground, under cover and away from sweating walls and construction site flooding problems. All bags that have been exposed to water before use must be discarded. Stock of material is to be rotated and used prior to its expiration date. Material storage should be close to the mixer for easy access by the mixer man and well protected from the weather.

Note: 1. When material is delivered and stored in trailers, the trailers should be inspected for possible water leaks. The easiest way is to see that there is no daylight coming through the roof or walls of the trailer. Trailer doors should be closed at the end of the work day to protect the material from the weather.

Note: 2. Contractors that use GCP/Independent delivery trailers as drops and move material from trailer to pump should make the mixing station platform large enough to hold a day's production . This will allow some flexibility during delivery day if there are any unplanned problems that arise.

Note: 3. Contractors that unload GCP/Independent delivery trailers should plan on about 4 hours unloading time with three or four men when unloading material by hand. If you use a jobsite fork truck to unload your material you must make arrangements ahead of time. Because the fork truck has limited reach into the trailer, a pallet puller and chains are normally needed to pull the skids of material from the nose of the trailer. The storage area should be close to the mixing area and a pallet jack should be available for moving them around on site. Once the material is unloaded take the necessary precautions to protect it from the weather and possible damage from other trades working on site.

Section 3: Set Up

Station Set Up

Pump Station Location

The pump station location should be permanent for the duration of the project. The area should have good drainage so that the area will not become wet and muddy during bad weather or wash out procedures. Overhead protection should be looked at and the necessary safety precautions taken to avoid injury or downtime. The pump station should be located close enough to the center of the building to minimize the length of the delivery system and positioned to accommodate a 3" aluminum riser delivery system when necessary. The area should be adequate in size to accommodate the pump, mixer, injection unit, job box, (fuel), and a working material platform. The removal of the empty bags should be taken into consideration when determining the logistics for your pump station location. In many cases a disposal container is set close enough to the pump room to discard the empty bags easily. Proper protection should be included to protect the material and equipment during bad weather.

Pump Station Set Up

Construct a sturdy work platform to keep the equipment elevated out of the water and mud. Set the pump into position. With standard mixers, set up the mixer over the pump hopper so that rotation into the complete dump (mixer empty) position is possible. Pay special attention to height requirements when using continuous mixers. The mixer will need to be elevated to allow the material to flow smoothly out of the mix tube, but not so high that the material spatters outside the hopper. Position the flow of material from the mix tube so that the material in the hopper is continually rotated with new material. Positioning the flow directly over the pump intake will cause the material on the sides of the hopper to become dry and in some case set up over time.

Construct a sturdy elevated work platform behind the mixer. The platform should be at a height that makes the mixer man's waist even with the top of the mixer. It should be large enough to move around easily with room for a day's supply of material. This will aid in material trailer switches when applicable, and it will also aid in undisturbed pumping if the pump operator is not traveling a great distances for the material.

Roller conveyors and platform trucks have been used successfully to quickly move material from the storage area to the mixer.

Pump Station Requirements

Select a pump station location that will be close to your work and have independent:

a. Access to clean water with sufficient volume and pressure (20 GPM per nozzle).

b. Adequate electrical service for electric pumps and a 30 amp independent service for the Injection Units.

NOTE: Motors draw significant amperage on start up and in cold weather. The wire size must be sufficient to accommodate the amperage draw, and the distance from the power supply source to the equipment. Insufficient wire size and /or excessive distance will result in voltage drop and overheating of the motor.

c. Access for easy material delivery and an adequate material storage area that is protected from the elements

d. A suitable area for washout and clean up.

e. Access to a disposal container for empty bags and pallets.

Conveying Systems

The conveying system should always be matched in size and pressure rating to the volume and distance being pumped. The large hydraulic pumps and high production pumps are capable of generating high pumping pressures. For this reason care must be taken in choosing the components for the conveying system.

Manifold. A 3” manifold is best for high volume pumping. On pumps requiring balls and seats the 2 1/8” balls and high production seats are recommended when pumping Monokote Products. The manifold should also consist of a Safety blow out valve and Pressure relief valve. (See the equipment safety section)

Surge Hose. A 25 foot 3” wire braided high pressure hose is recommended. It should be connected to the manifold using a 3” boss fitting or a high pressure two bolt fitting. Important factory installed high pressure (3000 psi) full flow fittings are also available. The surge hose should be supported off of the ground to prevent abrasion due to the pumps surge. Placing old tires under the surge hose or suspending it with ropes are two common methods of avoiding abrasion.

Safety warning: Surge hoses operate under high pressure and should be tethered to the pump frame with a chain or other restraining device. In addition it is prudent to avoid standing in or around the surge hose during pumping operation. (See equipment safety in Section V).

3” Ball Valve. Closes the system and allows the surge hose to be removed from the pump after releasing the pressure. The ball valve allows a sponge to be inserted into the surge hose during washout. This also permits working on the pump without having to empty the conveying system.

Pipe Elbow. The elbow should be a long radius, 3” diameter rigid aluminum pipe, with no angle less than 90o. A 10 foot section of pipe formed into a gradual curve creates the least back pressure. All aluminum pipes should be securely fastened from this point forward to prevent movement. If the pipe is allowed to move, a weak point will form and the pipe will burst usually at an elbow or joint. Another option is to allow the surge hose to make the 90o turn up the riser in place of an aluminum elbow.

Standpipe. High pressure 3” aluminum pipe is recommended. Galvanized couplings with full tapered thread, ground unions or vitaulic couplings should be used to join sections. Construction Forms® heavy duty snap couplings with raised end pipe fittings are easy to assemble and disconnect. Vertical and horizontal pipe must be well anchored and supported to prevent movement due to pump surge. Construction Forms® makes easy to install column support brackets that clamp the pipe to a column. Aluminum pipe can be used for horizontal runs to reduce pressure. Be sure to slope the pipe so that washout water will drain freely and completely. Failure to slope the pipe will allow material to build up in the pipe and restrict material flow, increasing back pressure on the pump. Steel pipes can be used in high pressure situations please consult your GCP Representative for more information.

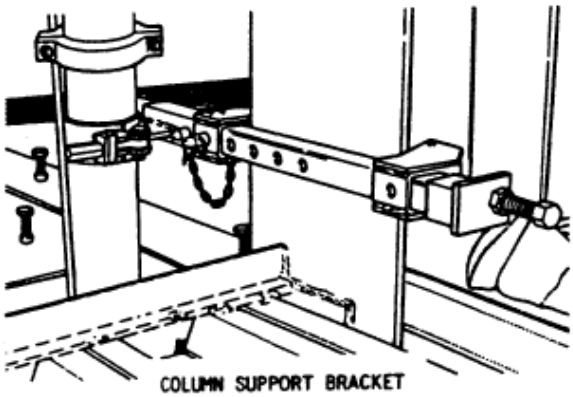


DIAGRAM D

Floor Hose Reinforced 2”, high pressure, fabric braided plaster hose with full flow fittings should be used. Due to the relatively lower pumping pressures with Monokote products 1 1/2” floor hose is now being used in place of the 2” floor hose.

Floor Hose Reduction. With the reduction in pumping pressures the following is a demonstration of a typical floor hose assembly. This assembly should be compatible with most pump set up’s and enable the application of most typical jobs. When tested this system showed no significant increase in line pressure, and no dramatic loss in pumping rate.

Typical floor hose assembly	**25’**	**3” Surge Hose**
	50’	**2” material hose**
	200’	**1 1/2” material hose**
	50’	**1 1/4” material hose**
	25’	**1” material hose**
	17’	**3/4” whip**
		TOTAL = 367’

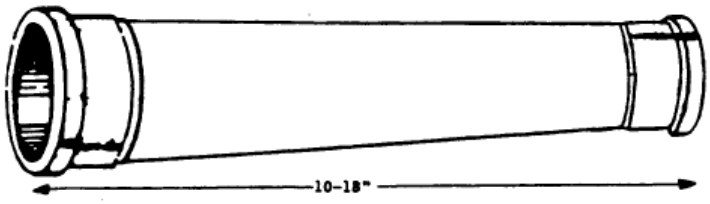
a. Some of the advantages to reducing the floor hose size are that it will reduce pump in and pump out time due to less volume of material required to fill the system.

b. Every day floor hose movements are easier due to the reduction in overall weight.

c. Transferring hose from floor to floor is easier and less time consuming with smaller diameter lighter weight hoses.

d. Replacement cost of new hoses are reduced when replacing 2” with 1 1/2’ floor hose.

In all hoses, fittings should be pressure rated, full flow and compatible with the rated hose pressure. They should also be checked regularly for wear or damage.



LONG TAPERED REDUCER 3" - 2". 2" - 1 1/2"

DIAGRAM F

Connectors. Double female swivels, Victaulic couplings, Kamlok, or Hanson quick disconnect are all means of joining or coupling the hoses. Hanson quick disconnects work well on the smaller diameter hoses where changing nozzles for different applications is required. The change over from hand held nozzle to pole gun assemblies is quick and easy, resulting in less downtime time.

Reducers. When assembling risers the reducers should be long tapered and full flow. The use of swage reducers on the floor hoses is the most common practice.

General Notes:

On projects up to 14 stories, 2” pump hose can be substituted for the 3” riser pipe. First, the pump should be equipped with a hydraulic pressure gauge or an inline pressure gauge must be installed to monitor material line pressure. This results in lower labor cost to assemble and disassemble the delivery system and also saves on equipment purchasing if the pipe is not previously owned.

Pumping Pressures will increase as additional height and hoses are added to the system. By noting these additional increases a better understanding of delivery system can be accomplished and potential problems will be noticed easier. Hydraulic pumps are equipped with pressure gauges built into the hydraulic system, on smaller pumps an inline pressure gauge is recommended, and is easily installed into the material delivery lines.

Longer pumping distances and pumping heights require the addition of more water to the mix. These adjustments in water should be made each time significant additional riser pipe or floor hose are added to the delivery system.

Periodical inspection of reducers and hose is highly recommended Material hoses can wear from abrasion and reducers can generate build up over a period of time. Daily / weekly inspection can reduce risk of personal injury and reduce equipment maintenance cost.

Washout

Thorough washing and flushing of the conveying system is necessary to prevent material from settling and accumulating in the fittings. The importance of this step cannot be over-emphasized.

After the last mix for the day has cleared the hopper, the pump should be slowed and water pumped through the system. A sponge should be pumped through the line by removing the hose at the pump manifold and placing the sponge directly into the hose.

At least 2 minutes of clean, clear water must pass through the nozzle before the pump is shut off.

Periodically, all fittings should be disassembled, inspected for build up, and cleaned as necessary.

For more specific details refer to the Pump in and Pump out portion of the manual.

3/4’ whips

3/4” whip hoses are the latest improvement in the conveying systems. These light weight, flexible (1500 psi) hoses allow the sprayer to move the nozzle easily thereby increasing thickness control and reducing waste. The lighter weight hoses also reduce fatigue, which increase daily productivity. The 3/4” Whip hoses should have a 1500 psi pressure rating and be fitted with compatible, full flow Scovil type fittings. Hanson quick disconnects are particularly useful at the 1 1/4” or 1” connection end of the hose, as this facilitates removal of the 3/4” whip during pump in procedure, eliminating morning start up packing at this reducer.

Draining the Delivery System (Winter Procedures)

When assembling the delivery system special attention should be paid to installing aluminum pipe and hoses so that they are able to be drained easily. The best method is to slope the delivery system back to the pump. Floor hoses should be disconnected and thoroughly drained of all water to prevent freezing in the lines and packing hoses the next morning. When draining the delivery system the following procedure should be followed:

1. After the sponge out procedure has been completed, with the pump turned “off”. Open the ball valve at the nozzle.
2. Close the ball valve at pump station, and then relieve the pressure on surge hose at the pump by opening the pressure relief valve on the manifold. Disconnect surge hose and reattach to a secured discharge hose which should be safely fasten down to prevent the hoses from whipping. Slowly open the ball valve and relieve the water (pressure) and drain thoroughly. Depending on the height and length of the delivery system, relieving the water can be at higher than expected pressures. Use Caution.
3. Open the ball valve at pump station, when draining is completed, reconnect the surge back on the pump and close pressure relief valve. The discharge hose should drain the water to a suitable collection point.

Additional Winter Procedures

The Pump/Manifold, pump hopper, and manifold system need to be drained to prevent water from freezing and causing pump damage. At temperatures below 32 0 F (0 0C) these cautions must be taken to prevent the balls and seats from freezing into place and to prevent other damage to the system. GCP Applied Technologies recommends having a heated pump station during winter operations. Even with heat, the following recommendations should be closely followed.

Option 1. Remove the manifold from the pump entirely and drain. Precautions should be taken to make sure that water does not get trapped in the upper and lower manifold parts by the balls and seats.

Option 2. The addition of windshield washer fluid can be added to the pumps manifold to prevent freezing. The following direction must be followed.

a. With the hopper empty, delivery system drained, and the surge line disconnected.
b. Add one / two gallons of windshield washer fluid into the pump hopper.
c. Place a container (5 Gal Bucket) at the discharge point of the manifold to collect the fluid.
d. Run pump until the fluid is exiting the pump manifold.

The fluid can be left in the manifold and recollected the following morning for reuse.

**** Specific equipment manufacturers have installed draining devices on other parts of their pumping equipment. i.e.: heat exchangers, water filters etc. Refer to the manufactures manual for the best recommendations on winter precautions.***

Pump Hoses: The water will need to be removed from the pump hoses each night. Such methods as disassembling the hoses and walking from end to end, or blowing back the pump hose with a large air compressor and special fittings have been successfully used. This preventive measure will minimize downtime related to freezing. To walk the hoses, two methods have been successfully used. The first is to disassemble each hose when quick disconnects are used (vitaulic, Kamlocks), and slowly elevate one end of the hose and walk towards the other end, keeping the hose elevated while the water drains out the other end. Continue to walk the entire length of each individual hose until you are comfortable all the water has been removed from all the hoses. The second is a similar method to the first but treating all the hoses as one hose assembly. This is normally quicker and easier to accomplish than disconnecting and reconnecting all the hoses, but caution must be used to assure ALL the water has been removed. Repeating this process will increase the odds there will be no remaining water.

Air Lines: The air compressor operating in cold conditions creates condensation in air lines that can freeze into ice crystals and restrict airflow. By having an air compressor on the heated spray floor the potential risk is greatly reduced. When this is not an option and the air flow comes from the pumps compressor precautions such as condensation separators can be installed to remove excess moisture. The addition of dry gas into the airline can also reduce moisture build up.

Caution should be taken when additives are used as a solution.

Water delivery system: All water must be thoroughly drained from these systems. Where appropriate, additional steps should be taken, such as. placing timed sump pumps and water hose into heated areas for overnight storage. Both at night and during daytime operations it may also be necessary to insulate and or heat trace water feed lines to prevent freezing.

Accelerator: refer to the Winter Injection Procedures portion of this manual.

Section 4: Application

Mixing

General:

All types of Monokote Fireproofing can be mixed by machine in a conventional, plaster - type mixers with paddle or ribbon blades. Many Continuous mixers, specifically modified for cementitous fireproofing can also be used. Check with your area salesperson or technical advisor to confirm the required modifications. Conventional plaster mixers should empty completely between batches and the mixer should be kept clean and free of all previously mixed material.

Caution: Do not mix any Monokote Fireproofing material that contains partially set, frozen or caked material. Do not use hot water when mixing any Monokote Fireproofing materials.

Monokote Fireproofing material needs to be mixed to a consistent slurry to maximize yield and hangability during application. There are several factors governing the quality of the mix for all materials. The key is being consistent from batch to batch by maintaining the proper water ratio and mixer density for the product being mixed. Refer to the specific products yield chart for proper density ranges. Mix water, mix time and mixer rpm will dictate the product density.

The mixer blade speed should be between (35-40 rpms). Using the product yield charts set in the targeted amount of water to be used per batch. The water may varied within the published range to give the sprayer the best possible spraying scenario for thickness, steel size, sprayers ability, and job conditions.

Once you have established a given water amount per batch, you should maintain that amount batch to batch by some type of water metering system. Timed Sump Pump with a 55 gallon drum or some type of In-Line Water meter such as the (Neptune or Fill Rite) are the most commonly used . (Refer to Water Metering Systems in section V of this manual for additional information.)

Mix time for gypsum based products should be 1 1/2 minutes +/-15 seconds. Cement based products should be mixed 2-3 minutes. There are digital and mechanical timers available to help your mixer person maintain a consistent mixing time.

Note: Adding water increases yield and raises mixer density. Use enough water to create a creamy, fluid mix while maintaining good hangability. Mix material long enough to achieve target mixer density (longer mix times will reduce mixer density).

Caution: Short stroke piston pumps do not pump material well that is over mixed (mixer densities below 39 pcf). Over mixing will dramatically reduce the pumping rate with these short stroke piston pumps. Increasing the RPM of the mixing blades (within the 35 - 45 rpm range) will reduce the length of mix time necessary to achieve the target mixer density.

Mixing Procedures

Conventional Mixers

1. Prior to mixing Monokote Fireproofing materials in a mechanical mixer, set the blade speed to 35-40 RPM.
2. With the blades turning, begin filling the mixer with water. Keep the blades turning until at least three-quarters of the water has been added. *Important; Filling the mixer with water while the blades are turning will help keep the blades clean and prevent dry material clumps from hanging up balls or plugging seats*.
3. Turn off the blades.
4. With the blades off, empty two bags of fireproofing into the mixer.
5. Place the unopened third bag of fireproofing over the dust cover opening or mixer grate. This will reduce the dust that exits the mixer when you engage the mix blades.
6. Engage the mix blades while adding the third bag of Fireproofing.
7. Start timing the mix.
8. Mix the material for a set length of time to achieve a material target mix density. It is recommended the mixer person use some kind of timer, to keep the mix time the same from batch to batch.
9. After mixing material for a set mixing length, disengage the mixing blades.
10. Empty the mixer into the pump hopper.

Periodically, it may be necessary to use a wash down hose to clean the mixer of residue material.

Continuous mixers

The mixing procedure for continuos mixers is simply fill the mix hopper with dry material and use the on /off switch to keep the pump hopper full. Water and material are automatically delivered in proportional amounts. The water should be adjusted to the maximum possible, consistent with a hangable mix matching steel size to the sprayer's skill level.

Measuring Mix Water:

Conventional mixers

Timed Sump Pump and 55 Gallon Drum; To use the attached calculations the drum must measure 22.5 inches in diameter.

1. With the drum full of water , hold the float valve in the up (off) position to prevent water from entering the drum during the entire measuring process.
2. Measure the distance from the top of the drum to the water level and record.
3. Have the mixer man turn on the sump pump to fill the mixer with water from the drum. When the sump pump as stopped measure the distance from the top of the drum to the water level and record. Remember to hold the float valve up at all times so that no new water enters the drum.
4. Subtract the height of the water before turning on the pump (first measurement) from the height of the water after the pump had stopped (second measurement). This is the water drop in inches.
5. Multiply the water drop in inches by 1.72 to determine gallons per batch. Divide gallons per batch by the number of bags per batch to determine gallons per bag.

Important Note : If you do not have a drum measuring 22.5" in diameter than you can use the formula below to determine gallons per inch of drop:

Gallons / Inch = r2 /73.5
Gallons per inch of drop is equal to (Radius of the drum squared, divided by 73.5).

Continuous mixers

When using Continuous mixers; an electronic digital flow meter must be used.

1. Fill the continuous mixer to the top with dry material.
2. Zero the flow meter by depressing the "ON" button for 3 seconds.
3. When the continuous mixer is started keep count of the number of bags being emptied into the mixer hopper. Run the mixer until approximately 10 or more bags have been used. Start and stop operation is OK. At a point after the 10 bags have been used, Stop the continuous mixer. Continue to add dry material and count the number of bags added until the continuous mixer hopper is filled to the top as in step 1.

Note: The more bags put through the mixer the more accurate your gallons will be.

4. Read the number of gallons on the flow meter. Divide the number of gallons by the number of bags emptied into the hopper. This is the gallons per bag used.

Example: Eighteen bags emptied into hopper and 153 gallons of water used from the meter reading, so 8.5 gallons of water are being used per bag.

The Benefits Of A Proper Mixed Material Using a Conventional or Continuous Mixer:

Consistent pumping rate.

Variation in material mix when using mechanical pumps can change the pumping rate in bags per hour. Consistent material eliminates pumping rate variation.

Improved hangability and thickness control.

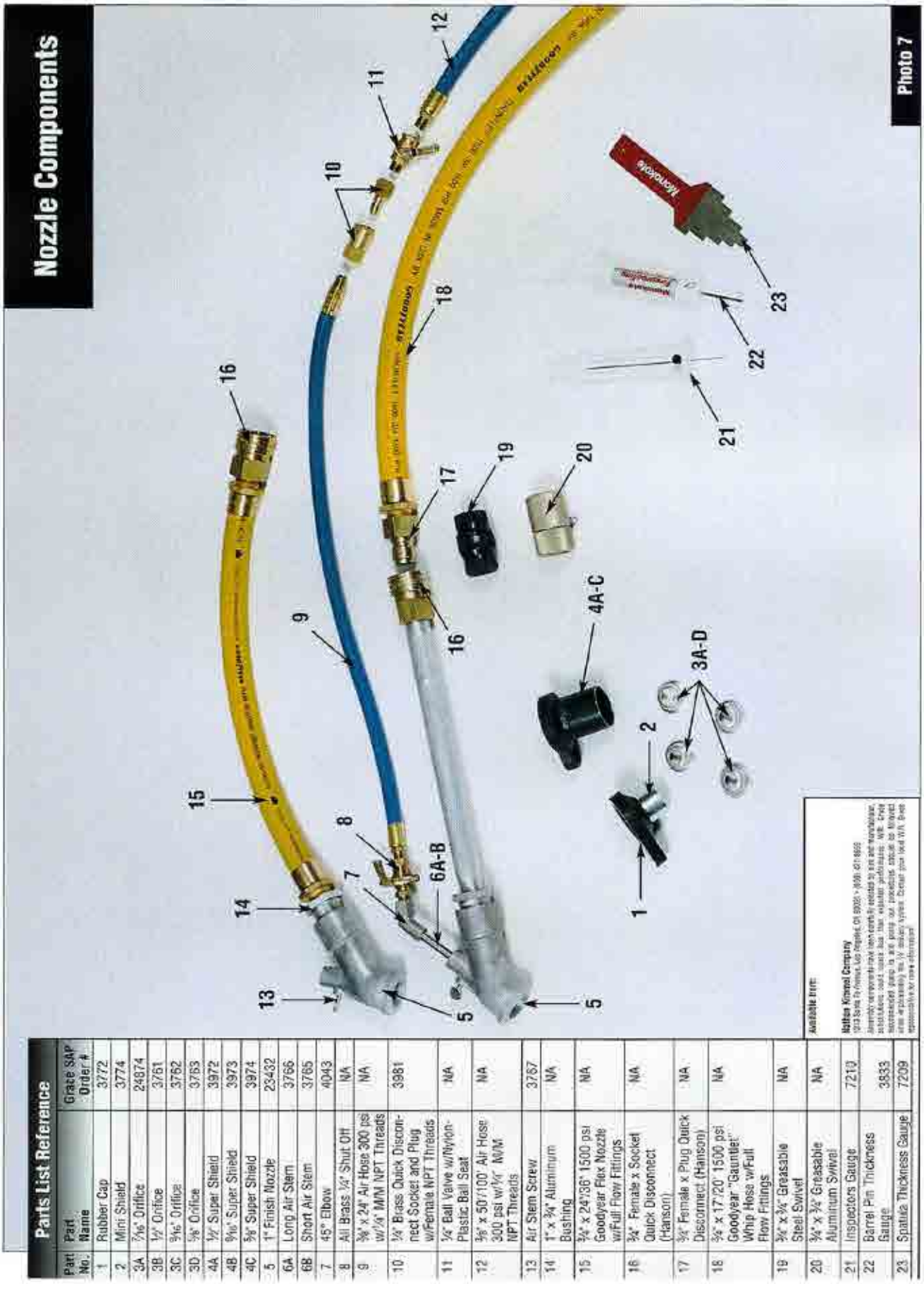
With a consistent mix, sprayers get into a productive rhythm that is not possible if the quality of the mix varies. The sprayer is now free to concentrate on improving his spray technique and controlling in place thickness.

Properly mixed material is self-feeding.

Material slides down the walls of the pump hopper and into the pump intake.

Fully activates the materials air entrainment.

This reduces material pumping pressures since it lubricates the conveying system. Helps improve material yield, spray pattern and hangability.


