

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 and transportation impact.

Section 501.3.1.1 (§ 5.3.1) limits building projects to existing buildings and previously developed sites including brownfields, greyfields and greenfields located in close proximity to existing development.

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.

Section 501.3.6 (§ 5.3.6) mitigates site light pollution.

Section 501.3.7 (§ 5.3.7) addresses transportation impacts, including requirements for pedestrian connectivity, bicycle parking and preferred parking for low-emission vehicles.

Section 501.3.8.1 (§ 5.3.8.1) requires building site waste management.

Changes to Site Sustainability

- 501.3.1.1 (§ 5.3.1.1) Allowable Sites.** Items e and f were revised to require compliance with ASTM E2843 (walkable proximity) and E2844 (access to public transit) for development on greenfields.
- 501.3.1.2 (§ 5.3.1.2) Prohibited Development Activity.** Clarification of exceptions under Section 501.3.1.2 (§ 5.3.1.2), Prohibited Development Activity, for fish/wildlife habitat conservation areas Item (b) and wetlands Item (c).
- 501.3.3.2 (§ 5.3.3.2) Greenfield Sites.** New exceptions for biodiverse plantings on greenfield sites including dedicated sports fields, driving ranges, burial grounds, vegetated pavers, and fire lanes required by governing jurisdiction.
- 501.3.5.3 (§ 5.3.5.3) Roofs.** Clarification of applicable roof slopes requiring heat island mitigation; update of steep-slope roof SRI from 15 to 25; inclusion of Climate Zone 0; and new climate zone map in correlation with ASHRAE Standard 169-2013, Climatic Data for Building Design Standards.
- 501.3.5.4 (§ 5.3.5.4) Solar Reflectance Index (SRI).** Updated CRRC reference standard for measuring SRI values..
- 501.3.5.5 (§ 5.3.5.5) Vegetated Terrace and Roofing Systems.** New section for the design of vegetated terrace and roofing systems.
- 501.3.7.1.1 (§ 5.3.7.1.1) Pedestrian Walkways.** New minimum 5-foot width requirement for on-site walkways. In addition, a public-use walkway is now required along the length of public-way frontage of the project site.
- 501.3.7.1.2 (§ 5.3.7.1.2) Bicycle Paths.** A new requirement to connect on-site bicycle parking areas to existing or planned adjacent off-site public use bicycle paths.
- 501.3.7.3b (§ 5.3.7.3b) and Table 501.3.7.3 (Table 5.3.7.3) Provisions for Electric Vehicle Charging Infrastructure.** A new EV ready option consisting of electric conduit from electric service panels to parking spaces for future charging capability.
- 501.3.8 (§ 5.3.8) Building Site Waste Management.** A new section added for building site waste management.

These changes are designated with a ❖ in the margin of this chapter. For the specific addenda that define the differences between the 2014 and 2017 editions of ASHRAE Standard 189.1/2018 IgCC, refer to Informative Appendix K of this code.

Scope 501.1 (§ 5.1)

The site sustainability measures in the IgCC are meant to address the environmental impacts associated with the selection, development, and use of a building *site*. For example, building on a *greenfield* or previously undeveloped *site* often disrupts natural 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 vehicular transportation to travel to and from the building. If a *site* is located adjacent to a *residential* community or public transportation lines, individuals are more able to use alternative forms of transportation such as walking or bicycling, thereby reducing greenhouse gases and other pollutant emissions 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 neighboring environments with glare or excess light.

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

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); and mitigation of transportation impacts, Section 501.3.7 (§ 5.3.7).

Site Selection 501.3.1 (§ 5.3.1)

This section provides requirements related to *site* selection criteria and identifies development activities that are prohibited.

