LCC | LIGHTWEIGHT CELLULAR CONCRETE

THE **ONLY** LIGHTWEIGHT FLOWABLE FILL
FOR MODERN INFRASTRUCTURE CHALLENGES

SPECIALTY CONCRETE CONTRACTORS
CELL-CRETE
CORPORATION

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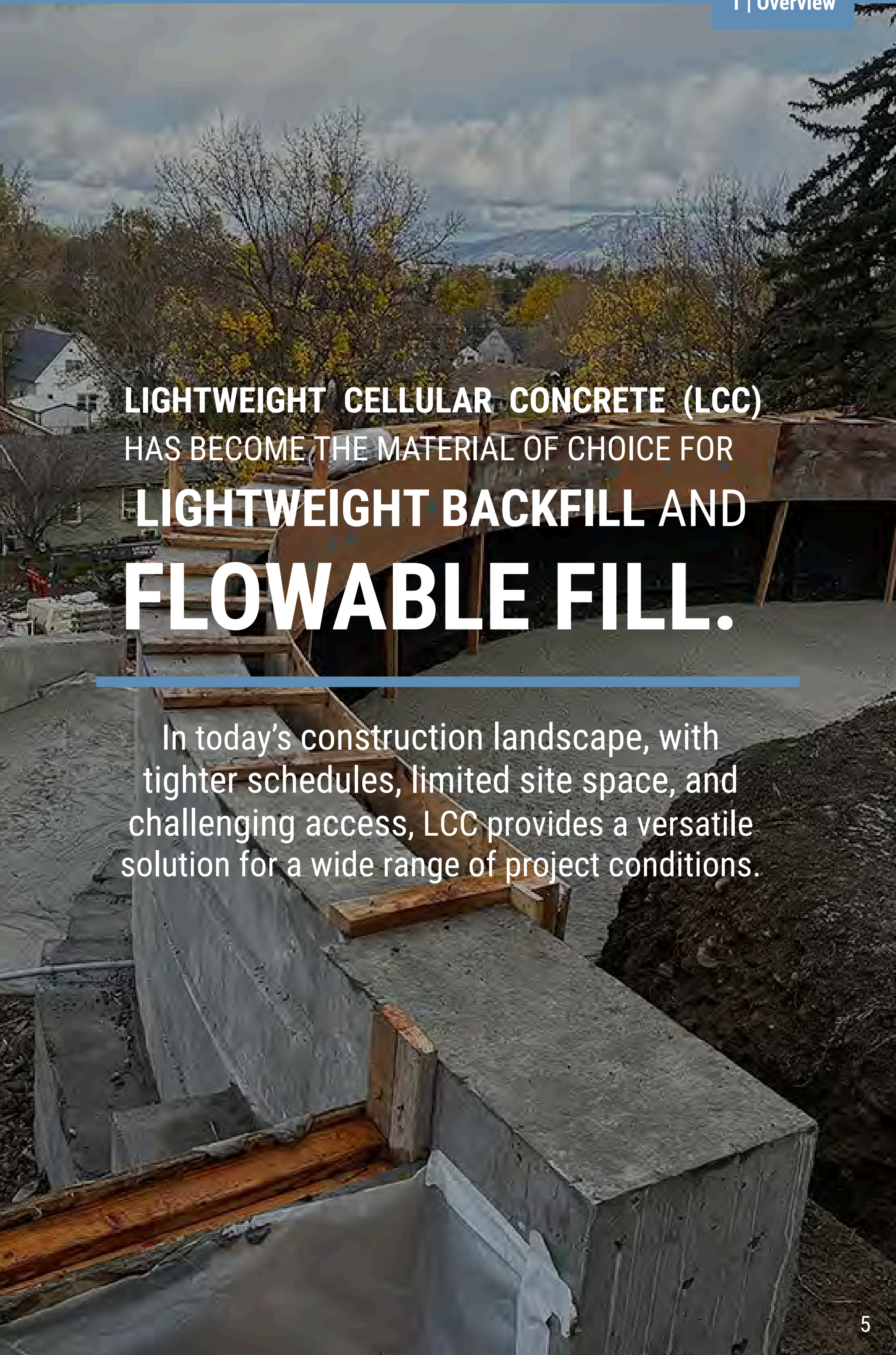
1 | Overview

1.1 What is LCC?

Lightweight concrete has been used in civil engineering applications for around 3,000 years, beginning with volcanic ash as a fine aggregate. Recent advancements in technology, materials, and equipment, have improved its strength, durability, and production consistency. Lightweight cellular concrete (LCC) is increasingly valued for its ability to reduce settlement, earth pressures, dynamic forces, and absorb seismic forces in subsurface structures.

The vesicular structure of LCC is created by incorporating air bubbles into a cement paste through mixing with water and specific admixtures. This unique composition allows LCC to be cast at project-specific low densities, while maintaining high durability and exceptional freeze-thaw resistance. Additionally, its lightweight nature provides a cost-effective solution for reducing loads on various infrastructure projects.



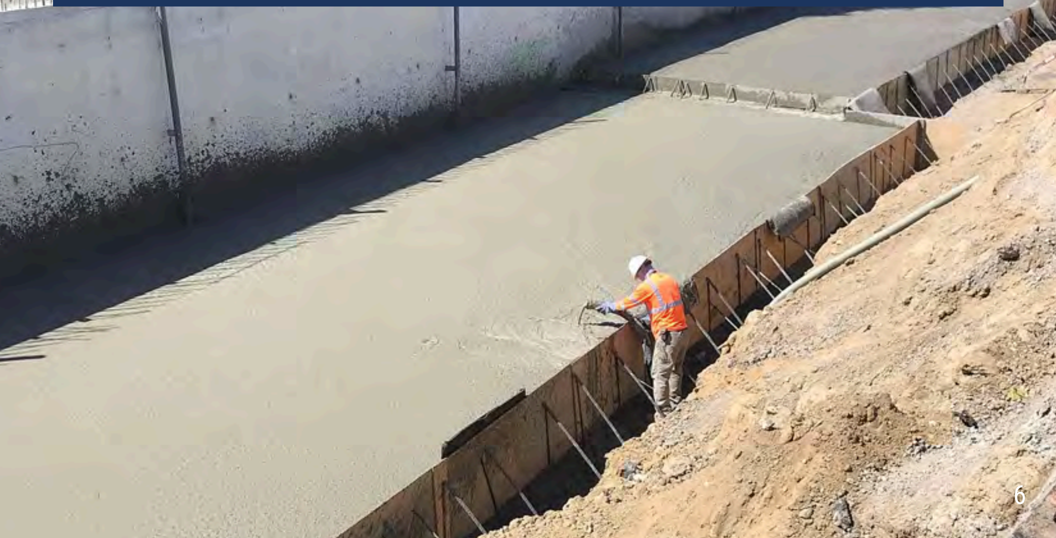
LIGHTWEIGHT CELLULAR CONCRETE (LCC) HAS BECOME THE MATERIAL OF CHOICE FOR **LIGHTWEIGHT BACKFILL** AND

FLOWABLE FILL.