Nozzle Components
Photo 7
Parts List Reference
Part No. | Part Name | Grace SAP Order #
1 | Rubber Cap | 3772
2 | Mini Shield | 3774
3A | 7/16" Orifice | 24874
3B | 1/2" Orifice | 3761
3C | 9/16" Orifice | 3762
3D | 5/8" Orifice | 3763
4A | 1/2" Super Shield | 3972
4B | 9/16" Super Shield | 3973
4C | 5/8" Super Shield | 3974
5 | 1" Finish Nozzle | 23432
6A | Long Air Stem | 3766
6B | Short Air Stem | 3765
7 | 45° Elbow | 4043
8 | All Brass 1/4" Shut Off | NA
9 | 3/8" x 24' Air Hose 300 psi w/3/4" M/M NPT Threads | NA
10 | 1/4" Brass Quick Disconnect Socket and Plug w/Female NPT Threads | 3981
11 | 1/4" Ball Valve w/Nylon-Plastic Ball Seat | NA
12 | 3/8" x 50'/100' Air Hose 300 psi w/1/4" M/M NPT Threads | NA
13 | Air Stem Screw | 3767
14 | 1" x 3/4" Aluminum Bushing | NA
15 | 3/4" x 24'/36' 1500 psi Goodyear Flex Nozzle w/Full Flow Fittings | NA
16 | 3/4" Female x Socket Quick Disconnect (Hanson) | NA
17 | 3/4" Female x Plug Quick Disconnect (Hanson) | NA
18 | 3/4" x 17'/20' 1500 psi Goodyear "Gauntlet" Whip Hose w/Full Flow Fittings | NA
19 | 3/4" x 3/4" Greasable Steel Swivel | NA
20 | 3/4" x 3/4" Greasable Aluminum Swivel | NA
21 | Inspectors Gauge | 7210
22 | Barrel Pin Thickness Gauge | 3833
23 | Spatula Thickness Gauge | 7209
Available from:
Nathan Kimmel Company
1, 2, 3A-D, 4A-C, 5, 6A-B, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23

Nozzle Set Up and Adjustments

Orifice Selection

The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be. This will aid in increasing yield while still maintaining a proper spray pattern. When matching the orifice size to the pumping rate, the following chart can be used as a guideline for most spray applications.

For 10 to 30 bags per hour use a 1/2" orifice with a Short Mini Shield
For 25 to 35 bags per hour use a 9/16" orifice with a Medium to Long Mini Shield
For 35 to 45 bags per hour use a 5/8" orifice with a Medium to Long Mini Shield

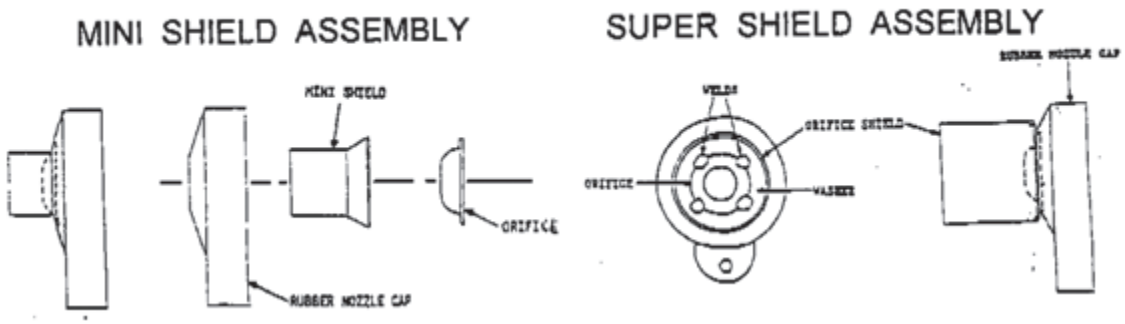
For 25 t 35 bags per hour use a 1/2" Super Shield
For 35 to 45 bags per hour use a 9/16" Super Shield
For 40 to 55 bags per hour use a 5/8" Super Shield

A special 7/16" orifice is available for Z146 and Z 156 products.

The use of an orifice shield is highly recommended. The orifice shield (Mini or Super) decreases the size of the spray pattern and provides a well defined spray pattern. The mini shield comes in different lengths 3/4" short, 7/8" medium, or 1' long. The longer the shield the narrower the spray pattern. On jobs with small beams the narrower pattern works better for thickness control and reducing waste and overspray.

While the use of either spray shield is highly recommended the Super Shield has several advantages.

1. The spray pattern is more defined, and allows for more accurate placement of material thus dramatically reducing waste and overspray.
2. The spray pattern is more uniform which aids in the application of the flange tips. The material is more uniformly distributed across the spray pattern eliminating volume of material and air pressure in the center of the pattern seen more often with the mini shield.



Nozzle Air Pressure

The nozzle air pressure should be set as low as possible (approximately 15-20 psi) while still maintaining a well defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine. The higher the air pressure the more difficult it is to obtain maximum yield. The gaseous air bubbles generated in the mix, and with the injection process, can break when hit with high air pressure at the nozzle. This results in a higher density material and a reduction in material yield. The lowest possible air pressure while maintaining a controlled spray pattern is the best practice. The use of an air valve at the nozzle is highly recommended to make the necessary adjustments during the application process. The factory set pressure relief valve on the pumps air compressor is set higher than the pressure needed at the nozzle. The air valve at the nozzle is the best way to regulate the proper amount of air pressure needed. The pressure relief valve on the compressor will go into relief when excessive air pressure is built up within the system.

Air Stem Adjustment

The nozzle is equipped with a thumb set screw for locking down the air stem when the proper adjustments have been made. The tip of the air stem should be back approximately 1/4" from the orifice. This is a good starting point from which to make fine adjustments. It is advisable to remove and clean the air stem daily to prevent it from getting frozen into place. When it is necessary to change orifice size, the air stem will also have to be adjusted. Without proper maintenance the air stem freezes and proper adjustment are impossible. There can also be a material build up on the inside of the air stem. A 1/8" round file or rigid piece of wire should be used to clean out the air stem daily.

Caution: Take extreme caution and use protective eyewear when cleaning the air stem as pressure may be built up unknowingly.

Hand Held Nozzles

When spraying Monokote selecting the proper type of nozzle assembly to match job site conditions, is critical to the outcome of the project. The major difference today is the reduction from the standard 1" nozzle assemblies to 3/4" nozzle assemblies. The reduction in weight and flexibility allows the sprayer to move the nozzle easily, there by increasing thickness control and reducing waste. While the selection of a nozzle assembly is the sprayers preference, the two most popular hand held nozzles are: (refer to drawing #002 for nozzle components)

3/4" Rigid Nozzle assembly: This is the most commonly used nozzle assembly. The 3/4" assembly consist of a Goodyear Gauntlet 1500 psi whip, brass full flow material shut off valve , 3/4"x 2" close nipple, E Z swivel, 12" to 16" 3/4' rigid aluminum pipe, 3/4" x 1" reducing bushing, connected to a 1" short injection gun head. The rigid aluminum pipe length should be matched to the dimension between steel beam members and scaffold size, allowing the sprayer to comfortably apply the material without reaching or bending. The pipe should be short enough to allow the sprayer to spray and gauge during the application process. The option of different swivel connector exist refer to the swivels portion of this section.

3/4' Rubber Nozzle assembly . This 3/4" assembly consist of a Goodyear Gauntlet 1500 psi whip, brass full flow material shut off valve , 3/4"x 2" close nipple, E Z swivel, 12" to 16" Goodyear Gauntlet 1500 psi rubber nozzle hose, 3/4" x 1" reducing bushing, connected to a 1" short injection gun head. The hand held rubber nozzle is ideal for applications when the sprayer has easy access to the steel members. The majority of the applications are from the scaffold where the sprayer is close to the steel and does not require the added reach obtained from the rigid aluminum pipe extension. Sprayer fatigue is reduced and allows for direct application to the steel while gauging for thickness.

The flexibility of the nozzle also allows for application of hard to reach areas such as the backs of outside perimeter columns where a rigid nozzle experiences some difficulty.

3/4" Nozzle Swivels

Nozzle bearing swivels are a must in spray applications. They allow for the easy rotation of the nozzle assembly when spraying various shapes and sizes of steel members. Most E Z swivels are fitted with a grease fitting to assure smooth easy rotation of the nozzle. It should be greased on a daily basis and replaced when worn. The three most popular swivels are:

Hanson Quick Disconnect: This unit is a two component unit of brass construction. The unit swivels on stainless steel ball bearings for a smooth easy rotation of the nozzle. The Hanson quick disconnects also works well where changing nozzles for different applications is required. The change over from hand held nozzle to pole gun assemblies is quick and easy, result in less downtime. Special attention should be paid to the assembly for proper direction when installing.

1" E Z Nozzle Bearing Swivel: This unit is a single component unit of steel or aluminum construction. The steel units tend to weigh a little more than the aluminum unit but last up to 50% longer. The unit swivels on stainless steel ball bearings for a smooth easy rotation of the nozzle. The unit is fitted with a grease fitting to assure smooth easy rotation of the nozzle, and should be greased on a daily basis. The 1" E Z swivel will require two 1"x 3/4" aluminum or PVC reducing bushings to allow for the reduction to 3/4" assemblies.

3/4" Barrel Swivel: This unit is a single component unit of aluminum construction. This unit is the lightest weight unit available and tested today. The unit swivels on stainless steel ball bearings for a smooth easy rotation of the nozzle. This is the recommended swivel when it is not necessary to switch nozzles during the spraying operation. The Barrel swivel is fitted with a grease fitting to assure smooth easy rotation of the nozzle and should be greased on a daily basis.

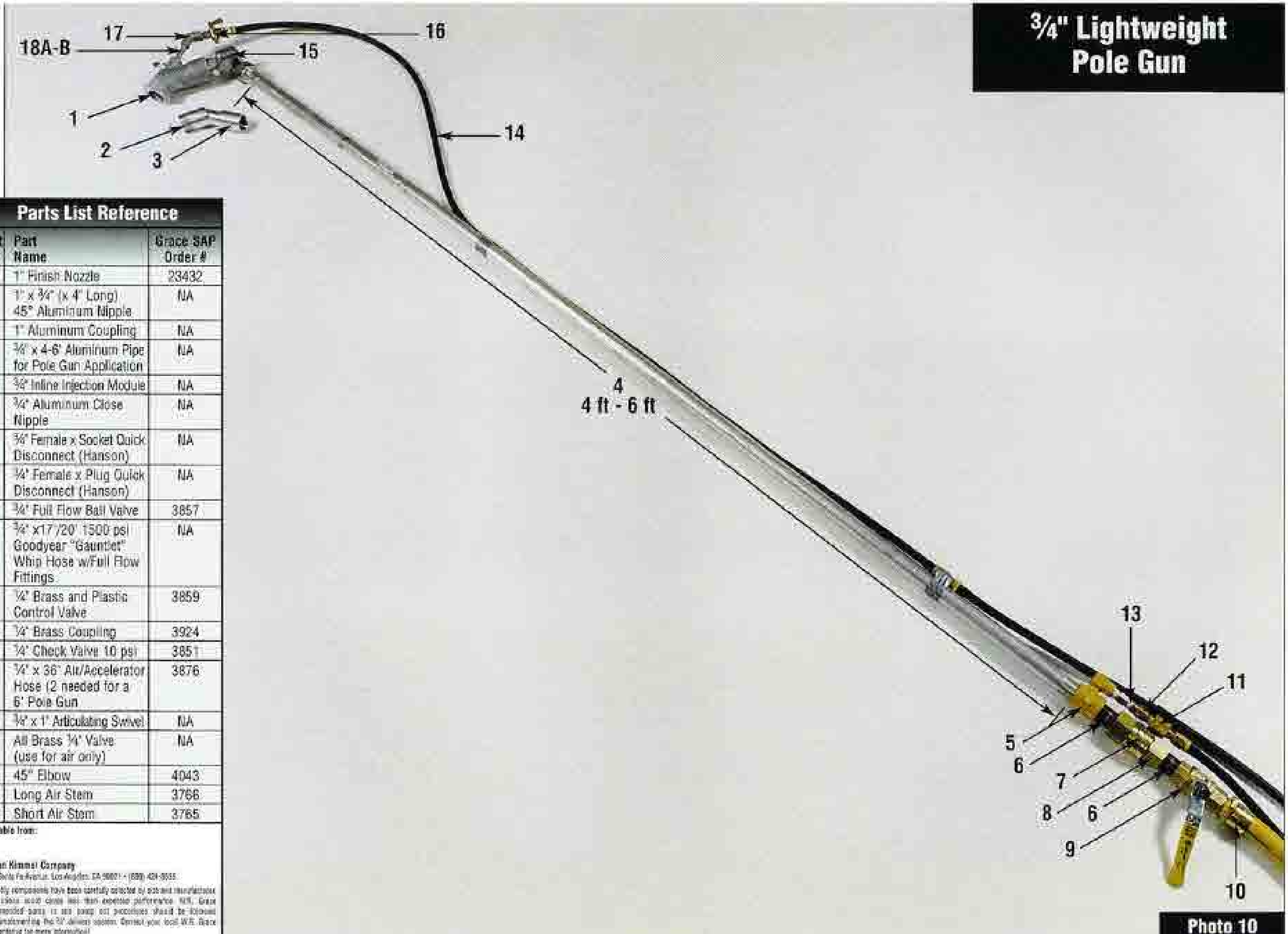
3/4” Light Weight Pole Gun Assemblies

The use of a pole gun has some limitations. It is recommended for more experienced crews, when applying a scratch coat in multi pass application situations, Small Projects, and hard to reach areas on typical jobs. Refer to these application directions for specific information pertaining to when to use a pole gun.

The components of the pole gun assemblies can be found on drawing # 010 and should be referred to when assembling a pole gun to meet your specific needs.

Pole Gun assembly with special 3/4” x 1” Articulating Swivel: This nozzle assembly is recommended when on small projects and hard to reach areas on typical jobs. The Articulating Swivel enables the sprayer to adjust the nozzle spray pattern to achieve the up and down shot in most beam applications. The nozzle can be set up with either a 1” short injection gunhead or a standard nozzle with an inline injection module. The inline injection module allows for the easy on /off operation of the injection process. If the inline injection module is not available, the 1” short gunhead is recommended to minimize the distance between the deck and the top of the lower beam flange. This gives the sprayer more flexibility in achieving the desire distance the nozzle should be held from the steel. The use of Hanson quick disconnects is highly recommended for quick changes if a hand held nozzle assembly is required. i.e. column application. The articulating swivel is equipped with thumb set screws to lock the gunhead into the desired location. The length of the 3/4’ pole gun assembly should be designed to comfortably reach the spray area

Pole Gun assembly with a 1” x 1” x 4” 45o Aluminum Nipple: This nozzle assembly is recommended for more experienced crews, when applying a scratch coat in multi pass applications. The 45o Aluminum Nipple enables the rotation of the gunhead which enables the sprayer to adjust the nozzle spray pattern to achieve the upshot, and the proper angle for deck and joist applications. The nozzle can be set up with either a 1” short /long injection gunhead or an inline injection module, which allows for the easy on /off operation of the injection process. The use of the injection module is highly recommended to minimize the weight of the nozzle and also removes the accelerator line from the pole assembly. The use of Hanson Quick Disconnects is highly recommended for quick changes when a hand held nozzle assembly is required. Pay particular attention to material line, air line, and accelerator line connections as they will need to be installed properly for the quick change over of the nozzle assemblies



Parts List Reference

Part No.	Part Name	Grace SAP Order #
1	1" Finish Nozzle	23432
2	1" x ¾" (x 4" Long) 45° Aluminum Nipple	NA
3	1" Aluminum Coupling	NA
4	¾" x 4-6' Aluminum Pipe for Pole Gun Application	NA
5	¾" Inline Injection Module	NA
6	¾" Aluminum Close Nipple	NA
7	¾" Female x Socket Quick Disconnect (Hanson)	NA
8	¾" Female x Plug Quick Disconnect (Hanson)	NA
9	¾" Full Flow Ball Valve	3857
10	¾" x17'/20' 1500 psi Goodyear "Gauntlet" Whip Hose w/Full Flow Fittings	NA
11	¼" Brass and Plastic Control Valve	3859
12	¼" Brass Coupling	3924
13	¼" Check Valve 10 psi	3851
14	¼" x 36" Air/Accelerator Hose (2 needed for a 6' Pole Gun	3876
15	¾" x 1" Articulating Swivel	NA
16	All Brass ¼" Valve (use for air only)	NA
17	45" Elbow	4043
18A	Long Air Stem	3766
18B	Short Air Stem	3765

Available from:

Nathan Kimmel Company
[illegible]

[illegible]

Pump In & Pump Out Procedures for the 1" & 3/4" whip assemblies
With Continuous, and Conventional Batch mixers
When using the 3/4" Whips the following Pump In and Pump Out procedures are highly recommended:

Pump in Procedure

1. With the water in the hose from the previous night, pump in an additional 1/2 - 3/4 of a hopper of clean water. Start the pump and pump the water through the delivery system. (Make sure all material line valves are in the open position). When the hopper almost empty **STOP** the pump (do not let it suck air.) *Note: In winter conditions refer to cold weather procedures Section 3 Conveying systems*
2. For continuous mixers, Start the mixer with a bag placed under the end of the mix tube, and mix material until a uniform mix is achieved.
    2a. With conventional batch mixers mix the Monokote per manufactures recommendations and continue with the following steps.
3. Fill the pump hopper with Monokote
4. Start the pump and begin pumping material.
5. When water flows freely form the nozzle. **STOP the PUMP,** and disconnect the last 1 1/4" hose from the 11/4"x 1" reducer and the 1"x 3/4" reducer.
6. Restart the pump and continue pumping until **uniform** Monokote material has reached the end of the last 1 1/4" hose.
7. **STOP the PUMP**.
8. Reconnect the 1 1/4" hose to the 11/4" x 1" reducer.
9. **Restart** the pump, and pump in the 1" whip assembly.
10. **STOP the PUMP**
11. Reconnect the 1 " pump hose to the 1" x 3/4" reducer.
12. Restart the pump, and pump in the 3/4" whip assembly.
13. Stop the pump, reassemble the nozzle and begin spray application.

Spraying

Spraying is the single most important aspect of fireproofing. Ideally the fireproofing should be applied at it's highest yield, at the correct thickness, with the least amount of waste and overspray. Keep the pumping rate at a manageable level. Adjusting the pumping rate to sprayers skill levels and job site conditions is critical in thickness control and managing waste and overspray. A pumping rate that is too slow causes profit losses in labor, and pumping rates that are too fast generate profit losses from excessive waste in thickness control and waste in overspray

Particular attention should be paid to the following area's that affect the daily profitability of fireproofing applications.

Spraying basics

Nozzle set up and adjustment are critical to achieve a uniform spray application. The proper air stem adjustment, air pressure, orifice selection, and nozzle assembly all aid in this process. (refer to "Nozzle set up and Adjustments" portion of the manual).

Thickness Control

The ability to gauge and spray while allowing for material swell is crucial to achieving proper thickness control. Refer to spraying diagrams for specific directions for application of Beams, Columns, and Joist. Setting the thickness gauge slightly lower than the required thickness allows sprayers to judge the correct thickness, allowing for the swell of injected Monokote.

Waste & Overspray

The use of an orifice shield is highly recommended. The orifice should be as large as possible while still maintaining a well defined spray pattern. Using the proper spray technique also aids in minimizing waste and overspray. A simple a thing as keeping the nozzle aimed at the substrate can dramatically reduce waste and overspray and minimize clean up cost (refer to "Nozzle set up and Adjustments" portion of the manual).

Labor Productivity

Productivity is a function of planning, material allocation, equipment procedures and management. Productivity is a function of how long people work not how hard they work. The Monokote elapsed time meter has been successfully used to monitor how long the pump is actually pumping and by logging in the reason for downtime, corrective action can be taken to increase pumping time per day.

Yield

Changes in the system will affect the yield at the nozzle. Yield can be one of the most profitable components of a job bid if managed correctly. Using the Simplified Yield Kit, nozzle yield can be checked periodically throughout the day. GCP Applied Technologies recommends checking the nozzle yields at least twice daily, and as adjustments are made in water ratio's, pumping rates, or when freshly mixed batches of accelerator are used.

Beam Application Technique

Then following application technique is recommended for single pass beam applications which include thickness up to 9/16 inches for multiple pass applications greater than 9/16" refer to multiple pass applications techniques.

The following steps are recommended to obtain a uniform thickness with minimal waste and overspray.

Set up

Position your body facing the steel member making sure scaffold height is adequate to spray and gauge during the application process. Scaffold to low or too far away from the steel, increases overspray and waste and inhibits the sprayer from maintaining a quality application for thickness control. Normal recommended working height is 4" to 6" from the top of the sprayer's hard hat to the decking. Decking is used as the reference point as beams tend to vary in height.

Application preparation should have the sprayer (right handed) starting the application from left to right this enables the sprayer to keep the nozzle pointed at unfinished work while he/she is gauging the completed application. Left hand sprayers should work right to left for the same reasons.

Single Pass Application Technique

Step 1. Application should start at the bottom flange with the nozzle pointed up, angled slightly, into the member (See step 1. While using only 25% of the spray pattern, spray the bottom flange tip while spraying only 1/2 of the bottom beam. Let the overspray flow onto the upper beam web, this can then be incorporated into the final thickness in step 2. After the bottom flange is at full thickness:

Step 2. Raise the nozzle slightly, maintaining the same angle to bring the web area and upper flange to full thickness as illustrated in step 2. Working left to right and gauging as you go bring the area to full thickness.
Upon completion rotate the nozzle 180o to the full down position:

Step 3. Start the down shot application. Bring the lower flange to full thickness by holding the nozzle tight enough to the steel and rolling the material over the lower flange tip.

Step 4. After visual inspection of the beam for proper thickness of the lower flange, web., upper flange fill the flutes with a side by side motion approximately 3/4's of the way full to allow for the swell of injected MK 6 HY material.

REPEAT steps 1-4 on the reverse side of the beam paying particular attention to the underside of the beam for potential light areas down the center of the beam where the material meets.

Note: In some cases an additional pass on the center of the web may be required when larger beams are being sprayed.

Multiple Pass Application Technique

When multiple pass applications are be used the decision of how much thickness to spray on the initial scratch coat has be asked. The recommendation is to normally spray 1/2 of the desired thickness. By applying lighter thickness this enables the sprayer to have more time to spray and gauge which aids in better thickness control and less waste and overspray. Caution must be taken not to underspray in thickness and try to hang more material than recommended on the following passes. Under normal conditions material hanability per pass is increased on the second coat compared to spraying on bare steel

Reducing the water ratio and drying up the material to hang heavier thickness comes with a reduction in yield. Lower water ratios reduce the efficiency of the injection process and make it harder to achieve high yields.

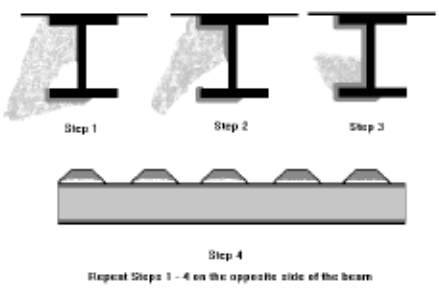
The option of spraying the lower flange to full thickness exists when spraying heavier thicknesses. This step should be included on the first pass in step 3 and when repeating steps on the opposite side of the beam.

With the initial application complete and set (10 - 15 minutes with injection) , repeat Steps 1 through 3 for thickness greater than 9/16". Particular attention should be paid to maintaining a uniform application to build subsequent passes more easily.

The recommended thickness per pass is 1/2" to 7/8" per application, for best hangabilty results. The following number of passes is recommended for these thicknesses:

up to	1 1/4"	2 passes
up to	1 7/8"	3 passes
for	1 7/8" or greater	4 passes

The flute fill operation (step 4) should be completed on the final pass in multiple pass applications.



Column Application Technique

The following application technique is recommended for single pass column applications which include thickness up to 9/16 inches for multiple pass applications greater than 9/16" refer to multiple pass applications techniques.

The following steps are recommended to obtain a uniform thickness with minimal waste and overspray.

Set up.

Position your body facing the web side of the steel column to enable spraying and gauging during the application process. Make sure hose length is adequate to enable you to move freely around the column. Debris and other obstacles should be cleared ahead of time to enable free movement from column to column during the application process. It is recommended that the base of the column be applied up to a comfortable working height before the top of the column application to minimize possible slides and drop offs of material. Application coordination should include all the column bottoms within the daily work area. This will minimize labor cost, reduce waste and overspray, and increase daily production.

Note: A light scratch coat on the column top during the bottom application will enhance material hangability when applying the material to the top of the column. In some cases this can eliminate the need to double back for column top application.

Single Pass Application Technique

Step1. While standing facing the web of the column start the application by holding the nozzle 90o tight to the steel and running a bead of material up the center of the flat side of the column (see step 1). This bead should be approximately 1/3 of the width of the column and sprayed to the desired thickness.

