**RAMPS AND RAMP JUNCTIONS WORKSHEET**

### General Information

- **Analyst**: AL
- **Agency or Company**: AIM ENGINEERING
- **Date Performed**: 3/8/2012
- **Analysis Time Period**: PM

### Site Information

- **Freeway/Dir of Travel**: I-75 NB
- **Jurisdiction**: GGP NB OFF RAMP
- **Analysis Year**: 2039 EVERGLADES

### Inputs

- **Upstream Adj Ramp**: Yes
- **Number of Lanes, N**: 3
- **Acceleration Lane Length, \(L_A\)**: ft
- **Deceleration Lane Length, \(L_D\)**: 310 ft
- **Freeway Volume, \(V_F\)**: 4470 veh/h
- **Ramp Volume, \(V_R\)**: 781 veh/h
- **Freeway Free-Flow Speed, \(S_{FF}\)**: 70.0 veh/h
- **Ramp Free-Flow Speed, \(S_{FR}\)**: 45.0 veh/h

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>(pc/h)</th>
<th>(V)</th>
<th>PHF</th>
<th>Terrain</th>
<th>%Truck</th>
<th>%Rv</th>
<th>(f_{HV})</th>
<th>(f_p)</th>
<th>(v = V/PHF \times f_{HV} \times f_p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>4470</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>4846</td>
</tr>
<tr>
<td>Ramp</td>
<td>781</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>847</td>
</tr>
</tbody>
</table>

### Estimation of \(v_{eq}\)

\[
L_{EQ} = \frac{V_3}{V_3 + V_{av4}} \times (Equation 13-6 or 13-7)
\]

\[
P_{FM} = \text{using Equation (Exhibit 13-6)}
\]

\[
V_{eq} = \frac{V_3}{V_3 + V_{av4}} \times (Equation 13-14 or 13-17)
\]

\[
V_{eq} = 2700 \text{pc/h} \quad \text{if } V_3 + V_{av4} > 2700 \text{pc/h} \quad \text{No}
\]

\[
V_{eq} = 1.5 \times V_{eq}^2 \text{pc/h} \quad \text{if } V_3 + V_{av4} > 1.5 \times V_{12}^2 \quad \text{No}
\]

### Estimation of \(v_{12}\)

\[
V_{12} = V_F + (V_F - V_R) \times P_{FD}
\]

\[
L_{EQ} = \frac{V_3}{V_3 + V_{av4}} \times (Equation 13-12 or 13-13)
\]

\[
P_{FD} = 0.600 \text{ using Equation (Exhibit 13-7)}
\]

\[
V_{12} = 3246 \text{ pc/h}
\]

### Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V_{FO})</td>
<td>Exhibit 13-6</td>
</tr>
</tbody>
</table>

### Flow Entering Merge Influence Area

- **Actual**: 3246 pc/h
- **Desirable**: Exhibit 13-8
- **Violation**: 2100 pc/h

### Level of Service Determination (if not F)

\[
D_R = 5.475 + 0.00734 \times V_R + 0.0078 \times V_{12} - 0.00627 \times L_A
\]

\[
D_R = 23.4 \text{ (pc/mi/ln)}
\]

\[
LOS = \text{D (Exhibit 13-2)}
\]
# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information
- **Analyst**: AL
- **Agency or Company**: AIM ENGINEERING
- **Date Performed**: 3/16/2012
- **Analysis Time Period**: PM

## Site Information
- **Freeway/Dir of Travel**: I-75 NB
- **Junction**: GOLDEN GATE PKWY NB
- **Jurisdiction**: ON
- **Analysis Year**: 2039 EVERGLADES

## Inputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Lanes, N</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Acceleration Lane Length, L_A</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Deceleration Lane Length L_D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freeway Volume, V_F</td>
<td>3689</td>
<td></td>
</tr>
<tr>
<td>Ramp Volume, V_R</td>
<td>2199</td>
<td></td>
</tr>
<tr>
<td>Ramp Free-Flow Speed, S_RF</td>
<td>70.0</td>
<td></td>
</tr>
<tr>
<td>Freeway Free-Flow Speed, S_FF</td>
<td>35.0</td>
<td></td>
</tr>
<tr>
<td>Downstream Adj Ramp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>(pc/h)</th>
<th>V (Veh/hr)</th>
<th>PHF</th>
<th>Terrain</th>
<th>%Truck</th>
<th>%Rv</th>
<th>f_HV</th>
<th>f_p</th>
<th>V = V/PHF x f_HV x f_p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>3689</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>4000</td>
</tr>
<tr>
<td>Ramp</td>
<td>2199</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>2384</td>
</tr>
</tbody>
</table>

