Rule #237 - Parking Rule Specification

Contents

Description

Rule ID	237
Rule Name (en)	Parking Rule
Rule Description (en)	This rule checks the size of the parking spaces. The checking can be limited to check only parking spaces with specific orientation to parking aisle or with specific obstructions nearby.

<u>The rule checks the following requirements for the checked components:</u>

- **Car Park Lot Size**
  - Min and Max Width
  - Min and Max Length
  - Min and Max Height

<u>The rule filters checked components by:</u>

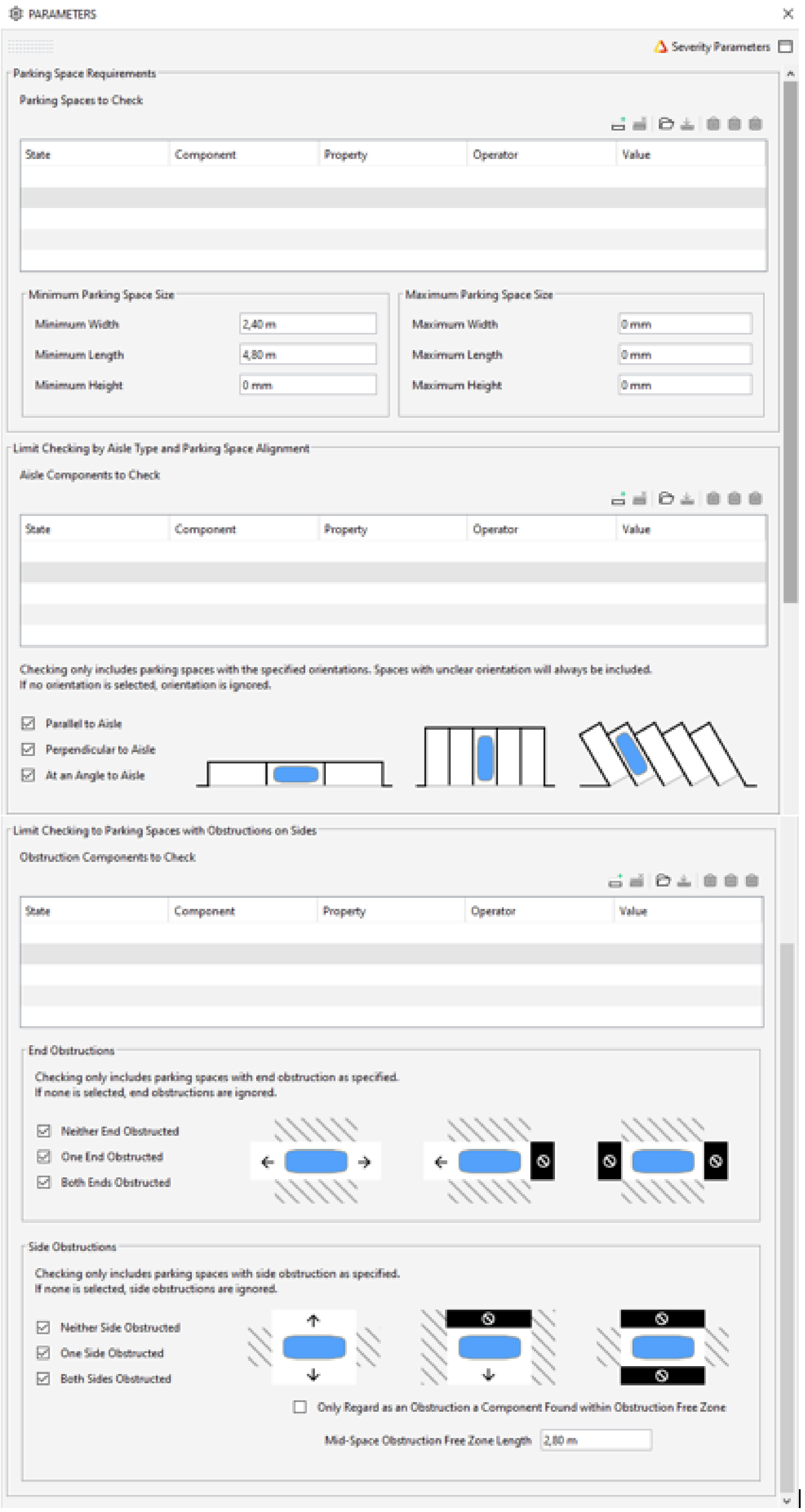
- Component Filter of Parking Lot
- Component Filter for Aisle
- Component Filter for Obstruction

