CONTENTS

GENERAL INFORMATION

1.1 CONCEPT

This chapter provides general criteria and guidelines for off street parking lots. The majority of jurisdictions have their own parking lot ordinances and criteria. However, when variances are requested or when certain elements are not in current ordinances these guidelines will provide the parameters. Also, the guidelines may be used as standards for those jurisdictions that do not have ordinances covering parking lots.

In formulating the guidelines, a wide variety of factors were considered including zoning and parking lot layout. A parking lot is not usually expected to serve the broad spectrum of traffic, except for occasional use, that streets and highways must serve. Therefore, it is important to determine the type of traffic the lot will be expected to serve.

The principal considerations when designing off street surfaced parking lots are type of traffic, Jurisdictional setback requirements, handicapped requirements, and storm water runoff requirements.

1.2 CONDITIONS

1. The design of parking lots should be in conformance with the following:

   A. AASHTO's policy on Geometric Design of Highways and Streets.
   B. Americans with Disabilities Act/State and Federal Handicapped Standards.
   C. Conflict – In case of a conflict between the above design standards, the Jurisdictional Engineer should be contacted for clarification.

2. Construction Standards shall be the most recent revision of The Urban Standard Specifications for Public Improvements.

3. Project submittals – All projects are to be submitted to the Jurisdictional Engineer for review, comment and approval.

1.3 GENERAL CRITERIA

General planning is an important detail. It should be considered when laying out a parking lot. The following is a list to be considered when designing parking lots:

1. Maximum convenient parking capacity to insure the best use of available space:

   - Use rectangular areas when possible.
   - Make the long side of the parking area parallel to the main access road.
   - Design traffic lanes to serve two rows of parking stalls where possible.
   - Align the perimeter of the area with parking stalls where possible.

1.3 GENERAL CRITERIA (Continued)

2. Develop alternate geometric layouts.

3. A surface water drainage plan is important and must be designed to include a slope of .6% minimum with a preferred minimum of 2% on paved surfaces. Parking lots are normally designed so some of the water is collected internally and is conveyed away through underground systems. Where rainfall runoff from large impervious surfaces must be regulated, parking lots are often called on to serve as detention basins. This means that the pavement must store water for a period of time without incurring any damage due to loss of support from a saturated subgrade.

4. Besides interior drainage inlets and under ground drainage systems parking lots must often accommodate other appurtenances such as:

   A. Traffic islands and pedestrian ways
   B. Lighting
   C. Landscape areas, fencing, and screenings
   D. Vehicle and trash storage, loading docks, and concentration of fuels and lubricants
   E. Underground utilities

   Provisions for the appurtenances should be considered in the planning and design of the jointing system and layout for construction. Construction staging is also important. For example, underground utilities should be constructed in early stages and compacted properly to prevent future settlement of paved surfaces.

5. Traffic flow into and out of the parking area as well as within must be studied carefully to allow vehicles (both large and small) to move easily and with maximum safety and efficiency. Refer to Chapter 5, Section 5 - Access Criteria.

6. Pedestrian movement in parked vehicle areas must be planned to provide the highest degree of safety and convenience. Refer to the Americans with Disabilities Act/State and Federal Handicap Standards.

7. Where facilities are planned to serve light vehicles and heavier delivery trucks, controls or special lanes are usually imposed to separate and channelize the heavier trucks away from areas designed for automobiles and light trucks. Facilities designed for heavier vehicles are very likely to be those facilities where relatively accurate predictions of vehicle sizes and numbers are possible. Those facilities intended to serve only light vehicles may have slabs whose thickness is influenced more by the practical limitations of the material and the effects of the environment than by the stresses imposed by the vehicles. Refer to the specific Jurisdiction where development is occurring for minimum pavement thickness requirements. If a Jurisdiction has not set forth requirements then refer to Section 4 of this Chapter for pavement thickness requirements.

1.3 GENERAL CRITERIA (Continued)

8. Community and customer relations are enhanced by attractive landscaping that includes proper plantings and fencings in screening areas such as trash storage and loading docks. Refer to Jurisdiction where development is occurring for the specific landscaping and screening requirements. If a Jurisdiction has not set forth requirements then refer to Section 5.1 of this Chapter for landscaping and screening requirements.

9. Adjacent parking lots, accessways or connections between lots must be considered in the design. Many times in commercial areas support between commercial business are ignored until after the business is operational. This leads to exiting from one parking lot to the adjacent street and then entering immediately onto the next parking area. This causes traffic operational problems and may be avoided when planned early. The design of a parking lot should take into account the internal circulation within the lot. Care should be taken to incorporate a scheme where traffic movement within the lot will be the least impeded and not affect the traffic on the public street.

10. The future expansion of a parking lot and the facility it serves should also be considered in the initial design insofar as additions may affect changes in the traffic pattern and may place heavy vehicles on pavement that was initially intended only for light vehicles. Industries and shopping centers served by public transportation and schools served by buses are examples of places where expansion may transform auto parking areas into truck or bus driveways.

