SOLVING LA’S PARKING DILEMMA:
HIGH DENSITY PARKING SYSTEMS

THURSDAY, MARCH 28, 2019
8:00AM-12:00PM // UCLA
Parking is and continues to be a threshold issue for development. Despite the use of Uber, Lyft, electric scooters, ride sharing, Metro and the coming of autonomous cars, parking requirements still exist along with market requirements. With the use of mechanical, semi-automated and fully automated/robotic high-density parking systems, developers can save space and dollars to eliminate parking levels.

Several of these high-density parking systems are currently in use throughout Los Angeles, with many more in the pipeline. Some of these projects provide for repurposing of garage levels at a future date. This is typically accomplished by above-grade levels with sufficient height to accommodate stackers or lift slide systems that can later be unbolted and removed to allow for office or residential use.

Please join the UCLA Ziman Center for Real Estate and our industry experts on Thursday, March 28th for a timely discussion on the latest technology, planning and implementation of high-density parking systems in a development project. Our program panels will include a developer, an architect, a contractor, a construction manager, high-density parking systems providers, and municipal officials, each of whom has incorporated one or more of these systems in projects.

**Donald Shoup**
Distinguished Research Professor, Department of Urban Planning, UCLA
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KEYNOTE
Donald Shoup
Distinguished Research Professor,
Department of Urban Planning, UCLA

FEATURED SPEAKERS

Shahen Akelyan
Assistant Deputy Superintendent of Building, Department of Building and Safety, City of Los Angeles

Oscar Delgado
Deputy City Manager, City of West Hollywood

Andrew Demming
Senior Director & Board Member, Gardiner & Theobald

Yair Goldberg
Executive VP of Sales & Marketing, Unitronics

Matt Howell
Senior Vice President, Western Region, Lincoln Property Company

Michael O’Bryan
President, West Coast Operations, Park Plus California Inc.

Amy Pokawatana, AIA, LEED AP
Director, Development, Hudson Pacific Properties

Michael Vetters
Senior Project Manager, RA, Choate Parking Consultants

George Winter
Senior Project Manager, Morley Builders

Paula Reddish Zinnemann
CNO, West Coast Operations, Park Plus Inc.
History of High Density Parking (HDP)

Vehicle stacking-type technologies have been a part of the parking industry since its origin in the early 20th century. As long as the motor vehicle has been around, so has the need to park it. Some of the first types of garages put to use mechanical devices such as turntables and elevators to efficiently store vehicles on multiple levels. The ramp-access garage gained popularity in the 1920s, and several multi-story automated parking garages were constructed in the United States during that time using systems that fully integrated vertical and horizontal movement with a center open space for the transfer of vehicles. One of the first automated garages that went beyond elevators and turntables was developed in Paris by Augustus Perret; the Garage Rue de Ponthieu which made its debut in 1905 (as cited in McDonald, 2007). Inside the garage, an elevator lifted and transferred the vehicles onto pallets on horizontal tracks that were then moved to a parking spot. It may well have been the world’s first automated parking system. Although technology may have improved in the intervening years, the concept remains the same.

While innovations in architecture and engineering continued, the demand for high density parking declined in the 1950s. Some garages are still in use today, but many have been repurposed and adaptively reused and converted into apartments and condominiums (as cited in McDonald 2007).
Since the last Parking Dilemma Program in 2011 more than 100 HDP systems have been built in the Los Angeles Area. PARKPLUS has built more than 40 projects in LA in the last 3 years with another 50 under construction and in the permitting process. This demonstrates the trend towards High Density Parking in LA.
High Density Parking System Types

**MECHANICAL**
Manually operated systems for basic stacking

**AUTOMATED**
Advanced technologies for robotic parking solutions

**SEMI AUTOMATED**
Hybrid design for effective self-park stacking

**CUSTOM SOLUTIONS**
Creative solutions for custom design & exposure
HDP Systems: Rack and Rail Automated Parking Systems

Rack and Rail Comb Type Systems

AGV Pallet Type Systems

Rack and Rail Pallet Type Systems

Rack and Rail Pallet-less Type Systems

Under Construction Valencia

Helms, LA

West Hollywood
HDP Systems: Semi-Automated Puzzle Parking Systems

Various Locations in SoCal

3 Level Puzzle System with Pit

5 Level Puzzle System Indoors with Pit

4 Level Puzzle System Outdoors

6 Level Puzzle System with Skin
HDP Systems: Stacker Parking Systems

- Santa Monica: Double Car Stacker Subterranean
- Venice Beach: Quad Car Stacker, Indoors
- Los Angeles: 3 Level Triple Car Stacker w/ Screening
- Under Construction, Playa Vista: Quad Car Stacker, Indoors
HDP Systems: Pit Systems and Carousel Systems

Bel Air
Double Deep Pit Systems

Pasadena
2 Post Double Wide Pit System

Carousel Parking Systems

Manhattan Beach
4 Post Pit Systems
HDP Systems Trends: How Los Angeles Developers are planning for the future.
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HDP Systems Trends: How Los Angeles Developers are planning for the future.

