CHAPTER 9

SAFETY REST AREAS AND WELCOME CENTERS

9.0 INTRODUCTION

The development of Safety Rest Areas and Welcome Centers is a necessary component of highway development. Site development of these areas may also include the provision for a truck weigh-in-motion scale system in order to provide a dual use opportunity at the Safety Rest Area.

Site development must provide visually pleasing, safe and easily accessible facilities which are also fully accessible to persons with disabilities.

9.1 DEFINITIONS

1. Access Aisle. An accessible pedestrian space between parking stalls that provides appropriate clearances to use the space.

2. Accessible Route (AR). A continuous unobstructed path connecting all accessible elements and spaces of a building or facility.
(Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities (ADAAG))
http://www.access-board.gov/adaag/html/adaag.htm

3. Parking Stall. Surface area generally paved and delineated by pavement markings to denote intended vehicle parking space allotments.

4. Pedestrian Access Route (PAR). A continuous and unobstructed walkway within a pedestrian circulation path that provides accessibility. Pedestrian accessible routes may include parking access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps, and lifts.
Draft Public Rights of Way Accessibility Guidelines (PROWAG)
http://www.access-board.gov/prowac/draft.htm

5. Safety Rest Area. A roadside facility safely removed from the roadway with parking, and other facilities deemed necessary for the rest, relaxation, comfort, convenience and information of the motorist. Interstate Safety Rest Areas will also have an all-weather, enclosed building.

6. Sidewalk. A portion of a roadway between curb lines or the lateral line of a roadway and the adjacent property line or easement of private property that is paved or improved and intended for use by pedestrians.

7. Welcome Center. A Safety Rest Area specifically designed to provide information and other services of interest to the traveling public. Welcome Centers are generally located at major highway entry points to the state.

9.2 DESIGN CRITERIA

The design of Safety Rest Areas and Welcome Centers must be in accordance with current Department design standards and the American Association of State Highway and Transportation Officials (AASHTO) to insure adequacy of acceleration and deceleration ramps, turning radii, vehicle parking areas, signing, surface water drainage provisions and highway lighting.

Wastewater disposal systems and drinking water supply systems must be in accordance with all appropriate regulations of the PA Department of Environmental Protection (PA DEP).

Chapter 6, Pedestrian Facilities and the Americans with Disabilities Act must be used for all pedestrian accessibility provisions.

9.3 PARKING CAPACITY DETERMINATION

The capacity of the parking areas needed for each site are determined by calculating traffic volume data for the projected design year with directional distribution and design hour volume constants for peak hour usage as outlined below:

A. Traffic Data - Peak Hour.

ADT = Average Daily Traffic (Normal 20-year projection or other design year as directed)

K = Ratio of Design Hour Volume to ADT (Interstate - Rural 12% or Urban 10%)

D = Directional Distribution (generally about 0.60)

Therefore: Peak Hour Directional Traffic (PHD) = ADT × K × D

B. Parking Requirements.

N = Percentage of vehicles stopping at Safety Rest Areas during peak hours (location factor). The percentage varies from about 5% to about 13% depending upon the location as follows:

1. Near commercial or recreational facilities = 5%.

2. Rural Area = 9%.

3. Isolated area with no nearby commercial or recreational facilities = 13%.

Percentages may be interpolated to reflect locations of nearby existing or proposed facilities.

M = Total parking spaces = PHD × N × length of stay in Safety Rest Area (generally 20 to 30 min or 0.33 to 0.50)

Car Parking Spaces = M × the percentage of cars (generally about 0.80; a lower factor may be used if anticipated truck traffic is high)

Truck Parking Spaces = M - Car Parking Spaces

It is desirable to use the maximum number of calculated parking spaces if the topography of the site and the available property size are compatible for full sized development.

<u>Example</u>: Determine Range of Parking Needed

Assume: ADT = 31 714 (20-year design projection)

N = Rural Area of 9%
Length of stay of 20 min = 0.33
Length of stay of 30 min = 0.50

Therefore: PHD = 31 714 × 0.12 × 0.60 = 2283
M = 2283 × 0.09 × 0.33 = 67.8 CALL 68
2283 × 0.09 × 0.50 = 102.7 CALL 103

Car Parking Spaces = 68 × 0.80 = 54.4 CALL 54
Truck Parking Spaces = 68 - 54 = 14

or

Car Parking Spaces = 103 × 0.80 = 82.4 CALL 82
Truck Parking Spaces = 103 - 82 = 21

Therefore: Desirable range of parking requirements = Car Parking - 54 to 82
Truck Parking - 14 to 21
Total Parking - 68 to 103

9.4 PARKING CRITERIA

A. General.

1. Vehicular traffic flows should be in a continuous, one-way direction. Avoid two-way traffic and the use of dead-end parking lot arrangements.

