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Parking Space 'Wheel Stops' in California – Answers for Puzzled Facility Owners, Managers, and Designers

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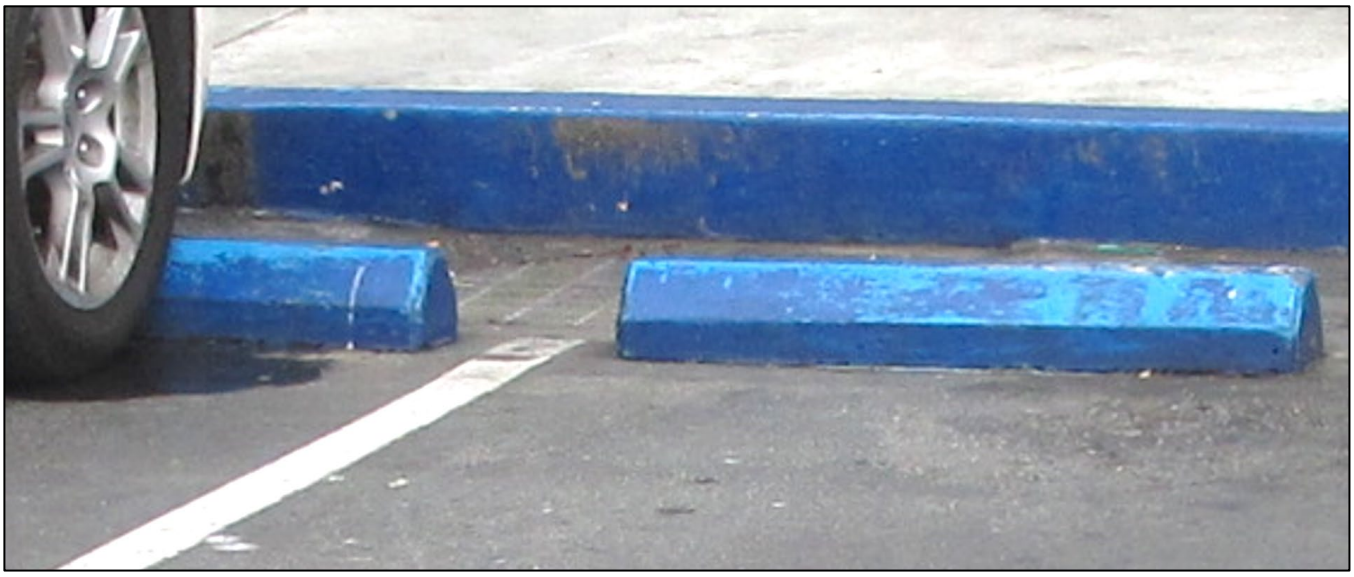

Photo 1 – Pedestrian trip-and-fall incidents at parking space wheel stops occur far too often throughout California.

Even though trip-and-fall injuries at parking space ***wheel stops*** continue to occur throughout California (and the nation), parking facility owners, managers, and even licensed architects and engineers often are reluctant to remove them due to fears of unknowingly violating provisions of the federal Americans with Disabilities Act (ADA), the California Building Code (CBC), or the state's Unruh Civil Rights Act. This paper outlines why most of these fears are unfounded by answering the following questions:

- For what functional purposes are wheel stops commonly installed?
- Don't wheel stops also function as physical 'barriers' that stop moving vehicles? (NO)
- Aren't wheel stops mandated by state or federal code? (NO)
- Must wheel stops at accessible parking spaces be painted blue? (NO)
- At which wheel stop locations are pedestrian trip-and-fall injuries most likely to occur?
- Can wheel stops readily be eliminated (or repositioned) to make parking facilities safer? (YES)
- Shouldn't parking wheel stops be positioned close to the perimeter striping? (NO)
- Is there a code-prescribed "correct" length for wheel stops? (NO)

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➢ Question 1 – For what purposes are wheel stops installed?

In general, there are two standard uses for wheel stops at parking facilities:[1]

i. To warn and deter drivers from damaging structural interactions – such as 'car vs. building', 'car vs. car', and 'car vs. steel post' encounters; and

ii. To deter vehicle encroachment into designated pedestrian walkways.

In short, wheel stops serve as a ***physical signal*** to drivers that no further forward movement is advised:

Photo 2 – At this shopping mall in Capistrano Beach, California, the concrete wheel stops deter vehicle encroachment into the code-required clear width (60 inches) of this wheelchair-accessible sidewalk.

[1] Reference our 2018 paper, "*Uses and Misuse of Wheel Stops at Parking Spaces in California*": https://avelar.net/position-paper-uses-and-misuse-of-wheel-stops-at-parking-spaces-in-california/.

➢ Question 2 – Don't wheel stops also serve as physical 'barriers' that stop moving vehicles?

NO --- wheel stops do not function as a protective safeguard against cars accidently being driven over them (often, when the driver mistakes the gas pedal for the brake):

Photo 3 – In Las Vegas, NV this vehicle was not stopped by the wheel stop or by the now-flattened 'ADA' signpost.