Step2. The bead then acts as a restraint to enable the sprayer to start building the material out to develop the flange tip. (See Step 2). The material should be built up in numerous, long sweeping, light coats, starting from the bottom and working towards the top of the column and back again. The application should start against the bead rotating the nozzle towards the inside web of the column. The nozzle should be held at a 45o angle to the column while focusing on rolling the flange tip. Roll the material around the flange tip to the inside of column. The overspray should go into the web portion of the column and later will be incorporated into the overall thickness.

Step 3. Flip the nozzle over and Repeat step 1 on the opposite side of the column.

Step 4. Move the nozzle out. Repeat step 2 to develop the flange tip

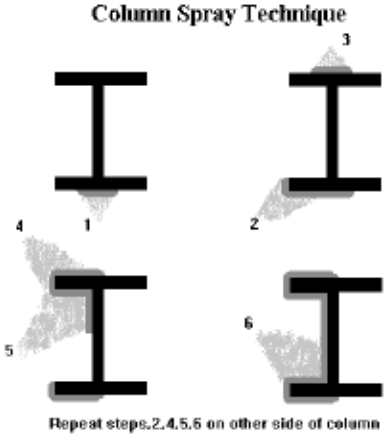
Step 5. Holding the nozzle at a 45o angle to the inside column web (See Step 5), build up thickness in numerous, long sweeping, light coats, starting from the bottom and working towards the top of the column. The nozzle should be held tight enough to the column to roll the material out on to the flange tip. As the material is building on the flange tip, special attention should be paid to the overspray going out from the column. The overspray should be minimized by maintaining the proper distance from the column. The distance the nozzle is held from the flange depends on the width of the column. The smaller the column the closer the nozzle will need to be held.

Step 6. Repeat step 5 on the opposite side of the column.
The opposite side of the column is complete in the same application technique with the exception of steps 1 and 3

On some wider columns an additional pass down the center of the inside column web may be necessary to achieve a uniform application.

Multiple Pass Application Technique

When multiple pass applications are be used the decision of how much thickness to spray on the initial scratch coat has be asked. The recommendation is to normally spray 1/2 of the desired thickness. By applying lighter thickness this enables the sprayer to have more time to spray and gauge which aids in better thickness control and less waste and overspray. Caution must be taken not to underspray in thickness and try to hang more material than recommended on the following passes. Under normal conditions material hangability per pass is increased on the second coat compared to spraying on bare steel



On multiple pass applications the placement of the bead up the center is not required. In step 2 & 4 the nozzle is held a little further back from the column, the spray pattern should be wide enough to spray half of the side of the column. Particular attention should be paid to maintaining a uniform application to build subsequent passes more easily.

The recommended thickness per pass are 1/2” to 5/8” per application, for best hangabilty results. The following numbers of passes are recommended for these thicknesses:

up to	1 1/4”	2 passes
up to	1 7/8”	3 passes
for	1 7/8” or greater	4 passes

Bar Joist Application Technique (with Scrim)

Then following application technique is recommended for single pass joist applications which include thickness up to 9/16 inches, for multiple pass applications greater than 9/16” refer to multiple pass applications techniques.

Bar Joist bridging is address in each particular UL design, refer to your specific design for coverage and thickness requirements.

The following steps are recommended to obtain a uniform thickness with minimal waste and overspray.

Set up

Position your body facing the joist member making sure scaffold height is adequate to spray and gauge during the application process. Scaffolds to low or too far away from the steel, increases overspray and waste and prohibits the sprayer from maintaining a quality application for thickness control. Normal recommended working height is 4” to 6” from the top of the sprayer’s hard hat to the decking. Decking is used as the reference point as beams tend to vary in height.

Application preparation should have the sprayer (right handed) starting the application from left to right, this enables the sprayer to keep the nozzle pointed at unfinished work while gauging the completed application. Left hand sprayers should work right to left for the same reasons.

Single Pass Application Technique (with Scrim)

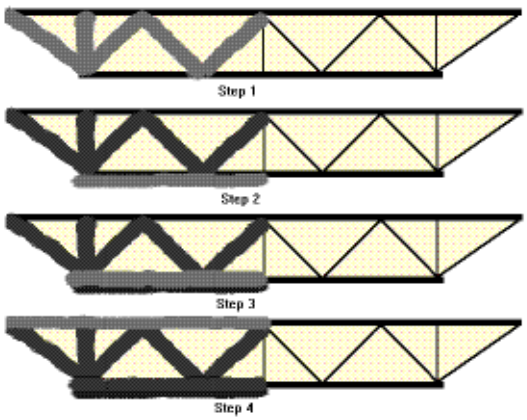
Step 1. Application should start on the scrimmed side of the joist. With the nozzle pointed up, angled slightly, into the member (See step 1). Start the application on the diagonal support members (bars / angles) angling the nozzle at a 45o angle to minimize blow through of the material. This will start the material bridging on the scrim and minimize waste and overspray. Follow the contour of the diagonals to within comfortable reach (approx. 4 – 5 feet). The distance the nozzle is held from the joist is critical in controlling waste as excessive thickness. The further the nozzle is held away from the joist the wider the spray pattern and the more waste. The width of the spray pattern should enable the sprayer to achieve the desired thickness required on the joist. As an example a 1 1/2” requirement should have a 3” spray pattern. This will minimize the excessive wasted material on the open joist portion of the scrim netting

Note on metal lath a minimal coverage on the lath is required in all UL designs..

Step 2. Holding the nozzle tight to the bottom chord, spray the bottom flange while focusing on rolling the flange tip. The nozzle needs to be held close enough to minimize material waste off the backside of the joist and also on the scrimmed netting. Continue spraying within comfortable reach until you meet the end of the spray area.

Step 3. Rotate the nozzle 180o and start the down shot on the top of the chord. Again paying close attention to the distance from the chord to minimize waste and overspray. At the end of the down shot again rotate the nozzle 180o and roll the flange tip again to assure proper thickness.

Step 4. Raise the nozzle up to the top chord and begin application by holding the nozzle tight enough to establish a spray pattern that will enable the application of the top chord will filling the flutes.



Multiple Pass Application Technique (with Scrim)

When multiple pass applications are be used the decision of how much thickness to spray on the initial scratch coat has be asked. The recommendation is to normally spray 1/2 of the desired thickness. By applying lighter thickness this enables the sprayer to have more time to spray and gauge which aids in better thickness control and less waste and overspray. Caution must be taken not to underspray in thickness and try to hang more material than recommended on the following passes. Under normal conditions material hanability per pass is increased on the second coat compared to spraying on new joist.

Step 1 For multiple passes repeat Steps 1 through 4 for thickness greater than 9/16". Particular attention should be paid to maintaining a uniform application to build subsequent passes more easily.

The recommended thickness per pass is 1/2" to 5/8" per application, for best hangabilty results. The following number of passes is recommended for these thicknesses:

up to	1 1/4"	2 passes
up to	1 7/8"	3 passes
for	1 7/8" or greater	4 passes

The flute fill operation should be inspected and completed on the final pass in multiple pass applications. Working left to right and gauging as you go bring the area to full thickness.

Bar Joist Application Technique (Open without Scrim)

The Open Joist application technique is only recommended to the more experienced applicator when the follow conditions can be met. On jobs where the decking requires spray on fire protection ,and the thickness is 1 1/2" or less on the bar joist The intention is to utilize the overspray from the joist application and convert it into the thickness required for the deck application. It is our recommendation that cost comparisons be done between scrimmed joist applications, and open joist applications, to determine the most economical means of the application.

For more information on open joist application please consult your local GCP Representative.

Pole Guns for use on Small Projects and Hard to Reach Areas

The use of a special lightweight 3/4" pole gun assembly is recommended for Small Projects and hard to reach areas on typical jobs. In the past many sprayers objected to the use of pole guns due to the weight and awkwardness. The new pole gun assembly is lighter weight due to the 3/4" aluminum construction, and needs to be fitted with a special 3/4" x 1" Articulating Swivel, or a 1" x 1" x 4" 45o aluminum nipple. These fittings enable adjustments of the nozzle, to achieve the proper nozzle direction tom properly coat steel surfaces.

The upshot and downshot can be easily adjusted to spray the entire steel member. The pole gun application technique for spraying a beam will differ from the normal beam application technique. The sprayer must focus on maintaining a quality application and achieving the minimal thickness requirement. Material waste in over thickness and overspray should be understood as a trade of against reduced labor. This savings should be carefully evaluated before this method of application is chosen. The trade off of using extra material for reducing labor and scaffolding cost can be profitable, based on labor wages and material cost. The higher your labor cost, the more appealing this option will be.

Below is an example of a cost analysis which demonstrates a reduction from a 3 man crew and an increase in material waste. Waste is described as additional thickness and overspray. Production rates in the 25 bag per hour range have been used to maintain nozzle control and reduce sprayer fatigue. Higher production rates are possible but are restricted to the sprayers experience and skill level. Pumping in the 40 plus bag per hour range is not recommended as normal practice when trying to spray the entire application. Refer to High production pole gun application portion of this manual for recommendations and directions.

Pole Gun Application Technique

The concern of achieving the downshot on the lower beam flange has to be addressed to maintain a quality application. Refer to the pole gun photo's for the necessary components to fabricate the pole gun assembly. You will notice two substantial differences in the pole gun assembly. The first is the 3/4" x 1" Articulating Swivel or a 1" x 1" x 4" x 45o aluminum nipple, which is rotated to achieve the proper nozzle direction. The second is the inline injection module which replaces the injection nozzle. This eliminates the need for the accelerator hose to be run up the length of the pole gun assembly (minimizing the weight) and places the injection shut off controls at a convenient location for the sprayer. The following application techniques must be followed to assure a quality application.

Step 1. The Down Shot

The nozzle should be held at a reasonable distance away from the steel to enable the complete application of the downshot to the top of the bottom beam flange. This sprayers focus should be on watching the material roll over the flange tip. This step may require some practice depending on the sprayer's skill level and in all cases should be visually checked to assure the entire lower flange has received the proper coverage and thickness. In most cases additional material will be applied (i.e. Heavy thickness) but will improve with practice. The sprayer should select a large enough area that will enable sufficient application time between nozzle rotations, and complete the lower flanges for all beams in this area.

Step 2. Upshot on Bottom Beam

Rotating the nozzle (See Note below) to the up position will enable the sprayer to spray the upshot on the lower flange with the material overspray going into the web portion of the beam. This is similar to the standard beam application technique.

NOTE: When columns are available on the project they can be used as a spray location to rotate the nozzle direction to switch from the lower flange application to the upshot and flute fill nozzle direction. This will eliminate the necessity to stop the pump, and rotate the nozzle while controlling overspray.

Step 3. Spraying the Beam Web (When using the 45o aluminum nipple step 4 is completed before step 3).
The pole gun can then be rotated 180o to spray the web portion of the beam. Utilizing the overspray from the upshot into the overall thickness of the beam complete the web and upper flange portion of the beam. The distance the nozzle needs to be held from the steel will vary with beam size.

Step 4. The Flutes
Fill the flutes using a side to side motion approximately 3/4's full to allow for material swell. This step may require additional practice due to the increase in the sprayers distance from the steel. The Nozzle angle will vary on depending on floor to ceiling heights and flute size.

Note: An additional pass over the upper flange and web area is advisable to assure proper coverage and material thickness.

High Production Pole Gun Application Technique (scratch coat)

For some more experienced crews, pole guns have be have been found to be a cost effective method of applying a scratch coat in multi pass application situations.

The final pass is always done from a scaffold with the gun and sprayer near the steel to accurately measure thickness and achieve a quality application without excess waste.

Pole Gun High Production Application

Where multiple passes are required, the daily production rate can be dramatically increased when the scratch coat operation is applied with the pole gun application procedures. The objective is to spray at a higher productivity rate than your normal spraying operations. This will eliminate the necessity of a scaffold for the initial pass. The final application is applied with a hand held version of the nozzle assembly from a scaffold where the sprayer can control thickness and maintain the quality of the application. The intention of the high production pole gun operation is not to spray the entire member from the floor. These applications include: beam only jobs, beam & deck, and roof decks with open bar-joist. There are limitations such as floor heights that exceed 13' (4 meters) and is not recommended for the less experienced sprayer who has difficulty with nozzle control.

Equipment Selection

Refer to the equipment portion of the manual for photo's and components to fabricate the pole gun assembly. (Optional equipment selections are available). The pole-gun assembly should be 6'-7' (approx. 2 meters) long when spraying a typical floor height 12 - 13' (4 Meters). The pole gun will need to be fabricated for a quick change over to a short nozzle assembly to complete the application process. Pay particular attention to material line, air line, and accelerator line connections as they will need to be installed properly for the quick change over of the nozzle assemblies. Shorter versions of the pole gun assembly can be used when floors are lower than 12 - 13 feet (4 Meters).In such cases as parking garages etc, the objective is to design the nozzle assembly to comfortably reach the spray area.

The following procedure should be followed closely to maximize production and minimize waste and overspray.

Material Application on Typical Floors

1. The pole gun application would include the "up-shot" only, applying approx. 3/8" to a 1/2" of material per pass when working with standard floor heights. Production in bags per hour should be increased to enable the application to be done at a comfortable pumping rate with the material, but not to exceed the sprayer's capabilities so that excessive waste and overspray become costly. As an example a sprayer who would normally spray at 35-40 bags per hour should increase the pumping rate to 45 -50 bags per hour on the scratch coat.

The material hose should be laid out down the middle of the bays to be sprayed. The hose should be behind the sprayer with enough additional hose to move freely. The person moving the hose for the sprayer should communicate the sequencing of the application before the start of the application. For safety reasons obstacles or debris should be removed before the application starts to prevent accidental trips or falls. The following application sequences should be followed for:

Pole Gunn Beam Only application

Starting in end section of a bay start the upshot application on either the left or right side and spray around the entire section. By following the beam line around the section this will minimize the overspray on the decking. Upon completion move to the next section of the bay and complete in the same sequence, until the bay(s) are complete. Doubling back for heavier thickness can be accomplished in 10 - 15 minutes if the proper injection process is followed. Enough work can be scratch coated in 1 to 2 hours with the pole gun, to enable the sprayer to return to the hand held nozzle for the remainder of the day. This will minimize sprayer fatigue while maximizing production.

Pole Gun Beam And Deck Applications

A slightly different approach will be necessary when spraying beams and decking. Spray the beams in the same manners as described in beam only application. When spraying the deck the sprayer will need to position himself in the center of the section and walk away from the sprayed portion. The nozzle should be held close enough to the deck to minimize overspray but far enough away to spray 2 - 4 sides of deck. The nozzle should be held at an angle that will enable the sprayer to cover the deck from the center of the bottom crest to the center of the top valley with a side to side sweeping motion. (see diagram A.) Complete one side of the deck turn around and repeat to complete other side. (see diagram B.) The production rate in bags per hour will determine the speed at which the sprayer must move and the distance the nozzle is held from the decking.

Diagram A.

Diagram B.

Caution should be used not to overspray the beams that have been previously sprayed. The use of an orifice shield or Super shield will aid in a well defined spray pattern.

Pole Gun (Non scrimed) Joist and Roof Deck Application

On scrimed joist projects the pole gun is not recommended.

Pole Gun is recommended for scratch coat only. Finish coat to be done from a scaffold, with the sprayer and gun close to the work.

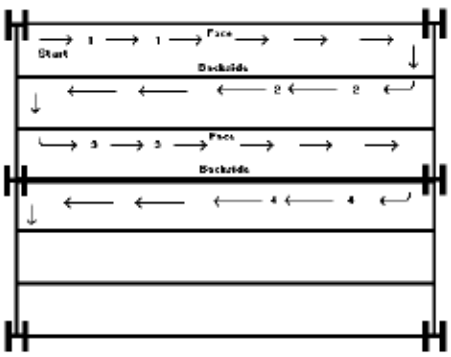
The joist will need to be sprayed in a similar fashion as a beam. The angle of the spray pattern is critical in achieving the proper application of a joist and deck. The nozzle angle will need to be pointed up at the bottom of the joist angled slightly to the top of the joist to allow the spray pattern to achieve a full uniform application of the joist. Particular attention should be paid to sequencing as timing, and set time of the material play, a vital role in the success of the application. The final pass is always done from a scaffold with the gun and sprayer near the steel to accurately measure thickness and achieve a quality application without excess waste. The following sequence should be followed

Start in the corner of the bay. Begin by spraying a scratch coat of 1/4" to 3/8"of material to only one side of the joist. Working from left to right and right to left as diagrammed below.

Be sure to select an area large enough to allow sufficient set time of the material (10-15 minutes) before the backside of the joist is applied. The material will build up easier and the possibility of drop outs will be reduced if the initial application is set before applying the material to the backside of the joist.

After the material has set spray the backside of the joist, starting in the same initial location. This will allow the last portion of the spray area to set while the application continues.

Repeat this process until the desired thickness is achieved. Numerous passes can be applied when spraying heavy thickness applications. Allow enough remaining thickness to achieve a quality application from the scaffold with a hand held nozzle.



As an example a 1 5/8" joist thickness can be scratched coated in 3 passes 1/4" + 3/8" + 3/8" with the remaining 5/8" from the scaffold.

The overspray from the joist application will be used in the deck thickness. Upon completing the area or, when spraying the final scratch coat in a section, address light area's in the center of the deck area. The decking should be brought to a uniform thickness but the application should not exceed the required thickness. Allow enough remaining thickness to achieve a quality application from the scaffold with a hand held nozzle.

Thickness should be checked periodically to assure a quality application.

INJECTION

Introduction to Injection

Injection refers to the patented process developed by GCP Applied Technologies where by Monokote Accelerator is "injected" into the flow of the Monokote slurry near the nozzle, which causes Monokote MK-6/HY. Retro-Guard® Type RG Monokote MK-10/HB to foam and set soon after being sprayed into place.

The injection process is also used to reduce the set time of Monokote Z 106/HY, Z- 106/G, and MK-6s. Yield is not a benefit of the injection process with these products.

The foaming is due to the reaction between Monokote Accelerator and ingredients specifically added to Monokote. The principal benefit of this foaming is to increase the yield of Monokote as it leaves the nozzle. Additional benefits include improved hangability and set. When properly injected Monokote yield increases 30-40% and set time is reduced to approximately 10 minutes, longer in colder climates. The fast set allows scratch and double operations in one continuous process.

The key to achieving the Maximum Walk Off yield is the proper use of the Deluxe High Yield Kit. The components of this kit allow the applicator to maximize the yield at the nozzle and then to minimize the waste left on the steel in the form of excess thickness. The kit includes yield charts which detail parameters for setting water and accelerator, cups and scale to quickly measure results, and thickness gauges with written measurement procedures to accurately monitor and control in place thickness.

Proper and regular monitoring of nozzle yield (at least twice per day) and the continual use of a thickness gauge by the spray man is a major component of meeting the profit goals on all Monokote Fireproofing projects.

In-line Injection

In-line Injection is the most common application method for injecting Monokote MK6 HY and Monokote Retro Guard. In-line injection is accomplished by removing the injection gun head from the nozzle and replacing it with a standard spray nozzle. A special 1" injection body needs to be purchased and installed into the delivery system between the 1" hose and the 3/4" whip hose or between the 1-1/4" and 1" hoses depending on the whip system being used. Special attention should be paid to location of the injection shut off valve so that it is easily accessible when it becomes necessary to turn off the injection valve.

In-line Injection should not be attempted by anyone not familiar with the Standard Injection Method or those not willing to spend the extra time and effort required to install and develop the skills to use the In-line Injection process.

There are several advantages as well as disadvantages to In-line injection:

Advantages

- Increased hangability of material due to reduction in density
- Increased yield due to better accelerator dispersion into material
- Reduced bulk at nozzle by removing injection unit and alum line from whip hose
- Decreases sprayer fatigue

Disadvantages

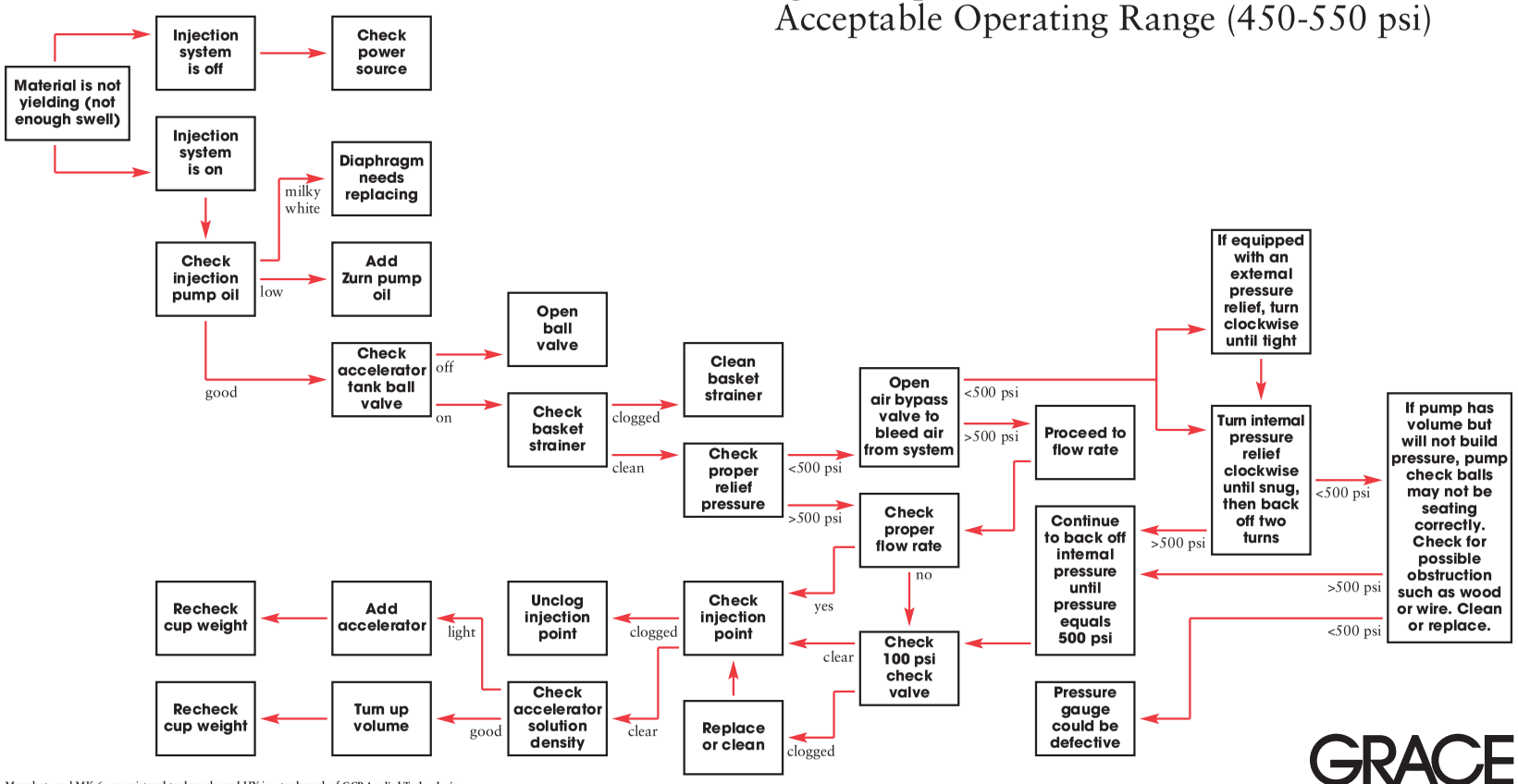
- Increased use of accelerator
- Increase chance of violating density
- Possibility of flash setting material in hose

Please consult your local GraceTechnical Service Representative to find out more about the In Line Injection Process.

