LEED Reference Guide
For Precast Concrete Products
REINFORCED CONCRETE PIPE

NPCA
Precast ... The Concrete Solution
Reinforced Concrete Pipe in the Environment

Reinforced concrete pipe is instrumental in protecting precious groundwater by conveying wastewater and stormwater through complex underground infrastructure systems. You may not see it working, but precast concrete pipe plays a major role in preserving groundwater quality and ensuring a sanitary environment. Precast pipe is available in a huge variety of shapes and sizes. The flexibility and modularity of precast pipe make it possible to meet the needs of any sanitary wastewater or stormwater project. With its long history of unparalleled strength and proven performance, precast concrete is the material of choice for piping projects.

General Benefits of Reinforced Concrete Pipe

LEED 2009 – New Construction
• SS 5.1 – Site Stewardship: Protect or Restore Habitat
• SS 5.2 – Sustainable Sites: Maximize Open Space
• SS 6.1 – Stormwater Design: Quantity Control
• SS 6.2 – Stormwater Design: Quality Control
• MR 4 – Recycled Content
• MR 5 – Regional Materials

LEED 2009 – Neighborhood Construction
• GIB 7 – Minimize Site Disturbance in Design and Construction
• GIB 15 – Recycled Content in Infrastructure

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The Credit Requirements listed in this document are contained within the Leadership in Energy and Environmental Design Green Building Rating System developed by the United States Green Building Council. For more information on the LEED Green Building Rating System, please visit www.usgbc.org.

For additional information about using precast concrete within the LEED system, please visit www.precast.org
Reinforced Concrete Pipe Has Many Advantages Over Competing Materials

Rough and tough
The strength of concrete increases with time. Other materials can deteriorate, experience creep and stress relaxation, lose strength and/or deflect over time. The load-carrying capacity of concrete is derived from its own structural qualities and does not rely on the strength or quality of the surrounding backfill material.

Here for the long haul
Studies have shown that manufactured concrete products, such as concrete pipe, can provide a service life in excess of 100 years. For severe service conditions, additional design options are available that can extend the life of the concrete product. This is important when calculating life-cycle costs for a project.

Setting the standards
Concrete pipe is produced in a plant-controlled environment using repeatable processes. The design and manufacture of concrete pipe is covered by many ASTM International Standards to help ensure quality:


Watertight? Darn right
Concrete products manufactured in a quality-controlled environment are watertight. Standard watertight gaskets and sealants are formulated to adhere to concrete, making multiple-seam waterproof structures possible.

Installation is easy
Because concrete pipe can be manufactured well in advance, it is ready for transportation to the job site at a moment’s notice. Concrete pipe is quickly installed using a crane and a small crew.

Heavyweight champion
With a specific gravity of 2.40 and superior frictional resistance, concrete pipe resists the buoyant forces associated with underground construction better than all other pipe materials. Alternative materials such as HDPE have lower specific gravities, causing potential buoyancy problems.

Can take the heat
Concrete pipe is noncombustible. Materials other than concrete and steel are flammable and/or do not perform well at elevated temperatures.

Modularity
Because of the modular nature of concrete pipe, piping systems of nearly any size can be accommodated. Concrete pipe is designed and manufactured for simple connection to reduce installation time.

Looks good in “Green”
Besides water, concrete is the most frequently used material on earth. It is nontoxic, environmentally safe and composed of natural materials, so groundwater quality is not affected after installation.
Credit Requirement  
Max. Points: 1

Site Development – Protect or Restore Habitat

Case 1 – Greenfield Sites
Limit all site disturbances to the following parameters:
- 40 feet beyond the building perimeter
- 10 feet beyond surface walkways, patios, surface parking and utilities less than 12 inches in diameter
- 15 feet beyond primary roadway curbs and main utility branch trenches
- 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities and playing fields) that require additional staging areas to limit compaction in the constructed area, or

Case 2 – Previously Developed Areas
Restore or protect a minimum or 50% of the site (excluding the building footprint) or 20% of the total site area (including building footprint area), whichever is greater, with native or adapted vegetation.

Precast Contribution

Precast concrete products are cast and cured in the plant and delivered to the site ready to set so they reduce the staging area required, which can reduce the overall site disturbance.