## Estimation of \( V_{12} \)

\[
L_{EQ} = (\text{Equation 13-6 or 13-7})
\]

\[
P_{FM} = 0.591 \text{ using Equation (Exhibit 13-6)}
\]

\[
V_{12} = 2366 \text{ pc/h}
\]

\[
V_{3} \text{ or } V_{av34} = 1634 \text{ pc/h (Equation 13-14 or 13-17)}
\]

\[
\text{Is } V_{3} \text{ or } V_{av34} > 2,700 \text{ pc/h?} \quad \bigcirc \quad \text{Yes} \quad \bigcirc \quad \text{No}
\]

\[
\text{Is } V_{3} \text{ or } V_{av34} > 1.5 \times V_{12}/2 \quad \bigcirc \quad \text{Yes} \quad \bigcirc \quad \text{No}
\]

\[
\text{If Yes, } V_{12a} = \text{ pc/h (Equation 13-16, 13-18, or 13-19)}
\]

## Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Capacity</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>6384</td>
<td>Exhibit 13-8</td>
<td>No</td>
</tr>
</tbody>
</table>

## Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>4750</td>
<td>Exhibit 13-8</td>
<td>4600:All</td>
</tr>
</tbody>
</table>

\[
D_{R} = 5.475 + 0.00734 V_{R} + 0.0078 V_{12} - 0.00627 L_{A}
\]

\[
D_{R} = 38.3 (\text{pc/mi/ln})
\]

\[
\text{LOS} = E (\text{Exhibit 13-2})
\]
### Diverge Analysis

**Analyst:** AL  
**Agency/Co.:** AIM ENGINEERING  
**Date performed:** 3/8/2012  
**Analysis time period:** PM  
**Freeway/Dir of Travel:** I-75 SB  
**Junction:** GGP SB OFF RAMP  
**Jurisdiction:** 2039 EVERGLADES  
**Analysis Year:**

---

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>6404 vph</td>
</tr>
</tbody>
</table>

### Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>45.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>1710 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>165 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>465 ft</td>
</tr>
</tbody>
</table>

---

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td>ft</td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>6404</td>
<td>1710</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1685</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>0.00</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV = 0.971
Driver population factor, fP = 1.00
Flow rate, v_p = 6943 pcph

Estimation of V12 Diverge Areas

\[ L = \quad \text{(Equation 13-12 or 13-13)} \]
\[ EQ \]
\[ P = 0.450 \quad \text{Using Equation 0} \]
\[ PD \]
\[ v = v + (v - v) P = 4144 \text{ pc/h} \]
\[ 12 \quad R \quad F \quad R \quad FD \]

Capacity Checks

\[ v = v \quad \text{Actual} \quad 6943 \quad \text{Maximum} \quad 7200 \quad \text{LOS F?} \quad \text{No} \]
\[ v = v - v \quad \text{FO} \quad F \quad R \quad 5089 \quad 7200 \quad \text{No} \]
\[ v \quad \text{v} \quad \text{F} \quad R \quad 1854 \quad 4200 \quad \text{No} \]
\[ v \quad \text{R} \quad 2799 \text{ pc/h} \quad \text{(Equation 13-14 or 13-17)} \]
\[ 3 \quad \text{av34} \quad \text{Is } v \quad \text{or } v \quad > 2700 \text{ pc/h?} \quad \text{Yes} \]
\[ 3 \quad \text{av34} \quad \text{Is } v \quad \text{or } v \quad > 1.5 \quad v /2 \quad \text{No} \]
\[ 3 \quad \text{av34} \quad 12 \quad \text{If yes, } v = 4243 \quad \text{(Equation 13-15, 13-16, 13-18, or 13-19)} \]
\[ 12A \]

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>4243</td>
<td>4400</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 \quad v - 0.009 \quad L = 33.6 \quad \text{pc/mi/ln} \]
\[ 12 \quad R \quad D \]

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable,
\[ D = 0.465 \quad S \]

Space mean speed in ramp influence area,
\[ S = 57.0 \quad \text{mph} \]

Space mean speed in outer lanes,
\[ S = 70.2 \quad \text{mph} \]

