



# LEED Reference Guide For Precast Concrete Products MANHOLES



**NPCA**

Precast ... The Concrete Solution



# PRECAST CONCRETE MANHOLES



Precast concrete manholes are an integral component of any modern sewer system. A properly designed and installed precast concrete manhole system provides superior watertight performance compared with competing methods and materials. A typical precast concrete manhole can be installed 500 feet deep and more, because lateral forces act equally around the periphery, which places the section in pure compression – the ideal state for concrete. Precast concrete manhole sections are produced in a controlled environment, so they exhibit high quality and uniformity of construction.

Advantages of Precast Concrete Manholes ..... 3

## **LEED 2009 – New Construction**

SS 5.1 – Site Development: Protect or Restore Habitat ..... 4  
SS 6.1 – Stormwater Design : Quantity Control ..... 5  
SS 6.2 – Stormwater Design : Quality Control ..... 6  
MR 4 – Recycled Content ..... 7  
MR 5 – Regional Materials..... 8

## **LEED 2009 – Neighborhood Construction**

GIB 7 – Minimize Site Disturbance in Design and Construction ..... 9  
GIB 15 – Recycled Content in Infrastructure ..... 10

---

**National Precast Concrete Association**  
**1320 City Center Dr. Suite 200, Carmel, IN 46032**  
**(800) 366-7731 | [www.precast.org](http://www.precast.org)**

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered; however, National Precast Concrete Association acts as a mediator without approving, disapproving or guaranteeing the validity or accuracy of any data, claim or opinion appearing herein. Information is provided and disseminated with the understanding that the National Precast Concrete Association is not engaged in rendering engineering, legal or any other professional services. If engineering, legal or other professional assistance is required, the services of a competent professional should be obtained. The National Precast Concrete Association does not assume and hereby disclaims liability to any person for any loss or damage caused by errors or omissions in the material contained herein, regardless of whether such errors result from negligence, accident or any other cause whatsoever. 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](http://www.usgbc.org).

**For additional information about using precast concrete within the LEED system, please visit [www.precast.org](http://www.precast.org)**

# PRECAST CONCRETE MANHOLES

## Advantages of precast concrete manholes

### Installation is easy

Precast concrete manholes are desirable over cast-in-place concrete or brick manholes due to ease of installation. Precast concrete manholes can be easily installed on demand and immediately backfilled – there is no need to wait for concrete or mortar to cure at the job site. The size of the excavation may be smaller for precast as the other methods may require more work space and costly formwork and scaffolding. The degree of soil compaction around the manhole and remaining trenches is never a problem, making installation easier. Contractors are familiar with how to handle precast concrete manholes and can easily install them. Standard sealants and flexible joints are vital to watertightness.

### We're talking quality here

Because precast concrete products typically are made in a controlled environment, they exhibit high quality and uniformity. Variables affecting quality typically found on a job site – temperature, curing conditions, material quality and craftsmanship – are controlled in a precast plant.

### Rough and tough

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

Studies have shown that precast concrete products 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 precast concrete product. This is extremely important when calculating life-cycle costs for a project.

### Nasty weather? No problem

Precast concrete increases efficiency because weather will not delay production of the manholes. In addition, weather conditions at the job site do not significantly affect the schedule because less time is required to install precast compared with



other construction materials, such as cast-in-place concrete, brick, or plastic and fiberglass products.

### Watertight – can do

ASTM C 478, "Standard Specification for Precast Concrete Manhole Sections," specifies the proper manufacture of quality, watertight precast concrete manholes. Standard watertight sealants and gaskets are available that are specially designed for use with precast concrete, making multiple seam precast concrete manholes very easy to construct. Vacuum testing is an easy means of verifying watertightness, either in the plant or in the field, as detailed in ASTM C 1244, "Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test."

### Will stay on the job

With a specific gravity of 2.40 and superior frictional resistance, precast concrete manholes resist buoyant forces better than all other manhole materials. Fiberglass has a specific gravity of 1.86 and HDPE has a specific gravity of 0.97, requiring the use of tie downs and ultimately increasing project costs. With the many advantages over alternative products, precast concrete manholes are clearly the material of choice for long-term maintenance-free conveyance of sewer and stormwater.



