

CHAPTER 3

BUILDING BLOCKS

- ❖ Chapter 3 describes the core requirements that are referenced by other sections of this standard. The intent is to reduce duplication of requirements through the use of “building blocks.” For example, knee and toe clearances are referenced for drinking fountains, lavatories, sinks, dining surfaces, service counters and working surfaces.
 - Section 301 is a general statement indicating that the “building blocks” may be referenced directly from scoping provisions or as part of requirements elsewhere in this standard.
 - Section 302 contains requirements for floor surfaces (see Section 105.5).
 - Section 303 sets out criteria for changes in level, typically when floor surfaces change or at door thresholds.
 - Section 304 provides technical criteria for turning.
 - Section 305 contains criteria for a clear floor space for a wheelchair, including the moving of a chair into a restricted area such as an alcove.
 - Section 306 establishes the three-dimensional space needed for clearances for knees and toes of a person using a wheelchair when he or she moves under an element or counter.
 - Section 307 contains criteria for objects that may protrude over a walking surface so the chances for injury to a person with visual impairments are reduced.
 - Section 308 provides guidance for the height of items so they can be reached by someone using a wheelchair. This includes reaching over obstructions such as a counter.
 - Section 309 provides technical criteria for any operable parts, such as light switches, heating/air conditioning controls or controls on plumbing fixtures.

SECTION 301 GENERAL

- ❖ This chapter is appropriately named “building blocks.” The chapter provides the core requirements that are used to establish accessible items. These technical provisions and the limitations within them are used in the later chapters for the full range of elements and spaces that are included within the scope of the standard and eliminate the need for duplicating the provisions within numerous sections.

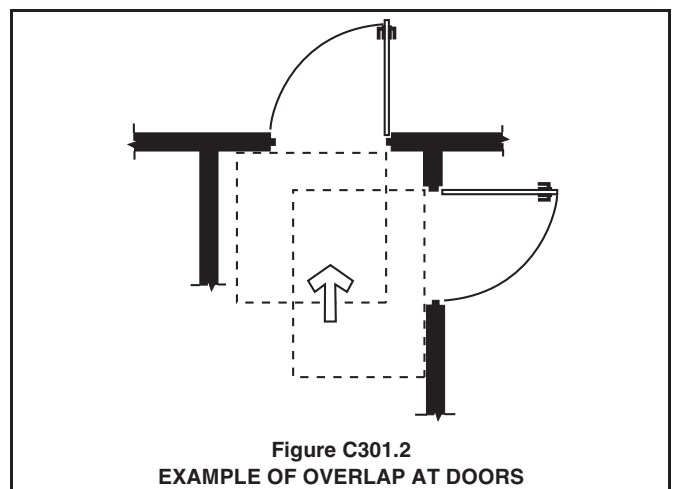
301.1 Scope. The provisions of Chapter 3 shall apply where required by the scoping provisions adopted by the administrative authority or by Chapters 4 through 11.

- ❖ Although the provisions of this chapter may, in general, improve the design and usability of all buildings, the section is qualified by the phrase “where required.” This is intended to be consistent with the fact that scoping provisions are not included in this standard. See the commentary to Chapter 2.

The standard does not establish which or how many buildings, facilities and spaces or elements within these spaces must be made accessible and comply with this standard. This standard correlates with the adoption of scoping provisions by the administrative authority. This is typically accomplished through the adoption of a model building code, which references this standard. The adopted scoping provisions will establish what, how many and where accessibility is required, and this standard will establish technical criteria for how those required elements and spaces are to be designed and constructed to be considered accessible.

301.2 Overlap. Unless otherwise specified, clear floor spaces, clearances at fixtures, maneuvering clearances at doors, and turning spaces shall be permitted to overlap.

- ❖ Overlap of clearances is common in confined spaces. See Commentary Figure C301.2 for an example of two doors in a corner. See Commentary Figure C603.2 for examples of clearance overlap at wheelchair turning spaces, plumbing fixtures and doors. This section had previously been repeated in several sections of the code. By placing this allowance for overlap in the building block chapter of the standard, overlap is universally permitted unless another section specifically states otherwise.



**SECTION 302
FLOOR SURFACES**

❖ Section 105.5 states that the term “floor surface” refers as applicable to the finished floor or ground surface.

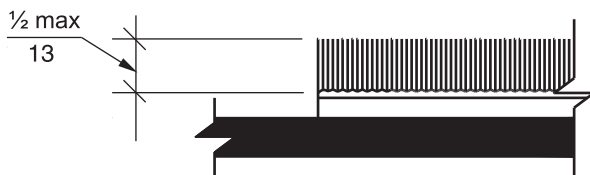
302.1 General. Floor surfaces shall be stable, firm, and slip resistant, and shall comply with Section 302. Changes in level in floor surfaces shall comply with Section 303.

