BMP 5.7.2: Reduce Parking Imperviousness

Reduce imperviousness by minimizing imperviousness associated with parking areas.

Key Design Elements

- Evaluate parking requirements considering average demand as well as peak demand.
- Consider the application of smaller parking stalls and/or compact parking spaces.
- Analyze parking lot layout to evaluate the applicability of narrowed traffic lanes and slanted parking stalls.
- Where appropriate, minimize impervious parking area by utilizing overflow parking areas constructed of pervious paving materials.

Potential Applications

Residential:	Yes
Commercial:	Yes
Ultra Urban:	Limited
Industrial:	Yes
Retrofit:	Limited
Highway/Road:	Limited

Stormwater Functions

Volume Reduction:	Very High
Recharge:	Very High
Peak Rate Control:	Very High
Water Quality:	High

Water Quality Functions

TSS:	Preventive
TP:	Preventive
NO3:	Preventive

Description

Reducing parking imperviousness performs valuable stormwater functions in contrast to conventional or baseline development: Increasing infiltration; Decreasing stormwater runoff volume; Increasing stormwater time of concentration; Improving water quality by decreasing the pollutant loading of streams; Improving natural habitats by decreasing the deleterious effects of stormwater runoff; Decreasing the concentration and energy of stormwater. Imperviousness greatly influences stormwater runoff volume and quality by facilitating the rapid transport of stormwater and collecting pollutants from atmospheric deposition, automobile leaks, and additional sources. Increased imperviousness alters an area's hydrology, habitat structure, and water quality. Stream degradation has been witnessed at impervious levels as low as 10-20% (Center for Watershed Protection, 1995).

Applications

In commercial and industrial areas, parking lots comprise the largest percentage of impervious area. Parking lot size is dictated by lot layout, stall geometry, and parking ratios. Modifying all or any of these three aspects can serve to minimize the total impervious areas associated with parking lots.

Parking Ratios

Parking ratios express the specified parking requirements provided for a given land use. These specified ratios are often set as minimum requirements. Many developers seeking to ensure adequate parking provide parking in excess of the minimum parking ratios. Additionally, commercial parking is often provided to meet the highest hourly demand of a given site, which may only occur a few times per year. Excess parking is often rationalized by the desire to avoid potential complaints from patrons that have difficulty finding parking. However, as shown in Table 5.7-4, average parking demand is generally less than typical required parking ratios and therefore much less than parking provided in excess of these ratios. The result of using typically specified parking ratios is parking capacity that is underutilized.

Table 5.7-4 Example Minimum Parking Ratios

Land Use	Parking Ratio	Average Parking Demand
Single Family Home	2 spaces per dwelling unit	1.1 spaces per dwelling unit
Shopping Center	5 spaces per 1,000 ft^2 of GFA	3.97 spaces per 1,000 ft^2 of GFA
Convenience Store	3.3 spaces per 1,000 ft^2 of GFA	Not available
Industrial	1 space per 1,000 ft^2 of GFA	1.48 spaces per 1,000 ft^2 of GFA
Medical/Dental Office	5.7 spaces per 1,000 ft^2 of GFA	4.11 spaces per 1,000 ft^2 of GFA

GFA – gross floor area, excluding storage and utility space

(Institute of Transportation Engineers, 1987; Smith, 1984; Wells, 1994)

In residential neighborhoods, the perception of the need for large quantities of parking may lead developers to provide on-street parking; residential land use will greatly influence the quantity needed. Each on-street lane increases street impervious cover by 25%. Many communities require 2-2.5 parking spaces per residence. In single-lot neighborhoods, with both standard and reduced setbacks, parking requirements can likely be met using private driveways and garages. In townhouse communities, if on-street parking is required, providing one on-street space per residence is likely sufficient. Urban settings will require the greatest use of on-street parking. However, continuous parking lanes on both sides of the street, while common for all residential land uses, is often unnecessary. When on-street parking is necessary, queuing lanes (discussed in BMP 5.7.1) provide a parking system alternative that minimizes imperviousness.

Parking Spaces and Lot Layout

Parking spaces are comprised of five impervious components (Center for Watershed Protection, 1998):

1. The parking stall;
2. The overhang at the stall's edge;
3. A narrow curb or wheel stop;
4. The parking aisle that provides stall access; and
5. A share of the common impervious areas (e.g., fire lanes, traffic lanes).

Of these, the parking space itself accounts for approximately 50% of the impervious area, with stall sizes ranging from 160 to 190 ft^2. Several measures can be taken to limit parking space size. First, jurisdictions can review standard parking stall sizes to determine their appropriateness. A typical stall dimension may be 10 ft by 18 ft, much larger than needed for many vehicles; while the largest SUVs are wider, the great majority of SUVs and vehicles are less than 7 ft providing opportunity for making stalls slightly narrower and shorter. In addition, typical parking lot layout includes parking aisles that accommodate two-way traffic and perpendicularly oriented stalls. The use of one-way isles and angled parking stalls can reduce impervious area.

Jurisdictions can also stipulate that parking lots designate a percentage of stalls as compact parking spaces. Smaller cars comprise 40% or more of all vehicles and compact parking stalls create 30% less impervious cover than average-sized stalls (Center for Watershed Protection, 1998). This is currently an underutilized practice that has potential to reduce the total area of parking lots.

