PARKING STANDARDS

601.201 – GENERAL DESIGN REQUIREMENTS

1.1 INTRODUCTION

A. Design Overview. Arrival, parking, and pedestrian travel are important activities that should be considered with many other factors and should be reviewed when starting any project, especially one involving parking.

B. General Design Requirements includes standards for renovating existing and developing new surface and structured parking.

1.2 DESIGN QUALITY LEVEL

A. Parking Design Standards are based on particular industry-recognized levels of service referred to as the "Design Quality Level". The four levels are:

1. Design Quality Level A, Best
2. Design Quality Level B, Good
3. Design Quality Level C, Average
4. Design Quality Level D, Below Average (Not permitted)

B. Design Quality Level Factors. Establishing the Design Quality Level requires identifying what use the parking is for (by Building Type) and who will be using the parking area (by User Group).

1. Building Type. Hospitals require and outpatient care centers require a higher design quality level compared to offices and other non-critical buildings.

2. User Group(s). There are three basic user groups that are considered.

   a. User Group 1. Priority Patient/Visitor parking. These spaces must be very accessible and located as close as possible to the desired and ultimate location. This user group level includes patient and visitor parking for the Emergency Department, Obstetrics, Orthopedics, and other essential and critical users, including those required by ADA. Consideration should be given to make parking very easy to navigate, especially in urgent situations. This translates to wider drive lanes, larger parking spaces, unrestricted access, and immediate access from public road to the parking area.

   b. User Group 2. General Patient/Visitor and Priority Staff/Employee parking. This group includes general patient and visitor parking, physician parking, and those staff determined to be of critical/clinical importance. The parking is fairly close to the destination and generally accessible to enter and exit. Consideration for easy navigation includes drive lanes and parking spaces of sufficient dimension.

   c. User Group 3. General Staff/Employee. This level is for all staff and employees. Because these individuals regularly use the parking, they are very familiar navigating the parking area and they may expect to park further away. Efficiency is an important consideration.

	User Group 1	User Group 2	User Group 3
	Priority patient and visitor parking	General Patient and Visitor parking, Priority employees	General Employee and all other non-critical staff
General User Characteristics:	*Persons are less mobile, and/or have a need to be near entry, and/or use parking area infrequently*		*Persons are more mobile, and/or have less need to be near entry, and/or use parking area frequently*
General Parking Characteristics:	*Wider parking spaces, deeper parking spaces, wider drive lanes Less restrictive, easy to navigate from public roadways, fewer turns, close proximity to building entrance*		*Efficient parking layout including less wide and deep parking spaces, drive lanes that are not as wide,*

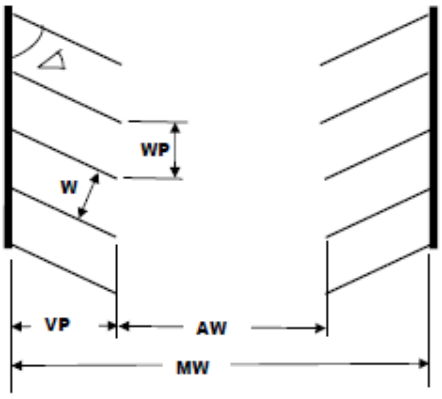
C. Determination of Design Quality Level. The following matrix establishes the specific minimum Design Quality Level for each condition.

	User Group 1	User Group 2	User Group 3
	Priority patient and visitor parking	General Patient and Visitor parking, Priority employees	General Employee and all other non-critical staff
Hospital	Design Quality Level A, Best		Design Quality Level B, Good
Ambulatory Care and Medical Office	Design Quality Level A, Best	Design Quality Level B, Good	Design Quality Level C, Average
Administrative/Office	Design Quality Level B, Good	Design Quality Level C, Average	

Design Quality Level Table: User Group and Building Type

1.3 PARKING TERMINOLOGY

A. The following terms are used in the design standards.



1. Stall Width (W). Width from center to center of the stall, measured perpendicular to the lane markers.

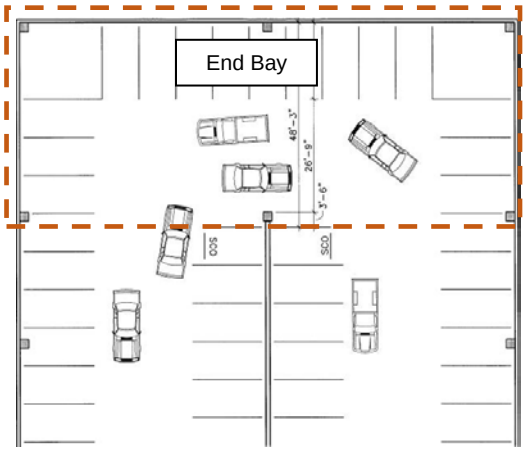
2. Width Projection (WP). This is the dimension of the stall width measured parallel to the drive aisle. This dimension will vary from Stall Width in angled parking conditions.

3. Vehicle Projection (VP). This is the dimension of the length of the stall measured perpendicular to the drive aisle.

4. Aisle Width (AW). This is the cross dimension of the drive aisle measured from Vehicle Projections. In single loaded parking (not recommended) this is the distance from Vehicle Projection to a wall.

5. Module Width (MW). This is the sum of the Vehicle Projections and Aisle Width. In parking structures, the module width is not the total width of one side. This dimension does not account for crash walls, columns, or other obstructions.

6. End Bay. A parking structure end bay is a level transition area located at each end of a parking structure. There are particular requirements for end bays because of turning dimensions and obstructed views. In general, drive aisles are greater and parking is limited.



1.4 OVERALL DESIGN REQUIREMENTS FOR PARKING

A. This section identifies general design considerations and requirements when evaluating a site for new surface and structured parking. Refer to 601.201 *Parking Standards - General Planning Requirements* for additional information.

B. Parking Area Location. Surface and Structured parking should be located such that they are easy to find and access when arriving on a medical campus and that the distance one has to walk from their parked vehicle to their destination is minimized.

