

5 Site Sustainability

SYNOPSIS

Chapter 5 Site Sustainability. Chapter 5 contains requirements related to the selection and development of sites and the mitigation of heat island effect, light pollution, transportation and site debris impacts.

Section 501.3.1.1 (§ 5.3.1) limits building projects to existing buildings and previously developed sites including brownfields, greyfields and greenfields. Development on greenfields is limited to sites that are located in walkable proximity to neighborhood services or public transit. Development on agricultural, forest or park land is permitted as long as the proposed building project is related to the intended function of the agricultural, forest or park land.

Section 501.3.1.2 (§ 5.3.1.2) prohibits building development on previously undeveloped sites having an elevation lower than 5 feet (1.5 m) above the elevation of the 100-year flood and lands in close proximity to wetlands and to fish and wildlife habitat conservation area.

Section 501.3.2 (§ 5.3.2) requires predesign site inventory and assessment.

Section 501.3.3 (§ 5.3.3) prohibits invasive plants and protects native plants on greenfields.

Section 501.3.4 (§ 5.3.4) contains requirements for stormwater management systems.

Section 501.3.5 (§ 5.3.5) requires the mitigation of heat island effect on hardscape surfaces and roofs. Mitigation of wall surfaces is a jurisdictional option.

Section 501.3.6 (§ 5.3.6) provides mitigation of site light pollution as a jurisdictional option.

Section 501.3.7 (§ 5.3.7) addresses transportation impacts, including requirements for pedestrian connectivity, bicycle parking and electric vehicle charging facilities. Bicycle parking location, rack design and security/visibility provisions are jurisdictional options.

Section 501.3.8.1 (§ 5.3.8.1) provides building site waste management as a jurisdictional option based on percentage of landfill diversion.

Changes to Site Sustainability

- ❑ **101.5.1 (§ 4.2) Jurisdictional Options.** New jurisdictional options provide the adopting jurisdiction the flexibility to adopt the code in a manner that is best suited to meet the environmental priorities of their given community. Jurisdictional options for site sustainability include mitigation of heat island effect on walls, reduction of light pollution, bicycle parking location, parking racks, bicycle security and site waste landfill diversion. The informative symbol [JO] indicates jurisdictional option.
- ❑ **501.3.5.3 (§ 5.3.5.3) Roofs.** New requirement for Climate Zones (CZ) 4A and 4B to meet the heat island mitigation criteria for roofs with two new exceptions. An exception is added for existing buildings in CZ 4A and 4B undergoing alteration, repair, relocation or a change of occupancy. A second exception is for ballasted roofs in CZ 4A and 4B.
- ❑ **501.3.6 (§ 5.3.6) Reduction of Light Pollution.** Removes reference to lighting requirements in ANSI/ASHRAE/IES Standard 90.1, which is already covered by Section 701.4.6 (§ 7.4.6) of this standard. Tables 501.3.6.2A and 501.3.6.2B (Tables 5.3.6.2A and 5.3.6.2B) are combined into one Table 501.3.6.1 (Table 5.3.6.1) to clarify applicable requirements. The new change also removes one of the options for uplight compliance in order to align with the IDA/IES Model Lighting Ordinance (MLO).
- ❑ **501.3.7.3 (§ 5.3.7.3) Electric Vehicle Charging Facilities.** Revises and clarifies requirements for electric vehicle charging infrastructure based on occupancy group as classified by the *International Building Code*® (IBC®). Definitions are added for “electric vehicle supply equipment (EVSE)” and “EV ready space.” Preferred parking provisions are deleted.

These changes are designated with a ❖ in the margin of this chapter. For the specific addenda that define the differences between the 2017 and 2020 editions of ASHRAE Standard 189.1/2021 IgCC, refer to Informative Appendix N of the IgCC.