- Orientation of Parking Lot to Aisle
    - Parallel to the Aisle
    - Perpendicular to the Aisle
    - At Angle to the Aisle
- Obstruction
    a. Component Filter for Obstruction in front of short side of car park lot
    b. Wall at the back of the short side of the car park lot
    c. Obstruction within Free Zone

Scope Restrictions

- Number of parking spaces or ratios are going to be checked by Rule #235 through a property denoting accessibility.
    - Ratio of Accessible car park lots vs. Normal Car Park Lots
- Those same accessible spaces are checked through this rule to verify dimensions satisfy accessibility.
- Total counts of the parking lots are not checked by this rule
- Degrees of the angled parking spaces cannot be specified in the first version. Parking lots rotated more than 2% from being otherwise perpendicular or parallel shall be considered angled.
- Aisles width are not checked in the first version.
- A parking space (not angled), with undefined orientation, that can be accessed from the aisle from the short side is considered as perpendicular in any case.
- For an object to be an obstruction in the free zone, the distance of the object from the side of the parking space should be less than the following:
    - Required Width – Actual Width (for one side obstruction)
    - (Required Width – Actual Width) / 2 (for double side obstruction)

Parameters



PARAMETERS

Severity Parameters

Parking Space Requirements

Parking Spaces to Check

State	Component	Property	Operator	Value

Minimum Parking Space Size

Minimum Width	2,40 m
Minimum Length	4,80 m
Minimum Height	0 mm

Maximum Parking Space Size

Maximum Width	0 mm
Maximum Length	0 mm
Maximum Height	0 mm

Limit Checking by Aisle Type and Parking Space Alignment

Aisle Components to Check

State	Component	Property	Operator	Value

Checking only includes parking spaces with the specified orientations. Spaces with unclear orientation will always be included.
If no orientation is selected, orientation is ignored.

☑ Parallel to Aisle

☑ Perpendicular to Aisle

☑ At an Angle to Aisle

Limit Checking to Parking Spaces with Obstructions on Sides

Obstruction Components to Check

State	Component	Property	Operator	Value

End Obstructions

Checking only includes parking spaces with end obstruction as specified.
If none is selected, end obstructions are ignored.

☑ Neither End Obstructed

☑ One End Obstructed

☑ Both Ends Obstructed

Side Obstructions

Checking only includes parking spaces with side obstruction as specified.
If none is selected, side obstructions are ignored.

☑ Neither Side Obstructed

☑ One Side Obstructed

☑ Both Sides Obstructed

□ Only Regard as an Obstruction a Component Found within Obstruction Free Zone

Mid-Space Obstruction Free Zone Length: 2,80 m

Figure 1. Parameter UI

Figure 1. Parameter UI is static for all but the last section (Obstructions). For obstructions at the end of the parking space, 3 cases are illustrated; as checked and unchecked by user, the images are fully visible (alpha 100%) or partially visible (alpha 40%). Same applies to side obstructions, which have additional option to limit check to spaces with an Obstruction Free Area at the midsection of the parking space, if found to be partially or fully occupied by a component on neither side, on either one side, or both sides (left: obstruction free area defined; right: obstruction free area undefined).

Results

This rule creates following results:

- Too low parking spaces (main category)
- Too high parking spaces (main category)
- Too narrow parking spaces (main category)
- Too wide parking spaces (main category)
- Too short parking spaces (main category)
- Too long parking spaces (main category)
    - Floor 1 (sub category)
        - Space.1.123: Parking[212], 1.3m (problem name)
            - Space.1.123: Parking[212] is too low. The height is 1.3m and required minimum height is 2.0m. (problem description)
            - Space.1.123: Parking[212] is too high. The height is 1.3m and required maximum height is 2.0m. (problem description)
            - Space.1.123: Parking[212] is too narrow. The width is 1.3m and required minimum width is 2.0m. (problem description)
            - Space.1.123: Parking[212] is too wide. The width is 1.3m and required maximum width is 2.0m. (problem description)
            - Space.1.123: Parking[212] is too short. The length is 1.3m and required minimum length is 2.0m. (problem description)
            - Space.1.123: Parking[212] is too long. The length is 1.3m and required maximum length is 2.0m. (problem description)

Visualization

Visualize parking space and related aisle transparent.