1. Navigation to Parking Area. Orient parking to facilitate efficient travel from public roadways. Traffic studies are typically required (often by authorities having jurisdiction) when entrances and exits occur at or near primary public ways. These studies will influence the design with respect to entering and exiting and the impact this may have on stacking and queuing and vehicular circulation.

   a. Entrances which are directly connected to high volume or high velocity streets should consider the use of deceleration lanes to reduce accidents.

   b. For restricted parking areas (gated, pay to park and card access) consider locate entrance gates and ticketing internal to the parking area to permit the staging/stacking of several vehicles entering at one time. Consideration should also be given to the entry queing so as to avoid blocking intersections, sidewalks, and bicycle lanes.

   c. Signage. Coordinate with BJC Sign Services and Director of Design for parking identification and wayfinding signage.

2. Proximity to Destination. Locate parking close to building entrances in order to reduce walking distances. To meet the requirements, the parking must be located such that the Total Path of Travel is not exceeded AND the distances within the environments are not exceeded.

   a. Total Path of (Pedestrian) Travel: This measurement is the distance one must walk from their parked vehicle to the destination. The perception of how far a person must walk is influenced by the actual environment. There are five different types of environments to consider, each with their own limits for pedestrian travel. To meet the Proximity to Destination requirement, the Total Path of Travel must not be exceeded AND each environment distance may not be exceeded. The five environments are:

      1) Path of pedestrian travel within a parking structure

2) Path of pedestrian travel within surface parking area

3) Path of pedestrian travel in unprotected (no roof covering) and unconditioned (no HVAC) walkway (such as sidewalks)

4) Path of pedestrian travel in protected (roof covering) but unconditioned (no HVAC) walkway (such as beneath a canopy)

5) Path of pedestrian travel in protected (roof covering) and conditioned (HVAC) walking area (such as within a building)

Pedestrian Travel Distances by Design Quality Level

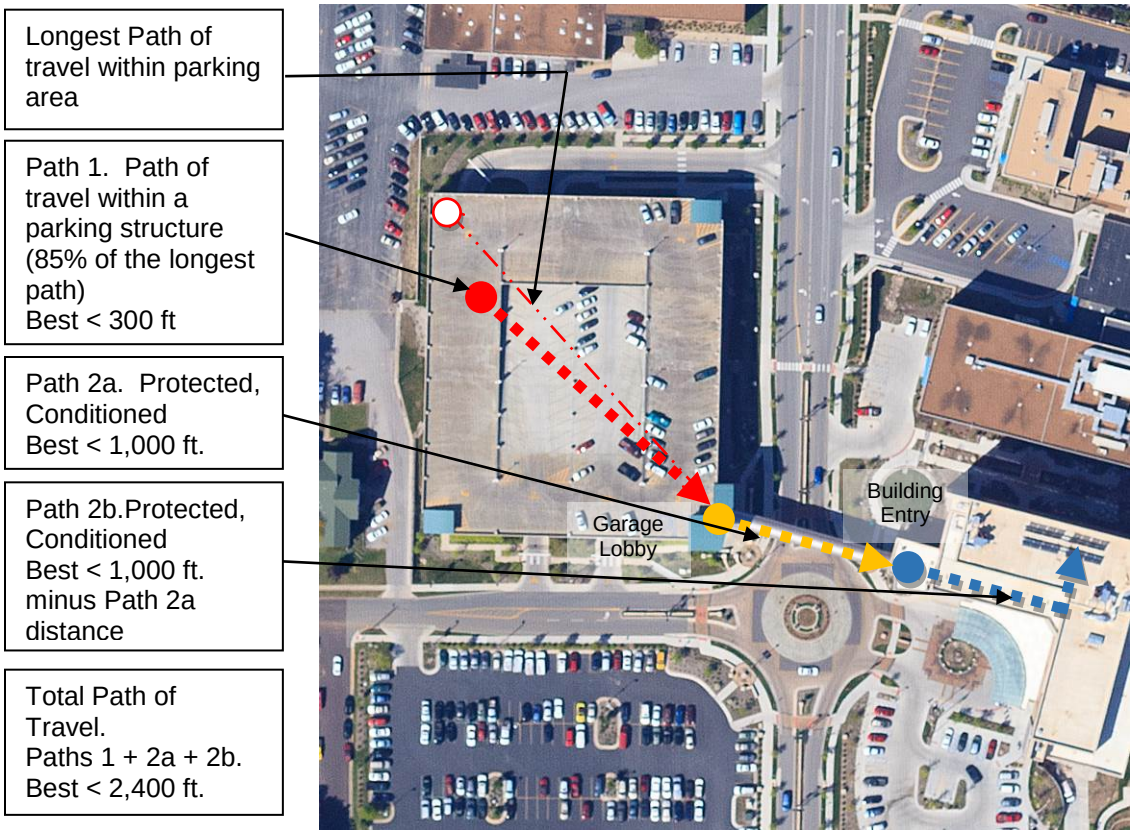
			Design Quality Level			
			A	B	C	D
			Best	Good	Average	Below Average
Max. Pedestrian Travel Distances	By Environment (in feet)	Walk in structured parking (85% rule)	300	600	900	1,200
		Walk in surface parking (85% rule)	350	700	1,050	1,400
		Unprotected, unconditioned walkway	400	800	1,200	1,600
		Protected, unconditioned walkway	500	1,000	1,500	2,000
		Protected, conditioned walkway	1,000	2,400	3,800	5,200
	TOTAL Path of Travel (in feet) to destination		2,400	3,800	5,200	6,600

b. Example. The following example considers the paths of travel for the BHC William Street Garage. A Total Path of Travel from a parking space to a destination within a hospital building is comprised of 3 environments.

1) Path 1 – Parking Structure. From parking space to edge of surface parking lot or to a parking structure's stair/elevator lobby. Consider furthest space for 85% of the parking. The example represents structured parking, assuming a Design Quality Level A, Best, this distance may not exceed 300'.

2) Path 2a - Bridge. From edge of surface parking lot or a parking structure's stair/elevator lobby to building main entrance. The example is elevated enclosed and conditioned walkway, therefore the maximum permitted distance cannot exceed 1,000 ft.