Photo 4 – In Phoenix, AZ neither the wheel stop nor the now-flattened 'ADA' signpost prevented this vehicle damage.

Photo 5 – Neither the wheel stop nor this 'ADA' post stopped this car from being driven into the middle of this store in Gresham, OR.

At highly concentrated areas of pedestrian-vehicular interaction (such as busy storefronts), we instead strongly recommend installation of ***structural bollards*** in lieu of wheel stops to prevent such crashes.[2]

- Reference our paper, "*Reducing Parking Lot Injuries, Storefront Crashes, and Tort Claims: Safety Bollards, ADA Parking Signposts, and Wheel Stops*", coauthored with Rob Reiter of the Storefront Safety Council.[3]

Photo 6 – There are no wheelstops anywhere in the entire parking lot at this shopping mall in San Clemente, CA --- at the storefronts, bollards have been installed to protect pedestrians (and the buildings) from moving vehicles.

Photo 7 – At this Mill Valley, CA shopping mall, wheel stops have been replaced with bollards (concrete-filled steel piping) to protect pedestrians using the wheelchair-accessible walkway.

[2] Reference our 2019 paper, "*Let's Eliminate Parking 'Wheel Stops' at Busy Storefronts*": https://avelar.net/lets-eliminate-parking-wheel-stops-at-busy-storefronts/.
[3] https://www.storefrontsafety.org.

Photo 8 – These structural bollards in Fullerton, CA serve to maximize pedestrian safety and accessibility.

As seen in Photos above, bollards are vertical posts, commonly fabricated from steel, that can function as a physical barrier against vehicle-into-building and vehicle-into-pedestrian crashes and also against improper vehicle intrusions ("overhangs") into the required width accessible pedestrian routes.

- Industry standard ASTM F3016 (*Standard Test Method for Surrogate Testing of Vehicle Impact Protective Devices at Low Speeds*), promotes and standardizes the testing of such structural bollards, making it easier for designers to specify the appropriate crash-tested system.
- Specifically, ASTM F3016 details a testing method to determine a bollard's ability to stop a 5,000-pound test vehicle traveling at 10, 20 and 30 miles per hour.[4]

Importantly, however, it certainly can be appropriate at parking facilities to install bollards that do not constitute crash-tested, engineered 'physical barriers' able to stop speeding vehicles.

- At many locations, as identified by each facility's qualified designer, the use of less-load-resistive (i.e., less expensive) bollards – whether rigid or flexible – can, in the same manner as a wheel stop, satisfactorily serve as a 'physical signal' to drivers that no further forward movement is advised – while also not creating a potential pedestrian tripping hazard.
- In short, any "*either-or*" assertion that wheel stops only may be replaced with ASTM-certified, crash-tested structural bollards should be rejected --- such decisions always are project-specific.

[4] https://www.astm.org/f3016_f3016m-14.html

➢ Question 3 – Aren't wheel stops mandated by the Americans with Disabilities Act?

NO --- the "2010 ADA Standards for Accessible Design" (2010 ADAS) and the CBC only suggest – as a possible option – using wheel stops for one purpose: to ensure that "*cars and vans, when parked, cannot obstruct the **required clear width** of adjacent accessible routes.*"[5] [Bold emphasis added.]

- Per Section 403.5 of the 2010 ADAS, the minimum ***required clear width*** of wheelchair-accessible exterior walkways commonly is 36 inches.
- Comparably, per Section 11B.403.5 of the California Building Code, the minimum ***required clear width*** of wheelchair-accessible exterior walkways commonly is 48 inches.

In short, the ADA and CBC decree that vehicles utilizing parking spaces should not overhang adjacent accessible walkways in such a manner that wheelchairs cannot negotiate the minimum ***required clear width*** of these walks --- however, as seen at Photo 7 above (and multiple Photos below), such deterrence also can be accomplished with bollards in lieu of wheel stops

- Neither the ADA nor the CBC requires or recommends wheel stops at any parking space (whether accessible or not) for any other purpose --- consider the nonrequired wheel stops in Photo 9 below.
- Further, if the adjacent wheelchair-accessible walkway significantly exceeds its minimum "required clear width", then ***no wheel stop, bollard (or any other form of deterrent) is necessary*** – because overhanging vehicles cannot obstruct this accessible route --- e.g., consider Photo 13 below.

Photo 9 – Neither the ADA nor the CBC requires or recommends wheel stops at these Oakland, CA parking spaces.

[5] Section 502.7 (Relationship to Accessible Routes) and Advisory 502.7 of "2010 ADA Standards for Accessible Design": https://www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm. (Note: Section 502.7 of California Building Code Chapter 11B is identically worded.)

Photo 10 – Comparably, neither the ADA nor the CBC requires or recommends wheel stops at this shopping mall parking lot in San Clemente, CA

Photo 11 – At this Corte Madera, CA parking lot, these two wheel stops serve no code-required function. (The intended purpose of these tripping hazards apparently is to protect the metal 'ADA' signpost from vehicle damage.)

