Accessibility Requirements for Solar Photovoltaic Systems at School Sites


This Interpretation of Regulations (IR) is intended for use by the Division of the State Architect (DSA) staff, and as a resource for design professionals, to promote more uniform statewide criteria for plan review and construction inspection of projects within the jurisdiction of DSA which includes State of California public elementary and secondary schools (grades K-12 and community colleges), and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

This IR is reviewed on a regular basis and is subject to revision at any time. Please check the DSA web site for currently effective IRs. Only IRs listed in the document at www.dgs.ca.gov/dsa/publications at the time of plan submittal to DSA are considered applicable.

**Purpose:** This Interpretation of Regulations clarifies DSA’s position regarding the installation of solar photovoltaic electric (PV) systems and the accessibility provisions applicable to those projects.

**Background:** When PV systems are proposed for installation at public school sites, the project documentation is first reviewed from a scoping perspective to determine the required accessibility features and then to verify that the technical information for any required features are included within the project scope.

For PV systems at existing school facilities, the key question is whether or not their installation is an alteration which could trigger accessibility upgrades to related “Path of Travel” elements. Attachment B – Code References provides the definitions of “Alteration” from both the 2010 and 2013 editions of the California Building Code (CBC) and the provisions of 2013 CBC Chapter 11B Section 11B-202.4 Path of Travel Requirements in Alterations, Additions and Structural Repairs.

1. **Project Categories:** This IR covers the following categories of PV system projects:
   - Roof Mounted
   - Elevated
   - Ground Level
   - Parking Facility

Unique situations that cannot be easily categorized should be discussed with the DSA Supervising Architect and, if a resolution is still unclear, referred to DSA Access Code and Policy for a determination.
1.1 Balance of System (BOS) Equipment - The BOS equipment, along with the area or enclosure housing it, qualifies for the machinery space and path of travel exceptions as long as the installation does not require an addition to or additional alteration of an existing school building to house the BOS equipment.1

2. Educational Uses: Areas of PV systems on a school site that will be used by teachers, students, staff or the general public for teaching, educational, demonstration or informational purposes shall be made accessible in compliance with the applicable requirements of the California Building Code.

For example, while roof top solar panels with access restricted to operations and service personnel do not have to be accessible, any BOS equipment used for teaching purposes or demonstration of renewable energy production must be accessible.

3. Roof Mounted PV Systems
   a. Roof mounted PV systems qualify for the machinery space exception; there are no accessibility requirements for the area of work on the roof.2
   b. Roof mounted PV systems are not considered alteration projects that would trigger path of travel accessibility work elsewhere in the facility.3 4
   c. To qualify for the machinery space and path of travel exceptions, access to rooftop areas with PV systems must be by ladders or narrow passageways5 or otherwise restricted to operations and maintenance personnel.6
   d. The BOS equipment, which may be located away from the rooftop equipment, also qualifies for the machinery space and path of travel exceptions, see 1.1 above.

---

1 2013 California Building Code §11B-202.4 Path of travel requirements in alterations, additions and structural repairs. Exceptions: 7. “Projects consisting only of . . . electrical work not involving the placement of switches or receptacles . . . shall not be required to comply with 11B-202.4. unless they affect the usability of the building or facility.”

2 2013 California Building Code §11B-203.5 Machinery spaces. “Spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment shall not be required to comply with these requirements or to be on an accessible route. Machinery spaces include, but are not limited to, . . . mechanical, electrical or communications equipment rooms; . . . ”


4 2013 California Building Code §202 definition of Alterations provides that “. . . changes to mechanical and electrical systems are not alterations unless they affect the usability of the building or facility.”

5 2013 California Building Code §11B-203.4 Limited access spaces. “Spaces not customarily occupied and accessed only by ladders, catwalks, crawl spaces or very narrow passageways shall not be required to comply with these requirements or to be on an accessible route.”

