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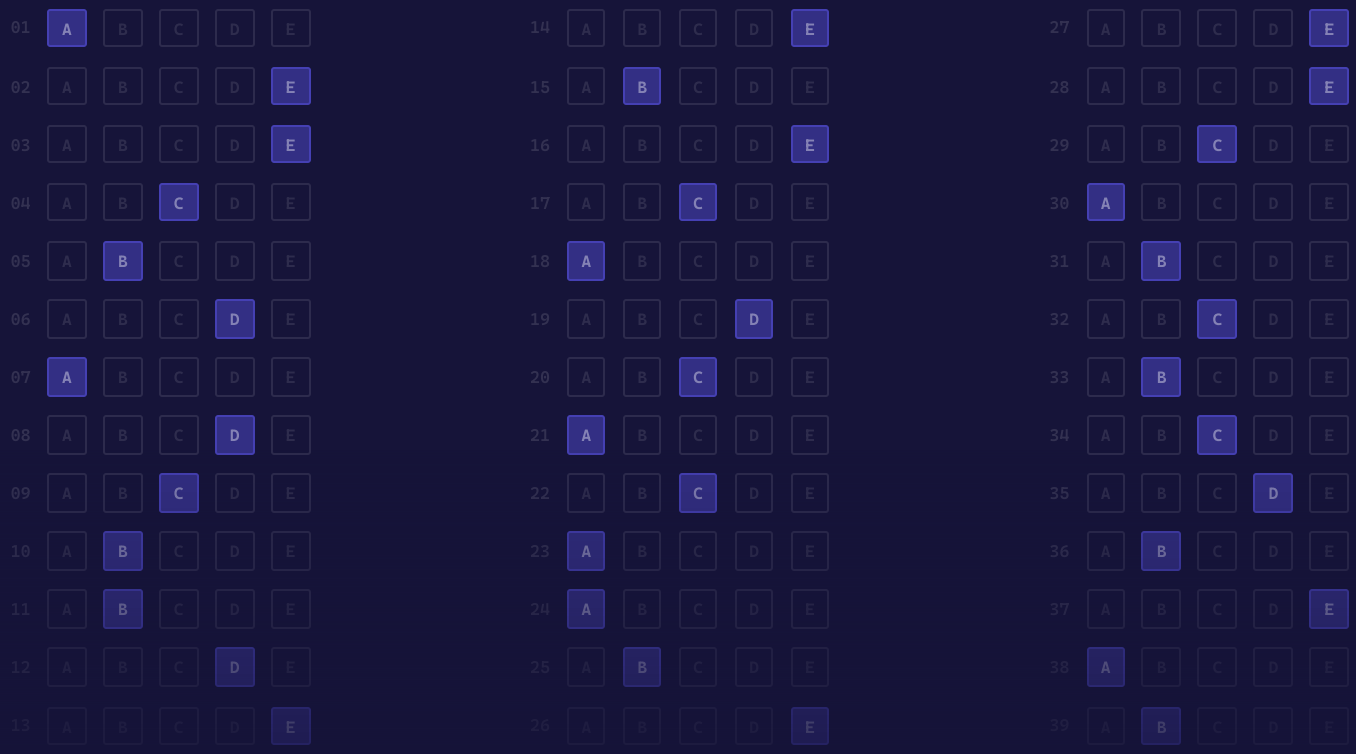


PRACTICE QUESTIONS

## American Concrete Institute (ACI)

# SCND

SHOTCRETE NOZZLEMAN-DRY MIX PROCESS

| EDITION | QUESTIONS | FORMAT |
|---|---|---|
| Demo | 9 | Limited Edition PDF |

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# Before you begin

## What this is

9 practice questions for American Concrete Institute (ACI) `SCND`, each with its answer key and an explanation. Answer a question before you read its key — the explanation is worth more once you have committed.

## If something looks wrong

Send us three things and we will check it:

- the exam code, `SCND`
- the question number
- the email address on your order

Write to **support@mometrix.net**. We reply within one business day.

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**QUESTION 1** SINGLE CHOICE

In the dry-mix shotcrete process, where does the water get added to the mixture?

A Water is added at the batching plant and mixed thoroughly with the cement and aggregates before being pumped through the hose.

**B Water is added at the nozzle by the nozzleman just before the material is projected onto the receiving surface.**

C Water is added at the pre-wetting chamber inside the gun before the material enters the delivery hose.

D Water is added at the air compressor intake so that it is entrained with the conveying air.

**ANSWER B**

**WHY** In the dry-mix process, cement, aggregates, and admixtures are delivered through the hose pneumatically as a damp mix, and the nozzleman controls the addition of water (and air) at the nozzle through a water ring just before projection. This is the defining characteristic that distinguishes the dry-mix process from the wet-mix process.

**QUESTION 2** SINGLE CHOICE

If a nozzleman adds too little water to the dry-mix shotcrete stream at the nozzle, which condition is most likely to result?

**A Excessive rebound, high dust, and reduced cement hydration leading to lower strength.**

B Sagging of the material on vertical surfaces due to excess slump.