2. Whenever possible, the car parking area should be designed as a separate area from the parking area used for trucks, buses, car-trailers and recreational vehicles.

3. The geometric design of the parking areas should avoid small acute angle curbed areas and excessive small protrusions or islands into the parking area which can make snow removal operations difficult.

4. The design of the parking areas must be functional, simple, and attractive and provide safe vehicular movements which will not test the driver's ability.

5. The gradient of the parking areas should be relatively level but still sloped or crowned to permit surface drainage flows directed toward inlet structures.

6. Clearing or removal of snow during winter should be carefully analyzed. Increased turning radii for snow removal equipment should be considered. Determining where snow can be piled during the design stage can increase the efficiency of the parking area during the winter season.

7. Parking stalls must be indicated with pavement markings to delineate the designated parking pattern and other pavement markings such as directional arrows, crosswalk indicators, etc. should be considered.

8. If parking stalls are too narrow, the drivers will often ignore stripe demarcation lines and overlap into adjacent stalls. Drivers often do not park precisely in the center of the designated stall and do not always pull-in to the full depth allowance of the stall. Therefore, where space permits, it is always best to avoid minimum stall dimensions.

Maximum allowable grade for the accessible parking stalls is 1V:50H (2.00%). Parking spaces that are not level may deny use to persons with disabilities since vehicle doors are more difficult to operate on slopes where wheelchairs tend to roll away.

B. Parking Configurations.

1. Car Parking.

a. The car parking stalls should be designed for head-in parking either at a 60° or 45° angle to the traffic lane.

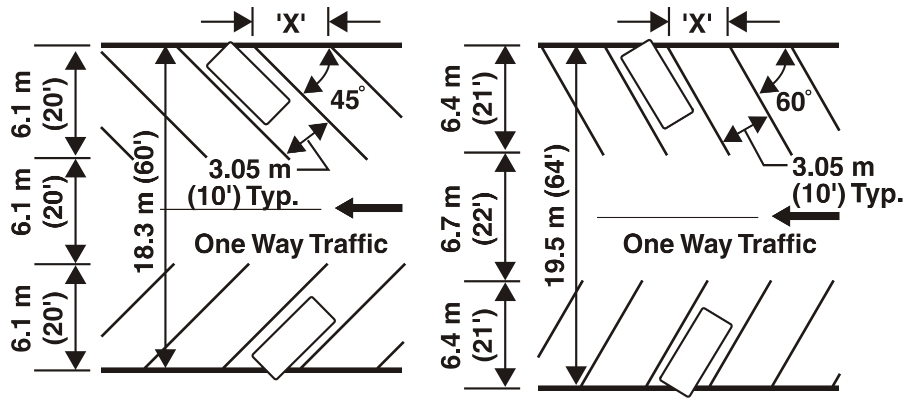
b. Stalls at a 60° angle are more commonly used and are generally considered the most satisfactory in relation to pull-in and back-out vehicle movements. Traffic aisle and parking lot widths are reasonable.

c. Stalls at a 45° angle are preferred in some cases since they require a smaller change of direction to enter the stall and allow a reduced lot width. However, fewer cars can be parked in a given space since the stall width dimension per vehicle measured along the curb is greater.

d. Refer to Figure 9.1 for recommended parking dimension information.

e. Provide the appropriate number of accessible car parking stalls as shown in Table 9.1 at a convenient location or locations near the Safety Rest Area/Welcome Center building. Provide an accessible route from the parking area to the building.

f. Two accessible car parking stalls can share a common access aisle. In general, a person with disabilities should not be forced to travel behind parked vehicles along their circulation path.



METRIC					
PARKING ANGLE (DEGREES)	**AISLE WIDTH (m)**	**STALL DEPTH (m)**	**STALL WIDTH (m)**	**TOTAL WIDTH (m)**	**CURB LENGTH 'x' (m)**
45	6.1	6.1	3.05	18.3	4.31
60	6.7	6.4	3.05	19.5	3.52

ENGLISH					
PARKING ANGLE (DEGREES)	**AISLE WIDTH (ft)**	**STALL DEPTH (ft)**	**STALL WIDTH (ft)**	**TOTAL WIDTH (ft)**	**CURB LENGTH 'x' (ft)**
45	20	20	10	60	14.14
60	22	21	10	64	11.55

