Architects • Engineers • Parking Planners

WATRY DESIGN, INC.

Memorandum

Date:	January 10, 2017	WDI No.:	15021.313
Project:	4 W Santa Inez – San Mateo		
From:	Taylor Kim		
To:	John Lucchesi		
Regarding:	Mechanical Parking		

History

Mechanical parking systems are not a new parking strategy. These types of parking configurations are typically used in denser urban areas with limited space for traditional self-park garages. One prevalent type of mechanical parking system is the puzzle lift, also known as a lift-and-slide system. Puzzle lifts offer an independently accessible system, allowing all cars to be accessed without moving another vehicle. This allows the most flexible and convenient parking on this project.

As land values and construction costs have increased, developers and designers have been looking to better utilize volume in parking facilities to meet their parking goals. Traditional single space parking has become prohibitively costly, if not impossible, to build in new urban developments. Alternative parking strategies that create denser parking solutions are common and necessary to provide the number of parking spaces that are both code required and desired by the local market.

Mechanical parking systems create denser parking by utilizing the vertical space above a standard parking space. Puzzle lifts work similarly to a traditional mechanical stacker. A person drives onto a platform and exits the vehicle. Once they are safely outside the system and the gate closes, the driver can press a button or turn a key to store the car in place. Cars on upper pallets are then lifted into place, while cars on the slab level stay in place until an upper car needs to be accessed. Vehicles on the slab level are able to slide horizontally allowing all the upper platforms to be accessed without moving a vehicle. When retrieving a vehicle, the reverse takes place – a button or switch is triggered which signals the system to shift and lower the specific car to be accessed and driven off the platform. Users are typically assigned a specific parking space and code to be able to access their parking space. These can be operated by everyday drivers with minimal training.

Although mechanical and automated parking systems are not commonly used for public parking in the United States yet, they have been used in numerous residential buildings in the Bay Area since the 1990's. They are most conducive for use in residential buildings because of the ability to assign specific parking spaces and train the users.

Some cities like San Francisco and Sunnyvale have recognized these systems and have incorporated their use in zoning codes. It has been forcing designers to come up with creative solutions to minimize the amount of square footage dedicated to parking, which is better used as other occupied space.

Mechanical parking systems maximize vertical and horizontal space while minimizing the required drive aisle and circulation space to park more vehicles. Although installing puzzle lifts require some loss of stalls compared to a traditional stacker, the big advantage is being able to provide all independently accessible parking spaces to residents.

Project Details

4 West Santa Inez is a for-sale residential project with 1, 2, and 3 bedroom units. There are a total of 23 parking spaces for residents and visitors that meet the city's minimum parking requirements. Two of the 23 spaces are provided outside of the secured gate for visitor parking, including one accessible space. These spaces are all

standard self-park spaces that meet the city's parking requirement, without the use of tandem stalls or mechanical lifts. The other 21 spaces are located behind a secured gate for assigned resident parking. Every unit will be sold with dedicated parking spaces. Seventeen of the 21 spaces are in puzzle lifts, while the other four are standard non-mechanical spaces. In total, there are four self-park residential spaces, 17 mechanical spaces, and two self-park visitor spaces. Vehicles that exceed the size limit of the lifts can be parked in one of the self-parking spaces.

Based on our review of the parking layout, we do not see any issues to the function or usability of this parking facility. The layout complies with all of the city's parking regulations which are comparable to general industry standards. These geometrics are very common in the Bay Area, and what you would typically find at public parking garages. The city requires 8'-6" x 18'-0" standard stalls, with an extra 6" next to walls or columns, and an extra 12" with columns or walls on both sides. All of these requirements are met in this project. An additional 3'of drive aisle space is provided at the dead end as required by the code. The lift platform will also be sized for a standard 8'-6" wide stall.

Resident operation of the puzzle lifts is not an issue because basic training and everyday use will increase dedicated users' familiarity with the system. Furthermore, these residences will be for-sale and thus, owners will know what they are purchasing with their units. Familiarity with the garage will make it easier to maneuver and park because they will always be using their designated spaces. Residential units typically have low turnover, and will not require any visitors or unfamiliar drivers to use these parking spaces. Therefore, the proposed design is adequate for providing the required parking in this project.