Photo 12 – At this Mill Valley, CA parking lot, this difficult-to-see wheel stop serves no code-required function.

Photo 13 – At this Corte Madera, CA shopping mall, these wheel stops do not serve a code-mandated function because overhanging vehicles cannot obstruct the minimum required clear width of this very wide accessible walkway.

Photo 14 – At this Corte Madera, CA mall, a 36-inch wide wheelchair-accessible path of travel fronts this oddly configured parking space --- the wheel stop prevents this truck from obstructing this accessible route.

Photo 15 – At this Sunnyvale, CA office park, this wheel stop is necessary to prevent overhanging vehicles from obstructing this 36-inch wide accessible walkway.

Photo 16 – At this Santa Clara, CA shopping mall, this blue-painted wheel stop serves no code-required function.

Photo 17 – At this San Rafael, CA multilevel parking garage, the blue-painted wheel stop serves no code-required function – the putative walkway in front of these spaces is far too narrow to accommodate a wheelchair and further is obstructed by overhanging vehicles at the garage's many hundreds of non-accessible parking spaces at which no wheel stops are installed. Oddly, even though the wheel stop itself is painted blue (which is <u>not</u> required by any code), these spaces' striping and the adjacent "access aisles" are <u>not painted blue</u> (contrary to the California Building Code).

Photo 18 – At this San Rafael, CA multilevel parking garage, this blue-painted wheel stop serves no code-required function – the putative walkway in front of these spaces is far too narrow to accommodate a wheelchair and further is obstructed by overhanging vehicles at the garage's many hundreds of non-accessible parking spaces at which no wheel stops are installed. Oddly, even though the wheel stop itself is painted blue (which is <u>not</u> required by any code), these spaces' striping and the adjacent "access aisles" are <u>not painted blue</u> (contrary to the California Building Code).

➢ Question 4 – Doesn't the ADA/CBC require wheel stops at accessible spaces be painted blue?

NO --- neither the ADA nor the CBC requires wheel stops at parking spaces be painted blue (<u>or any other color</u>). Where wheel stops are provided (for any reason) at parking spaces (whether accessible or non-accessible), we recommend that these potential tripping hazards should have a highly contrasting color (whether painted or unpainted) from the underlying substrate --- consider Photos 19 and 20 below:

Photo 19 – The whitish color of these unpainted concrete wheel stops in Oakland, CA provide a good visual contrast with the gray-painted wall and the blackish asphalt below.