In today's construction landscape, with tighter schedules, limited site space, and challenging access, LCC provides a versatile solution for a wide range of project conditions.

1.2 Applications & Use

LCC is a versatile material composed of Portland cement, water, and a preformed foam admixture, creating air voids for cast densities as low as 20 pounds per cubic foot (PCF). Its lightweight, flowable nature makes it ideal for construction in challenging environments like soft ground, constrained working areas, and retaining walls. With strengths up to ten times greater than typical earthen fill materials, LCC reduces dead loads, eliminates the need for compaction, and ensures consistent quality—making it perfect for embankments over soft soils or near sensitive utilities, backfilling retaining walls, or retrofitting buildings.



An efficient on-site production process using a truck-mounted plant can produce over 2,000 cubic yards of LCC daily, significantly reducing reliance on traditional backfill.

For reference, a single bulk cement delivery can yield up to 120 cubic yards—equivalent to more than ten truckloads of conventional fill.

LCC is also well-suited for lightweight fill over soft soils at bridge approaches, eliminating costly surcharging. It serves as a reliable roadway base for new construction or repairs and excels in void fills, such as abandonment, sinkholes, and washouts. Its load-spreading capabilities make it ideal for slabs and footing pads while reducing lateral pressure on retaining walls, leading to cost savings in design and construction.

1.3 Our Company

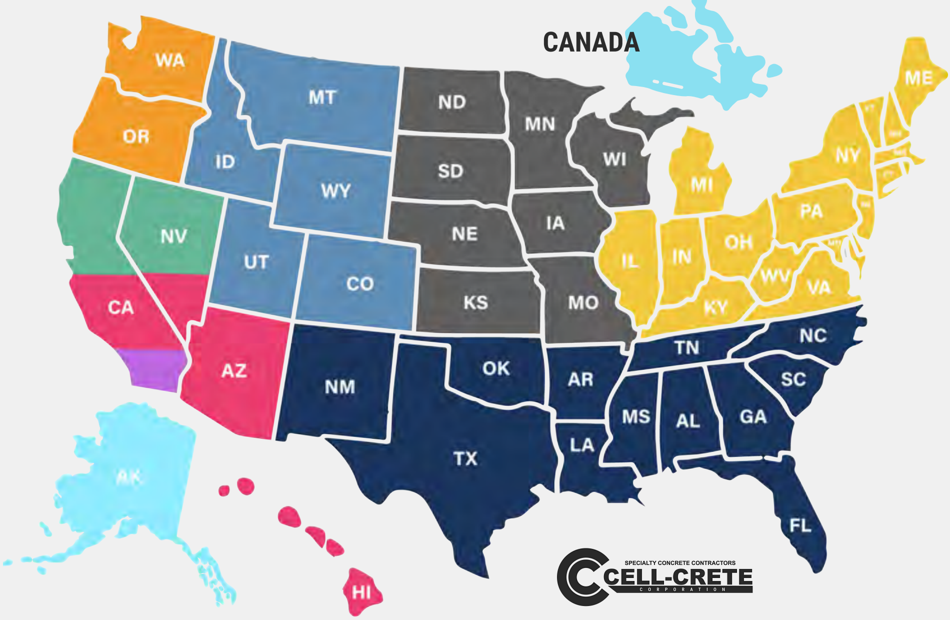
Cell-Crete Corporation is a leader in lightweight concrete solutions, specializing in innovative lightweight cellular concrete and other materials.

We serve a variety of industries, including commercial construction, heavy civil infrastructure, and even environmental projects.

Our team is driven by a commitment to quality, sustainability, and customer-focused solutions.

National Presence

Our Bid Map highlights the regions where we actively provide cellular concrete solutions across the U.S and Canada.
To support projects efficiently, we've included key contacts for each area. These representatives are available to assist with inquiries, estimates, and project coordination.



Kyle Johnson / Akash Dhaliwal
(510) 362-2043
adhaliwal@cell-crete.com
Kaushal Das
(510) 340-8876
kdas@cell-crete.com

Akash Dhaliwal / Kaushlendra Das
(510) 362-2043
adhaliwal@cell-crete.com
kdas@cell-crete.com

Osmond Basilio
(626)945-8646
obasilio@cell-crete.com

Rob Halley
San Diego/Imperial county
(619) 905-9385 | rhalley@cell-crete.com

Diego Villegas
(626)940-8251
dvillegas@cell-crete.com

Aaron Powell
(385) 505-8652
apowell@cell-crete.com

Abhinab Baruah
(385) 602-7065
abaruah@cell-crete.com

Brian Faurot
(712) 308-6106
bfaurot@cell-crete.com

Nathan Hackney
(804) 987-3968
nhackney@cell-crete.com

2 | LCC Applications

2.1 Road Construction Over Soft Soils

LCC offers a lightweight, reliable, highly insulative alternative to traditional earthen embankments materials for road construction on weak subgrades, minimizing stress on unstable soils. Its structure improves load distribution, helping prevent settlement and excessive deformation, while promoting sustainable practices by reducing the need for costly ground improvements.

Case Study Highlight

A project involving eight Mechanically Stabilized Earth (MSE) walls (up to 40 feet high) faced significant geotechnical challenges due to a highly compressible layer.
Project challenges included low bearing resistance, schedule constraints (slow consolidation rates), global stability deficiences and settlements (up to 13 inches) that exceeded the preferred wall type allowances.