❖ Ambulatory and semi-ambulatory people who have difficulty maintaining balance and those with restricted gaits are particularly sensitive to slipping and tripping hazards. For those people, a stable and regular surface is necessary to walk safely. Wheelchairs are propelled most easily on surfaces that are hard, stable and regular. Soft, loose surfaces such as shag carpet, loose sand, gravel, crushed stone or wet clay, and irregular surfaces such as cobblestone, significantly impede movement of a wheelchair.

A stable surface is one that remains unchanged by contaminants or applied force, so that when the contaminant or force is removed, the surface returns to its original condition. A firm surface resists deformation by either indentation or particles moving on its surface. It is not the intent of the standard to require only paved surfaces; however, any other types (e.g., wood chips, gravel) would need to be evaluated.

Slip resistance is based on the frictional force necessary to keep a shoe or crutch tip from slipping on a walking surface under the conditions of use likely for that surface. For example, outside surfaces or entryways may be wet from rain or snow, or bathroom floors may be wet and should be evaluated under those conditions; however, the tile on the upstairs hallway would typically not be influenced by outside weather and should be evaluated in a dry condition. Although it is known that the static coefficient of friction is one basis of slip resistance, there is not as yet a generally accepted method to evaluate the slip resistance of walking surfaces for all use conditions.

302.2 Carpet. Carpet or carpet tile shall be securely attached and shall have a firm cushion, pad, or backing or no cushion or pad. Carpet or carpet tile shall have a level loop, textured loop, level cut pile, or level cut/uncut pile texture. The pile shall be 1/2 inch (13 mm) maximum in height. Exposed edges of carpet shall be fastened to the floor and shall have trim along the entire length of the exposed edge. Carpet edge trim shall comply with Section 303.



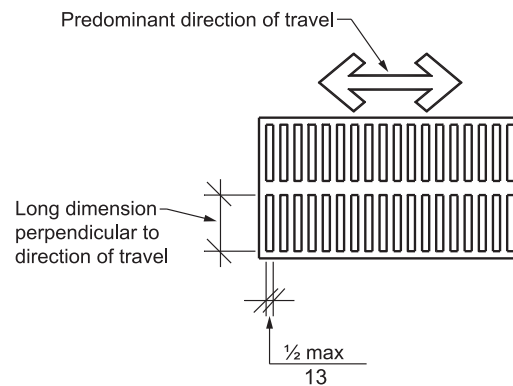
**FIGURE 302.2
CARPET ON FLOOR SURFACES**

❖ Carpet can significantly increase the amount of force (roll resistance) needed to propel a wheelchair over a surface. The firmer the carpet and backing, the lower

the roll resistance. Therefore, although no pad is preferred, if a pad is installed, it must be firm. The 1/2-inch (13 mm) pile height is measured from the top of the carpet to the backing, cushion or pad (see Figure 302.2). The edge of the carpet must be installed so as to avoid tripping hazards and allow for wheelchair movement over that edge. While the text specifies that there shall be trim at an exposed edge, the key word is “exposed.” The concern is the step up if a carpet is on top of a floor surface, like an area rug. If the carpet is recessed so that there is a smooth transition to the adjacent floor system, a separated trim piece is not required.

Much more is to be done in developing both quantitative and qualitative criteria for carpeting. However, certain functional characteristics are well established. When both carpet and padding are used, it is desirable to have minimum movement (preferably none) between the floor and the pad and the pad and the carpet, which would allow the carpet to hump or warp. In heavily trafficked areas, a thick, soft (plush) pad or cushion, particularly in combination with long pile, makes it difficult for individuals in wheelchairs and those with other ambulatory disabilities to move around. Firm carpeting is achieved through proper selection and combination of pad and carpet, sometimes with the elimination of the pad or cushion, and with proper installation.

302.3 Openings. Openings in floor surfaces shall be of a size that does not permit the passage of a 1/2-inch (13 mm) diameter sphere, except as allowed in Sections 407.4.3, 408.4.3, 409.4.3, 410.4 and 805.10. Elongated openings shall be placed so that the long dimension is perpendicular to the predominant direction of travel.



**FIGURE 302.3
OPENINGS IN FLOOR SURFACES**

❖ These limitations are intended to eliminate openings of a size or orientation into which a crutch tip or the wheels of a chair could drop (see Commentary Figure C302.3). If elongated openings are oriented perpendicular to the expected direction of travel, the casters of a wheelchair will roll over them without great difficulty because the openings will be no wider than 1/2 inch (13 mm) in the direction of travel (see Figure 302.3.).