4. Overhead PV Systems

Overhead PV systems can be attached to, adjacent to or remote from school buildings and accessible outdoor areas. The area beneath an overhead PV system elevated components can be either 1) restricted to operations and service personnel or 2) available to teachers, students, staff and the general public. For purposes of accessibility compliance, overhead PV systems fall into one of the three following types:

4A – Restricted Access: The PV system is located within a secure enclosure. Access to the PV system is limited to operations and service personnel:

a. There are no accessibility requirements in the area of work.\(^7\)

b. The project is not an alteration that would trigger path of travel upgrades.\(^8\)

c. An accessible route to the enclosure’s entrance shall not be required.\(^9\)

d. To qualify for the machinery space and path of travel exceptions, signage must be posted indicating the area is to be entered only by operations and service personnel.

4B - Unrestricted Access with No Change in Use - If access to the area below the PV system is not physically restricted and there is no proposed change of use of the area below the elevated PV system components:

a. The area below the elevated PV system components must be accessible consistent with the CBC accessibility provisions applicable to the current use of that area.\(^10\)

b. If the current use of the area below the elevated PV system components requires that area to be on an accessible route, one shall be provided.

c. The project, including incidental work to implement a) and b) above, is not an alteration that would trigger path of travel upgrades;\(^11\)

d. When located on sloping ground (running slope exceeds 5%) the area below the elevated PV system components need not be made accessible.

---


10 For example, if the area beneath the PV system elevated components is being used as an outdoor lunch area, scoping provisions for dining surfaces in 11B-226 and technical provisions for dining surfaces in 11B-902 will apply.

4C - Unrestricted Access with Change in Use - If access to the area below the PV system elevated components is not physically restricted and there will be a change of use or other alterations to that area:

a. The area under the PV system elevated components must be made accessible consistent with the proposed use of that area and must be on an accessible route to other areas of the facility.

b. Upgrades of path of travel elements serving the area undergoing a change in use or other alterations may be required.

c. See Section 7 - Path of Travel Requirements and Adjusted Construction Cost for policy guidance on the adjusted construction cost for compliance with path of travel requirements.

5. Ground Level PV Systems

Ground level PV systems will have components other than vertical supports installed less than 80 inches above the ground or floor surface. For purposes of accessibility compliance, ground level PV systems fall into one of the two following types:

5A – Restricted Access: The PV system components are located within a secure enclosure with access to the area where the PV system is installed limited to operations and service personnel:

a. There are no accessibility requirements within the area of work.12

b. The project is not an alteration that would trigger path of travel upgrades.13

c. An accessible route to the enclosure’s entrance shall not be required.14

d. To qualify for the machinery space and path of travel exceptions, signage must be posted indicating the area is to be entered only by operations and service personnel.

5B – Unrestricted or Limited Access: There will be use of the area or portion of the area of the ground level PV system by teachers, students, staff, and the general public:

a. The areas available for use shall be made accessible.

b. The project is an alteration that could trigger upgrades of path of travel elements serving that area.

c. The area should be on an accessible route.

---


d. Special attention should be paid to potential obstructions within accessible areas or on accessible routes.

e. See Section 7 - Path of Travel Requirements and Adjusted Construction Cost for policy guidance on the adjusted construction cost for compliance with path of travel requirements.

6. PV Systems at Parking Facilities

PV systems are frequently installed over existing parking facilities. Shaded or covered parking is considered an amenity or user convenience, the provision of which could allow accessible parking to be located in different parts of a parking facility or in different parking facilities on a single site. After installation of a PV system, even if not all the parking spaces are shaded or covered, the parking lot will be considered a single parking facility.

The access compliance requirements for these projects will be determined by the following considerations:

- Whether or not the existing parking meets the accessibility requirements.

- Whether or not a reasonable portion of accessible parking will be shaded or covered by the PV system elevated components.

- Whether or not new accessible parking provided under the PV system elevated components will be located on the shortest accessible route to a facility entrance.

There are different options for meeting the accessibility requirements triggered by the addition of a PV system over existing and new parking facilities, based upon the extent of coverage of the parking by the PV system (full or partial) and the level of accessibility of the existing parking facility (accessible or not accessible).

6.1 Required Elements for Accessible Parking

Parking at school facilities shall be considered accessible when the following elements are provided in compliance with the CBC edition in effect at the time of the installation of a solar PV project:

a. Accessible parking in compliance with the CBC;

---

15 2010 ADA Standards Advisory 208.3.1 General Exceptions 2. “Factors that could affect ‘user convenience’ include, but are not limited to, protection from the weather, security, lighting, and comparative maintenance of the alternative parking site.”