FIGURE 9.1
DIMENSIONS FOR CAR PARKING SPACES

TABLE 9.1
REQUIRED MINIMUM NUMBER OF ACCESSIBLE CAR SPACES AT SAFETY REST AREAS

NUMBER OF SPACES IN SAFETY REST AREA PARKING LOTS	REQUIRED MINIMUM NUMBER OF ACCESSIBLE SPACES
1 TO 25	1
26 TO 50	2
51 TO 75	3
76 TO 100	4
101 TO 150	5
151 TO 200	6

g. At least one accessible parking space must be served by an access aisle at least 2440 mm (96 in) wide and be signed by an appropriate "VAN ACCESSIBLE" sign. Utilization of the universal parking space design criteria can eliminate the requirement for the "VAN ACCESSIBLE" sign. See Section 9.4.B.2.

h. Access aisles should be delineated with white cross-hatch pavement markings to further indicate that these areas should not be obstructed by parked vehicles.

Use 100 mm (4 in) wide stripes spaced 1220 mm (48 in) center to center to delineate the access aisle. Border the entire area with a 100 mm (4 in) wide stripe. Generally position the stripe at a 45° angle to the vehicle stall curb line. Extend stripes the full length and width of the aisle. See Figures 9.2 and 9.3 for details of the accessible parking stall layout.

2. Universal Parking Design Criteria. All accessible car spaces are 3350 mm (132 in) wide with a 1525 mm (60 in) access aisle so that the stall measures 4875 mm (192 in) wide. See Figure 9.4.

The 4875 mm (192 in) stall permits vehicles to park to one side or the other within the 3350 mm (132 in) dimension to allow persons to exit and enter the vehicle on either the driver or passenger side although the marked access aisle may not be usable.

No additional signage for vans is needed since all spaces can accommodate a van with a side-mounted lift or ramp. The 4875 mm (192 in) stall eliminates competition between cars and vans for space since all stalls can accommodate either vehicle.

3. Truck Parking (Buses, RV's, Car-Trailers).

a. Truck parking stalls should be designed for pull-through operation at either a 30°, 45° or 60° angle to the traffic lane.

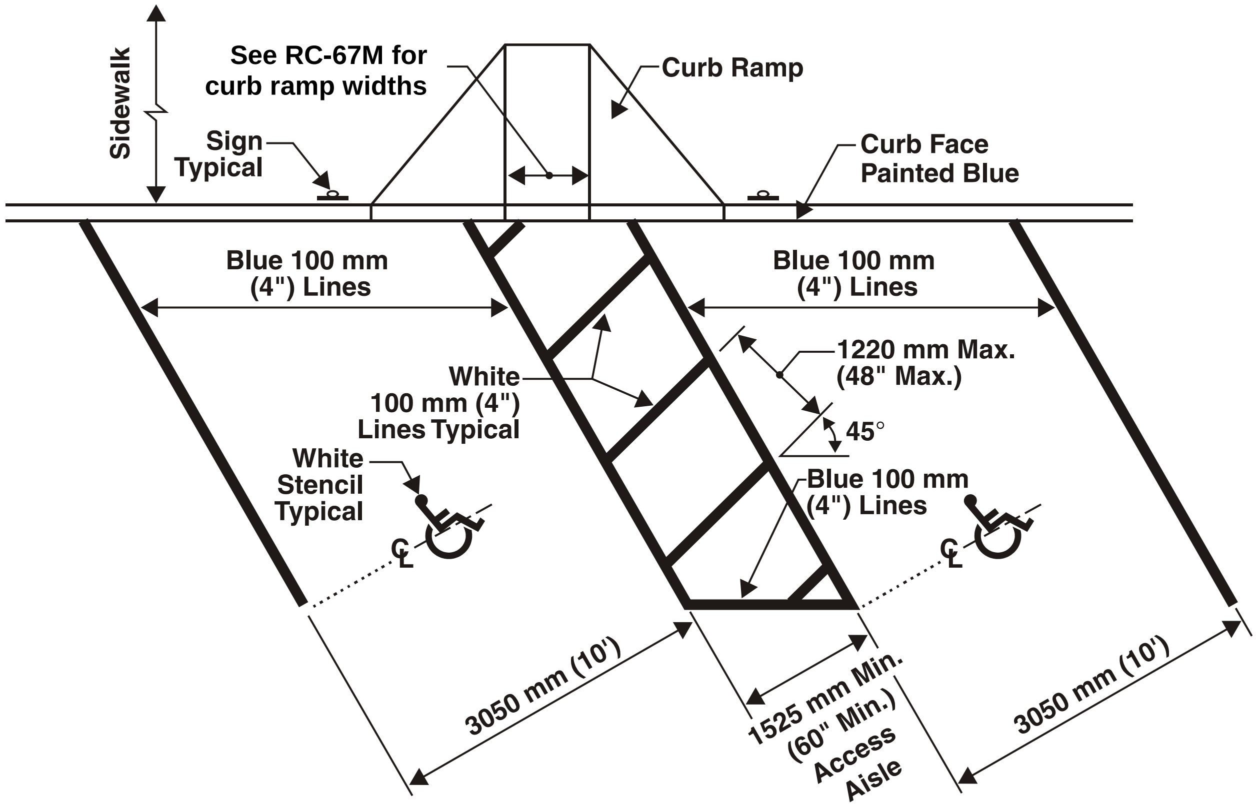
b. Stalls at a 30° angle are generally more satisfactory in relation to pull-through vehicle movements. However, they also require a longer overall length of parking area.