3) Path 2b. Within Hospital. From building main entrance to destination within the hospital building. This environment is both protected and conditioned. This environment is similar to the pedestrian bridge in that it is protected and conditioned



C. Striping. Coordinate striping type and color with existing facility requirements.

1. Color. For mixed user group parking, it is recommended to use different colors for stall markings to identify visitor versus employee parking. Typical color for standard visitor parking is white. Typical color for employee parking is yellow.
2. Type. The standard parking stall marker is a single 4" wide painted line. Consider a double line boxed end (hairpin) design which results in better centering of vehicles in the parking space.

D. Wheel Stops. Wheel stops are not permitted unless otherwise approved by Director of Design and Director of Facility Engineering.

E. Storm Water Control. Design parking areas to prevent or control surface storm water flow across pedestrian routes and walks.

F. Parking Dimensions. Standard parking stall dimensions shall be in accordance with the table and as required by local zoning ordinances. In general, the minimum dimension for 90 degree parking shall be as follows:

1. Design Quality Level A, Best 9'-0" x 18'-0"
2. Design Quality Level B, Good 8'-9" x 18'-0"
3. Design Quality Level C, Average 8'-6" x 18'-0"

Standard Parking Space – Minimum Dimensions

			Design Quality Level			
			A	B	C	D
			Best	Good	Average	Below Average
Parking Space Dimensions – Standard (non ADA)	Stall Width (W)		9’-0”	8’-9”	8’-6”	8’-3”
	Stall Width Projection (WP)	90 degree	9’-0”	8’-9”	8’-6”	8’-3”
		75 degree	9’-4”	9’-1”	8’-10”	8’-6”
		70 degree	9’-7”	9’-4”	9’-1”	8’-9”
		65 degree	9’-11”	9’-8”	9’-5”	9’-1”
		60 degree	10’-5”	10’-1”	9’-10”	9’-6”
		55 degree	11’-0”	10’-8”	10’-5”	10’-1”
		50 degree	11’-9”	11’-5”	11’-1”	10’-9”
		45 degree	12’-9”	12’-4”	12’-0”	11’-8”
	Module Width (MW)	90 degree	62’-0”	61’-0”	60’-0”	59’-0”
		75 degree	58’-0”	57’-0”	56’-0”	55’-0”
		70 degree	57’-0”	56’-0”	55’-0”	54’-0”
		65 degree	55’-9”	54’-9”	53’-9”	52’-9”
		60 degree	54’-6”	53’-6”	52’-6”	51’-6”
		55 degree	53’-0”	52’-0”	51’-0”	50’-0”
		50 degree	51’-7”	50’-7”	49’-7”	48’-7”
		45 degree	49’-10”	48’-10”	47’-10”	46’-10”
	Vehicle Projection (VP)	90 degree	18’-0”	18’-0”	18’-0”	18’-0”
		75 degree	19’-1”	19’-1”	19’-1”	19’-1”
		70 degree	19’-3”	19’-3”	19’-3”	19’-3”
		65 degree	19’-2”	19’-2”	19’-2”	19’-2”
		60 degree	19’-0”	19’-0”	19’-0”	19’-0”
		55 degree	18’-8”	18’-8”	18’-8”	18’-8”
		50 degree	18’-2”	18’-2”	18’-2”	18’-2”
		45 degree	17’-7”	17’-7”	17’-7”	17’-7”
	Aisle Width (AW)	90 degree	26’-0”	25’-0”	24’-0”	23’-0”
		75 degree	19’-10”	18’-10”	17’-10”	16’-10”
		70 degree	18’-6”	17’-6”	16’-6”	15’-6”
		65 degree	17’-5”	16’-5”	15’-5”	14’-5”
		60 degree	16’-6”	15’-6”	14’-6”	13’-6”
		55 degree	15’-8”	14’-8”	13’-8”	12’-8”
		50 degree	15’-3”	14’-3”	13’-3”	12’-3”
		45 degree	14’-8”	13’-8”	12’-8”	11’-8”

2.1 DESIGN REQUIREMENTS FOR SURFACE PARKING

A. This section identifies general design considerations and requirements when considering new surface parking and for the renovation of existing surface parking areas. Refer to 601.201 *Parking Standards - General Planning Requirements* for additional information. In addition, refer to standards for site improvements (roadways/parking, pedestrian paving) associated with specific building types. The section above titled Overall Design Requirements for Parking are also applicable to this section.

B. Design Standards by Quality Level. The following table identifies the minimum requirements for surface parking based on the Design Quality Level.

Design Requirements for Surface Parking Based on Design Quality Level

				Design Quality Level			
				A	B	C	D
				Best	Good	Average	Below Average
Efficiency and Navigation	Gross area per vehicle			400 sf per vehicle maximum unless otherwise approved by Director of Design			
	Unrestricted vehicular access (free to park)	Number of entrance lanes		Minimum of 1 entry lane and 1 exit lane per every 400 vehicles. Consider Peak demand conditions that may increase the minimum requirement			
		Number of exit lanes					
	Restricted vehicular access (pay to park, card access	Number of entrance lanes		Minimum of 1 entry lane and 1 exit lane per every 350 vehicles. Consider Peak demand conditions that may increase the minimum requirement			
		Number of exit lanes					
Quantity of Accessible Spaces	General			Comply with applicable codes, regulations and all Planning and Zoning requirements. 1 to 2 spaces required: 1 26 to 50 spaces required: 2 51 to 75 spaces required: 3 76 to 100 spaces required: 4 101 to 150 spaces required: 5 151 to 200 spaces required: 6 201 to 300 spaces required: 7 301 to 400 spaces required: 8 401 to 500 spaces required: 9 501 to 1,000 spaces required: 2% of total Over 1,001: 20 plus 1 for each 100 (or fraction thereof) over 1,000			
	Hospital, Ambulatory Care, Medical Office		General	10% min for the total number of visitor/patients served, comply with latest codes and regulations (including 2010 ADA Standards) verify with local Planning and Zoning			
			Parking for Physical Therapy, Obstetric, Orthopedic and Geriatric diagnostic and treatment services	20% min for the total number of visitor/patients served, comply with latest codes and regulations (including 2010 ADA Standards) verify with local Planning and Zoning			