Automated Parking Systems

DP003 Double Stackers

LS2H Lift Sliding System

SP100 Suspended Platform
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HDP Systems: Rack and Rail Automated Parking Systems
SOLVING LA’S PARKING DILEMMA: HIGH DENSITY PARKING SYSTEMS

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HDP Systems: Double Stackers and Puzzle Parking Systems

Under Construction, WeHo

Hollywood
HDP Fire Department Guidelines and Requirements

ALI is in the process of developing ANSI standards for Mechanical Car Stackers, but currently there is no national standard for Mechanical, Semi-Automated and Automated Parking Systems. Each Municipality adopts its own set of guidelines and standards for occupancy type, building code requirements, planning requirements, and fire protection requirements. The City of Los Angeles has adopted the most comprehensive set of guidelines for these system types and continues to amend and expand these guidelines periodically.

The UBC and NFPA 88A and 13 address some general aspects of mechanical and automated parking but most municipalities find it difficult to fit the vast variety of system types into their current codes. Most Cities in SoCal treat 2 level system, which only raises one car between primary supporting members, as equipment, but all other systems supporting 2 or more cars are reviewed seismically as non-building structures. Fire protection is often provided similar to high pile storage for open racking systems, and similar to S-2 occupancies for AGV types systems.
PARKING DESIGN

I. GENERAL REQUIREMENTS

A. STALL WIDTHS

1. Minimum 8 ft 6 inches wide for standard stalls serving dwelling units.
2. Minimum 8 ft 4 inches wide for all other standard stalls.
3. Minimum 8 ft 0 inches wide for all parallel parking standard stalls.
4. Minimum 7 ft 6 inches wide for all compact stalls.
5. For disabled access stall widths and other requirements, refer to Information Bulletin P/BC 2008-084.
6. Stall widths must be increased 10 inches for obstructions, except for stalls serving single family dwellings and duplexes, as shown in Figures 8 & 9 and shall be increased for end stall conditions as shown in Figures 2 and 3 in section N. For purposes of determining increases for obstructions, property lines shall be considered as obstructions. No increase for obstructions is required for parallel parking stalls.

B. STALL DEPTHS

1. Minimum 18 feet deep for all standard stalls.
2. Minimum 15 feet deep for all compact stalls.
3. Minimum 26 feet deep for all standard parallel stalls and 30 feet deep for end parallel stalls.
4. Minimum 23 feet deep for all compact parallel stalls and 27 feet deep for end parallel stalls.

C. COMPACT PARKING SPACES PERMITTED

In parking areas or garages containing 10 or more spaces for other than dwelling uses, up to 40% of the total required parking spaces and 100% of the non-required parking spaces may be compact. For dwelling uses, all parking stalls in excess of one stall per unit may be compact. Unless specified otherwise, required guest parking spaces may be compact spaces.

D. ACCESS AISLE AND PARKING BAY WIDTHS

1. The basic access aisle and parking bay widths for compact and standard stalls are shown in Tables 1 through 6.

G. MECHANICAL AUTOMOBILE PARKING LIFTS

Mechanical automobile parking lifts can be used to provide required parking spaces with the following conditions:

1. Types of mechanical automobile parking lifts that are covered by this section are:
   a. 2- post lifts
   b. Scissor lifts
   c. 4-post lifts

Other types of mechanical automobile parking lift system may be considered on case-by-case bases. See Figure 12 below for graphical representation of the typical lifts.

2. The platform of the mechanical lift on which the automobile is first places shall be individually and easily accessible and shall be placed so that the location of the platform and vehicular access to the platform meets the LAMC Section 12.21A5(a), (b), and (i) requirements.

3. An approved Los Angeles Research Report (LARR) from the Los Angeles Building and Safety’s Electrical Testing Laboratory is required for a mechanical automobile parking lifts. All of the conditions of approval shall be complied with.
4. Mechanical automobile parking lifts must maintain the following clear width between vertical supports or any obstructions:
   a. Minimum 8'-0" clear width for standard stalls
   b. Minimum 7'-0" clear width for compact stalls.
   See Figure 13 below for additional information.