Visualize all three dimensions of the parking space. NOTE: entering 0 as a parameter skips the check for that dimension

Visualize obstruction objects opaque.

Checking Algorithm

Check one parking space by parking space.

check(parkingSpace)

1. Create parking space data structure from a component.
2. Skip (filter out) this parking space if the orientation is not matching the parameters.
3. Skip (filter out) this parking space if the obstruction is not matching the parameters.
4. Check the size
    a. Create needed issues

Testing

Integration tests using 2 BCA project models. The models should be from real building projects.

Integration tests using 1 in-house test model

- Test size filtered by Orientation (Parallel, Perpendicular, Angled)
- Test size filtered by Obstruction (End, Side, Both, Free Zone, None)
- Test nothing to check (Irrelevant state)

Requirements

We need to check the existence of an obstruction (wall) on the short side of the accessible parallel car park lot. This requires some complexity in checking to know if there is an obstruction in front OR behind the space (accessible parallel car park lot). The industry would not be expected to classify or name spaces to designate an obstruction in front of OR behind, see (Figure 2).

According to requirements, for parallel parking, where vehicles cannot be parked by reversing or where there are obstructions at the ends of the parking spaces, minimum stall length should be 7200 mm.

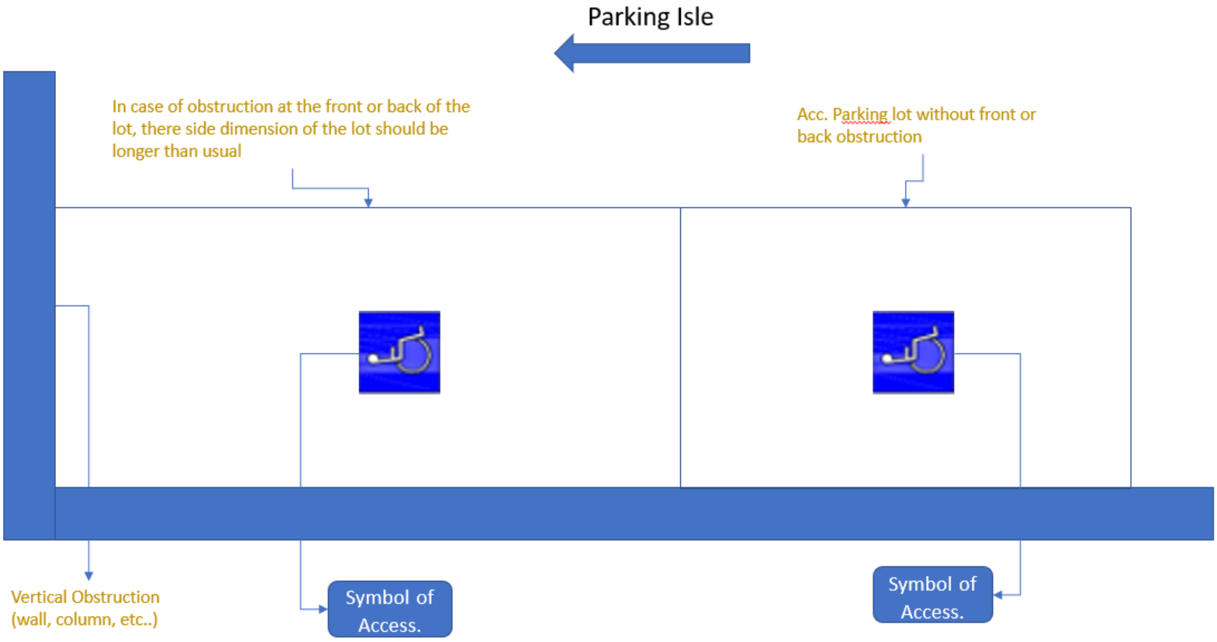

Parking Isle
In case of obstruction at the front or back of the lot, there side dimension of the lot should be longer than usual
Acc. Parking lot without front or back obstruction
Vertical Obstruction (wall, column, etc..)
Symbol of Access.
Symbol of Access.