11. The parking angle for rows of stalls is important. The three most commonly used angles follow:

    - 45 degree angle - Where lot size restricts the dimensions available for aisles and stalls a 45 degree angle may be warranted. Since a small change of direction is required from the traffic lane to the stall, the aisle can be reduced in width. However, this results in loss of some of the stalls.
    - 60 degree angle - This stall angle is used most often due to ease of entering and backing out and the fact that the traffic lane can be a reasonable width with reasonable install efficiency.
    - 90 degree angle - The main reason to use this integral is to achieve the highest stall capacity in a parking lot. In most in and out lots, the disadvantage such as difficulty of entering the stalls may outweigh the advantage of the high stall capacity.

1.3 GENERAL CRITERIA (Continued)

12. For general planning areas use approximately 350 square feet per car. This includes total space requirements for lanes, turns and stalls in the preliminary space requirement calculations. Individual standard stalls are typically 9'x18' as the desirable minimum depending on owner's requirements and whether the facility is attended parked. Stall widths where shoppers have large packages, such as supermarkets, should be 9.5' or even 10' wide. Smaller stall widths (grouped together) may be allowed by Jurisdictions for preferred attendant parking lots. Also special sections may be marked off for compact cars (8'x16') if allowed by ordinances. General two-way traffic lanes should be a minimum width of 24 feet (two 12' lanes).

13. Entrances and exits require special attention and are usually closely controlled.

- Separate entrance and exit driveways should be used when opening width is less than 24 feet (two 12' lanes).
- The entering vehicles should be figured in planning the location of entrances and exits in order to align these vehicles easily with interior traffic lanes. Refer to Chapter 5 for driveway separation and location requirements.
- The number of driveways and areas within each lot requires careful study to meet the needs of the owner and legal requirements of the Jurisdiction. Refer to Chapter 5 for required number of driveways and the location of such within a parking lot.

14. Proper lighting of the parking area is important from the vehicle and pedestrian, safety and community relations standpoint. Some details to consider are:

- Plan the initial lighting installation so that it can be easily expanded or increased at some later time.
- When lighting is required within the interior of the parking lot, installing light poles on a 30" high structural base for poles located on the pavement surface should be considered where safety concerns are an issue.
- Design lighting in accordance with Chapter 11, Section 2 - Roadway Lighting Design. Refer to Table 2.1 for the recommended illuminance values and uniformity ratios for parking lots.
- Where possible any light poles installed in medians or along the perimeter of the parking lot should be offset a minimum of three (3) feet from the edge of pavement or back of curb and may not require bases.

15. Paint striping, markings and signage are important parts of parking lots and include:

- Lines or stripes, words, numbers and symbols.
- Words noting "In" and "Out" and "Stop" may be included.
- Numbers in the stall may be included.
- Symbols to direct traffic flow.

1.3 GENERAL CRITERIA (Continued)

16. Curb bumpers and stops are widely used as boundary barriers. Interior bumpers and stops may be a problem due to maintenance with street sweeping and/or snow removal and must be evaluated on their use. The use of steel poles, such as bollards set in concrete is discouraged, but may be used for utility and other structure protection per Jurisdictional Engineer approval.

17. Subgrade must be a uniform select material compacted to a consistent density. If not available a granular subbase is to be considered. Reference Section 4.2 for subgrade design requirements.

SITE PROVISIONS

2.1 GENERAL PROVISIONS

1. The following are considered as guidelines and where a Jurisdiction does not have an ordinance covering a certain item the designer can follow these as a guide. The Jurisdiction also recognizes that due to additional needs of certain developments their ordinance may result in inadequate parking spaces or parking spaces in excess of its needs. The former situation may lead to traffic congestion or parking violations on adjacent streets as well as unauthorized parking on nearby private lots. Therefore, the Jurisdiction may permit deviations from the requirements and allow more parking or less parking whenever such deviations are likely to satisfy the standard.

2. Unknown uses for new buildings are proposed when the owner or developer does not wish to designate the type of use that will occupy the building. The most intensive use possible should determine the parking requirements.

3. In determining the parking requirements of a business, the designer needs to look at the maximum employment period in which the greatest number of employees are present at the business. If a building contains two or more uses, the parking requirements may be determined by the addition of the parking requirements for each use.

2.2 RESIDENTIAL

Parking should be provided for single family dwellings, two family dwellings, and multiple dwellings. All developments should provide a sufficient number of off street parking spaces to accommodate the number of vehicles that ordinarily are likely to be attracted to the development. The parking spaces may be designed in accordance with this manual subject to the Jurisdiction's approval. The designer should refer to the individual Jurisdiction's Zoning Ordinance for the number of required parking spaces per type of dwelling unit.