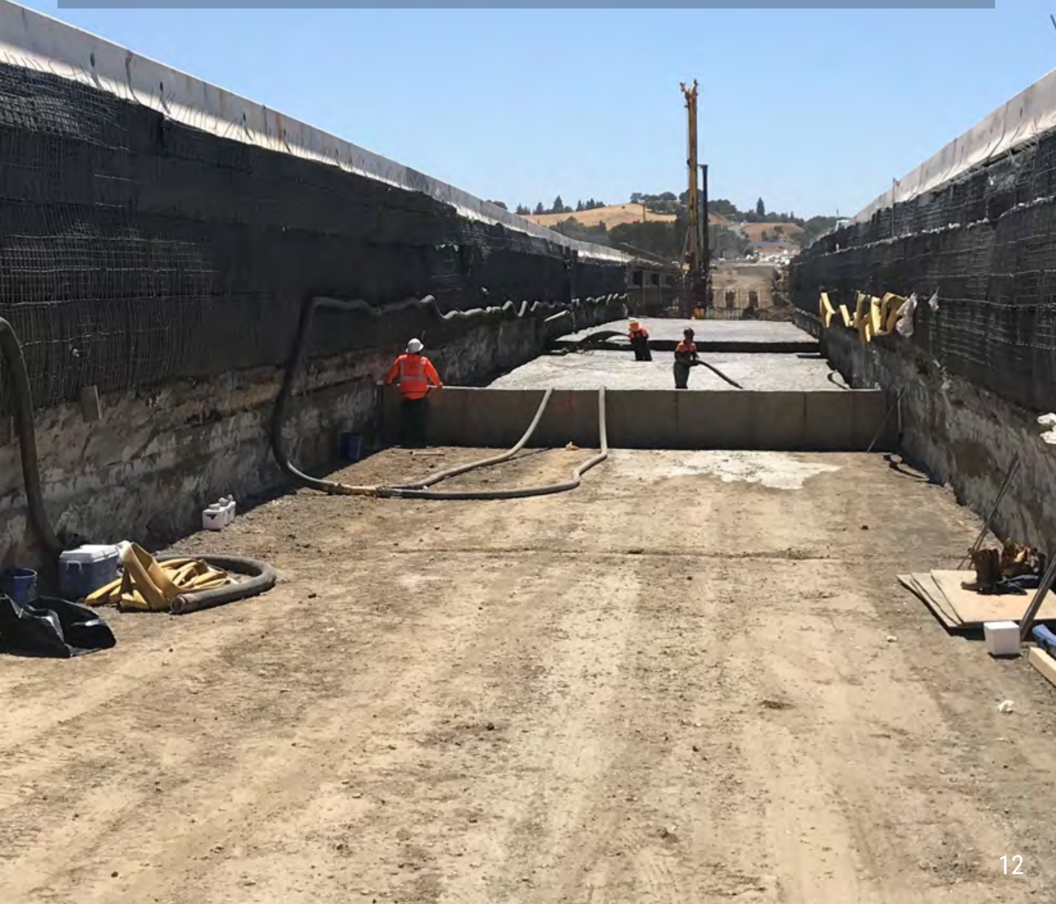
Solution

After evaluating costly alternative wall systems, ground improvements, and vertical drains, LCC emerged as the most effective solution to meet project schedule and costs. Its lightweight nature (1/4 to 1/2 the weight of traditional materials) reduced earth pressures and settlement risks, eliminating the need for extensive ground improvements. On-site mixing and easy placement streamlined the construction process, facilitating a faster schedule and efficient quality processes.

The use of cellular concrete effectively addressed the project's geotechnical challenges, improving wall stability and construction efficiency for the Orange County Transportation Authority and Caltrans.

2.2 Road Widening

LCC simplifies utility and maintenance of traffic conflicts for road and railway widenings by eliminating the need for compaction, cutting down construction times, and minimizing disruption to existing roadways, structures, and utilities. Its high compressive strength supports ever increasing modern traffic loadings, without overburdening weak soils and enables steeper slopes, potentially reducing the need for additional right-of-way.



Case Study 1: Highway 1 Honolulu, HI

Faced with settlement-prone areas, this shoulder widening project used precast panels and LCC as a cost-effective alternative to foundation improvements. LCC reduced embankment loads and eliminated the need for heavy hauling equipment, enhancing efficiency and sustainability.

Case Study 2: I-680/SR 4, California

This multi-phase highway widening project involved placing 63,000 (CY) of 27 PCF LCC to raise the road grade while protecting sensitive delta soils. The first phase widened the roadway, and subsequent phases elevated existing lanes and developed a two-lane connector ramp. LCC reduced the need for retaining walls and met engineering requirements while addressing environmental concerns.

2.3 Bridge Abutment

LCC is increasingly used for bridge abutment backfill, especially in areas with soft soils, as it reduces pressure on foundations and mitigates settlement risks.

Case Study: New Gordie Howe Bridge, Michigan

Challenging soil conditions on the U.S. side led engineers to use LCC for backfill. This solution minimized settlement, reduced long-term maintenance costs, and expedited construction, enhancing the bridge's stability and longevity.

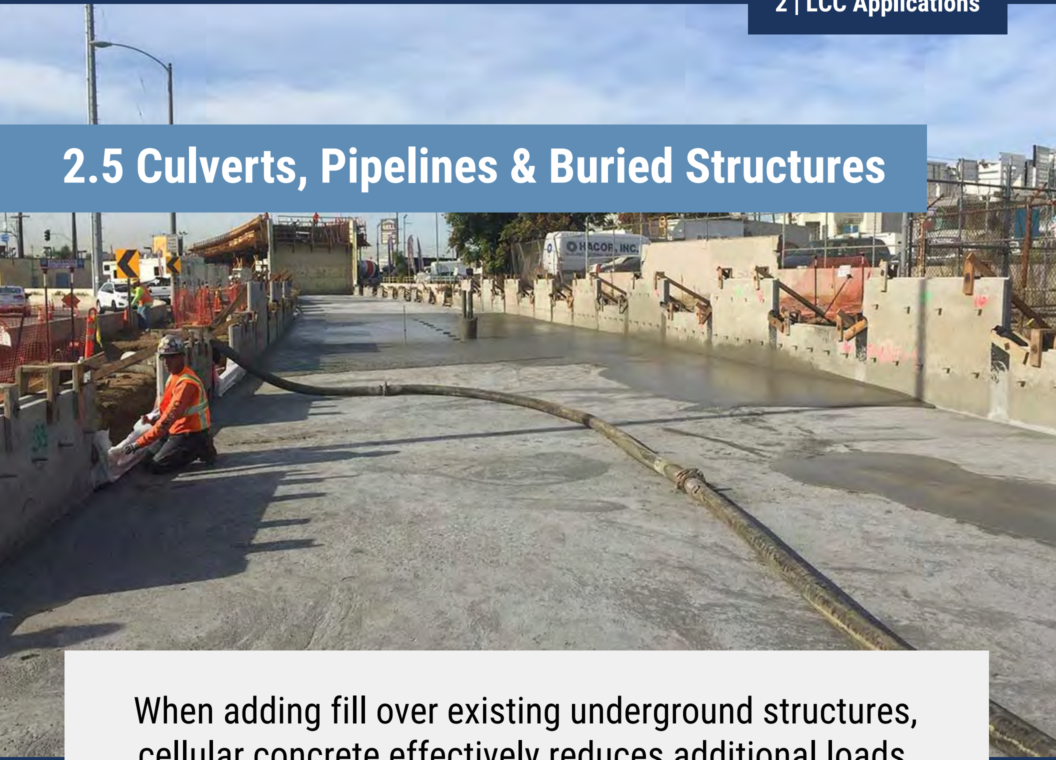
2.4 Bridge Underfill

LCC is an effective solution for supporting structurally deficient bridges, transforming them into embankments without adding excessive load to the foundations.