c. In certain situations, parallel park stalls designed for RV or car-trailer type vehicles which would allow a right-side curb discharge for occupants of the vehicle should be considered in order to increase the capacity of the parking area and safety of the vehicle occupants.

d. Parking stall dimensions should be designed to accommodate the WB-20 (WB-67) truck Interstate semi-trailer units.

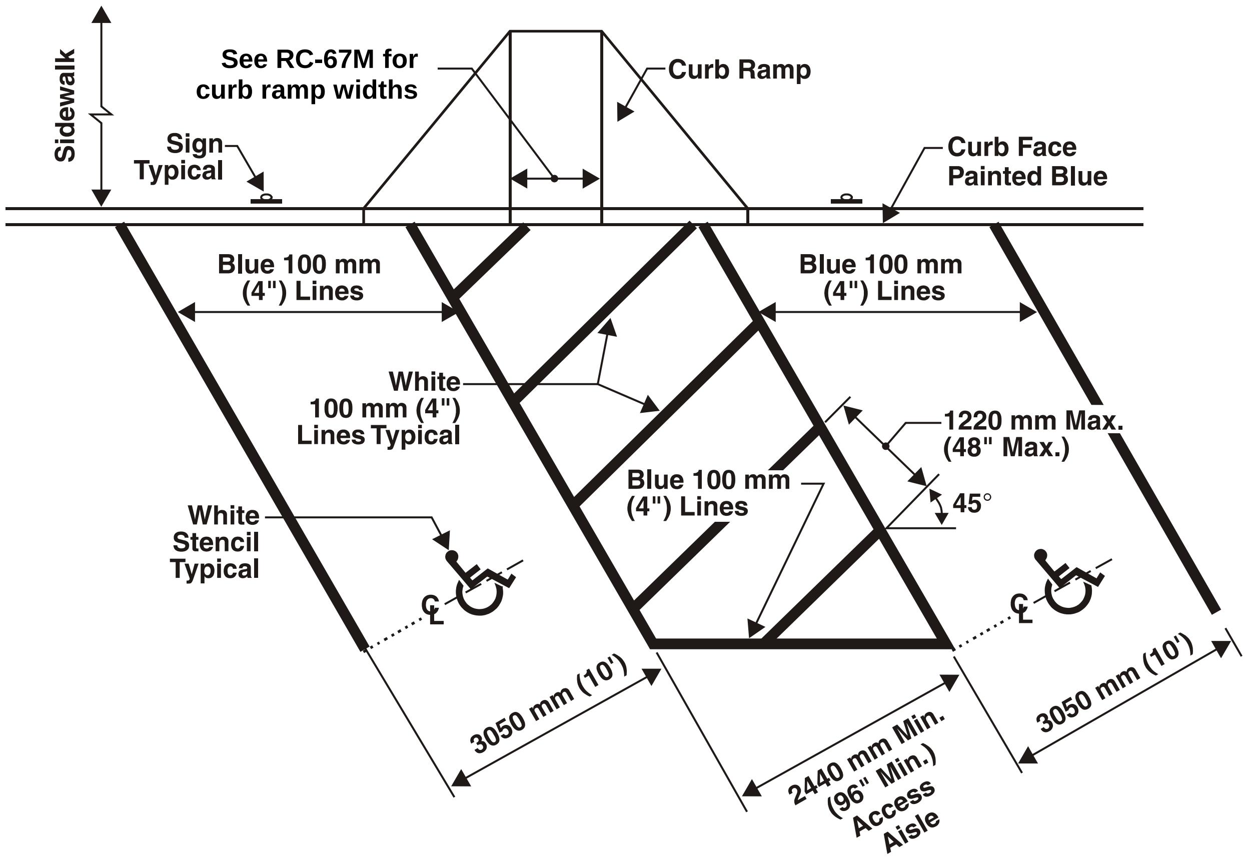
e. An accessible route must be provided from the truck parking lot to the building.

f. Refer to Figure 9.5 for recommended parking dimension information.