Design Requirements for Surface Parking
Based on Design Quality Level

				Design Quality Level			
				A	B	C	D
				Best	Good	Average	Below Average
Max. Pedestrian Travel Distances	By Environment (in feet)	Walk in structured parking (85% rule)		300	600	900	1,200
		Walk in surface parking (85% rule)		350	700	1,050	1,400
		Unprotected, unconditioned walkway		400	800	1,200	1,600
		Protected, unconditioned walkway		500	1,000	1,500	2,000
		Protected, conditioned walkway		1,000	2,400	3,800	5,200
	TOTAL Path of Travel (in feet) to destination			2,400	3,800	5,200	6,600
ADA Parking Space Dimensions	Standard stall width (W)			8'-0"			
	Accessible aisle width			5'-0"			
	Van accessible stall width (W)			8'-0" width in conjunction with 8'-0" accessible aisle preferred (11'-0" width in conjunction with 5'-0" accessible aisle is acceptable)			
	Van accessible aisle width			See above, 8'-0" preferred			
Miscellaneous	Striping	Standard parking space delineation	Color	White for Visitor Parking designation and Yellow for employee parking - preferred (verify with facilities)			
			Type	Double striped line (4" stripe/ 8" space/4" stripe hairpin with boxed end) preferred	4" wide single striped line		
	Active Security Measures	Emergency Call Station	Low-risk sites	Not required. Coordinate with Facility Security and Risk Management.			
			High-risk sites	Required. Provide one call station within 400' of every parking space, minimum. Coordinate with Facility Security and Risk Management			
		CCTV		Required, coordinate number and location with facility and safety/security consultant			
	Signage and Wayfinding	Exterior Signage		Surface lot identification - coordinate requirements with Sign Services and PDC Design Director			
	Safety	Lane markers		Not required			
		Speed bumps		Not required			
		Safety bollards		Consider pedestrian areas adjacent to vehicular travel			
Lighting	Maintained minimum horizontal illuminance value at floor level – footcandles (Lux)	General		2.0fc (20.0)			
	Maintained minimum vertical illuminance value at floor level – footcandles (Lux)	General		2.0fc (20.0)			
	Uniformity ratio**	General		10:1			

C. New Surface Parking Requirements.

1. Type of Pavement. Unless otherwise directed, all surface parking areas are to be designed to include the following Base Bid and the following Alternate Bid.

   a. Base Bid. Provide normal duty asphalt at all areas subject to typical vehicular loads. Provide heavy duty asphalt at drive lanes and areas subject to heavy vehicle travel. These may include trash service vehicles, fire trucks, ambulance, parcel delivery vehicles, bus and shuttle bus, mobile generator transports, mobile mammography units, etc. Provide cast-in-place concrete at entry drive aprons, drop-off areas, trash dumpster pad and area where dumpster will be raised/lowered, loading docks, and all other areas subject heavy vehicle turning locations.

   b. Alternate Bid: Provide concrete at all areas in surface parking in lieu of normal duty and heavy duty asphalt.

2. Curbs. All curbs shall be cast-in-place concrete. Asphalt curbs are not permitted.

   a. Barrier type curbs shall be no more than 6” above adjacent roadways.

   b. Roll type curbs shall be located in high volume pedestrian areas. Roll type curb locations shall include vehicle barriers and be designed to manage storm water run-off.

3. Islands. Parking islands present opportunity for storm water management and/or create opportunities for vegetation. These types are preferred over painted striping on the parking surface.

4. Pedestrian Considerations.

   a. Collector Route. Primary pedestrian walkways are required. These routes shall serve to connect primary building entrances to the major parking area. These paths shall be designated as pedestrian areas by appropriate striping and signage.

   b. Lighting. Consider low-level pedestrian lighting along the primary pathway. Coordinate with BJC Corporate Engineer and Director of Design.

   c. Drive Aisle Orientation. Drive aisles in parking areas shall be oriented perpendicular to the building/entrance. The purpose is to prevent cross-aisle pedestrian travel.

   d. Drop-Off Area. Drop-off areas shall be included for all buildings as near to the building main entrance as possible. Coordinate the number of stacked vehicles with Director of Design. Coordinate drop off area with canopy design.

5. Vehicle Geometrics. Coordinate parking layout and drive aisle widths with vehicle turning dimensions including but not limited to fire department vehicles, trash truck, delivery vehicles, shuttles, etc. Parking and drive aisle configurations shall accommodate entrance and exiting of large vehicles without having to reverse. Show the vehicle and turning dimensions on the plans, especially at critical turning points.

6. Fixtures, Furniture, Equipment. Surface parking areas shall include considerations for benches, bicycle parking, campus information signs, trash receptacles, etc.

D. Renovation of Existing Surface Parking. The following general considerations should be evaluated when renovating an existing surface parking area.

1. Asphalt Areas. Whether existing asphalt parking surfaces should be repaired (milled and over-laid) or replaced depends on many variables. Consultation with a Civil Engineer may be required to assist with the determination. When existing grades and slopes change, consultation with a Civil Engineer is required. Some of the factors to consider when evaluating an asphalt surface for repair are:

    a. Thickness and composition of existing materials (as a result of core tests).
    b. Evaluation of asphalt surface competency.
    c. Evaluation of current sloes and cross slopes for ADA compliance.
    d. Evaluation of current sloes and cross slopes for surface storm water management.
    e. Evaluation of subgrade conditions that may affect the surface parking. This includes any areas of heaving, pumping, deformations, surface irregularities, etc.
    f. Heights of curbs relative to adjacent asphalt surfaces shall be considered. In some instances, existing surface parking areas may have been repaired by adding layer(s) of asphalt over existing conditions. This results in barrier curbs that are no longer tall enough to act as a barrier. If milling and overlaying is still the preferred action in this instance, then consideration for curb height must be addressed.
    g. Transitions at concrete joints where full depth milling, removal, and/or tapered milling may be necessary.
    h. Saw-cutting straight joints is required to transition from milled areas to existing areas to remain.
    i. Barricade off milled areas and re-routing pedestrian path of travel is required.