MONOKOTE® MK-6®/HY™

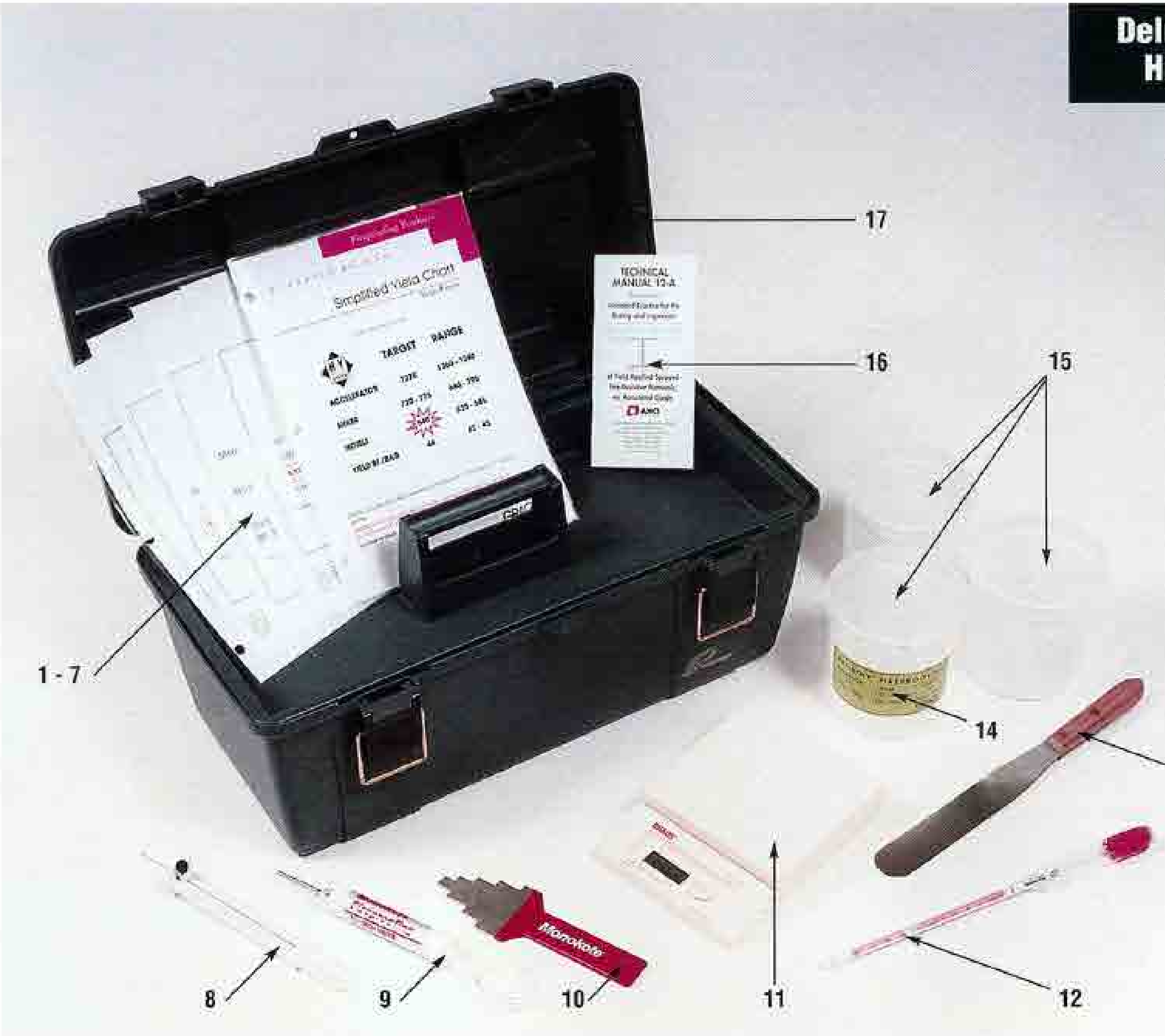
Injection System Troubleshooting Guide

Target 500 psi for Accelerator Relief Pressure
Acceptable Operating Range (450-550 psi)



GRACE
Construction Products

Deluxe Simplified High Yield Kit



Parts List Reference

Part No.	Part Name	Grace SAP Order #
	Deluxe Simplified Yield Kit (As Shown)	3961
1	Yield Chart, MK-6/HY	3755
2	Yield Chart, MK-6s	7204
3	Yield Chart, Z-106	7205
3A	Yield Chart, Z-106/HY	20490
3B	Yield Chart, Z-106/G	20491
4	Yield Chart, Z-146	7206
5	Yield Chart, PK-140	7207
6	Yield Chart, PK-150	7208
7	Injection System Troubleshooting Guide	24873
8	Inspectors Gauge	7210
9	Spatula Thickness Gauge	7209
10	Barrel Pin Thickness Gauge	3833
11	Ohaus Electronic Scale	3828
12	Hydrometer	24875
13	Stainless Spatula 10"	3817
14	Yield Cup Label	3749
15	1 Liter Yield Cup	3757
16	Field Inspection Manual	7211
17	Plastic Utility Box	3816

Photo 1


The Monokote Tool Box
Flexible — Lightweight — High Production
Deluxe Simplified High Yield Kit
¾" Lightweight Pole Gun
Inline Injection
Full Flow Quick Fits
1" Hose
¾" Whip
1500 psi Goodyear Gauntlet
Reversible 45° Fitting
Articulating Swivel
1¼" Hose
¾" Lightweight Flexible Nozzle
Caps, Shields & Orifices
Quickfits & Swivels
Photo 5

MONOKOTE®MK-6®/HY® | Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
12 1/4	21.0	7.0
13	22.5	7.5
14	24.0	8.0
14 3/4	25.5	8.5
15 3/4	27.0	9.0

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches. To determine water used measure the water drop in inches and multiply by 1.72.*

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR INJECTED APPLICATION (b)

Yield (a)		Water				
		7.5 U.S. gal 28 L	8.0 U.S. gal 30 L	8.5 U.S. gal 32 L	9.0 U.S. gal 34 L	Dry Density (PCF)
3.72 m²	40 BF	545	565	585	605	17.1
3.90 m²	42 BF	520	540	560	580	16.3
4.09 m²	44 BF	500	515	535	550	15.6
4.25 m²	45.7 BF	480	500	515	535	15.0

NOZZLE YIELD FOR UN-INJECTED APPLICATION (b)

Yield (a)		Water				
		6.0 U.S. gal 23 L	6.5 U.S. gal 25 L	7.0 U.S. gal 26 L	7.5 U.S. gal 28 L	Dry Density (PCF)
2.51 m²	27.0 BF	685	710	740	770	24.3
2.56 m²	27.5 BF	675	700	730	760	23.9
2.60 m²	28.0 BF	660	685	715	745	23.4

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

Warning. Yields in excess of 45.7 bf. per bag will result in dry densities below the 15 pcf minimum published in the Underwriters Laboratories Inc® Fire Resistance Directory.

***NOTE:** Nozzle yields should be taken 3 times a day; more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzle before taking the cups.

MONOKOTE® MK-6®/HY® | Injected

Accelerator Mixing:
One 60 lb Bag/10 gallons water

Concentration 1270 g/liter cup (specific gravity)

1. Mix Monokote accelerator in a GCP injection system as directed on the accelerator bag.
2. Place an empty one liter container on scale and press “on/tare” to tare the container.
3. Fill the container level (flat) to the top with accelerator.
4. As an alternate to 1–3 above, place a hydrometer in the solution and determine the specific gravity.

Note: Freshly mixed solution contains small air bubbles. Target 1260 grams.

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

15 – 20 bags per hour = 90 – 120 bags per day[(a)]

20 – 30 bags per hour = 120 – 180 bags per day[(a)]

30 - 40 bags per hour = 180 – 240 bags per day[(a)]

a) assumes 6 hours of application time.

MONOKOTE® MK-6®/HY® | Supplemental Field Application Information

BONDING AGENT REQUIREMENT

Prior to application of Monokote MK-6/HY, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive MK-6/HY. A bonding agent may also be required on certain primed or painted steel. Please check with your local sales representative.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum. GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density
720-775 grams

1. Mix Monokote as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Monokote, tapping lightly to remove air voids.
4. Place the container filled with Monokote on the scale and record the net weight.

   If the weight is above 795 grams, mix longer or speed up the mixing blades.

   If the weight is below 640 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density
480 - 535 grams

1. Set the accelerator flow rate to a “fast trickle”.
2. Start spraying and spray for about one minute until the system stabilizes.
3. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
4. Cut the Monokote level with the top of the container. Wait approximately one minute or until no further swelling is apparent. Again cut the Monokote flush with the top of the container.
5. For accurate readings cut to a smooth surface before the MK begins to set.
6. Place an empty container on the scale and press “on/tare”.
7. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield and adjust the injection rate to yield 45.7 board feet per bag.

MONOKOTE® MK-6®/HY®

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be.
- **Orifice Shield:** The use of an orifice shield is highly recommended. The orifice shield decreases the size of the spray pattern and provides a well-defined spray pattern.
- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Injected Application Thicknesses:

— 1st pass: 3/8" to 3/4"

— 2nd pass: 3/8" to 7/8"

Uninjected Application Thicknesses:

— 1st pass: 3/8" to 5/8"

— 2nd pass: 3/8" to 5/8"

Product Change Over

GCP recommends the use of 5 ounces of retarder per 3 bag mix, with Monokote on the first three batches when switching EITHER TO or FROM cement based Monokote products to gypsum based Monokote products.

Set Times

Set times vary due to job site conditions

With Injection: 5-10 minutes, longer in colder temperatures.

Without Injection: 3-4 hours before reapplication.

ADVANTAGES

- Proven in-place performance
- Achieve multiple passes in the same day.
- Fast, efficient application
- Low pumping pressures
- Low wear on equipment
- Higher production rates

GCP Applied Technologies, Inc., 62 Whittemore Avenue, Cambridge, MA 02140.

In Canada, GCP Canada, Inc., 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

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gcp applied technologies

MONOKOTE®MK-6® GF | Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
12 1/4	21.0	7.0
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*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches.*
To determine water used measure the water drop in inches and multiply by 1.72.

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7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

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Yield (a)		Water				
		7.5 U.S. gal 28 L	8.0 U.S. gal 30 L	8.5 U.S. gal 32 L	9.0 U.S. gal 34 L	Dry Density (PCF)
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NOZZLE YIELD FOR UN-INJECTED APPLICATION (b)

Yield (a)		Water				
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a) Yield based on 1 inch (25.4 mm) thickness
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Warning. Yields in excess of 45.7 bf. per bag will result in dry densities below the 15 pcf minimum published in the Underwriters Laboratories Inc® Fire Resistance Directory.

***NOTE:** Nozzle yields should be taken 3 times a day; more frequently if changes occur in the mixing or conveying process.*

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MONOKOTE® MK-6® GF | Injected

Accelerator Mixing:
One 60 lb Bag/10 gallons water

Concentration 1270 g/liter cup (specific gravity)

1. Mix Monokote accelerator in a GCP injection system as directed on the accelerator bag.
2. Place an empty one liter container on scale and press “on/tare” to tare the container.
3. Fill the container level (flat) to the top with accelerator.
4. As an alternate to 1–3 above, place a hydrometer in the solution and determine the specific gravity.

Note: Freshly mixed solution contains small air bubbles. Target 1260 grams.

Calculating bags per hour with a batch mixer

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- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
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15 – 20 bags per hour = 90 – 120 bags per day[a]

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a) assumes 6 hours of application time.

MONOKOTE® MK-6® GF | Supplemental Field Application Information

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FIREBOND™ APPLICATION

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Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

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MONOKOTE® MK-6® GF

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- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

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— 2nd pass: 3/8" to 7/8"

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— 1st pass: 3/8" to 5/8"

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Set times vary due to job site conditions

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Without Injection: 3-4 hours, before reapplication.

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- Proven in-place performance
- Achieve multiple passes in the same day
- Fast, efficient application
- Low pumping pressures
- Low wear on equipment
- Higher production rates

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MONOKOTE®MK-10 HB | Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
12 1/4	21.0	7.0
13	22.5	7.5
14	24.0	8.0
14 3/4	25.5	8.5
15 3/4	27.0	9.0

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches. To determine water used measure the water drop in inches and multiply by 1.72.*

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR INJECTED APPLICATION (b)

Yield (a)		Water				
		7.5 U.S. gal 28 L	8.0 U.S. gal 30 L	8.5 U.S. gal 32 L	9.0 U.S. gal 34 L	Dry Density (PCF)
3.72 m²	40 BF	545	565	585	605	17.1
3.90 m²	42 BF	520	540	560	580	16.3
4.09 m²	44 BF	500	515	535	550	15.6
4.25 m²	45.7 BF	480	500	515	535	15.0

NOZZLE YIELD FOR UN-INJECTED APPLICATION (b)

Yield (a)		Water				
		6.0 U.S. gal 23 L	6.5 U.S. gal 25 L	7.0 U.S. gal 26 L	7.5 U.S. gal 28 L	Dry Density (PCF)
2.51 m²	27.0 BF	685	710	740	770	24.3
2.56 m²	27.5 BF	675	700	730	760	23.9
2.60 m²	28.0 BF	660	685	715	745	23.4

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

Warning. Yields in excess of 45.7 bf. per bag will result in dry densities below the 15 pcf minimum published in the Underwriters Laboratories Inc® Fire Resistance Directory.

***NOTE:** Nozzle yields should be taken 3 times a day; more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzle before taking the cups.

MONOKOTE® MK-10 HB | Injected

Accelerator Mixing:
One 60 lb Bag/10 gallons water

Concentration 1270 g/liter cup (specific gravity)

1. Mix Monokote accelerator in a GCP injection system as directed on the accelerator bag.
2. Place an empty one liter container on scale and press “on/tare” to tare the container.
3. Fill the container level (flat) to the top with accelerator.
4. As an alternate to 1–3 above, place a hydrometer in the solution and determine the specific gravity.

Note: Freshly mixed solution contains small air bubbles. Target 1260 grams.

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

15 – 20 bags per hour = 90 – 120 bags per day[(a)]

20 – 30 bags per hour = 120 – 180 bags per day[(a)]

30 - 40 bags per hour = 180 – 240 bags per day[(a)]

a) assumes 6 hours of application time.

MONOKOTE® MK-10 HB | Supplemental Field Application Information

BONDING AGENT REQUIREMENT

Prior to application of Monokote MK-10 HB, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive MK-10 HB. A bonding agent may also be required on certain primed or painted steel. Please check with your local sales representative.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum. GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density
720-775 grams

1. Mix Monokote as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Monokote, tapping lightly to remove air voids.
4. Place the container filled with Monokote on the scale and record the net weight.

   If the weight is above 795 grams, mix longer or speed up the mixing blades.

   If the weight is below 640 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density
480 - 535 grams

1. Set the accelerator flow rate to a “fast trickle”.
2. Start spraying and spray for about one minute until the system stabilizes.
3. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
4. Cut the Monokote level with the top of the container. Wait approximately one minute or until no further swelling is apparent. Again cut the Monokote flush with the top of the container.
5. For accurate readings cut to a smooth surface before the MK begins to set.
6. Place an empty container on the scale and press “on/tare”.
7. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield and adjust the injection rate to yield 45.7 board feet per bag.

MONOKOTE® MK-10 HB

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be.
- **Orifice Shield:** The use of an orifice shield is highly recommended. The orifice shield decreases the size of the spray pattern and provides a well-defined spray pattern.
- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Injected Application Thicknesses:

— 1st pass: 3/8" to 3/4"
— 2nd pass: 3/8" to 7/8"

Uninjected Application Thicknesses:

— 1st pass: 3/8" to 5/8"
— 2nd pass: 3/8" to 5/8"

Product Change Over

GCP recommends the use of 5 ounces of retarder per 3 bag mix, with Monokote on the first three batches when switching EITHER TO or FROM cement based Monokote products to gypsum based Monokote products.

Set Times

Set times vary due to job site conditions

With Injection: 5-10 minutes, longer in colder temperatures.

Without Injection: 3-4 hours, before reapplication.

ADVANTAGES

- Superior option for meeting the IBC building requirements for bond strength in excess of 430 psf
- High yield capabilities
- Proven in-place performance
- Achieve multiple passes in the same day
- Fast, efficient application
- Low pumping pressures
- Low wear on equipment
- Higher production rates

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MONOKOTE® MK-1000 HB | Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
13 1/2	23.25	7.75
14 1/2	24.75	8.25
15 1/4	26.25	8.75
16 1/4	27.75	9.25
17	29.75	9.75

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches.*
To determine water used measure the water drop in inches and multiply by 1.72.

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR INJECTED APPLICATION (b)

Yield (a)		Water				
		8.25 U.S. gal 31 L	8.75 U.S. gal 33 L	9.25 U.S. gal 35 L	9.75 U.S. gal 37 L	Dry Density (PCF)
3.25 m^2	35 BF	660	680	705	725	19.5
3.35 m^2	36 BF	640	660	685	705	18.9
3.44 m^2	37 BF	620	645	665	685	18.4
3.53 m^2	38 BF	605	630	645	670	18.0

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

Warning: A minimum density of 18.0 pcf is required to meet 1,000 psf bond strength.

***NOTE:** Nozzle yields should be taken 3 times a day; more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzle before taking the cups.

MONOKOTE® MK-1000 HB | Injected

Accelerator Mixing:
One 60 lb Bag/10 gallons water

Concentration 1270 g/liter cup (specific gravity)

1. Mix Monokote accelerator in a GCP injection system as directed on the accelerator bag.
2. Place an empty one liter container on scale and press “on/tare” to tare the container.
3. Fill the container level (flat) to the top with accelerator.
4. As an alternate to 1–3 above, place a hydrometer in the solution and determine the specific gravity.

Note: Freshly mixed solution contains small air bubbles. Target 1260 grams.

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

15 – 20 bags per hour = 90 – 120 bags per day[a]

20 – 30 bags per hour = 120 – 180 bags per day[a]

30 - 40 bags per hour = 180 – 240 bags per day[a]

a) assumes 6 hours of application time.

MONOKOTE® MK-1000 HB

Supplemental Field Application Information

BONDING AGENT REQUIREMENT

Prior to application of Monokote MK-1000 HB, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive MK-1000 HB. A bonding agent may also be required on certain primed or painted steel. Please check with your local sales representative.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum. GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density
725-775 grams

1. Mix Monokote as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Monokote, tapping lightly to remove air voids.
4. Place the container filled with Monokote on the scale and record the net weight.

   If the weight is above 830 grams, mix longer or speed up the mixing blades.

   If the weight is below 675 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density
605 - 670 grams

1. Set the accelerator flow rate to a “fast trickle”.
2. Start spraying and spray for about one minute until the system stabilizes.
3. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
4. Cut the Monokote level with the top of the container. Wait approximately one minute or until no further swelling is apparent. Again cut the Monokote flush with the top of the container.
5. For accurate readings cut to a smooth surface before the MK begins to set.
6. Place an empty container on the scale and press “on/tare”.
7. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield and adjust the injection rate to yield no more than 38 board feet per bag. A minimum density of 18.0 pcf is required to meet 1,000 psf bond strength.

MONOKOTE® MK-1000 HB

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be.
- **Orifice Shield:** The use of an orifice shield is highly recommended. The orifice shield decreases the size of the spray pattern and provides a well-defined spray pattern.
- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Injected Application Thicknesses:

— 1st pass: 3/8" to 3/4"

— 2nd pass: 3/8" to 7/8"

Product Change Over

GCP recommends the use of 5 ounces of retarder per 3 bag mix, with Monokote on the first three batches when switching EITHER TO or FROM cement based Monokote products to gypsum based Monokote products.

Set Times

Set times vary due to job site conditions

With Injection: 5-10 minutes, longer in colder temperatures.

ADVANTAGES

- Excellent option for meeting the IBC building requirements for bond strength in excess of 1,000 psf
- High yield capabilities
- Low pumping pressures
- Low wear on equipment
- Higher production rates

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MONOKOTE® Z106®/HY® | Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
14	24.00	8.00
14 1/2	24.75	8.25
14 3/4	25.50	8.50
15 1/4	26.25	8.75
15 3/4	27.00	9.00

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches.*
To determine water used measure the water drop in inches and multiply by 1.72.

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR INJECTED APPLICATION (b)

Yield (a)		Water				
		8.0 U.S. gal 30 L	8.25 U.S. gal 31 L	8.5 U.S. gal 32 L	8.75 U.S. gal 33 L	Dry Density (PCF)
2.79 m²	30.0 BF	740	750	760	775	24.3
2.88 m²	31.0 BF	715	725	740	750	23.6
3.02 m²	32.5 BF	685	695	710	720	22.6

Warning. Yields in excess of 32.5 bf. per bag will result in dry densities below the 22 pcf minimum published in the Underwriters Laboratories Inc® Fire Resistance Directory.

NOZZLE YIELD FOR UN-INJECTED APPLICATION (b)

Yield (a)		Water				
		8.0 U.S. gal 30 L	8.25 U.S. gal 31 L	8.5 U.S. gal 32 L	8.75 U.S. gal 33 L	Dry Density (PCF)
2.70 m²	29.0 BF	750	760	775	790	24.8
2.79 m²	30.0 BF	730	740	750	765	24.1
2.88 m²	31.0 BF	705	715	730	740	23.3
3.02 m²	32.5 BF	670	680	695	705	22.2

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

***NOTE:** Nozzle yields should be taken 3 times a day more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzlebefore taking the cups.

MONOKOTE® Z106®/HY® | Injected

Accelerator Mixing:
One 60 lb Bag/10 gallons water
Concentration 1270 g/liter cup (specific gravity)

Flow Rate: Set according to Z106HY pumping rate

Z-106/HY Pumping Rate	Net Wt. of Accelerator (15 seconds)*
20 bags per hour	210-220 grams
30 bags per hour	320-330 grams
40 bags per hour	430-440 grams
50 bags per hour	540-550 grams
60 bags per hour	650-660 grams

**Net weight in grams accumulated in the cup during 15 seconds taken at the nozzle (at constant flow).*

Warning. Z-106/HY fast sets with Accelerator.

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

15 – 20 bags per hour = 90 – 120 bags per day[(a)]

20 – 30 bags per hour = 120 – 180 bags per day[(a)]

30 - 40 bags per hour = 180 – 240 bags per day[(a)]

a) assumes 6 hours of application time.

MONOKOTE® Z106®/HY® | Supplemental Field Application Information

BONDING AGENT REQUIREMENT

Prior to application of Monokote Z-106/HY,Firebond™ Concentrate bonding agent must be applied to all substrates at a rate of 500 SF per gallon. There are two exceptions to this requirement;

1. Firebond™ Concentrate is not required when Monokote Z-106/HY is applied uninjected to bare steel.
2. Firebond™ Concentrate is not required when bond tests run in accordance to the Coatings Materials section of the Underwriters Laboratories Fire Resistance Directory Volume 1 indicate that a bonding agent is not required for Monokote Z-106/HY in conjunction with the specific primed or painted structural steel.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum. GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density
610-690 grams

1. Mix Monokote as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Monokote, tapping lightly to remove air voids.
4. Place the container filled with Monokote on the scale and record the net weight.

   If the weight is above 690 grams, mix longer or speed up the mixing blades.

   If the weight is below 610 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density Injected
685 - 720 grams

1. Set the accelerator flow rate to a “fast trickle”.
2. Start spraying and spray for about one minute until the system stabilizes.
3. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
4. Cut the Monokote level with the top of the container. Wait approximately one minute or until no further swelling is apparent. Again cut the Monokote flush with the top of the container.
5. For accurate readings cut to a smooth surface before the MK begins to set.
6. Place an empty container on the scale and press “on/tare”.
7. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield.

Target Weight - Nozzle Density Uninjected
670 - 705 grams

1. Start spraying and spray for about one minute until the system stabilizes.
2. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
3. Cut the Monokote level with the top of the container. Wait approximately one minute and cut again to allow for a more accurate cup weight reading.
4. Place an empty container on the scale and press “on/tare”.
5. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield.

MONOKOTE® Z106®/HY®

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. Using a 7/16 in. orifice for 30-40 bph or 1/2" orifice 40-50 bph. This is very important for same day multiple pass operation!
- **Orifice Shield:** When injecting — **ONLY THE MINI SHIELD** is recommended!

  Super-shields can be used when not injecting:
  35-55 bph 9/16 in.
  45-55 bph 5/8 in.

- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Injected Application Thicknesses:

— 1st pass: 1/2" to 1"
— 2nd pass: 1/2" to 1-1/2"

Uninjected Application Thicknesses:

— 1st pass: 1/2" to 5/8"
— 2nd pass: 1/2" to 5/8"

Product Change Over

GCP recommends the use of 5 ounces of retarder per 3 bag mix, with Monokote on the first three batches when switching EITHER TO or FROM cement based Monokote products to gypsum based Monokote products.

Set Times

Set times vary due to job site conditions

With Injection: 1 -2 hours, longer in colder temperatures.

Without Injection: 6 - 8 hours before reapplication.

ADVANTAGES

- Low pumping pressures allow use of small diameter hoses for increased maneuver-ability and greater pumping distances

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MONOKOTE® Fireproofing Product

MONOKOTE® Z106® G | Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
14	24.00	8.00
14 1/2	24.75	8.25
14 3/4	25.50	8.50
15 1/4	26.25	8.75
15 3/4	27.00	9.00

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches.*
To determine water used measure the water drop in inches and multiply by 1.72.

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR INJECTED APPLICATION (b)

Yield (a)		Water				
		8.0 U.S. gal 30 L	8.25 U.S. gal 31 L	8.5 U.S. gal 32 L	8.75 U.S. gal 33 L	Dry Density (PCF)
2.70 m²	29.0 BF	770	785	800	810	23.3
2.79 m²	30.0 BF	745	760	775	785	22.5
3.85 m²	30.7 BF	730	745	755	770	22.0

Warning. Yields in excess of 30.7 bf. per bag will result in dry densities below the 22 pcf minimum published in the Underwriters Laboratories Inc® Fire Resistance Directory.