Note: Accessible parking signs shall be mounted 2.4 m (8 ft) above grade and setback sufficient to avoid car bumper overhang and pedestrian traffic.

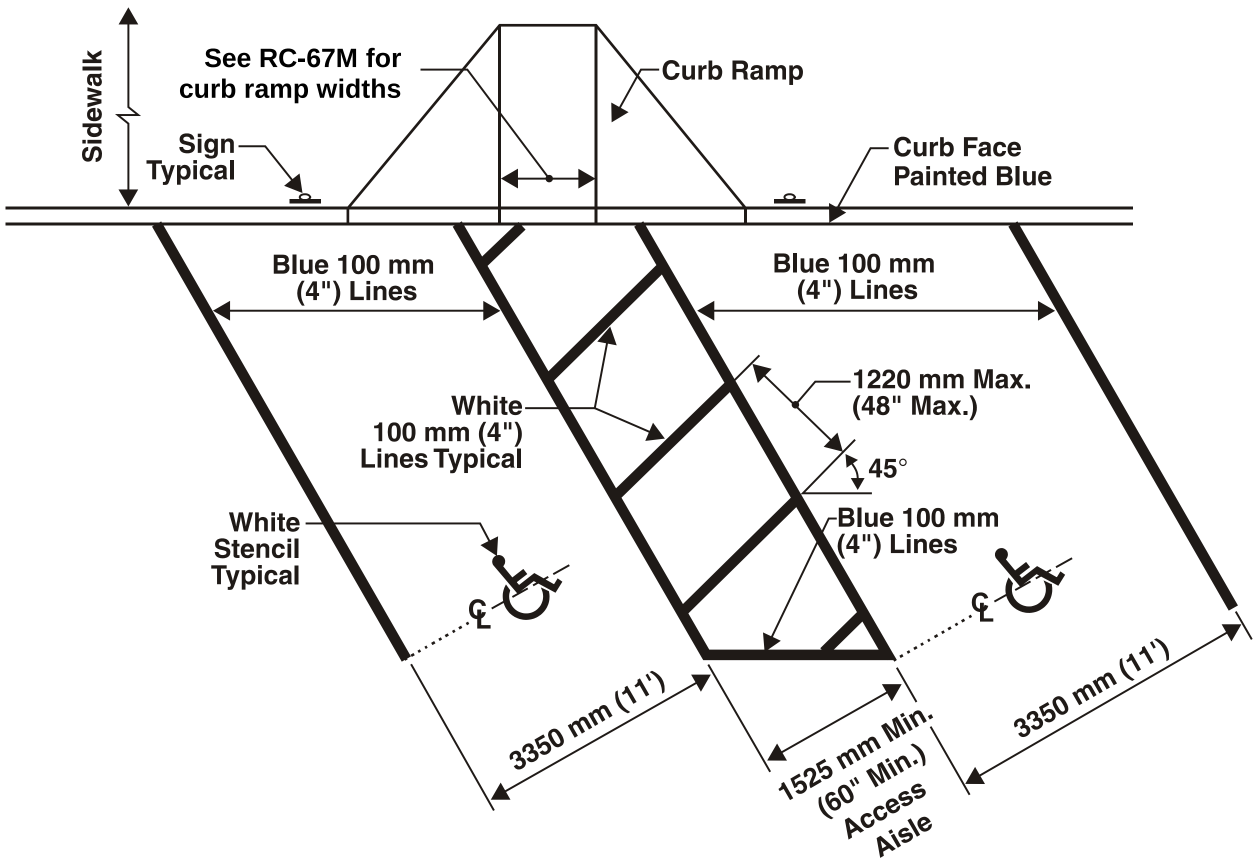
FIGURE 9.2
Standard Accessible Parking Stalls



Note: Accessible parking signs shall be mounted 2.4 m (8 ft) above grade and setback sufficient to avoid car bumper overhang and pedestrian traffic.