Conclusion

The independent access puzzle lifts, like the one proposed at 4 West Santa Inez, is the most flexible system and common system on the market today. It is typically an electric powered lift that moves a vehicle on a platform vertically or horizontally. This system allows users to park and retrieve their car from the system themselves, independent of any other vehicle. With regular maintenance, these systems are tried and tested and provide simple operation. The systems are usually expected to have a 20+ year life span. However, with proper maintenance and use, they can have an indefinite life span.

The mechanical lifts need minimal ongoing maintenance that will be provided as part of the Homeowners Association, and paid for by the HOA fees. Maintenance is usually provided from the mechanical lift vendor with the initial purchase agreement for the systems. With the regularly scheduled annual or bi-annual maintenance, there is almost no failure or issue with the systems. Local maintenance crews can be dispatched very quickly, especially during business hours, with response times within one or two hours in case of an issue. The maintenance and service of these systems are similar to those of elevators.

The hoists are very safe and the major manufacturers we have worked with have never had a mechanical failure or injury in their system. Lifts provide several safety features contributing to their clean record with no history of injuries. Some of the safety features include a key switch that only operates when the key is held in the on position to move the platform up or down. The key can only be removed when the platform is all up or all down, and cannot be removed in an intermediate position. The key control is also located outside of the platform area so it cannot be operated while you are located under the platform. Often, a fence or gate is installed in front of or around the systems to further ensure safety of both the vehicles and the users operating the system. With a gated system, like the one proposed, the risk of injury, theft and general interference is avoided.

There is also a mechanical stop that prevents the platform from falling in case there is a hydraulic failure. Wheel stops can be located at specific locations for dedicated user's vehicles to help position it in the right place. These systems are thoroughly tried and tested throughout the world and in the Bay Area.

Below is a list of some projects in the Bay Area with similar mechanical lift systems:

Bay Area Projects – Residential For Sale:

Stonefire, 1974 University Ave. Berkeley, CA – 61 space puzzle, under construction
Thomas Berkley, 528 Thomas Berkley Way Oakland, CA – 22 space puzzle, under construction
Dogpatch, 800 Indiana St. San Francisco, CA – 50 space puzzle with pit, under construction
The Jefferson, 612 18th St. Oakland, CA – 75 space puzzle, under construction
Lumina, 201 Folsom San Francisco, CA – dependent access stackers for valet, completed 2016
The Blu, 631 Folsom San Francisco, CA – 112 independent access puzzle lifts, completed 2009
The Creamery, 425 11th St, Oakland, CA – 6 dependent access stackers
Telegraph Gateway, 24th and Telegraph, Oakland, CA – 12 independent access stackers, completed 2004
The Franklin 88, 9th and Franklin St, Berkeley, CA – 38 dependent access stackers, completed 2004
Shattuck Ave. Lofts, 1849 Shattuck Ave, Berkeley, CA – 12 independent access stackers, completed 1995

Bay Area Projects – Residential For Rent:

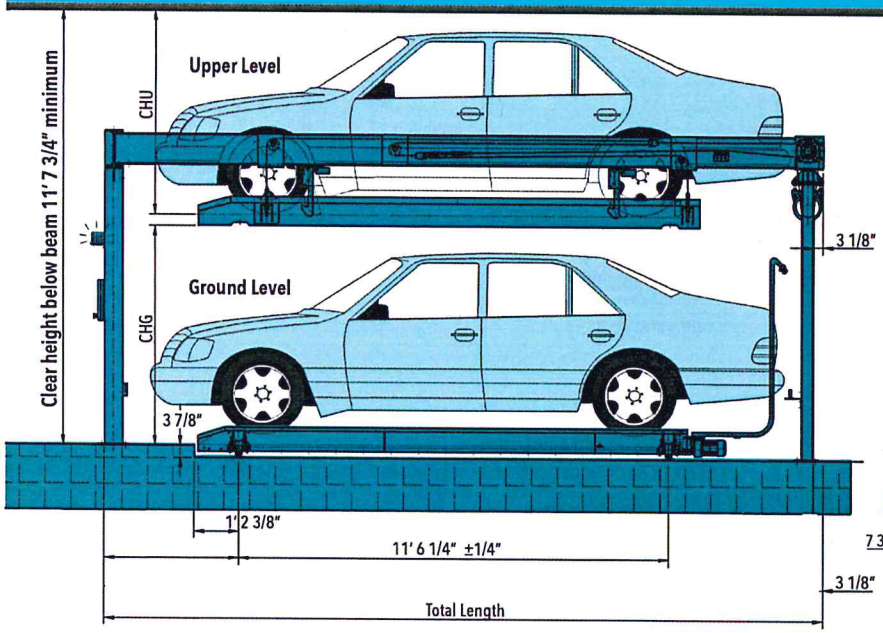
240 Pacific, 240 Pacific Ave. San Francisco, CA -37 space puzzle, under construction
The Austin, 1545 Pine St. San Francisco, CA – 78 space puzzle, under construction
4th & U, 700 University, Berkeley, CA – 125 independent access puzzle lifts, completed 2010
1950 MLK, Berkeley, CA – 40 independent access puzzle lifts, completed 2010
Hillside Village, 1797 Shattuck Ave, Berkeley, CA – 55 independent access stackers, completed 2004
Acton Courtyards, 1370 University, Berkeley CA – 61 independent access puzzle lifts, completed 2004
Fine Arts, 2110 Haste St. Berkeley, CA – 59 independent access puzzle lifts, completed 2004
Telegraph Bays, Carlton & Telegraph Ave, Berkeley, CA – 24 independent access triple stackers, completed 2004
The Gaia Building, 2116 Allston Way, Berkeley, CA – 39 independent access stackers, completed 2002
ARTech Building, 2101 Milvia St. Berkeley, CA – 22 dependent access stackers, completed 2002
Creekside Plaza, 2161 Allston, Berkeley, CA – 12 dependent access platforms, completed 2001
The Berkeleyan, 1910 Oxford St, Berkeley, CA – 39 independent access stackers, completed 1998

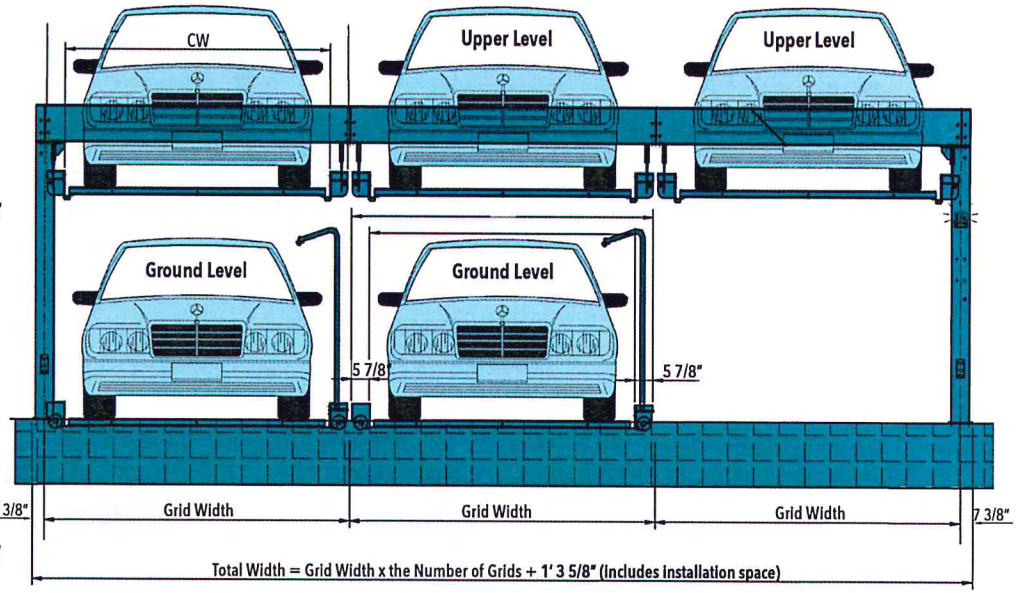
Bay Area Projects – Public Parking:

Broadway/Grand Public Garage, 438 West Grand Avenue Oakland, CA - 30 space puzzle, completed 2015

TWO LEVEL PUZZLE

cityLift
2335 Broadway, Suite 100 Oakland, CA 94612 844-38 80424 citylift parking.com





Standard Two Level Puzzle Specifications

Standard Vehicle Dimensions

	Length	Width	Height
Mid-Size	15' 9"	6'	4' 8"
Full-Size	16' 4 7/8"	6' 2 3/4"	4' 8"
SUV/Van	17' 3/4"	6' 4 3/4"	6'
Oversized/Truck	19'	6' 6 3/4"	6' 4"

Note: Average dimensions. Refer to CityLift Car Grid for specific vehicles.