The impact on the construction site is also reduced because there is no additional formwork, which often requires more construction area for above-ground products and larger excavation areas for underground products.

Less impact on sites can reduce construction waste, shorten the construction schedule and require fewer laborers on-site.
Credit Requirement

Site Development – Maximize Open Space

Requirements

Case 1: Sites with Local Zoning Open Space Requirements
Reduce the development footprint and/or provide vegetated open space within the project boundary such that the amount of open space exceeds local zoning requirements by 25%.

Case 2: Sites with No Local Zoning Requirements
(examples – some university campuses and military bases)
Provide a vegetated open space area adjacent to the building that is equal in area to the building footprint.

Case 3: Sites with Zoning Ordinances but No Open Space Requirements
Provide vegetated open space equal to 20% of the project site area.

ALL CASES
For projects in urban areas that earn SS Credit 2: Development Density and Community Connectivity, pedestrian-oriented hardscape areas can contribute to credit compliance. For such projects, a minimum of 25% of the open space counted must be vegetated.

Precast Contribution

Precast concrete stormwater management products can help maximize open space when utilized as underground detention/retention. These components can easily be located beneath paved parking, which reduces the need for an on-site water retention pond and reduces the site disturbance while maximizing vegetated open spaces.

Note: The precast products must be located within the site boundaries of a LEED rating system project type. Currently, infrastructure projects that are not part of a rating system would not contribute toward any LEED credits.
Credit Requirement  Max. Points: 1

Stormwater Design – Quantity Control

Case 1: Sites with existing imperviousness 50% or less

Option 1
Implement a stormwater management plan that prevents the postdevelopment peak discharge rate and quantity from exceeding the predevelopment peak discharge rate and quantity for the 1- and 2-year 24-hour design storms, or

Option 2
Implement a stormwater management plan that protects receiving stream channels from excessive erosion. The stormwater management plan must include a stream channel protection and quantity control strategies.

Case 2: Sites with existing imperviousness greater than 50%
Implement a stormwater management plan that results in a 25% decrease in the volume of stormwater runoff from the 2-year 24-hour design storm.

Precast Contribution

Precast concrete is an excellent choice to help control the quantity of stormwater runoff with a wide variety of products that can contribute to a proper stormwater management plan. Precast concrete underground storm systems are sized to channel large discharges to nearby bodies of water during heavy rains. Precast concrete not only withstands the forces from fluids inside the pipe, but also handles extreme loading conditions outside the pipe.
Credit Requirement  Max. Points: 1

Stormwater Design – Quality Control

Implement a stormwater management plan that reduces impervious cover, promotes infiltration and captures and treats the stormwater runoff from 90% of the average annual rainfall using acceptable best management practices (BMPs).

BMPs used to treat runoff must be capable of removing 80% of the average annual postdevelopment total suspended solids (TSS) load based on existing monitoring reports.

BMPs are considered to meet these criteria if:

- They are designed in accordance with standards and specifications from state or local program that has adopted these performance standards, or
- There exists infield performance monitoring data demonstrating compliance with the criteria. Data must conform to accepted protocol for BMP monitoring.

Precast Contribution

Precast concrete reinforced concrete pipes capture stormwater runoff in retention/detention systems. The outlets in these structures are sized to release the stored runoff at flow rates that serve to reduce the effects of pollutants leaving a site during peak flows.

Flow-through stormwater treatment structures can be utilized to separate sediments and other pollutants through a swirl flow pattern.

Precast concrete structures are often designed to fit stormwater treatment systems within them.
Credit Requirement

Max. Points: 2

Recycled Content

Requirements

Use materials with recycled content such that the sum of postconsumer recycled content plus 1/2 the preconsumer content constitutes at least 10% or 20% (based on cost) of the total value of the materials in the project. The minimum percentage materials recycled for each point threshold is:

<table>
<thead>
<tr>
<th>Recycled Content</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>1</td>
</tr>
<tr>
<td>20%</td>
<td>2</td>
</tr>
</tbody>
</table>

The recycled content value of a material assembly is determined by weight. The recycled fraction of the assembly is then multiplied by the cost of the assembly to determine the recycled content value.