FIGURE 9.3

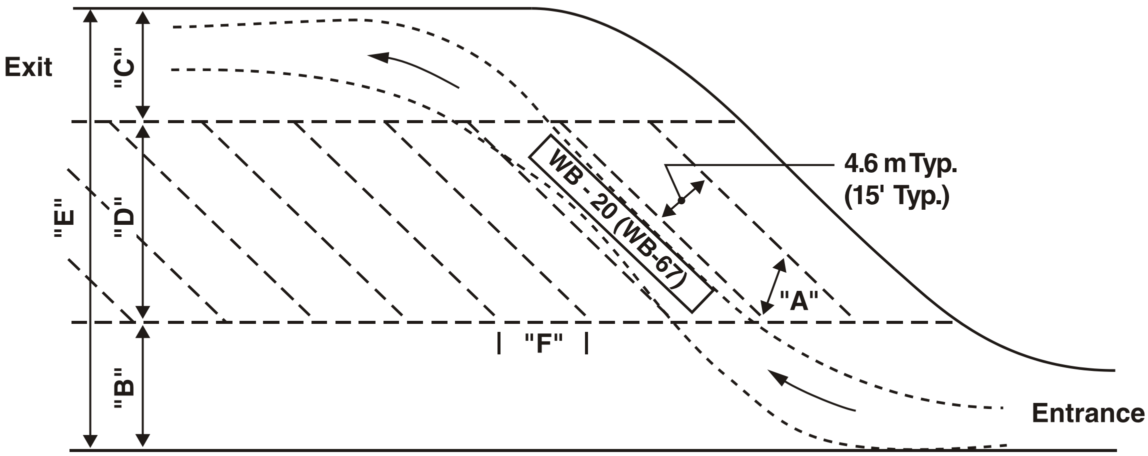
Van Accessible Parking Stalls



Note: Accessible parking signs shall be mounted 2.4 m (8 ft) above grade and setback sufficient to avoid car bumper overhang and pedestrian traffic.

FIGURE 9.4

Universal Accessible Parking Stalls



METRIC (WB-20)					
ANGLE OF PARKING (DEGREES) "A"	ENTRANCE ROADWAY WIDTH (m) "B"	EXIT ROADWAY WIDTH (m) "C"	PARKING WIDTH (m) "D"	TOTAL WIDTH PARKING AREA (m) "E"	STALL ENTRANCE WIDTH (m) "F"
30*	6.7	6.7	14.0	27.4	9.20
45	9.1	9.1	18.3	36.5	6.51
60	12.2	10.7	21.3	44.2	5.31

ENGLISH (WB-67)					
ANGLE OF PARKING (DEGREES) "A"	ENTRANCE ROADWAY WIDTH (ft) "B"	EXIT ROADWAY WIDTH (ft) "C"	PARKING WIDTH (ft) "D"	TOTAL WIDTH PARKING AREA (ft) "E"	STALL ENTRANCE WIDTH (ft) "F"
30*	22	22	46	90	30
45	30	30	60	120	21.2
60	40	35	70	145	17.3

*Note: The "D" parking width dimension will allow a truck vehicle length of 23.7 m (78 ft) if parked in center of stall.

FIGURE 9.5
DIMENSIONS FOR TRUCK PARKING SPACES
(DESIGN VEHICLE WB-20 (WB-67))

9.5 WASTEWATER FLOW CALCULATION

Determine the average daily flow of wastewater from the Safety Rest Area facility by using the following calculations and procedures:

Assume: ADT = Average Daily Traffic (20-year projection or other design year as directed).

D = Directional Distribution (assume 0.60).

N = Percentage of vehicles stopping at Safety Rest Area (assume 9% or 0.09).

V = The number of vehicles stopping per day at the Safety Rest Area.

= ADT × D × N.

U = Vehicle Occupancy (3.0 to 3.5 persons per vehicle, assume average of 3.25).

S = Percentage of persons stopping at Safety Rest Area using the toilet facilities (assume 75% or 0.75).

P = The number of restroom facility users per day.

= V × U × S.

Design Parameters:

1. 60% male users.

2. 40% female users.

3. 67% of males use the urinals (40% of total usage).

4. 60% watercloset (toilet) usage.

5. Assume 2.3 L (0.6 gal) of grey water per user. (This figure includes all other water usage in the building excluding toilet and urinal usage).

6. Low-flow water saving fixture usage.
Urinal - 3.8 L (1.0 gal) per flush.
Toilet - 6.0 L (1.6 gal) per flush.

7. Diurnal Flow Distributions:
8:00 AM - 12:00 Noon = 30% of total daily flow
12:00 Noon - 4:00 PM = 30% of total daily flow
4:00 PM - 8:00 AM = 40% of total daily flow

8. Peak Hourly Flow (PHQ) Percentage of the average daily flow (Q) ranges between 13.5% and 16%. (Assume average of 15% or 0.15)
Q (Average Daily Wastewater Flow) = P × CF (Composite Flow Per User)

Determine the composite wastewater flow (liters (gallons)) per user (CF) based on the proposed fixture water usage as indicated in the following example:

METRIC	ENGLISH
0.6 toilet usage × 6.0 L/flush = 3.6 L	0.6 toilet usage × 1.6 gal/flush = 1.0 gal
0.4 urinal usage × 3.8 L/flush = 1.5 L	0.4 urinal usage × 1.0 gal/flush = 0.4 gal
Grey water usage = 2.3 L	Grey water usage = 0.6 gal
CF = 7.4 L/user	CF = 2.0 gal/user

Calculation Example: Design Year ADT = 21 688	
METRIC	**ENGLISH**
V = ADT × D × N V = 21 688 × 0.6 × 0.09 V = 1171 (vehicles per day stopping at Safety Rest Area) P = V × U × S P = 1171 × 3.25 × 0.75 P = 2854 (users per day) Q = P × CF Q = 2854 users/day × 7.4 L/user Q = 21 119.6 L/day CALL 21 000 L/day (Average Daily Flow) PHQ = Q × 0.15 PHQ = 21 000 × 0.15 PHQ = 3150 L	V = ADT × D × N V = 21,688 × 0.6 × 0.09 V = 1171 (vehicles per day stopping at Safety Rest Area) P = V × U × S P = 1171 × 3.25 × 0.75 P = 2854 (users per day) Q = P × CF Q = 2854 users/day × 2.0 gal/user Q = 5708 gal/day CALL 5700 gal/day (Average Daily Flow) PHQ = Q × 0.15 PHQ = 5700 × 0.15 PHQ = 855 gal

Diurnal Flow Distribution:

	METRIC	ENGLISH
8:00 AM - 12:00 Noon	0.3 × 21 000 = 6300 L	0.3 × 5700 = 1710 gal
12:00 Noon - 4:00 PM	0.3 × 21 000 = 6300 L	0.3 × 5700 = 1710 gal
4:00 PM - 8:00 AM	0.4 × 21 000 = 8400 L	0.4 × 5700 = 2280 gal

9.6 WATER SUPPLY DEMAND CALCULATION

The method for determining the peak instantaneous demand must be based on weighting fixtures in accordance with their water supply load producing effects on the water distribution system as follows:

1. Determine the total number of toilets, urinals and sinks in the Safety Rest Area building.

2. Assign a demand weight to each fixture in terms of Fixture Units (FU) (Refer to Table 9.2) and compute the cumulative Fixture Unit value.

3. Convert the total Fixture Unit value to equivalent liters per second (gallons per minute) peak instantaneous demand. (Refer to Table 9.3)

Calculation Example:

Refer to Section 9.7.A, Safety Rest Area Building Criteria and Tables 9.2 and 9.3.

Determination of Fixture Units:

17 water closets (toilets) × 10 FU	= 170
6 urinals × 5 FU	= 30
17 lavatories (sinks) × 2 FU	= 34
Total Fixture Units	= 234

234 Fixture Units equates to 6.2 L/s (98 gal/min) peak instantaneous demand. (Table 9.3)

TABLE 9.2
DEMAND WEIGHT OF FIXTURES IN FIXTURE UNITS

FIXTURE	OCCUPANCY	TYPE OF SUPPLY CONTROL	LOAD (FIXTURE UNITS)
Water Closet	Public	Flush Valve	10
Water Closet	Private	Flush Valve	6
Urinal	Public	Flush Valve	5
Lavatory	Public	Faucet	2
Lavatory	Private	Faucet	1
Kitchen Sink	Private	Faucet	2
Service or Mop Basin Sink	Office, etc.	Faucet	4

TABLE 9.3
CONVERSION OF FIXTURE UNITS TO EQUIVALENT L/s (gal/min)

DEMAND (LOAD) FIXTURE UNITS	DEMAND (LOAD), L/s SYSTEM WITH FLUSH VALVES (METRIC)	DEMAND (LOAD), gal/min, SYSTEM WITH FLUSH VALVES (ENGLISH)
6	–	–
8	–	–
10	1.7	27
12	1.8	29
14	1.9	30
16	2.0	32
18	2.1	33
20	2.2	35
25	2.4	38
30	2.6	41
35	2.8	44
40	3.0	47
45	3.1	49
50	3.3	52
60	3.5	55
70	3.7	59
80	3.9	62
90	4.1	65
100	4.3	68
120	4.6	73
140	4.9	78
160	5.2	83
180	5.5	87
200	5.8	92
225	6.1	97
250	6.4	101
275	6.7	106
300	6.9	110
400	7.9	126
500	9.0	142

9.7 SAFETY REST AREA AND WELCOME CENTER BUILDINGS

A. Safety Rest Area Building. The current standard Safety Rest Area building design includes 23 rest room fixtures comprised as follows:

Men's Rest Room - 6 water closets (toilets)
6 urinals
8 lavatories (sinks)

Women's Rest Room- 10 water closets
8 lavatories

Family Assisted Rest Room - 1 water closet
1 lavatory

B. Welcome Center Building. A standard Welcome Center building design does not exist. Each building design and its component number of rest room fixtures will be determined for each site location.