Space mean speed for all vehicles,
\[ S = 61.5 \quad \text{mph} \]
### RAMPS AND RAMP JUNCTIONS WORKSHEET

#### General Information
- Analyst: AL
- Agency or Company: AIM ENGINEERING
- Date Performed: 3/16/2012
- Analysis Time Period: PM
- Jurisdiction: Golden Gate PKWY SB ON
- Analysis Year: 2039 Everglades

#### Site Information
- Freeway/Dir of Travel: I-75 SB

#### Project Description

#### Inputs
- Number of Lanes, N: 3
- Acceleration Lane Length, L_A: 550 ft
- Deceleration Lane Length L_D: ft
- Freeway Volume, V_F: 4694 veh/h
- Ramp Volume, V_R: 994 veh/h
- Ramp Free-Flow Speed, S_FF: 70.0 veh/h
- Ramp Free-Flow Speed, S_FR: 35.0 veh/h

#### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>(pc/h)</th>
<th>V (Veh/hr)</th>
<th>PHF</th>
<th>Terrain</th>
<th>%Truck</th>
<th>%Rv</th>
<th>f_Hv</th>
<th>f_p</th>
<th>v = V/PHF x f_Hv x f_p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>4694</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>5089</td>
</tr>
<tr>
<td>Ramp</td>
<td>994</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>1078</td>
</tr>
</tbody>
</table>

#### Estimation of v_{12}

\[
V_{12} = V_F \left( P_{FM} \right)
\]

\[
L_{EQ} = \frac{V_{12}}{P_{FM}}
\]

### Merge Areas

#### Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Capacity</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{FO}</td>
<td>6167</td>
<td>Exhibit 13-8</td>
</tr>
</tbody>
</table>

#### Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{R12}</td>
<td>4095</td>
<td>Exhibit 13-8</td>
</tr>
</tbody>
</table>

### Diverge Areas

#### Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{FO} = V_F - V_R</td>
<td>Exhibit 13-8</td>
</tr>
<tr>
<td>V_R</td>
<td>Exhibit 13-10</td>
</tr>
</tbody>
</table>

#### Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{12}</td>
<td></td>
<td>Exhibit 13-8</td>
</tr>
</tbody>
</table>

#### Level of Service Determination (if not F)

\[
D_R = 5.475 + 0.00734 V_R + 0.0078 V_{12} - 0.00027 L_A
\]

\[
D_R = 33.5 \text{ (pc/mi/ln)}
\]

\[
\text{LOS} = D \ (Exhibit 13-2)
\]
**Diverge Analysis**

**Analyst:** AL
**Agency/Co.:** AIM ENGINEERING
**Date performed:** 3/8/2012
**Analysis time period:** AM
**Freeway/Dir of Travel:** I-75 EB
**Junction:** SR 29 OFF RAMP
**Jurisdiction:**
**Analysis Year:** 2039 DESOTO
**Description:**

---

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2111 vph</td>
</tr>
</tbody>
</table>

---

**Off Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>45.0  mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>648   vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>202 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

**Adjacent Ramp Data (if one exists)**

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td></td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td></td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2111</td>
<td>648</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td>v</td>
</tr>
<tr>
<td>Peak 15-min volume, vi5</td>
<td>556</td>
<td>171</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>22</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td></td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV
Driver population factor, fP
Flow rate, vp

Estimation of V12 Diverge Areas

L = (Equation 25-8 or 25-9)
EQ
P = 1.000 Using Equation 0
FD
v = v + (v - v) P = 2543 pc/h
12 R F R FD

Capacity Checks

v = v
Fi F
v = v - v
FO F R
v
R
v 0 pc/h (Equation 25-15 or 25-16)
3 or av34
Is v v > 2700 pc/h?
3 or av34
Is v v > 1.5 v /2
3 or av34
12
If yes, v = (Equation 25-18)
12A

Flow Entering Diverge Influence Area

v
Actual Max Desirable Violation?
2543 4600 No
12

Level of Service Determination (if not F)

Density,
D = 4.252 + 0.0086 v - 0.009 L = 24.3 pc/mi/ln
R 12 D
Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable,
D = 0.374
S
Space mean speed in ramp influence area,
S = 59.5 mph
R
Space mean speed in outer lanes,
S = N/A mph
0
Space mean speed for all vehicles,
S = 59.5 mph
HCS+: Ramps and Ramp Junctions Release 5.21

Phone: 
E-mail: 
Fax: 