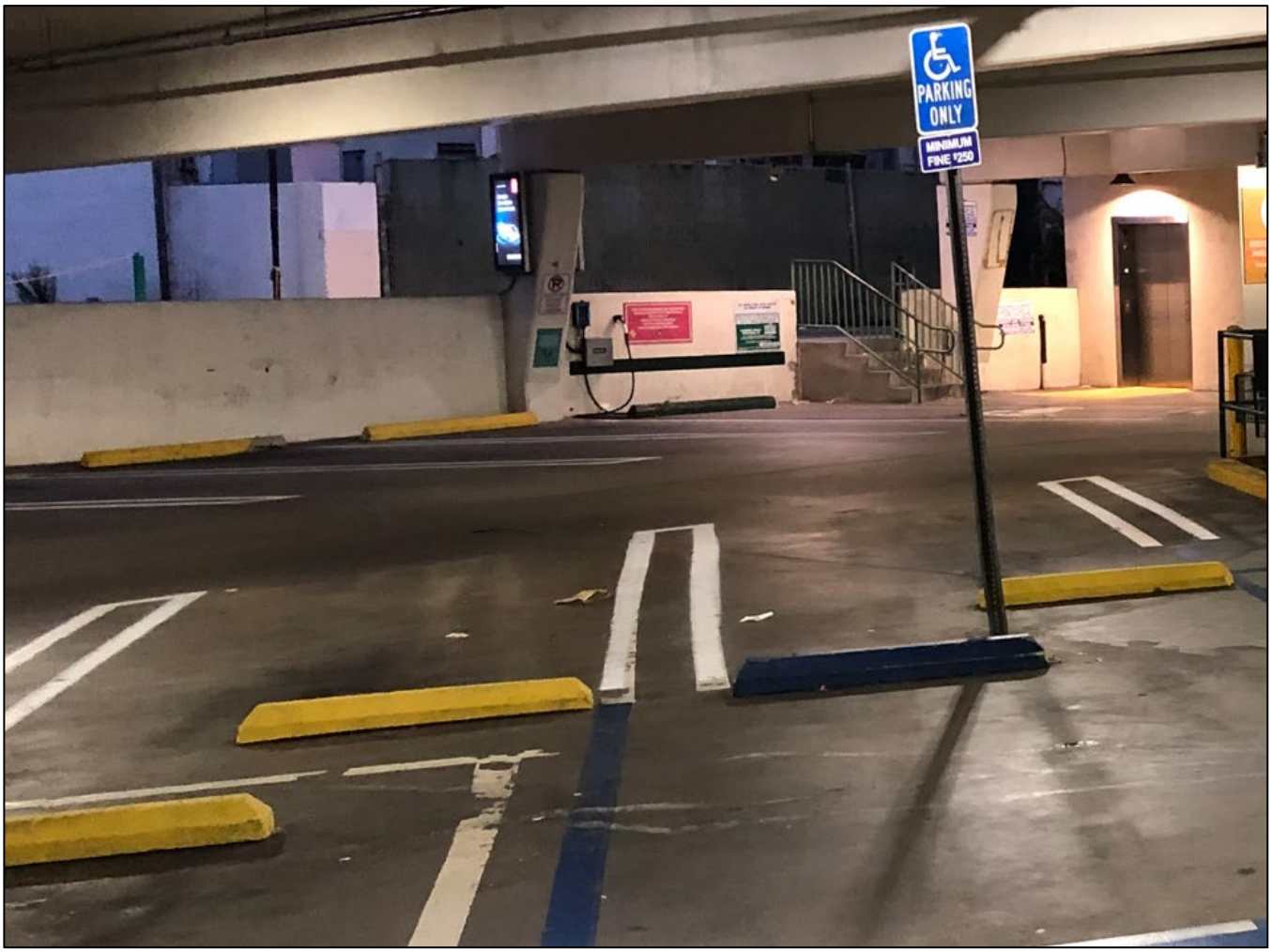

Photo 20 – At this Los Angeles, CA parking garage, neither the ADA nor the CBC requires the wheel stop at this accessible parking space to painted its difficult-to-see blue instead of the far-more-visible yellow paint at the remaining wheel stops at the non-accessible parking spaces.

➢ **Question 5 – At which wheel stops are pedestrian trip-and-fall injuries most likely to occur?**

While obvious, the following foundational principle for all such "risk-assessment" processes should be emphasized: ***The greater the rate of pedestrian traffic across any particular wheel stop, the greater the likelihood of pedestrian trip-and-fall incident(s) occurring over time.***

- Consider the heavily pedestrian-trafficked store entryways at Photos 21 and 22 below.

Corollary principles for such knowledgeable risk-assessment processes include:

1) Even though these risks of wheel stop trip-and-fall incidents are proportionally higher for elderly and disabled pedestrians, wheel stops are more likely to be installed at accessible parking spaces that are, of course, most commonly utilized by the elderly and physically disabled.
2) Trip-and-fall incidents also tend to occur more often at poorly illuminated wheel stops and similarly obscured ("difficult-to-see") or hidden (e.g., between parked cars) wheel stops.
   - Consider the parked cars and protruding wheel stops seen at Photos 23 thru 25 below.
3) Pedestrians tend to take the shortest routes (including between parked cars) from Point A to Point B when crossing parking lots and inside parking garages.

Photo 21 – Multiple trip-and-fall incidents at this difficult-to-see wheel stop occurred at this heavily pedestrian-trafficked accessible parking space in Southern California.

(Note: the pedestrian at left is taking the shortest route from his distant parked car to the store's entry doors.)

Photo 22 – Multiple trip-and-fall incidents occurred at this wheel stop at this heavily pedestrian-trafficked accessible parking space in a parking garage in Northern California – even after the “Zebra” striping was added.

(Note: a primary pedestrian route leading to/from this garage’s main parking area directly crossed this wheel stop.)

Photo 23 – As seen at this standard non-accessible parking space in Redding, CA, wheel stops commonly are installed in a manner that impedes intended and expected routes of pedestrian travel.