2.2 DESIGN REQUIREMENTS FOR STRUCTURED PARKING

A. The section above titled Overall Design Requirements for Parking are also applicable to this section.

B. Structure Type. Parking structures shall be designed as either structural precast concrete or cast-in-place post-tensioned concrete structures. Each has advantages and disadvantages and evaluation of all the factors should be considered. Consultation with a structural engineer or parking consultant with demonstrated experience in designing both parking structure types is required.

1. Cast-In-Place Post-Tensioned Concrete Structure. These structures are best-suited for mid to high rise structures and those with complex ramping/circulation patterns. They offer excellent quality with reduced vibrations and limited cracking. The monolithic nature of the structure makes it very durable. These structures are typically more expensive to construct and take longer to complete compared to the precast structure. Structural design should be repetitive to optimize re-use of concrete form work. CARE MUST BE TAKEN DURING THE LIFE OF THE STRUCTURE TO PREVENT DAMAGE TO THE POST-TENSIONED STRANDS. All future penetrations, pathways and attachments into and thru the structure should be considered in the design. Consider block-out area locations. Provide threaded inserts at 5'-0" on center in the bottom of structural slabs for future anchoring.

2.

CAST-IN-PLACE POST-TENSIONED CONCRETE STRUCTURE	
ADVANTAGES	**DISADVANTAGES**
Floors are constructed in a monolithic way which results in fewer horizontal sealant joints	Potentially higher initial construction cost due to labor intensive work
Positive drainage will not be restricted by slab warping as occurs on precast structures	Quality control concern with weather exposure during construction
Floor vibration is minimized and generally imperceptible	Resulting concrete finish is not controlled and may require cladding or additional finishing
Post-tensioning reduce cracking in slabs	Construction schedule is slightly greater than for precast structures
Column spacing is more flexible than precast	More expensive to build during cold weather months
Generally there are no shear walls which may limit visibility	Reinforcing is congested at beam-to-column interface
Maintenance is less due to fewer sealant joints	Site staging requirements are slightly larger than for a precast structure
Wider beam to beam spacing creates the illusion of greater headroom, vertical clearance	
More accommodating for irregular-shaped configurations, underground structures, and structures built beneath buildings	
Availability of local, skilled subcontractors	
Predominant structure type constructed in this region	

2. Structural Precast Concrete Structure. These structures are best-suited for low to mid rise structures and those with simple ramping/circulation patterns. The initial cost and construction duration for these structures is typically less than that of the cast-in-place structures. Moreover, since the structural components are made in a controlled environment and not on site, construction is less affected by weather conditions. The controlled conditions are favorable to achieving more uniform and controllable concrete strengths. While these are considerably desirable factors, the maintenance cost related to horizontal sealant joint repairs and frequent bearing plate inspections must be considered. The perceived quality is less than that of the post-tensioned cast-in-place types due to increased vibrations and greater surface cracking. These structures rely on internal or external shear walls for horizontal load transfer which, if not carefully designed, can lead to obstructed views within the parking area. Floor slabs are typically double-tee type with the tees being 6' to 8' on center. This creates a garage that feels less open than the cast-in-place post-tensioned structure. Girder beams are typically upside-down T shapes which if not addressed can create environments conducive for pests.

STRUCTURAL PRECAST CONCRETE STRUCTURE	
ADVANTAGES	**DISADVANTAGES**
Precast members are fabricated off site in controlled environments and certified to ensure consistent quality	Maintenance costs are higher – horizontal sealant joints occur every 10 – 12 feet
Slightly lower initial construction cost partly due to a reduction of on-site labor costs	Vertical members of the structural tee are typically 5 to 6 feet on center which results the perception of less headroom. Tees also reduce visibility for signage
Construction schedule is slightly less than for site cast	Shear walls are needed to resist lateral forces which depending on their location can decrease visibility within the garage and affect the exterior design intent
Allows for greater spacing between expansion joints	Warping of the structural tees may limit the drainage slope
Can easily be erected during cold winter months with minimal adaptations	Greater floor bounce and vibrations can be expected
Spandrels on the exterior façade also serve as structural beams	The tee to beam connections create horizontal ledges where birds can roost
Concrete finish of structural elements can be better controlled	Precast structural systems are historically not the predominant structure type for parking facilities in this area
	Weld plates and connectors must be rigorously inspected and maintained

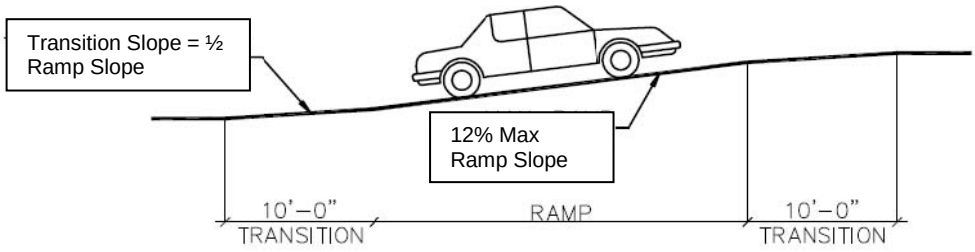
C. Parking Structure Circulation. Verify the parking structure circulation based on the planning requirements. All design documents that contain floor plan information shall include an isometric view key plan similar to the ones represented in 601.201, *Parking Standards, General Planning Requirements*. Key plan isometric shall include traffic flow and ingress/egress locations.

1. Allowable slope for ramps with parking spaces shall be based on the Design Quality Level.

   a. Design Quality Level A, Best: 5.0% max
   b. Design Quality Level B, Good: 5.5% max
   c. Design Quality Level C, Average: 6.0% max.