Merge Analysis

Analyst: AL
Agency/Co.: AIM ENGINEERING
Date performed: 3/16/2012
Analysis time period: AM
Freeway/Dir of Travel: I-75 EB
Junction: SR 29 EB ON
Jurisdiction: 2039 DESOTO
Analysis Year: 
Description:

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>1463 vph</td>
</tr>
</tbody>
</table>

On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>202 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>560 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

| Does adjacent ramp exist? | No |
| Volume on adjacent Ramp | vph |
| Position of adjacent Ramp | |
| Type of adjacent Ramp | |
| Distance to adjacent Ramp | ft |

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>1463</td>
<td>202</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>385</td>
<td>53</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>22</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV = 0.971
Driver population factor, fP = 0.90
Flow rate, vp = 1762 pcph

Estimation of V12 Merge Areas

L = \text{(Equation 25-2 or 25-3)}

P = 1.000 \text{ Using Equation 0}

v = v \ (P \ F) = 1762 \ pc/h

Capacity Checks

\begin{align*}
\text{v} & \text{ Actual} & \text{Maximum} & \text{LOS F?} \\
\text{PO} & 2024 & 4800 & \text{No} \\
\text{v} & 0 \ \text{pc/h} & \text{(Equation 25-4 or 25-5)} \\
3 \ or \ av34 & \text{or av34} & \text{No} \\
\text{v} & > 2700 \ pc/h? & \text{No} \\
3 \ or \ av34 & \text{or av34} & \text{No} \\
12A & \text{If yes, v} & \text{(Equation 25-8)} \\
\end{align*}

Flow Entering Merge Influence Area

\begin{align*}
\text{v} & \text{ Actual} & \text{Max Desirable} & \text{Violation?} \\
12 & 1762 & 4400 & \text{No} \\
\end{align*}

Level of Service Determination (if not F)

\begin{align*}
\text{Density, D} & = 5.475 + 0.00734 \ v + 0.0078 \ v - 0.00627 \ L = 17.6 \ pc/mi/ln \\
R & \text{ for ramp-freeway junction areas of influence B} \\
\end{align*}

Speed Estimation

\begin{align*}
\text{Intermediate speed variable, M} & = 0.311 \\
\text{Space mean speed in ramp influence area, S} & = 61.3 \ mph \\
\text{Space mean speed in outer lanes, S} & = \text{N/A} \ mph \\
\text{Space mean speed for all vehicles, S} & = 61.3 \ mph \\
\end{align*}
HCS+: Ramps and Ramp Junctions Release 5.21

Phone: 
E-mail: 
Fax: 

Diverge Analysis

Analyst: AL 
Agency/Co.: AIM ENGINEERING 
Date performed: 3/8/2012 
Analysis time period: AM 
Freeway/Dir of Travel: I-75 WB 
Junction: SR 29 OFF RAMP 
Jurisdiction: 2039 DESOTO 
Analysis Year: 

Description: 

Freeway Data

Type of analysis: Diverge 
Number of lanes in freeway: 2 
Free-flow speed on freeway: 70.0 mph 
Volume on freeway: 2119 vph 

Off Ramp Data

Side of freeway: Right 
Number of lanes in ramp: 1 
Free-Flow speed on ramp: 45.0 mph 
Volume on ramp: 259 vph 
Length of first accel/decel lane: 215 ft 
Length of second accel/decel lane: 

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?: No 
Volume on adjacent ramp: vph 
Position of adjacent ramp: 
Type of adjacent ramp: 
Distance to adjacent ramp: ft 

Conversion to pc/h Under Base Conditions

Junction Components 

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td>vph</td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>558</td>
<td>68</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>22</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>0.00</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>0.00</td>
<td>0.00</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV 0.971 0.901
Driver population factor, fP 0.90 0.90
Flow rate, vp 2553 336 pcph

Estimation of V12 Diverge Areas

\[ L = (\text{Equation 25-8 or 25-9}) \]
\[ \text{EQ} \]
\[ P = 1.000 \quad \text{Using Equation 0} \]
\[ \text{FD} \]
\[ v = v + (v - v) P = 2553 \quad \text{pc/h} \]
\[ 12 \quad \text{R} \quad \text{F} \quad \text{R} \quad \text{FD} \]