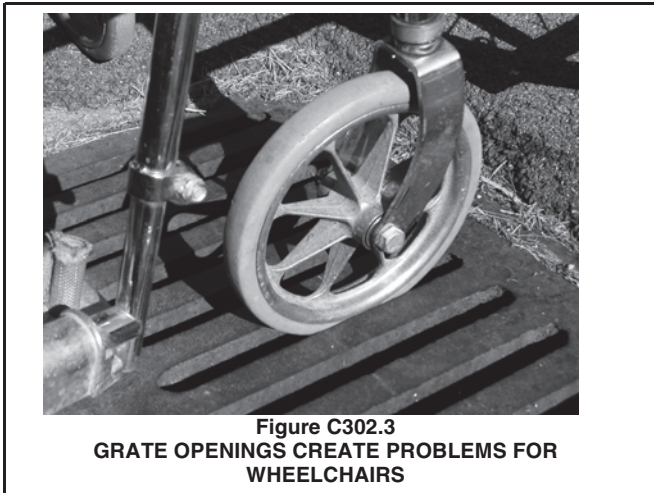


Figure C302.3
GRATE OPENINGS CREATE PROBLEMS FOR WHEELCHAIRS

SECTION 303
CHANGES IN LEVEL

303.1 General. Changes in level in floor surfaces shall comply with Section 303.

❖ As used in the standard, a change in level is a change in the elevation of a walking surface. Typical examples would be a change in floor surface from tile to carpet (see Commentary Figure C303.1) or door thresholds.



Figure C303.1
CHANGES IN LEVEL

303.2 Vertical. Changes in level of $\frac{1}{4}$ inch (6.4 mm) maximum in height shall be permitted to be vertical.



FIGURE 303.2
VERTICAL CHANGE IN LEVEL

❖ Abrupt changes in elevation can create a significant barrier for a person using a wheelchair because of the small caster wheels on the wheelchair. Changes in elevation up to $\frac{1}{4}$ inch (6 mm) can be negotiated by a person using a wheelchair with minimal difficulty

and do not present an unreasonable tripping hazard. The standard permits a vertical edge at the level change and does not require a beveled or special edge treatment (see Figure 303.2).

303.3 Beveled. Changes in level greater than $\frac{1}{4}$ inch (6.4 mm) in height and not more than $\frac{1}{2}$ inch (13 mm) maximum in height shall be beveled with a slope not steeper than 1:2.

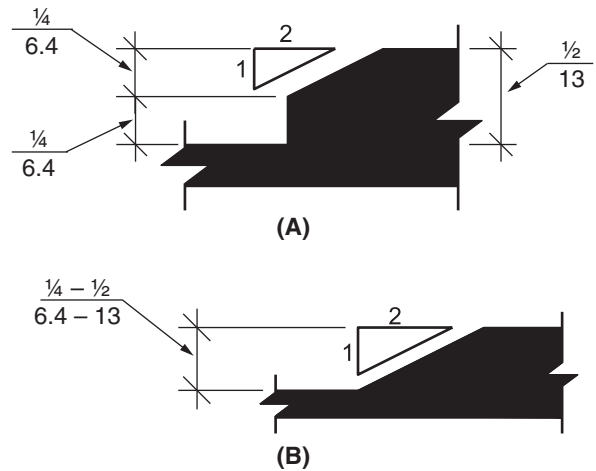


FIGURE 303.3
BEVELED CHANGES IN LEVEL

❖ Changes in elevation between $\frac{1}{4}$ inch (6 mm) and $\frac{1}{2}$ inch (13 mm) cannot be as easily negotiated by a wheelchair. They create edges on the accessible route surface that can “catch” the small caster wheels on a wheelchair. Additionally, they present a greater potential tripping hazard because of the increased likelihood of a crutch tip or toe of a shoe catching the edge. For changes in elevation in this range, it is preferable that the entire edge be beveled as shown in Figure 303.3(B) of the standard. However, when the provisions of Section 303.2 and 303.3 are combined, it would be acceptable to bevel only the portion that is over $\frac{1}{4}$ inch in height. See Fig. 303.3(A). This permits the bottom $\frac{1}{4}$ inch (6 mm) of the edge created by the elevation change to be an abrupt vertical change and requires the remainder of the edge between $\frac{1}{4}$ inch (6 mm) and $\frac{1}{2}$ inch (13 mm) to be sloped or beveled at a slope no steeper than 1 unit vertical to 2 units horizontal (50 percent slope). This is significantly steeper than is allowed for a ramp but is adequate for the limited rise. However, in no case may the combined changes in level exceed $\frac{1}{2}$ inch (13 mm).

303.4 Ramps. Changes in level greater than $\frac{1}{2}$ inch (13 mm) in height shall be by a ramp complying with Section 405 or by a curb ramp complying with Section 406.

❖ Changes in level exceeding $\frac{1}{2}$ inch (13 mm) must comply with the provisions for ramps, curb ramps or sloped walks.

