Review of Barrier Standards Applicable to Flexible Parking Areas -- Appendix 1

EXHIBIT K

At the request of the City of Bothell, BergerABAM reviewed various standards for barrier design and placement between a travelled way and outdoor pedestrian areas to be used as a guide in the design of barriers adjacent to flexible parking zones.

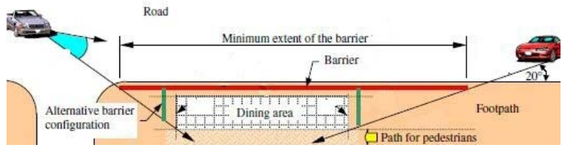
Consideration of types of barriers for outdoor seating requires evaluation of various risks. Such risks include the barrier itself, the risks involved in an event of a car accident, flying vehicle parts or flying barrier parts. Documents, such as bollard crash tests, roadside safety manuals, and urban design standards, were reviewed to provide general guidelines for creating a safe outdoor roadside dining area. This memo summarizes our interpretation of the documents.

Bollards

Various crash tests show that the bollard should be 36 inches in height with a minimum 8-inch diameter to perform as needed. They should have some type of tamper-proof locking and should be manually removable from the base or foundation. Safety will be enhanced if the bollards have reflective tape or some type of illumination (MUTCD; Bike Blogs). Any feature used in combination with the bollards, such as a fence, must not create a hazard to occupants of any vehicle or anyone in the dining area during a crash or during any time. Materials should not be used that can break apart and potentially become projectiles.

The bollards shall be certified to show that any final penetrations are less than 3 feet (ASTM F265-07; Deflection distance as specified by the Department of State Standards).

The location and arrangement of the bollards should provide a minimum 3-foot clearance distance from the edge of the dining area to the bollards. The spacing should provide a maximum 4 feet on center between the bollards (Secure USA). Most of the installation guidelines found were based on a roadside dining area separated from the travel lane by a curb, as flexible parking is a fairly new concept.



To ensure bollard or barrier satisfaction, submittals should include manufacture's specifications and installations, color and model details, and manufactured material product location of production. If bollards are selected, a site soil investigation by a registered geotechnical engineer is required for determination of allowable soil pressures for bollard foundations.

Planters as Rigid Barriers

If rigid barriers are selected, they can be disguised as planter boxes. The performance of these planter boxes shall be same as a rigid concrete barrier (ASTM F2656-07). The minimum height, weight, and sloped face should be same as a rigid traffic barrier as approved by the state. Additionally, the height of the barrier should not exceed 3.5 feet, including the plants (Outdoor Design Standards, Santa Monica). If a rigid barrier is used, the 3-foot clearance distance to the edge of the dining area may not be necessary.

Requirements for Both Bollards and Rigid Barriers

If bollards or planter boxes are used as a barrier, they shall be K4 crash tested for impacts speeds between 28 to 30 mph (DOS SD- STD – 02.01; ASTM F2656-07).

The bollards and barriers shall be Americans with Disabilities Act (ADA) compliant and generally pedestrian friendly (ADA Accessibility guidelines).

The installation of the bollard or barrier should be such that it does not create a tripping or maintenance hazard. It must not intrude in the road or dining area at any time. Barriers or bollards should be located along the curb or road so that they protect the entire dining area, including areas parallel and perpendicular to the roadside. If they are arranged on corners or curves, they should be evaluated on a case-by-case scenario. Ideally, outdoor seating areas should be 50 feet away from any alley or driveway (Collingswood Outdoor Dining Ordinance). If the dining areas are near a driveway or alley, protect the dining area and evaluate the arrangement of the bollards or barriers on a case-by-case scenario.

Recommendations

If bollards are used, to comply with the guidelines, they should be placed a maximum of 4 feet on center. The fencing used between the bollards should not be constructed of material that could shatter or splinter and potentially become projectiles. The bollards and fencing should be placed to separate the dining area from the travelled way by 3 feet.

If planters are used, the minimum height, weight, and sloped face should meet the requirements of a rigid traffic barrier. The height should not exceed 3.5 feet.

References

- King Street Outdoor Dining Design Guidelines
- Outdoor Dinning Policy – Adelaide City Council
- Lismore City Council – Outdoor Dining Policy
- Establishing Attractive Security and Pedestrian Areas in Low Manhattan - Bollards Specifications - Security - Recommendations
- Secure USA Inc. – Secure SENTRY Removable Bollard – Bollard Specifications - Bollard Manufacturing
- Delta Scientific Corp. – Bollard Specifications – Bollard Manufacturing – Bollard Testing
- MaxiForce Traffic Control Bollards – Bollard Standards
- Formex Permanent Steel Forms – Auto Testing and Crash Results
- Urban Services - Design Standards for Urban Infrastructure 11 Fences, guardrails and barriers – Australia
- Collingswood Outdoor Dining Ordinance – Amended outdoor dining regulations
- MUTCD – obstructions in travel way of a shared use path shall be marked with retro reflectorized material.)
- Stonewear force protection
- City of Santa Monica Outdoor Design Standards
- ASTM F2656-07