2.3 COMMERCIAL/OFFICE

Off street parking should be provided for commercial uses which include sale and rental of goods, merchandise and equipment. Parking lot requirements for those uses are determined by space per square feet of gross floor area.

Off street parking requirements for office, clerical, research and service uses not primarily related to goods or merchandise, are determined by space per square feet of gross floor area.

Off street parking requirements for educational, cultural, religious philanthropic, social and fraternal uses, are determined by space per classroom or space per gross floor area plus additional spaces for employees. In some cases, spaces for safe and convenient loading and unloading must be considered.

2.3 COMMERCIAL/OFFICE (Continued)

Off street parking requirements for recreation, amusement, and entertainment facilities are determined by the number of persons the facility was designed to accommodate, the number of seats within the facility, or spaces per square feet of gross floor area of the facility.

Off street parking requirements for institutional residence for care of confinement facilities are determined by the number of beds within the facility or the gross floor area of the facility.

The designer should refer to the individual Jurisdiction's Zoning Ordinance for the specific number of required parking spaces for the commercial/office uses.

2.4 INDUSTRIAL

Off street parking requirements for industrial uses include warehouses and manufacturing process in creating, repairing, renovating, painting, cleaning goods and equipment. Parking requirements for industrial uses are usually broken down if walk-in-trade is allowed or not. Parking requirements for walk-in-trade facilities are typically determined by space per square feet of gross floor area. Parking requirements for non-walk-in-trade facilities are typically determined using one space per employee on maximum shift. The designer should contact the Jurisdiction in regards to the specific number of required parking spaces for the industrial use.

2.5 PUBLIC

Off street parking requirements for public uses include government facilities such as city halls, fire stations, courthouses, public works buildings and maintenance facilities. The parking requirements are typically based on number of employees per maximum shift plus the number of public vehicles parked at facility.

The designer should contact Jurisdiction for specific ordinances for required spaces per public uses.

2.6 LOADING REQUIREMENTS

If the Jurisdiction does not have an ordinance on a specific requirements of a use the following parking requirements can be used as a guide.

Parking Lot Stall Requirements

Land Use	**Spaces/Unit**
Residential	
Single-Family	2.0/Dwelling
*Multifamily	
Two-family dwelling	1.0/Dwelling Unit
Row dwellings	1.0/Dwelling Unit
Multiple dwellings	1.5/Dwelling Unit
Hospital	0.2/Bed plus 0.5/Employee plus 0.5/Doctor
Auditorium/Theater/Stadium	0.3/Seat
Restaurant/Taverns/Night Clubs	1.0/150 GFA
Industrial	
Manufacturing Plants	0.5/Employee on maximum work shift plus 1/400 SF office space
Mini-warehouse	0.1/Storage spaces plus 1/caretaker plus 5 for customers
Church	0.3/Seat
Retail Stores, Shops, Super Markets	
0-4,000 SF (without gas)	1/400 GFA
0-4,000 SF (with gas)	1/300 GFA
4,001 - 200,000 SF	1/200 GFA plus specified use requirements other than retail
over 200,000 SF	1/200 GFA
Office	3.3/1000 GFA
Hotels/Motel	1.0/Room plus 0.5/Employee
Elementary & Intermediate School	0.5/Employee plus 10 spaces for visitors
High School	0.5/Employee plus 0.1/student
Business, Trade & College/University	0.5/employee plus 0.2/student

GFA, sq. ft. of gross floor area
GLA, sq. ft. of gross leasable area
SF, sq.ft.

* Designer may desire to add additional spaces for visitor/guest parking such as 1 space per four units.

2.7 PARKING LOT SETBACK REQUIREMENTS

The designer shall refer to the individual Jurisdiction's Zoning Ordinance for parking lot setback requirements. If no such ordinance exists then refer to the following general setback requirements.

	Setback	Notes
Residential Parking Lot Location	(ft)	
In all Residential Districts (from street ROW)	10	2, 3, 4
Along alley line across from a Residential District	5	1, 2, 3
Along adjacent a Residential District property lines	10	2, 3
Along adjoining a Residential District parking lots	5	2, 3
Along adjacent Commercial or Industrial District property lines	0	2, 3

Notes:
(1) No setback required when use is a single family, a duplex or when the use is across from a parking lot.
(2) Setback area should consist of a permeable material and should be landscaped.
(3) No vehicle shall encroach into a required setback.
(4) Parking on driveways parallel to a public sidewalk for single family residences shall maintain a minimum setback of 10 feet from the Public Street Right of Way.

	Setback	Notes
Commercial/Industrial Parking Lot Location	(ft)	
Along alley lines bordering a Residential District	5	1, 2, 3
Commercial or Industrial District abuts a Residential District	10	2, 3
Commercial or Industrial District abuts a Residential District parking lot	5	2, 3
Adjacent to a Commercial or Industrial District property line	0	2, 3
Office and Commercial Districts	15	2, 3, 4
Light Industrial and General Industrial Districts	10	2, 3, 4
Business Park and Professional Commerce Park Districts	20	2, 3, 4

NOTES:
(1) No setback required along that portion of an alley across from a residential parking lot.
(2) Setback area shall consist of a permeable material and shall be landscaped.
(3) No vehicle shall encroach into a required setback.
(4) Setback from Public Street Right of Way.