C Sand streaking caused by too much entrained air at the nozzle.

D Cold joints caused by overly wet material sliding off the substrate.

**ANSWER A**

**WHY** Too little water causes the material to be excessively dry at impact, producing increased rebound (more aggregate bounces off), excessive dust, and incomplete cement hydration, all of which reduce in-place strength. Too much water, by contrast, leads to sagging, sloughing, and reduced strength from high water-cement ratio.

**QUESTION 3** SINGLE CHOICE

When shooting shotcrete on a vertical wall, the nozzle should be held at approximately what angle to the receiving surface?

A 30 degrees

B 45 degrees

C 60 degrees

**D 90 degrees (perpendicular)**

**ANSWER D**

**WHY** ACI shotcrete nozzleman guidance recommends the nozzle be held perpendicular (90 degrees) to the receiving surface whenever possible. This orientation minimizes rebound, produces the most uniform compaction, and yields the highest in-place quality. Angled shooting increases rebound and can create laminations.

**QUESTION 4** SINGLE CHOICE

What is the typical recommended stand-off distance for dry-mix shotcrete placement?

A 2 to 6 inches (0.5 to 1.5 m)

B 1 to 3 feet (0.3 to 0.9 m)

**C 3 to 5 feet (0.9 to 1.5 m)**

D 6 to 8 feet (1.8 to 2.4 m)

**ANSWER C**

**WHY** ACI guidance and standard shotcrete practice call for a stand-off distance of roughly 3 to 5 feet (about 0.9 to 1.5 m) for dry-mix shotcrete. Shooting too close causes excessive rebound and sand streaking; shooting too far increases dust, reduces compaction, and increases overspray.

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**QUESTION 5** SINGLE CHOICE

A vertical shotcrete wall shows thin sandy layers parallel to the surface between layers of sound shotcrete. This defect is called:

**A** **Sanding (or sifting)**

B Shadowing

C Voids

D Plastic shrinkage cracking

**ANSWER A**

**WHY** Sanding (also called sifting) is the formation of thin sandy planes between successive shotcrete layers. It is typically caused by letting a previously placed layer become too dry before the next layer is applied, by shooting at too steep an angle, or by excessive water in the mix. It creates planes of weakness in the finished shotcrete.

**QUESTION 6** SINGLE CHOICE

In addition to the water supply, the dry-mix nozzleman typically requires a source of compressed air for which purpose?

A To pre-mix the dry materials at the gun

**B** **To atomize the water at the nozzle and to convey and accelerate the material onto the receiving surface**

C To cool the cement during hydration

D To provide breathing air for the nozzleman

**ANSWER B**

**WHY** Compressed air at the nozzle has two primary jobs in the dry-mix process: it atomizes the water introduced through the water ring so it mixes with the dry materials, and it provides the velocity to propel the mixed shotcrete onto the receiving surface and compact it. Adequate, steady air pressure and volume are essential to consistent quality.

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**QUESTION 7** SINGLE CHOICE

Before applying shotcrete to a concrete or rock substrate, the receiving surface should be:

A Smooth and polished so the shotcrete flows evenly over it

**B Clean, sound, damp (SSD) and free of bond-inhibiting materials**

C Coated with a curing compound to improve bond

D Allowed to dry completely so the shotcrete adheres by suction

**ANSWER B**

**WHY** A properly prepared substrate is clean, sound, and brought to a saturated surface-dry (SSD) condition so that the substrate does not absorb mix water (which would hurt hydration and bond), but no free water film is present. Bond-inhibiting materials such as laitance, oil, dirt, or curing compound must be removed before shooting.

**QUESTION 8** SINGLE CHOICE

Proper curing of newly placed shotcrete is required primarily to:

A Reduce the alkalinity of the cement paste so it bonds to subsequent lifts

**B Prevent moisture loss so that cement hydration continues and the shotcrete achieves its intended strength and durability**

C Allow entrained air to escape before final set

D Promote carbonation of the surface layer for aesthetic finish

**ANSWER B**

**WHY** ACI requires that shotcrete be cured to maintain adequate moisture and temperature so cement hydration continues. Without proper curing, surface drying causes plastic shrinkage cracking, dusting, and significantly reduced strength and durability. Curing compounds, wet burlap, or other ACI-accepted methods are used.

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**QUESTION 9** MULTIPLE CHOICE

Which of the following items of personal protective equipment (PPE) are required for a dry-mix shotcrete nozzleman while shooting? (Choose two.)

A Rubber gloves and rubber boots only

**B Approved respirator or hood with fresh air supply to protect against dust and rebound**

**C Safety glasses, goggles, or face shield to protect against rebound**

D Hard hat only when working under other crews; not required when actively shooting

**ANSWER** **B · C**

**WHY** Dry-mix shotcrete generates significant dust and rebound at the nozzle, so a respirator (or fresh-air hood) and eye/face protection are essential. Rubber gloves and boots alone are not adequate PPE for the nozzleman, and a hard hat is generally required in active work areas regardless of whether the worker is shooting.

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