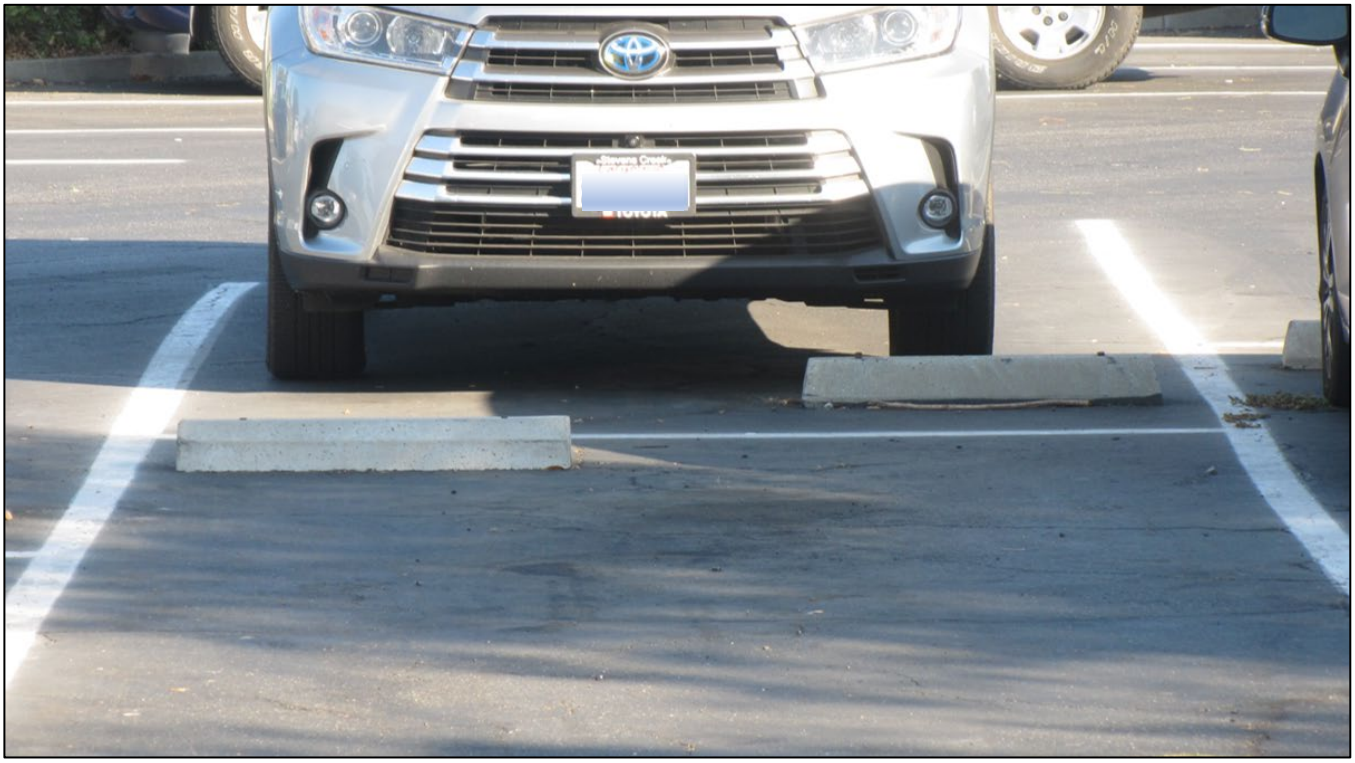

Photo 24 – As seen at these standard non-accessible parking spaces in Union City, CA, wheel stops commonly are installed in a manner that impedes intended and expected routes of pedestrian travel. (Also see Photo below.)

Photo 25 – As exemplified by this parking lot in Union City, CA, wheel stops commonly are installed in a manner that impedes intended pedestrians' intended walkways between adjoining parked vehicles.

(Important note: at night, even at well-illuminated parking lots and garages, the darkest locations are found between adjoining parked vehicles – i.e., where protruding wheel stops can be hardest to discern.)

➢ **Question 6 – Can wheel stops readily be eliminated (or repositioned) to make facilities safer?**

YES --- as seen at Photos 6 and 10 above, the designers of this very large parking lot in San Clemente, CA recognized that wheel stops simply were not necessary (nor required by code).

- In like manner, at the "zero curb" wheelchair-accessible walkway at the Mill Valley, CA shopping mall at Photo 7, wheel stops have been replaced by structural bollards (concrete-filled steel piping).
- Comparably, at Photo 26 below, note how the City of Novato, CA – during successful revitalization of its "Old Town" district – strategically positioned structural bollards, light poles, and large planters eliminate the need for wheel stops to deter vehicular encroachment into the public sidewalks.

Photo 26 – At the City of Novato's revitalized "Old Town" district, structural bollards, lamp poles, and planters prevent vehicular encroachment into the "zero curb" accessible public sidewalks.

Similarly, because the wheel stops seen above at Photos 9, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 24, and 25 serve no code-required function, they might be deemed suitable for removal after site-specific 'risks assessment' evaluations by qualified parking facility professionals. In general, we recommend:

- High-risk/low-benefit wheel stops should be eliminated.
- Where wheel stops specifically are deemed necessary, then other actions (e.g., repositioning and/or repainting the wheel stop and/or providing improved lighting) that lessen pedestrian trip-and-fall risks should be considered.

In particular, the simple act of repositioning existing wheel stops farther away from intended and expected pedestrian routes – including between parked cars, as seen in the Redding, CA parking lot at Photo 27 below – can substantially lessen trip-and-fall risks:

Photo 27 – After a trip-and-fall incident at a Redding, CA parking lot, this wheel stop was repositioned to provide a somewhat-wider pedestrian pathway between adjoining parked cars.

➢ Question 7 – Shouldn't parking wheel stops be positioned close to the perimeter striping?

NO!! --- this highly common practice in California (as evidenced by Photos 9, 11, 12, 13, 14, 16, 20, 21, 23, 24, and 25 above) does not make any sense.

- Consider Photos 28 and 29 below --- for what conceivable purpose should potentially distracted pedestrians walking between adjoining parked cars be forced to traverse these wheel stops?
- Note again that pedestrians tend to take the shortest routes (including between parked cars) from Point A to Point B when crossing parking lots and inside parking garages.

Photo 28 – At this parking lot in Daly City, CA, why should potentially distracted pedestrians walking between adjoining parked cars be forced to traverse these wheel stops?