Allowable Sites 501.3.1.1 (§ 5.3.1.1)

In order to preserve open *space*, farmland, and the critical environmental and ecological functions that undeveloped *sites* provide, and to minimize the impacts related to constructing new infrastructure and to the travel to and from a building, the IgCC directs development to or away from specific types of *sites*¹. Projects will need to contact their local

1. <http://www2.epa.gov/smart-growth>

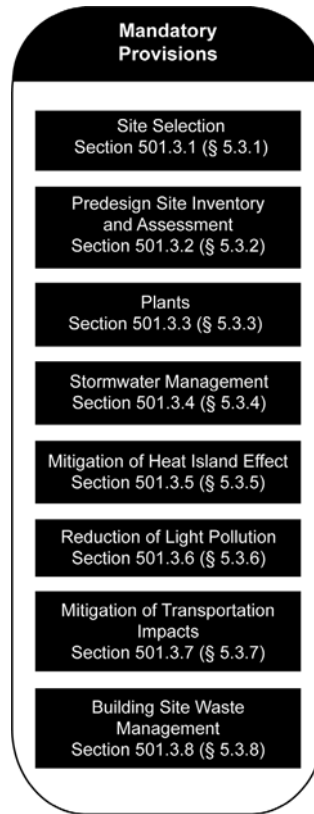


Figure F-A Compliance paths.

planning department or other jurisdictional authority to obtain relevant information pertaining to zoning, land use, and density. Projects shall be located in or on one of the following:

- An existing building. 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 3².
- 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 that is not *agricultural land or forest land* and that is within $\frac{1}{2}$ mi (800 m) of *residential* land that is developed, or that has one or more buildings under development, at an average density of 10 *dwelling units* per acre (4 units per ha).
- ❖ A greenfield where the proposed building complies with ASTM E2843, *Standard Specification for Demonstrating that a Building is in Walkable Proximity to Neighborhood Assets*, unless that site is *agricultural land* or forest land. 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 occupants will be less dependent on single-occupant vehicles for commuting, which has a direct impact on air pollutant emissions and other environmental factors. To determine whether a *site* meets this requirement, project teams are encouraged to create a scaled map showing the distance from the potential project *site* to surrounding neighborhood assets. A useful example of a basic services map, illustrating community connectivity, is provided in Figure 5-B.
- ❖ A greenfield where the proposed building complies with ASTM E2844, *Standard Specification for Demonstrating that a Building's Location Provides Access to Public Transit*, unless that site is *agricultural land* or forest land. By selecting a site with access to alternative or public transportation routes, building occupants will be

2. <http://www.epa.gov/brownfields>

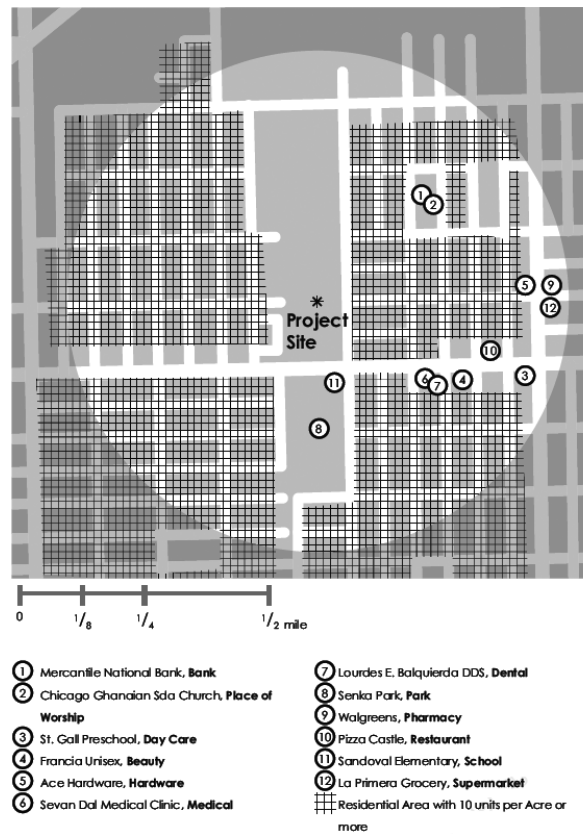


Figure 5-B Sample map of community connectivity.