NOZZLE YIELD FOR UN-INJECTED APPLICATION (b)

Yield (a)		Water				
		8.0 U.S. gal 30 L	8.25 U.S. gal 31 L	8.5 U.S. gal 32 L	8.75 U.S. gal 33 L	Dry Density (PCF)
2.52 m²	27.0 BF	805	820	835	850	24.8
2.61 m²	28.0 BF	780	790	805	820	23.9
2.70 m²	29.0 BF	750	765	780	795	23.1

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

***NOTE:** Nozzle yields should be taken 3 times a day more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzlebefore taking the cups.

MONOKOTE® Z106® G | Injected

Accelerator Mixing:
One 60 lb Bag/40 gallons water
Concentration 1060 g/liter cup (specific gravity)

Flow Rate: Set according to Z106 G pumping rate

Z-106 G Pumping Rate	Net Wt. of Accelerator (15 seconds)*
20 bags per hour	100-110 grams
30 bags per hour	150-160 grams
40 bags per hour	210-220 grams
50 bags per hour	260-270 grams
60 bags per hour	315-325 grams

**Net weight in grams accumulated in the cup during 15 seconds taken at the nozzle (at constant flow).*

Warning. Z-106 G fast sets with Accelerator.

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level.(Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

15 – 20 bags per hour = 90 – 120 bags per day[(a)]

20 – 30 bags per hour = 120 – 180 bags per day[(a)]

30 - 40 bags per hour = 180 – 240 bags per day[(a)]

a) assumes 6 hours of application time.

MONOKOTE® Z106® G

Supplemental Field Application Information

BONDING AGENT REQUIREMENT

Prior to application of Monokote MK-6s, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive MK-6s. A bonding agent may also be required on certain primed or painted steel. Please check with your local sales representative.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum. GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density
625-675 grams

1. Mix Monokote as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Monokote, tapping lightly to remove air voids.
4. Place the container filled with Monokote on the scale and record the net weight.

   If the weight is above 700 grams, mix longer or speed up the mixing blades.

   If the weight is below 600 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density Injected
730 - 770 grams

1. Set the accelerator flow rate to a “fast trickle”.
2. Start spraying and spray for about one minute until the system stabilizes.
3. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
4. Cut the Monokote level with the top of the container. Wait approximately one minute or until no further swelling is apparent. Again cut the Monokote flush with the top of the container.
5. For accurate readings cut to a smooth surface before the MK begins to set.
6. Place an empty container on the scale and press “on/tare”.
7. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield.

Target Weight - Nozzle Density Uninjected
750 - 795 grams

1. Start spraying and spray for about one minute until the system stabilizes.
2. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
3. Cut the Monokote level with the top of the container. Wait approximately one minute and cut again to allow for a more accurate cup weight reading.
4. Place an empty container on the scale and press “on/tare”.
5. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield.

MONOKOTE® Z106® G

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be.
- **Orifice Shield:** The use of an orifice shield is highly recommended. The orifice shield decreases the size of the spray pattern and provides a well-defined spray pattern.
- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Injected Application Thicknesses:

— 1st pass: 1/2" to 3/4"
— 2nd pass: 1/2" to 7/8"

Uninjected Application Thicknesses:

— 1st pass: 3/8" to 5/8"
— 2nd pass: 3/8" to 5/8"

Product Change Over

GCP recommends the use of 5 ounces of retarder per 3 bag mix, with Monokote on the first three batches when switching EITHER TO or FROM cement based Monokote products to gypsum based Monokote products.

Set Times

Set times vary due to job site conditions

With Injection: 10 - 15 minutes, longer in colder temperatures.

Without Injection: 3 - 4 hours before reapplication.

ADVANTAGES

- High yield medium density product
- Designed to meet interior exposed product requirements where the superior durability and water resistance of Portland cement based products is not required.

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gcp applied technologies

MONOKOTE®
Z-146/Z-146PC/Z-146T

Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
5 1/4	9.0	3.0
6	10.5	3.5
7	12.0	4.0
7 3/4	13.5	4.5
8 3/4	15.0	5.0

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches.*
To determine water used measure the water drop in inches and multiply by 1.72.

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR UN-INJECTED APPLICATION (b)

Yield (a)		Water				
		3.5 U.S. gal 13 L	4.0 U.S. gal 15 L	4.5U.S. gal 17 L	5.0 U.S. gal 19 L	Dry Density (PCF)
1.42 m²	15.25 BF	965	1,015	1,070	1,120	42.4
1.46 m²	15.75 BF	935	985	1,035	1,085	41.0
1.50 m²	16.10 BF	915	960	1,010	1,060	40.0

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

***NOTE:** Nozzle yields should be taken 3 times a day; more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzle before taking the cups.

MONOKOTE®
Z-146/Z-146PC/Z-146T

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

20 - 30 bags per hour = 120 – 180 bags per day[(a)]

30 – 40 bags per hour = 180 – 240 bags per day[(a)]

40 - 50 bags per hour = 240 – 300 bags per day[(a)]

a) assumes 6 hours of application time.

MONOKOTE®

Z-146/Z-146PC/Z-146T

Supplemental Field Application Information

BONDING AGENT REQUIREMENT

Prior to application of Monokote Z-146, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive Z-146. A bonding agent may also be required on certain primed or painted steel. Please check with your local sales representative.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum. GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density

865 - 915 grams

1. Mix Monokote as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Monokote, tapping lightly to remove air voids.
4. Place the container filled with Monokote on the scale and record the net weight.

   If the weight is above 945 grams, mix longer or speed up the mixing blades.

   If the weight is below 835 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density

915 - 1,060 grams

1. Start spraying and spray for about one minute until the system stabilizes.
2. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
3. Cut the Monokote level with the top of the container. Wait approximately one minute and cut again to allow for a more accurate cup weight reading.
4. Place an empty container on the scale and press “on/tare”.
5. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield.

MONOKOTE®
Z-146/Z-146PC/Z-146T

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be. A special 7/16" orifice is available and highly preferred for Z146 and Z156 products
- **Orifice Shield:** The use of an orifice shield is highly recommended. The orifice shield decreases the size of the spray pattern and provides a well-defined spray pattern.
- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Uninjected Application Thicknesses:

— 1st pass: 3/8" to 5/8"
— 2nd pass: 3/8" to 5/8"

Product Change Over

GCP recommends the use of 5 ounces of retarder per 3 bag mix, with Monokote on the first three batches when switching EITHER TO or FROM cement based Monokote products to gypsum based Monokote products.

Set Times

Set times vary due to job site conditions

Normally 3-4 hours before reapplication.

ADVANTAGES

- Z-146 may be sprayed or hand troweled after spraying to achieve a lightly textured appearance.
- Z-146 can be mixed in standard plaster mixer. After mixing, Z-146 may be spray-applied with commonly available pumping and spraying equipment.

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MONOKOTE®
Z-156/Z-156PC/Z-156T

Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
5 1/4	9.0	3.0
6	10.5	3.5
7	12.0	4.0
7 3/4	13.5	4.5
8 3/4	15.0	5.0

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches.*
To determine water used measure the water drop in inches and multiply by 1.72.

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR UN-INJECTED APPLICATION (b)

Yield (a)		Water				
		3.0 U.S. gal 11 L	3.5 U.S. gal 13 L	4.0 U.S. gal 15 L	4.5U.S. gal 17 L	Dry Density (PCF)
1.11 m^2	12.00 BF	1,160	1,230	1,295	1,360	53.9
1.16 m^2	12.50 BF	1,115	1,180	1,240	1,305	51.7
1.20 m^2	13.00 BF	1,080	1,140	1,200	1,260	50.0

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

***NOTE:** Nozzle yields should be taken 3 times a day; more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzle before taking the cups.

MONOKOTE®
Z-156/Z-156PC/Z-156T

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

20 - 30 bags per hour = 120 – 180 bags per day[(a)]

30 – 40 bags per hour = 180 – 240 bags per day[(a)]

40 - 50 bags per hour = 240 – 300 bags per day[(a)]

a) assumes 6 hours of application time.

MONOKOTE®

Z-156/Z-156PC/Z-156T

Supplemental Field Application Information

BONDING AGENT REQUIREMENT

Prior to application of Monokote Z-156, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive Z-156. A bonding agent may also be required on certain primed or painted steel. Please check with your local sales representative.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum. GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density
1,055 - 1,105 grams

1. Mix Monokote as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Monokote, tapping lightly to remove air voids.
4. Place the container filled with Monokote on the scale and record the net weight.

   If the weight is above 1,120 grams, mix longer or speed up the mixing blades.

   If the weight is below 1,040 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density
1,080 - 1,260 grams

1. Start spraying and spray for about one minute until the system stabilizes.

2. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.

3. Cut the Monokote level with the top of the container. Wait approximately one minute and cut again to allow for a more accurate cup weight reading.

4. Place an empty container on the scale and press “on/tare”.

5. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield.

MONOKOTE®
Z-156/Z-156PC/Z-156T

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be. A special 7/16" orifice is available and highly preferred for Z146 and Z156 products
- **Orifice Shield:** The use of an orifice shield is highly recommended. The orifice shield decreases the size of the spray pattern and provides a well-defined spray pattern.
- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Uninjected Application Thicknesses:

— 1st pass: 3/8" to 5/8"
— 2nd pass: 3/8" to 5/8"

Product Change Over

GCP recommends the use of 5 ounces of retarder per 3 bag mix, with Monokote on the first three batches when switching EITHER TO or FROM cement based Monokote products to gypsum based Monokote products.

Set Times

Set times vary due to job site conditions

Normally 3-4 hours before reapplication.

ADVANTAGES

- Z-156 may be sprayed or hand troweled after spraying to achieve a lightly textured appearance.
- Z-156 can be mixed in standard plaster mixer. After mixing, Z-156 may be spray-applied with commonly available pumping and spraying equipment.

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RETRO-GUARD® RG | Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
13	22.5	7.5
14	24.0	8.0
14 3/4	25.5	8.5
15 3/4	27.0	9.0
17	29.75	9.75

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches.*
To determine water used measure the water drop in inches and multiply by 1.72.

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR 15 PCF Density & 430 PSF Bond Strength (b)

Yield (a)		Water				
		7.5 U.S. gal 28 L	8.0 U.S. gal 30 L	8.5 U.S. gal 32 L	9.0 U.S. gal 34 L	Dry Density (PCF)
3.72 m²	40 BF	545	565	585	605	17.1
3.90 m²	42 BF	520	540	560	580	16.3
4.09 m²	44 BF	500	515	535	550	15.6
4.25 m²	45.7 BF	480	500	515	535	15.0

NOZZLE YIELD FOR 18 PCF Density & 1,000 PSF Bond Strength (b)

Yield (a)		Water				
		8.25 U.S. gal 31 L	8.75 U.S. gal 33 L	9.25 U.S. gal 35 L	9.75 U.S. gal 37 L	Dry Density (PCF)
3.25 m²	35 BF	660	680	705	725	19.5
3.35 m²	36 BF	640	660	685	705	18.9
3.44 m²	37 BF	620	645	665	685	18.4
3.53 m²	38 BF	605	630	645	670	18.0

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

Warnings

Yields in excess of 45.7 bf. per bag will result in dry densities below the 15 pcf minimum published density in the Underwriters Laboratories Fire Resistance Directory.

A minimum density of 18.0 pcf is required to meet 1,000 psf bond strength.

***NOTE:** Nozzle yields should be taken 3 times a day; more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzle before taking the cups.

RETRO-GUARD® RG | Injected

Accelerator Mixing:
One 60 lb Bag/10 gallons water

Concentration 1270 g/liter cup (specific gravity)

1. Mix Monokote accelerator in a GCP injection system as directed on the accelerator bag.
2. Place an empty one liter container on scale and press “on/tare” to tare the container.
3. Fill the container level (flat) to the top with accelerator.
4. As an alternate to 1–3 above, place a hydrometer in the solution and determine the specific gravity.

Note: Freshly mixed solution contains small air bubbles. Target 1260 grams.

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

15 – 20 bags per hour = 90 – 120 bags per day[(a)]

20 – 30 bags per hour = 120 – 180 bags per day[(a)]

30 - 40 bags per hour = 180 – 240 bags per day[(a)]

a) assumes 6 hours of application time.

RETRO-GUARD® RG

Supplemental Field Application Information

BONDING AGENT REQUIREMENT

Prior to application of Retro-Guard RG, a bonding agent, approved by the fireproofing manufacturer, shall be applied to all concrete substrates to receive Retro-Guard RG. In advance of the application of the fireproofing, a bond test shall be conducted on all painted/primed steel surfaces or steel that has been covered with a lock down agent to determine if the paint or lock down agent will impair the ambient bond of the fireproofing.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum.

GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density

720-775 grams

1. Mix Retro-Guard RG as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Retro-Guard RG, tapping lightly to remove air voids.
4. Place the container filled with Retro-Guard RG on the scale and record the net weight.

   If the weight is above 795 grams, mix longer or speed up the mixing blades.

   If the weight is below 640 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density

For 15 PCF/430 PSF - 480 to 535 grams
For 18 PCF/1,000 PSF - 605 to 670 grams

1. Set the accelerator flow rate to a “fast trickle”.
2. Start spraying and spray for about one minute until the system stabilizes.
3. After about one minute spray Retro-Guard RG directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
4. Cut the Retro-Guard RG level with the top of the container. Wait approximately one minute or until no further swelling is apparent. Again cut the Retro-Guard RG flush with the top of the container.
5. For accurate readings cut to a smooth surface before the RG begins to set.
6. Place an empty container on the scale and press “on/tare”.
7. Replace the tared container with the identical container filled with Retro-Guard RG and record the net weight.

Check the charts on page 1 to determine yield and adjust the injection rate to yield 45.7 board feet per bag.

RETRO-GUARD® RG®

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be.
- **Orifice Shield:** The use of an orifice shield is highly recommended. The orifice shield decreases the size of the spray pattern and provides a well-defined spray pattern.
- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Injected Application Thicknesses:

— 1st pass: 3/8" to 3/4"

— 2nd pass: 3/8" to 7/8"

Uninjected Application Thicknesses:

— 1st pass: 3/8" to 5/8"

— 2nd pass: 3/8" to 5/8"

Product Change Over

GCP recommends the use of 5 ounces of retarder per 3 bag mix, with Retro-Guard RG on the first three batches when switching EITHER TO or FROM cement based Monokote products to gypsum based Monokote products.

Set Times

Set times vary due to job site conditions

With Injection: 5-10 minutes, longer in colder temperatures.

Without Injection: 3-4 hours before reapplication.

ADVANTAGES

- Designed to meet all IBC Bond Strength Requirements
- Proven in-place performance
- Achieve multiple passes in the same day.
- Fast, efficient application
- Low pumping pressures
- Dries to a light blue color for easy identification

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MONOKOTE®Z-3306 | Simplified Yield Chart

1 First step in measuring nozzle yield is to determine the gallons of water per bag.

For batch mixers use the charts below. For continuous mixers, instructions are provided to the right.

BATCH MIXER / Timed Sump Pump

Mix Water Chart (based on 3 bag mix)

Water drop in inches	Gallons per batch	Gallons per bag
8 3/4	15.0	5.0
9 1/2	16.5	5.5
10 1/2	18.0	6.0
11 1/4	19.5	6.5
12 1/4	21.0	7.0

*This is valid for 55 gallon drum with a **22.5 in diameter** and for 3 bag batches.*
To determine water used measure the water drop in inches and multiply by 1.72.

CONTINUOUS MIXER / Inline Digital Flow Meter

1. Fill the continuous mixer hopper level to the top with dry material.
2. Zero the flow meter by depressing the on button for 3 seconds.
3. Start the continuous mixer and count the number of bags emptied into the mix hopper.
4. Run the mixer until 5 or more bags have been mixed. Start and stop operations are OK.
5. Stop the mixer level with the top as in step 1.
6. Once level, now read the number of gallons on the flow meter.
7. Divide the number of gallons by the number of bags mixed.

EX: 68 gallons divided by 8 bags = 8.5 gallons per bag.

2 Once the water has been determined use the yield chart to find your target cup weight.

NOZZLE YIELD FOR UN-INJECTED APPLICATION (b)

Yield (a)		Water				
		5.5 U.S. gal 21 L	6.0 U.S. gal 23 L	6.5 U.S. gal 25 L	7.0 U.S. gal 27 L	Dry Density (PCF)
2.13 m²	23 BF	720	755	790	820	24.1
2.23 m²	24 BF	690	725	755	790	23.1
2.33 m²	25 BF	660	690	725	755	22.1

a) Yield based on 1 inch (25.4 mm) thickness
b) Cup weights are based on an actual 980 ml cup. Cup weights in table are in grams.

Warning. Yields in excess of 25.0 bf. per bag will result in dry densities below the 22 pcf minimum published in the Underwriters Laboratories Inc® Fire Resistance Directory.

***NOTE:** Nozzle yields should be taken 3 times a day; more frequently if changes occur in the mixing or conveying process.*

Allow enough time for changes in mix time, water ratio, pump speed, and new accelerator mixes to reach the nozzle before taking the cups.

MONOKOTE® Z-3306

Calculating bags per hour with a batch mixer

- Completely empty the mixer into the pump hopper.
- Mix a new 2 or 3 bag batch.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the hopper.
- Empty the new batch into the pump hopper and start the stop watch.
- Time the mix until the new mix reaches the same level. (Continuous pumping is best).
- Stop the watch and record the time. Using the data recorded, calculate the bags per hour as demonstrated in the CALCULATION EXAMPLE presented later in this section.

Calculating bags per hour with a continuous mixer

- Fill the continuous mixer to the top with dry material.
- Let the pump hopper run down until all most empty (do not draw air).
- Note the level of material remaining in the pump hopper.
- With the pump pumping, start the mixer and stop watch.
- Continuous pumping is best. If the pumps stops and starts, then stop and start the stop watch as well.
- Continue to mix and convey at least 3 bags and make sure the dry mixer hopper is filled to the top as in step 1.
- Allow the 3 bags to run down until the pump hopper is at the same level noted.
- Once 3 bags have run down, stop the watch and record the time and calculate using the example below.

CALCULATION EXAMPLE: 5 minutes 45 seconds for 3 bag mix

5 minutes x 60 sec per minute =	300 sec
Remaining 45 seconds =	45 sec
Total seconds to pump:	345 sec
Divided by the 3 bags =	115 sec /bag

Divide the 115 seconds for 1 bag into: 3600 sec per hour

Equals 31.3 bags per hour

BAGS PER DAY

Pumping Rates

15 – 20 bags per hour = 90 – 120 bags per day[(a)]

20 – 30 bags per hour = 120 – 180 bags per day[(a)]

30 - 40 bags per hour = 180 – 240 bags per day[(a)]

a) assumes 6 hours of application time.

MONOKOTE® Z-3306 | Supplemental Field Application Information

BONDING AGENT REQUIREMENT

A bonding agent must be applied to all foamed surfaces at a rate of 500 ft^2/gal prior to application of Z-3306. Firebond should be allowed to become tacky or dry prior to application of Z-3306.

FIREBOND™ APPLICATION

Coverage:

Full concentrated strength—up to 1000 ft^2/gal

Diluted 1:1 (with water)—up to 500 ft^2/gal

Container size 5 gallon bucket or 55 gallon drum. GCP recommends using an airless pump for Firebond™ application.

Target Weight - Mixer Density
625-675 grams

1. Mix Monokote as directed.
2. Place an empty GCP 980 ml container on the scale and press on/tare to tare the container.
3. Fill the container with Monokote, tapping lightly to remove air voids.
4. Place the container filled with Monokote on the scale and record the net weight.

   If the weight is above 700 grams, mix longer or speed up the mixing blades.

   If the weight is below 600 grams, mix for a shorter time or slow the mixer blades.

Target Weight - Nozzle Density
660 - 755 grams

1. Start spraying and spray for about one minute until the system stabilizes.
2. After about one minute spray Monokote directly into the GCP 980 ml container. Position the nozzle above the container so that there is no overspray outside the container. Overfill the container.
3. Cut the Monokote level with the top of the container. Wait approximately one minute and cut again to allow for a more accurate cup weight reading.
4. Place an empty container on the scale and press “on/tare”.
5. Replace the tared container with the identical container filled with Monokote and record the net weight.

Check the charts on page 1 to determine yield.

MONOKOTE® Z-3306

DELIVERY SYSTEM

- **PUMPS:** Piston, Hydraulic, rotor stator, squeeze pumps.
- **HOSES:** 800 psi plaster grout to 1500 psi Goodyear Gauntlet ¾" whip hose.
- **WATER DELIVERY SYSTEMS:** Timed sump pumps, Digital in-line meters, and Fil-Rite water meters.

APPLICATION

- **Orifice Selection:** The orifice should be as large as possible while still maintaining a proper spray pattern. The faster the pumping rate the larger the orifice size needs to be.
- **Orifice Shield:** The use of an orifice shield is highly recommended. The orifice shield decreases the size of the spray pattern and provides a well-defined spray pattern.
- **Nozzle Air Pressure:** The nozzle air should be set as low as possible (approx. 15-20 psi) while still maintaining a well-defined spray pattern. The air pressure should make a dull buzzing noise rather than a high pitched whine.

Uninjected Application Thicknesses:

— 1st pass: 3/8" to 5/8"
— 2nd pass: 3/8" to 5/8"

Set Times

Set times vary due to job site conditions

Normally 3-4 hours before reapplication.

ADVANTAGES

- After being spray applied,Z-3306 may be lightly trowelled.
- Ease of installation makes Z-3306 a low cost way to protect foam plastics.
- Dries to a hard, durable surface which resists damage.

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Accelerator Lines

For very cold (night and day) environments, heat tracing has been used to prevent both the Monokote accelerator hose and the conveying system from freezing. For high rise pumping where many floors are directly exposed to the very cold and windy conditions, heat tracing cable may be wrapped around the standpipe, accelerator hose and air hose to prevent freezing. All three lines then wrapped in fiberglass insulation.

Below are the specifications for the heat tracing from one manufacturer as an example. You will need approximately 1.5 feet of tracing cable for every one foot of standpipe for spiral wrapping.

Manufacturer: Raychem Corporation
Process Division
300 Constitution Drive
Menlo Park, Ca 94025
(415) 361-4900

Part Name: Chemelex Auto-Trace Self Regulating Heaters

Catalog No: 3BTV, 5BTV, 8BTV, 10BTV.

Warning: Not all hoses are compatible with heat tracing and Monokote Accelerator. Pay particular attention to the specification with respect to pressure rating and hose lining. A hose consisting of an acrylonitrile inner core with a rayon fiber reinforcement and a minimum rating of 800psi is suitable for this application. It is available from GCP or can be purchased through hose distributors under the generic label SAE100R3. The manufacturer is insignificant as long as SAE100R3 is used to describe the hose.

If the temperature will remain above 20º F (-70º C.) the solution may stay in the lines overnight, ready for use the next day.

If heat trace is not used and temperatures are expected to fall below 20º F (-70 C.), then at the end of the work day, draining the accelerator from the lines is recommended.

This can be accomplished by:
1. Turning “OFF” the accelerator pump.
2. Make sure the bleed hose is securely inside the mixing barrel
3. Make sure the accelerator solution line shut off valve is open, then ”OPEN” the flow rate valve on the Injection unit.
4. At the nozzle, open the accelerator shut of valve.
5. By using quick disconnects and a shut off valve, connect the airline to the accelerator line
6. Slowly open the shut off valve and blow back the accelerator solution into the barrel. (This takes approximately 5 - 10 min. depending on the length of accelerator line in use).
7. Leave the air running as long as possible to allow all the accelerator solution to be blown back.

Restarting the next morning:
1. Close the flow rate valve, Make sure the accelerator solution line shut off valve is open.
2. Reconnect the air and accelerator lines for normal operation
3. Turn on the accelerator pump and repurge the system.
4. The knurled knob can be increased in pumping capacity to minimize the purging time but must be returned to normal operations settings upon completion. Verify your yield with the Simplified Yield Kit.

Miscellaneous

Firebond Application

Firebond Concentrate is a UL listed acrylic latex that is designed to be used as either a bonding agent or as a surface sealant. Firebond is available in 5 gallon pails or in 55 gallon drums. Firebond may be applied with a Hudson Sprayer, an airless sprayer (i.e. Graco Encapsulator II), a roller or brush.

On larger projects when an airless sprayer (i.e. Graco EM 590 or 495st) is used, the use of a pole gun assembly greatly reduces installed cost. This eliminates the need for scaffolding and additional manpower in most cases. Proper selection of orifice size and type of nozzle tip can also aid in a quality application. Graco's Reverse-A-Clean with Drip Less Guard tip is highly recommended to minimize clean up and decrease production loss due to tip clogging. The tapered orifice is simply rotated 180o and the clog is blown back out of the orifice, rotated back, and production continues. (refer to the equipment selection in this manual for more information on Graco equipment.)

