

**INTRODUCTION**

Abrasive blasting is the process of ejecting a stream of abrasive particles from a blast machine using compressed air propelled at high speeds. Abrasive blasting is used for the cleaning, surface preparation and finishing of concrete surfaces.

Used as a finishing technique, abrasive blasting can be produce pleasing, decorative effects, enhancing the visual features of the sandblasted surface. Blasting can make the color of the surface uniform, expose aggregate and create designs. This unit is designed to acquaint you with the use of abrasive blasting for decorative purposes.

**FOCUS  
ASSIGNMENTS****FOCUS ASSIGNMENTS**

1. Find a company, either locally or on the Internet, that uses abrasive blasting for decorative purposes. What kind of blasting equipment do they use? What kind of decorative blasting do they perform?
2. Find an example of their work (a picture or the actual job) and describe the blasting job. Does it complement its surroundings? Is it well done?

**UNIT  
OBJECTIVE**

After completing this unit, you will show the following competencies by scoring at least 85% on the Written Test.

**SPECIFIC  
OBJECTIVES**

1. Explain the purposes of abrasive blasting.
2. Identify characteristics of abrasives.
3. Identify the components of an abrasive blasting setup.
4. State the degrees of exposure of a blasted surface finish.
5. Discuss the methods for decorative sandblast stenciling.
6. State the techniques for finishing concrete surfaces with abrasive blasting.



7. Explain the procedures for abrasive blasting concrete surfaces.
8. Describe the characteristics of a surface that has been sandblasted or etched.
9. List safety guidelines for abrasive blasting of concrete surfaces.



**OBJECTIVE 1**

**Explain the purposes of abrasive blasting.**

- **To prepare a slab or floor for resurfacing**
  - Remove stains, dirt, sealers, oils, chemicals, and grease
  - Open pores for material repair
  - Create a profile for repair

EXAMPLE: Overlay

- **To create a decorative finish**

- Exposed aggregate

✓ **NOTE:** This method of creating an exposed aggregate finish is mostly used on existing concrete. Refer to Unit 11, Exposed Aggregate Finishes, which covers creating exposed aggregate finishes on plastic concrete.

- Stenciled designs and patterns

EXAMPLE: Custom business logos

**OBJECTIVE 2**

**Identify characteristics of abrasives.**

✓ **NOTE:** Only use high-quality abrasives. Avoid using materials that have not been prepared for the purpose of blasting, such as sand and rock taken from riverbeds without proper cleaning, screening and grading.

- **Natural** — The most common natural abrasive is silica sand from beaches and rivers. Its advantages are its availability, cost efficiency and abrasive properties. It is the most friable of abrasives and cannot be reused. Other natural abrasives include flint, garnet and other minerals.

**CAUTION:** Silica quickly produces a large amount of dust that can cause a disease called silicosis when inhaled for a long period of time. OSHA has established regulations that limit worker's exposure to the dust. Check local regulations. Silica may be illegal in some areas.



- **Manufactured** — Produced specifically for blasting, these products include plastic, glass bead, steel grit and shot.
- **By-product** — A product of other manufacturing processes. These include agricultural by-products from food sources such as walnut shell and corncob and slag residue from power generating stations or metal smelting.

✓ **NOTE:** Many abrasives can be recycled, especially manufactured and by-product abrasives. Because of the health and environmental hazards of non-recyclable abrasives such as silica, it is highly recommended that contractors use recyclable abrasives when possible. Doing so can also reduce overall costs.

### OBJECTIVE 3

**Identify the components of an abrasive blasting setup.**

WORDS YOU SHOULD KNOW	
<b>abrasive</b>	the substance used for abrasive blast cleaning, finishing and preparation, for example, sand, slag, steel grit, and plastic
<b>friability</b>	a term that refers to the abrasive's capacity to break apart upon impact. If it is extremely friable it creates more small particles of dust

A blasting setup consists of three main components: the blast machine system, air compressor, and abrasive. The blast machine contains the abrasive and regulates the airflow. The compressor provides the air pressure and volume that propels the abrasive from the blast system. The abrasive, under the pressure of the forced air, cleans, finishes or prepares the surface as needed.

- **Blast machine system** — Cement masons can choose between two types of blast machine systems: suction and pressure blast.



- ❑ **Suction** — Pulls abrasive from a non-pressurized container that uses suction to blast the abrasive onto the surface. More often used for touch-up blasting or less work intensive jobs (Figure 1).

FIGURE 1



- ❑ **Pressure** — A moving stream of compressed air shoots the abrasive onto the concrete surface, frequently used in blast rooms and the outdoors
- **Air Compressor** — Air blasting requires a compressor that can produce a steady supply of high-pressured and high-volume air. The choice of a compressor is determined by the job specifications.



**CAUTION:** It is important to keep all hose connections secured during operation (Figure 2).

FIGURE 2



- ❑ For in-plant use, electric compressors are the common choice because they are economical.
- ❑ In the field, portable gasoline and diesel engines are the norm.
- ❑ Old-style, piston engines are not recommended. Pressure fluctuations affect the blasting speed making it difficult to control the outcome of the finish.
- ❑ Oil-free rotary vane and screw compressors are the recommended choice for air blasting.
- ❑ The size of the air compressor should be determined by adding the air requirement for all equipment plus a 50 percent reserve.



**CAUTION:** To prevent overheating, compressors require shutdown devices. Overheating produces carbon monoxide that is deadly when inhaled. Air compressors that supply breathing air to respirators such as air-fed helmets and hoods must have a high temperature shut-off, a carbon-monoxide alarm or both. See C.F.R. 1926.103.