Capacity Checks

<table>
<thead>
<tr>
<th></th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>2553</td>
<td>4800</td>
<td>No</td>
</tr>
<tr>
<td>Pi</td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>2217</td>
<td>4800</td>
<td>No</td>
</tr>
<tr>
<td>FO</td>
<td>F</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>336</td>
<td>2100</td>
<td>No</td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>0</td>
<td>pc/h</td>
<td>(Equation 25-15 or 25-16)</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is \( v \) \( v < 2700 \) pc/h? No

Is \( v \) \( v > 1.5 \frac{v}{2} \) ? No

If yes, \( v = \)

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th></th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>2553</td>
<td>4600</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, \( D = 4.252 + 0.0086 v - 0.009 L = 24.3 \) pc/mi/ln
\[ 12 \quad \text{D} \]

Level of Service for ramp freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, \( D = 0.328 \) S

Space mean speed in ramp influence area, \( S = 60.8 \) mph

Space mean speed in outer lanes, \( S = \text{N/A} \) mph

Space mean speed for all vehicles, \( S = 60.8 \) mph
HCS+: Ramps and Ramp Junctions Release 5.21

Phone:  
Fax:  
E-mail:  

--- Merge Analysis ---

Analyst:  
Agency/Co.:  AIM ENGINEERING  
Date performed:  3/16/2012  
Analysis time period:  AM  
Freeway/Dir of Travel:  I-75 WB  
Junction:  SR 29 WB ON  
Jurisdiction:  2039 DESOTO  
Analysis Year:  
Description:  

--- Freeway Data ---

Type of analysis:  Merge  
Number of lanes in freeway:  2  
Free-flow speed on freeway:  70.0 mph  
Volume on freeway:  1860 vph  

--- On Ramp Data ---

Side of freeway:  Right  
Number of lanes in ramp:  1  
Free-flow speed on ramp:  35.0 mph  
Volume on ramp:  824 vph  
Length of first accel/decel lane:  415 ft  
Length of second accel/decel lane:  

--- Adjacent Ramp Data (if one exists) ---

Does adjacent ramp exist?  No  
Volume on adjacent Ramp:  vph  
Position of adjacent Ramp:  
Type of adjacent Ramp:  
Distance to adjacent Ramp:  ft  

--- Conversion to pc/h Under Base Conditions ---

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>1860</td>
<td>824</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>489</td>
<td>217</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>22</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV 0.971 0.901
Driver population factor, fP 0.90 0.90
Flow rate, vp 2241 1070 pcph

Estimation of V12 Merge Areas

\[ L = \quad \text{(Equation 25-2 or 25-3)} \]
\[ EQ \]
\[ P = 1.000 \quad \text{Using Equation 0} \]
\[ FM \]
\[ v = v \quad \left( P \right) = 2241 \quad \text{pc/h} \]
\[ 12 \quad F \quad FM \]

Capacity Checks

\[
\begin{array}{ccc}
\text{Actual} & \text{Maximum} & \text{LOS F?} \\
\text{v} & 3311 & 4800 \\
\text{PO} & & \text{No} \\
\text{v} & 0 \quad \text{pc/h} \quad \text{(Equation 25-4 or 25-5)} & \\
\text{3 or av34} & & \\
\text{Is } \text{v} & \text{v} & > 2700 \quad \text{pc/h?} \\
\text{3 or av34} & & \text{No} \\
\text{Is } \text{v} & \text{v} & > 1.5 \text{v} / 2 \\
\text{3 or av34} & & 12 \\
\text{If yes, v} & = & \\
\text{12A} & & \\
\end{array}
\]

Flow Entering Merge Influence Area

\[
\begin{array}{ccc}
\text{Actual} & \text{Max Desirable} & \text{Violation?} \\
\text{v} & 2241 & 4400 \\
\text{12} & & \text{No} \\
\end{array}
\]

Level of Service Determination (if not F)

\[ D = 5.475 + 0.00734 \text{v} + 0.0078 \text{v} - 0.00627 \frac{L}{R} = 28.2 \quad \text{pc/mi/ln} \]

Level of service for ramp-freeway junction areas of influence \( D \)

\[
\begin{array}{ccc}
\text{Speed Estimation} & \\
\text{Intermediate speed variable,} & M = 0.399 \\
\text{Space mean speed in ramp influence area,} & S = 58.8 \quad \text{mph} \\
\text{Space mean speed in outer lanes,} & S = \text{N/A} \quad \text{mph} \\
\text{Space mean speed for all vehicles,} & S = 58.8 \quad \text{mph} \\
\end{array}
\]
### General Information
- **Agency or Company**: AIM ENGINEERING
- **Date Performed**: 3/6/2012
- **Project Description**: EVERGLADES I/R