2. Speed ramps are non-parked ramps designed only for vehicle travel and therefore the slope is permitted to be greater than the slope for ramps with parking. Typically these types of ramps are only found in medium to high rise structures. The maximum slope for speed ramps is 12%.

    a. A speed ramp slope requires transition slopes to prevent vehicles scraping the drive. 10'-0" long transition slopes at the top and bottom of the ramp that are one-half of the differential slope are required.



D. Aesthetics. Coordinate aesthetics and architectural detailing with Director of Design.

1. Where site cast concrete is the finish, all voids in exposed concrete surfaces that are greater than the size of a dime shall be grouted solid and hand rubbed to match the surrounding concrete.
2. Pull pockets. For post-tensioned cast-in-place structures, pull pockets shall be located internally or away from the predominant elevation if possible. Pull pockets shall be prefinished aluminum cover in lieu of solid grouting.
3. Consider

E. Signage and Wayfinding. Coordinate signage, wayfinding, and supergraphics with Director of Design.

F. Open Air Structures. Open-air structures are generally preferred over ventilated structures. Coordinate with building code requirements for minimum openness percentages. Provide openness diagrams as necessary to verify compliance with code requirements.

G. Design Standards by Quality Level. The following table identifies the minimum requirements for surface parking based on the Design Quality Level.

Design Requirements for Structured Parking
Based on Design Quality Level

			Design Quality Level			
			A	B	C	D
			Best	Good	Average	Below Average
Efficiency and Navigation	Gross area per vehicle		Varies, assume 350 sf min for high efficiency and 750 sf for low efficiency			
	Vehicular access	Number of entrance lanes	Depends on peak demand – assume 1 entry and 1 exit lane per 350 vehicles			
		Number of exit lanes				
	Percent of total parking spaces on flat decks		90	60	30	0
	Maximum percent for sloped ramp to be used for parking		5.0	5.5	6.0	6.5
	Maximum percent for sloped ramp – non parked		12.0% max, grade differentials greater than 8% shall include 10'-0" horizontal transition slopes			
	Number of 360 degree turns to reach the top deck		2.5	4.0	5.5	7.0
	Maximum distance to a cross aisle in a parking bay (for double-threaded helix type)		250	300	350	400
	Maximum distance to a cross-over (for double-threaded helix type)		300	450	600	750
	Number of spaces to be searched, angled parking		400	800	1,200	1,600
	Number of spaces to be searched, 90 degree parking		250	500	750	1,000
Vertical Pedestrian Circulation	Number of elevators	1 – 1,000 vehicles	2 min			
		1,001 – 1,750 vehicles	3 min			
		1,751 – 2,500 vehicles	4, depends on peak demand usage/location			
		2,501 – 3,250 vehicles	5, depends on peak demand usage/location			
	Number of stairs		2 min. and as req. by code (distance between stairs shall not exceed 300')			
Quantity of Accessible Spaces	General		Comply with applicable codes, regulations and all Planning and Zoning requirements. 1 to 2 spaces required: 1 26 to 50 spaces required: 2 51 to 75 spaces required: 3 76 to 100 spaces required: 4 101 to 150 spaces required: 5 151 to 200 spaces required: 6 201 to 300 spaces required: 7 301 to 400 spaces required: 8 401 to 500 spaces required: 9 501 to 1,000 spaces required: 2% of total Over 1,001: 20 plus 1 for each 100 (or fraction thereof) over 1,000			
	Hospital building, Ambulatory surgery center, Ambulatory care center, Medical office building		10% min for the total number of visitor/patients served, comply with latest codes and regulations (including 2010 ADA Standards)			
	Parking that serves physical therapy/rehabilitation services		20% min for the total number of visitor/patients served, comply with latest codes and regulations (including 2010 ADA Standards)			
Max. Pedestrian Travel Distance	By Environment (in feet)	Walk in structured parking (85% rule)	300	600	900	1,200
		Walk in surface parking (85% rule)	350	700	1,050	1,400
		Unprotected, unconditioned walkway	400	800	1,200	1,600
		Protected, unconditioned walkway	500	1,000	1,500	2,000
		Protected, conditioned walkway	1,000	2,400	3,800	5,200
	TOTAL Path of Travel (in feet)		2,400	3,800	5,200	6,600

Design Requirements for Structured Parking
Based on Design Quality Level

				Design Quality Level			
				A	B	C	D
				Best	Good	Average	Below Average
Misc. Dims	Parking spaces adjacent to side obstructions (walls, columns)			Increase stall width (W) by 1'-0"		No change to stall width (W)	
	End bay conditions	Min. drive aisle width for two way travel		30'	28'	26'	26'
		Vehicle Projection (VP) for inside end stall		18'		17'	
ADA Parking Space Dimensions	Standard stall width (W)			8'-0"			
	Accessible aisle width			5'-0"			
	Van accessible stall width (W)			8'-0" width in conjunction with 8'-0" accessible aisle preferred (11'-0" width in conjunction with 5'-0" accessible aisle is acceptable)			
	Van accessible aisle width			See above, 8'-0" preferred			
	Vertical clearance for ADA van accessible spaces			8'-2" Minimum along the entire route from garage entry to van accessible space. Clearance requirements for ALL obstructions including beams, haunches, conduit, signage)			
Miscellaneous	Striping	Standard parking space delineation	Color	Yellow preferred (verify with facilities)			
			Type	Double striped line (4"/ 8"/4" hairpin) preferred		Single striped line acceptable	
			Width	4" wide			
	Active Security Measures	Emergency Call Station	Low-risk locations	One per level and located along the primary accessible route and near the garage main vertical circulation			
			High-risk locations	Shall meet the requirements for low-risk locations AND shall be installed so that a pedestrian path-of-travel to reach a call station does not exceed 400' horizontally.			
		CCTV		Required, coordinate number and location with facility and safety/security consultant			
	Signage and Wayfinding	Graphics		Coordinate with Sign Services and PDC Design			
		Numbering		Coordinate with Sign Services and PDC Design			
		Supergrahics		Preferred, coordinate requirements with Sign Services and PDC Design		Not required	
	Safety	Clearance sign (headache bar)		Required at every vehicle entrance lane and where any obstructions along the vehicular route require such notification			
		Lane markers		Preferred		Not required	
		Speed bumps		Preferred		Not required	
		Safety bollards		Required at pedestrian vertical circulation areas adjacent to vehicular travel			
		Pipe protection		Required at all locations where vehicle impact may occur			
		Cable Barrier System		Designed to withstand 5,000 lb vehicle traveling 5 mph with no more than 18" cable deflection Cables shall be ½" 7 wire zinc galvanized strand in strengths up to 270K.			
		Threaded inserts (for ease of current or future installation of ceiling mounted items)		Required 5'-0" on center spacing in each direction at underside of all elevated decks			