5. The stall heights within the mechanical automobile parking lifts shall be as follows:
   a. Minimum clear height of 7'-0" for standard stalls
   b. Minimum clear height of 6'-0" for compact stalls
   See Figure 14 below for additional requirements.

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FIGURE 13- MINIMUM CLEAR WIDTH BETWEEN SUPPORTS AND OBSTRUCTIONS

FIGURE 14- MINIMUM CLEAR HEIGHTS
Los Angeles City HDP Zoning Codes and Planning Requirements

**Requirement for Different Types of Systems**
- Planning
- General Building Codes Requirements
  - Architectural
  - Structural (ASTM Steel, Approved Fabricator)
- Electrical and Mechanical Codes (LADBS Electrical Test Lab)
- Fire Code (FPB 101 Fire Protection Guidelines)
- Administrative (Covenants and Agreements)

**Building Code Requirements:**
- There are general provisions in the IBC for Automated Parking Garages that can be followed in collaboration with the Fire Department Requirements.
- Enclosed Mechanical and Automated Parking Garages - occupancy classification determined with help from LAFD
- Open Mechanical and Automated Parking Garages - may be considered as S-2 occupancy.
- Other requirements - Using Sound Engineering and Construction Judgement.
- Engineering review as Non-building Structures, ASTM steel required for Lateral Resisting Systems.

**Electrical Test Lab:**
- An approved Los Angeles Research Report (LARR) from the Los Angeles Building and Safety’s Electrical Testing Laboratory is required for mechanical and automated parking systems. All of the conditions of approval shall be complied with.
Los Angeles City HDP Zoning Codes and Planning Requirements

**Architectural Requirements:**
- Mechanical automobile parking lifts must provide adequate door clearance for attendant to exit a vehicle per manufactures specifications.
- Minimum Height Requirements for Standard and Compact Stalls
- Mechanical automobile parking lifts shall be arranged in such a manner as to allow full operation of the sprinkler systems.
- A minimum height of 14’ compact/compact to 16’ standard/standard for indoor installations.
- The height may be reduced by 18” if in a non-sprinklered garage, or when a approval has been obtained from the Mechanical Plan Check for wall mounted fire sprinklers.
- Additional headroom may be required for roll-up garage doors.

**Administrative Requirements:**
- A “Covenant and Agreement Regarding Maintenance of Vehicle Lift System” shall be recorded with LA County Recorder’s Office to maintain vehicle lift system in operable conditions at all times.
- A “Covenant and Agreement to Provide Parking Attendant” shall be recorded with LA County Recorder’s Office for tandem parking in public areas.
Los Angeles City HDP Zoning Codes and Planning Requirements

**Fire Department Requirements**
Mechanical automobile parking lift shall comply with Los Angeles Fire Department (LAFD), Fire Prevention Bureau Requirement. *FPB 101 Mechanical Parking Design Requirements.*

**LAFD Issues of concern:**
Access: To system and vehicles in the system
Fire Detection and Reporting
Fire Attack, how will they get to fire and what is their water source.
Fire Fighters Safety
Automatic and Manual Emergency Shut Down
Fall Protection
Two means of access to each level.

**FPB 101 Highlights:**
- Mechanical Parking Storage Area must be within 150’ of a fire lane and within 150’ from a fire hydrant.
- Mechanical Car Stacker Piles must be separated from property lines, and buildings per the FPB 101.
- Each platform must be directly accessible from a Main Aisle or Fire Lane and Side Aisle access.
- Tandem Mechanical Parking must provide access to the back row.
- Catwalks required for third and fourth level.
- Mechanical Car Stacker Piles shall not be located with in 15 feet from opening in a building.
- Mechanical Parking Storage Area shall be separated from other uses by a 2 hour fire wall.
- Mechanical Ventilation must be provided per the Mechanical Code at a minimum of four air changes per hour and up to seven air changes when smoke removal is required.
City of West Hollywood Municipal Code
19.28.090 Parking Area Design and Layout Standards.

H. Mechanical Parking Lifts. **Mechanical parking lifts may be used to satisfy parking requirements** at the discretion of the review authority through the approval of the parking plan required by Section 19.28.030(A) (General Parking Regulations - Layout and Access Plan Required), as follows.  
- The permit shall condition: **screening, noise and/or landscaping requirements** for mechanical lift systems
- shall not park more than **three levels**.
- shall be operated by a **valet or attendant** at all times.
- At least one parking lift level shall have a minimum unobstructed clearance **height of six feet six inches**.
- All other levels shall have a minimum unobstructed clearance **height of five feet**.
- installed on existing surface lots shall be **covered on top and screened on all sides**.
- Residential Uses. Mechanical parking lifts shall **not park more than two levels** of cars.
- For self-park lift systems, each parking lift level shall have a minimum unobstructed clearance **height of six feet six inches**.
- **Minimum Width and Length** of Parking Space shall comply with subsection (B)(1) (Parking Area Design and Layout Standards).
- Mechanical parking lifts shall provide a **manual override** to access or remove vehicles from the parking lift.
- Mechanical lifts shall be designed to **prevent vehicle liquids and/or debris** from spilling onto other vehicles.

