# Precast Sound Walls

## Field Installation Best Practices Manual

NPCA

Precast ... The Concrete Solution

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Precast Concrete Sound Wall Systems Best Practices Manual



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NOTES

1. This manual does not claim or imply that it addresses all safety-related issues, if any, associated with its use. The manufacture of concrete products may involve the use of hazardous materials, operations and equipment. It is the user's responsibility to determine appropriate safety, health and environmental practices, and applicable regulatory requirements associated with the use of this manual and the manufacture of concrete products.
2. Use of this manual does not guarantee the proper function or performance of any product manufactured in accordance with the requirements contained in the manual. Routine conformance to the requirements of this manual should result in products of an acceptable quality according to current industry standards.

# INTRODUCTION

This Best Practices Manual is designed to provide general information on wetcast precast concrete sound walls and provide guidance in proper field construction techniques. This manual includes the basics of wall construction and presents many of the details encountered in site work. Visit our website www.precast.org, NPCA's BPM (Best Practice Manual), the Sound Wall Technical Brochure or consult with your local precast wall design engineer for additional information.

# DEFINITIONS

**backfill** – earth or other material placed between a retaining wall and existing ground to replace material that has been previously excavated.

**base material** – a base pad with 28-day compressive strength of 3,000 psi or a free-draining granular material that has been compacted and leveled.

**borrow soil** – any soil imported from another location, typically offsite, to be used as backfill.

**contractor** – person or entity who undertakes responsibility for the construction of the sound wall.

**engineer** – owner's designated organization or trained and experienced individual with authoritative charge over engineering functions and responsibilities.

**foundation (also called caisson footings, piles, piers, continuous footings)** – concrete structure usually constructed below ground level in various widths (or diameters) and depths used to transmit the load directly to the supporting soil.

**foundation soil** – soil mass supporting the wall base. Foundation soil is typically undisturbed in-situ soils; these soils may be compacted to reduce settlement from base excavation work. Proof-rolling may be required in order to obtain a firm, unyielding base for the wall.

**manufacturer's representative** – a product representative able to provide technical assistance to the contractor, engineer or owner.

**owner** –owner of the project, who is identified in the project contract as being responsible for the payment for the work performed under the terms of the contract.

**shop drawings** – graphics, usually in contract documents, produced by the sound wall supplier to show installation details for the contractor.

**Site contractor** – organization responsible for the installation of the wall system.

**soil compaction** – proper soil placement and consolidation are essential to the successful performance of sound wall footings. Soils must be compacted in specified lifts to achieve maximum soil shear strength and validate the design.

**subbase soil** – see foundation soil

**subgrade soil** – see foundation soil

# CONSTRUCTION RESPONSIBILITIES

Precast concrete sound walls are available in a variety of designs with each system having its own unique installation requirements. Sound walls should be installed to meet the design criteria of the prescribed wall system as well as the criteria dictated by the owner, engineer and local building codes.

### Manufacturer's Responsibilities

Responsibilities include assisting the owner, contractor and inspectors in scheduling of materials, construction procedures, contract documents, plans and engineering specifications. A manufacturer's representative is available to assist and train the contractor and inspectors as requested and when necessary. To locate an NPCA producer member please click on the following link: http://www.precast.org/find-a-precaster?t=45

The manufacturing of sound wall products should be in compliance with industry specifications and guidelines. Refer to Sound Wall BPM for additional information: http://www.solutions.precast.org/pdfs/SoundWallTechBrochure_12-23-09.pdf

### Engineer or Owner's Representative Responsibilities

Owner representative or Engineer is responsible for the enforcement of the contract documents, plans and specifications. Owner shall employ the services of a material engineering/testing firm to provide quality control testing (if required by the owner or building agency) for the casting of panels and pouring of foundations.

Owner and Engineer shall not be responsible for construction means or methods or for safety of workers or of the public.

### Site Contractor/Installer Responsibilities

The site contractor shall be responsible for:

- Checking the materials upon delivery to assure that proper materials have been received.
- Protecting the materials from damage. Damaged materials shall not be incorporated into the wall system.
- Preventing excessive mud, concrete, adhesives and other substances that may adhere after coming in contact with the materials.
- Furnishing and installing precast wall units to the lines and grades shown on the plans and as specified.
- Patching and coating walls as required.
- Job site safety.

# MATERIALS

Concrete for precast sound wall units and foundations shall have a minimum 28-day compressive strength of 2,500 psi or as required by engineering. Entrained air content shall be between 5% and 7% or as required by engineering. Concrete mix designs may include air entrainment or other specialized cementitious materials and should be reviewed by an engineer familiar with the native soils and other regional conditions

Reinforcing steel shall be Grade 60. Minimum concrete clear cover of reinforcement shall be 1.5 in. Size and placement of reinforcement are to comply with engineering specifications for the given project.

Refer to manufacturer's specifications for sound wall tolerances.

