



Parking Dimensions

The City of Calgary, in continuation of its Land Use Bylaw review, sought to bring parking stall dimensions in line with the current sizes and types of vehicles on the City's roads. Analyses of the design vehicle dimensions and review of other cities' Bylaws indicated that the City of Calgary existing stall and module dimensions are adequate to accommodate the current vehicle fleet. It was, however found that stall sizes adjacent to physical barriers need to be reviewed. Recommendations were made for the size of intrusion into parking spaces by overhead storage and stairwell in both residential and commercial parking lots.

OVERVIEW

In June 2008, the City of Calgary implemented the new Land Use Bylaw (LUB 1P2007)¹. To ensure that the new Land Use Bylaw continues to be an effective document to regulate land use planning in the City of Calgary, the City established a Sustainment Team to continually reevaluate existing regulations and to identify emerging trends. The LUB Sustainment Team identified that some of the parking stall requirements may be excessive and/or restrictive. As well, the team recognizes that the Land Use Bylaw currently does not make provisions for private storage within public parking facilities, specifically above the parking stall.

STUDY OBJECTIVES

The objectives of this program were to review the City of Calgary Land Use Bylaw in order to gain an understanding of the specification and regulations related to parking stall dimensions as well as to determine the maximum allowable projection into a parking stall.

EXISTING CITY OF CALGARY BYLAW PARKING DIMENSIONS

A review of the City's of Calgary Bylaw parking dimensions was reviewed to gain an understanding of the requirements and/or any deficiencies that should be addressed as part of this study. The majority of the Bylaw parking stall dimensions are consistent with the preceding 2P80 Bylaw² standard. The results of the review are summarized in Table 1.

ASSESSMENT OF OTHER CITIES

As part of this review, the City of Calgary parking dimensions were compared to 18 other North American municipalities, including Vancouver, Toronto, and Seattle. The selection of the municipalities was based on characteristics such as a high rate of growth, size of municipality, and demographics. Basic statistical analyses were performed on the parking stall dimensions. The results of the comparative assessment confirmed the following key findings:

- The City's existing parking dimensions requirements are for the most part consistent to those used by other municipalities.
- The majority of the municipalities do not provide small-vehicle parking stalls. It is clear that most municipalities are incorporating a one size fits all approach.
- The parking stall widths could vary depending on the number of barriers next to the parking stall.

PARKING STALL GEOMETRICS BASED ON EMPIRICAL ANALYSIS

Stall Width

A typical stall must accommodate the size of the design vehicle when its doors are open. The width of an opened passenger vehicle door is typically 0.55 m (22 inches). As such, the minimum stall width should be the width of the design vehicle plus 0.55 m (22 inches). For areas that exhibit high turnover, 0.61 m to 0.68m (24 to 27 inches) should be provided to accommodate wider door opening



A review of the City of Calgary's Bylaw parking dimension requirements confirmed the following in addition to those stated in Table 1:

- Other than the requirements for structural column and minimum vertical clearance requirements, the Land Use Bylaw does not make provisions for parking stall encroachment.
- At present, the 3.1 m requirement for those stalls abutting a physical barrier applies to both the one-sided and two-sided scenarios.

1

CITY OF CALGARY MINIMUM DIMENSIONS (IN METRES) – 1P2007

Parking Angle	Aisle Width	Depth	Stall Width	
			Dwelling Units	Commercial
90	7.20	5.40	2.50	2.60
75	6.12	5.64	2.59	2.69
60	4.82	5.49	2.89	3.00
45	4.00	5.00	3.54	3.68

1. The City of Calgary Land Use Bylaw 1P2007, The City of Calgary, 2008
 2. The City of Calgary Land Use Bylaw 2P80, The City of Calgary, 1980

clearance. Conversely, if the turnover is expected to be very low, the door opening clearance could be reduced to 0.51m (20 inches).