For application procedures, coverage's, and types, refer to the Firebond Product Data Sheet

Spatterkote Application

Spatterkote SK -3 is a portland cement - based, textured product designed for use in conjunction with Monokote and Retroguard Fireproofing on all cellular steel decking with flat plate bottom and on many UL listed roof deck assemblies.

Spatterkote can be applied by two methods: through the main Monokote pumping system or by using a small separate pump on each floor. Job site conditions and experience will determine which method is best for you.

Spatterkote is designed to create a rough, discontinuous texturing of the surface with approximately 10 - 30 percent of the decking left exposed between spots of spatterkote. Completely covering the steel deck is not acceptable.

Spatterkote should be applied with a pole gun assembly consisting of a standard nozzle, E Z swivel, and an aluminum pipe long enough to place the gun head within 2 -3 feet of the steel deck.. Orifice size should be 1/2" to 9/16" maximum. Air pressure and air stem should be set to create an evenly textured application.

The hoses on the spray floor should be set up so spraying will start farthest from the source and work back toward the standpipe or pump. The sprayer will start in the far corner and walking backward applies Spatterkote to the underside of the deck. To maximize productivity, a laborer should walk with the sprayer at all times to pull the hose and help direct the sprayer.

One bag of Spatterkote will cover approximately 950 square feet of deck. The total square foot of deck area will determine the number of bags of Spatterkote required.

Mixed Spatterkote is a very wet, loose mix that will pump much faster than Monokote. Due to Spatterkote's characteristics, it is necessary to pump at a low rpm and in a lower gear. This will enable the sprayer to apply the correct amount of material on the deck. Pump speed should be set so that the sprayer will be able to move with the pole gun at a walking speed.

Many applicators pump Spatterkote first thing in the morning and then switch to a Monokote application. Making the switch from Spatterkote to Monokote is not difficult but does require the addition of gypsum retarder to the first batch of Monokote. Approximately one five oz. cup of gypsum retarder should be added to the mix water of the first batch of Monokote following Spatterkote. The retarder must be used in this situation.

Mixing Procedure

Spatterkote is designed to be mixed with water in a mechanical plaster mixer. This requires the addition of 10 to 12 gallons of water per bag. At this water ratio Spatterkote will be significantly wetter than Monokote; do not make the mix stiff. Mix time is approximately 2 1/2 to 3 minutes with the blade speed at 35 - 40 rpm.

1 In a plaster mixer, add approximately 10 - 12 gallons of clean, potable water per bag of Spatterkote to be mixed. Example 33 gallons for 3 bags.

2. With the mixer blades stopped, add two bags of Spatterkote.

3. Start the mixer blades and add the third bag of Spatterkote.

4. Mix for approximately 2 1/2 to 3 minutes.

5. Mix will be a loose, creamy texture in the mixer. If the mix looks too stiff, add more water with the blades turning.

Using Rotor Stator and Patch Pumps

Pumps with lesser out puts than the higher production pumps have been used very successfully in the application of Spatterkote. Rotor Stator pumps, Patch pumps and Carrousel Squeeze pumps are widely used. Some of the common rotor stator pumps are the FM-9 and the R Tex series. When using a small unit, the pump, mixer, material, water, and power must be available on the floor. The following steps will help insure efficient application.

1.a With rotor stador pumps use approximately 50 feet of 1 1/2" floor hose and 50 feet of 1 1/4", and 17 or 25 feet of 1" whip hose. This length will allow for application of Spatterkote on most floors.

1b. With the Carrousel pump use approximately 50 feet of 1 1/4" floor hose and 17 or 25 feet of 1" whip hose. Note: The Carrousel has an 1 1/4" manifold.

2. Use a pole gun with a 1/2" to 9/16" orifice.

3. The pumps should be operated in or at a speed that will provide sufficient material flow to maximize production while minimizing waste and overspray.

4. When the last batch of Spatterkote is in the system, add water to wash out or add retarder to the last first batch of Monokote if spraying of Monokote is ready to start.

Using High Production Pumps

Spatterkote can be pumped through any of the large, high production Monokote pumps in use today. The pump and the conveying system can be the same as that for Monokote, with the exception of the nozzle set up (Ref. #6). When applying Spatterkote through the main system, the following steps will assure efficient application.

1. Pump in low gear at low rpm. Only a spattering is to be applied to the deck. Low speeds will allow the sprayer to apply the correct amount and prevent waste and overspray.

2. Use a pole gun with a 1/2" to 9/16" orifice.

3. Mix only enough material to cover the deck area. if the deck is completed and there is Spatterkote left, the beams and columns can be sprayed (with a spattering) so that the material is not wasted.

4. When the last mix of Spatterkote is in the system, either slowly add water (if washing out) or add a batch of retarded Monokote, if beginning Monokote application.

5. Continue pumping at low speed until all the Spatterkote has been applied.

6. Remove the pole gun and reattach your usual nozzle assembly if resuming Monokote application with a hand held nozzle.

Pumping Spatterkote with a High Production Pump to a Rotor Stator or Patch pump on the Spray Floor

A large pump can be used to pump Spatterkote to the spray floor and into the hopper of a small pump. This gives the best control over the application of Spatterkote without the need to have the mixer, material, water, and power on the spray floor. The large pump must be able to be controlled from the floor. It will also be necessary to get clean washout water to the spray floor to clean out the small pump after the Spatterkote application is complete.

How to Pump Spatterkote then Monokote

1. As the last of the Spatterkote is in the pump hopper, readjust the water meter for the next batch.

2. Add water and one 5 oz. cup of gypsum retarder to the mixer with the blades turning.

3. Mix Monokote as you would normally.

4. Quickly wash down the side walls of the pump hopper as the last of the Spatterkote enters the manifold.
5. Dump the retarded Monokote into the pump hopper and continue to pump at a low speed.
6. Continue mixing subsequent batches of Monokote in the normal way without the added retarder.
7. When the last of the Spatterkote has been sprayed and the Monokote has arrived at the nozzle, detach the pole gun and reattach your regular nozzle assembly if using a hand held nozzle. The pump should be placed in a gear or speed that is your normal setting for pumping Monokote.

If you need to switch back to Spatterkote from Monokote, the final batch of Monokote should be retarded. As the last of the retarded Monokote enters the pump, do a quick wash down of the pump hopper and dump the mixed Spatterkote into the pump hopper. At this point, it is again necessary to reduce the pump speed. When the last of the Monokote is sprayed and Spatterkote is at the nozzle detach the regular nozzle assembly and reattach the pole gun for Spatterkote.

Spatterkote Washout

When washing out the system after using Spatterkote, the procedure is the same as for Monokote. The sponge out procedure is best because it eliminates residue and helps prevent cement build up in the conveying system. (See Pump In and Pump Out procedures for step by step instructions)

Section 5: Equipment

General

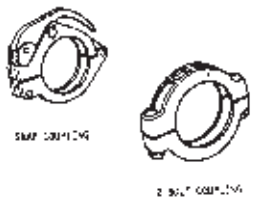
Equipment Safety

Large hydraulic pumps and mechanical pumps are capable of generating very high pumping pressures. For this reason care should be taken in choosing the components of the conveying system. Properly rated surge and material hoses along with added safety equipment should be used and maintained in proper working order. The following is a list of some of the necessary safety equipment and specifications.

This information does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this information to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

Surge Hose

The industry standard is a 25 foot 3" wire braided 3000 psi full flow fitted high pressure hose. Surge hoses operate under high pressure and should be tethered to the pump frame with a chain or other restraining device. In addition it is prudent to avoid standing in or around the surge hose during pumping operation. It should be connect to the pump with a 3" Boss fitting or a high pressure two bolt fitting.



Material Hoses

Reinforced 800 psi high pressure, fabric braided plaster hoses, with full flow fittings must be used. The fittings should be pressure rated equal to or better than the hose pressure rating The majority of hose burst occur at the fittings due to improperly fitted or improperly rated fittings. They should be checked regularly for wear and abrasion and replaced if damaged. Safety slings (cables) are useful in preventing a dangerous situation in the event that a fitting should blow or when disconnecting a packed hose section

Line Pressure Gauges

The addition of an inline pressure gauge is extremely useful to monitor material line pressure. Changes in material line pressure can indicate potential problems in the delivery system. Daily increases in line pressure can indicate the potential of material build up at fittings and by closely monitor the line pressure gauge these situations can be corrected before serious problems arise. The gauge can also be used to confirm material line pressure is being relieved when using the pressure relief valve. There will always be some pressure held within the delivery system. The necessary safety precautions should be taken when disconnecting any hoses with material in the system.

Safety Blow Out Valve

This unit consist of a rubber ball held in place by a brass cap in a pipe "T". Excessive pressure in the conveying system forces the ball out of the cap and releases the line pressure. There are valves with various pressure rating available and it should be matched to the pressure rating of the conveying system. Standing in or around the safety blow out ball should be avoided when possible

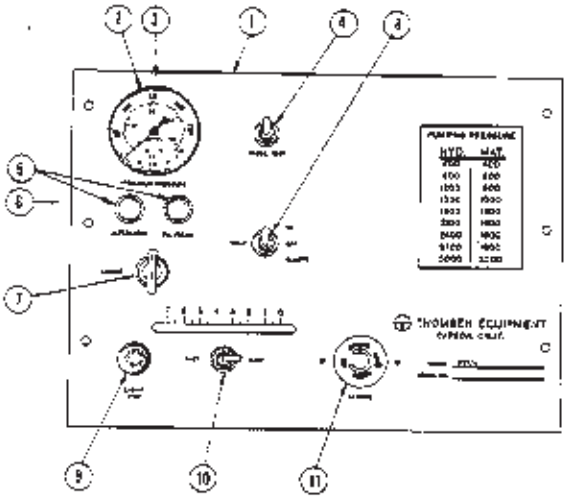
SAFETY BLOW OUT VALVE

Pressure Relief Valves

A manually operated valve usually located at the manifold that can be used to release line pressure in the conveying system. The pressure relief valve should be inspected and cleaned at the end of each work day to assure it functions properly. In an emergency situation with, most large pumps, it is the only safe way the relief line pressure. During the pumping operation material will build up and set in the valve and pipe nipple portion of the assembly. Only with routine maintenance and inspection will the valve function properly when needed.

Hydraulic Relief Settings

Hydraulic pumps are equipped with pressure relief settings that can be adjusted in the valve body of the hydraulic system. The pumps high end pressure setting can be adjusted so that the pump will go 'into relief" (stop pumping) when higher than set pressures are encountered. The adjustment procedures vary from pump to pump so it is advisable to consult your pump manufacturer for specific directions for adjusting the relief pressure. The relief pressure should be set 100 to 200 psi above your normal daily pumping pressure. As height increases or additional line length is added to the conveying system, the pressure setting will need to be adjusted accordingly. Most pumps are equipped with a pressure gauge on the pumps control panel for reading the line pressure. (see item 2). Material line pressure and hydraulic pressure are not the same. As you can see in the pumping pressure chart on the control panel below 600 psi of hydraulic pressure equals 400 psi of material line pressure.



Reversing the Flow of Material

Many rotor stator pumps are equipped with a reverse drive that will enable the operator to relieve the line pressure in the conveying system. When a line pack or disassembly of the hose requires the material line pressure to be reduced, the pump can be turned off ,placed in the reverse drive, restarted, and the material will be pulled back into the pump hopper.

Pumps and Mixers

Super Pump

PUTZMEISTER BIG BLUE

A very high volume, hydraulic drive pump, the Big Blue is capable of production rates exceeding 120 bags per hour. The Big Blue can be equipped with a continuous mixer (as a separate unit) that is powered through the pump's hydraulic drive system.

1. Necessary Modifications

    a. Accumulator - The one gallon hydraulic oil Accumulator should be replaced with a 2.5 gallon accumulator and charged to 300 psi (cold). It may be necessary to add hydraulic oil when the larger Accumulator is installed. An Accumulator works in the following manner:

It contains a bladder of gas charged to a specific pressure. When the hydraulic pressure builds (during the end of a stroke) fluid fills a portion of the dampener by pressing against the bladder. When a new stroke begins and hydraulic fluid pressure drops, the bladder dumps the fluid into the circuit to build pressure faster. This function smoothes pumping by absorbing the pressure peaks and filling the valleys. This reduces line surge at the nozzle.

Line pressure must exceed 300 psi in order for the Accumulator to operate and reduce the surge. Pressure can be increased to achieve this by replacing one or more sections of 2" hose with l l/2" hose on the spray floor.

BIG BLUE CONTINUOUS MIXER

For use with the Big Blue pump, this continuous mixer is powered from the pump's hydraulic drive system. With the modifications below, it mixes at approximately 150 bags per hour. This continuous mixer requires modification to properly mix MK-6/HY to the specified 41-45 pcf mixer density range. These modifications consist of a dry material auger, a longer high shear mixing blade, and a tube extension. A modification kit is available from Putzmeister. Mixers can be purchased with these modifications already made by Putzmeister, at the request of the purchaser.

High Production Pumps

PUTZMEISTER A 3.75

SPRAY FORCE EXCALIBER

WESTERN MANUFACTURING PREDATOR D 500

MACCO PF 60

These types of mechanical pumps are considered medium production pumps. Unmodified (except for MK-6 seats) they are capable of reaching production rates of about 45 bags per hour. With all the possible modifications made, these pumps will produce volumes of up to 60+ bags per hour.

These pumps can be especially sensitive to pieces of dry material clumps clogging the bottom seat. These dry clumps usually originate in the mixer, and GCP has issued a slightly modified mixing procedure as a remedy. The mixing blades are left turning while adding the water for the next batch of material. This cleans the blades and helps prevent formation of dry clumps. See "Conventional Mixers", for more details.

1. Necessary Modifications

   a. SEATS - Seats must be of the type that is designed for use with a steel ball. This means very little or no bevel where the ball rests on the seat. This is a very sharp or pronounced edge. This seat is open, i.e., it has no bar across the opening.
   You may see a reversible seat, i.e., a seat that has a very long, dual bevel which takes a plastic/rubber ball on one side and, when turned over, has a more pronounced seat edge that uses a steel ball.
   Caution: Do not use the plastic rubber ball side of the seat with a steel ball, and do not use the steel ball side of the seat with a plastic ball.

   b. MARVEL KIT - This kit, which is also referred to as "Fireproofing Kit", is simply a steel plug that is inserted in the manifold in front of the master cylinder to reduce dead space thus increasing compression. All A-3.75 type pumps should be equipped with a Marvel Kit. There is a drastic reduction in pumping rate when this part is not used.

   c. OVERSIZED SEAT - This is a highly recommended, yet optional, modification to help boost production. It is particularly important when the optional modifications, such as increasing the bore and stroke (described on the next page) are used. A 2 1/8 inch ball replaces the 2 inch ball when the oversized seats are installed.

   d. THREE INCH MANIFOLD - This is also an optional modification, but, again, it is something that should be used. Like Item C above, it is possible to use this pump without this modification, but, if pumping distances of 250 feet and at rates over 30 bags per hour are desired, then the changes should definitely be made.

2. Optional Modifications

   a. HIGH PRODUCTION (bored) CYLINDERS -The standard 3 ½ inch cylinders and pistons can be replaced with 3 3/4 inch cylinders and pistons. The chart below shows increases in cylinder volume when the cylinders are bored and/or stroked.

   b. LONG STROKE PISTON - This involves changing the attachment point of the connecting rod to the rocker arm which increases the travel of the pumping piston from 5 inches to 7 1/2 inches. This significantly increases pumping volumes.

Putzmeister A-3.75 Cylinder Displacement with Bore and Stroke Modifications

	3.5” Bore	3.75” Bore	Increase in Volume
	5” Stroke	48.1 in. 55.2 in.	15%
	7.5” Stroke	72.1 in. 88.8 in.	15%
Increase in Volume		50% 50%	75%

3. Special notes

   a.) The machine should always be set up so that the hopper is tilted slightly toward the manifold inlet to let gravity assist feeding the material into the pump.

   b.) The Monokote must be mixed long enough and with an adequate amount of water to make it sufficiently fluid to flow into the manifold inlet.

ESSICK TM-30 AND TM-45

Although these pumps are no longer in production they are still widely used by Contractors and are available in the Used Pump Market and all parts for them are available from Multi Quip. The TM -30 is a mechanically driven high production pump. The TM-45 has higher production capabilities than the TM-30. The TM-30 is capable of pumping rates of 60+ bags per hour. The TM-45 can pump over 90 bags per hour and is capable of supplying material to two nozzles.

1. Necessary Modifications for Pumping MK-6

    a. SEATS - Seats that use steel balls for pumping MK-6 must have little or no bevel (thus a very sharp area) where the ball rests on the seat. The seats presently recommended are an oversized version of the original open steel ball seat The oversized seats have the potential to increase pumping rates as much as 20% over the standard open seat.

    Caution: Standard Essick seats have proved unreliable and should be replaced before starting to pump MK-6.

    b. PISTON EXTENDERS & HEAVY PATTERN COVERS - both of these serve to eliminate dead space inside the pump chamber to increase compression. They are very easy to install and very effective at increasing pumping rate.

2. Optional High Production Modifications

    a. EIGHT INCH TRANSMISSION PULLEY - Switching from a 10 inch to an 8 inch pulley on the transmission provides more strokes per minute thus higher production rates.

    b. THREE INCH MANIFOLD OUTLET - Larger outlet opening for more volume and less back pressure on the cylinder during the forward stroke.

3. Special Notes

    a. BALL STOP CLEARANCE - For optimum pumping efficiency, the clearance between the bottom ball and its ball stop pin should be 1/4 “ + 1/16”.

In addition:

1. The seat area of the manifold must be clean prior to installation.
2. The position of the piston cover, which the ball stop is part of, can be altered slightly during installation, to allow more or less ball stop clearance. For more ball stop clearance, holding the piston cover in place with the diagonal bar, the bottom nut can be tightened by first tipping the pin back. Less clearance can be obtained by tipping the cover and pin forward. With the oversize seats, where additional ball clearance is required to obtain the optimum 1/4 + 1/16, an additional 1/8 inch of clearance can be obtained by using a 2 inch ball in place of the 2 1/8 inch ball.

    MK-6 Mix Consistency - If the MK-6 has been mixed too long and/or is especially dry, the result will be a low mixer density and the material will not pump very well. Perhaps due to the auger feed, the material must be mixed with a sufficient amount of water to pump efficiently. Although this is true with all mechanical pumps, the TM-30 seems to be especially sensitive.

SUN SPRAY HP

The Sun Spray HP is a two piston hydraulically driven pump that is suitable for both new construction fireproofing and re-spray. Pumping rates of around 65 bags per hour are possible. A very slight surge has been noted when short lengths less that 100 feet of conveying system are used.

Designed for use in conjunction with Sun Continuous Mixers, the HP features a water cooling system that is then used to supply the mixer with water. The HP also features a hydraulic pump which contains a sensor that reads “pressure”, and automatically reduces or recycles hydraulic flow when the pressure reaches a pre-set limit. Output is variable from 0 through 65 bags per hour.

HY- FLEX

The Hy-Flex 321E is a two piston hydraulically driven pump that is suitable for both new construction fireproofing and re-spray. Pumping rates of around 65 bags per hour are possible. A very slight surge has been noted when short lengths less that 100 feet of conveying system are used.

Designed for use in conjunction with CM 71 Continuous Mixer, the 321E features a water cooling system that is then used to supply the mixer with water. The312E also features a hydraulic pump which contains a sensor that reads “pressure”, and automatically reduces or recycles hydraulic flow when the pressure reaches a pre-set limit. Output is variable from 0 through 65 bags per hour.ROTOR STATOR PUMPS

Rotor/Stator Pumps

As with any Rotor/Stator Pump hose length, diameter, and water ratio greatly affect the pumping rate. For example: With a 1 inch hose the Sun Spray can pumps approximately 125 feet. With the 1 inch hose vertical pumping is limited to 30 feet with a maximum of 100 feet of hose. Using a larger diameter hose will allow the machine to pump longer distances. Several Contractors have been successful in pumping to 200 feet using 175 feet of 1 1/4 inch hose and 25 feet of 1 inch hose. However, the idea behind the small portable pumps, such as the Putzmeister S-5 Essick F.M. 9 Sun Spray, the Muller R-Tex and the Stong Mixor Mate is that they allow minimum hose lengths to be used because the pump can be moved to the work.

Essick FM9/FM5 Electric

Essick FM Series pumps are primarily designed as a finish machine of high quality. The transmission has three forward and one reverse gear, which allows a full selection of volume. The large capacity pumps will produce sufficient volume for applying fireproofing material.

Extra Features:

1. Interchangeable Rotor and Stator Pumps - Standard and high volume provide up to 2 cubic feet per minute.

2. Pump change over takes only five minutes from the 2L-3.5 low volume to the 2L-4 high volume.

Putzmeister S.5

The S.5 series was designed for easy and reliable operation. These small, but powerful pumps, can do it all.

The S.5 Electric Version is one of the most popular models used by re-spray applicators in the USA. With its narrow frame the S.5 can easily pass through standard 30 in. doorways or fit in an elevator. Putzmeister line of stators, from the L3 to the 2L88 allows this pump to spray the widest range of material possible.

Muller R-Tex

The Muller R.-Tex comes in a wide range of models to fit many different project types. The R-Tex is also available in gas or electric models.

Special Features: Hydrostatic transmission and no gear box, no belts, no gears or clutch to malfunction

Patch Pumps

These type pumps are in the “low volume” range designed for small patch jobs such as repairing damaged fireproofing and for working in small areas such as stair wells, elevator rooms and shafts or areas that are not accessible to larger equipment.

Spray Force Twister/Sun Spray 110/Sun Spray 220

Essick Mini-Sprayer and J & M Mini-Mag

These are small Rotor/Stator pumps that run on normal 110v current

(220v Sun Spray) and are widely used in the patch repair market. These pumps are usually very small and light weight which makes them very portable and easy to carry.

Carrousel Peristaltic Pump (Squeeze Pump)

In this type pump rollers rotate against the rubber tube flattening it against the U-shaped pressure wall of the pump which squeezes the material through the system, forcing the material forward. High acceptance of this pump is due to its simplicity and durability. The Carrousel Peristaltic Pump has no internal moving parts that come in contact with the material being pumped. This results in it being low maintenance.

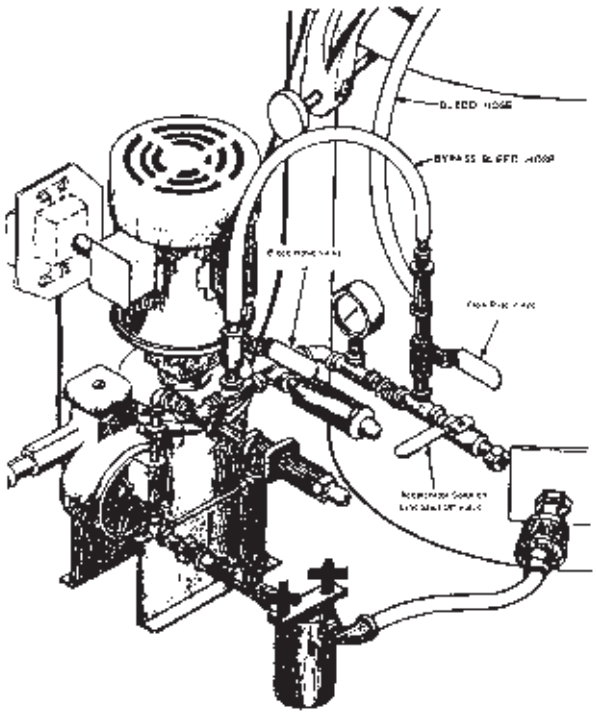
Injectors/Injection

Injection Units

Overnight Temperatures Below 15ºF (- 10º C).

If the overnight temperature is expected to drop below 15ºF (- 10º C) then additional precautions must be taken. In this case there are few ways to protect the system.