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

less dependent on single-occupant vehicles for commuting, which has a direct impact on air pollutant 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 transportation routes. A useful sample drawing for this type of transportation map is shown in Figure 5-C.

- A *greenfield* that is *agricultural land* for a building purpose that relates 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 that are dependent on these *site* characteristics³.
- A *greenfield* that is *forest land* and where the building's purpose is related to forestry. 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 factors. An example of a building appropriately located on a *greenfield* that is a designated *forest land* might include a ranger station, visitor center, or forestry service building located within a national forest.
- On a *greenfield* that is *designated park land* and where the building's purpose relates to use of the land as a park. Examples of acceptable buildings on *greenfield sites* that are *designated park land* might include an administration building servicing a local national park, visitors center, or a recreational facility located within a municipal public park.

3. Additional information on designated agricultural lands can be found in CFR Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5) (<http://www.ecfr.gov>).

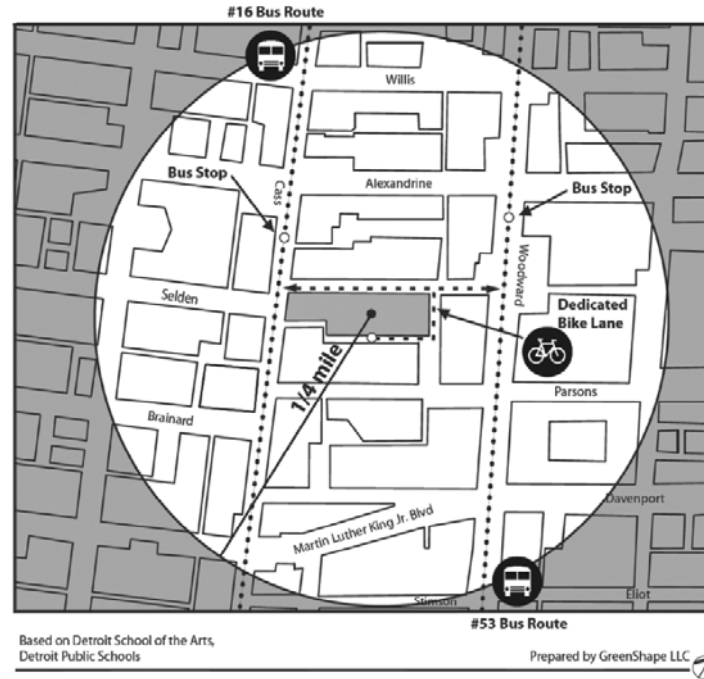


Figure 5-C Sample map of community connectivity.

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:

- a. 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, and to promote stormwater infiltration.

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

Two exceptions to Section 501.3.1.2(a) [§ 5.3.1.2(a)] exist.

1. 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 are 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.
 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

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

structure development is acceptable within an AO flood zone if engineered floodproofing that protects the building and floodwater control is included in the design. Floodproofing protects the building to a floor elevation not lower than the flood elevation. Floodwater control diverts 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 shall 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*. 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)]**

Where the disturbance or development comprises *low-impact trails*, construction of such trails is allowed no closer than 15 feet (4.5 m) to the habitat conservation areas as such trails minimally disturb the surrounding environment.

Site disturbance or development shall be allowed for habitat enhancement measures or for restoration of the habitat.

- c. Land within 100 feet (35 m) of any *wetland*. *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 as such 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.

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

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, as such trails should minimally disturb the surrounding environment.

Site disturbance or development shall be allowed for habitat enhancement measures or for restoration of the functions of the wetland.

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5. Refer to the following for additional information on wetland characteristics and buffer zones:
- http://moderncms.ecosystemmarketplace.com/repository/moderncms_documents/Setting%20Buffer%20Sizes%20for%20Wetlands.pdf
 - http://water.epa.gov/type/wetlands/upload/2003_07_01_wetlands_vital_wetlands.pdf