



# Sound Walls

## Revision and Approval

Revision	Date	Nature of Changes	Approved By
0	03-02-2023	Original Issue	Richard Foley

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## Background

This process establishes Structure Construction (SC) responsibilities and procedures for submittal review and authorization, quality assurance, and construction of sound walls (including masonry block, precast concrete panels, and alternative sound wall systems).

For precast concrete panel sound walls, additional requirements are detailed in the [Contract Specifications](#) (CS):

- Section 51, *Concrete Structures*
- Section 90-4, *Concrete – Precast Concrete*

Prior to reviewing this Bridge Construction Memo (BCM), it is essential to review the CS, Section 58, *Sound Walls*, 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. Project that requires new sound wall construction or modifications to existing sound walls.

# 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 the following activities:
    - i. Verification of sound wall layout line, and verification of grades for structural components supporting the sound wall (typically top of barrier elevation) prior to actual sound wall construction.
    - ii. Placement of bar reinforcing steel.
    - iii. Verification of sound wall precast concrete panel materials and concrete masonry units (CMU) upon arrival at the jobsite. Check for damage and conformance with authorized submittals.
  - b. [Intermittent](#) during all work other than various activities specifically described in “Benchmark” above and “Continuous” below.
  - c. [Continuous](#) for the following activity:
    - i. Grouting of masonry block cells
3. Before construction begins:
  - a. Review the contract documents for sound wall construction. Note that:
    - i. In addition to the Structure plan sheets, details for sound walls may also be located on the Utility, Drainage and Electrical sheets. Verify that there are no discrepancies between these sheets.
    - ii. American Society for Testing and Materials standards (ASTMs) can be accessed using the “Engineering Workbench” section of the [Caltrans Transportation Library](#) (note – registration required).
    - iii. For the *California Building Code* and other industry standards, request a copy from the Bridge Design (BD) Structure Project Engineer or Materials Engineering and Testing Services Representative ([METS Rep](#)).
    - iv. Aesthetic requirements shown (texture, color, architectural pattern, anti-graffiti coatings, etc.) may require discussion with the District Landscape Architect (DLA) and Local Agency Representatives; refer to [Attachment 1, Sound Walls – Additional Information](#), for further guidance.
    - v. For sound walls constructed with precast concrete panels, review unique contract requirements found in:
      1. *Contract Specifications*, Section 51-4.01C(2), *Concrete Structures – Precast (PC) Concrete Members – General – Submittals – Shop Drawings*, for requirements of shop drawings. Note that CS, 58-3.01A,

*Sound Walls – Precast Concrete Panels – General – Summary*, provides the contractual link to Section 51, *Concrete Structures*.

2. *Contract Specifications*, Section 90-4.01D(1), *Concrete – Precast Concrete – General – Quality Assurance – General*, which defines sound wall panels and supports as tier 2 category.
  3. *Contract Specifications*, Section 90-4.01D(2), *Concrete – Precast Concrete – General – Quality Assurance – Quality Control (QC)*, for requirements such as:
    - a. Fabrication of PC concrete members at a plant on the Authorized Facility Audit List
    - b. Precast (PC) concrete quality control (QC) plan
    - c. Contractor to hold a PC concrete QC meeting.
- b. Review the *Construction Manual (CM)*:
- i. Chapter 4, [Section 4-58](#), *Construction Details – Sound Walls*
  - ii. Chapter 6, [Section 6-2](#), *Sampling and Testing – Acceptance of Manufactured or Fabricated Materials and Products*.
- c. Review the [Outline of Field Construction Practices](#), Chapter 46, *Sound Walls*.
- d. Verify that the Contractor's baseline critical path method schedule and updates include the following activities:
- i. Review and authorization of submittals related to sound walls.
  - ii. METS source inspection, if required.
  - iii. Fabrication and authorization of test panels, for sound walls constructed with precast concrete panels. Multiple test panels may be necessary to verify that the Contractor's proposed construction materials and methods will produce a satisfactory finish, pattern, and color.
  - iv. Sound wall construction.
- e. For sound walls constructed with precast concrete panels, attend the PC concrete QC meeting (although the Contractor is required to hold the meeting, it may largely be organized and conducted by the METS Rep). During the meeting, verify that the following topics are discussed:
- i. Qualifications for the quality control inspector
  - ii. Qualifications for quality control laboratory testing personnel
  - iii. Production facility must be on the [Authorized Facility Audit List](#).
- f. Although not currently required in the CS, it is good practice to schedule and conduct a sound wall preactivity meeting with the Contractor, their sound wall

