Complete Streets Considerations for Freight and Emergency Vehicle Operations

Module 3: Street Design and Management Approaches

May 2018
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Information contained in this document, such as web page addresses, are current at the time of publication.
Topics discussed in this module are detailed in Chapters 3 and 4 of:

Complete Streets Considerations for Freight and Emergency Vehicle Operations
Module 3 Outline (1)

• Selecting an appropriate design vehicle
• Addressing vehicle navigation challenges
  – Providing adequate space for large vehicle turns
  – Reducing conflicts with vulnerable roadway users
  – Safely reducing speeds
  – Providing network connectivity and redundancy
Module 3 Outline (2)

• Addressing curbside challenges
  – Providing adequate space for parking, loading, and emergency response operations
  – Providing curb and building access

• Managing demand
Introduction

• In the US, design and operational solutions should be considered in the context of:
  – Local standards
  – Manual on Uniform Traffic Control Devices (MUTCD)
  – Americans with Disabilities Act (ADA) requirements

• Non-approved solutions can be implemented as a pilot
Selecting an appropriate design vehicle
Design Vehicle vs. Control Vehicle

• Design vehicle
  – Largest commonly used vehicle
  – Can navigate without encroachment

• Control vehicle
  – Larger vehicle that may occasionally use street
  – May be permitted to encroach on infrastructure typically used by another mode or movement
Design Vehicle vs. Control Vehicle Example

1. Space available for wide design vehicle turn from inside lane
2. Larger control vehicle can use adjacent lane
3. Clear midblock turning path may require parking restriction
Freight Design Vehicles

DL - 23
13’
22'-6”

SU - 30
20’
30’

WB - 40
12'-6”
25'-6”
45'-6”

WB - 50
15'-6”
35'-6”
55’

WB - 62

WB - 67
Considerations for Freight Design
Vehicle Selection

• Current/expected freight trip generating land uses
• Street functional classes and network designations
• Applicable truck size and weight regulations
• Current/expected freight traffic flows
• Historic incident data involving freight vehicles
Emergency Vehicle Equivalents

1. Equivalent to city fire truck in Portland, OR

2. Equivalent vehicle in Amherst, MA

- Aerial Platform
  - 7'-10" x 20' x 40'

- Intercity Bus
  - 7'-11" x 21'-8" x 40'
Considerations for Selection of Emergency Design Vehicle Equivalent

- Types and dimensions of vehicles in local fleet
- Regulatory authorities granted to fire chief or commissioner in local fire code
- Locations of designated fire access routes
- Operating exceptions granted for emergency vehicles in state or local traffic laws
Providing adequate space for large vehicle turns
Incompatibility with Pedestrian Movements

- Narrow lanes
- Raised median islands
- Corner bulbouts
- Neckdowns
Specific Challenges

• Intersection turning movements
• Entry to driveways, loading docks, and alleys
• Entry to, navigation of, and exit from traffic circles and roundabouts
Curbside Parking and Bicycle Lanes

1. Space available for wide turning path
2. Painted conflict area
Asymmetrical Median Nose

Asymmetrical median nose provides space for wide turn
Recessed Stop Line

1. Recessed stop line
2. Space available for lane encroachment
Mountable or Flush Curbs

1. Inclined curb
2. Infrastructure may require structural reinforcement
Painted, Striped, or Textured Curb Extensions
Channelized Right Turn Lanes

• Generally not recommended but may be best available solution at very wide intersections
Vehicle Size Restrictions

• Fixed
• Time-based

• Safety benefits of size restrictions must be carefully weighed against related impacts
  – VMT and congestion
  – Operator costs and industry participation
Dedicated Signal Phases

1. Separated turn phases
   - Diagram showing different turn phases

2. Separated directional movement phases
   - Diagram showing different movement phases
Reducing conflicts with vulnerable roadway users
Vulnerable Road User Interaction Challenges

- Large vehicle operator blind spots
  - In front of vehicle
  - Adjacent to vehicle
- High speeds (for emergency vehicles)
- Collisions involving large vehicles disproportionately fatal
Bike Boxes and Two-Phase Turn Queue Boxes
Paint and Pavement Texturing to Delineate Conflict Areas
Dedicated or Leading Signal Phases for Non-motorized Travelers

1. Leading bicycle phase
2. Vehicle turning phase

- Bicycle
- Car
Convex Safety Mirrors

• Commonly used at driveway entrances
• Not currently approved as an on-street traffic control device in the US
On-Board Blind Spot Mitigation

- Mirrors
- Fresnel safety lenses
- Cameras
- Direct vision
Truck Side Guards

• Reduce severity of side collisions
• Mandated in:
  – Many European cities
  – Boston, MA
Education Programs

- Drivers
- Non-motorized travelers
- General public
Safely Reducing Speeds
Speed Reduction Challenges

• Raised speed reducers can impact loads
  – Goods damage
  – Equipment damage
  – Patient injury

• Curved/circular routes difficult to navigate in a large vehicle
Speed Cushions

1. Width of speed bump should be less than emergency or freight vehicle tire-to-tire axle width
Mini Roundabouts

1. Flush or mountable center island
2. Flush or mountable splitter island
Providing network connectivity and redundancy
Network Challenges