LAYOUT DESIGN CRITERIA

3.1 ACCESS/ MANEUVERING/CIRCULATION

Off street parking lots should be designed to accommodate traffic volumes and pedestrian circulation based on the land use served. The use of islands, medians and curbing is encouraged to eliminate parking spaces from traffic and pedestrian circulation areas. Handicap stalls shall be provided as required by the Code of Iowa. Spaces at parking lot access points shall be terminated except at one and two family dwelling units. All off street parking areas shall provide a curb or wheel barrier around its entire perimeter unless a walkway or border is provided. When adjacent to required setback and adjoining property lines, wheel barriers or curbs shall be located two feet from the edge of setback areas or property lines.

3.2 STANDARD SPACE DIMENSIONS

1. The standard-size parking stall should be at least nine (9) feet wide and eighteen (18) feet long. Refer to figures in Section 3.3.

STANDARD-SIZE CAR REQUIREMENTS STANDARD AASHTO

Degree of Angle	Stall Width A	Curb Length B	Stall Depth C	Stall Length D	Aisle Width 1-Way/2-Way E	Island Width F
0	8.5'	23'	--	--	13'/24'	--
45	9'	12.7'	19.8'	19'	13'/13'	33.2'
60	9'	10.4'	21'	19'	18'/18'	37.4'
90	9'	9'	18'	18'	24'/24'	36'

2. If parking stalls for compact cars are allowed the stall dimensions should be at least seven (7) feet six (6) inches wide and sixteen (16) feet long. Refer to figures in Section 3.3.

STANDARD COMPACT CAR REQUIREMENTS

Degree of Angle	Stall Width A	Curb Length B	Stall Depth C	Stall Length D	Aisle Width 1-Way/2-Way E	Island Width F
0	7.5'	16'	--	--	13'/24'	--
45	8'	11.3'	17'	16'	13'/13'	28.3'
60	8'	9.2'	17.8'	16'	18'/18'	31.7'
90	8'	8'	16'	16'	24'/24'	32'

3.3 TYPICAL GEOMETRIC DRAWINGS

Enclosed are typical drawings that illustrate accepted practices in the geometric design of the lanes and stalls of a parking lot as presented in this section.

FIGURE 3.1 - STRAIGHT-IN (90°) PARKING

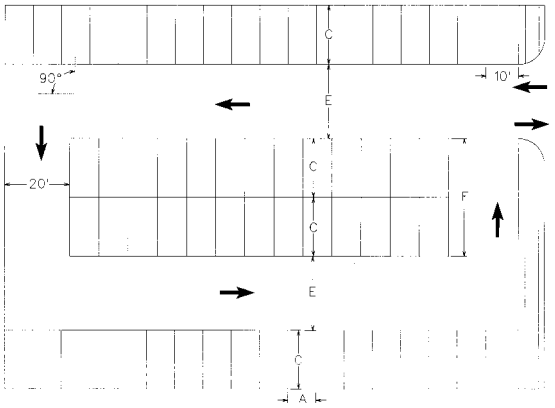


FIGURE 3.2 - ANGLE (45° AND 60°) PARKING

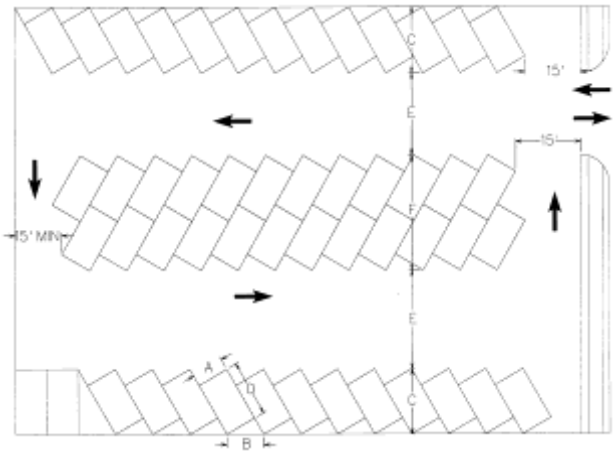
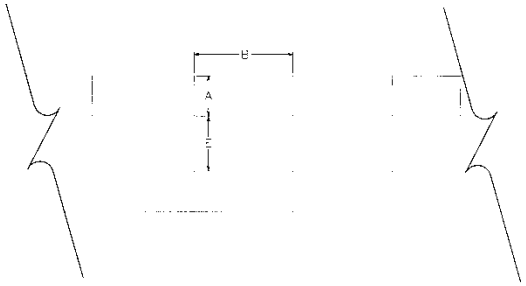


FIGURE 3.3 PARALLEL (0°) PARKING



SURFACE DESIGN

4.1 GENERAL

Any off street parking areas included in any parking lots for more than four vehicles shall be surfaced with a flexible or rigid pavement. For off street parking of 4 stalls or less a dust free surface must be provided. Parking lots should be graded and drained as to dispose of all surface water cumulated within the area and should be arranged and marked as to provide for orderly and safe loading or unloading and parking and storage of self propelled vehicles.