1. The best way to protect an injection system from the effects of cold weather is simply to heat the system above 32ºF (0º C). This can be accomplished in a maintained heated pump room, or if this is not possible, the entire system (including floor hose and nozzle) can be kept on a heated floor where Monokote is being sprayed. This is provided that, A), the system can be transported to the floor, B), there is water and electricity on the floor for operation, and C), heat will be maintained throughout the entire night. If a mini or mobile system is being used the unit could also be moved to a heated jobsite shed each night if available
2. If the system cannot be kept on a heated floor or kept in a heated pump room, than an insulated enclosure or “dog house” can be built around the unit. It should be constructed so that the filters and mixing tanks are easily accessible. The structure should be insulated (e.g. with insulation board) and can be heated with a small thermostat heater or even a high wattage heat lamp. Any heat source should be pointed at metal objects and away from plastics. If there is no heat source available whatsoever, i.e. no heated floor or shed, no power during the night, the motors should be heated up in the morning prior to attempting to start up the system. In extremely cold weather, grease and oil will thicken in the metering pumps and motors. This can create hard starts and increase power draw.
3. Fill the plumbing with windshield wiper fluid (see warnings and cautions). Use a five (5) gallon (19) liter) tank (available from GCP) equipped with the same type of quick disconnect fitting that connects the metering pump to the injection tank. Half fill the five (5) gallon (19) liter) tank with windshield wiper fluid and connect it to the metering pump at the end of the day. This amount is sufficient to flush the system. When the tank at the metering pump is nearly empty of windshield wiper fluid close the accelerator line valve at the pump. Let the metering pump run for about one minute so that the pressure builds and the external relief valve opens. This gets the windshield wiper fluid into the relief valve plumbing and the pulsation dampener. Open the bleed valve until the bypass hose fills with windshield wiper fluid. Close the bleed valve and open the flow rate valve following the same procedure. Turn off the metering pump. The metering pump plumbing is now protected. In the morning, connect the quick disconnect back into the injection tank, turn on the injector pump and purge the windshield washer fluid from the injection system. Collect the windshield wiper fluid in the bucket . When accelerator begins to come out of the accelerator solution line shut off valve allow about one quart (1 liter) to flow out before reconnecting the accelerator line. This will help purge the system of any residual windshield wiper fluid.



See the diagram below for the valve locations.

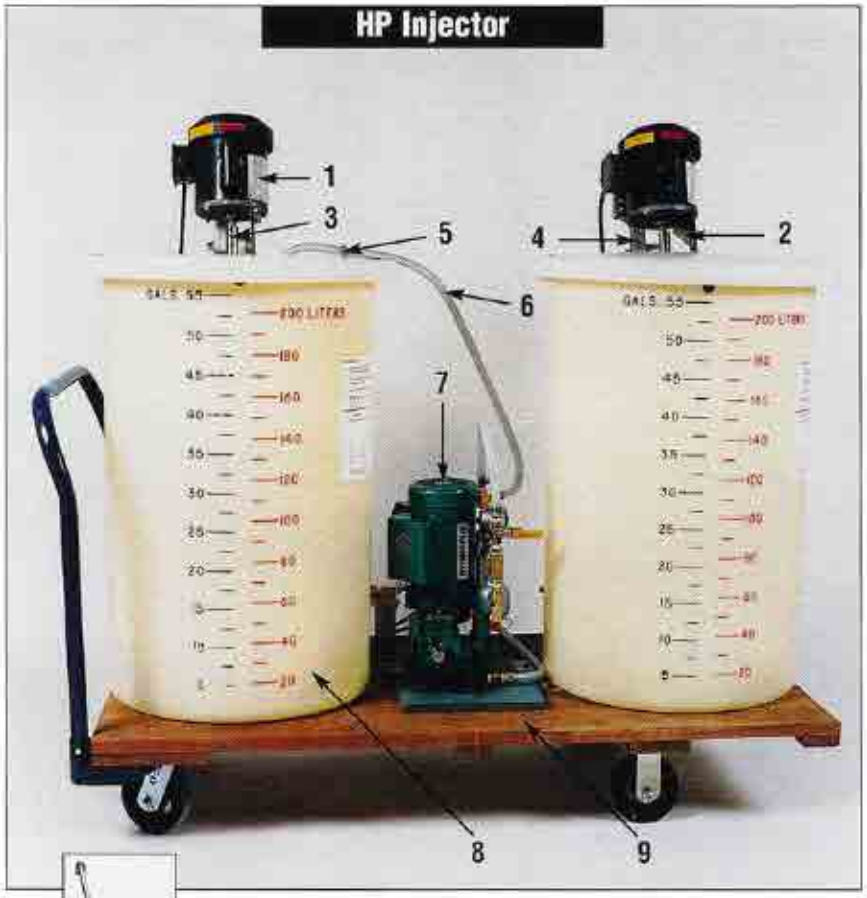
Warning / Cautions

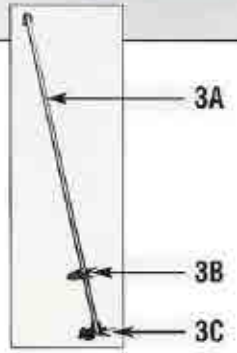
• Only use standard windshield washer fluid (approximately $1.50 / gallon)
• Never use automotive antifreeze (ethylene glycol) of any kind; it is poisonous
• Do not use propylene glycol (non toxic antifreeze). Propylene glycol together with accelerator solution may form crystals that will clog the system.

• Windshield washer fluid contains methanol which is poisonous. When using windshield washer fluid use caution.
• Do not add or mix antifreeze of any kind with the accelerator solution in the tanks. It will not help and the crystals will form resulting in clogs throughout the system.

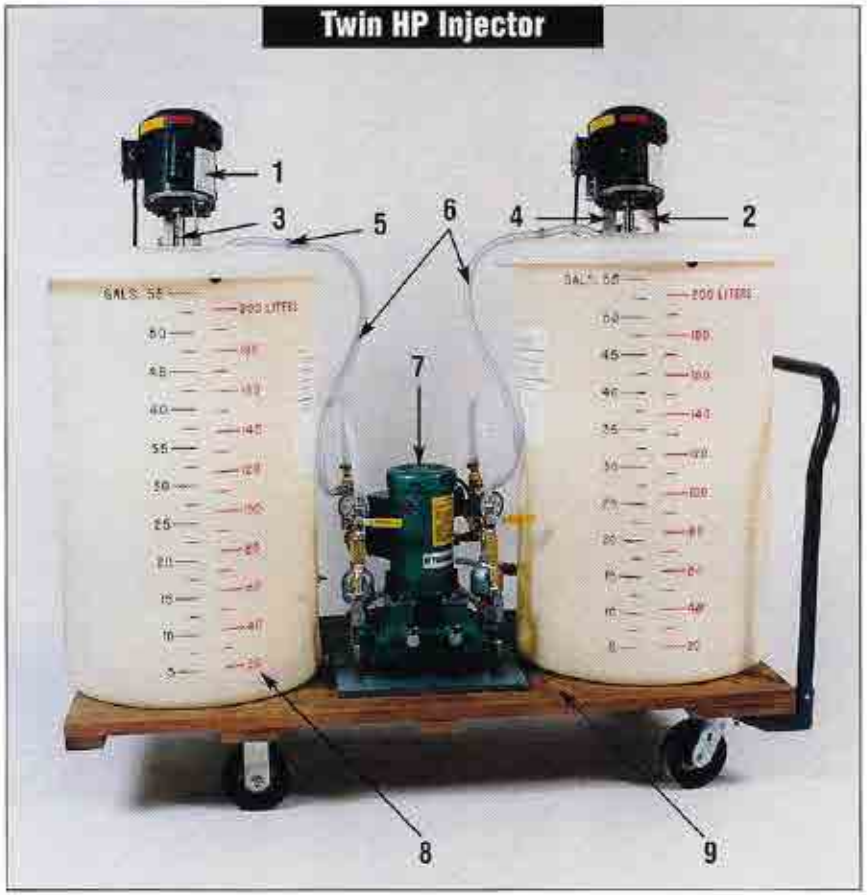
Injection Units

HP Injector





Twin HP Injector



Parts List Reference

Part No.	Part Name	Grace SAP Order #
1	Mixer Motor Only	3802
2	Mixer Motor Support Bracket	19652
3	Mixer Coupler (only) S/S ⅝" x ⅝"	3803
3A	Mixer Shaft 316 S/S ⅝" x 32" S/S Tension Pins	3806
3B	Mixer Impeller S/S & Tension Pins S/S use w/4773	3805
3C	6 Blade Prop	4773
4	Mixer Motor Mount w/Clamp	3804
5	Hold Down Clip	24916
6	½" Polybraid Hose	3879
7	Injector Pump Motor Only Replacement	3791
8	55 Gallon Tank w/Cover	3837
9	Platform Truck (24" x 60") w/Floor Lock	3811
	Accelerator Hose SAE100R (50') *(Not Shown)*	3878

Photo 2

HP Plumbing

Parts List Reference		
Part No.	Part Name	Grace SAP Order #
1	Basket Filter for PVC Filter	24915
2	Gasket for PVC Filter	24877
3	½" Bulkhead Fitting	3838
4	½" Brass Ball Valve	3856
5	½" Quick Disconnect M/F	3984
6	½" PVC Filter	24876
7	½" NPT x ½" Barbed Brass Swivel	24878
8	⅜" NPT x ½" Barbed Brass Swivel	24879
9	⅜" Brass 90° Ell	4074
10	⅜" Brass Union	4094
11	½" x ⅜" Brass Bushing	4053
12	½" Brass Tee	4057
13	⅜" Brass Ball Valve	3855
14	Glycerine Filled Pressure Gauge	3873
15	½" x 4 way Brass Cross	24880
16	Pulsation Dampener	3801
17	100 psi Brass Check Valve	3852
18	½" Brass Union	24881
19	⅜" Brass Tee	4048
20	⅜" Quick Disconnect M/F	3982
21	Polybraid Hose	3879
22	Injector Pump Ball Check Valve Assembly (lower)	24884
23	Injector Pump Ball Check Valve Assembly (upper)	24885

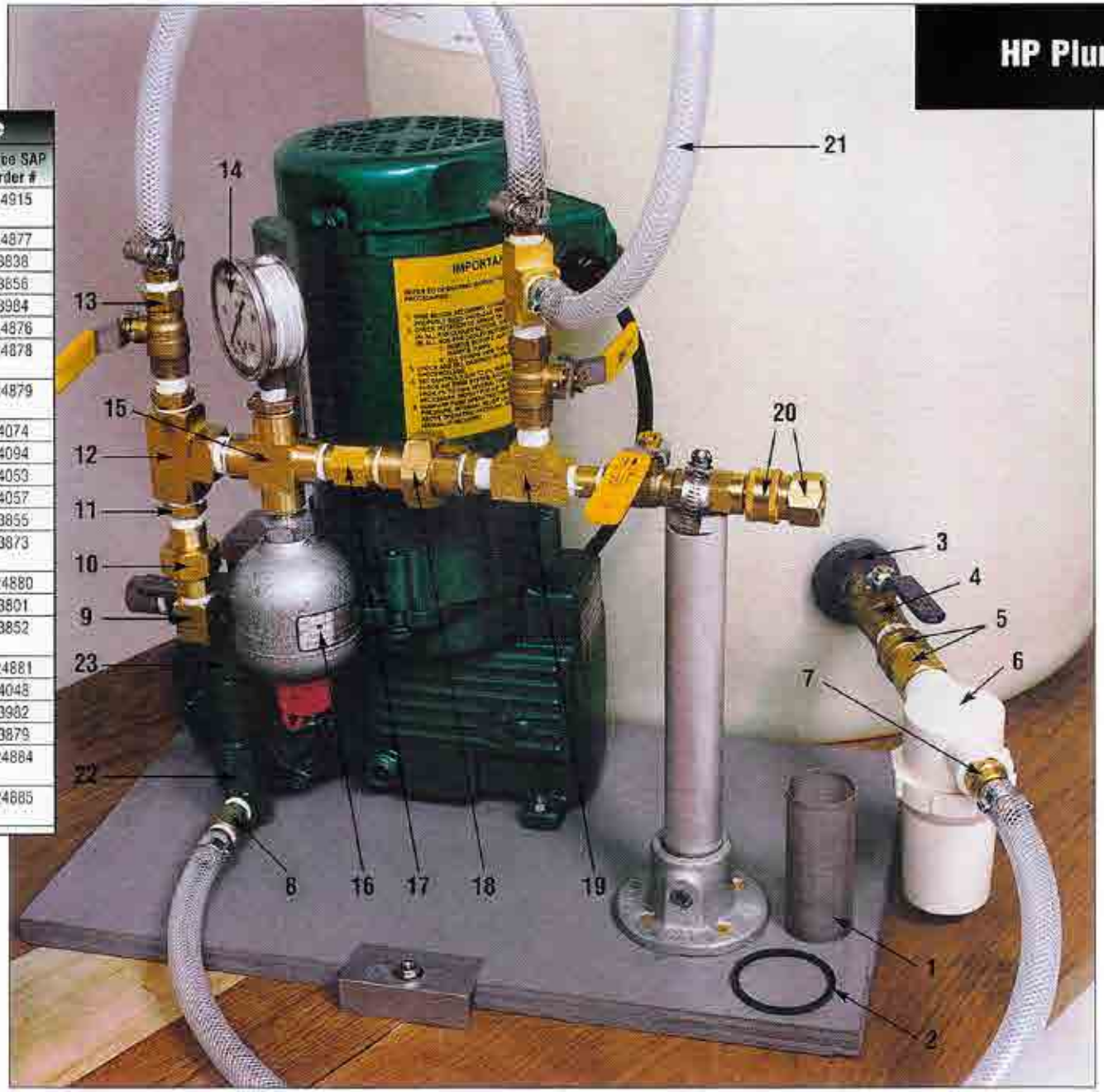


Photo 3

Twin HP Plumbing

Parts List Reference		
Part No.	Part Name	Grace SAP Order #
1	Basket Filter for PVC Filter	24915
2	Gasket for PVC Filter	24877
3	½" Bulkhead Fitting	3838
4	½" Brass Ball Valve	3856
5	½" Quick Disconnect M/F	3984
6	½" PVC Filter	24876
7	½" NPT x ½" Barbed Brass Swivel	24878
8	⅜" NPT x ½" Barbed Brass Swivel	24879
9	⅜" Brass 90° Ell	4074
10	⅜" Brass Union	4094
11	½" x ⅜" Brass Bushing	4053
12	½" Brass Tee	4057
13	⅜" Brass Ball Valve	3855
14	Glycerine Filled Pressure Gauge	3873
15	½" x 4 way Brass Cross	24880
16	Pulsation Dampener	3801
17	100 psi Brass Check Valve	3852
18	½" Brass Union	24881
19	⅜" Brass Tee	4048
20	⅜" Quick Disconnect M/F	3982
21	Polybraid Hose	3879
22	Injector Pump Ball Check Valve Assembly (lower)	24884
23	Injector Pump Ball Check Valve Assembly (upper)	24885
24	⅜" x 4" Brass Pipe Nipple	24882
25	½" x ½" Brass Hose Barb	3900

Photo 4

Scaffolding

Scaffolding Recommendations

The scaffolding used to spray from must comply with all OSHA and other relevant safety requirements and should have the following features:

1. Large 10 - 12” diameter wheels - this helps the scaffolding roll easier. One source is Payson Casters, Inc. 2323 Delaney Road, Gurnee IL 60021-1287
2. Expanded metal open grate floor - allows material to fall through rather than collect on the floor and create a slippery surface.
3. Cantilevered end - to allow spraying around open shafts, and obstacles on the floor. A counterweight,and or other device as required by governing authorities, should be used on the end opposite the cantilever.
4. Waist high railings - for obvious safety reasons.

The proper scaffold height is important in controlling daily production rates. By reducing the sprayers fatigue by properly setting the scaffold height, the pumping time will increase therefore increasing daily production. Adjustable screwjacks are the best means of setting the proper height. As a general rule, 4” – 6” between the decking and sprayer is the most comfortable working height.

Scaffold assembly should be checked before shipping to the jobsite for:

a. Total components

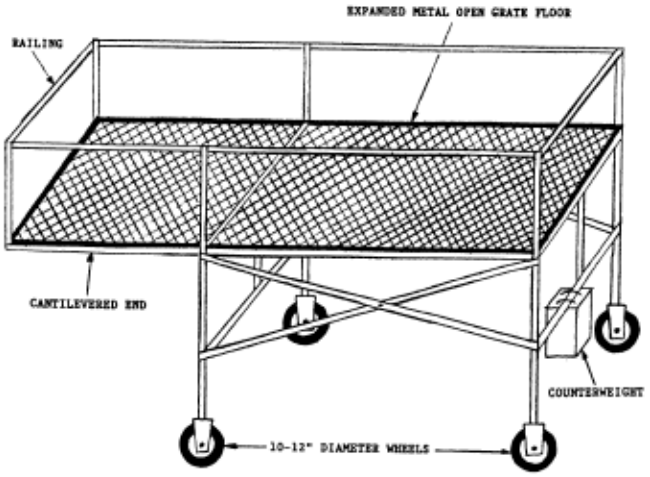
b. Undamaged and functional

c. Pipe diameters are compatible:
   Frame to Frame
   Screwjack to Frame
   Wheel to Screwjack

d. Proper Braces to set span

e. Wheels are greased and rotate smoothly

Toeboards and other local safety requirements must be included, illustration is for discussion purposes only!



Scaffolding Components and Price

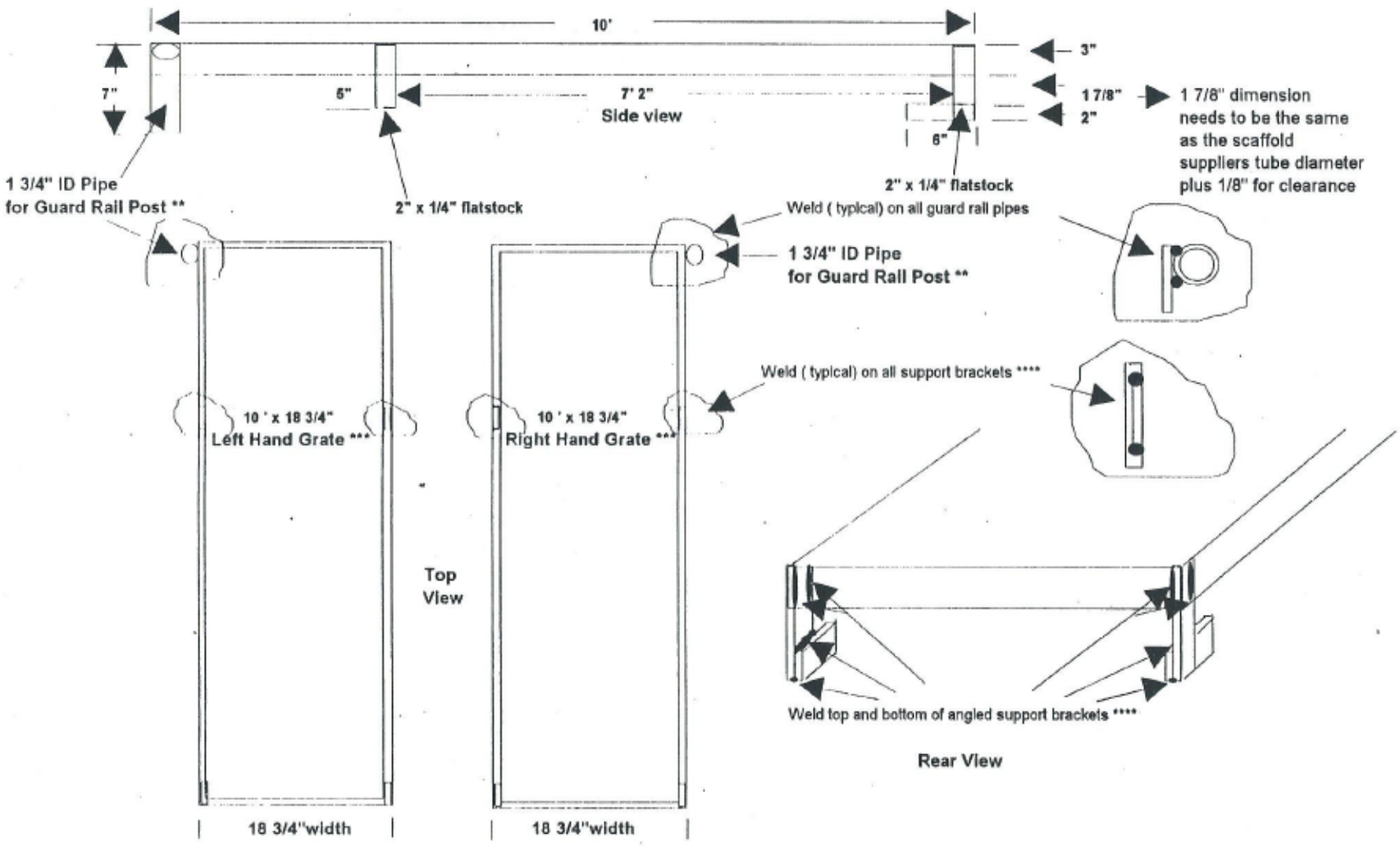
Detailed below is a partial list of scaffolding parts and approximate prices to give you an idea of some of the components and price required to assemble a complete scaffold tower. There are additional size frames to achieve added height and should be universal for most applications. These are all Safeway Scaffold (Manufacturer) parts numbers and approximate prices. The other information on the following pages is for the grating required for the cantilevered deck. These will need to be manufactured by the applicator referencing the attached blue print. All scaffolding must incorporate appropriate safety equipment and parts to minimize workers exposure and comply with all applicable safety regulations.

SCAFFOLD COMPONENTS AND PRICE

6' FRAMES	FM-6	2	$72.65	$145.30
5' FRAMES	FM-5	2	$61.78	$123.56
3' FRAMES	FM-3	2	$51.38	$102.76
BRACES B 74	B-74	4	$16.48	$65.92
BRACES B72	B-72	2	$15.60	$31.20
SCREWJACKS	AL1	4	$30.00	$120.00
8" CASTER WHEELS	C8R	4	$33.60	$134.40
GUARD RAIL POST	CGGRP	4	$20.38	$81.52
5 FOOT GUARD RAILS	GR5	4	$5.20	$20.80
10 FOOT GUARD RAILS	GR10	4	$14.51	$58.04
CANTILEVERED DECK (SET 0F 3)	BY APPLICATOR	1	$500.00	$500.00
COUNTER WEIGHTS (200 LBS)	NOT INCLUDED	2	$0.00	
GUIDE PINS (EXTRA)	CP	4	$2.55	$10.20
SAFETY LOCK PINS	PTP	12	$0.55	$6.60
10 FOOT TOE BOARDS	SET OF 2	1	$141.00	$141.00
5 FOOT TOE BOARDS	SET OF 2	1	$141.00	$141.00
				$1,682.30

PRICES ARE APPROXIMATE AND VARY BY SUPPLIER

Cantilevered Scaffold Grating System *



Note * Grate composition is Grip Strut 8 Diamond 18 3/4" plank 12 ga. steel, 3" channel, 10' length
Note: ** Guard rail pipe Inside diameter will need to be large enough to receive guard rail post manufacturers out side diameter.
Note: *** 3 grates will need to be fabricated per scaffold assembly. Center grate will not require the guard rail post only. The left and right grates will be designated by the location of the guard rail pipe
Note **** Inside rolled lip of the Grip Strut will need to be flattened (or cut and straightened) to allow for bracket penetration and welding

Scfdiag

Equipment

Water Metering Systems

The importance of measuring mix water cannot be stressed enough. There are a few different types of water metering systems that are available in the market today. The timed sump pump and inline mechanical meters are recommended for conventional batch mixers while the electronic digital meter is better suited for continuous mixers.

Timed sump pump and drum

An electric sump pump is submerged in a 55 gallon drum and is controlled by a timing device positioned near the mixer man. When the ON button is pushed, the sump pump runs for the determined amount of time delivering a specified amount of water into the mixer. The timer can be adjusted to allow the pump to run longer or shorter for more or less water. The meter's markings should not be confused with delivering gallons per minute. The length of delivery line and changes in the barrel height will change the pressure and the volume of water being delivered. Voltage reductions will also change the speed the impeller turns which will also affect the consistent delivery of water per batch. Having the correct power source and electrical supply lines is critical in maintaining consistent material mixes.

The 55 gallon drum reservoir is refilled via a water supply. A float valve should be used to minimize the risk of overflowing the drum. These are similar to the float systems used in every day toilet tanks, and can be purchased from equipment suppliers, hardware stores, and equipment supply houses.

Mechanical In Line Water Meter

such as the Fil-Rite and Neptune are meters used to register the amount of water per batch. They display the amount delivered in gallons (much like a cars' odometer). Some in line meters will automatically stop at a preset amount, others must be monitored and stopped manually at the appropriate amount of water. Refer to the equipment portion under water meters to see the available meters.

Electronic Digital Flow Meters

Primarily for continuous mixers, this turbine flow meter installs on the water inlet of the mixer. On some models it can be fitted with quick disconnects (Kamloks) for easy installation and removal. On others it is fabricated into the hard plumbing. There are three functions on the digital meter.

1. An LCD readout displays a flow rate, which can be used as a reference when making adjustments or when changing from product to product. The dry through put of the Monokote materials will need to be determined to precalculate the desired flow rate. Normally it is used to reference consistent water delivery after the best water ratio is determined.
2. It can be reset for bags used to water used. By dividing the total water into the total actual bags used, the gallons per bag can be determined, This information will be necessary to correctly use the Deluxe Simplified Yield Kit. (Refer to the Simplified Yield Chart in this manual for more detailed instructions on this procedure).
3. It also has a cumulative water total which registers the amount of water run through for the life of the unit. The electronic flow meters are battery operated.