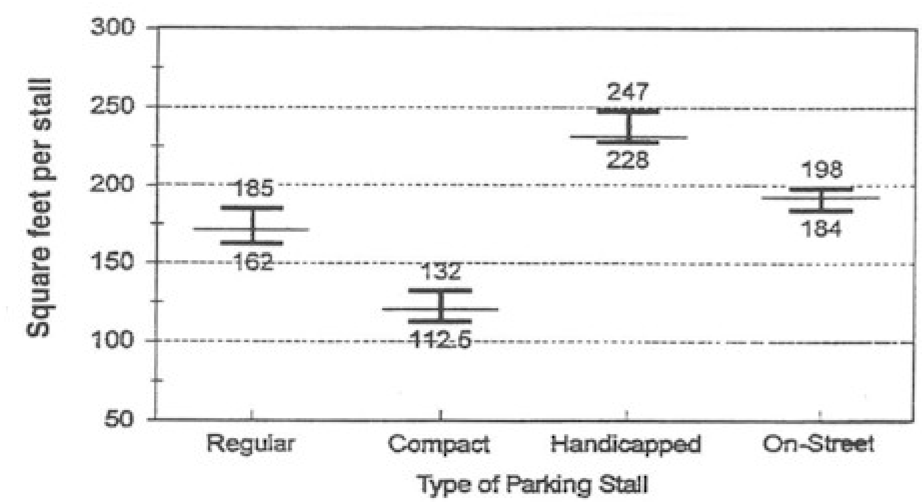

Figure 5.7-4 ("Conservation Design for Stormwater Management", DNREC, 1997)

Parking Lot Design

Because of parking ratio requirements and the desire to accommodate peak parking demand, even when it occurs only occasionally throughout the year, parking lots often provide parking capacity substantially in excess of average parking needs. This results in vast quantities of unused impervious surface.

A design alternative to this scenario is to provide designated overflow parking areas. The primary parking area, sized to meet average demand, would still be constructed on impervious pavement to meet local construction codes and American with Disabilities Act requirements. However, the overflow parking area, designed to accommodate increased parking requirements associated with peak demand, would be constructed on pervious materials (e.g., permeable pavers, grass pavers, gravel). This design approach focused on average parking demand will still meet peak parking demand requirements while reducing impervious pavement.

Figure 5.10-2 Overflow parking using permeable pavers

Cost Issues

Estimates for parking construction range from $1,200 to $1,500 dollars per space (Center for Watershed Protection, 1998). For example, assuming a cost of $1,200 per parking space, reducing the required parking ratio for a 20,000 ft^2 shopping center from 5 spaces per 1,000 ft^2 to 4 spaces per 1,000 ft^2 would represent a savings of $24,000.

Parking lots incorporating pervious overflow areas may not present cost savings, as permeable paving products are generally more expensive than traditional asphalt. However, the additional costs may be offset by reduced curb and gutter and stormwater management costs.

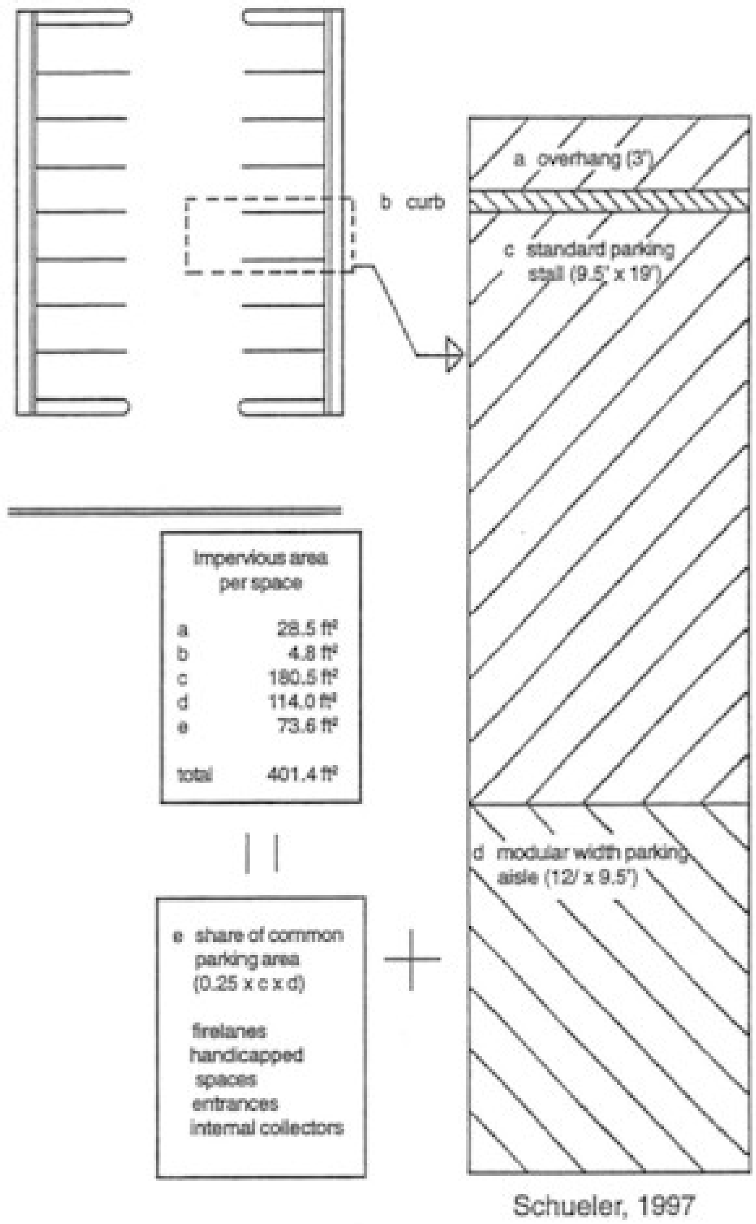

Figure 5.7-5 Parking Stall Dimensions (Schueler, 1997)

References

Center for Watershed Protection, 1998
Center for Watershed Protection, 1995