CityLift Equipment Dimensions

CITYLIFT EQUIPMENT MEASUREMENTS

	Minimum Length	Minimum Grid Width	Minimum Clear Width (CW)
Mid-Size	17' 11"	7' 8 1/2"	6' 7 3/8"
Full-Size	18' 7 5/8"	7' 10 1/2"	6' 9 3/8"
SUV/Van	19' 3 1/2"	8' 1/2"	6' 11 3/8"
Oversized/Truck	19' 3 1/2"	8' 2 3/8"	7' 1 3/8"

Sample Height Configurations

Clear Height (CH)	Maximum Ground Car Height (CHG)	Maximum Upper Car Height (CHU)
11' 7 3/4"	5' 10 7/8"	4' 11"
12'	6'	5' 1"
12' 6"	6' 4"	5' 7 3/8"
13'	6' 4"	5' 10 1/4"
13' 6"	6' 4 3/4"	6' 4"

Heights per level can be configured to customer specifications.

Weight Calculations

Steel Structure per Parking Space	Pallet and Components per Parking Space	Vehicle per Parking Space	Other Components
992 pounds	662 pounds	4,409 pounds*	221 pounds

Total Weight With Cars = (Steel structure + Pallet and Components) x (Number of Spaces) + (Vehicle Weight x Number of Vehicles) + (Other x Number of Spaces)

Total Without Cars = (Steel Structure + Pallet and Components) x (Number of Spaces) + (Other x Number of Spaces)

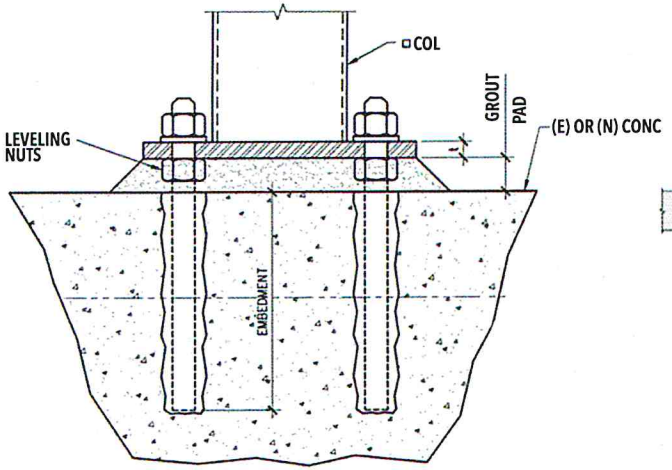
** Standard load is 4,409 lbs per vehicle. Heavier loads up to 5,270 per vehicle available.*
Note: Some oversized vehicles may not be accommodated. Please refer to CityLift Car Grid for specific dimensions and/or custom options.

Custom sizes, tandem configurations, and electric vehicle charging options are available. Please consult with your CityLift design team about which options are best for your project.

ANCHORING OPTIONS for TWO LEVEL PUZZLE

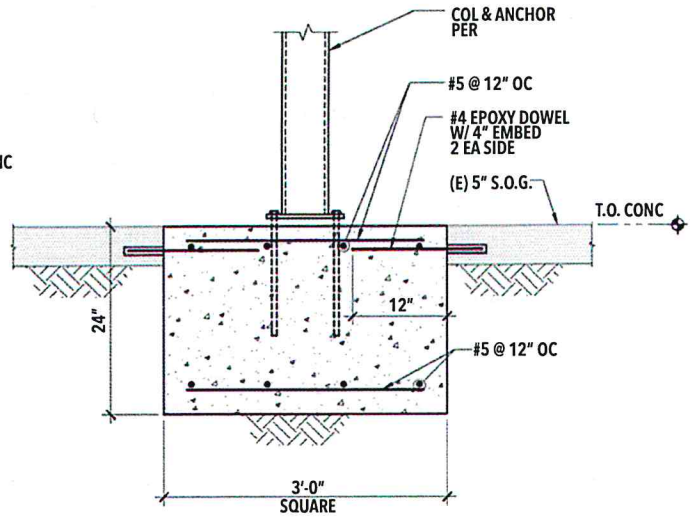
cityLift
2335 Broadway, Suite 100 Oakland, CA 94612 844-388-0424 cityliftparking.com