Case Study: Taxiway P Bridge Conversion

Instead of demolishing a weakened bridge, LCC was used to prevent excessive settlement, reduce pipeline risks at joints, and minimize structural cracking. This transformed the structure into a stable embankment, capable of handling increased air traffic loads, preserving infrastructure and reducing costs.

2.5 Culverts, Pipelines & Buried Structures



When adding fill over existing underground structures, cellular concrete effectively reduces additional loads, preventing potential damage and settlement.

Case Study: Metro Track ROW Project

In this project, LCC was placed between MSE walls to protect vulnerable DWP duct banks beneath the embankments. The use of LCC reduced loads, maintaining the integrity of underground infrastructure.

Key Benefits

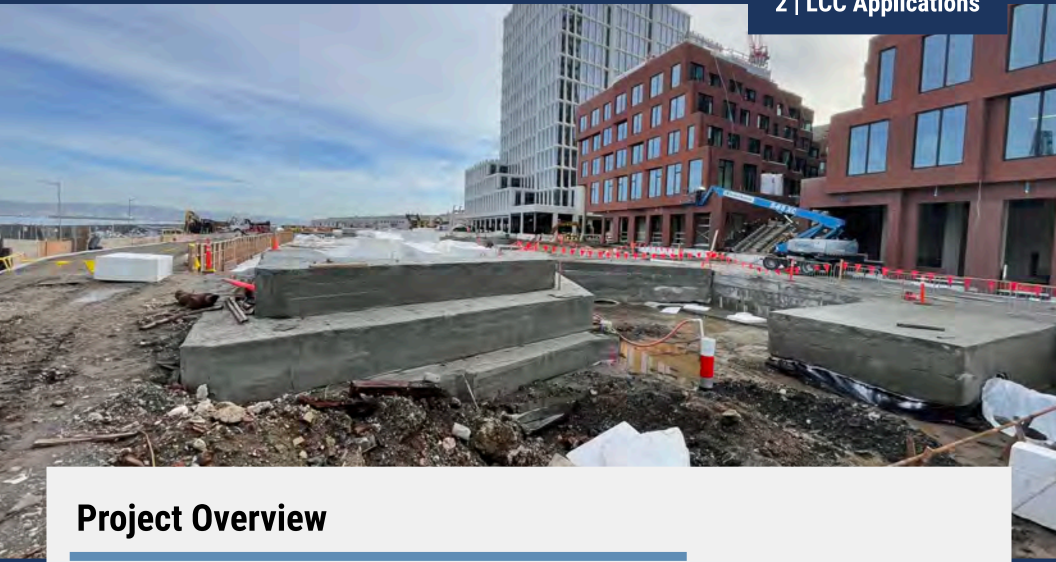
- **Load Reduction:** Minimizes pressure on underground systems.
- **Lightweight Composition:** Reduces overall structural weight.
- **Enhanced Stability:** Prevents settlement and cracking.
- **Cost-Effective:** Eliminates the need for expensive mitigations such as ground improvements, joint restraints, or utility relocation.
- **Versatile Applications:** Compatible with various wall systems.

2.6 Permeable Lightweight Fills

Permeable-Lightweight Cellular Concrete (PLCC) combines traditional cellular concrete's lightweight properties with great permeability, allowing water to flow through the material. This reduces stormwater runoff, minimizes hydrostatic pressure, and mitigates settlement and heave risks—ideal for urban environments facing sea-level rise and unstable soil conditions.

Case Study: China Basin Park (CBP)

China Basin Park (CBP) is a forward-thinking urban development project aimed at enhancing public space while addressing environmental challenges, particularly rising sea levels. As climate change intensifies, the need for sustainable infrastructure has never been greater. Permeable Lightweight Cellular Concrete (PLCC) offers a cutting-edge solution for projects like CBP, especially in areas with soft soils susceptible to excessive settlement.



Project Overview

The CBP project was driven by clear performance goals and design standards that ensure both construction quality and long-term functionality. All guidelines met the approval of the Chief Harbor Engineer and complied with building permit requirements, reinforced by strict Quality Control and Quality Assurance protocols.

CBP Key Performance Goals

- **Prevent Settlement & Heave:** PLCC stabilized streets and rights-of-way, ensuring ADA compliance.
- **Sea-Level Rise Resilience:** Designed to handle future groundwater rise, maintaining a 1.2 safety factor.
- **Traffic Load Support:** Achieved a compressive strength of 40 psi after 28 days to support heavy traffic.
- **Excavatable for Utilities:** Allowed future access for excavation, installations, or repairs.
- **Seismic Resilience:** Met design requirements for elevated dynamic loads in a seismically active city.

2.7 Rail Embankment

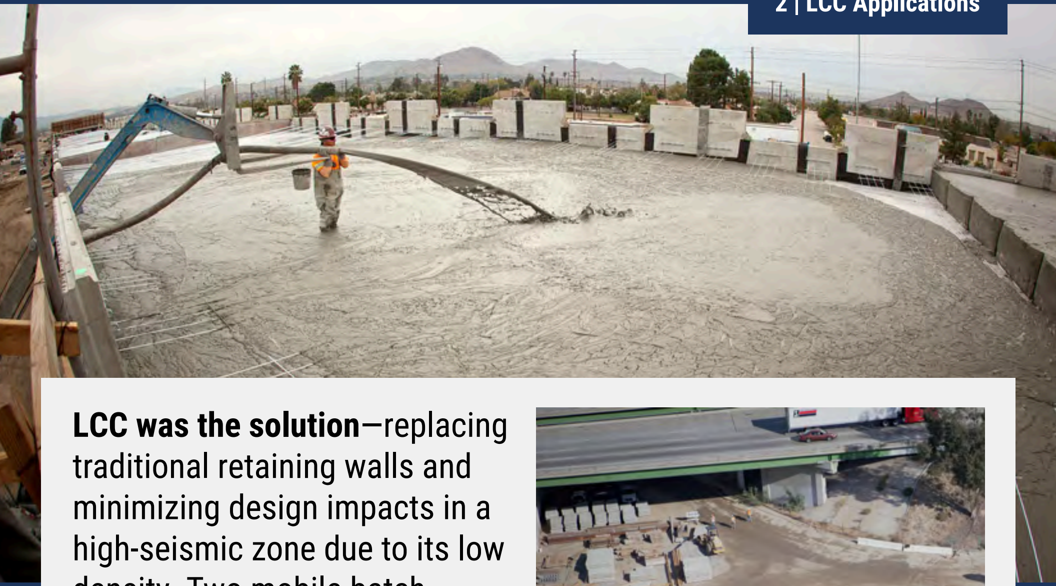
The U.S. Federal Highway Administration encourages the use of alternative materials for fill and embankment projects—LCC stands out as an ideal solution. It offers the strength needed to support heavy railway loads without overburdening existing soils and integrates seamlessly with traditional wall systems.