• Change in street direction
• Non-traversable median
• Removal of bypass lane (e.g. two-way left turn)
• Difficult to navigate street infrastructure
Redundant Networks

• Street connectivity
  – Short blocks/frequent intersections
  – Comparable alternative routes

• Fire code may mandate multiple access points
Wide Bike Lanes

• Provide space to pull over
• Provide bypass lane in extreme congestion
Mountable Medians

Traversable island. Painted potential conflict area
Providing adequate space for parking, loading, and delivery or emergency operations
Loading Challenges

• Parking
• Curb access
• Unsafe loading conditions
• “Green” alley conversions
Loading Impacts

• Obstruction of:
  – Bike lanes
  – Sidewalks
  – Crosswalks
  – Travel lanes
Emergency Access Challenges

• Space for staging and operations
Dedicated On-Street Space for Loading

- Length to park, maneuver, and load/unload
  - Ramps
  - Lift gates
- Access aisle
- Wide lane widths
Dedicated On-Street Space for Emergency Vehicles

- Mid-block clearance at tall building locations
- Hydrant access
Offset Bus or Bicycle Lane

1. Direct curb access for loading
2. Transit bulb
3. Corner bulb
Mountable Sidewalk or Sidewalk Cutout

1. Mountable curb
2. Paint or pavement texturing
3. Full grade separation
Zoning Regulations

• Off-street parking and loading minimums
• Freight elevator requirements
Building Delivery Management

• Centralized delivery location
• Secure storage room
• Lockers
• Loading dock appointment system
Commercial Meter Pricing

- Promotes parking space turnover
- May be occupied by service vehicles if no distinction made in regulation
Flexible Curb Regulations

• Can prioritize different modes or movements by time of day
Enforcement

• Maintain access
• Enforce consequences for operator non-compliance
• Limited effectiveness if no reasonable alternative
Providing curb and building access
Access Challenges

• Vehicle and bicycle conflicts
• Long delivery distances
• Sidewalk obstructions
• Vertical obstructions
Mid-Block Curb Cuts

1. Loading zone with adequate length for maneuvering and rear loading
2. Access aisle
3. Midblock curb cut
Vertical Clearance Zone
Horizontal Clearance Zone

1. Horizontal clearance zone for loading and delivery
Shared Streets

1. Textured pavement delineates vehicle space
Approaches to Demand Management
Demand Management Strategies

• Change the volume, spatial, or temporal distribution of demands

• May require policy change, infrastructure investment, and/or behavior change by multiple stakeholders

• Will only be implemented if costs are acceptable to decision-makers
# Off-Hour Deliveries

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<thead>
<tr>
<th>Method</th>
<th>Benefits</th>
<th>Challenges/Concerns</th>
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<tbody>
<tr>
<td>Shift deliveries to non-peak hours • Early morning • Late evening • Overnight</td>
<td>For operator: • Reduce travel time delays, fuel costs, and parking fines</td>
<td>For operator: • Increase driver labor costs • Increase safety risk</td>
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<tr>
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<td>For business: • Receive deliveries when few customers present</td>
<td>For business: • Additional staff costs for off-hour receipt</td>
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<tr>
<td></td>
<td>For neighborhood: • Reduce congestion impacts • Reduce demand for shared curb space</td>
<td>For neighborhood • Generate delivery noise at night</td>
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## Consolidation Center

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| Transfer goods from large freight vehicles to small, green vehicles for final delivery | For operator:  
• Avoid expensive last mile costs  
For business:  
• May provide value added services  
• May improve reliability  
For neighborhood:  
• Reduce large vehicle trips  
• Reduce demand for parking  
• Reduce emissions | For operator:  
• Increase costs for transloading  
• Lose final delivery visibility  
For business:  
• May have to pay premium for services  
For neighborhood  
• May increase local VMT  
• May require public subsidy for start-up, operations |
## Lockers and Pickup Points

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| **Lockers:** Secure locker where package can be accessed via security code; may be located in residential area, public space, or local business | **For operator:**  
  • Avoid expensive failed deliveries, repeat trips  
**For residents:**  
  • Provide secure location to leave package  
**For neighborhood:**  
  • Reduce delivery trips | **For operator:**  
  • Difficult to identify host business  
**For residents:**  
  • May be at risk during pickup  
**For host business:**  
  • Generate foot traffic |
| **Pick-up Points:** Staffed delivery points at local businesses (e.g. pharmacy, grocery store) | **For neighborhood:**  
  • May need public space  
**For host business:**  
  • May use floor space | |
## Secondary Referrals

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<th>Challenges/Concerns</th>
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</table>
| Divert non-critical cases to local medical facilities | For providers: • Reduce unnecessary trips  
For neighborhood: • Reduce volume of high-speed trips | For providers: • May require investment in staff training, database development, and technology support |
## Fireproofing

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<tr>
<td>Reduce intensity of fire/speed of fire spread by use of fireproof building materials, sprinklers</td>
<td>Reduce required speed of response</td>
<td>Can be mandated through fire codes, but must be properly installed during construction or retrofit and well-maintained</td>
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