Photo 29 – At this parking lot in Daly City, CA, why should potentially distracted pedestrians walking between adjoining parked cars be forced to traverse these wheel stops?

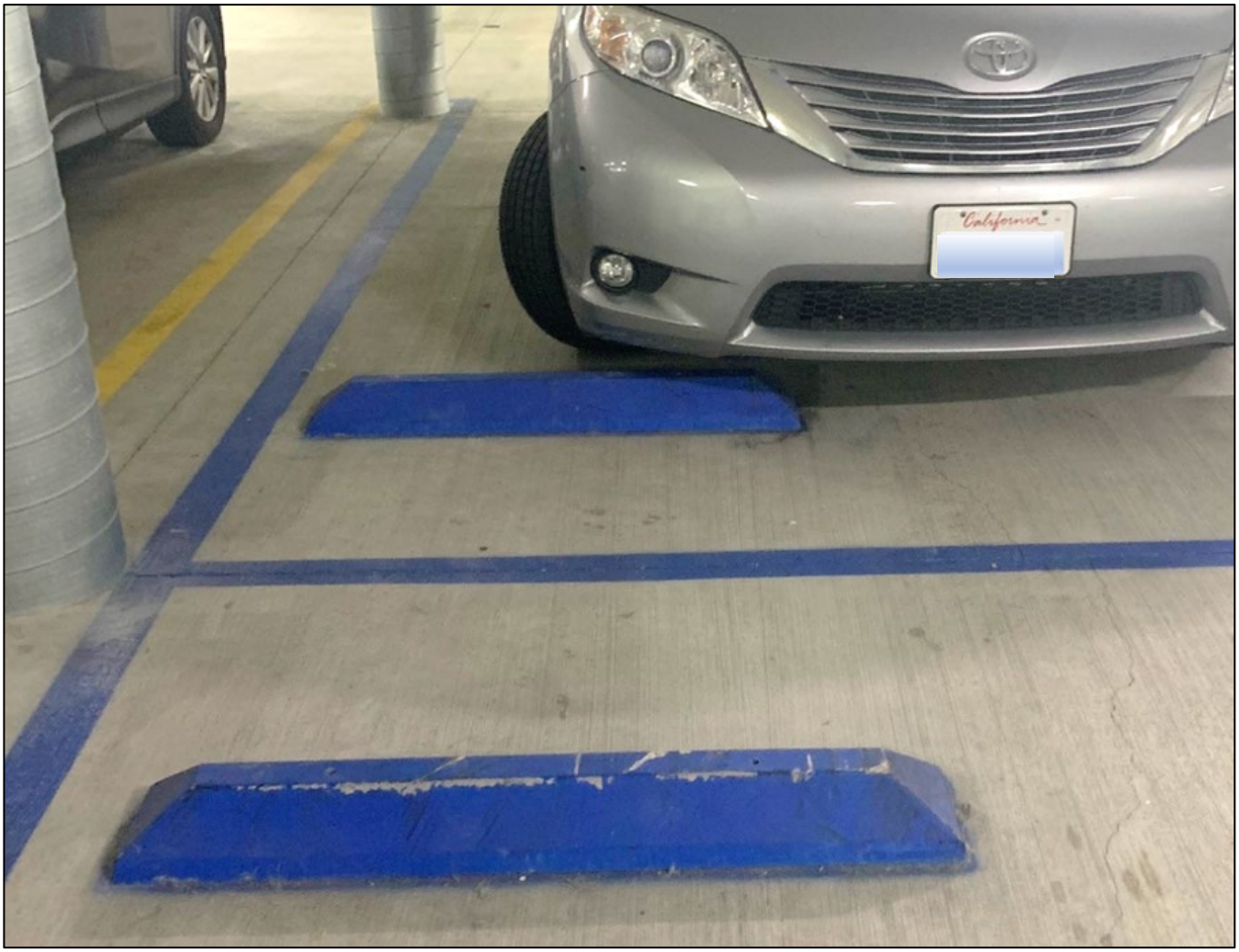

Photo 30 – At this parking garage in San Diego, CA, for what conceivable purpose do these wheel stops protrude into the intended and expected pedestrian walking path?

Photo 31 – At this parking lot in Temecula, CA, why should potentially distracted pedestrians walking between adjoining parked cars be forced to traverse this wheel stop?

It is important to emphasize that there literally are no codes or standards (or logic) that would support the commonly seen practice in California (and elsewhere) of positioning wheel stops adjacent to the 4-inch-wide perimeter striping --- i.e., where pedestrians are intended and expected to walk. In contrast, we recommend:

- Where safe and practical (as defined by each facility's qualified parking professional), such wheel stops are best positioned about 18 inches from the center of the 4-inch-wide painted striping.
- However, at a minimum, wheel stops located directly opposite the same striping (as seen in Photos 28 and 29 above) should be positioned to provide a 20- to 24-inch-wide unimpeded pedestrian route between them --- as judged safe and practical by each facility's qualified parking professional.

➢ Question 8 – Is there a code-prescribed "correct" length for wheel stops?