As with any measuring device the water meters should be periodically checked for accuracy. This can be accomplished by weight (1 gal water = 8.34 lb.) or by comparing the volume against a reliable premeasured source/calibrated container.

Timers/Temp gauges

Mixing Timers

It is recommend and beneficial to use a mix timer . Keeping each batch mixed for the same amount of time will help the sprayer apply a quality application to the steel . Features to look for when purchasing a mix timer . 1) Memory recall , 2) audible and visual alarms , 3) size of LCD display , 4) countdown time , and 5) magnetic back and clip. Below is a list of sources you can purchase :

Cole-Parmer Instrument Company
625 East Bunker Court
Vernon Hills , Illinois 60061-1844
(800) 323-4340

MODEL # H-94440-10 Jumbo digital clock/ timer
H-08610-22 Mini alarm timer

VWR Scientific Products
(800) 932-5000
MODEL # 62373-090 Time-link memory alarm
62344-778 Memory alarm timer

Fisher Scientific Products
(800) 766 - 7000
MODEL # 14-649-15 Mini-alarm timer/stopwatch with memory recall
06-662-26 Fingertip timer

Moisture Meter

Moisture Register Products
1712 Earhart Court
LaVerne , CA 91750
(909) 392-5833
MODEL # 9XDC

Surface Temperature Thermometers

Used during the late fall , winter , and early spring months to check actual steel temperatures . When spraying steel that maybe too cold and you need to know .

Cole-Parmer
625 East Bunker Court
Vernon Hills , Illinois 60061-1844
(800) 323 - 4340
MODEL # H- 08107 - 06 Dual - magnet thermometer

Section 6: Miscellanous

Testing and Inspection

Section 6: Miscellanous

Frequently Asked Questions

Filling Flutes

The General Information Section of the UL Fire Resistance Directory states that unless otherwise allowed in the specific fire resistance design, all flutes above beams (and joists/trusses) must be completely filled. This information is also contained in AWCI Technical Manual 12-A (third edition) "Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials; an Annotated Guide" under section 5.3.4.2.2 Void Inspection.

Exceptions:

1. Flutes may be "plugged" with the minimum thickness required for the beam when the beam is protected with a thickness specified for use on beams supporting cellular deck.
2. For beams with flange widths greater than 8 inches, UL allows filling a minimum 4 inches on each side of the fluted.

Miscellaneous Steel Application

It is the responsibility of the fireproofing subcontractor to determine what miscellaneous steel on a project requires fire protection. The project engineer and/or the Authority Having Jurisdiction must determine whether various elements are considered structural or non-structural.

In general, ULI requires bracing tying into columns and beams to be protected a minimum 12 inches beyond the column or beam with the protection thickness specified for the column or beam. This limits lateral heat flow to the member. Joist bridging unless otherwise stated in the specific Fire Resistance Design shall be protected a minimum 12 inches on each side of the joist at the protection thickness specified for the joist.

Bridging for castellated beams (ULI Design Nos. N784 or N831) requires full protection as specified in the Fire Resistance Designs. Monokote Fireproofing Bulletin #244 addresses additional miscellaneous applications such as brick lintels and secondary structural framing. Monokote Fireproofing Bulletin #156 addresses protection of bracing using the column formula. W/D ratios for miscellaneous structural steel shapes can be found in the Monokote Estimating Guide. Thickness requirements based on the column formula can be found in the Monokote UL Thickness Handbook.

ULI does not allow direct protection of Z-purlins, CEE joists or trusses fabricated from light gage framing members.

Hand Patching

Hand patching of Monokote is addressed in Monokote Fireproofing Bulletin #201A and in the CHPX section of the UL Fire Resistance Directory Volume 1.

Hand patching of hand mixed Monokote products is limited to a maximum individual area of 144 square inches. Larger areas should be sprayed / patched either directly by machine or with a product that is pumped and sprayed into a bucket. There is no size limit on those areas with respect to hand patching when mixed and sprayed using conventional equipment.

Regardless of the product being used, the ULI and code requirements must be maintained.

ULI does not allow the use of Monokote to patch sprayed mineral fiber. See Bulletin #201.

Monokote Type MK-6/CBF, MK-6/ED, MK-6/HY, MK-6s and RetroGuard RG and RG1 are all considered to be thermally equivalent and chemically compatible by ULI and can be used interchangeably for patching only. These products can also be used to patch MK-4 and MK-5 applications.

Half-Flange Tip Thickness Application

The protection thickness on column flange tips and on the lower flange tips of beams and joists can be reduced according to specific ULI Fire Resistance Designs. This is accomplished by increasing the protection on other areas of the column or beams to compensate for the thickness reduction on the flange tips.

In the ULI Fire Resistance Designs, the protection thickness required for these other areas is specified. The protection thickness on the flange tips is one-half of the thickness specified for these other areas (but not less than 1/4 inch).

ULI allows the use of the formula listed in the General Information section of the Fire Resistance Directory, under Beams, "Adjustment of Sprayed Protection Material Thickness For Unrestrained Beam Ratings for Various Beam Sizes" for use with half flange tip thicknesses when Monokote Fireproofing Products are used. See Monokote Fireproofing Bulletin #251.

No "generic" ULI formula exists for adjusting protection thicknesses on columns when the half flange tip option is used. A formula specific to Monokote® MK-6, Z-106, Z-146 and RG is available from your GCP Representive.

Painted Deck

The use of painted steel deck is allowed in all D900 and P900 series floor and roof ceiling designs as long as the deck profile, gauge and span requirements are maintained.

Only ULI classified painted deck is allowed in designs requiring direct application of SFRM to the deck. The use of non-classified deck will require the use of sand blasting to remove the paint or 100 percent mechanical attachment in order to maintain the ULI fire ratings. This information is addressed in detail in Monokote Fireproofing Bulletin #198 Addendum A, 198C and 215.

It is acceptable to substitute UL classified painted decking from one protected roof ceiling design to another where the same products are used.

Monokote Type Z-106 is limited to use with galvanized steel decking.

Structural Members at Walls

The situation sometimes occurs where beams or columns are either partially embedded in walls or are in such close proximity that it is either impossible to spray materiel to the back of the beam or column or the clearance does not allow application of the full protection thickness.

Guidance related to this issue may also be found in the CHPX section of the UL Fire Resistance Directory Volume 1.

On a case specific basis, UL has been able to computer model fire protection requirements and determine the appropriate protection thickness to compensate for a specific reduction from the required design thickness. This evaluation must be done on a case by case basis.

Note: ASTM E-605 allows the thickness tolerance of 25 percent or 1/4 inch (whichever is less) below the required thickness as long as the average thickness is maintained. This provides a small degree of flexibility for close cases.

Dissimilar Materials

In general, UL does not allow the use of dissimilar materials on the same structural member. However, UL does allow dissimilar materials to be used on separate elements in an assembly (e.g., Z-146 on beams and Z-106 on roof deck) as long as the protection thicknesses are adequate to meet the fire rating requirements.

UL does allow dissimilar materials on the same column (e.g., Z-146 on first ten feet of a column and Z-106 on the remainder) under certain conditions. These include mechanical reinforcement of the seam and overlapping of the materials. In general, the cost of switching materials and mechanical attachments makes this option non-cost effective.

Estimating

I. Introduction

This manual contains reference data which is useful for estimating in-place quantities of Monokote® or Retro-Guard® Spray-applied Fireproofing. In providing the market with the quality fire protection offered by the Monokote family of products, we depend on your ability to properly bid Monokote, to bid competitively, and to make a profit for your company. This comprehensive guide has been prepared to assist estimators properly and competitively bid Monokote products.

Included in this edition of the Estimating Guide are Monokote and Retro-Guard material use factors for metal decks, joist elements, beams and columns based upon the latest information from Underwriters Laboratories fire resistive designs, deck manufacturer's catalogs and structural steel industry manuals. GCP Applied Technologies Inc. assumes no responsibility for misapplication of the data or information within this manual.

How does this Estimating Guide differ from previous editions?

New Features

This is the most comprehensive fireproofing estimating guide published to date. In addition to wide flange shapes, material estimating tables are provided for tube and pipe elements, angles, channels, wide flange tailor-made, and tee shapes. Besides more shapes, the guide also has been improved to provide a wider range of material thicknesses- from 1/4 inch up to 4 inches. Since many applicators request simplified wide flange beam and column tables for use on less complex projects, simplified W-shape tables are also provided for beams and columns.

Applicators are strongly encouraged to read this introduction in its entirety before estimating a job, including the suggested contract terms and conditions offered at the end of this introduction.

II. Estimate Preparation

The data presented in this guide is not intended to replace careful preparation of your fireproofing estimate but only to provide direction in its preparation. It is important to remember that the conditions of each job are different and that these should be taken into account when estimating. Estimators should also factor labor skill and experience when estimating a job opportunity. The following is a partial check list for use in preparing your estimate:

- Have a complete copy of the job specifications, plus addenda.
- Have a complete set of plans to review—these should include architectural, structural, mechanical and electrical drawings.
- Require clarification from the architect, engineer or specifier on interpretations of drawings, specifications, codes and building regulations. You must have sufficient information, such as proper UL designs, to determine material thickness requirements for columns, floor, roofs or other elements. Also make certain building code requirements, such as the hourly rating of each element type, are fully understood.
- Make sure that your application of Monokote can be accomplished within the specified time using normal installation techniques and equipment. If this is not possible, make appropriate adjustments.
- Consult the latest Monokote literature for technical data, such as minimum application temperature, preparation and substrate requirements, product performance requirements, gross material yield, material density, and other data.
- Make sure to contact your local GCP Applied Technologies field representative to assist you in selecting the most economical fire-proofing thicknesses and to provide current literature, test data, certificates, etc. often required to be submitted with your bid.

For our part, we will continue to provide you and the fireproofing industry with:

- Competitive spray-applied fireproofing materials
- Quality fireproofing materials, and
- Product support and field technical assistance.

Contact your local GCP Applied Technologies Representative for recommended gross (before waste) material yield (coverage) for each Monokote product.

III. Estimating Steel Floor & Roof Decks

When estimating fireproofing requirements for steel deck, great care should be taken in determining the following information from the plans and specifications:

1. The UL design reference, or at least the hourly requirements for the floor or roof construction being protected. UL approved floor assemblies are generally found in the D-700 or D-900 series designs and UL approved roof assemblies are generally found in the P-700 or P-900 series designs.
2. The type, density and thickness of concrete since this will affect the fireproofing thicknesses. Some floor assemblies do not require spray fireproofing to the underside of the deck.
3. The manufacturer(s), type, profile and depth of steel floor units. In electrified floors, the blending of cellular and fluted deck significantly affects fireproofing requirements.
4. The type of in-floor electrification which may be used as part of the floor system. This will require determining the type, number, width and length of trench headers and the possible use of electrical inserts. NOTE: All in-floor electrical components require increased fireproofing requirements—consult the UL Directory or your GCP Representative for information on proper protection of these areas. Electrified floor systems generally require the use of Spatterkote and steel pin studs with discs.
5. The type of roof insulation system and its thickness can affect the quantity of fireproofing required. Some roof systems require the use of Spatterkote and/or wallboard.
   To estimate the gross quantity of material required to protect steel deck using a board foot basis:
   a. Separate floor and roof decks by deck type, electrification requirements, location and hourly rating.
   b. Determine required material thickness.
   c. Determine total square foot of each deck type with respective hourly rating and material thickness.
   d. For each deck type (profile), multiply the square foot of the deck by the appropriate board foot factor for the required Monokote thickness. If the specified deck type is not listed in the estimating tables, make certain that you expand the deck corrugations or flutes to determine the true area to be protected. The board foot factors in the tables provided in this guide do not include material waste.
   e. If flat plate deck is blended with fluted deck, the board foot factor for the flat plate deck will be different than the factor for the fluted deck.

6. Estimating Beams & Columns

As in estimating steel deck areas, there are key rules to follow in preparing an accurate fireproofing take-off for beams and columns:

1. Verify the hourly requirements for beams and columns from the plans and specifications.
2. Keep in mind that some codes or specifications require different ratings for primary (beams connected to columns) beams and secondary beams.
3. If the designer does not specify correct fireproofing thicknesses, determine the fireproofing thicknesses from appropriate UL beam (N-700 series) or UL column (X-700 series) designs in the UL Directory or local product code approvals such as ICBO Evaluation Report #4601. Pay close attention to rules regarding the use of beams smaller than the minimum size beam listed in the UL approval.
4. Separate columns and beams into size categories. Each column or beam has a W/D ratio (weight of member divided by heated perimeter) which is a description of the member's size and can be used to determine the thickness of fireproofing. Ratings for columns and beams are generally established for small members (such as W6x16 which has a small W/D ratio), intermediate members (such as W10x49) and large members (W14x228 which has a large W/D ratio). Fireproofing thicknesses are greatly influenced by size (W/D ratio)—that is, small members require more fireproofing than large members for the same hourly rating.
5. In preparing estimates for beams supporting metal floor or roof decks, care should be taken to estimate the amount of fireproofing material required to fill the flutes above the beam. Deeper deck sections with wide flute areas can use 1.5 (or more) board feet of material per lineal foot of beam (based on a 12-inch flange width).
6. Certain building areas require constructions to be classified for fireproofing considerations as unrestrained, while others will permit for restrained classifications. It should be the responsibility of the structural engineer to make the determination of restrained/unrestrained if there is any question as to classification. When in doubt, select unrestrained classifications. If restrained classifications are permitted, determine if the individual beam rating required is equal to the assembly rating required.

7. New UL approvals provide the option of reducing thicknesses at the flange tips of certain beam and column designs. By increasing the thickness on the other surfaces, flange tip thickness may be cut in half. Some approvals permit only the lower flange tip thickness to be reduced. This may result in a cost savings by reducing material waste and increasing the efficiency of application labor. If you plan to use reduced flange tip thicknesses, make certain you use the correct table from this guide. Contact your GCP Representative for additional information on this subject.
   To estimate the gross quantity of material required to protect columns or beams using a board foot basis:
   a. Separate columns or beams by designation (size), location and hourly rating.
   b. Determine required material thickness.
   c. Determine total lineal footage of each column or beam with respective hourly rating and material thickness.
   d. Multiply the lineal foot for each column or beam by the appropriate board foot factor for the required Monokote thickness. The board foot factors in the tables provided in this guide do not include material waste.

   Note: The U. L. Fire Resistance Directory states that "Cavities between the upper beam flange and the floor units, if any, shall be filled with the protective material." When deck profiles were shallow, the volume to fill these flutes was relatively small. New decks (2" & 3" deep) having 5" to 9" wide cells require significant amounts of material to fill the flutes. This extra amount of material must be calculated and added to the bid.

V. Estimating Bar Joists

1. Two alternate methods for applying Monokote are acceptable to Underwriters Laboratories. These are (1) direct fireproofing application to encase each chord and web member, or (2) application to metal lath, plastic net or glass fiber mesh fastened or adhered to the joists encasing the member in a Monokote envelope.
2. Your steel joist estimate should follow the same format as a beam or column take-off. The tables for back-to-back angles (2L) that appear in this estimating guide assume a 1 inch space between angles. Additional material will be required when the space exceeds 1 inch.
3. Determine the hourly rating required by the plans and specifications. Separate the joist into length, size (depth) and hourly rating to determine the square footage of coverage and fireproofing thickness required. As an alternative, use the angle, back-to-back angle or bar tables in this guide for determining material requirements for the individual elements of the joist such as the top chord, web and bottom chord.
   Note: When applying Monokote to the contours of the joist, a higher waste factor can be expected. The use of metal lath, glass fiber mesh or plastic net will significantly reduce waste. Using lath, mesh or net should result in a waste factor similar to the waste factor for spraying a beam or column. Metal lath may be required to be protected by the fire resistive design.

Waste

The board foot estimating factors listed in this guide do not include material waste. The amount of waste will vary based on some of the following factors:

- Experience and skill of foremen, sprayers, mixermen and laborers.
- Difficulty of job; replacement fireproofing applications can be difficult.
- Unprotected decks generally have higher material waste than protected deck applications.
- Size of member; for example, members with small flange tips are more difficult to spray than large flange tip members.
- Type of fire rating; heavy thickness applications requiring multiple spray passes generally result in lower material waste than comparable applications with light thicknesses.
- Required applied density of product.
- Pumping rate; excessive pumping rates can increase overspray.
- Optimization of Monokote Accelerator and injection to maximize yield.
- Optimization of material mix.

Waste factors can be as little as 5% or more than 25% based on the factors discussed above. Adjust material estimates to include waste factors by multiplying the total board footage by an anticipated waste percentage. Waste is likely to be different on columns, beams, joists, unprotected decks, protected floor decks and protected roof decks.

General Estimating Guidelines

The following suggestions are made to enable the estimator to perform unit price estimating in a logical, easy to check and thorough manner.

1. Use pre-printed or columnar forms for orderly sequence of dimensions and locations and for recording quotations.
2. Use only the front side of each paper or form except for certain pre-printed summary forms.
3. Be consistent in listing dimensions: for example, length x width x height. This helps in re-checking your estimate.
4. Use printed (rather than measured) dimensions where given.
5. Add up multiple printed dimensions for a single entry where possible.
6. Measure all other dimensions carefully.
7. Use each set of dimensions to calculate multiple related quantities.
8. Convert foot and inch measurements to decimal feet when listing. Memorize decimal equivalents.
9. Do not "round off" quantities until the final summary.
10. Mark drawings with colored pens as items are taken off. Use different colors to separate different elements (such as primary versus secondary members).
11. Keep similar items together and different items separate.
12. Identify location on your estimate to aid in future checking for completeness.
13. Measure or list everything on the drawings or mentioned in the specifications.
14. It may be necessary to list items not called for to make the job complete.
15. Be alert for: notes on plans such as N.T.S. (not to scale); changes in scale throughout the drawings; reduced size drawings; and discrepancies between the specifications and the drawings.
16. Develop a consistent pattern of performing an estimate, for example:
    a. Start the quantity take-off at the lower floor and move to the next higher floor.
    b. Proceed from the main section of the building to the wings.
    c. Proceed from south to north or vice versa, clockwise or counterclockwise.
    d. Take off floor plan quantities first, elevations next, then detail drawings.
17. List all gross dimensions that can be either used again for different quantities, or used as a rough check of other quantities for verification (exterior perimeter, gross floor area, individual floor areas, etc.).
18. Utilize design symmetry or repetition (repetitive floors, repetitive wings, symmetrical design around a center line, similar room layouts, etc.). Note: extreme caution is needed here to avoid omiting or duplicating an area.
19. Do not convert units until the final total is obtained.
20. When figuring alternates it is best to total all items involved in the basic system, then total all items involved in the alternates. Thus you work with positive numbers in all cases. When adds and deducts are used, whether to add or subtract a portion of an item, it is often confusing, especially on a complicated or involved alternate.

Suggested Terms and Conditions

When appropriate, for your protection GCP recommends that the following terms and conditions are incorporated into your contract and pre-job meeting with the general contractor.

1. We propose to meet the hourly fire resistive requirements of the plans and specifications only. The applicability of these documents to laws, statutes, building codes and regulations are not the responsibility of this contractor.
2. Surfaces to receive fireproofing shall be free from any substance that would impair adhesion.
3. The general contractor will make available a permanent location for our mixing and pumping station for the duration of our activity. This site must:
    a. Be convenient to the structure to be fireproofed.
    b. Be convenient to the structure to establish a single station for centralized pumping of the fireproofing material.
    c. Be able to accommodate (including access routes) truckload deliveries of material.
    d. Have ample space for trailer parking, material, and equipment storage.

e. Be well drained.

f. Establish a permanent material riser location for the duration of the job.

g. Suitable locations for priming and washing out of the material conveying system.

4. General contractor to furnish all necessary light, power, heat, water and temporary enclosures where required, without charge. Specifically,

    a. Have a convenient and constant water source with adequate pressure and volume to maintain job schedule (minimum requirement: 20 gallons per minute per machine).

    b. Have a minimum 110 volt 30 amp independent power service for the fireproofing operation.

5. Within the building, we require free and clear ingress/egress for movable scaffolds from the floor line to the area to be fireproofed. No installation that would restrict movement of our scaffolds, personnel or equipment or limit our uninterrupted application of fireproofing materials will be permitted. Clutter, debris and/or items stored on the floor must be located where they will not interfere with said application. Protection of these items is not the responsibility of this contractor.

6. All patching and repairing of fireproofing due to damage (intentional or unintentional) by others shall be completed by the fireproofing contractor and paid for by the general contractor.

7. After completion of the fireproofing work, equipment shall be removed and all exposed floor areas shall be left in a scraped-clean condition. We shall deposit debris in trash chutes provided by the general contractor or outside the building for removal by others.

8. General contractor to furnish adequate hoisting facilities including fuel and operator without charge.

9. The cost of performance and payment bond has not been included. If required, add premium cost to contract price.

10. No backcharges to our contract will be accepted unless previously agreed to by both parties in writing.

11. No penalties will be accepted for delays caused by labor walk-outs, inability to secure men or materials, or damage from acts of God.

12. We shall not be required to start work until the job is sufficiently ready for us to proceed in a continuous operation without any undue interference or delay from other crafts. Specifically,

    a. The substrates to receive application of fireproofing shall be satisfactory for direct spray application. Structural steel shall be free of primers/paint, oils, grease, loose mill scale, dirt or other foreign substances which may impair proper adhesion. Steel decks shall be free of rolling compounds, lubricates, incompatible paints or primers or other foreign substances which may impair proper adhesion.

    b. Ducts, piping, equipment or other suspended matter which would interfere with application of the fireproofing materials shall not be positioned until the fireproofing work is complete.

    c. Prior to the application of fireproofing, clips, hangers, support sleeves, and other attachments required to penetrate the fireproofing shall be in place.

    d. Prior to the application of the fireproofing to the underside of metal decks, all roof applications and concrete work shall be complete. All roof traffic shall be prohibited upon commencement of the fireproofing application and until the fireproofing material is cured and fully dried.

13. The general contractor shall provide adequate ventilation and temperature for application of fireproofing in accordance with manufacturer's recommendations. If necessary for job progress, the general contractor shall provide enclosures with heat to maintain temperature and forced air ventilation until material is substantially dry.

14. This proposal shall be subject to change unless accepted within thirty (30) days from date of general contract award.

15. Test results from inspection of applied materials shall be provided to the fireproofing contractor at the completion of each floor.

Color Coded Structural Steel Drawings

Color Coded Structural Steel Drawings are a valuable resource for field superintendents. A carpenter needs drawings to correctly build walls, shafts. etc. The fireproofing applicator needs direction to spray the proper substrates to the correct thickness. With the complexity of different thickness' from hourly ratings, UL Designs, W/D ratio's etc. Proper direction is a must to be profitable. The following information should be included on the structural drawings to properly apply spray fireproofing.

They should be color coded and marked up for proper thickness. Each member should be marked, and the thickness should range in 1/8" increments. Only one color per thickness should be used for columns, beams, joist, etc. Items such as decking, diagonals, and misc. steel can be marked as notes on the side of the drawings. Some contractors break down the thickness by 1/16" increments and have numerous thicknesses per floor. From our experience only the more experienced sprayers can accomplish this profitably. The less confusion there is on thickness requirements the better the results of the project will be.

They should have what areas require, and do not require spray fire protection. Many times questions are ask if areas such as elevator shaft divider beams, misc. support angles, areas that qualify for the 20 foot flame rule, etc. are to be sprayed. By clearly making the drawings these areas are identified and proper direction and field coordination can be accomplished. This will also indicated what was originally included in the bid package. In many cases the additions of structural steel members have been added to the original design of the building. By comparing the bid drawings against actual field installations these areas will be identified and additional pricing can be accomplished if necessary.

The drawings should also include bags required to spray a given area or floor, depending on the footprint of the building. GCP highly recommends establishing areas for net walk off evaluations. These areas are used to determine how the job will progress in relation to material usage. The drawings should include the board foot bid factor(s) for the different areas or floors and for the different product types used. By comparing these against actual field usage the potential to identify material overage on a project will come early on while corrective action can still be accomplished. Many times the contractor evaluates material usage at the middle or end of a project when it is too late to take the corrective action. This can also be used to establish benchmarks or set goals for the spray crew(s) to achieve. Higher walk off yields can give you a competitive edge in the bid process.

By understanding how many bags it takes for a given area or floor, field supervisors can establish daily production goals which will aid them in coordinating their work with the general contractor, and other trades. The more organized a spray application is the more profitable it can become. They can also be used to monitor daily production goals (Benchmarks). By marking the areas completed per day the estimators have the option to review what type of production is realistic for given types of work. Example: Thin thickness beam only work should not be bid at the same daily production rate as heavy thickness beam and deck work. The volume of area available is directly related to the production that can be accomplished per day.

Contact your local GCP Representative to understand more about "Net Walk Off" evaluations and "Benchmarks".