Figure 2. BCA Building Code Snapshot

1. Orientation

The rule filters the car park lot according to its (Orientation) + (Obstruction both End & Side) -> all this to proceed to the final check which is the Dimensions of the lot (Figure 3).

- **Orientation**
  - For the rule **to know orientation** correctly, the lots must be less than 500 mm away from the aisles/drive way.
    - Perpendicular: the shorter edge is close to aisle and angle to the aisle is 90 degrees with 2 degrees tolerance.
    - Parallel: the longer edge is close to aisle.
    - Angled: the shape is not a rectangle and it is close to the aisle.

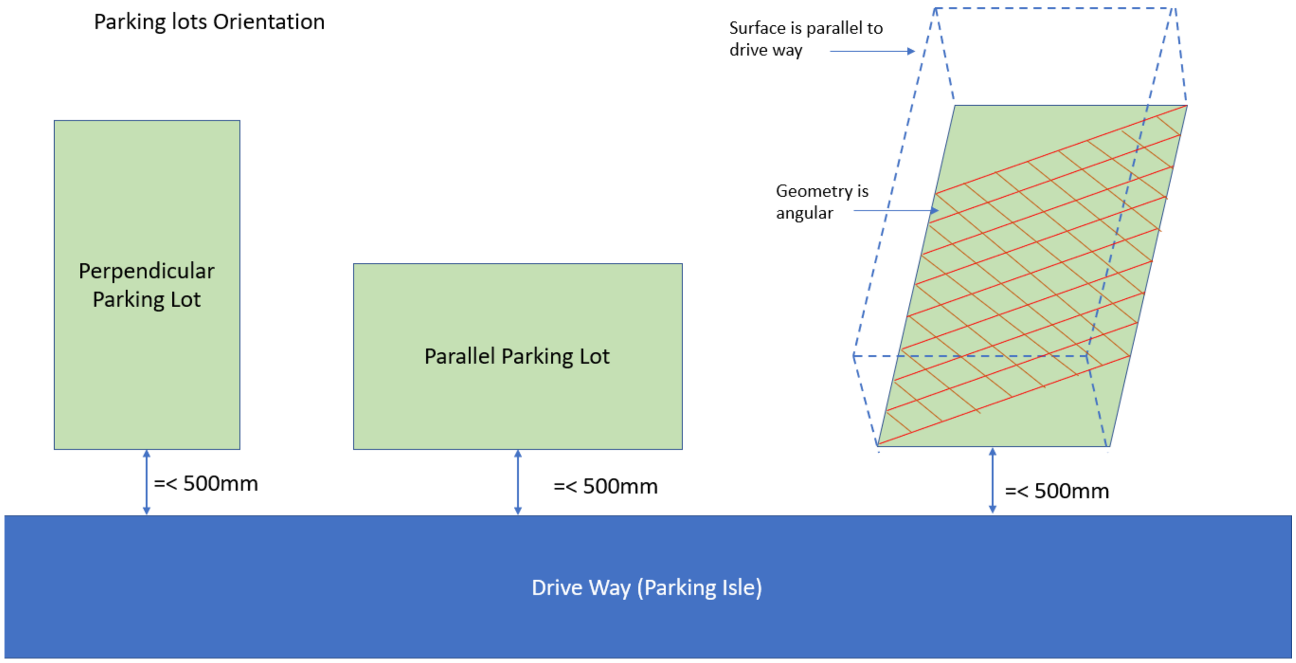


Figure 3. Orientation of Parking lots

2. Obstruction

- For an obstruction to be found at the end of the lot/component, it has to be within 1m or less to the lot.

- For a side obstruction to be found, it must be 1.5 m or less from the lot

By default the rule goes up to 2.0m depth from the long side (side obstruction) and 1.5m from the short side (end obstruction) of the lot when trying to find an obstacle. On the other hand, to find the end obstruction it should be within 1m or less, to find side obstruction it should be within 1.5 m or less

  - In general the rule checks if there is an obstruction along the width & length of the parking lot.
  - If we want to specify a certain area/zone where to check the obstruction (for example besides the car doors) then we do the following:
    - Check the box for (Only Regard as an Obstruction a Component Found within Obstruction Free Zone.
    - Add tolerance for the (Mid-space Obstruction Free Zone Length