**SECTION 304
TURNING SPACE**

304.1 General. A turning space shall comply with Section 304.

❖ This section provides the requirements for a space that will permit a person using a wheelchair, scooter or other walking aid to turn and change directions along her or his route of travel. The standard specifies where the turning space is actually required. See Sections 403.5.4 (passing space), 404.2.5 (vestibules), 405.7.5 (doorways on ramp landings), 603.2.1 (toilet and bathing rooms), 612.3 (Saunas), 803.2 (dressing fitting and locker rooms), 806.2.1 (holding and housing cells), 807.2 (raised or depressed areas in courtrooms), 1002.3 (amusement ride load and unload areas), 1005.6 (fishing piers and platforms), 1008.4.3.1 (levels of play components), 1010.2 (shooting facilities), 1102.3.2 (rooms in Accessible units) and 1103.3.2 (rooms in Type A units).

304.2 Floor surface. Floor surfaces of a turning space shall comply with Section 302. Changes in level shall not be permitted within the turning space.

Exception: Slopes not steeper than 1:48 shall be permitted.

❖ Any type of cross slope steeper than 1:48 on the surface of a turning space can cause considerable difficulty for a person maneuvering or propelling a wheelchair in a straight line. The 1:48 slope is for allowances to slope surfaces to drain or for material tolerances. For ease of use, abrupt changes in elevation (e.g., such as a change in flooring or a threshold) within the turning space should be avoided; however, if it is present, it must be limited to 1/2 inch (13 mm) or less in accordance with Section 303. This is not intended to prohibit tile grout lines or rounded edges on wood deck boards. The reference to Section 302 would require the turning space to have a stable and firm surface.

304.3 Size. Turning spaces shall comply with Section 304.3.1 or 304.3.2.

❖ This section refers to the creation of either a circular space or a T-shaped space as an acceptable method for providing a turning space. The specific requirements for these two methods are found in Sections 304.3.1 and 304.3.2.

The user and wheelchair shown in Commentary Figure C103(a) represent typical dimensions for a large adult male. The space requirements for existing buildings in this standard are based on maneuvering clearances that accommodate most manual wheelchairs. Commentary Figure C103(a) provides a uniform reference for design not covered by this standard. Sport or other special wheelchairs do not necessarily fall within the dimensions contained within this section.

The requirements for new buildings have been

expanded to include research for motorized wheelchairs and scooters.

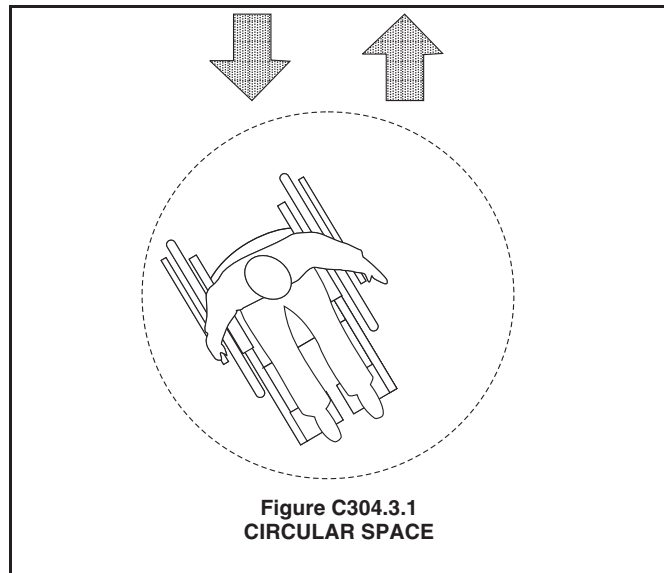
304.3.1 Circular space.

❖ The criteria for circular turning space are split between the criteria for new buildings (Section 304.3.1.1) and existing buildings (Section 304.3.1.2).

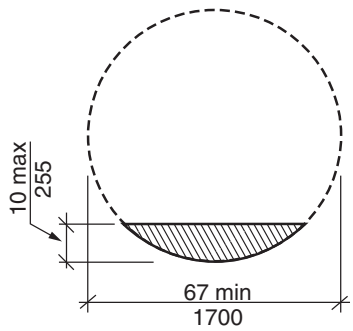
Throughout the standard there will be many elements that are divided between the criteria for new buildings and existing buildings. For additional information on where the existing building criteria apply, see the commentary for the definitions of “existing building” and “existing facilities.” For new buildings, the differences are mostly due to the change in the clear floor space (see Section 305), the turning spaces (see Section 304) or the route (see Section 403) that were made based on a new study on anthropometrics for persons who use manual wheelchairs, motorized wheelchairs or scooters. See Section 103 for a general description of the study and the relationship of the US population and the people who participated in the study.

The intent of this section is to specify a minimum circular space that allows for a person using a mobility device to pivot 180 degrees (3.14 rad) (see Commentary Figure C304.3.1). This space is adequate for turning around, but many people are not able to turn without repeated tries and bumping into surrounding objects.