Design Requirements for Structured Parking
Based on Design Quality Level

				Design Quality Level			
				A	B	C	D
				Best	Good	Average	Below Average
Lighting	Maintained minimum horizontal illuminance value at floor level – footcandles (Lux)	General		2.0fc (20.0)			
		Ramps	Day	2.0fc (20.0)			
			Night	2.0fc (20.0)			
		Entrance Areas	Day	60.0fc (600.0)			
			Night	2.01fc (20.0)			
		Uncovered parking (top deck level)		2.0fc (20.0)			
		Stairways*		2.0fc (20.0)			
	Maintained minimum vertical illuminance value at floor level – footcandles (Lux)	General		2.0fc (20.0)			
		Ramps	Day	2.0fc (20.0)			
			Night	2.0fc (20.0)			
		Entrance Areas	Day	30.0fc (300.0)			
			Night	2.0fc (20.0)			
		Uncovered parking (top deck level)		2.0fc (20.0)			
		Stairways*		2.0fc (20.0)			
	Uniformity ratio**	General		10:1			
		Ramps	Day	10:1			
			Night	10:1			
		Entrance Areas	Day				
			Night	10:1			
		Uncovered parking (top deck level)		10:1			
		Stairways*					

* Stairways are calculated by averaging the light levels measured, not by the minimum light level value.
** A Uniformity Ratio of 10:1 is preferred however a ratio of 12:1 is allowable with just cause.

H. Lighting. Light fixtures approved for use are identified in Chapter 1, 102.203 - *Lighting Guidelines and Standards*. Any deviation from the standard fixtures shall be reviewed and approved by BJC Corporate Engineer and Director of Design.

1. Luminaire Requirement. All luminaires shall be baked-on enamel or powder-coated unless otherwise directed.
2. Energy Conservation. Lighting within the parking structure (excluding dedicated emergency lighting) shall not exceed a maximum of 0.225 W/ sf lighting power density (LPD). (1 fc = 1 lumen (and lux) and 1 lumen = 0.001496 watts).
    a. A target LPD of 0.18 W / sf is desired.
    b. Through the use of select controls, either occupancy or daylighting based, the lighting system shall be designed to save at least 20% energy compared to the total installed power times the full operating schedule of the garage.
3. Light Loss Factors (LLF)
    a. Assume Luminaire Dirt Depreciation (LDD): 0.95 for all luminaires.
    b. Assume the following Lamp Lumen Depreciation (LLD):
        1) 0.92 for fluorescent luminaires
        2) 0.70 for LED-dedicated luminaires

3) Assume the appropriate effects from temperature on the lumen output of the luminaire.

I. Safety and Security. The following safety and security requirements shall be included in the design of structured parking.

1. Emergency Call Station.

a. Low-risk locations. Unless otherwise directed, for locations identified as low-risk security sites, parking garages shall be equipped with a minimum of one emergency call station per level of parking. These call stations shall be located near the main vertical circulation and in a manner maximizing the lines of sight to the station for pedestrians. They should also be located so as not to be obstructed by physical barriers.

b. High-risk locations. In addition to the requirements identified in the low-risk locations, emergency call stations for high-risk locations shall be installed at every vertical circulation point in the garage and in locations so that a pedestrian path of travel to reach a call station does not exceed 400' horizontally in any direction.

2. CCTV system. All garages should include a CCTV system. The minimum requirements are for the cameras to capture digital images of the vehicle ramps at each level and shall also capture every vertical circulation element in the garage. Additional consideration should be given to cameras at the entry and exit locations and all pedestrian entrance points to the garage.

a. Unless otherwise directed, the Owner will engage a security consultant to design and install a system. The design and construction team will coordinate with the security consultant throughout the development of the project. Coordinate electrical, data requirements as well as all slab and structure penetration requirements prior to the start of construction. Size, quantity and location of sleeves for Owner's CCTV system shall be included in the sleeve/embed coordination drawing submittal. Coordinate with hospital entity for specific security requirements.

b. CCTV cameras along the exterior of the garage should also be considered on a project basis.

3. Passive Security measures. Each of these should be considered on an individual basis for low-risk structures and they all should be implemented for high-risk crime locations.

a. Perimeter enclosure. At grade, consider perimeter barriers or fencing to prevent pedestrian entry at areas not designed for pedestrian entry.

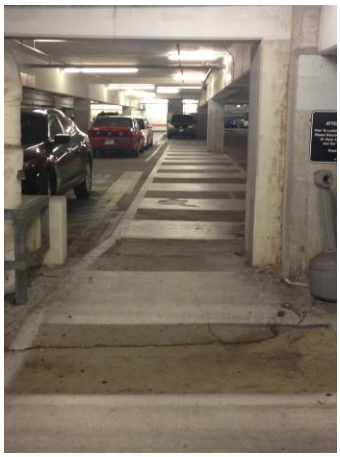
b. Sightlines. Designs should avoid creating blind spots, niches and corners that are not completely visible.

c. Natural light. Maximizing the amount of openness and natural light can provide greater illumination and offer a greater sense of security. To enhance this, consider paining the ceilings a light or white color to reflect light deeper into the middle of the garage.

d. Visible Lobby. Open-to-view stair and elevator lobbies can contribute to the safety and security for pedestrians in a garage structure. Consider a stair/elevator lobby that is outside of the garage footprint. This will result in a vertical circulation/lobby space that can be exposed to view on three sides. In addition, the deep beams of a garage structure will not interfere with the amount of openness available.