9.8 WEIGH-IN-MOTION SCALE SYSTEM

The truck weigh-in-motion (WIM) scale system comprised of stationary weighpads installed in the roadway must be designed to operate in conjunction with the design layout of the truck parking access roadway and parking area when directed.

The access roadway is an essential part of the WIM system and therefore should be as flat and uniform as possible for approximately 60 m (200 ft) ahead of and 15 m (50 ft) beyond the weighpad location. The roadway gradient should not exceed 3% and the transverse slope of the pavement should not exceed 1%.

The WIM scales should be located within a tangent section of the access roadway and outside of the superelevation of the roadway, if possible.

The design layout relationship of the truck parking area to the access roadway should promote a reasonable view of the side of each truck as it passes over the sorting scale from the first truck parking space where the mobile weigh command center van will park.

The WIM scale location must be set no closer than 90 m (300 ft) from the location of the system control enclosure. The control enclosure pedestal support must be located from 1.5 m to 4.5 m (5 ft to 15 ft) behind the curb line of the first truck parking stall.

9.9 PLANTING DESIGN GUIDELINES FOR WELCOME CENTERS AND SAFETY REST AREAS

The following guidelines should be used when considering landscape planting design for Welcome Centers and Safety Rest Areas.

- Consider trees that will provide good shading opportunities at table pad areas. Place trees on the appropriate side of the pad to give shade throughout the afternoon if possible.

- Avoid 'dirty' trees that have the potential to drop excessive branches, fruit, and large leaves in use and pavement areas such as: Sugar and Norway Maple, American Redbud, White and Green Ash, some crabapples, etc.

- Use colorful spring flowered and fall foliage species.

- Avoid disease prone varieties of Crabapple and other flowering trees. Avoid pest problem trees such as Littleleaf Linden (Japanese Beetle). Avoid thorny type trees and shrubs.

- Use native species to the best extent possible but do not be strictly limited to native species. Use the best plant necessary for the planting situation.

- Avoid planting too close to buildings and other structures such as light poles and signs. Allow for normal plant growth development and light to reach all sides of the plant. Remember, plants are constantly changing in size as they mature and can quickly overgrow a particular planting site. Trees planted too close together will grow into or over any nearby plants.

- Avoid planting vegetation over underground utility service runs and drainage pipes. Avoid planting in the center of drainage swales.

- Avoid planting shrubs too close to the edge of sidewalks where the shrub's potential spread will grow out over the sidewalk and require pruning to keep it from interfering with pedestrian movement.

- Trees located along sidewalks should not be placed where their lower limbs will interfere with pedestrian movement. Larger growing trees such as Sycamore and Maple with large growing surface roots should not be placed where the roots can damage sidewalks.

- Avoid placing plants that can be damaged by salt in areas where winter maintenance activities will harm the plants either by spray or by plowed snow. Snow pushed or dumped on top of the plants will physically damage them.

- Avoid using planting arrangements that could promote unsafe conditions by creating areas where people can easily hide.

- Avoid excessive use of ground cover type plants such as ivy, myrtle, pachysandra, etc. since they are hard to maintain (weed) and require large numbers of plants to "fill" in an area. Ivy will eventually climb over other landscape features.

- Use varying planting sizes of trees and shrubs. Use deciduous trees up to 90 mm (3.5 in) caliper. However, cost considerations may limit the size to smaller caliper trees. More trees can be provided at 50 mm (2 in) cal. than for 90 mm (3.5 in) caliper. Limit planting size of evergreen trees to 1.8 m (6 ft) or less in height. Limit planting size of shrubs to 1.2 m (4 ft) or less in height. Larger plants do not survive transplant shock, as well as smaller plants, since a large amount of the feeder roots are lost in digging the plant.

- Small earth mounds can be used to help limit views to certain areas and to provide special planting sites. Limit the steepness of the mound slope to a 1V:4H ratio. Large rocks and boulders can also be placed among shrub plantings to create visual diversity. Landscape timbers or interlocking blocks can be useful to create shrub bed edges or planting walls.

- Planting for naturalized areas with daylilies and spring bulbs can be effective in creating colorful planting sites that do not have to be mowed.

- If trees are to be braced, use a 1 or 2 stake method (see Publication 72M, *Roadway Construction Standards*, Drawing RC-91M) that will not interfere with mowing operations.

- Layout trees and shrubs in free flowing or "natural" arrangements in order to avoid straight-line plantings.

BLANK PAGE