To make a turn, both wheels are simultaneously turned in opposing directions within a 60-inch diameter. For electrically powered wheelchairs, coordination of this opposing wheel rotation, coupled with the longer wheel base typical of powered chairs, makes the full turning space even more critical compared to the space needed for a smaller, manually operated wheelchair.



304.3.1.1 New buildings and facilities. In new buildings and facilities, the turning space shall be a circular space with a 67-inch (1700 mm) minimum diameter.



Overlap of knee and toe clearance

**FIGURE 304.3.1.1
CIRCULAR TURNING SPACE - NEW BUILDINGS
SIZE AND OVERLAP**

❖ A diameter of 60 inches accommodates only 75 percent of persons using manual and power wheelchairs performing a 180-degree turn. A 180-degree turn diameter of 67 inches would accommodate 95 percent of persons using manual and power wheelchairs.

The study found that only 50 percent of the manual and powered wheelchair users measured in this study could complete a 360-degree turn within the 60-inch diameter minimum required space. Further, in order for 95 percent of the persons using manual and powered chairs in this study to successfully complete a 360-degree turn, a minimum square area of 83 inches by 83 inches was required. Corresponding dimensions for persons using a scooter was found to be 98 inches by 98 inches.

The information from the study for the 180-degree turn and percentages of the persons in the study are stated in Commentary Table C304.3.1.1(1).

Percent accommodated	Manual wheelchairs (198 participants)	Motorized wheelchairs (140 participants)	Scooters (16 participants)
< 50%	51	59	63
≥50% & <75%	59	59	67
≥75% & <90%	67	67	72
≥90% & <95%	67	67	83

The information from the study for the 360-degree turn and percentages of the persons in the study are stated in Table C304.3.1.1(2).

Percent accommodated	Manual wheelchairs (185 participants)	Motorized wheelchairs (139 participants)	Scooters (15 participants)
< 50%	63	59	83
≥50% & <75%	75	67	91
≥75% & <90%	75	83	94
≥90% & <95%	83	83	98

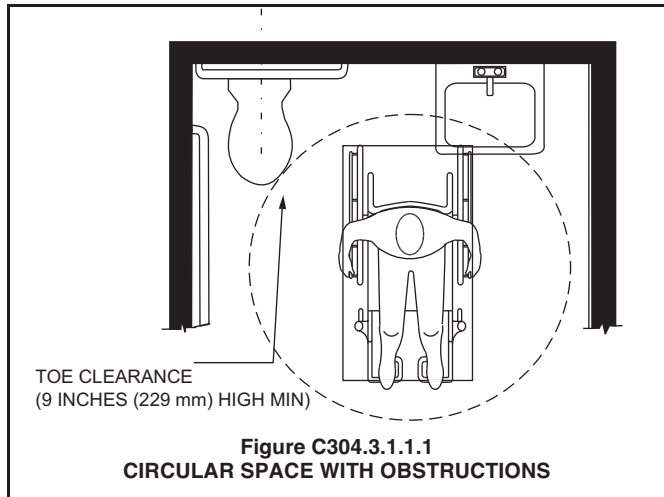
304.3.1.1.1 Overlap. Turning spaces shall be permitted to include knee and toe clearance complying with Section 306. Where the turning space includes knee and toe clearances under an obstruction, the overlap shall comply with all of the following:

1. The depth of the overlap shall not be more than 10 inches (255 mm), and
2. The depth shall not exceed the depth of the knee and toe clearances provided, and
3. The overlap shall be permitted only within the turning circle area shown shaded in Figure 304.3.1.

❖ As stated in Section 301.2, turning spaces can overlap clearances unless specifically stated otherwise. The section does permit objects such as lavatories, drinking fountains, work surfaces or any other items that have space underneath to encroach into the turning circle provided the overlap meets the following three criteria.

1. The depth of the overlap cannot be more than 10 inches of the 67-inch diameter of the circle.
2. The overlap can use knee and toe clearances that comply with Section 306. While knee and toe clearance can extend under a surface to a maximum depth of 25 inches, the reference is more for the height limits. For example, an accessible work counter could only overlap a turning space by 10 inches, even if the space underneath is over 27 inches high and 25 inches deep.
3. This requirement prevents an option where a turning space could be placed so that multiple sides are 10 inches under an obstruction – a doughnut-type effect. The reference to the diagram indicates the overlap can be on only one side.

Knee and toe clearance could be under more than one object provided the overlap of both items could still meet the same three criteria as a group. See Commentary Figure C304.3.1.1.1 for an example in a single-occupant toilet room.



304.3.1.2 Existing buildings and facilities. In existing buildings and facilities, the turning space shall be a circular space with a 60-inch (1525 mm) minimum diameter.