Case Study: Union Pacific Railroad (UPRR) Flyover

An 8,150-foot flyover was constructed to ease congestion where UPRR and Burlington Northern & Santa Fe (BNSF) tracks intersected.

Project Challenges:

- Minimize disruption to rail operations.
- Proximity to the I-10 freeway.
- Limited construction footprint.
- Soft soil conditions.



LCC was the solution—replacing traditional retaining walls and minimizing design impacts in a high-seismic zone due to its low density. Two mobile batch plants produced over 3,000 cubic yards daily, with a total of 220,000 cubic yards placed—setting a single site placement record since 2007, with no reported performance issues.

Benefits of Cellular Concrete for Heavy Rail Construction

- **Strength:** Supports heavy rail loads without stressing existing soils.
- **Seismic Resilience:** Met design requirements for elevated dynamic loads and challenges with narrow embankment footprint.
- **Innovative Application:** Replaced traditional retaining walls, simplifying construction.
- **Efficient Production:** Mobile batch plants enable high-volume, rapid placement.
- **Proven Reliability:** Long-term success in large-scale projects with no reported performance issues or excessive movements after two decades of service.

2.8 Load Reduction Solutions

The demand for lightweight fills in construction has grown as the industry focuses on efficiency and sustainability. Traditional fill materials can add significant weight, increasing stress on foundations and the risk of settlement. Lightweight fills like LCC reduce this load, providing stability while minimizing settlement risks and enabling faster, more cost-effective construction.

Case Study: SoFi Stadium

Designed to host over 70,000 spectators, SoFi Stadium required innovative solutions for ground preparation due to its location on a former racetrack. Cellular Concrete met these challenges through various applications: **Trench Backfill, Lightweight Backfill for MSE Seismic Moat,** and **support for Roofing Structures.**

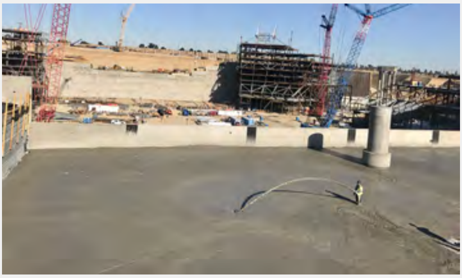
Trench Backfill

To increase cover over an existing 87” Reinforced Concrete Pipe (RCP) of more than 10 feet without exceeding load limits, Class II Cellular Concrete was used—one-fourth the weight of traditional fill.

- 1,400 feet of trench divided into 100-foot sections.
- Rapid placement in single lifts allowed each section to be completed within hours.
- Reduced load and protected existing infrastructure while while expediting the timeline.

Lightweight Backfill for MSE Seismic Moat

Used in a 100-foot MSE seismic moat to reduce dynamic loading during seismic events.



- Minimized backfill weight without compromising strength.
- Enhanced seismic resilience by managing dynamic loads effectively.

Support for Roofing Structures

Applied around the stadium's butterfly caps, a vital component of its seismic design.

- Provided strong yet lightweight support.
- Contributed to the stadium's overall structural resilience.

Key Benefits of LCC for Load Reduction

- **Lightweight Strength:** Reduces load while maintaining structural stability.
- **Seismic Resilience:** Effectively reduces dynamic loads in seismic zones.
- **Versatility:** Supports diverse applications from trench backfill to roofing structures.
- **Efficiency:** Speeds up construction timelines without compromising integrity.

The use of LCC at SoFi Stadium showcases its versatility and effectiveness in overcoming complex engineering challenges, setting a new standard for future large-scale construction projects.

2.9 LCC for Hazardous Environment Backfill

Retrofitting aging infrastructure, especially in contaminated sites, presents unique challenges. A century-old dam, deemed unsuitable by the US Army Corps of Engineers, faced structural and environmental risks due to contaminated soil from historic mining (arsenic, mercury, lead).

LCC was chosen for backfilling, offering key advantages:

1. **Self-Compacting:** Fills voids without heavy equipment—ideal for fragile structures.
2. **Lightweight:** Minimizes stress on the existing dam.
3. **Strong and Stable:** Provides necessary compressive strength.
4. **Logistical Flexibility:** On-site batching suited the hillside location.
5. **Dust Control:** Reduced airborne contamination during application.

LCC's use ensured structural integrity and environmental compliance, proving its value for complex geotechnical projects where traditional methods fall short.

2.10 Slope Stabilization

Stabilizing slopes in landslide-prone areas is crucial for economic stability and public safety. Traditional methods, such as soil excavation and replacement, are often expensive and time-consuming. LCC offers a more efficient solution by reducing the forces acting on the top of unstable slopes.

Case Study: Caltrans Highway 128 Project

In 2015, Caltrans tackled an unstable repair on Highway 128 near Winters, CA. Initial plans involved using EPS Geofoam, but Cell-Crete Corporation proposed Lightweight Cellular Concrete (LCC) as a more cost-effective and efficient alternative. The LCC mix, with a 27 PCF density and 40+ psi compressive strength, proved highly effective after replacing unstable soil and slide debris.

Key Benefits

- **Enhanced Stability:** Reduced landslide risk by reducing loading and increasing strength of site materials.
- **Cost Savings:** More economical than other lightweight materials or structural stabilization systems.
- **Community Safety:** Secured roadway and infrastructure.
- **Efficient Application:** Faster installation with long-term durability.

LCC's success in slope stabilization showcases its potential for safer, cost-effective infrastructure solutions in geotechnically challenging scenarios.

2.11 Levees and the Role of LCC

Levees built on compressible soils often experience settlement over time due to primary and secondary compression. Traditional methods of raising them with heavy soil fill can exacerbate future settlement. LCC offers a more effective solution by restoring levee crown elevations while reducing the risk of future settlement and maintenance without adding excessive weight.

Case Study: Foster City Levee Improvement Project

Faced with FEMA's determination that its levee system lacked adequate flood protection, Foster City launched a $72 million improvement project to enhance its resilience against storm surges, a 100-year flood hazard, and sea level rise through 2050.