Scope 501.1 (§ 5.1)

The site sustainability measures in the IgCC are meant to address the environmental impacts associated with the development and use of a building *site*. For example, building on a *greenfield* or previously undeveloped *site* often disrupts ecosystems and increases the negative effects of erosion. Similarly, *hardscape* on a building *site* affects stormwater runoff and can increase the *heat island effect*, depending on the color, reflectivity and emissivity of paved surfaces.

The selection of a building *site* also affects air pollutant emissions, including carbon dioxide. Building occupants frequently rely on automobiles to travel to and from buildings. If a *building project* is located in close proximity to an existing *residential* community, neighborhood services or public transit, individuals are more inclined to use alternative modes of transportation, including walking and bicycling, thereby helping to mitigate greenhouse gas emissions and other pollutants emitted from passenger vehicles.

Light pollution is another environmental impact associated with the design of a building *site*. Exterior lighting can disrupt the nocturnal habitats of wildlife and reduce visual access to night skies. Additionally, excessive or improperly shielded lighting can travel beyond the building property line, disrupting adjacent properties with glare or blinding light.

By evaluating *site*-related criteria early in the design process, projects can dramatically reduce the environmental impacts associated with *site* selection, *stormwater*, *heat islands*, light pollution, transportation and site debris.

Compliance 501.2 (§ 5.2)

To comply with the site sustainability requirements of the IgCC, projects shall demonstrate compliance with all Chapter 5 provisions. Chapter 5 does not include the prescriptive or performance paths found frequently in other chapters. Figure 5-A provides a graphical representation of the compliance requirements for Chapter 5, Site Sustainability.

Mandatory Provisions 501.3 (§ 5.3)

The *site*-related requirements are mandatory for all projects. These mandatory provisions ensure that critical *site*-related features are implemented. The mandatory provisions cover the following topics: *site* selection, Section 501.3.1 (§ 5.3.1); predesign *site* inventory and assessment, Section 501.3.2 (§ 5.3.2); *plants*, Section 501.3.3 (§ 5.3.3); stormwater management, Section 501.3.4 (§ 5.3.4); mitigation of *heat island effect*, Section 501.3.5 (§ 5.3.5); reduction of light pollution, Section 501.3.6 (§ 5.3.6); mitigation of transportation impacts, Section 501.3.7 (§ 5.3.7); and building site waste management, Section 501.3.8 (§ 5.3.8).

Site Selection 501.3.1 (§ 5.3.1)

This section provides criteria related to *site* selection and limits development on environmentally sensitive lands.

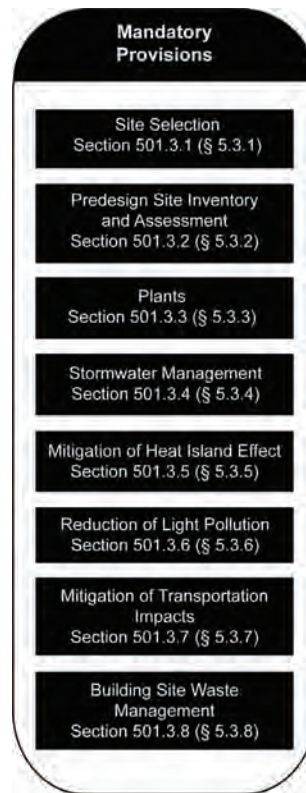


Figure 5-A Compliance paths.

Allowable Sites 501.3.1.1 (§ 5.3.1.1)

As a measure to preserve open *space*, greenfields and the ecological functions that natural ecosystems provide, the IgCC establishes low impact development (LID) measures intended to enhance the environmental quality of development within any given community.¹ However, users of the code will need to interface and comply with local planning for regulations pertaining to land use, zoning and density. In addition to such regulations, the IgCC limits development to any of the following land use conditions:

- Existing building and site. Reuse of and reinvestment in existing building infrastructure can be one of the most sustainable choices for a building project.
- A *brownfield* as defined in Chapter 3.²
- A *greyfield* as defined in Chapter 3. Examples of a *greyfield* include an abandoned parking lot or an underutilized real estate asset such as an aging retail mall or other commercial development.
- A greenfield, as defined in Chapter 3, where the land that is not *agricultural land or forestland* and that is within $\frac{1}{2}$ mile (800 m) of *residential* land that is developed, or that has one or more buildings under construction with an average density of 10 *dwelling units* per acre (4 units per ha). Proximity is determined by drawing a circle with a $\frac{1}{2}$ mile (800 m) radius around the center of the proposed site.
- A greenfield where the proposed building complies with ASTM E2843, *Standard Specification for Demonstrating that a Building is in Walkable Proximity to Neighborhood Assets*, with the exception of *agricultural* or forest lands. By selecting a site in walkable proximity to wide range of neighborhood assets such as grocery stores, day-care facilities, dry cleaners, beauty shops, hardware stores, financial institutions, post offices and restaurants, building users will be less dependent on vehicles, thereby helping to mitigate greenhouse gas emissions and other environmental impacts.

1. <http://www.epa.gov/smart-growth>.
 2. <http://www.epa.gov/brownfields>.

To determine whether a *site* meets this requirement, project teams are encouraged to create a scaled map showing the distance from the project *site* to surrounding neighborhood assets. A useful example of a basic services map, illustrating community connectivity, is provided in Figure 5-B.

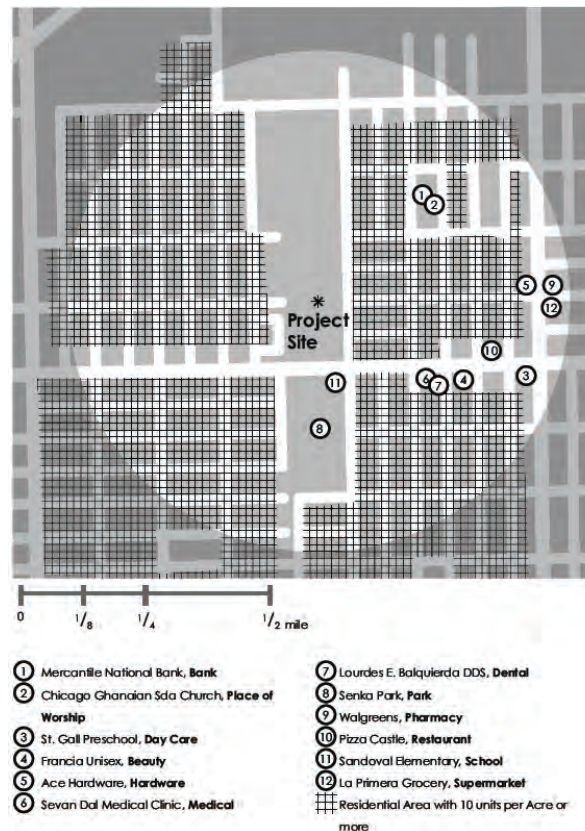


Figure 5-B Sample map of community connectivity.

Source: *LEED Reference Guide for Green Building Design and Construction*, 2009 Edition, Sustainable Sites Credit 2: Development Density and Community Connectivity

- A greenfield where the proposed building complies with ASTM E2844, *Standard Specification for Demonstrating that a Building's Location Provides Access to Public Transit*, with the exception of agricultural or forest lands. By selecting a site with access to alternative or public transit, building users will again be less dependent on vehicles to access neighborhood services, thereby helping to mitigate greenhouse gas emissions and other environmental factors. To determine whether a potential site meets this requirement, projects should create a scaled map showing the location of the project site in relation to the surrounding public transit. A useful sample drawing for this type of transit map is shown in Figure 5-C.
- *Agricultural land* is limited to building projects whose function is related to agriculture. The intent of this requirement is to promote local agricultural trade and production by reserving lands with suitable soil, water properties, etc., for projects dependent on these characteristics.³
- *Forest land* is limited to *building projects* whose function is related to the forest. The intent of this requirement is to prohibit development that leads to deforestation, which has a direct impact on wildlife habitat, biodiversity, carbon sequestration, erosion and other environmental conditions. An example of a building appropriately

3. Additional information on designated agricultural lands can be found in CFR Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7 CFR 657.5) (<http://www.ecfr.gov>).

located on *forest land* might include a ranger station, visitor center or forestry service building located within a national forest.