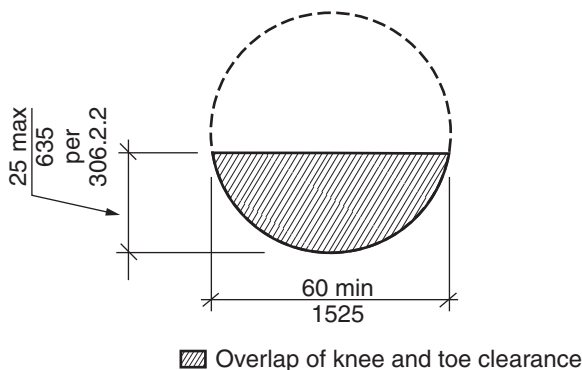


FIGURE 304.3.1.2
CIRCULAR TURNING SPACE - EXISTING BUILDINGS - SIZE AND OVERLAP

❖ The intent of this section is to specify a minimum circular space of that allows for a person using a mobility device to pivot 180 degrees (3.14 rad). This space is adequate for turning around, but many people are not able to turn without repeated tries and bumping into surrounding objects (see Commentary Figure C304.3.1). The 60-inch diameter is based on an adult male using a standard manual wheelchair.

To make a turn, both wheels are simultaneously turned in opposing directions within a 60-inch diameter. This space may not be adequate for larger motorized wheelchairs or scooters. Scooters are not as maneuverable as wheelchairs.

304.3.1.2.1 Overlap. Turning spaces shall be permitted to include knee and toe clearance complying with Section 306.

❖ As stated in Section 301.2, turning spaces can overlap clearances unless specifically stated otherwise.

The section does permit objects such as lavatories, drinking fountains, work surfaces or any other items that have space underneath to encroach into the 60-inch diameter circle provided any space underneath meets at least the height and depth of the knee and toe clearances in Section 306. Where properly located, the space under an element may be usable when making a turn. The overlap can extend the full 25 inches permitted by the knee and toe clearances. The intent indicated in the figure is to prevent an option where a turning space could be placed so that multiple sides are 25 inches under an obstruction – a doughnut-type effect. The reference to the diagram indicates the overlap can be on only one side.

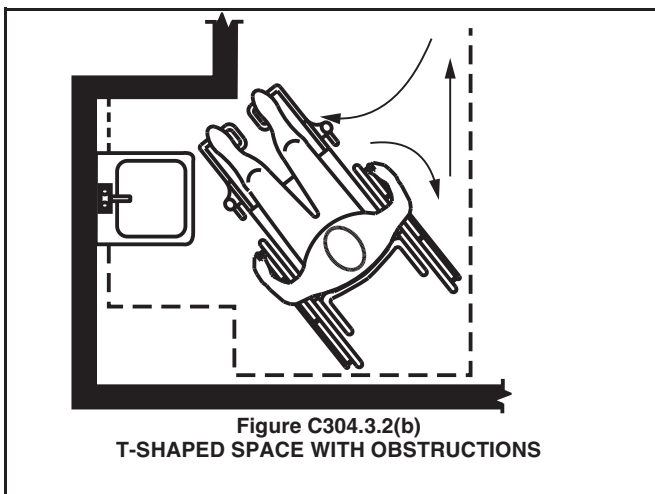
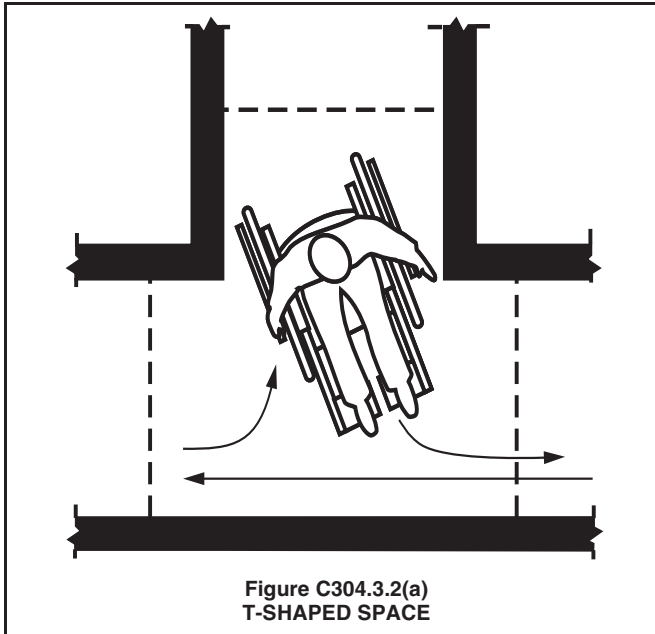
Knee and toe clearance could be under more than one object provided the overlap of both items could still meet the same three criteria as a group. See Commentary Figure C304.3.1.1.1 for an example in a single-occupant toilet room.