### Site Information
- **Highway/Direction of Travel**: I-75 EB
- **Jurisdiction**: CR 951/DESOTO BLVD
- **Analysis Year**: 2039 DESOTO

### Flow Inputs
- **Volume, V**: 2918 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %
- **Peak-Hr Direction Prop, D**: veh/h
- **Driver type adjustment**: 1.00

### Calculate Flow Adjustments
- \( f_p \) = 1.00
- \( E_T \) = 1.5
- \( E_R \) = 1.2
- \( f_{HV} = 1/(1+P_T(E_T - 1) + P_R(E_R - 1)) \) = 0.971

### Speed Inputs
- **Lane Width**: 12.0 ft
- **Rt-Shoulder Lat. Clearance**: 6.0 ft
- **Interchange Density**: 0.50 l/mi
- **Number of Lanes, N**: 3
- **FFS (measured)**: 75.0 mi/h

### LOS and Performance Measures
- **Operational (LOS)**: \( v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p) \) pc/h/ln
- **S**: 75.0 mi/h
- **D**: \( v_p / S \) pc/mi/ln
- **LOS**: B

### Glossary
- **N**: Number of lanes
- **V**: Hourly volume
- **\( v_p \)**: Flow rate
- **LOS**: Level of service
- **DDHV**: Directional design hour volume

### Design (N)
- **Design LOS**: \( v_p = (V \text{ or DDHV}) / (PHF \times N \times f_{HV} \times f_p) \) pc/h
- **S**: mi/h
- **D**: \( v_p / S \) pc/mi/ln
- **Required Number of Lanes, N**

---

**Factor Location**
- \( E_R \): Exhibits 23-8, 23-10
- \( f_{LV} \): Exhibit 23-4
- \( E_T \): Exhibits 23-8, 23-10, 23-11
- \( f_{LC} \): Exhibit 23-5
- \( f_p \): Page 23-12
- \( f_N \): Exhibit 23-6
- \( f_{ID} \): Exhibit 23-7

---

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4/23/2012
### Merge Analysis

**Analyst:** AL  
**Agency/Co.:** AIM ENGINEERING  
**Date performed:** 3/16/2012  
**Analysis time period:** AM  
**Freeway/Dir of Travel:** I-75 EB  
**Junction:** DESOLO BLVD EB ON  
**Jurisdiction:**  
**Analysis Year:** 2039 DESEO  
**Description:**

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>1952</td>
</tr>
</tbody>
</table>

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>159</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1200</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td></td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td></td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>ft</td>
</tr>
</tbody>
</table>

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>1952</td>
<td>159</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>514</td>
<td>42</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>6</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, BR</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV 0.971 0.971
Driver population factor, fP 0.90 0.90
Flow rate, vp 2352 192 pcph

Estimation of V12 Merge Areas

\[ L = \quad (\text{Equation 25-2 or 25-3}) \]

\[ \text{EQ} \]

\[ P = 1.000 \quad \text{Using Equation 0} \]

\[ F \quad \text{FM} \]

\[ v = \frac{v}{\left(\frac{P}{F} \quad \text{FM}\right)} = 2352 \quad \text{pc/h} \]

Capacity Checks

\[ \frac{v}{\text{PO}} \]

\[ \frac{v}{v} = 2544 \quad 4800 \quad \text{No} \]

\[ \frac{v}{3 \quad \text{or} \quad \text{av34}} \]

\[ 0 \quad \text{pc/h} \quad (\text{Equation 25-4 or 25-5}) \]

Is \[ \frac{v}{v} > 2700 \quad \text{pc/h}? \]

No

Is \[ \frac{v}{3 \quad \text{or} \quad \text{av34}} \]

\[ > \frac{1.5 \quad v}{12} \]

No

If yes, \[ v = \frac{v}{12A} \]

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2352</td>
<td>4400</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density, \[ D = 5.475 + 0.00734 \quad v + 0.0078 \quad v - 0.00627 \quad L = 17.7 \quad \text{pc/mi/ln} \]

\[ R \quad R \quad 12 \quad A \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, \[ M = 0.287 \]

Space mean speed in ramp influence area, \[ S = 62.0 \quad \text{mph} \]

Space mean speed in outer lanes, \[ S = \text{N/A} \quad \text{mph} \]