Our lifts have been designed to be free standing structures for new construction or retrofits. This allows CityLift to anchor directly to the garage floor without the need to attach to an adjacent structure.



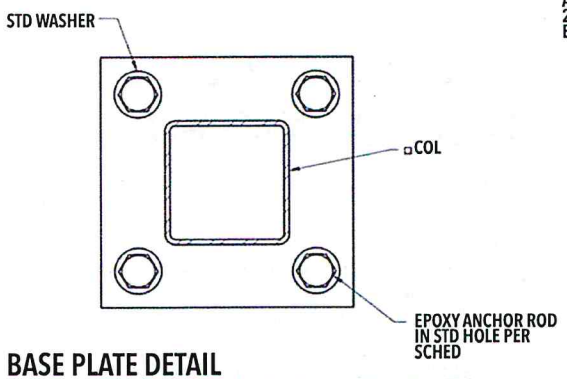
BASE PLATE SECTION AT SOLID SLAB OVER FOOTING

For use with new or existing footing

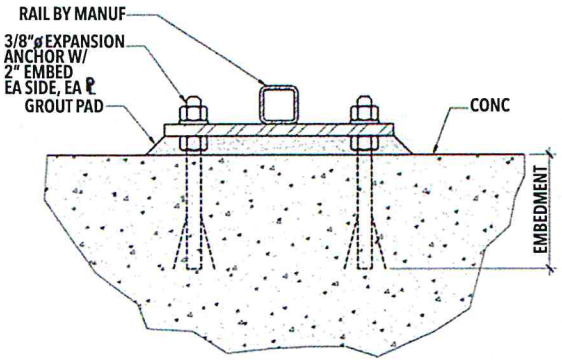


(N) FOOTING

For use with new footing

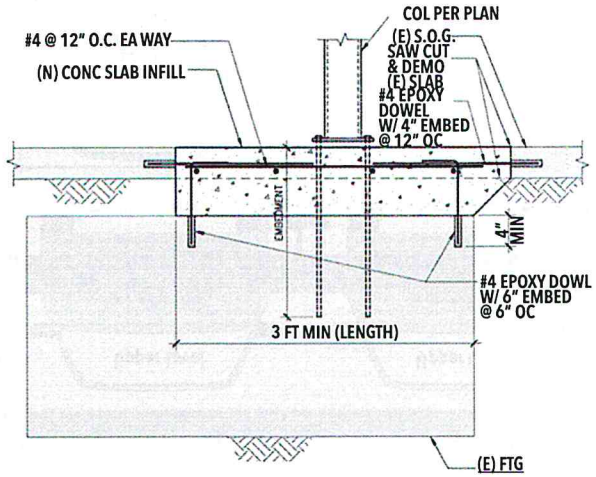


BASE PLATE DETAIL



RAIL ANCHORAGE

For use on existing slab



DETAIL AT SLAB INFILL AT VOID OVER FOOTING

Existing slab above footing

TWO LEVEL PUZZLE
TECHNICAL SPECIFICATIONS

cityLift
2335 Broadway, Suite 100 Oakland, CA 94612 844-388-0424 cityliftparking.com