# DELIVERY, STORAGE AND HANDLING

Check materials upon delivery to assure that proper material has been received. Remove damaged or otherwise unsuitable material from the site.

Prevent mud, concrete, adhesives and other substances that may harm appearance of unit from coming in contact with the system components.

Refer to NPCA's Sound Wall Best Practices Manual for dunnage procedures.

# EQUIPMENT AND SUPPLIES

The following tools are recommended but should not be limited to this list. Site conditions may require other equipment, tools and materials.

### Tools and Equipment:

- Drill rig
- Boom truck
- Concrete pump
- Spreader bar
- Slings
- Temporary bracing
- Roller blocks
- Crane
- Laser level
- Levels
- Shovels
- Brooms
- Pry bars
- Wheel barrow
- Airless painting equipment
- Concrete vibrators
- Water pump
- Welder
- Cutting torch
- Ladders
- Man lift
- Rebar bender
- Forklifts
- Footing forms

### Materials:

- Layout stakes
- String line
- Plastic shims
- Patch material
- Rebar
- Tie wire
- Embeds
- Form release
- Welding rod
- Rebar chairs
- Concrete

# SITE & FOUNDATION PREPARATION

- Review the approved site plan to confirm lot lines, wall location, length and elevations.
- Schedule preconstruction meeting.
- Verify the on-site soil conditions.
- Call the local utility companies to confirm the location of underground utilities.
- Obtain all necessary building permits.
- Obtain survey for exact location of wall and ensure surveyor's stakes are installed.
- Check site drainage that may affect sound wall. Contractor is responsible for positive drainage away from wall during construction and proper ground water drainage after construction.
- Have bottom of wall grade graded +- 1/10 ft. prior to moving on site.

# FOUNDATION CONSTRUCTION

Foundation soils shall be excavated as required for wall base to the dimensions shown on the plans. Foundation soil shall be observed by the Geotechnical Engineer to confirm that the bearing soils are similar to the design criteria.

- Drill holes for foundations to the proper specified diameter and depth.
- Level bottom of the hole.
- Insert column connecting system to the excavation.
- Establish a level string line over foundations. This reference line will be used for finishing concrete to the proper grade, ensuring that reinforcing steel at the proper elevation including foundation steel alignment and layout centers. Support frame may be used if needed, mostly with larger posts.
- Tailgate or pump concrete into pier holes as required by site access conditions.
- Wet set wall anchor embeds into foundation per approved drawings.
- Finish concrete to the proper elevation.

# WALL UNIT INSTALLATION

- Transport panels via tractor trailer to the job site and unload by the contractor with the appropriate equipment per project details.
- Set the panel on the foundations. Once the panel is set, it must be leveled and plumbed with the use of shims as per the approved drawings.
- Patch & finish as required once the panels have been placed.
- If column caps are used with columns, assure all caps are secure and level.

# BACKFILL PLACEMENT & COMPACTION

Backfill shall be spread in uniform loose lifts of 8 to 12 in. behind the wall system. Each lift shall be compacted to 95% of standard proctor density within 2% of its optimal moisture content.

Excessively wet/dry and/or nonuniform soils shall not be used as backfill unless the following procedures are employed at a minimum:

- For excessively dry soils – water shall be added to the soil and mixed to within ± 2% of its optimal moisture content and confirmed by the Geotechnical Engineer.
- For excessively wet soils – these soils may require aeration, discing and drying until they are within ± 2% of its optimal moisture content and confirmed by the Geotechnical Engineer.
- For nonuniform soils – as directed by the Geotechnical Engineer, these soils may be mixed by discing with other onsite excavated soils or with borrow soils to achieve properties consistent with the design criteria. Testing of these soils shall be performed by the Geotechnical Engineer in accordance with the design specifications.

Compaction of the backfill shall be completed using lightweight compaction equipment so that the wall's stability is not disrupted or compromised by vibration from operation of heavy equipment.

Heavy construction equipment adjacent to or near the wall should be avoided; these additional loads or vibratory impacts may not have been considered in the design and may result in immediate settlement, and/or may disrupt the wall's stability and/or cause worker injury.

# CONSTRUCTION TOLERANCES

Construction tolerances should be established prior to the commencement of construction. These tolerances are normally outlined within the construction specifications. Agreeing on these tolerances prior to construction enables both the owner and the contractor to have an understanding of acceptable limits within the wall system's construction.