Space mean speed for all vehicles, \[ S = 62.0 \quad \text{mph} \]
Diverge Analysis

Analyst: AL
Agency/Co.: AIM ENGINEERING
Date performed: 3/8/2012
Analysis time period: AM
Freeway/Dir of Travel: I-75 WB
Junction: DESOTO BLVD OFF RAMP
Jurisdiction: 2039 DESOTO
Analysis Year: Description:

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2684 vph</td>
</tr>
</tbody>
</table>

Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>45.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>202 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>400 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td></td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td></td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>ft</td>
</tr>
</tbody>
</table>

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2684</td>
<td>202</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>706</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>6 %</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0 %</td>
<td></td>
</tr>
<tr>
<td>Terrain type: Grade</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>0.00</td>
<td>0.00</td>
<td>%</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV 0.971 0.971
Driver population factor, fP 0.90 0.90
Flow rate, vp 3233 243 pcph

Estimation of V12 Diverge Areas

\[ L = \] (Equation 25-8 or 25-9)
EQ
\[ P = 1.000 \] Using Equation 0
PD
\[ v = v + (v - v) P = 3233 \text{ pc/h} \]
12 R F R FD

Capacity Checks

<table>
<thead>
<tr>
<th>v = v</th>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fi F</td>
<td>3233</td>
<td>4800</td>
<td>No</td>
</tr>
<tr>
<td>v = v - v</td>
<td>2990</td>
<td>4800</td>
<td>No</td>
</tr>
<tr>
<td>FO F R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v R</td>
<td>243</td>
<td>2100</td>
<td>No</td>
</tr>
<tr>
<td>v 3 or av34</td>
<td>0 pc/h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is \[ v > 2700 \text{ pc/h?} \] No

Is \[ v > 1.5 v /2 \text{ on} \] No

If yes, \[ v = \] (Equation 25-18)

Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>v</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>3233</td>
<td>4600</td>
<td>No</td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

Density,
\[ D = 4.252 + 0.0086 v - 0.009 L = 28.5 \text{ pc/mi/ln} \]
12 12 D

Level of service for ramp-freeway junction areas of influence D

Speed Estimation

Intermediate speed variable, \[ D = 0.320 \text{ S} \]
Space mean speed in ramp influence area, \[ S = 61.0 \text{ mph} \]
Space mean speed in outer lanes, \[ S = \text{N/A} \text{ mph} \]
Space mean speed for all vehicles, \[ S = 61.0 \text{ mph} \]
BASIC FREEWAY WORKSHEET

BASIC FREEWAY SEGMENTS WORKSHEET

<table>
<thead>
<tr>
<th>Application</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational (LOS)</td>
<td>FFS, N, v_p</td>
<td>LOS, S, D</td>
</tr>
<tr>
<td>Design (N)</td>
<td>FFS, LOS, v_p</td>
<td>N, S, D</td>
</tr>
<tr>
<td>Design (v_p)</td>
<td>FFS, LOS, N</td>
<td>v_p, S, D</td>
</tr>
<tr>
<td>Planning (LOS)</td>
<td>FFS, N, AADT</td>
<td>LOS, S, D</td>
</tr>
<tr>
<td>Planning (N)</td>
<td>FFS, LOS, AADT</td>
<td>N, S, D</td>
</tr>
<tr>
<td>Planning (v_p)</td>
<td>FFS, LOS, AADT</td>
<td>v_p, S, D</td>
</tr>
</tbody>
</table>

General Information

Analyst: GSR
Agency or Company: AIM ENGINEERING
Date Performed: 3/26/2012
Analysis Time Period: AM
Project Description: EVERGLADES IJR

Flow Inputs

Volume, V: 2482 veh/h
AADT: veh/day
Peak-Hr Prop. of AADT, K: %
Peak-Hr Direction Prop, D: veh/h
Driver type adjustment: 1.00

Calculate Flow Adjustments

f_p = 1.00
E_T = 1.5

Speed Inputs

Lane Width: 12.0 ft
Rt-Shoulder Lat. Clearance: 6.0 ft
Interchange Density: 0.50 l/mi
Number of Lanes, N: 2
Base free-flow Speed, BFFS: 75.0 mi/h

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_HV x f_p) 1346 pc/h/ln
S = 74.8 mi/h
D = v_p / S 18.0 pc/mi/ln
LOS = B