Speed	**Lifting**	Two options: 6.8 m/min for 4.0 kw motor or 4 m/min for 2.2kw lifting motor
	Traverse	9.0 m/min for 0.37 kw motor
Frame all Q345 (mm unless specified)	**Front column**	Square Steel 150×150×5t (thickness) painted front
	Rear column	Square Steel 120×120×5t painted back
	Front beam	H-TYPE Steel H300×150×6.5 t×9t painted front
	Rear beam	H-TYPE Steel H250×125×6 t×9t painted rear
	Side beam	H-TYPE Steel H125×125×6.5 t×9t painted
Motors	**Power**	480-3 phase/60 hz or 208-3 phase
	Lifting motor	Two options: 4.0 kW-4P or 2.2 kW-4P
	Traverse motor	0.37 kW-4P
	Safety gate motor	0.18 kW-4P
Transmission Components	**Lifting chain**	#100
	Balance chain	#80
	Propeller shaft	Round steel tube70*5t-Shaft60
	Rail of traverse	Square steel tube30×30×3t
Electrical System	**Control method**	PLC control
	Operation method	Button board, auto/manual
	Circuit breaker	ABB S204-C40
	Motor overload protector	TA25DU 10
	Cable Terminal	SAK 2.5/EN, SAK 6.0/EN
	Contactor	ABB A16-30-10*88
	Phase protector	ABB CM-PVS.41S
	Thermorelay	ABB TAU25DU 11
	Relay	CR-M024DC2L+CR-M2SS
	Emergency stop switch	ZB4BS884+ZB4BZ102
	Key switch	XB2-BG21C
	Optoelectronic switch	LD31/LV31/76a/115/136
	Range/limiting switch	Honeywell SZL-VL-S-J, Honeywell SZL-VL-S-J
	Switch power supply	PRO EC03
	Alarm light	826 100 00+956 149 75 DC24V LED+97582605
	Proximity detector	IIS701
	Electromagnetic iron absorption	DC100V

Security Device	1. Security hook anti-dumping device 2. Operation warning device 3. Emergency stop device 4. Electrical overload protection device 5. Operation interlock device 6. Photoelectric safety device for entrance 7. Power brake 8. Vehicle positioning device 9. Power anti-phase protector 10. Vehicle height detector magic eye safety device 11. Overrun protection switch 12. Loose chain detection device
Software Program Protection	Running overtime protection Advance running protection

Components Sample

	Item	Vendor	Certification
Driving System	**Movement Motor**	SEW-Germany	UL
	Lift Motor	SEW-Germany	UL
	Revolve Motor	SEW-Germany	UL
Electrical System	**PLC**	Schneider Electric-France	UL
	Limit Switch	Honeywell	UL
	Infared Photoelectric	Pepperl+Fuchs- Germany	UL

Actual specifications can vary based on size, load, configurations and other factors. Electrical vehicle charging options are available.

CAR GRID:
Mid- & Full-Sized

cityLift
2335 Broadway, Suite 100 Oakland, CA 94612 844-388-0424 cityliftparking.com