- Designated *park land* is limited to *building projects* whose function is related to the park. Examples of buildings on *designated park land* might include an administration building servicing a national or regional park, a visitors center or a recreational facility located within a municipal public park.

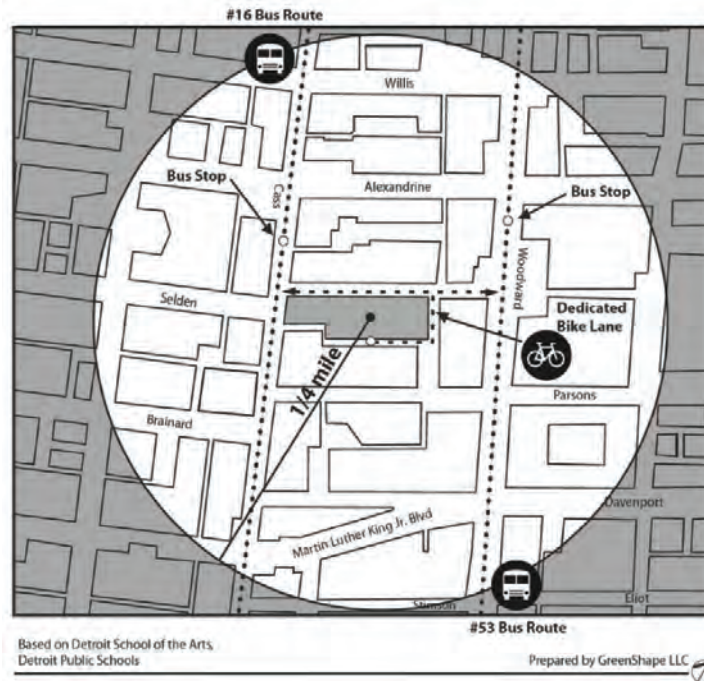


Figure 5-C Sample map of community connectivity.

Source: *LEED Reference Guide for Green Building Design and Construction*, 2009 Edition, Sustainable Sites Credit 4.1: Alternative Transportation—Public Transportation Access

Prohibited Development Activity 501.3.1.2 (§ 5.3.1.2)

In order to protect environmentally sensitive lands from development, there shall be no *site* disturbance or development of the following:

- Previously undeveloped land having an elevation lower than 5 feet (1.5 m) above the elevation of the 100-year flood as defined by the US Federal Emergency Management Agency (FEMA).⁴ A 100-year flood, as defined by FEMA, pertains to “the flood elevation that has a 1-percent chance of being reached or exceeded each year.” The intent of this requirement is to minimize the risk of *site*-related hazards, such as flooding, that may result from naturally occurring storm events.

Exceptions to 501.3.1.2(a) [§ 5.3.1.2(a)]

There are two exceptions to Section 501.3.1.2(a) [§ 5.3.1.2(a)].

- The first exception allows the development of *low-impact trails* anywhere within a flood zone. *Low-impact trails* are pathways or tracks intended for pedestrian and nonmotorized vehicles. They must be erosion-stabilized and use permeable or natural ground cover. Although some damage to *low-impact trails* may occur during a flood, trails do not significantly impede water flow or infiltration.

4. <http://www.fema.gov>.

2. The second exception to this requirement allows building structures to be located within alluvial “AO” flood zones, as designated by FEMA Flood Insurance Rate Maps (FIRMS).[†] “AO” zones are those where flood depths of 1 to 3 feet have a 1-percent chance of occurring each year. The flooding in this zone is usually sheet flow on sloping terrain rather than ponding in low-lying areas. Building structures are acceptable within an AO flood zone if engineered floodproofing is provided that protects the building. Floodproofing is required to protect the building to a floor elevation not lower than the flood elevation. Floodwater control must divert the water around and away from the building structures. An example of floodproofing is elevating the lowest floor of a building 12 inches (305 mm) above the designated design flood elevation.^{††} In addition, the building foundation is required to be designed and constructed with materials that are flood-resistant and can withstand all anticipated flood loads.^{†††}

[†] <http://msc.fema.gov>.