# PRECAST CONCRETE MANHOLES



## MANHOLES LEED New Construction

### SS 5.1 Sustainable Sites

Site Development  
Protect or Restore Habitat

## 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 of 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.

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

## 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.

# PRECAST CONCRETE MANHOLES



<b>MANHOLES</b> <b>LEED New Construction</b>
<b>SS 6.1</b> <b>Sustainable Sites</b>
<b>Stormwater Design</b> <b>Quantity Control</b>

## Credit Requirement

Max. Points: 1

## Precast Contribution

### 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 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.

Precast concrete manholes are often used as part of a storm retention system which helps minimize land use.



# PRECAST CONCRETE MANHOLES



## MANHOLES LEED New Construction

### SS 6.2 Sustainable Sites

#### Stormwater Design Quality Control

## Credit Requirement

**Max. Points: 1**

### 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.

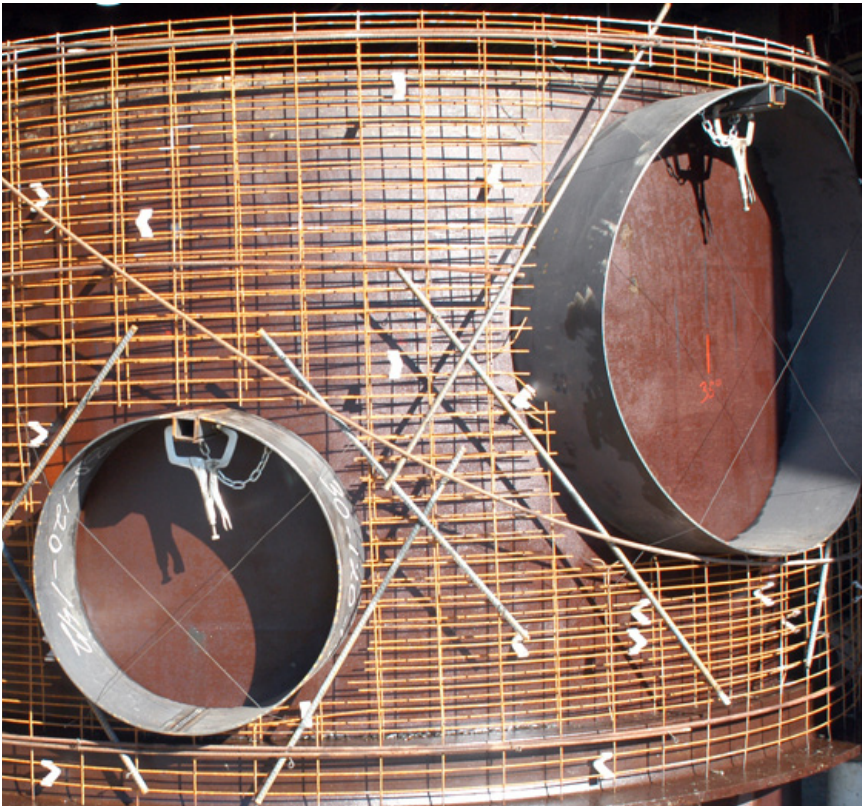
## Precast Contribution

Precast concrete reinforced manholes help control the quality and quantity of water in stormwater systems.

Precast concrete stormwater structures such as manholes are often designed to incorporate flow-through stormwater treatment systems within their structures.

These systems can be utilized to separate sediments and other pollutants through a swirl flow pattern.

# PRECAST CONCRETE MANHOLES



## 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:

Recycled Content	Points
10%	1
20%	2

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.

**MANHOLES**  
LEED New Construction

**MR 4**  
Materials and Resources

Recycled Content

## 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 is often made from 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 helps members respond with the proper documentation required for this credit. Simply input the Zip Code/Postal Code and weight for each component to generate a pdf file that can be e-mailed directly to the LEED AP, contractor or architect.

# PRECAST CONCRETE MANHOLES



<b>MANHOLES</b> <b>LEED New Construction</b>
<b>MR 5</b> <b>Materials and Resources</b>
<b>Regional Materials</b>

## Credit Requirement

**Max. Points: 2**

### 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](http://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 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.



# PRECAST CONCRETE MANHOLES



**MANHOLES**  
**LEED Neighborhood  
Development**

**GIB 7**  
**Green Infrastructure  
and Buildings**

**Minimized Site  
Disturbance in Design  
and Construction**

## Credit Requirement

**Max. Points: 1**

### 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.

# PRECAST CONCRETE MANHOLES



**MANHOLES**  
**LEED Neighborhood**  
**Development**

**GIB 15**  
**Green Infrastructure**  
**and Buildings**

**Recycled Content in**  
**Infrastructure**

## Credit Requirement

**Max. Points: 1**

### Recycled Content in Infrastructure

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](http://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.