304.3.2 T-Shaped space.

❖ The criteria for T-shape turning space are split between the criteria for new buildings (Section 304.3.2.1) and existing buildings (Section 304.3.2.2).

Throughout the standard there will be many elements that are divided between the criteria for new buildings and existing buildings. For additional information on where the existing building criteria apply, see the commentary for the definitions of “existing building” and “existing facilities.” For new buildings, the differences are mostly due to the change in the clear floor space (see Section 305), the turning spaces (see Section 304) or the route (see Section 403) that were done based on a new study on anthropometrics for persons who use manual wheelchairs, motorized wheelchairs or scooters. See Section 103 for a general description of the study and the relationship of the US population and the people who participated in the study.

The T-shaped space permits the user to approach and turn within the space, similar to a three-point turn when turning a car around in a parking space. The T-shaped space is every bit as acceptable as the circular space listed in Section 304.3.1. The layout of the T and the approach to it may be made from either direction on the arm or from the base. This type of turning space is commonly used at intersections of accessible routes or within rooms or areas where cabinets or counters may be located in the spaces adjacent to the T [see Commentary Figure C304.3.2(a)]. As stated in Section 301.2, turning spaces can overlap clearances unless specifically stated otherwise. The T-shaped space may include knee and toe clearances beneath an object on one leg or the base of the T as long as the knee and toe clearance are in compliance with Section 306 [see Commentary Figure C304.3.2(b)].



304.3.2.1 New buildings and facilities. In new buildings and facilities, the turning space shall be a T-shaped space complying with one of the following:

1. A T-shaped space, clear of obstruction, that fits within an area 68 inches (1725 mm) wide and 60 inches (1525 mm) deep, with two arms and one base that are all 36 inches (915 mm) minimum in width. Each arm shall extend 16 inches (405 mm) minimum from each side of the base located opposite the other, and the base shall extend 24 inches (610 mm) minimum from the arms. At the intersection of each arm and the base, the interior corners shall be chamfered for 8 inches (205 mm) minimum along both the arm and along the base.

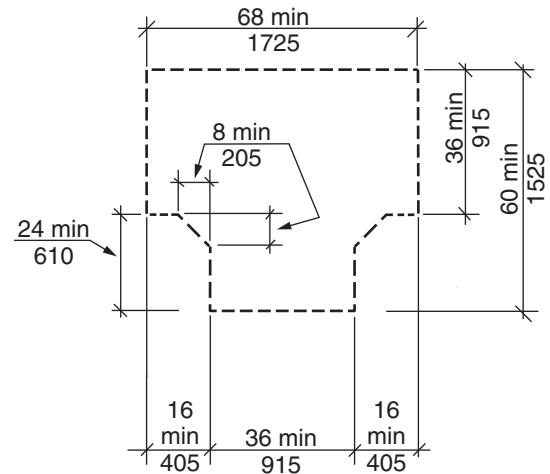


FIGURE 304.3.2.1(A)
T-SHAPED TURNING SPACE - NEW BUILDINGS - OPTION 1

2. A T-shaped space, clear of obstruction, that fits within an area 64 inches (1625 mm) wide and 60 inches (1525 mm) deep, with two arms and one base that are all 38 inches (965 mm) minimum in width. Each arm shall extend 11 inches (280 mm) minimum from each side of the base, located opposite the other, and the base shall extend 22 inches (560 mm) minimum from each arm.

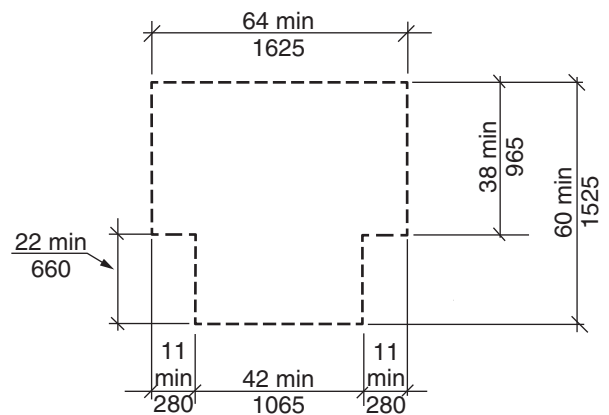


FIGURE 304.3.2.1(B)
T-SHAPED TURNING SPACE - NEW BUILDINGS - OPTION 2

3. A T-shaped space, clear of obstruction, 64 inches (1625 mm) wide and 60 inches (1525 mm) deep, with two arms and one base 40 inches (1015 mm) minimum in width. Each arm shall extend 12 inches (305 mm) minimum from each side of the base and the base shall extend 20 inches (510 mm) minimum from each arm.

