



# Shotcrete – Sculpted Shotcrete

## Revision and Approval

Revision	Date	Nature of Changes	Approved By
0	12-08-2022	Original Issue	Richard Foley

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## Background

This process establishes Structure Construction (SC) responsibilities and procedures for review and authorization of submittals, quality assurance, materials, construction, and payment for sculpted shotcrete.

Additional unique requirements that supplement this process are detailed in:

- [Section 52, Reinforcement](#)
- [BCM 53-1, Shotcrete – General](#)
- [BCM 53-2, Shotcrete – Structural Shotcrete](#)

Prior to reviewing this Bridge Construction Memo (BCM), it is essential to review the [Contract Specifications](#), Section 53-3, *Shotcrete – Sculpted Shotcrete*, that this BCM is based on as identified in the title block above. The information in the *Contract Specifications* typically will not be repeated in the text of this BCM.

## Process Inputs

1. Form [CEM-3101](#), *Notice of Materials to be Used*
2. Contractor’s Quality Control (QC) Plan
3. Sculpted shotcrete mix design (must be compliant with *Contract Specifications*, Section 53-2.02, *Shotcrete – Structural Shotcrete – Materials*)
4. Strata lines layout
5. Test Panels.

# Procedure

1. All work associated with this process is charged as [Project Direct – Construction](#).
2. Inspection of field work for this process is:
  - a. [Benchmark](#) for:
    - i. Completed form inspection including grades, prior to sculpted shotcrete application.
    - ii. Completed strata line inspection and authorization.
  - b. [Intermittent](#) for inspection of forms, rebar, and strata lines.
  - c. [Continuous](#) for inspection of sculpted shotcrete delivery and application.
3. Before construction begins the Structure Representative (SR) or delegate must:
  - a. Review the *Construction Manual*, Chapter 4, *Construction Details*, [Section 53, Shotcrete](#).
  - b. Verify information is correct on [Form CEM-3101, Notice of Materials to be Used](#), and includes cement and aggregate.
  - c. Review American Association of State Highway and Transportation Officials (AASHTO) publication, [Inspector's Guide for Shotcrete Repair of Bridges](#), for guidance and information such as shotcrete basics, corrosion protection considerations, construction monitoring, etc.
  - d. Review guidance found in *Shotcrete – A Field Guide for SC Employees*, available on the [SC Technical Team F page](#) under the *Resources* section.
  - e. Review and authorize or reject for resubmittal in writing the following required submittals per the contract requirements:
    - i. Contractor's QC plan
    - ii. Preconstruction test panels
    - iii. Production test scores and test results
    - iv. Sculpted shotcrete mix design:
      1. Sculpted shotcrete mix design must conform to the specifications for structural shotcrete. Refer to *Contract Specifications*, Section 53-2.02, *Shotcrete – Structural Shotcrete – Materials*, and *Concrete Technology Manual*, [Chapter 3, Review of Concrete Mix Designs](#).
  - v. Sculpted shotcrete test panel:
    1. Verify it is safely accessible for inspection and coordinate a visit with the Landscape Architect.

4. During construction the Structure Representative (SR) or delegate must:
  - a. Perform the following field inspection tasks:
    - i. Verify line and grade of forms.
    - ii. Verify that the strata lines match authorized strata line layout before placing reinforcing steel. Remember to invite the Landscape Architect as this will allow them an opportunity to provide input, and will minimize rework.
    - iii. Verify all placement of reinforcement bars before placing shotcrete.
    - iv. Discuss safe inspection access with the Contractor. Fall protection must be used when riding in a manlift (with a certified operator) to perform inspection.
    - v. Understand Cal/OSHA safety requirements such as fall protection, reinforcement impalement protection, and abrasive blast protection; the latter is found in CCR Title 8, §5151, *Ventilation and Personal Protective Equipment Requirements for Abrasive Blasting Operations*.
  - b. Perform the following shotcrete application inspection activities:
    - i. Verify delivery of the authorized shotcrete mix.
    - ii. Verify that the lead sculptor and nozzle men listed on the authorized plan are being used to perform the work.
    - iii. Verify bottom-up application of shotcrete by the wet-mix process unless otherwise authorized.
      1. Verify that the various elements of the shotcrete operation are in conformance with the authorized submittals.
    - iv. Do not allow the Contractor to use rebound in sculpted shotcrete.
    - v. After the first day of shotcrete application, verify that the surface matches the authorized test panel and continue to monitor for consistency.
  - c. Perform sampling and testing of shotcrete materials.
  - d. Perform final sculpted shotcrete surface finish inspection prior to curing application.
  - e. Verify that sculpted shotcrete is cured as specified in the *Contract Specifications*, Section 51-1.03H, *Concrete Structures – General – Construction – Curing Concrete Structures*.
  - f. Request and authorize a repair plan for the replacement of any damaged sculpted shotcrete surfaces.

5. Following construction, the SR or delegate must:
  - a. Discuss lessons learned with the Contractor and staff.
  - b. Document all inspection, construction, and quality assurance activities pertinent to this BCM in the Daily Reports per [BCM C-7](#), *Daily and Weekly Reports*.
  - c. Complete as-built plans. Refer to the discussion regarding as-builts in [BCM C-6](#), *Required Documents to be Submitted During Construction*.
6. File all test results and Daily Reports in the appropriate category in the project records as specified in the *Construction Manual*, [Section 5-102](#), *Organization of Project Documents*.

## **Process Outputs**

1. Authorized sculpted shotcrete submittals (Subcontractor's experience, installation plan, test panel)
2. Completed sculpted shotcrete wall conforming to project requirements
3. Sculpted shotcrete test results (core compressive breaks)
4. Daily Reports (include lessons learned)
5. As-built plans.

## **Attachments**

None