16 2013 California Building Code §11B-208.3.1 General, EXCEPTIONS: 2 “Parking spaces shall be permitted to be located in different parking facilities if substantially equivalent or greater accessibility is provided in terms of distance from an accessible entrance or entrances, parking fee and user convenience.”

17 This is analogous to a parking structure in which parking spaces on the ground and lower levels are covered and the parking spaces on the upper deck are not covered, providing different levels of user convenience in different areas of the facility.
b. An accessible route from the accessible parking to the building served by the parking facility.

c. An accessible primary entrance into the building being served by the parking facility.

d. If the parking facility does not serve a specific building or facility, the accessible parking should be on the shortest accessible route to an accessible pedestrian entrance to the parking facility.

Path of travel upgrades other than those required for exterior site elements mentioned above shall not be triggered by PV projects at parking facilities

6.2 PV Systems at Existing Parking Facilities

6.2A – Parking Fully Covered - The PV system covers all of the standard parking, accessible parking, or code compliant location for accessible parking.

a. Existing facility has accessible parking - No additional access compliance work required.

b. Existing facility does not have accessible parking – If the elements listed in 6.1 above are not fully accessible, the scope of the project must include upgrades to bring them into compliance with the current standards.

6.2B – Standard Parking Covered, Accessible Parking Not Covered - The proposed PV system covers all existing standard parking spaces, however existing accessible parking or the code compliant location for accessible parking is not shaded or covered by the PV system. The following approaches for providing access compliance are acceptable:

a. Existing facility has accessible parking - Construct a shade structure over all existing accessible parking.

b. Existing facility does not have accessible parking – Provide accessible parking in accordance with the CBC and construct a shade structure over the new accessible parking spaces.

c. Option - Applicants have the option to construct the required number of covered accessible parking spaces beneath the PV system elevated components. These parking spaces shall comply with the shortest route requirements of 11B-208.3.1. If the existing uncovered accessible parking is closer to the facility entrance than the new covered accessible parking, it should remain in service to provide users a choice between proximity to an entrance and shade.
6.2C – Standard Parking Partially Covered, Accessible Parking Fully Covered - The proposed PV system covers a portion of the total parking. The covered portion includes the existing accessible parking or a code compliant location for accessible parking.

a. **Existing facility has accessible parking** – PV system covers the existing accessible spaces. As the accessible parking is provided with the additional amenity of weather protection (shade or cover) no new accessible spaces are required in the uncovered portion of the parking facility.

b. **Existing facility does not have accessible parking** – Provide the required number of accessible parking spaces beneath the PV system elevated components, based on the total number of both covered and uncovered parking spaces. Similar to a. above, no new accessible spaces are required in the uncovered portion of the parking facility.

6.3 PV Systems at Newly Constructed Parking Facilities

6.3D – New Construction, Standard / Accessible Parking Fully Covered - Provide accessible parking in accordance with the CBC.

6.3E – New Construction, Standard / Accessible Parking Partially Covered - Provide accessible parking, covered by the solar PV array, in accordance with the CBC. If the code compliant location for accessible parking is not covered by the PV system, the project can either:

a. Provide a shade cover over a pro-rata share of the accessible parking or;

b. Provide a pro-rata share of the accessible parking covered under the PV system elevated components. Shaded or covered accessible parking spaces should be located on the shortest accessible route to the accessible pedestrian entrance of the shaded portion of the parking facility.

Attachment A - Tables 1 and 2 summarize possible configurations of PV systems at both existing parking facilities and as part of new construction.

7. Path of Travel Requirements and Adjusted Construction Cost

Specific exceptions within the CBC provide that PV system projects are not alterations for purposes of accessibility. These include exceptions for machinery spaces\(^{18}\), exceptions for electrical projects\(^{19}\), and exceptions for changes to mechanical or electrical systems\(^{20}\). Additionally, alterations solely for the purpose of compliance with certain accessibility requirements of the code are limited to the scope of work of the project and shall not be required to comply with the alteration

---


provisions.\textsuperscript{21} For projects qualifying for these exceptions, there shall be no further path of travel upgrades beyond those specifically required by this IR.