- How does the rule uses the (Mid-space Obstruction Free Zone Length) tolerance in checking :

The rule centres the tolerance in the middle of the parking lot by cutting the long side from the centre and divides the tolerance on both sides of the centre -> the projection of the tolerance box is extended out the lot to see if it hits an obstruction (Figure 4)

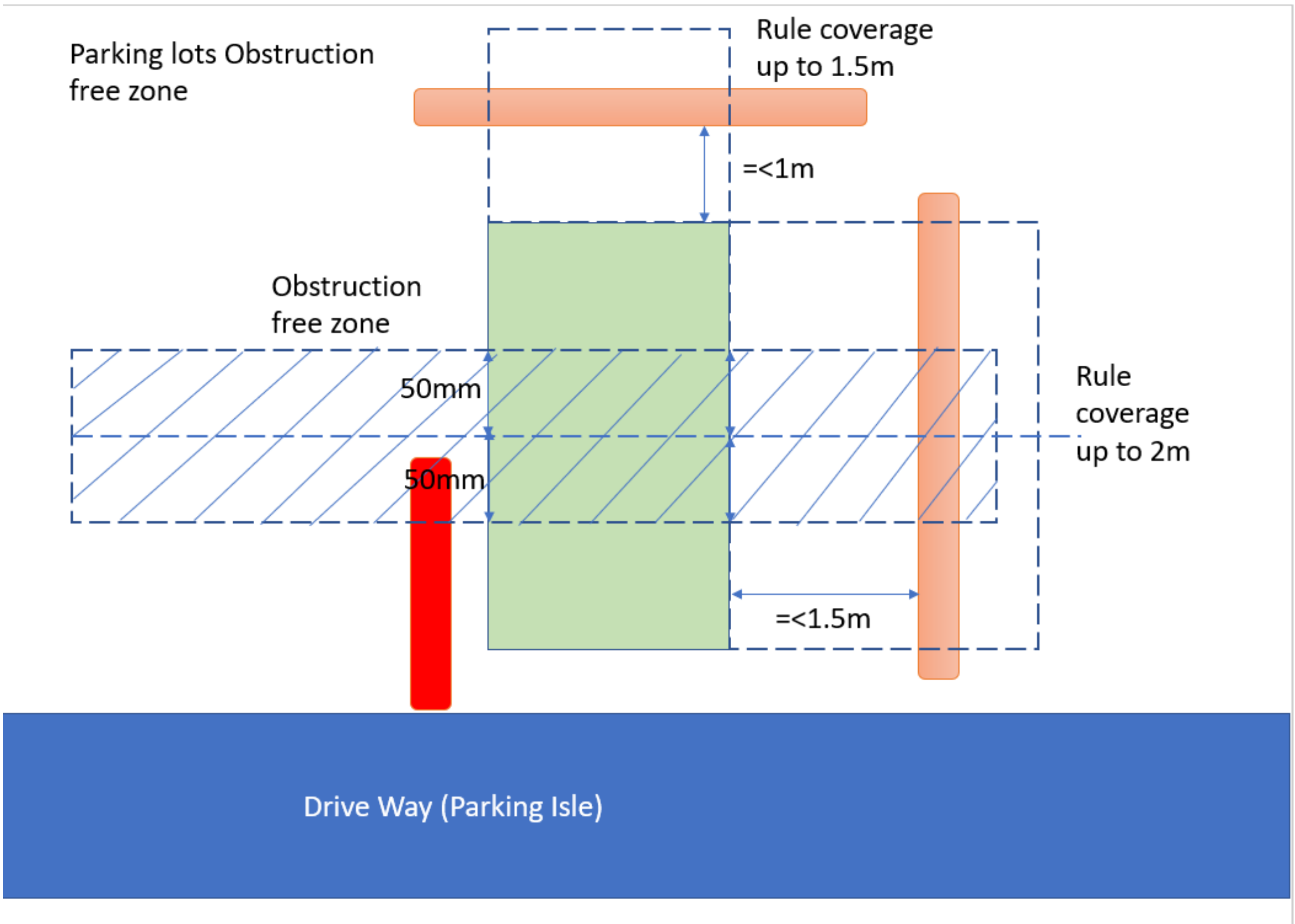


Figure 4. Obstructions location