4.2 SUBGRADE DESIGN

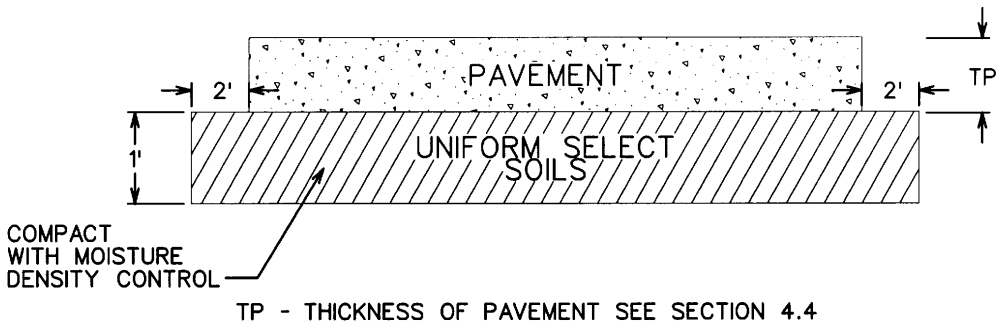
1. Subgrade preparation should be in accordance with the most recent version of the Urban Standard Specifications for Public Improvements.

2. Refer to Geotechnical Report for engineering analysis and recommendations (Chapter 6 - Section 3) for the design of the subgrade.

3. Grading and compaction of the area should be constructed so as to eliminate yielding or pumping of the soil. The subgrade must be uniform and compacted to 95% Standard Proctor Density with the moisture and density control throughout fill areas and a minimum of one foot deep in cut areas. If uniformity is not possible a granular subbase must be considered. See Figure 4.1 and 4.2

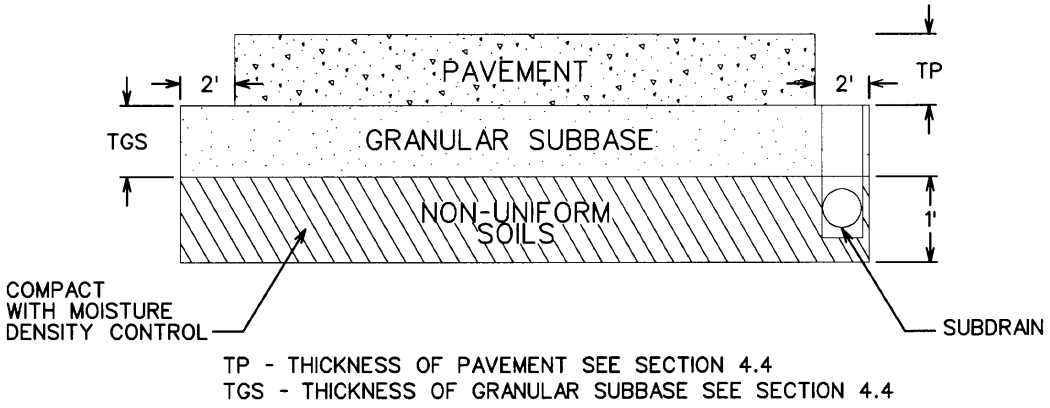
4. All underground utilities should be protected or relocated prior to grading.

FIGURE 4.1 - SUBGRADE WITH UNIFORM SELECT SOILS



4.2 SUBGRADE DESIGN (Continued)

FIGURE 4.2 - SUBGRADE WITHOUT UNIFORM SELECT SOILS



4.3 DRAINAGE CONSIDERATION

1. Off street parking areas should be graded and drained as to dispose of all surface water accumulation within the area. All required off street parking areas shall be so designed that surface water will not drain over any sidewalk or adjacent property. A Storm Water Drainage and Management Plan shall be performed for new off street parking areas. This plan may include detention areas within the parking lot.

2. Off street parking areas should be designed and improved with grades not to exceed a 6% slope. Parking area surfaces should have a minimum slope of 0.6% with a preferred minimum of 2%. Driveways are recommended not to exceed an 8% slope. Driveways shall be graded and drained to dispose of surface water to the street or public designated storm water drainage facilities. Driveways shall be designed and constructed in accordance with the Urban Standard Specifications for Public Improvements.