^{††} Minimum lowest floor elevation is determined by the local *authority having jurisdiction (AHJ)*.

^{†††} http://www.wbdg.org/resources/env_flood.php.

- b. Land within 150 feet (50 m) of any *fish and wildlife habitat conservation area* is prohibited from development activity. These areas are designated at the state or federal level as areas that support the needs of endangered, threatened or sensitive *plant* or animal species.

Exceptions to Section 501.3.1.2(b) [§ 5.3.1.2(b)]

1. Development of *low-impact trails* that are at least 15 feet (4.5 m) from the habitat conservation areas. Such trails as defined cause minimal disturbance to the surrounding environment.
 2. Site disturbance or development is allowed for activity associated with habitat enhancement measures or restoration of habitat.
- c. Land within 100 feet (35 m) of any *wetland* is prohibited from development activity. *Wetlands*⁵ are areas where the ground is routinely saturated with water such that only *plants* adapted to these damp conditions can thrive. They typically are low-lying areas where water collects. These areas frequently act as a means of controlling water flow during periods of heavy rain or snow runoff. By controlling water flow, silt and other debris are able to settle out of the water. The vegetation and wildlife that populate the areas provide further filtration of the water passing through the area. *Wetlands* include areas designated by state or federal entities but also include any area that meets the ground and vegetation conditions. These areas may be man-made or naturally occurring. An example of a man-made *wetland* includes detention areas that control *site* water runoff.

5. Refer to the following information on wetland characteristics and buffer zones: http://water.epa.gov/type/wetlands/upload/2003_07_01_wetlands_vital_wetlands.pdf.

Exceptions to Section 501.3.1.2(c) [§ 5.3.1.2(c)]

1. As with *fish and wildlife habitat conservation areas*, where the disturbance or development comprises *low-impact trails*, construction of such trails is allowed no closer than 15 feet (4.5 m) to *wetland* areas. Such trails will minimally disturb the surrounding environment.
2. *Site* disturbance or development shall be allowed for habitat enhancement measures or for restoration of the functions of the wetland.

Predesign Site Inventory and Assessment 501.3.2 (§ 5.3.2)

After the project *site* has been selected prior to the start of design, a *site* inventory and environmental assessment of the *site* shall be taken. The results of the assessment and inventory shall be included on the design and *construction documents*. It shall identify the following items:

- a. The location of prohibited development areas such as flood zones, *fish and wildlife habitat conservation areas*, and *wetlands* as prescribed by Section 501.3.1.2 (§ 5.3.1.2).
- b. The species of all *invasive plants* found on the building *site* that are listed on city, county or regional *invasive plants* lists or included in state and federal noxious weed laws. *Invasive plants* are not native or adapted to the *site* and pose a high risk of environmental harm to native species.
- c. The species of all *native plants* found on the building *site*. *Native plants* are indigenous to the local environment and contribute to a healthy ecosystem.
- d. *Site* features designated for preservation. This includes any vegetation, topography, geology or other features deemed to be preserved by the AHJ.

Plants 501.3.3 (§ 5.3.3)**Invasive Plants 501.3.3.1 (§ 5.3.3.1)**

Invasive plants outcompete and displace *native plants* that are vital to a healthy ecosystem. When *invasive plants* are found on the project *site* they shall be removed and either destroyed or disposed of in a landfill. The objective is to prevent these *plants* from reestablishing.

Greenfield Sites 501.3.3.2 (§ 5.3.3.2)

The following requirements ensure *building projects* maintain existing *native* or *adapted plants* or provide new *native* or *adapted plants* into the *site* landscape while limiting the use of *turfgrass*.