- subcontractor(s), and the Resident Engineer (RE). Discuss topics including but not limited to:
- i. Allowable lane closure hours, conditions of encroachment permit and/or temporary construction easements (if applicable), and any noise-related restrictions.
  - ii. Work area access, and available staging location for materials and equipment.
  - iii. Sequencing of sound wall construction activities with respect to District work such as drainage, utilities, and electrical.
  - iv. Quality control requirements including:
    1. Compressive strength testing intervals
    2. Structural Masonry Special Inspector qualifications and required duties.
- g. After requesting any necessary assistance from the METS Rep, BD Structure Project Engineer, DLA, or Technical Specialists, review and authorize the following submittals:
- i. For masonry block sound walls:
    1. Test data for prepackaged mortar materials, compressive strength of masonry for preconstruction testing and field QC testing, and grout compressive strength
    2. Mix design for each grout mix proposed for use
    3. Mix design for the mortar cap
    4. Samples of a CMU for each color and texture. Retain these samples and maintain accessibility for reference during construction.
  - ii. For sound walls constructed with precast concrete panels:
    1. Shop drawings; verify that the Contractor has electronically submitted shop drawings to SC Office Associates (in lieu of Office of Structure Design [OSD] Documents Unit), and that SC Office Associates have distributed them for review to all involved parties.
    2. Mix design for precast concrete panels.
    3. Project-specific PC concrete QC plan:
      - a. Note that a separate submittal is required for each plant proposed for use, and all plants must be on the [Authorized Facility Audit List](#).
  - iii. For alternative sound wall systems:
    1. Shop drawings; verify the same submission and distribution procedure is followed as outlined for precast concrete panels above.

- h. Review the following informational submittals:
  - i. For masonry block sound walls:
    - 1. Manufacturer's descriptive data for each type of CMU, accessory, and manufactured material.
    - 2. Qualification data for the authorized laboratory.
  - i. Verify that all sound wall submittals have been distributed to field staff for their reference during construction.
  - j. Verify with the RE that:
    - i. There are no unresolved right-of-way or permitting issues, if applicable.
    - ii. The Contractor has submitted [Form CEM-3101](#), *Notice of Materials to Be Used*, for all sound wall materials, and that:
      - 1. The forms have been forwarded to METS,
      - 2. METS has provided responses via [Form TL-0028](#), *Notice of Materials to be Inspected at the Job Site* or Form TL-0608, *Notice of Materials to be Furnished* as appropriate.
  - k. For masonry block sound walls, verify the qualifications for the Contractor's proposed Structural Masonry Special Inspector.
  - l. Verify that all preparatory work has been completed (foundations, barriers, grading and drainage, utilities, electrical, etc.) in accordance with the contract documents. Pay special attention to:
    - i. Begin/end points and spacing for bar reinforcing steel protruding from concrete barrier, pile cap, or footing, for verification that bar reinforcing steel will accommodate theoretical locations for masonry block open cells. Contractor may need to cut bar reinforcing steel if there is an issue and drill and bond new bars into the newly-constructed barrier or supporting element.
    - ii. As-built locations of overhead sign structure posts, electroliers, CCTV poles, etc., to verify that they match planned locations of sound wall discontinuities to facilitate the aforementioned items.
- 4. During construction:
  - a. For all sound wall types:
    - i. Verify that all sound wall construction activities comply with the contract documents, authorized action submittals, informational submittals, and manufacturer's instructions as applicable.
    - ii. Verify sound wall layout (including overall alignment, location of expansion joints, location of access doors, location of recesses or wall discontinuities for overhead sign structure posts, electroliers, CCTV poles, etc.).

- iii. Upon delivery to the job site, verify that sound wall materials match the information in their corresponding submittals and have not been damaged or otherwise compromised during transport.
- iv. Perform material acceptance in accordance with *CM*, Chapter 6, [Section 6-203, Sampling and Testing – Manufactured or Fabricated Materials and Products Acceptance](#), for all sound wall materials prior to their use and provide any attached material documentation to the SR. Complete [Form CEM-4102, Material Inspected and Released on Job](#), for all materials that have not been released by METS:
  - 1. Sound wall materials commonly subject to source inspection and released by METS include galvanized steel components of access gates.
  - 2. Sound wall materials commonly accepted on the basis of the Authorized Materials List include [Alternative Sound Wall Systems](#). Refer to *CM*, Chapter 6, *Sampling and Testing*, [Table 6-2.2, Materials Acceptance Based on Authorized Material List](#).
  - 3. Sound wall materials typically accepted by certificate of compliance include masonry blocks (CMU, aggregate for grout, and grout), precast concrete panels and cementitious materials used therein, bar reinforcing steel, expansion joint filler material, and timber for access gates. Refer to *CM*, Chapter 6, *Sampling and Testing*, [Table 6-2.3, Materials Accepted by Certificate of Compliance](#).
- v. Verify that scaffolding has been constructed in accordance with the Cal/OSHA [Construction Safety Orders](#), Article 21, *Scaffolds – General Requirements*. Note that the *Construction Safety Orders* are found in California Code of Regulations, Title 8, Chapter 4, Subchapter 4.
- vi. Immediately prior to incorporation into production work, verify that sound wall materials have not been damaged or otherwise compromised during storage and handling at the job site.
- vii. In the event that revisions to the sound wall aesthetics (texture, color, architectural pattern, anti-graffiti coating, etc.) are pursued during construction, coordinate with the DLA and Local Agency Representatives to provide input and concurrence before a change order is issued.
- viii. In the event that revisions to the sound wall layout are pursued during construction, coordinate with the RE for verification that Caltrans Division of Right of Way personnel have provided input and concurrence. Corresponding revisions to encroachment permits and/or temporary construction easements may be required.
- ix. In the event of noise complaints from the public, particularly for sound walls in close proximity to existing businesses or residences, coordinate