3. Subbases comprised of granular material should incorporate a subdrain system. The subdrain shall allow adequate drainage from the parking area subbase so as to prevent saturation; thereby, losing strength and stability, making the overlying pavement structure susceptible to breakup under imposed loads. Subdrains shall meet the Urban Standard Specifications for Public Improvements.

4.4 RIGID AND FLEXIBLE PAVEMENT DESIGN

The pavement thickness for parking areas occupied by autos and small trucks for rigid (Portland Cement Concrete Type C) and flexible (Hot Mix Asphalt, Type A aggregate) pavement should be in accordance with the following table. It should be noted that the layer of aggregate used as the subbase, is to be drainable. The design life is considered to be based on a 20 year life. If a design life of greater or less than 20 years is desired the Design Engineer should refer to Chapter 5, Section 4 for pavement thickness determination.

A. Areas Subject to Light Loads

TABLE 4-1. Thickness Chart: Parking Lots with 200 or Less Autos/Day and/or 2 or Less Trucks/Day or Equivalent Axle Loads.

PARKING AREAS ONLY					
Subgrade CBR	Surface Material	Pavement Thickness in inches on 1' of Prepared Uniform Soil Subgrade		Pavement Thickness in inches on 1' of Prepared Soil Subgrade with 4" Granular Subbase	
		Minimum	Desirable	Minimum	Desirable
9	Rigid	5.0	6.0	4.0	5.0
	Flexible*	5.0	6.0	4.0	5.0
6	Rigid	5.0	6.0	4.0	5.0
	Flexible*	5.0	6.0	4.0	5.0
3	Rigid	5.0	6.0	4.0	5.0
	Flexible*	6.0	6.0	5.0	5.0

* In two lifts.

If soils test are not available to determine the CBR value and uniformity of the soil (before and after construction) a CBR value of 3 and a nonuniform subgrade should be assumed.

B. Areas subject to Moderate Loads

Table 4-2. Thickness Chart: Parking Areas, Entrances, Perimeter Travel Lanes, and Frontage Roads Subject to 201 to 700 Autos/Day and/or 3 to 50 Trucks/Day (or Equivalent Axle Loads).

MODERATE LOADS						
Subgrade CBR	Surface Material	Pavement Thickness in inches on 1' of Prepared Uniform Subgrade		Pavement Thickness in inches on 1' of Prepared Soil Subgrade with Granular Subbase		
					Pavement	
		Minimum	Desirable	Granular Subbase	Minimum	Desirable
9	Rigid	5.0	6.0	4	4.0	5.0
	Flexible*	5.0	6.0	6	4.0	5.0
6	Rigid	5.0	6.0	6	4.5	5.0
	Flexible*	6.0	6.0	8	5.0	5.0
3	Rigid	5.5	6.0	6	5.0	5.0
	Flexible*	6.0	7.0	8	6.0	6.0

*In two lifts.

4.4 RIGID AND FLEXIBLE PAVEMENT DESIGN (Continued)

C. Areas Subject to Moderately Heavy Loads

The pavement for entrances, perimeter travel lanes, frontage roads, trash dumpster sites, and delivery truck parking, as well as the approach areas to these spaces, must be increased in thickness to prevent pavement failure caused by weight and dynamic loading. These areas should be constructed with portland cement concrete in a thickness that will support this special type of pavement loading. Failure to provide this strengthening can result in severe pavement failure. The pavement thickness in these areas should be in accordance with the following table:

Table 4-3. Thickness Chart: Heavily Loaded Areas in Parking Lots with 701/Autos/Day to 4,500 Autos/Day and/or 51 to 100 Trucks/Day (or Equivalent Axle Loads).

HEAVY LOADS						
Subgrade CBR	Surface Material	Pavement Thickness in inches on 1' of Prepared Uniform Soil Subgrade		Pavement Thickness in inches on 1' of Prepared Soil Subgrade with Granular Subbase		
				Thickness of Granular Subbase	Pavement	
		Minimum	Desirable		Minimum	Desirable
9	Rigid	5.5	6.0	4	5.5	6.0
	Flexible*	6.0	7.0	6	6.0	6.0
6	Rigid	6.0	7.0	4	5.5	6.5
	Flexible*	7.0	8.0	6	6.0	7.0
3	Rigid	6.5	7.5	6	6.0	7.0
	Flexible*	8.0	9.0	8	7.0	8.5

* In two lifts.

D. Areas Subject to Heavy Loads

Industrial parking lots/truck stops, and those areas designed primarily for trucks, require a thicker pavement than the other locations described in this chapter. The pavement thickness for parking lots with heavy truck parking should be in accordance with the following table: (Note: For those parking lots greater than 200 trucks/day will require pavement determination)

Table 4-4. Thickness Chart: Industrial Parking Lots for Heavy Truck Parking with Greater Than 4,500 Autos/Day and/or 101 to 200 Trucks/Day (or Equivalent Axle Loads).