Opening Door Clearance Abutting a Physical Barrier

Opening door clearance between two adjacent cars is shared within both parking spaces. The stall width requirements next to physical barriers will vary depending on whether-or-not the parking stall is adjacent to physical barriers on one-side or on both sides of the parking stall, as follows:

- If there is a physical barrier on one-side of the parking stall, the minimum size of the stall should be the width of the design vehicle plus 0.83 m (33 inches) or the stall width plus 0.28 m (11 inches). If the physical barriers are on both sides of the parking stall, the minimum size of the stall should be the width of the design vehicle plus 1.12 m (44 inches) or the stall width plus 0.55 m (22 inches).

Handicapped Stall Widths

Depending of the jurisdiction the requirements for handicapped parking will vary. For the most part, the stall widths do adhere to the standards set by the Uniform Federal Accessibility Standards. As outlined in Section 4.6.3 of UFAS, parking spaces for disabled people should be 96 inches (2.44m) wide and have an adjacent access aisle 60 inches (1.53m) wide, for an overall width of 4.0 m (2.44 + 1.53 = 3.97 m).

Stall Depth

Stall depth is defined as the sum of the length of the design vehicle and bumper clearance. As such, the minimum depth of stall must accommodate the length of the design vehicle plus a minimum of 0.15 m (6 inches) for bumper clearance.

Aisle Width

Aisles are specifically designed to accommodate the width and the turning capability of the design vehicle. Elements related to pedestrians, traffic circulation, and parking angle will influence the width of an aisle. Based on first principles, a two-way aisle should be wide enough to accommodate two-

way vehicular flow (6m) and pedestrian movements on either side of the aisle (0.6 m on each side for a total of 1.2m for a total of 7.2 m.

Parking Module Dimensions

A parking module consists of the lengths of parking stalls and the aisle. A parking module is either single loaded or double loaded. A single loaded module consists of an aisle with stalls on one side. A double loaded aisle consists of an aisle with parking stalls on both sides. Literature recommends a minimum of 12.6 m (42 feet) as the width of a single loaded module, and 18 m (60 feet) for double loaded module if the parking angle is 90 degrees.

Stall Height

Covered parking facilities often require minimum ceiling or clearance height in addition to the depth and width of stalls. The minimum height clearance has been generally designed as 2.1 m (7 feet). Higher heights between 2.3 m (7 feet 8 inches) and 2.5 m (8 feet 2 inches) are needed to accommodate handicap vans and vehicles with roof racks.

Design Vehicle

The basis for establishing the parking stall dimension is linked to the width, length, and height of the design vehicle. The current transportation infrastructure is a limiting factor for vehicle widths. Typically, a design vehicle is taken as not larger than the 85th percentile vehicle.

Bunt & Associates undertook a review of the current (2008 and 2009) vehicle fleet to establish an appropriate design vehicle for the Calgary market. In all, 3,225 vehicles models, comprising of 785 Cars, 1068 SUVs, 74 Minivans and 1298 Pick-up Trucks were analyzed. Based on the selected sample size, a total of 289 vehicle lengths, 169 vehicle widths and 226 vehicle heights were analyzed.

A review of sample size confirmed that cars and SUVs exhibited the greatest variance in overall vehicle dimensions when compared to the other types of vehicles. It is noted that Minivans have the least variations in their sizes. The 74 Minivan models analyzed exhibited only 9 different sizes. The results of the vehicle dimensions analysis are summarized in **Table 2**.

OVERALL COMPARATIVE ANALYSIS

Having established an appropriate design vehicle for the current vehicle fleet and the resulting parking stall dimensions associated with the selected design vehicle, Bunt & Associates compared the results of empirical analysis to the City's Bylaw and other cities throughout North America as well as to other sources of parking information. This analysis formed the basis for developing the recommended parking stall dimensions for the City of Calgary. Based on this analysis, stall depth was found to vary from 4.88-6.1 m, width varies from 2.3 to 2.7 m, height varies from 2.0 to 2.5 m, aisle width varies from 6.0 to 7.3 m and a parking module varies from 15.85 to 18.2 m.

RECOMMENDED PARKING STALL DIMENSIONS

Considering the practice of other Cities and development of parking dimensions based on the empirical assessment, the following parking dimensions summarized in **Table 3** is recommended.