NO --- neither the ADA nor the CBC provides prescriptive guidance regarding either the ***positioning*** or the ***dimensions*** of wheel stops at parking spaces.

- While we most commonly have observed 3- and 4-foot-long wheel stops (positioned toward either the left or right side of the parking space) throughout California, we also have encountered 5-foot wheel stops, centered 6-footers, and various other sizes ranging from 2½ to 8 feet.
- None of these variables is inherently incorrect – there is no federal nor California law, code, or regulation (nor "parking industry standard") that prescribes wheel stop positioning or dimensions.
    - An "industry standard" is a published document or detail delineating levels of design, materials, and workmanship currently recognized (via consensus) by an association representing a broad spectrum of the industry with potentially differing interests and concerns.
    - An "industry standard" is not simply the informal customary practice in a particular locale. (E.g., just because "everyone" within a certain area reportedly uses 6-foot (or 4-foot) wheel stops, this purportedly typical practice does not evidence a parking industry standard.)

- Similarly, "voluntary" (recommended) guidelines published by ASTM International (www.astm.org) committees do not constitute "industry standards" unless subsequently adopted by a regulatory entity or recognized (via consensus) by an association broadly representing an industry's differing interests and concerns (or, alternately, where specified by a particular project's licensed design professional).
  - For example, the many ASTM standards partially or fully referenced in the California Building Code have the same force of law as the CBC's other provisions.
  - In like manner, ASTM's voluntary standards can achieve the legal strength of contract law when cited by licensed professionals within project specifications and plan sets.
- A highly relevant example of voluntary ASTM guidelines that do not constitute a de facto industry standard is ASTM F1637 (*Standard Practice for Safe Walking Surfaces*),[6] which recommends:
  - "*9.1 Parking lots should be designed to avoid the use of wheel stops.*
  - "*9.2 Wheel stops shall not be placed in pedestrian walkways or foreseeable pedestrian paths.*
  - "*9.3 Wheel stops shall be in contrast with their surroundings.*
  - "*9.4 Wheel stops shall be no longer than 6 feet and shall be placed in the center of parking stalls. The minimum width of pedestrian passage between wheel stops shall be 3 feet.*
  - "*9.5 The top of wheel stops shall not exceed 6.5 inches in height above the parking lot surface.*
  - "*9.6 Adequate illumination shall be maintained at wheel stops as governed by local codes and ordinances or, in their absence, recommendations set forth by the Illuminating Engineering Society of North America*.
  - "*9.7 Bollards, not less than 3 feet in height, may be placed in the center of parking stalls as an alternative to wheel stops. Bollards should be appropriately marked to enhance visibility*."
  - While we generally agree with much (not all) of ASTM F1637's wheel stop recommendations, no federal or California codes or regulatory agency or other local or regional governmental body has formally adopted ASTM F1637's voluntary guidelines.
  - Further, multiple trial courts in California have rejected expert analyses based on ASTM F1637, including a determination that these voluntary guidelines have not been accepted "*as the proper standard to apply to business parking lots in California*."[7]
  - Similarly, regarding ASTM F1637, a federal court has declared: "…***voluntary guidelines do not amount to legal requirements*** *because they have not been formally adopted as definitive criteria by which the legality of activity will be measured… .*"[8] [Bold emphasis added.]
- In particular, we do not agree with the authors of ASTM F1637 that "*Wheel stops… no longer than 6 feet… **shall*** [i.e., must] *be placed in the center of parking stalls*." [Bold emphasis added]
  - While this mandate may be appropriate if vehicles *always* are parked in these spaces, when these spaces are empty the additional length of a centered 6-foot-long wheel stop exacerbates potential trip-and-fall risks. (Note again that pedestrians tend to take the shortest routes from Point A to Point B when crossing parking lots and inside parking garages.)
  - Therefore, all such positioning (left, right, or center) and dimensional (short, medium, or long) wheel stop decisions should be made by qualified professionals on a project-specific basis.
- When wheel stops are deemed appropriate for a project, we tend to accept 3- and 4-foot lengths in order to lessen trip-and-fall risks --- such decisions simply represent our professional judgments.[9]

[6] https://www.astm.org/f1637-21.html
[7] Lopez v. Ralph's Grocery Co.: https://casetext.com/case/lopez-v-ralphs-grocery-co
[8] Girdler v. United States: https://casetext.com/case/girdler-v-united-states
[9] At a 9-foot-wide accessible parking space, a 4-foot wheel stop positioned 18 inches from the center of the 4-inch-wide painted perimeter striping extends more than halfway across the space.