4. Pedestrian Environment.

a. Collector Walkways. Primary pedestrian circulation zones that extend from the primary vertical circulation areas to points within, across or through the parking areas offers some level of protection for pedestrians. These defined walkways are in addition to those required by the current ADA standards. Walkways should be clearly lit with a minimum footcandles at the floor level of 2.0. There should also be appropriate painted markings on the floor surface – 4" wide white diagonal striping is preferred. It is important to note that large painted areas of floor surfaces can affect the coefficient of friction and pose a greater risk of slips, especially when wet. In addition, signs and other elements may be used to further identify crossing points. Vehicles should be required to completely stop at all primary pedestrian crossings.



5. Vehicle Impact Protection.

a. Vertical Clearance. Otherwise known as "headache bars", these signs must be installed directly above and immediately before every entrance to a parking garage. The sign shall be suspended from the garage structure at a height no less than the lowest obstruction at all vehicle areas. The sign shall be aluminum and shall be painted traffic yellow with the following information "CLEARANCE X' XX"" on the face of the sign in black lettering. The sign shall be mounted at a height equal to and no great than the lowest obstruction.

1) Some obstructions may be permitted to be lower than the headache bar mounting on conditions as approved by Owner in writing. These conditions include but may not be limited to instance that vertical obstructions are not in the vehicular area or when the obstructions do not prevent vehicles from safely navigating the majority of the parking structure. Where these conditions occur, signage must be installed in advance of the obstruction and in a location that permits drivers to reconsider progressing further. Design team may consider adding a headache bar inside the structure and mounted at a height of the obstruction in lieu of a sign.

b. Safety Bollards. There are 2 types of bollards that should be considered in a parking garage – those that are designed to protect pedestrians and those designed to protect the structure and other building elements from impact. This type shall clearly delineate pedestrian and vehicular traffic areas and may be located adjacent to all vertical circulation areas, at primary pedestrian routes, and in front of building items that if impacted would require a costly repair or would negatively affect the garage function. These safety bollards shall be constructed of Schedule 40 steel pipe, painted traffic yellow and shall be no less than 42" above the floor surface. Where needed, these shall be placed no greater than 8'-0" on center and should be solidly attached to the floor surface. Bollards shall be capped with a sloping top surface.

1) Post-tension Structure Installation. Bollards impacted by a vehicle traveling less than 10mph shall be designed so as to not cause damage to the structure. Therefore, when installed in post-tensioned cast-in-place type garages, breakaway connections should be designed by the structural engineer or consider using the rebounding type bollard. Indicate all anchors on embed/sleeve submittal drawings.

2) At Grade Installation. Bollards mounted to slab-on-grade conditions shall be installed so that the bollard is embedded into concrete and shall extend at least 3'-0" below grade. Surface mounting to embedded or anchored plates is not considered an acceptable at-grade installation.

c. Vertical In-Drive Lane Marker. While not required, these markers may be used to provide bright delineation of medians and center lines of traffic at major 2-way travel intersections and transitions. These shall be designed to withstand low-speed impacts. Design team shall coordinate Owner for locations.

d. Speed bumps. As a traffic calming device, speed bumps shall be considered at specific locations to slow incoming traffic. Speed bumps should be limited in use, and appropriate signage in advance of the device should be installed. They may be cast-in-place concrete or may be a prefabricated type but in any instance they should be completely traffic yellow color. The floor area at the speed bump should be lit to a minimum of 3 footcandles.

e. Barrier System. Barrier systems between modules and along the interior columns shall be a cable system type. Cables shall be minimum 1/2", 7-wire zinc galvanized strand type in strengths up to 270K. As a minimum requirement, the system shall be designed to withstand the load of a 5,000 lb vehicle traveling at 5 mph with no more than 18" of cable deflection. Strands shall be installed no more than 4" on center and shall be at least 42" above the floor surface. While the photo to the upper right depicts a barrier cable attachment with surface mounted steel angles at each column, this is not the preferred method of attachment since barrier impact can cause the angles to become detached from the column thereby causing damage to other vehicles. The use of this attachment is permitted only with written approval from the Director of Design. The preferred barrier cable attachment is thru-column as depicted in the lower right photograph. This approach requires close coordination with the structural details and also requires a greater level of coordination during construction. Blockout of the columns is required

and should be included in the embed/sleeve coordination submittal. The structural engineer of record shall engineer the system and include appropriate drawings, details and specifications as necessary.

f. Pipe Protection. At all locations where pipes, conduits, ducts, etc. extend up into an area where they may be impacted by vehicles, the items must be protected with a metal plate. The expectation for most instances is that the element be protected with a metal plate fastened to the (side or front) of the adjacent column or wall. Metal shall be of sufficient thickness so as not to bend or deform when impacted at a low speed. Plate shall be held above the floor surface to prevent trapping water and plate shall be clear of surfaces to prevent debris accumulation. All metal surfaces shall be fully primed and painted. Every condition will require design consideration and metal plates may not work in every situation. Design details are required of all protective elements.

END OF SECTION 601.201

RESPONSIBILITY MATRIX

The following matrix identifies those individuals, roles or departments responsible for maintaining the accuracy of the information and those responsible for providing input. Refer to Preface for detailed explanation.

	BJC HealthCare													Hospital/Entity				
	PD&C																	
	Corporate Architect	Corporate Engineer	Director of Planning	Director of Design	Director of Construction	Other:	Clinical Asset Management (CAM)	Risk Management	Real Estate	Ergonomics	Infection Prevention (IP)	Info Systems, Data, Telecom (IS)	Other:	Standards Review Committee	Facilities Engineering	Housekeeping	Security	Other:
Primary Authorship	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Secondary Authorship	☒	☒	☒	☐	☒	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐

DOCUMENT REVISION HISTORY

The following able indicates the date the document originated and any subsequent revisions.

Document 601.201		
Issue	Description of Issue	Prepared by
2012 v2	Original Issue	G. Zipfel
2016 v1	Re-organization of Planning/Design Standard, misc. updates	G. Zipfel
2018 v1	Re-numbered, misc. updates	G. Zipfel