PROJECTIONS AND STORAGE REVIEW

Typically, the minimum vertical clearance is based on the limitations set by Alberta Building Code. The City requires a minimum vertical clearance of 2.1 metres and when compared to other known literatures, 2.1 m (7 feet) represents the minimum clearance. Desirably, 2.5 m (8 feet 2 inches) is the preferred vertical clearance as it provides vertical clearance for vehicles used by the disabled and enhances a sense of space.

Of the municipalities reviewed in Canada and the United States, a single reference was found that specifically addressed intrusions and overhead storage requirements. An intrusion and/or overhead storage requirement may be permitted within the first 1 m (3 feet) from the wall and the base of the intrusion or overall storage unit should be 1.83 m (6 feet) above grade (or 0.3 m from the lowest point of the ceiling).



2

RESULTS OF THE STATISTICAL ANALYSIS – ALL 2008 AND 2009 VEHICLE MODELS

	Length (m)	Width (m)	Height (m)
Average	5.02	1.98	1.76
Median	4.89	1.87	1.78
85th Percentile	5.66	1.99	1.95
90th Percentile	5.81	2.01	1.97
95th Percentile	6.20	2.03	2.01
Minimum	3.88	1.68	1.39
Maximum	6.68	2.44	2.06

The key findings are summarized here:

- The 85th percentile length (5.67m) is longer than those of 96 percent of Car, 100 percent of Minivans, 98 percent of SUVs and 62 percent of Pick-up Trucks.
- The 85th percentile width (1.99m) is wider than those of 96 percent of Car, 99 percent of Minivan, 90 percent of SUV and 52 percent of Pick-up Trucks.
- The 85th percentile height (1.95m) is higher than those of 100 percent of Car, 100 percent of Minivan, 87 percent of SUV and 72 percent of Pick-up Trucks.

Considering the typical dimensions of standard personal vehicle, the typical length of a hood ranges between 1.0 m to 1.5 m, and the net difference between the hood of the vehicle and the top of the cab is approximately 1.0 m. There is therefore a potential for the space between the hood of vehicle, ceiling, windshield, and outside wall to permit an intrusion and/or accommodate an overhead storage unit.

CONCLUSIONS AND RECOMMENDATIONS

Based on the data collected, research completed and analysis undertaken a number of recommendations regarding stall dimensions have been developed as summarized below.

- Maintain the existing parking dimension. That is, length 5.4m, width 2.5/2.6m aisle 7.2 m, height 2.1m and module 18 m.
- Modification to the minimum parking stall requirements for those stalls abutting a physical barrier are recommended as follows:
 - *Physical barrier on one-side of the parking stall: The recommended minimum stall width for both residential and commercial uses should be 2.85 m.*
 - *Physical barrier on both sides of the parking: The recommended stall width for parking spaces placed in a commercial setting should be 3.1m and 3.0 m for a residential setting.*
- Although not part of Bylaw 1P2007, modification to the current 4.0 m wide requirement for handicapped use is not required.
- The one-stall fits all approach should be maintained.
- The limits of the intrusion and/or overhead storage unit should be limited to a depth of 0.3 m and not exceed a width of 1 m.
- The base of the intrusion and/or overhead storage unit should be placed at least 1.83 m above grade.
- Based on the typical vehicle dimensions, projections up to 0.5 m stall could be accommodated.
- Projections beyond the 0.5 m limitation would require additional depth to ensure a minimum depth of 5.4 m.

ACKNOWLEDGEMENT

The City of Calgary initiated and funded this project. Bunt & Associates is grateful to the City for allowing the materials from the project to be presented and published. ■

DIMENSION	RESIDENTIAL	COMMERCIAL	
		(High Turnover)	(Low Turnover)
Width	2.5m	2.6m	2.5m
	2.85m – physical barrier abutting one side	2.85m – physical barrier abutting one side	2.85m – physical barrier abutting one side
	3.0m – physical barrier abutting both sides	3.1m – physical barrier abutting both sides	3.0m – physical barrier abutting both sides
Depth	5.9m – private garage	5.4m	5.4m
	5.4m – parkade/surface		
Aisle	7.2m parkade/surface	7.2m	7.2m
Module	18m – parkade/surface	18m	18m