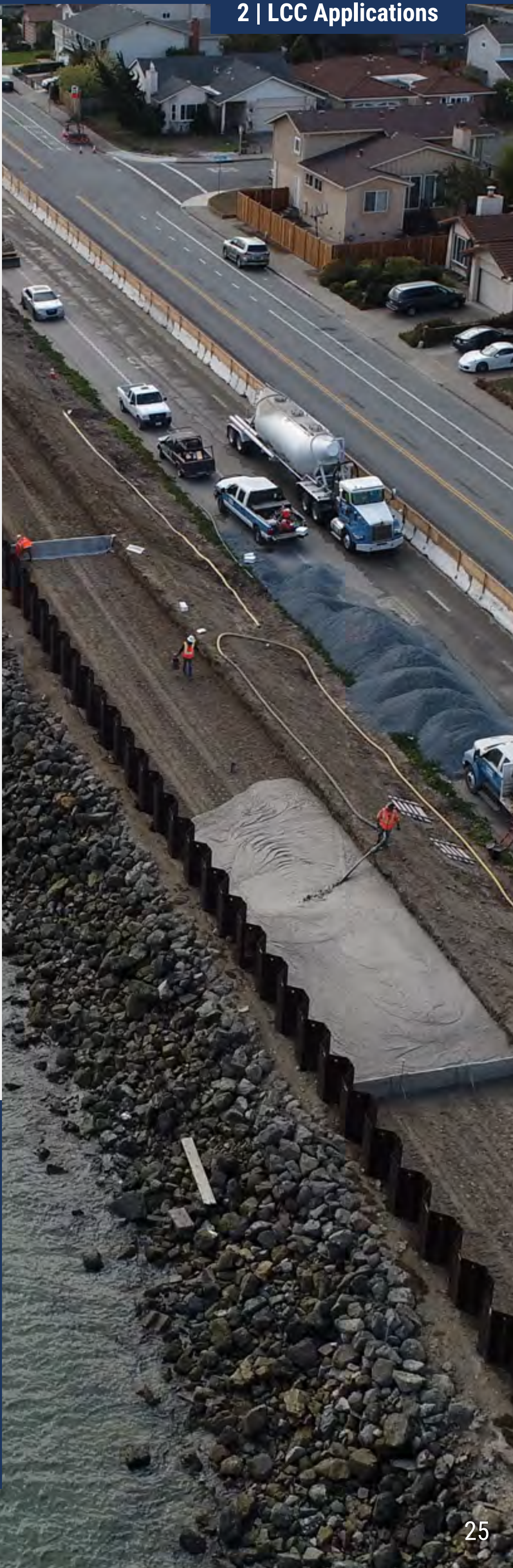
Spanning 6.5 miles along the San Francisco Bay, the project incorporated:

- 2,100 linear feet of steel sheet pile floodwalls.
- 4,000+ linear feet of concrete and mechanically stabilized earth walls.
- 5,000+ linear feet of embankment construction using earthen fill and LCC.

Key Advantages of LCC in Levee Construction

- **Customizable Density & Strength**: Densities ranged from 30 to 90 PCF, allowing tailored material properties for different geotechnical conditions.
- **Weight Reduction**: Enabled levee height increases without overloading the underlying soils.
- **Smaller Construction Footprint:** Allowed quicker installation, reducing neighborhood disruptions and project delays.
- **Improved Resilience**: Enhanced flood and seismic resistance, ensuring long-term safety and reliability.

By leveraging LCC, the Foster City project achieved increased stability, minimized settlement, and enhanced flood protection —offering a sustainable approach to levee improvements with reduced environmental impacts.



2.12 Net Zero Loading

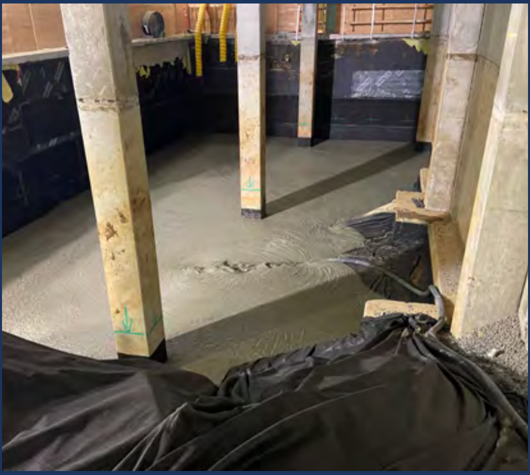
Net zero loading is a design strategy that balances new loads by removing existing materials in areas with compressible soils like peat or clay. LCC plays a key role by reducing overall load, controlling settlement, and improving stability.

Case Study: Chicken Ranch Casino, Jamestown, CA

Due to settlement issues on a hillside site, extensive cut and fill operations were needed.

The solution involved:

- Excavating existing fill down to bedrock.
- Replacing it with LCC backfill, reducing lateral loads on foundation walls.
- Incorporating drainage provisions to eliminate hydrostatic pressure.



LCC's lightweight nature minimizes foundation stress, while load calculations ensure structural stability. Soil removal prevents overstressing, and footing design evenly distributes loads. This approach stabilizes foundations, reducing settlement risks and ensuring long-term integrity.

2.13 Cellular Concrete for Trench Backfill

Cellular concrete is an efficient, durable, and cost-effective trench backfill material, offering several advantages:

- **Lightweight & Flowable** – Reduces load on surrounding structures and conforms to trench shapes without extensive compaction.
- **Faster Installation** – Ideal for restrictive access areas, cutting labor costs and project timelines.
- **Enhanced Stability** – Improves trench integrity and prevents collapse.
- **Erosion Resistance** – Withstands environmental stress, ensuring long-term durability.
- **Customizable Densities** – Tailored for specific structural and thermal insulation needs.
- **Eco-Friendly** – Can incorporate recycled materials, reducing carbon footprint.

By using LCC, trench backfill operations benefit from improved efficiency, reduced settlement risks, and long-lasting performance.

2.14 Cellular Concrete Equipment

Innovations in LCC technology have enhanced both material properties and equipment for production and application. LCC is mixed and placed on-site, using a 2-4” discharge hose, with placement distances ranging from hundreds of feet to several miles.

For job sites with space constraints, specialized fleet equipment ensures efficient mixing and placement:

Paddle Mixer
(Dry Mix) – Optimized for uniform blending.

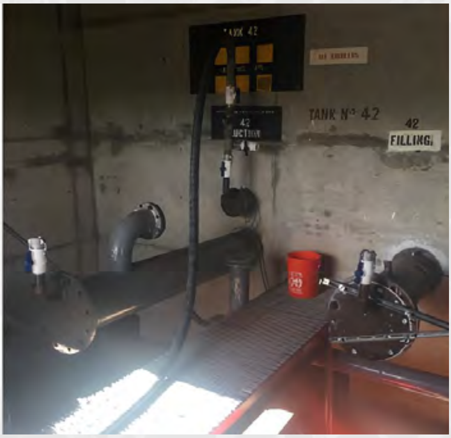
Colloidal Hydraulic Mixer
(Dry Mix) – Provides high-shear mixing for consistency.