- with the Contractor to verify the actual decibel level created by the work, and check against noise restrictions specified in the contract documents.
- x. Record quantities for all bid items corresponding to sound walls. Complete [Form CEM-4801](#), *Quantity Calculations*, on a monthly basis for each of these bid items as work progresses and distribute the completed forms to the RE.
  - xi. Document all inspection, construction, and quality assurance activities, pertinent to this BCM, in the daily reports per [BCM C-7](#), *Daily and Weekly Reports*.
- b. For masonry block sound walls:
- i. Verify that rows of regular and high strength concrete masonry units (referred to in the CS as HS CMU) are utilized where required in accordance with the contract documents.
  - ii. Verify that all cells with vertical reinforcement and bond beams are filled with grout. Verify that grout is vibrated and reconsolidated as required by the CS.
  - iii. Verify that sound walls are constructed in lifts of no more than 4 feet, with grouting completed and bond beam placed before construction on the next lift begins.
  - iv. Verify that exposed concrete masonry unit cells in partially completed sound walls are covered during inclement weather.
  - v. Verify that the Contractor's Structural Masonry Special Inspector is present at the job site on a daily basis and is submitting daily field reports in a timely fashion as work progresses. In the event of non-compliance, require the Contractor to replace the Structural Masonry Special Inspector.
  - vi. As materials arrive at the job site, obtain certificates of compliance for:
    - 1. Concrete masonry units (CMUs)
    - 2. Aggregate for grout
    - 3. Grout.
- c. For sound walls constructed with precast concrete panels:
- i. Coordinate with the DLA for inspection of the completed test panel. The test panel is typically located at the fabricator's facility rather than the project site. If ordered, construct additional test panels until a satisfactory finish, pattern, and color is authorized by the DLA. Multiple test panels may be necessary for the panels to be authorized for use.
  - ii. Verify that a daily production log is maintained by the quality control manager at the precasting plant.



- iii. Review and authorize the precast concrete report (to be submitted prior to shipping precast concrete panels to the job site).
  - iv. As precast concrete panels arrive at the job site, obtain certificates of compliance for:
    1. Cementitious material used in precast concrete panels, signed by the precast concrete product manufacturer.
    2. Each precast concrete panel, signed by the QC manager.
  - d. For sound walls constructed with alternative sound wall systems, verify that the sound wall is constructed to the lines and grades shown, with permissible variation as outlined in the CS.
5. Following construction:
- a. Provide final acceptance of the work. Verify that there are no visual defects on either side of the sound wall and/or any miscellaneous punchlist items of work remaining prior to the RE granting relief of maintenance to the Contractor in accordance with *CM*, Chapter 3, [Section 3-520](#), *General Provisions – Control of Work – Maintenance and Protection Relief*.
  - b. Lock all sound wall access gates with a Caltrans padlock ([item number 5340-01007](#) from Division of Maintenance’s warehouse product catalog).
  - c. For masonry block sound walls, verify that the Contractor’s Structural Masonry Special Inspector submits the final report.
  - d. For sound walls constructed with precast concrete panels or alternative sound wall systems, verify that the Contractor has submitted as-built shop drawings.
6. File all project documentation (correspondence, submittals, certificates of compliance, daily reports, etc.) in the appropriate category in the project records as specified in the *Construction Manual*, Chapter 5, [Section 5-102](#), *Contract Administration – Project Records and Reports – Organization of Project Documents*.

## **Process Outputs**

1. Authorized submittals
2. Completed materials acceptance documentation
3. Daily reports
4. Completed sound walls conforming with the contract requirements
5. As-built shop drawings for precast concrete panels and alternative sound wall systems



# **Attachments**

1. [Attachment 1](#), *Sound Walls – Additional Information*