INDUSTRIAL PARKING LOTS						
Subgrade CBR	Surface Material	Pavement Thickness in inches on 1' of Prepared Uniform Soil Subgrade		Pavement Thickness in inches on 1' of Prepared Soil Subgrade with Granular Subbase		
				Thickness of Granular Subbase	Pavement	
		Minimum	Desirable		Minimum	Desirable
9	Rigid	6.0	7.0	4	6.0	7.0
	Flexible*	8.0	9.0	6	7.0	8.0
6	Rigid	7.0	8.0	4	6.0	7.0
	Flexible*	9.0	10.0	8	8.0	9.0
3	Rigid	8.0	9.0	6	7.0	8.0
	Flexible*	10.0	11.0	8	9.0	10.0

* In two lifts.

4.5 DUST FREE SURFACE (FOUR STALLS OR LESS)

Parking lots having four or less stalls and having a gravel surface should be treated with emulsified asphalt. The treatment, consisting of two applications emulsified asphalt, shall be applied to the gravel surface at a rate of 0.2 gallon per square yard. A period of at least 24 hours with no rain shall separate the two applications. The owner of the lot needs to inspect for a dust free surface and must repeat the application of emulsified asphalt when needed.

4.6 CURB AND GUTTER OPTIONS

1. Where possible off street parking areas and associated driveways, access roadways, and frontage roads, except for single family attached and detached residences, should be constructed with permanent, integrally attached, continuous concrete curbing of at least six inches high and six inches wide.

2. All concrete curbing shall be at least three feet from any wall, fence, property line, walkway, or structure where parking and/or driveways or aisles are located thereto.

3. All concrete curbing shall be designed and constructed in accordance with the Urban Standard Specifications for Public Improvements.

4. Prefabricated curbs or wheel barriers (if permitted by Jurisdiction) shall be located two feet from the edge of the pavement of setback area.

5. Vehicular overhang areas adjacent to setback areas shall consist of a permeable material.

4.6 CURB AND GUTTER OPTIONS (Continued)

Figure 4.1: Concrete curb and gutter should be used when storm water flow is desired to flow toward the curb.

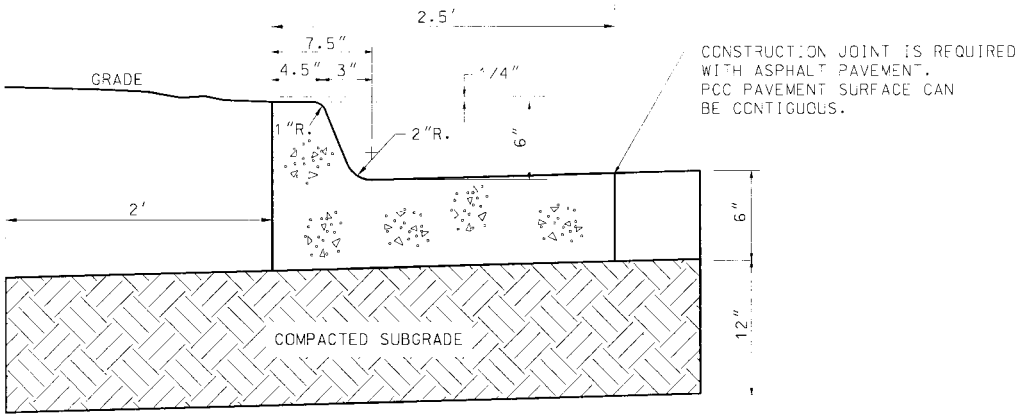
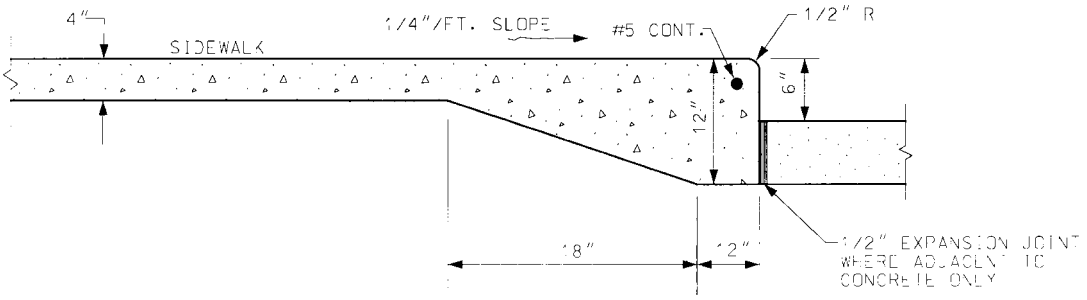


Figure 4.2: Concrete curb and sidewalk combination should be used when storm water flow is desired to flow away from curb.



REQUIRED AMENITIES

5.1 LANDSCAPING AND SCREENING GUIDELINES

1. Landscaping: The Designer shall refer to the individual Jurisdiction Zoning Ordinance for parking lot landscaping requirements. If no such ordinance exists then the requirements set forth in this section shall be used.