Towable Inline Pump
(Wet Mix) – Enables mobility and efficient pumping.

Colloidal (Electric) Unit – Offers an eco-friendly mixing solution.

2.15 Abandonment & Annular Grouting

Abandonment Grouting



LCC is an effective solution for sealing and stabilizing abandoned mines, tunnels, and underground voids.
Its lightweight, foam-based composition allows for easy injection, preventing subsidence and structural collapse while minimizing environmental impact.
Since it contains no aggregate, there is minimal risk of line blockages or excessive pressure that could damage surrounding structures.

Annular Grouting

Annular grouting uses LCC to fill the gap between casings, pipes, and surrounding soil or rock in tunneling, deep foundation, and well construction projects.
This method provides a hydraulic seal, preventing water ingress and stabilizing the structure.
LCC's low density and flowability ensure complete filling, while its high compressive strength and durability enhance load-bearing capacity and erosion resistance.
With over two decades of hands-on experience in annular grouting, Cell-Crete adds significant value to any underground project.

3 | Summary

3.1 Benefits of Cellular Concrete

- **Lightweight** – Low density reduces structural loads, eases handling, and suits poor soil conditions.
- **Highly Insulative** – Air voids enhance thermal efficiency, reducing heating and cooling costs.
- **Self-Compacting** – Flows easily into place, eliminating the need for compaction and reducing vibration risks.
- **Cost-Effective** – Lowers material, transportation, labor, and energy costs.
- **Versatile** – Applicable in roadbeds, foundations, tunnels, and precast elements.
- **Reduced Settlement Risks** – Reduces settlement and distributes loads evenly.
- **Sustainable** – Incorporates recycled materials, reduces energy consumption, and extends service life.
- **Acoustic Performance** – Provides superior sound absorption for noise-sensitive environments.
- **Ease of Application** – Pumpable over long distances and adaptable to complex geometries.
- **Customizable Mix Designs** – Density, strength, and permeability can be tailored for structural or geotechnical needs.
- **Local Material Sourcing** – Reduces logistical costs and supports regional supply chains.
- **Resilient** – Resists temperature fluctuations and chemical exposure as compared to other lightweight materials.

3.2 Design Considerations

- **Mix Design & Performance** – Select appropriate density (20-50 PCF) and strength for load-bearing and geotechnical applications.
- **Structural Load Analysis** – Assess dead, live, and dynamic loads, including seismic effects.
- **Soil Compatibility & Settlement** – Conduct geotechnical evaluations to characterize settlement risks.
- **Environmental Durability** – Consider permeability, moisture exposure, and material longevity.
- **Economic Viability** – Compare lifecycle costs with conventional materials to optimize value.
- **Long-term Monitoring:** Establish a plan for continuous monitoring to assess the durability and structural integrity of LCC in critical applications over time.
- **Maintenance Strategies:** Create proactive maintenance strategies to identify and address potential issues, ensuring the long-term effectiveness and longevity of cellular concrete installations.

By optimizing mix design and engineering parameters, LCC provides a high-performance, sustainable solution across geotechnical and structural applications.

04 | Quality Control

Resources Needed

- Scale
- Unit Weight Pot
- Strike-Off Plate
- Foam Box Cylinder Molds
- Appropriate Storage

Test Procedure ASTM C495

Refer to the ASTM Standard for full details.

1. Sampling

- Fill a 5-gallon bucket by capturing the concrete directly from the pump hose at the placement point.
- Avoid sampling from the beginning or end of the discharge to ensure the sample is representative.

2. Unit Weight Measurement

- Tare the unit weight container on the scale and place it on a level surface.
- Filling Process:
  1. Scoop material from the bucket, filling the container in two lifts.
  2. After each lift, tap the container sides 10–15 times.
  3. Level the material using a strike-off plate and clean off any excess.
- Weigh the filled container to determine the pounds per cubic foot (PCF) value.

3. Cylinder Molding

- Use foam box cylinder molds (each containing four 3” x 6” cylinders).
- Filling Process:
  1. Place material in two lifts, ensuring the second layer blends with the first.
  2. Tap the mold sides 10–15 times after each lift to release trapped air.
  3. Overfill slightly and DO NOT rod the concrete.
- Strike off the top, then cover the molds to prevent evaporation without disturbing the surface.

04 | Quality Control (Cont'd)

4. Labeling Requirements (Use a checklist for visual clarity)

- Mark the lid of the foam box with:
- Date Cast
- Time Cast
- Batch Number
- Wet Density
- Equipment Used (CC200, 180HP, 100HP, Ready Mix)
- Air Temperature at Collection
- Pour Location/Project/Phase

5. Cylinder Tracking Log

- Complete the tracking log and email it weekly.

6. Storage Instructions

- Keep samples at 70°F ± 10°F for the first 24 hours, avoiding direct sunlight or extreme temperatures (use a temperature-controlled curing box).
- After 24 hours, transfer to a shaded, safe area.
- Avoid transport or shipping for at least 48 hours.

7. Cylinder Removal

- Remove samples from molds 7 days after casting (as per ASTM C495 guidelines).
- Ensure specimens are only removed when there is no risk of damage.

Accredited Lab Testing

LCC testing is specialized and requires an accredited laboratory. The Gerhart Cole laboratory has been recognized for their expertise in this testing. Please contact Gerhart Cole for more info.

GERHART COLE

Ryan B. Maw, PE, GE, BCGE
Principal
O: (801) 849-0055
M: (435) 232-4984

05 | Sample Specs

PART 1: General

1.1 Section Includes

- Materials, procedures, and testing for lightweight cellular concrete fill.

1.2 Related Sections

- Section 03055: Portland Cement Concrete

1.3 References

- ASTM C 495: Compressive Strength of Lightweight Insulating Concrete
- ASTM C 796: Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam

1.4 Personnel Requirements

- Installer must be certified and approved in writing by the foam agent manufacturer.
- Installer's foreman must:
  - Have at least 2 years of experience with similar projects.
  - Have completed a minimum of three successful cellular concrete projects.
  - Submit Documentation:
    1. Project Name and Location
    2. Date of Contract Acceptance (Month/Year)
    3. Manufacturer and Material Used
    4. Project Owner's Name and Contact Information
    5. Evidence of skilled workers experienced in the specified requirements
    6. Foreman must be onsite full-time during placement.

1.5 Submittals

A.Contractor Qualifications:

- Contractor name and Contractor's License number.
- Letter from foam agent manufacturer verifying qualification.
- List of projects showing at least three years of experience.
- Record of projects completed by the proposed project foreman.

