

5.6 SHOTCRETE

- Shotcrete or gunitite is the mortar or fine concrete that is applied over a surface by pneumatically, at a high velocity.

Advantages of shotcrete

- Less formwork requirements
- Requires small plants for manufacturing
- Easy placement
- Required strength can be attained easily
- The shotcrete layer can be made very strong by applying pneumatic pressure
- 3 cm to 5 cm thickness of shotcrete lining is sufficient
- Shotcrete lining does not need expansion and construction joints
- Shotcrete can be applied even on uneven base successfully
- Shotcrete can be used for repair of disintegrated and leaking lining etc.
- Shotcrete can be applied at least from distance of 1 m , hence it is very useful to apply lining while tunneling

Disadvantages of shotcrete

- ✓ The success of shotcrete depends on the performance of the operator
- ✓ The cost of construction of shotcrete is more than ordinary concrete of same proportion and same thickness
- ✓ It is less durable than ordinary lining of the same thickness
- ✓ Its lining in canals is damaged very soon due to settlement, shrinkage and hydrostatic pressure etc
- ✓ To obtain perfect bond with the base is impossible

Applications of shotcrete

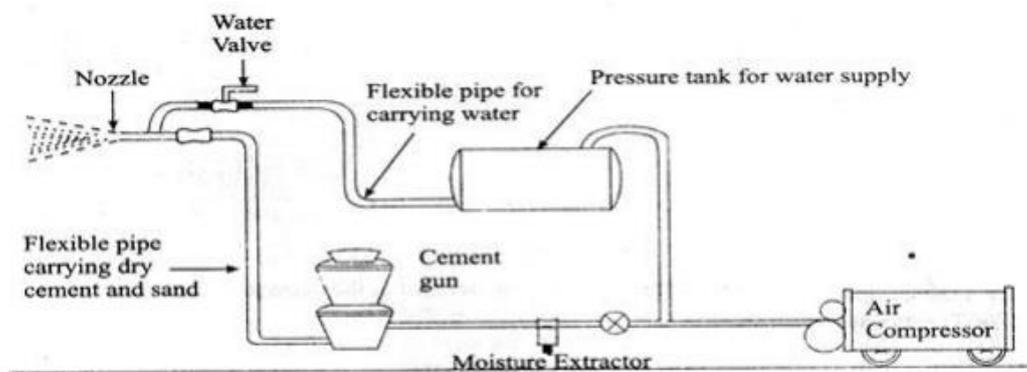
- Canal and tunnel lining
- Repair of concrete pavement
- Overlay of concrete pavements
- Refractory lining works
- Swimming ponds
- Pre-stressed tanks
- Thin overhead , vertical and horizontal surfaces

Process of Shotcreting

1. Mortar mixes of 1:4 or 1:4.5 and w/c ratio varies from 0.35 to 0.5 or 14 litres of water per 50kg of cement is sufficient.
2. Before putting the dry materials into the cement gun, the sand and cement should be mixed thoroughly for 12 minutes till the homogeneous mixture of one colour is obtained. Any mixed material not used within 45 minutes of mixing should be rejected.
3. In placing the mortar, the hose length should be kept as small as possible as long hose requires greater pressure for air and water. Though hose length up to 110 m has been used but preferably they should not be longer than 30 to 45 m.
4. The line diagram of a cement gun is shown in figure. After filling sand cement mix in vessel C, air at a pressure of 2.2 kg/cm² to 3.5 kg/cm² is sent from compressor A to vessel C through moisture extractor B. at B the moisture in air is absorbed and dry air reaches in the vessel C.
5. This air pushes the cement-sand mixture through pipe D and ejects it through nozzle E. as shown in Figure. Through another pipe, air is sent from compressor A at a pressure of 3.0 to 4.6 kg/cm² to water tank F. from this tank air is delivered through pipe G and ejected at E. pressures are controlled at E.

6. While guniting, the nozzle should be held normal to the surface and about 1 to 1.5 m from it. In order to obtain a uniform layer, it should be kept moving.
7. The process of guniting should be suspended when wind is blowing as it will not be possible to maintain the consistency of the mix.
8. The completed work should be protected from direct sun rays at least for 3 days and should be moist cured for at least 14 days

The material which bounces back from the working face is known as rebound. It is largely the coarser particles of sand which rebound and hence it should be avoided.



General arrangement of apparatus in guniting system.