Strategies for the Greening of Student Pick-Up During School Dismissal

Winter Conference
January 30th, 2010
Frisco, TX

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Today’s Discussion

Improve
Safety & Roadway
Operations

Safer, “Greener”
Student Pick-up

Improve
Emissions &
Air Quality

• The topic of design and operation of parent pick-up zones at schools has not received considerable attention until recently
• Parent pick-up zones are often overlooked in school site design
Safety / Roadway Operations Issues

Pedestrian / vehicular / bus conflicts

Safety / Roadway Operations Issues

Students staging outside school
Safety / Roadway Operations Issues

Vehicles queue in through lanes

Improve Safety / Roadway Operations

Reduce conflict points

- Hold back walkers and bicycle riders until all private vehicle pick-ups are complete (ensures no conflicts)
- Hold back private vehicle pick-up students until all walkers and bicycle riders are off-site (encourages walking and biking)
- Segregate buses, private vehicles and walkers/bikers
Improve Safety / Roadway Operations

Eliminate off-site vehicle queue

- Retrofit on-site queue lane for existing schools
- Case Study: C.E. Landolt Elementary School, Clear Creek ISD, Harris County, TX
  - Enrollment: 1,200 students
  - On-site storage for 8 vehicles in queue
  - Maximum observed queue of 82 vehicles
  - Through lanes of El Dorado Blvd (an adjacent major arterial) were blocked repeatedly

Improve Safety / Roadway Operations

C.E. Landolt ES
“Before”
02/23/2007
Improve Safety / Roadway Operations

C.E. Landolt ES
“After”
12/12/2009
Improve Safety / Roadway Operations

Design sufficient on-site vehicle queue lane for new schools

- Traffic Engineers, Inc., has collected data from 55 elementary schools around Harris County, Texas
- Linear-regression model developed to predict maximum queue length
- Data collected from each school includes:
  - Enrollment
  - Total number of private pick-up vehicles
  - Maximum queue length, in vehicles
  - Stacking and loading techniques

### Improve Safety / Roadway Operations

Data collected from 55 Elementary Schools in/around Harris County, Texas

<table>
<thead>
<tr>
<th>Observation Date</th>
<th>Total Enrollment</th>
<th>Total Parent Vehicles (Actual)</th>
<th>Percentage of School for Total</th>
<th>Maximum Queue (Actual)</th>
<th>Percentage of School for Maximum Queue</th>
<th>Queue as Percentage of Total</th>
<th>Double Stacking Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cy-Fair ISD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andre Elementary</td>
<td>12/7/2006</td>
<td>1,553</td>
<td>103</td>
<td>6.6%</td>
<td>85</td>
<td>5.5%</td>
<td>No</td>
</tr>
<tr>
<td>Duryea Elementary</td>
<td>12/7/2006</td>
<td>1,150</td>
<td>59</td>
<td>5.1%</td>
<td>58</td>
<td>5.0%</td>
<td>No</td>
</tr>
<tr>
<td>Sheridan Elementary</td>
<td>12/7/2006</td>
<td>1,321</td>
<td>118</td>
<td>8.9%</td>
<td>75</td>
<td>5.7%</td>
<td>No</td>
</tr>
<tr>
<td>Walker Elementary</td>
<td>12/7/2006</td>
<td>1,324</td>
<td>75</td>
<td>5.7%</td>
<td>69</td>
<td>5.2%</td>
<td>No</td>
</tr>
<tr>
<td>Keith Elementary</td>
<td>12/4/2007</td>
<td>1,036</td>
<td>99</td>
<td>9.2%</td>
<td>61</td>
<td>5.9%</td>
<td>No</td>
</tr>
<tr>
<td>Ault Elementary</td>
<td>12/6/2007</td>
<td>1,100</td>
<td>86</td>
<td>7.8%</td>
<td>68</td>
<td>6.2%</td>
<td>No</td>
</tr>
<tr>
<td>Postma Elementary</td>
<td>3/5/2009</td>
<td>1,057</td>
<td>87</td>
<td>8.2%</td>
<td>77</td>
<td>7.3%</td>
<td>No</td>
</tr>
<tr>
<td>Birkes Elementary</td>
<td>3/6/2009</td>
<td>1,335</td>
<td>108</td>
<td>8.1%</td>
<td>71</td>
<td>5.3%</td>
<td>No</td>
</tr>
<tr>
<td>Spring ISD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winship Elementary</td>
<td>12/12/2006</td>
<td>845</td>
<td>67</td>
<td>7.9%</td>
<td>43</td>
<td>5.1%</td>
<td>Yes</td>
</tr>
<tr>
<td>Salyers Elementary</td>
<td>12/12/2006</td>
<td>715</td>
<td>75</td>
<td>10.5%</td>
<td>53</td>
<td>7.4%</td>
<td>No</td>
</tr>
</tbody>
</table>
Improve Safety / Roadway Operations

Q = 0.045*N + 19
R² = 0.70
Sample = 55

Max Queue Length (Q, Vehicles)

Enrollment (N, Students)

Improve Safety / Roadway Operations

“Rule of Thumb” Design Value

• On-site queue length (in terms of vehicles) is approximately 6% of the total planned ultimate enrollment of the school
• Assume typical vehicle length of 23 feet\(^1\)
• Thus, a planned 1,000 student elementary school should have (1,000)(0.06)(23)=1,380 linear feet of queue length on-site

\(^1\)Source: Harris County, TX, School Traffic Study Guidelines
Today’s Discussion

- Improve Safety & Roadway Operations
- Safer, “Greener” Student Pick-up
- Improve Emissions & Air Quality

Table 11. Recommended Parent Drop-off/Pick-up Zone On-Site Stacking Length for Texas.