Mechanical, electrical and plumbing components and specialty items such as elevators cannot be included in this calculation.

Include only materials permanently installed in the project.

Furniture may be included if it is included consistently in MR Credit 3: Materials Reuse through MR Credit 7: Certified Wood.

Precast Contribution

Precast concrete products may contain supplementary cementitious materials such as fly ash and blast furnace slag which will add to the project’s recycled content goals.

Precast products may also contain rebar and welded wire mesh which often contain recycled steel.

Other less frequently used recycled content components include various fiber reinforcements, glass aggregates, silica fume, and recycled crushed concrete.

The NPCA LEED Calculator will consider both options for use of recycled content. For help with this credit, visit www.precast.org/leed.
Credit Requirement

Regional Materials

Use materials or products that have been extracted, harvested, and manufactured within 500 miles of the project site.

The calculation is based on the overall materials cost. Materials costs include all expenses to deliver the material to the project site. Materials costs should account for all taxes and transportation costs incurred by the contractor but exclude any cost for labor and equipment once the material has been delivered to the site.

Regional Materials of 10% = 1 point
Regional Materials of 20% = 2 points

See the NPCA LEED Calculator at www.precast.org/leed for help with this credit.

See the LEED Canada guide for information on Canada’s credit requirements.

Precast Contribution

Because concrete uses plentiful and natural raw materials, concrete components can be extracted, harvested and manufactured within 500 miles of the project site. Using locally obtained raw materials helps reduce transportation distances which reduces the environmental impact of carbon emissions.

If shipping is done by rail or water, LEED Canada allows up to 2,400 km (1,500 miles) from both the manufacturing site to the project site and the location where building materials are extracted, harvested, recovered and processed to the manufacturing site.

The NPCA LEED Calculator helps provide the proper documentation required for this credit. Simply input the Zip code or postal code where each raw material originates and the weight of each material to generate a printable file that can be e-mailed to the LEED AP contractor or architect.
Credit Requirement

Minimized Site Disturbance in Design and Construction

Option 1 – Development Footprint on Previously Developed Land:
Locate 100% of the development footprint on areas previously developed, or

Option 2 – Undeveloped Portion of Project Left Undisturbed:
Limit disturbance to:
- 40 feet beyond the building perimeter
- 10 feet beyond surface walkways, patios, surface parking and utilities less than 12 inches in diameter
- 15 feet beyond street curbs and main utility branch trenches
- 25 feet beyond constructed areas with permeable surfaces that require additional staging areas to limit compaction in the constructed zone.

Note: This is a condensed version of the credit. The full credit may be downloaded from USGBG’s Neighborhood Development Guide.

Precast Contribution

Precast concrete products are plant cast and delivered to the site ready to set so they reduce the staging area required which can reduce the overall site disturbance.

The impact on the construction site is also reduced because there is no additional formwork, which often requires more construction area for above-ground products and larger excavation areas for underground products.

Less impact on sites can reduce construction waste, shorten the construction schedule and require fewer laborers on-site.
Credit Requirement  Max. Points: 1

Use materials for new infrastructure such that the sum of postconsumer recycled content, in-place reclaimed materials and one-half of the preconsumer recycled content constitutes at least 50% of the total mass of infrastructure materials.

Count materials in all of the following infrastructure items as applicable to the project:
- Roadways, parking lots, sidewalks, unit paving, and curbs
- Water retention tanks and vaults
- Base and subbase materials for the above
- Stormwater, sanitary sewer, energy distribution, and water piping

See the NPCA LEED Calculator at www.precast.org/leed for help with this credit.

See the LEED Canada guide for information on Canada’s credit requirements.

Precast Contribution

Precast concrete products may contain supplementary cementitious materials such as fly ash and blast furnace slag which will add to the project’s recycled content goals.

Precast products may also contain rebar and welded wire mesh which often contain recycled steel.

Other less frequently used recycled content components include various fiber reinforcements, glass aggregates, silica fume, and recycled crushed concrete.

Beyond precast products themselves, recycled crushed concrete can also contribute to this credit when utilized as road fill base.