

SCOPE

- I 1.1 This practice covers the material composition and application of gunite (shotcrete) for internal linings of equipment and for fireproofing vessels and structural members.
- I 1.2 **An asterisk (*)** indicates that a decision by the Purchaser is required, or that additional information is furnished by the Purchaser.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the practice which shall be used with this practice.

TABLE 1

PRACTICE	
IP 19-1-1	Paints and Protective Coatings

- I 2.2 **Table 2** lists the standards which shall be used with this practice.

TABLE 2

STANDARDS	
ACI Standards	
506.2	Materials, Proportioning, and Application of Shotcrete
A 184/A 184M	Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
A 185	Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
C 33	Concrete Aggregates
C 150	Portland Cement

- R 2.3 **Temperature limitations.** The requirements of this practice apply to internal linings of equipment where the operating temperature is less than 500°F (260°C) and fire protective coatings.

MATERIALS

- R 3.1 **Sand** shall be natural, high silica sand per **ASTM C 33** for FINE AGGREGATE. Limestone sand may be used only for services where there are absolutely no acid components or sour stocks.
- R 3.2 **Reinforcement shall be welded steel** wire fabric and weldable carbon steel reinforcing bars. The wire fabric may be self-furring and the reinforcing bars may be plain or deformed.
- R * 3.3 **Cement** shall be per **ASTM C 150**, with the cement type to be specified.
- R 3.4 Water quality. Use potable mixing water.

APPLICATION

- R 4.1 **Reinforcement shall be provided in two directions** with the following minimum ratio of reinforcement areas to gunite areas in each direction:
 - a. Plain bars 0.0030
 - b. Deformed bars 0.0025
 - c. Welded wire fabric 0.0020
- R 4.2 **The reinforcement shall be fastened** by welding or by tie wires to anchoring devices welded to the surfaces to be gunited. Such devices may be any combination of rods, clip angles, Nelson studs or nuts on edge. Spacing of these points shall be a maximum of 18 in. (450 mm) in both directions.
- R 4.3 The reinforcement shall be placed not less than 1/2 in. (13 mm) from the surface to be gunited and there shall be not less than 3/4 in. (20 mm) between the reinforcement and final surface of the gunite. Where the gunite thickness does not permit these requirements, the reinforcement shall be placed midway between the steel surface and the final gunite surface.

IP 19-3-1		Gunite For Linings and Fireproof Coatings	
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(This practice is appropriate for attachment to Inquiry or Purchase Document)

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- R * 4.4 **The use of gunite without reinforcement** shall be limited to small or confined areas, for gunite thickness not exceeding 3/4 in. (20 mm). Details of such installation shall be approved by Purchaser.
- R 4.5 When used as a lining, steel surfaces shall be abrasive blast cleaned per SSPC SP 6, "Commercial Blast Cleaning;" when used for fire protection, steel surfaces shall be blasted and coated per [IP 19-1-1](#), Paints and Protective Coatings.
- S * 4.6 **During abrasive-blasting and guniting operations**, the equipment shall be grounded in locations where there is a possibility of flammable materials being present. In addition, protection shall be provided to prevent damage to adjacent structures.
- R 4.7 Additives to lower freezing point are prohibited.
- R 4.8 Minimum temperature of structure and during application and curing shall be no lower than 50°F (10°C).

INSPECTION

PRIOR TO APPLICATION

- R 5.1 The strength of the reinforced anchoring devices shall be checked with a hammer blow.

AFTER APPLICATION OF GUNITE

- R 5.2 **After curing for a minimum of 24 hours**, the linings and fire proof coatings shall be checked at no more than 12-in. (305 mm) centers for voids over the entire surface by tapping with a one-pound ball peen hammer.
- * **When tapping, a dull sound indicates a void or dry-filled space.** Any voids, dry-filled spaces, or hollow sounding areas are considered defective areas. These areas shall be repaired per the contractor submitted procedures approved by the Owner's Engineer.
- R * 5.3 **Visual Inspection.** The lining shall be inspected for cracking. Areas containing cracks in which a 1/16 in. (1.5 mm) diameter wire can be inserted to the depth of the anchoring devices are considered defective areas. These areas shall be repaired by application procedure approved by the Owner's Engineer.

Revision Memo

9/68 Original Issue of Basic Practice
1/73 Revision 1
1/75 Revision 2
1/85 Revision 3
6/86 Revision 4
12/92 Revision 5
12/93 Revision 6

3/98 Revision 0- Original Issue of International Practice

This is a reaffirmation of previous Revision 6 of **BP 19-3-1**, December, 1993, with only minor editorial changes.

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