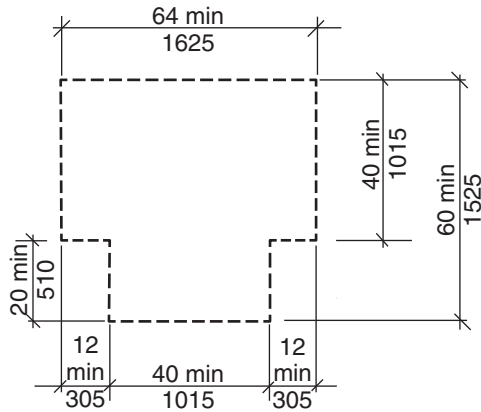


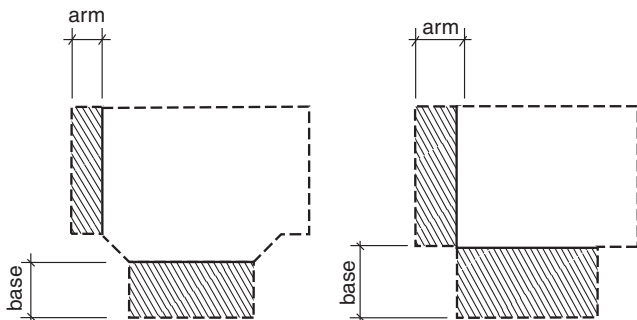
FIGURE 304.3.2.1(C)
T-SHAPED TURNING SPACE
NEW BUILDINGS - OPTION 3

❖ This section for new construction provides three options for the layout of the T-shaped space. These will vary for the overall size and the width of the arms and leg of the T. The three options are all 60 inches deep, but vary from 64 to 68 inches wide. The arms and base vary between 36 inches in width and having chamfered corners, to both of the arms and the base being increased to a 40-inch width.

The intent is to allow design options. The designer can choose any of the three options that works best with his or her design. None of the three options were shown to provide a higher level of accessibility or ease of use.

The criteria for the T-turn is based on the technical criteria for the L-turn. See Section 403.5.3.1 for additional information.

304.3.2.1.1 Overlap. Turning spaces shall be permitted to include knee and toe clearance complying with Section 306 of either the base or one arm. For Option 1, the base or arm is the portion beyond the chamfer.



▨ Overlap of knee and toe clearance

FIGURE 304.3.2.1.1
T-SHAPED TURNING SPACE
NEW BUILDINGS - OVERLAP

❖ See the commentary to Section 304.3.2 for a discussion of the overlap. The obstruction over the arm or

base is limited by the depth of the arm or leg on the option chosen. See Figure 304.3.2.1.1 for an illustration of the options. Depending on the options, the maximum depth could vary from 8 inches to 22 inches.

While the size of the T-shape has been increased to accommodate scooters, a scooter cannot typically go under an obstruction since the front steering mechanism would block a scooter from using knee and toe clearance

304.3.2.2 Existing buildings and facilities. In existing buildings and facilities, the turning space shall be a T-shaped space within a 60-inch (1525 mm) minimum square, with arms and base 36 inches (915 mm) minimum in width. Each arm of the T shall be clear of obstructions 12 inches (305 mm) minimum in each direction, and the base shall be clear of obstructions 24 inches (610 mm) minimum.

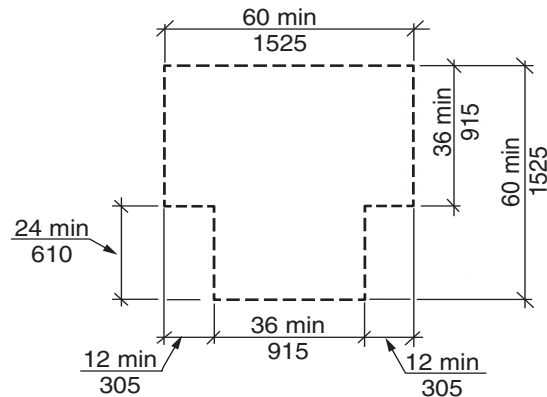


FIGURE 304.3.2.2
T-SHAPED TURNING SPACE
EXISTING BUILDINGS - SIZE

❖ The intent of this section is to specify a minimum T-shaped space that allows for a person using a mobility device to approach and turn within the space. This space is adequate for turning around, but many people are not able to turn without repeated tries and bumping into surrounding objects. The layout of the T and the approach to it may be made from either direction on the arm or from the base. This type of turning space is commonly used at intersections of accessible routes or within rooms or areas where cabinets or counters may be located in the spaces adjacent to the T [see Commentary Figure C304.3.2(a)]. The 60-inch T-shape is based on an adult male using a standard manual wheelchair and is coordinated with the width of an accessible route for the width of the arms and base.

This space may not be adequate for larger motorized wheelchairs or scooters. Scooters are not as maneuverable as wheelchairs.

304.3.2.2.1 Overlap. Turning spaces shall be permitted to include knee and toe clearance complying with Section 306 only at the end of either the base or one arm.