I. Automated Parking Structures. Automated parking structures may be used to satisfy parking requirements at the discretion of the review authority through the approval of the parking plan required by Section 19.28.030(A) (General Parking Regulations - Layout and Access Plan Required).
- A development permit is required for an automated parking structure.
- Parking Operations Plan is required.
- **On-Site Generator** is required
- shall be **designed per Section 19.28.110** (Parking Structure and Rooftop Parking Standards).
- in commercial zones shall have **pedestrian-oriented uses on the ground floor**
- shall be designed with a method to **prevent vehicle liquids and/or debris** from spilling onto other vehicles or building surfaces.
HDP Systems: Screening and Landscaping

LA - Arts District
Triple Stacker w/ Screening with Landscaping

Newport Beach
Stacker w/ Roof, Landscaping, and Screen

Culver City
Triple Stackers Fully Screened w/ Sprinklers

Culver City
Double Stackers Fully Screened
Design Considerations:

- Capacity
- Performance level / throughput
  - Peak entry/exit (appropriate time frame)
  - Different uses, their direction of traffic and overlap of peak hours
  - Is the performance limiting the parking capacity?
- Access (ingress and egress)- both external and internal
- System type selection for specific use (residential, commercial, retail, mixed-use) and given footprint.
- Users (monthly users Vs. transient users, their ratio and impact of uses on peak performance)
- Operational costs and operational savings
- Repurposing options

Other considerations
- Managing user expectations (information age, app based operation)
- Vendor selection (qualification in a lowest bid situation)
- Project structure (GC qualification, GC involvement early on, responsibilities matrix)
- Intellectual Property considerations
- Long term service and maintenance (spare parts, local service, price)
Los Angeles Case Studies: Small Lot Subdivisions
Los Angeles Case Studies: WeHo Municipal Garage

WeHo MUNICIPAL GARAGE
WEST HOLLYWOOD, CA

The WeHo Municipal Automated Parking Garage serves City Hall and the renovated Community Plaza.

It decreased CO2 emissions as cars no longer have to circle the lot looking for a parking space. The facility is solar-powered.

The garage uses 60% of the volume compared to a non-automated garage.

The city turned this space into West Hollywood’s Community Plaza, a “tranquil park-like space” complete with trees, benches, a water feature, and stage.
Los Angeles Case Studies: WeHo Municipal Garage
Los Angeles Case Studies: WeHo Municipal Garage

EXISTING SITE PLAN

68 Spaces Total
Los Angeles Case Studies: WeHo Municipal Garage
Los Angeles Case Studies: WeHo Municipal Garage
Los Angeles Case Studies: bLAckwelder Campus - 132 Cars, 9,000sf
Los Angeles Case Studies: bLAckwelder Campus

Parcel A
99 Standard Stalls
Triple Stackers

Parcel B
33 Stalls
Triple Stackers

Parcel A
99 Compact Stalls
8 Level Garage

Parcel B
11 Stalls
Surface Stalls

Existing Building
Utility Easement
Private Street

Ramp

132 Cars
9,000 sf Site
3 levels
17,952 sf

110 Cars
9,000sf Site
8 levels
63,159 sf

Utility Easement
Private Street
Los Angeles Case Studies: bLAckwelder Campus

**Challenge:** Maximize parking on a 9,000sf site area while maintaining two separate parcels under separate ownership and utility easement between parcels.

- **132 Parking Stalls**
  - 12-14 Weeks to Erect
  - Cost $1.75 Million
  - Integrated into Context

- **110 Parking Stalls**
  - 12-14 Months to Build
  - Cost $3.5 Million
  - Out of Context
Los Angeles Case Studies: bLACKwelder Campus
Thinking of parking as a machine is a new process in the United States, but by examining how many sustainable aspects can be contributed by using these new technologies, this parking solution can be appropriate and the best choice in many situations. While HDP systems cannot compete in cost to a stand-alone parking lots or conventional garages where land is not a major concern, the HDP systems have many applications and contributions to sustainability that can encourage walkable design and sustainability while still allowing for personal automobile use. Even in underground applications, the HDP systems can most frequently be the best choice for long term sustainability.

Resources