Key ○ Fits ⊘ Does Not Fit ● Requires Heavier Load

CARS	LENGTH (in.)	WIDTH (in.)	CURB WEIGHT (lbs.)	EQUIPMENT LENGTH 17' 11 3/4" (215.75 in.)	EQUIPMENT LENGTH 18' 7 5/8" (223.625 in.)	EQUIPMENT LENGTH 19' 3 1/2" (231.5 in.)	EQUIPMENT WIDTH 7' 8 1/2" (84.5 in.)	EQUIPMENT WIDTH 7' 10 1/2" (94.5 in.)	EQUIPMENT WIDTH 8' 1/2" (96.5 in.)	EQUIPMENT WIDTH 8' 2 3/8" (98.375 in.)
Acura RL	194	73	4,035	⊘	○	○	⊘	○	○	○
Audi A8	204	75	4,505 ●	⊘	⊘	○	⊘	○	○	○
BMW 3-Series	178	72	3,460	○	○	○	○	○	○	○
BMW 5-Series	191	73	3,650	⊘	○	○	○	○	○	○
BMW 6-Series	190	73	3,885	○	○	○	○	○	○	○
BMW 7-Series	204	75	4,505 ●	⊘	⊘	○	○	○	○	○
Buick Lucerne	203	74	3,845	⊘	⊘	○	⊘	○	○	○
Cadillac DTS	208	75	4,130	⊘	⊘	⊘	⊘	○	○	○
2001 Chevrolet Camaro	193	74	3,545	⊘	○	○	⊘	○	○	○
Chevrolet Impala	200	73	3,710	⊘	⊘	○	○	○	○	○
Chevrolet Monte Carlo	197	73	3,625	⊘	○	○	○	○	○	○
Dodge Charger	200	75	4,170	⊘	⊘	○	⊘	○	○	○
2001 Dodge Intrepid	204	75	3,471	⊘	⊘	○	⊘	○	○	○
Ford Crown Victoria	212	78	4,280	⊘	⊘	⊘	⊘	⊘	⊘	○
Ford Five Hundred	201	75	3,725	⊘	⊘	○	⊘	○	○	○
Ford Mustang	188	74	3,585	○	○	○	⊘	○	○	○
Honda Accord	190	72	3,455	○	○	○	○	○	○	○
Honda Civic	177	69	2,810	○	○	○	○	○	○	○
Infiniti G	187	69	3,515	○	○	○	○	○	○	○
Infiniti M	193	71	4,095	⊘	○	○	○	○	○	○
2001 Infiniti Q45	200	73	3,801	⊘	⊘	○	○	○	○	○
Jaguar S-Type	192	72	3,880	⊘	○	○	○	○	○	○
Jaguar XJ	200	73	3,860	⊘	⊘	○	○	○	○	○
Jaguar XK	189	82	3,890	○	○	○	⊘	⊘	⊘	⊘
Kia Amanti	196	73	4,020	⊘	○	○	○	○	○	○
Kia Optima	186	71	3,285	○	○	○	○	○	○	○
Lexus ES	191	72	3,670	⊘	○	○	○	○	○	○
Lexus GS	190	72	3,915	○	○	○	○	○	○	○
Lexus IS	180	71	3,510	○	○	○	○	○	○	○
Lexus LS	198	74	4,240	⊘	⊘	○	⊘	○	○	○
Lincoln Town Car	215	78	4,415 ●	⊘	⊘	⊘	⊘	⊘	⊘	○
Mazda G	187	70	3,150	○	○	○	○	○	○	○
Mercedes Benz S	205	73	4,465 ●	⊘	⊘	○	○	○	○	○
Mercedes Benz E	190	71	3,745	○	○	○	○	○	○	○
Mercury Grand Marquis	212	78	4,180	⊘	⊘	⊘	⊘	⊘	⊘	○
Mercury Milan	191	72	3,320	⊘	○	○	○	○	○	○
Mercury Montego	201	75	3,725	⊘	⊘	○	⊘	○	○	○
2001 Mercury Sable	198	73	3,340	⊘	⊘	○	○	○	○	○
Mitsubushi Galant	190	72	3,430	○	○	○	○	○	○	○
Nissan Maxima	194	72	3,545	⊘	○	○	○	○	○	○
2003 Oldsmobile Aurora	199	73	3,802	⊘	⊘	○	○	○	○	○
Pontiac Grand Prix	198	72	3,630	⊘	⊘	○	○	○	○	○
Porshe 911 Turbo	176	71	3,305	○	○	○	○	○	○	○
Saab 9-3	182	68	3,370	○	○	○	○	○	○	○
Saab 9-5	190	71	3,540	○	○	○	○	○	○	○
Saturn Aura	190	70	3,570	○	○	○	○	○	○	○
Subaru Outback	189	70	3,705	○	○	○	○	○	○	○
Toyota Avalon	197	73	3,600	⊘	○	○	○	○	○	○
Toyota Camry	189	72	3,530	○	○	○	○	○	○	○
Volkswagon Beetle	161	72	3,280	○	○	○	○	○	○	○
Volkswagon Jetta	179	69	3,615	○	○	○	○	○	○	○
Volkswagon Passat	188	72	3,615	○	○	○	○	○	○	○
Volvo S30	191	73	3,485	⊘	○	○	○	○	○	○

Notes: Standard load is 4,409 lbs per vehicle. Heavier loads up to 5,760 per vehicle available. Dimensions are taken from Car and Driver Magazine based on 2007 models and are not guaranteed. Individual cars should be measured.