Similarly, for other professionals making such wheel stops decisions, we recommend their consideration of the following (incomplete) listing of risk-assessment factors:

- Again, in general, high-risk/low-benefit wheel stops should be eliminated.
- Typical front wheel-to-wheel track clearances for most automobiles measure about five feet (or less).
- Commonly, the minimum prescribed widths of accessible automobile parking spaces in California range from eight feet (*for federal sites controlled by the 2010 ADAS*)[10] to nine feet (*for non-federal sites in California controlled by the CBC*).[11]
    - A benefit of centered 6-foot wheel stops at standard 8-foot and 9-foot-wide parking spaces is that they are less likely to extend into the pathway of pedestrians walking between parking vehicles.
    - A downside of 6-foot wheel stops is the proportionally increased trip-and-fall risks to pedestrians whenever these substantially longer wheel stops are not covered by parked vehicles.
    - Correspondingly, a benefit of shorter wheel stops is the proportionally decreased trip-and-fall risks to pedestrians whenever these wheel stops are not covered by vehicles.
    - However, a potential drawback of smaller non-centered wheel stops – if installed too close to the perimeter striping (e.g., see Photos 1, 9, 11, 12, 16, 21, 23, 24, 25, 27, 28, 29, 30, and 31 above) – is increased pedestrian trip-and-fall risks between adjacent parked vehicles.
    - Note: while some consultants could perceive that drivers might opt to drive around shorter wheel stops, we have not observed such practices by wayward drivers.
- Finally, where appropriate, we again strongly recommend that vertical bollards be specified in favor of wheel stops (whether short or long) to maximize pedestrian safety and accessibility.
    - Such bollards can be designed and specified to function as engineered 'crash barriers' or simply to serve as a less-resistant 'physical signal' to deter drivers from additional forward movement.
    - Again, all such evaluations should be made by a qualified parking professional upon a project-specific risks-benefits analysis.

➢ Final Comments

Many parking facility owners, managers, designers (architects and parking engineers), and contractors fail to proactively evaluate potential pedestrian trip-and-fall injuries associated with wheel stops. Often, these failures can be traced to undefined perceptions that the Americans with Disabilities Act mandates installing parking space wheel stops.

- In short, because violations of the ADA can be deemed actionable violations of California's Unruh Civil Rights Act, many designers perceive that – from a litigation-avoidance perspective – it's far safer to install too many wheel stops rather than too few.

Unfortunately, over the past 30 years, this misperception (*that installing numerous vertical tripping hazards throughout parking facilities promotes the safety and civil rights of the elderly and physically disabled*) has fueled a wave of pedestrian trip-and-fall incidents involving the elderly and physically disabled.

In response, more and more entities across North America have sounded the alarm --- for example:

- 2011 --- Centers for Disease Control and Prevention: "*Concrete wheel stops in parking lots can be a tripping hazard and should not be used*."[12]

[10] Section 502.2 of 2010 ADA Standards for Accessible Design: "*Car parking spaces shall be 96 inches wide minimum*."
[11] Section 11B-502.2 of 2019 and 2021 California Building Code: "*Car parking spaces shall be 108 inches wide minimum.*"
[12] "*Slip, Trip, and Fall Prevention for Healthcare Workers*", Centers for Disease Control and Prevention, 2011 (www.cdc.gov).

- 2014 --- AIG Loss Control Bulletin: "*Are bollards used whenever possible, limiting the use of wheel stops?*"
- 2018 --- Sompo International Insurance: "***Wheel stops*** *...are often installed to provide separation between vehicles and pedestrian walkways. While they can be an effective means of preventing pathway encroachment, they* ***are a leading cause of trip and fall occurrences*** *because they sit low to the ground and are often out of a pedestrian's direct line of sight. As such, more and more parking areas are removing them altogether, or replacing them with alternative solutions*." [Bold added.]

  "*When evaluating the use of wheel stops, be sure to consider the following: Are wheel stops really needed?* ***Even in locations where wheel stops are already in use, it is important to carefully evaluate if they are needed or an alternative solution is more appropriate***." [Bold emphasis added.]

We fully agree with this loss control guidance by Sompo: much closer consideration by facility owners, managers, and designers should be given to the pedestrian trip-and-fall risks associated with the use of wheel stops at parking lots and garages.

Our paper strives to elevate awareness of this issue while also emphasizing that pedestrian safety need not be sacrificed in the design and construction of ADA-compliant parking facilities and parking spaces.

Sincerely,

Lonnie Haughton, GC, MCP, CASp • Senior Partner • Principal Codes Consultant

David M. Field, AIA, NCARB, CASp • Partner • Principal Architect

Key References:

- Lonnie Haughton, Joel Agnello, AIA, David M. Field, AIA, NCARB, "*Uses and Misuse of Wheel Stops at Parking Spaces in California*": https://avelar.net/position-paper-uses-and-misuse-of-wheel-stops-at-parking-spaces-in-california/
- Lonnie Haughton, Joel Agnello, AIA, David M. Field, AIA, NCARB, "*Let's Eliminate Parking 'Wheel Stops' at Busy Storefronts*": https://avelar.net/lets-eliminate-parking-wheel-stops-at-busy-storefronts/
- Rob Reiter, Lonnie Haughton, Joel Agnello, AIA, David M. Field, AIA, "*Reducing Parking Lot Injuries, Storefront Crashes, and Tort Claims: Safety Bollards, ADA Parking Signposts, and Wheel Stops*": https://www.storefrontsafety.org