## OBJECTIVE 4

**State the degrees of exposure of an abrasive blasted surface finish.**

### WORDS YOU SHOULD KNOW

<b>reveal</b>	the projection of the coarse aggregate from the surface after exposure
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There are four degrees of exposing a surface using abrasive blasting. The cement mason may choose what particular design they want to achieve with the degree or depth of sandblasting. The different exposures are:

- **Brush** — Removes the surface sheen producing no reveal.
- **Light** — Exposes fine aggregate and the surface of the coarse aggregate, making the color uniform.
- **Medium** — Exposes coarse aggregate producing slight reveal.



- **Deep** — Exposes and reveals the coarse aggregate creating an uneven rocky surface.

✓ **NOTE:** Deep sandblasting is costly. This method is generally used for light and medium exposure of surfaces.

## OBJECTIVE 5

### Discuss the methods for decorative sandblast stenciling.

Decorative sandblast stenciling is an innovative method of creating designs on concrete surfaces. Borders, logos, diverse patterns and original artwork can be created with sandblast stenciling. Cement masons can create their own stencils with hardboard, plastic, sheetmetal, or plywood - commercial sand blasting tape is the most commonly used.

- **Stencils**

- Cement masons can purchase stencils or create their own with hardboard, rubber blasting tape, plastic, sheet metal, or plywood (Figures 3 and 4).

FIGURE 3



FIGURE 4



- ❑ Complicated creative patterns such as ornamental patterns should be purchased from companies that specialize in these designs.
- ❑ Companies offer standard patterns but can also design patterns with computer-assisted programs.

- **Equipment**

- ❑ Contractors use a wide range of air compressors and sandblast pots.

EXAMPLE: One contractor may prefer a 100 lb. blast machine powered by a 100 cfm or 180 cfm compressor while others may choose a portable handheld or walk-behind compressor.

- ❑ Use a recovery head and HEPA filtered vacuum equipment to remove blasting residue and dust for safety reasons and to provide better visibility for the operator.
- ❑ Use #90 grit size abrasive for average sandblast profiles and #60 grit for deeper profiles.
- ❑ Wet sandblasting nozzles are productive and useful for controlling dust problems but they should not be used with adhesive-backed stencils

- **Procedures**

- ❑ Sandblast stenciling is more commonly used on horizontal surfaces. It is also possible, however, to sandblast designs on walls and columns.
- ❑ Wait 28 days after sealing the surface before sandblasting the design.

## OBJECTIVE 6

### **State the techniques for finishing concrete surfaces with abrasive blasting.**

Finishing with an abrasive machine can be related somewhat to exposed aggregate. It takes a trained eye to produce a uniform surface from start to finish. A circular pattern with the nozzle should be used to avoid striping which can occur by vertical or horizontal strokes. Always do samples ahead of time for approval by the architect or owner. Samples will also help you determine the grit and type of abrasive material, nozzle and air pressure needed to be the most productive and do the best work.



## OBJECTIVE 7

- Blasting with plastic components, glass beads and agricultural abrasives
- Low-pressure blasting with ceramic or glass beads
- Exposing aggregate surfaces

**Explain the procedures for abrasive blasting concrete surfaces.**

### WORDS YOU SHOULD KNOW

**gap-grading** leaving out some of the intermediate aggregate normally found in a concrete mix

To insure an attractive surface when blasting, certain procedures should be followed.

- Create a sample panel to get an idea of how the aggregate will look after being sandblasted.
  - ✓ **NOTE:** Unsealed joints will leave lines on the concrete that cannot be removed by blasting exposed fins, projections.
- Choose equipment according to job requirements. A light removal of surface skin can be done with most sandblasting equipment. A deeper cut, however, requires equipment with the necessary capacity for the blast.
- If scheduling allows, do the blasting in the first 24 to 72 hours after casting. The concrete strengthens as it cures making it more difficult to blast off the surface to an appreciable depth, thus, increasing the cost of the operation.
  - ✓ **NOTE:** Surface retarders may be used to aid in the sandblasting process.

## OBJECTIVE 8

**Describe the characteristics of a surface that has been sandblasted or etched.**

Concrete surfaces can be blasted to expose and etch the surface of the aggregate, creating a variety of textured surfaces.

- The depth of the blast depends on the desired texture and color.



- The texture and color will change during the blasting process.
- The depth of the blast and exposure of the coarse aggregate will influence the color of the finish by bringing out the color of the aggregate.
- The more the coarse aggregate is exposed, the more it will influence the surface color.

✓ **NOTE:** If color uniformity is desired, do not choose contrasting matrix and coarse aggregate colors.

## OBJECTIVE 9

### List safety guidelines for abrasive blasting of concrete surfaces.

Abrasive blasting produces a variety of toxic dust-born particles that are hazardous to workers in the area. Inhaling this dust can cause severe lung diseases and even death. Lead and silica, for example, pose a hazard if inhaled. Some materials that are being blasted can also produce a toxic residue. Some abrasives may be flammable or explosive such as zinc, aluminum and tin. Safety guidelines must be strictly followed during abrasive blasting.

- Before blasting, check the MSDS (Material Safety Data Sheets) to determine the chemical composition of the abrasive material being used.
- Use a respiratory protection system appropriate for the particular blasting application. Consult a safety engineer to determine the appropriate respiratory system (Figure 5).

FIGURE 5



- Substances that contain more than 5% uncombined silica should be enclosed when blasting to prevent the escape of dust.



- Workers should never inhale dust. To prevent this occurrence, they should wear a NIOSH (National Institute of Occupational Health and Safety) approved blasting helmet (Figure 6).

FIGURE 6



- Workers should also wear protective clothing including coveralls, safety shoes and protective gloves (Figure 7).

FIGURE 7



- Workers should be warned of the dangers of inhaling the dust and are entitled to an annual medical examination that is paid for by the employer.