CAR GRID:
SUVs, Vans & Trucks

cityLift
2335 Broadway, Suite 100 Oakland, CA 94612 844-388-0424 cityliftparking.com

Key ● Fits ⊘ Does Not Fit ● Requires Heavier Load

SUV/VAN/ TRUCK	LENGTH (in.)	WIDTH (in.)	CURB WEIGHT (lbs.)	EQUIPMENT LENGTH 17' 11 3/4" (215.75 in.)	18' 7 5/8" (223.625 in.)	19' 3 1/2" (231.5 in.)	EQUIPMENT WIDTH 7' 8 1/2" (84.5 in.)	7' 10 1/2" (94.5 in.)	8' 1/2" (96.5 in.)	8' 2 3/8" (98.375 in.)
BMW X5	191	76	4,980 ●	⊘	●	●	⊘	⊘	●	●
Cadillac SRX	195	73	4,685 ●	⊘	●	●	●	●	●	●
Chevrolet Uplander	205	72	4,380 ●	⊘	⊘	●	●	●	●	●
Chvrolet Trailblazer	192	75	4,830 ●	⊘	●	●	⊘	●	●	●
Chevrolet Silverado	230	80	5,280 ●	⊘	⊘	⊘	⊘	⊘	⊘	⊘
Chevrolet Suburban	222	79	5,990 ●	⊘	⊘	⊘	⊘	⊘	⊘	⊘
Chevrolet Colorado	207	69	4,270 ●	⊘	⊘	⊘	●	●	●	●
Chrysler Aspen	202	76	5,335 ●	⊘	⊘	●	⊘	⊘	●	●
Chrysler Pacifica	199	79	4,635 ●	⊘	⊘	●	⊘	⊘	⊘	●
Chrysler Town & Country	201	79	4,515 ●	⊘	⊘	●	⊘	⊘	⊘	●
Dodge Dakota	219	74	4,790 ●	⊘	⊘	⊘	⊘	●	●	●
Dodge Ram	228	80	5,380 ●	⊘	⊘	⊘	⊘	⊘	⊘	⊘
Ford Expedition	206	79	5,900 ●	⊘	⊘	⊘	⊘	⊘	⊘	⊘
Ford Explorer	193	74	4,905 ●	⊘	●	●	⊘	●	●	●
Ford Explorer Sport Trac	210	74	4,985 ●	⊘	⊘	⊘	⊘	●	●	●
Ford F-150 Reg. Cab	224	79	5,690	⊘	⊘	⊘	⊘	⊘	⊘	⊘
Ford Ranger 4x2	202	70	3,870	⊘	⊘	●	●	●	●	●
Ford Freestar	201	77	4,280	⊘	⊘	●	⊘	⊘	⊘	●
Honda Odyssey	201	77	4,615 ●	⊘	⊘	●	⊘	⊘	⊘	●
Honda CR-V	178	72	3,505	●	●	●	●	●	●	●
Isuzu Ascender	192	75	4,830 ●	⊘	●	●	⊘	●	●	●
Infiniti QX	207	79	5,630 ●	⊘	⊘	⊘	⊘	⊘	⊘	⊘
Jeep Grand Cherokee	186	84	4,725 ●	●	●	●	⊘	⊘	⊘	⊘
Kia Sedona	202	78	4,725 ●	⊘	⊘	●	⊘	⊘	⊘	●
Lexus RX	186	73	4,200	●	●	●	●	●	●	●
Lincoln Navigator	208	79	6,070	⊘	⊘	⊘	⊘	⊘	⊘	⊘
Mazda Tribute	175	70	3,575	●	●	●	●	●	●	●
Mercedes Benz M	189	75	4,845 ●	●	●	●	⊘	●	●	●
Mitsubishi Outlander	183	71	3,670	●	●	●	●	●	●	●
Nissan Pathfinder	188	73	4,875 ●	●	●	●	●	●	●	●
Toyota 4Runner	189	74	4,345	●	●	●	⊘	●	●	●
Toyota Land Cruiser	193	76	5,435 ⊘	⊘	●	●	⊘	⊘	●	●
Toyota Rav4	181	76	3,750	●	●	●	⊘	⊘	●	●
2001 Toyota Sienna	200	77	4,365	⊘	⊘	●	⊘	⊘	●	●

Notes: Standard load is 4,409 lbs per vehicle. Heavier loads up to 5,760 per vehicle available. Dimensions are taken from Car and Driver Magazine based on 2007 models and are not guaranteed. Individual cars should be measured.