   It is desired that all parking areas be aesthetically improved to reduce obtrusive characteristics which are inherent to their use. Therefore, wherever practical, such parking areas should be effectively screened from general public view by incorporating the natural landscape and topography. All parking areas should include landscape areas, islands, screens, etc., equal to not less than ten percent (10%) of the total paved area. Landscaped islands within the parking area should be ground cover of grass (i.e. sod), shrubs or other acceptable living plant life, unless an alternate ground cover is specifically approved as part of the site plan review by the Jurisdiction.

   Landscape islands should not be less than a minimum of eight feet (8') in width from back of curb to back of curb, landscape planters a minimum six (6') feet in diameter, and no parking space should be greater than seventy five (75') feet from a landscaped open space. Parking spaces should be separated from any adjoining roadway, by a landscaped island or elevated separation (i.e., sidewalk) of a minimum of nine (9') feet in width except along the roadway or parking bay aisle that provides the direct access.

   Earthberming should be a minimum of three (3) feet above the top of curb of the adjoining parking lot, if applicable, or public thoroughfare, and should be designed to not negatively affect the drainage and sight distance of the surrounding area and to be aesthetically pleasing to the general public. Berms may be required to be higher if the minimum height is identified during the development review process as being inadequate to provide effective screening and buffering.

2. Screening: The Designer shall refer to the individual Jurisdiction's Zoning Ordinance for parking lot screening requirements. If no such ordinance exists then the requirements set forth in this section may be used.

   Screening may consist of one or any combination of the following:

   - Wood or masonry walls or fences.
   - Landscaped earthen berms.
   - Plant materials of such size, branching density, spacing and quantity to provide a minimum of 60% opacity while dormant. Such materials should provide screening function within three growing seasons after the initial planting. Failure to accomplish such function, whether due to slow growth, death, or other reason, shall be grounds for requiring the addition of wood or masonry walls or fences. In some Jurisdictions a published list may be available of approved materials. Any changes to this list must be made by a certified Landscape Architect.

5.1 LANDSCAPING AND SCREENING GUIDELINES (Continued)

A. Parking Lots in Residential Districts:

1. A six foot high opaque screen should be installed and maintained when a residential parking area abuts another residential district except in any required front yard set back area. No screening is required when said residential parking area abuts another parking area or a non-residential district.

2. A three foot high opaque screen may be installed and maintained along each alley and street line when the premises is located across the street or alley from any residential district. No screening is required when said residential parking area is located across the street or alley from another parking area or from a non-residential district.

B. Parking Lots in Commercial and Industrial Districts:

1. A six foot high opaque screen should be installed and maintained when a commercial and industrial parking lot abuts a residential district. No screening is required when said commercial and industrial parking area abuts another parking area or a non-residential use.

2. A three foot high opaque screen should be installed and maintained along each alley and street line when the premises is located across the street or alley from any residential district. No screening is required when said commercial and industrial parking area is located across the street or alley from another parking area or from a non-residential district.

3. A three foot high opaque screen should be installed and maintained along adjoining residential district. No screening is required when adjoining use is non-residential or parking.

5.2 LIGHTING

If required, all lighting used to illuminate off-street parking areas shall be so shielded or otherwise optically controlled so as to provide glareless illumination in such a manner as not to create a nuisance on adjacent "Residential" District property. Design lighting in accordance with Chapter 11, Section 2 - Roadway Lighting Design. Refer to Table 2.1 for the recommended illuminance values and uniformity ratios for parking lots.

5.3 MARKINGS

The location of each parking space and direct traffic flow shall be identified by surface markings and shall be maintained so as to be readily visible at all times. As specified in the Manual on Uniform Traffic Control Devices (MUTCD), parking on public streets shall be marked out by using white traffic paint, except for dangerous areas, which should be marked in yellow. However, yellow lines are commonly used in off-street parking lots. All pavement striping should be 4 inches in width. Cold applied marking tape can also be used.

5.4 WALKWAYS

Refer to Chapter 8 - Recreational Trails & Sidewalks.

DESIGN REFERENCE MATERIAL

6.1 DESIGN REFERENCE MATERIAL

1. American Association of State Highway and Transportation Officials.

2. Federal highway Administration.

   "Manual on Uniform Traffic Control Devices" and "The Traffic Control Devices Hand Book".

3. National committee on Uniform Traffic Laws and Ordinances.
   "Uniform Vehicle Code" (UVC).

4. McGraw-Hill
   "Time-Saver Standards for Landscape Architecture".

5. Iowa Department of Human Services Guidelines.

6. Iowa Concrete Paving Association, "P.C. Paving Manual", and "Concrete Paving Technology".

7. "Asphalt Paving Design Guide", Iowa Asphalt Paving Institute.

8. "Soils Manual for Design of Asphalt Pavement Structures", The Asphalt Institute.