05 | Sample Specs (Cont'd)

B. Mix Design (for approval):

1. Cement type and source
2. Fly ash type and source (if used)
3. Water source
4. Foaming agent information
5. Admixtures type and dosage (include compatibility letter from the foam agent manufacturer)
6. Test results:
   - Weight and density (per ASTM C 495)
   - Compressive strength according to ASTM C 495

C. Laboratory Certification:

- ASTM C 495 certification for the lab conducting compressive strength tests.

D. Work Plan (for review):

1. Construction schedule and sequence
2. Placement procedures as recommended by the foam agent manufacturer
3. Equipment list
4. Maximum lift thickness and slope placement details

E. Cold Weather Protection Plan:

1. Curing placement plan to prevent freezing of uncured materials.
2. Refer to Section 3.1 B for details.

1.6 Acceptance Criteria

- Prepare one set of four test specimens per 300 cubic yards placed (minimum one set per day).
  - Collect samples at the placement point.
  - Verify density matches cast density from Table: Refer to section 2.1 (Classes of Lightweight Cellular Concrete Fill)
  - Use 3 x 6-inch cylinders for testing.
  - Tap cylinders lightly to remove air pockets; do not rod the material.
- Compressive strength testing must be conducted at an AASHTO-accredited laboratory per ASTM C 495.

05 | Sample Specs

PART 2: Products

2.1 Classes of Lightweight Cellular Concrete Fill

Class	Max Cast Density (pcf)	Min 28-day Compressive Strength (psi)
II	30	40
III	36	80
IV	42	120
V	50	160
VI	80	300

Note: Weigh cylinders before compressive strength testing and include weight and calculated density in the testing report.

2.2 Materials

A. Portland Cement: As per Section 03055
B. Fly Ash: As per Section 03055
C. Foaming Agent
- *As recommmended by the manufacturer*
- *Conforming to ASTM C 796*

D. Potable Water
E. Admixtures
- *Only those allowed by the foam manufacturer*

PART 3: Execution

3.1 Preparation

A. Prepare subgrade area to be free of loose material and ensure uniform moisture levels.
   - Complete clearing, grubbing, stripping, and topsoil stockpiling.
   - Do not place material in standing water.

B. Only place concrete when ambient temperature is forecast to remain above 32°F for 12 hours post-placement.
   - Do not place on frozen ground.
   - For non-ground-contact lifts, placement can occur if temperatures remain above 28°F during the first 12 hours, with engineer approval.

3.2 Placement

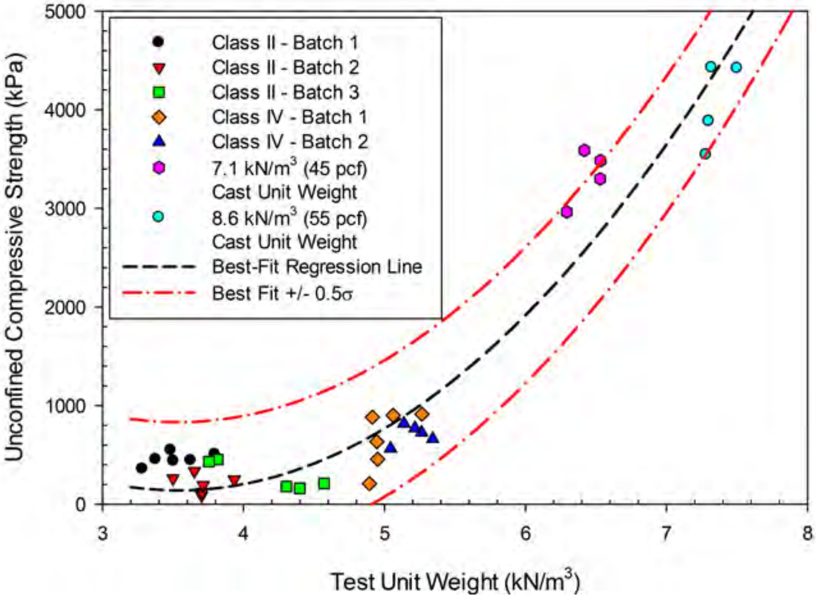
- Mix cement, water, and foaming agent on-site per manufacturer's recommendation.
- Place in lifts no thicker than 3 ft or as specified by the foam manufacturer.
- Bench into existing embankment if applicable.
- Allow a minimum 12-hour cure time between lifts.
  - Remove compromised material from previously poured surfaces before adding new lifts.

3.3 Protection

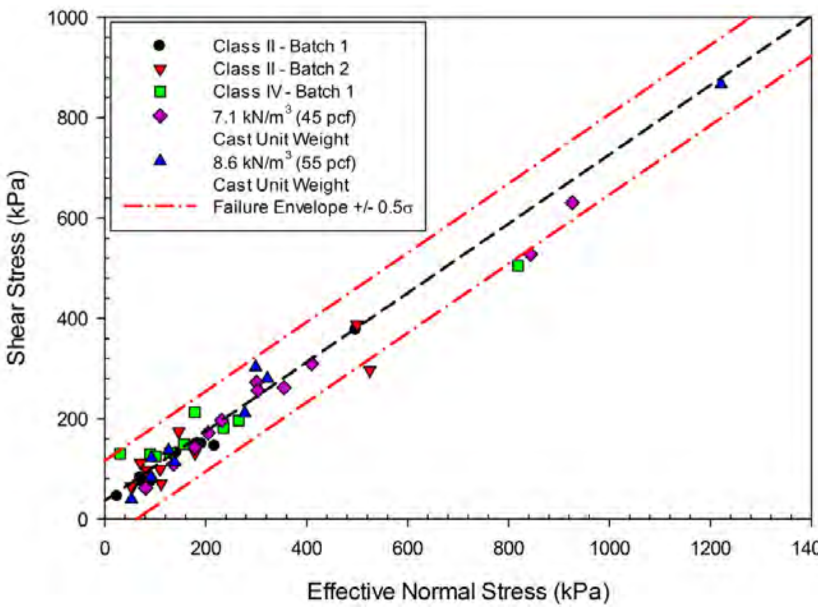
- Protect material from adverse weather, excessive moisture, and degradation.
- Avoid operating heavy equipment or placing backfill until the 28-day compressive strength is achieved.
- Place and compact at least 6 inches of loose material over the cellular concrete before operating earthwork equipment.
  - Protect edges from damage during subsequent operations.

Strength & Stability Analysis of LCC

Relationship between Unconfined Compressive Strength LCC Specimens with Their Corresponding Test Unit Weights.



Effective Stress Failure Envelope Obtained from DSS Tests for the LCC Materials.

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