<table>
<thead>
<tr>
<th>School Type</th>
<th>Student Population</th>
<th>Loop Drive Stacking Length (Linear feet/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>Less than 500</td>
<td>400 – 550 (122 – 167)</td>
</tr>
<tr>
<td></td>
<td>500 or more</td>
<td>750 – 1500 (228 – 458)</td>
</tr>
<tr>
<td>Middle</td>
<td>Less than 800</td>
<td>500 – 800 (153 – 244)</td>
</tr>
<tr>
<td></td>
<td>800 or more</td>
<td>800 – 1000 (244 – 305)</td>
</tr>
<tr>
<td>High (Jr)</td>
<td>400 – 600</td>
<td>600 – 1200 (182 – 366)</td>
</tr>
<tr>
<td></td>
<td>800 – 2500</td>
<td>1200 – 1500 (366 – 458)</td>
</tr>
</tbody>
</table>

Note: For high school populations greater than 2500 students, consider two separate student pick-up/drop-off loops.

Table 10. South Carolina DOT Recommendations for On-Site Stacking Length (Jr).

<table>
<thead>
<tr>
<th>School Type</th>
<th>Student Population</th>
<th>Loop Drive Stacking Length (Linear feet/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>200 – 600</td>
<td>900 – 1200 (274.5 – 366)</td>
</tr>
<tr>
<td></td>
<td>600 – 1400</td>
<td>1200 – 1500 (366 – 457.5)</td>
</tr>
<tr>
<td>Middle</td>
<td>200 – 600</td>
<td>900 – 1200 (274.5 – 366)</td>
</tr>
<tr>
<td></td>
<td>800 – 1200</td>
<td>1200 – 1500 (366 – 457.5)</td>
</tr>
<tr>
<td>High</td>
<td>400 – 800</td>
<td>800 – 1200 (244 – 366)</td>
</tr>
<tr>
<td></td>
<td>800 – 2500</td>
<td>1200 – 1500 (366 – 457.5)</td>
</tr>
</tbody>
</table>

Note: For high school populations greater than 2500 students, consider two separate student pick-up/drop-off loops.

Source: TTI Report 4286-2: "Traffic Operations and Safety at Schools: Recommended Guidelines"
Emissions / Air Quality Issues

Higher rates of emissions exist during low speeds/idling\(^1\)

\[\text{Vehicle Speed (mph)}\]

\[\text{Per-mile Emission Rates}\]

- Carbon Monoxide
- VOCs
- NO\(_2\)

\(^1\) Source: EPA MOBILE5a Emissions Model

Emissions / Air Quality Issues

Emissions while idling

- Vehicles idling at 5,050 Texas elementary schools produce \(~15-25K\) metric tons of CO\(_2\) annually (\(~3-4K\) metric tons in Harris County)
- Houston region has historically not met EPA air quality standards; expected to meet for first time for 2009
- EPA has recently proposed more stringent requirements

\(^1\) Source: Traffic Engineers, Inc., data collection averages
Improve Emissions / Air Quality

Educate the public
(Agency Side)

Increase efficiency of student loading
(School Side)

Reduce the quantity of pick-up vehicles
(Parent Side)

Educate the public

• Instill green thinking into community
• Promote walking and biking to school through printed materials and TV airwaves
• Encourage motorists to turn off engine when idling
• The 5 E’s:
  • Education
  • Encouragement
  • Enforcement
  • Engineering
  • Evaluation
**Improve Emissions / Air Quality**

**Educate the public – Case Study**

- Marin County, California: “Greenways to School”
- $175K grant to promote green ways for students to get to and from school
- Utilizes “SchoolPool” website

**Improve Emissions / Air Quality**

**Reduce the quantity of pick-up vehicles**

- Ride Share (Multi-family carpools)
  - Rotate weeks between families
  - May utilize “express lanes” for carpool pick-up
Improve Emissions / Air Quality

Increase the efficiency of student loading

- Stagger dismissal by grade
- Two stage process with loading stations
  - Hang-tags or placards in car to identify student early
  - Walkie-talkies or bullhorns call to stations
  - Load up to six vehicles simultaneously based on assigned station number

Case Study: Emerging Technologies

- Brookshire Elementary School, Orange County Public School, Winter Park, Florida
  - Pilot program which uses bar-code reader at driveway entrance to scan pick-up vehicle
  - TVs mounted inside building display which student to place in pick-up line based on successful bar-code read
  - Students staged inside school (away from vehicle emissions)
  - Multiple bar-codes available for family with more than one vehicle that picks up students
Improve Emissions / Air Quality

Results:\textsuperscript{1}:
- Maximum Queue Length Decreased 50%
- Pick-up Duration Time Decreased 10 min

\textsuperscript{1} Source: Brookshire Elementary School Principal Jeremy Moore

Goal: Reduce emissions by 50%
- Could potentially save 10-12K metric tons/year of CO\textsubscript{2} in Texas (for elementary schools alone)
Summary

- Improving the student pick-up process has significant safety and environmental benefits for the school and for the community.
- Planning in the school site design phase is best, but there are retrofit options.
- Statistical models can be developed to design on-site queue storage required for elementary schools.
- Improving operations requires collaborative effort between governmental agencies, architects, engineers, school districts, students and parents.

Resources

- Texas Transportation Institute Report 4286-2
- National Center for Safe Routes to School
  - [http://www.saferoutesinfo.org/](http://www.saferoutesinfo.org/)
- Texas Center for Safe Routes to School
- International Walk-to-School in the USA
  - [http://www.walktoschool-usa.org/](http://www.walktoschool-usa.org/)
- Traffic Engineers, Inc.
  - Dustin Qualls, PE, PTOE; dustin@trafficengineers.com