# CLEANUP

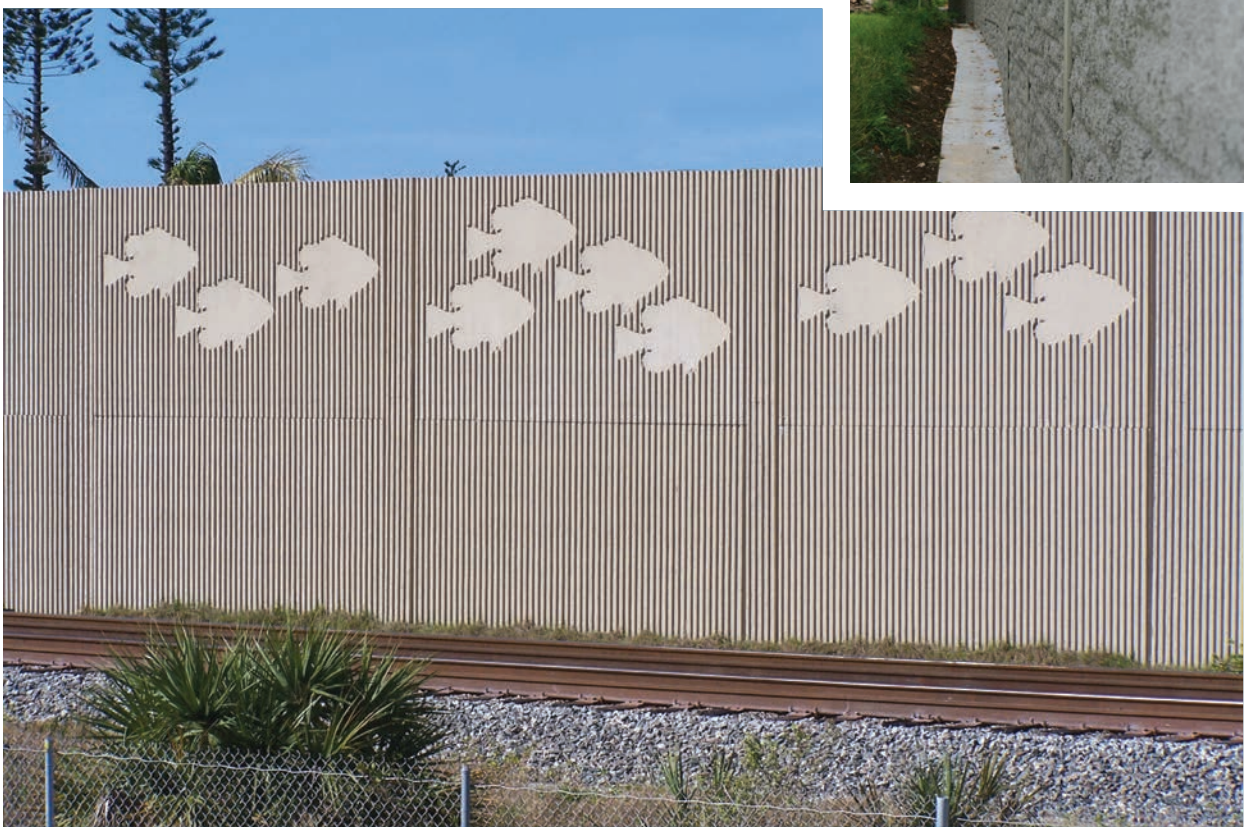
- Remove any damaged or unused precast wall units.
- Remove any unused unit fill or backfill material.
- Remove job-site debris caused by wall construction.

# SAFETY & LIABILITY

The contractor/installer of any sound wall is solely responsible for construction site safety. The sound wall manufacturer shall not be responsible for means or methods of construction or for safety of workers or of the public.

The contractor/installer will be responsible for the positive drainage away from the wall during construction to eliminate any unnecessary impact on the uncompleted wall.

- The sound wall manufacturer shall not be held liable for any damages or claims from the result of storms, floods, weather or other adverse conditions that are caused by nature.



# REFERENCES


- ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- ASTM C138 – Standard Test Method for Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete
- ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete
- ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- AASHTO T22 – Compressive Strength of Cylindrical Concrete Specimens
- AASHTO R20 – Standard Practice Procedures for Measuring Highway Noise
- AASHTO T141 – Sampling Freshly Mixed Concrete
- FHWA Highway Noise Barrier Design Handbook.
- NPCA Sound Wall Best Practices Manual
- NPCA Sound Wall Technical Brochure



This Best Practices Manual is subject to revision at any time by the NPCA Wall Committee & Soundwall Product Committee, which must review it at least every three years.

Special thanks are given to the Sound Wall Subcommittee for updating/compiling this manual.

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# SOUND WALL DEFINITIONS

## Sound or Noise Walls/Barriers

Walls specified and designed to mitigate roadway, railway, and industrial noise sources. Specifications for these walls will include one or more of the following requirements: sound attenuation line, sound transmission loss (STC), or noise reduction coefficient (NRC).

## Vision Walls

Walls specified and designed to block sight. These walls are normally erected to block unwanted sights, headlight glare or to provide privacy or security. Vision walls are not designed or intended to mitigate noise sources.

## Privacy Fencing, Security Walls, Industrial/ Commercial Enclosures, etc.

These types of walls can be designed to mitigate noise, block sight, or both. Project specifications or special provisions will identify design requirements.