When minor elective alterations incidental to the primary scope of installing a PV system are included as part of the project, the adjusted construction cost for purposes of complying with the 2013 California Building Code \textsection{11B-202.4 Path of travel requirements in alterations, additions and structural repairs. Exception 8} shall be limited to the cost of those minor alterations; the costs directly associated with the solar PV system shall not be included.

For the addition of a new parking lot in conjunction with the installation of a PV system at an existing facility, the adjusted construction cost for purposes of complying with the 2013 California Building Code \textsection{11B-202.4 Path of travel requirements in alterations, additions and structural repairs. Exception 8} shall be limited to the cost of the non-solar system improvements; the costs directly associated with the PV system shall not be included.

When a PV system is included as part of the construction of a new facility, there will be no path of travel requirements, as all aspects of the new facility must comply with the accessibility requirements of the current edition of the CBC.

\textsuperscript{21} 2013 California Building Code \textsection{11B-202.4 Path of travel requirements in alterations, additions and structural repairs. Exception 4} Item 18 Creating Designated accessible parking spaces.
## Table 1 – Accessibility Guidelines for PV Systems over Existing Parking

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Parking Currently Accessible?</th>
<th>Proposed Solar Photovoltaic (PV) Installation Project</th>
<th>Required Accessibility Work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Initial Scope of PV Work</strong></td>
<td><strong>Required Accessibility Work</strong></td>
</tr>
<tr>
<td>6.2A</td>
<td>Yes</td>
<td><strong>Parking Fully Covered</strong> - PV system over all existing standard and accessible parking.</td>
<td>Verify compliance of existing elements and accessible route to facility served by the parking. If current accessibility requirements met, no further access work required.</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td><strong>Parking Fully Covered</strong> - PV system over all existing standard parking and code compliant location for accessible parking.</td>
<td>Upgrades for accessible parking and accessible route from the parking in compliance with current requirements.</td>
</tr>
<tr>
<td>6.2B</td>
<td>Yes</td>
<td><strong>Standard Parking Covered, Accessible Parking Not Covered</strong> - PV system covers all standard parking, location of existing accessible parking not suitable for solar panels.</td>
<td>Shade cover over all existing accessible parking;(^{23})</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td><strong>Standard Parking Covered, Location for Accessible Parking Not Covered</strong> - PV system covers all standard parking, code compliant location for accessible parking not suitable for solar panels.</td>
<td>Accessible parking under a shade cover with an accessible route from that parking to the facility;</td>
</tr>
<tr>
<td>6.2C</td>
<td>Yes</td>
<td><strong>Standard Parking Partially Covered, Accessible Parking Fully Covered</strong> -- PV system covers existing accessible parking and a portion of existing standard spaces.</td>
<td>Verify compliance of existing elements and accessible route to facility. If current accessibility requirements met, no further access work required.</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td><strong>Standard Parking Partially Covered, Location for Accessible Parking Fully Covered</strong> - PV system covers code compliant location for accessible parking and a portion of existing standard parking.</td>
<td>Upgrades for accessible parking and accessible route to facility in compliance with current requirements. Dispersion of accessible parking to uncovered area not required.</td>
</tr>
</tbody>
</table>

---

22 Existing parking is accessible when it meets both scoping and technical requirements within the code, see 6.1 Required Elements for Accessible Parking.

23 When existing accessible parking will not be under the solar PV system elevated components, covered accessible parking could be provided as equivalent facilitation by a shade structure over the existing accessible spaces.
### Table 2 – Accessibility Guidelines for PV systems over New Parking

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Description</th>
<th>Initial Scope of Project</th>
<th>Required Accessibility Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.3D</td>
<td>New on-grade parking lot with PV system as part of larger project or as a separate concurrent project.</td>
<td>Parking Fully Covered - PV system over both standard and accessible parking, all parking covered.</td>
<td>Accessible parking spaces under PV system elevated components.</td>
</tr>
<tr>
<td>6.3E</td>
<td>New on-grade parking lot with PV system as part of larger project or as a separate concurrent project.</td>
<td>Parking Partially Covered - PV system over both standard and accessible parking, not all parking covered.</td>
<td>All accessible parking spaces under PV system elevated components, based on total number of covered and uncovered parking spaces or Pro-rata shares of accessible parking under the PV system elevated components and in the uncovered area, based upon the number of spaces within each area; or Shade cover over pro-rata share of new accessible parking in lieu of new accessible parking under the PV system elevated components.</td>
</tr>
</tbody>
</table>