1. If the predevelopment *site* contains *native plants* or *adapted plants* covering an area greater than 20 percent of the total *site* area, a minimum of 20 percent of the area of *native plants* or *adapted plants* is required to be retained.
2. If the predevelopment *site* is covered by *native plants* or *adapted plants* that have a total area equal to or less than 20 percent of the total *site* area, a minimum of 20 percent of the *site* area is required to be developed or retained as vegetated area. Such vegetated areas can include bioretention facilities, rain gardens, filter strips, grass swales, vegetated level spreaders, constructed *wetlands*, planters or open *space* with plantings. At least 60 percent of the vegetated area shall consist of *bio-diverse planting* of *native plants* or *adapted plants* other than *turfgrass*.
 - ❖ **Exception:** The following areas are not to be included in the 60 percent calculations: dedicated sports fields, driving ranges, burial grounds, vegetated pavers and fire lanes required by the AHJ.

Stormwater Management 501.3.4 (§ 5.3.4)

Uncontrolled stormwater runoff can cause excessive erosion, flooding, environmental damage and property damage. Stormwater management strategies reduce the flow rate and total volume of stormwater that leaves the project *site*. Stormwater management systems also reduce water *contaminants* introduced by nonpermeable surfaces. Except to the extent that other stormwater management requirements are enacted by local, state or federal jurisdictions, stormwater management provisions of this code shall be limited to one or more of the following management methods:

- a. **Infiltration.** The process of allowing precipitation to saturate the ground of the project *site*. The water will migrate through the earth and eventually contribute to aquifers below.
- b. **Evapotranspiration.** The sum of evaporation of water from the ground and other surfaces and the transpiration of water from vegetation.
- c. **Rainwater harvesting.** The collection and storage of precipitation that has fallen on a building or building *site*, for the purposes of being reused.
- d. **Stormwater collection and storage.** Similar to rainwater harvesting, this is the collection and storage of precipitation. However, stormwater collection typically refers to the collection of precipitation that has fallen on dirt or paved surfaces. Compared to rainwater, stormwater typically contains more sediment and *contaminants*, which requires treatment for collection, storage and potential uses.

All of the strategies provided above reduce both the flow rate and the total volume of stormwater runoff. The implementation of these strategies contributes to compliance with Sections 501.3.4.1 (§ 5.3.4.1), 501.3.4.2 (§ 5.3.4.2) and 501.3.4.3 (§ 5.3.4.3).

These requirements are not intended to circumnavigate any local stormwater management requirements. Where local, state or federal regulations require implementation of specific stormwater management practices that conflict with the stormwater management strategies listed previously, the local regulations shall take precedence.

Note that local regulations may not always require specific stormwater management practices. They may, however, prohibit certain strategies required by this section. Unless all stormwater management strategies listed in this section are prohibited, the project is expected to comply with one or more of the strategies.

Projects on Greenfields 501.3.4.1 (§ 5.3.4.1)

Projects located on *greenfields* shall comply with one of the following two options.

- a. To comply with this option, project *sites* shall be able to retain no less than the volume of water that would fall in a 24-hour period during a 95th-percentile precipitation event. For example, for a given project *site* location, 95 percent of all rainfall events in the past 30 years have not exceeded 1.5 inches (38.1 mm) in a 24-hour period.⁶ For a project *site* in this location that covers 100,000 square feet (9290 m²), the 95th-percentile volume of precipitation in a 24-hour period would be 12,500 cubic feet (350 m³). The project *site* shall be capable of retaining no less than this volume of water on *site*.

The method of retaining the water on *site* is not dictated by the IgCC. Common methods capable of satisfying the requirements of this section include but are not limited to detention and retention basins. Retention basins are typically wet and normally hold water. Where used as the sole stormwater management system, these retention basins shall be capable of accepting the 95th-percentile rainfall volume in addition to the typical standing water volume held in the basin. Detention basins are normally dry, so the volume of the basin is much closer to the volume of the 95th-percentile event.

6. <http://www.noaa.gov>.