---

24 If the full number of required accessible spaces can be located under the solar PV array and they are located closest to the facility on the shortest accessible route, under the principle of equivalent facilitation the provision of uncovered accessible spaces shall not be required.
2010 CBC Chapter 2, Section 202 Definitions:

**ALTERATION** or **ALTER** [DSA-AC] “Alteration or Alter” is any change, addition or modification in construction or occupancy or structural repair or change in primary function to an existing structure made by, on behalf of, or for the use of a public accommodation or commercial facility. Alterations include, but are not limited to, remodeling, renovation, rehabilitation, reconstruction, historic restoration, changes or rearrangement of the structural parts or elements, and changes or rearrangement in the plan configuration of walls and full-height partitions.

2013 CBC Chapter 2, Section 202 Definitions:

**ALTERATION** [DSA-AC] A change, addition or modification in construction, change in occupancy or use, or structural repair to an existing building or facility. Alterations include, but are not limited to, remodeling, renovation, rehabilitation, reconstruction, historic restoration, resurfacing of circulation paths or vehicular ways, changes or rearrangement of the structural parts or elements, and changes or rearrangement in the plan configuration of walls and full-height partitions. Normal maintenance, reroofing, painting or wallpapering, or changes to mechanical and electrical systems are not alterations unless they affect the usability of the building or facility.

2013 CBC Chapter 11B. Section 11B-202.4 Path of Travel Requirements in Alterations, Additions and Structural Repairs. When alterations or additions are made to existing buildings or facilities, an accessible path of travel to the specific area of alteration or addition shall be provided. The primary accessible path of travel shall include:

1. A primary entrance to the building or facility.
2. Toilet and bathing facilities serving the area.
3. Drinking fountains serving the area.
4. Public telephones serving the area, and
5. Signs.

**EXCEPTIONS:**

1. Residential dwelling units shall comply with 11B-233.3.4.2.

2. If the following elements of a path of travel have been constructed or altered in compliance with the accessibility requirements of the immediately preceding edition of the California Building Code, it shall not be required to retrofit such elements to reflect the incremental changes in this code solely because of an alteration to an area served by those elements of the path of travel:

   1. A primary entrance to the building or facility,
   2. Toilet and bathing facilities serving the area,
   3. Drinking fountains serving the area,
   4. Public telephones serving the area, and
   5. Signs

3. Additions or alterations to meet accessibility requirements consisting of one or more of the following items shall be limited to the actual scope of work of the project and shall not be required to comply with 11B-202.4:
1. Altering one building entrance.
2. Altering one existing toilet facility.
3. Altering existing elevators.
4. Altering existing steps.
5. Altering existing handrails.

4. Alterations solely for the purpose of barrier removal undertaken pursuant to the requirements of the Americans with Disabilities Act (Public Law 101-336, 28 C.F.R., Section 36.304) or the accessibility requirements of this code as those requirements or regulations now exist or are hereafter amended consisting of one or more of the following items shall be limited to the actual scope of work of the project and shall not be required to comply with 11B-202.4:

1. Installing ramps.
3. Repositioning shelves.
4. Rearranging tables, chairs, vending machines, display racks, and other furniture.
5. Repositioning telephones.
6. Adding raised markings on elevator control buttons.
7. Installing flashing alarm lights.
8. Widening doors.
9. Installing offset hinges to widen doorways.
10. Eliminating a turnstile or providing an alternative accessible route.
11. Installing accessible door hardware.
12. Installing grab bars in toilet stalls.
13. Rearranging toilet partitions to increase maneuvering space.
15. Installing a raised toilet seat.
16. Installing a full-length bathroom mirror.
17. Repositioning the paper towel dispenser in a bathroom.
19. Removing high-pile, low-density carpeting.

5. Alterations of existing parking lots by resurfacing and/or restriping shall be limited to the actual scope of work of the project and shall not be required to comply with 11B-202.4.

6. The addition or replacement of signs and/or identification devices shall be limited to the actual scope of work of the project and shall not be required to comply with 11B-202.4.

7. Projects consisting only of heating, ventilation, air conditioning, reroofing, electrical work not involving placement of switches and receptacles, cosmetic work that does not affect items regulated by this code, such as painting, equipment not considered to be a part of the architecture of the building or area, such as computer terminals and office equipment shall not be required to comply with 11B-202.4, unless they affect the usability of the building or facility.

8. When the adjusted construction cost is less than or equal to the current valuation threshold, as defined in Chapter 2, Section 202, the cost of compliance with 11B-202.4 shall be limited to 20
percent of the adjusted construction cost of alterations, structural repairs or additions. When the cost of full compliance with 11B-202.4 would exceed 20 percent, compliance shall be provided to the greatest extent possible without exceeding 20 percent.

When the adjusted construction cost exceeds the current valuation threshold, as defined in Chapter 2, Section 202, and the enforcing agency determines the cost of compliance with 11B-202.4 is an unreasonable hardship, as defined in Chapter 2, Section 202, full compliance with 11B-202.4 shall not be required. Compliance shall be provided by equivalent facilitation or to the greatest extent possible without creating an unreasonable hardship; but in no case shall the cost of compliance be less than 20 percent of the adjusted construction cost of alterations, structural repairs or additions. The details of the finding of unreasonable hardship shall be recorded and entered into the files of the enforcing agency and shall be subject to Chapter 1, Section 1.9.1.5, Special Conditions for Persons with Disabilities Requiring Appeals Action Ratification.

For the purposes of this exception, the adjusted construction cost of alterations, structural repairs or additions shall not include the cost of alterations to path of travel elements required to comply with 11B-202.4.

In choosing which accessible elements to provide, priority should be given to those elements that will provide the greatest access in the following order:

1. An accessible entrance;
2. An accessible route to the altered area;
3. At least one accessible restroom for each sex;
4. Accessible telephones;
5. Accessible drinking fountains; and
6. When possible, additional accessible elements such as parking, storage and alarms.

If an area has been altered without providing an accessible path of travel to that area, and subsequent alterations of that area or a different area on the same path of travel are undertaken within three years of the original alteration, the total cost of alterations to the areas on that path of travel during the preceding three-year period shall be considered in determining whether the cost of making that path of travel accessible is disproportionate.

9. Certain types of privately funded, multistory buildings and facilities were formerly exempt from accessibility requirements above and below the first floor under this code, but as of, April 1, 1994, are no longer exempt due to more restrictive provisions in the federal Americans with Disabilities Act. In alteration projects involving buildings and facilities previously approved and built without elevators, areas above and below the ground floor are subject to the 20-percent disproportionality provisions described in Exception 8, above, even if the value of the project exceeds the valuation threshold in Exception 8. The types of buildings and facilities are:

1. Office buildings and passenger vehicle service stations of three stories or more and 3,000 or more square feet (279 m²) per floor.
2. Offices of physicians and surgeons.
3. Shopping centers.
4. Other buildings and facilities three stories or more and 3,000 or more square feet (279 m²) per floor if a reasonable portion of services sought and used by the public is available on the accessible level.

For the general privately funded multistory building exception applicable to new construction and alterations, see Division 11B-206.2.3, Exception 1.
The elevator exception set forth in this section does not obviate or limit in any way the obligation to comply with the other accessibility requirements in this code. For example, floors above or below the accessible ground floor must meet the requirements of this section except for elevator service. If toilet or bathing facilities are provided on a level not served by an elevator, then toilet or bathing facilities must be provided on the accessible ground floor.

2013 CBC Chapter 11B. Section 11B-203.5 Machinery Spaces.

11B-203.5 Machinery Spaces. Spaces frequented only by service personnel for maintenance, repair, or occasional monitoring of equipment shall not be required to comply with these requirements or to be on an accessible route. Machinery spaces include, but are not limited to, elevator pits or elevator penthouses; mechanical, electrical or communications equipment rooms; piping or equipment catwalks; water or sewage treatment pump rooms and stations; electric substations and transformer vaults; and highway and tunnel utility facilities.