Site Information

Highway/Direction of Travel: I-75
From/To: BTWN WB DESOTO BLVD RAMP
Jurisdiction: 2039 DESOTO
Analysis Year: 2039

Flow and Design Measures

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_HV x f_p) pc/h
S = mi/h
D = v_p / S pc/mi/ln

Required Number of Lanes, N

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 23-9, 23-10, 23-11
f_LW - Exhibit 23-4
f_LC - Exhibit 23-5
f_ID - Exhibit 23-6
f_ID - Exhibit 23-7
### General Information
- **Analyst**: AL
- **Agency or Company**: AIM ENGINEERING
- **Date Performed**: 3/8/2012
- **Analysis Time Period**: AM
- **Project Description**: EVERGLADES IJR

### Site Information
- **Highway/Direction of Travel**: I-75 WB
- **From/To**: DESOTO BLVD/CR 951
- **Jurisdiction**: Analysis Year 2039 DESOTO

### Flow Inputs
- **Volume, V**: 3711 veh/h
- **AADT**: veh/day
- **Peak-Hr Prop. of AADT, K**: %Trucks and Buses, $p_T$ = 6
- **Peak-Hr Direction Prop, D**: %RVs, $p_R$ = 0
- **DDHV = AADT x K x D**: veh/h
- **Driver type adjustment**: 1.00

#### Calculate Flow Adjustments
- $f_p = 1.00$
- $E_T = 1.5$
- $E_{HV} = \frac{1}{1 + \frac{p_T}{E_T} \cdot (E_T - 1)} + \frac{p_R}{E_R} (E_R - 1) = 0.971$

### Speed Inputs
- **Lane Width**: 12.0 ft
- **Rt-Shoulder Lat. Clearance**: 6.0 ft
- **Interchange Density**: 0.50 l/mi
- **Number of Lanes, N**: 3
- **FFS (measured)**: mi/h
- **Base free-flow Speed, BFFS**: 75.0 mi/h

### LOS and Performance Measures

#### Operational (LOS)
- $v_p = (V \text{ or } DDHV) / (PHF \times N \times f_{HV} \times f_p)$ pc/h/ln
- $s = 74.8$ mi/h
- $D = \frac{v_p}{s}$ pc/mi/ln
- **LOS**

#### Design (N)
- **Design LOS**
- **Design LOS**
- **Required Number of Lanes, N**

### Glossary
- **N - Number of lanes**
- **S - Speed**
- **V - Hourly volume**
- **D - Density**
- **f_p - Flow rate**
- **FFS - Free-flow speed**
- **LOS - Level of service**
- **BFFS - Base free-flow speed**
- **DDHV - Directional design hour volume**
**Diverge Analysis**

- Analyst: GSR
- Agency/Co.: AIM ENGINEERING
- Date performed: 3/25/2012
- Analysis time period: AM
- Freeway/Dir of Travel: I-75 EB
- Junction: SR 951 OFF RAMP
- Jurisdiction: 2039 DESOTO
- Description:

**Freeway Data**

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>4423 vph</td>
</tr>
</tbody>
</table>

**Off Ramp Data**

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>45.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>2254 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1000 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>0 ft</td>
</tr>
</tbody>
</table>

**Adjacent Ramp Data (if one exists)**

- Does adjacent ramp exist? No
- Volume on adjacent ramp vph
- Position of adjacent ramp
- Type of adjacent ramp
- Distance to adjacent ramp ft

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>4423</td>
<td>2254</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1164</td>
<td>593</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>6</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0.00 %</td>
<td>0.00 %</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>0.00 mi</td>
<td>0.00 mi</td>
<td></td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Estimation of V12 Diverge Areas

\[ L = \text{EQ} \]
\[ P = 0.450 \text{ Using Equation 0} \]
\[ v = v + (v - v) P = 3502 \text{ pc/h} \]
\[ 12 \quad R \quad F \quad R \quad FD \]

Capacity Checks

\[
\begin{array}{ccc}
\text{v} & \text{Actual} & \text{Max} & \text{LOS F?} \\
\text{Fi} & 4795 & 7200 & \text{No} \\
\text{v} = v - v & 2351 & 7200 & \text{No} \\
\text{FO} & 2444 & 4100 & \text{No} \\
\text{R} & \text{v} & 1293 \text{ pc/h} & \text{(Equation 25-15 or 25-16)} \\
3 \text{ or av34} & & & \\
\text{Is v} & \text{v} & > 2700 \text{ pc/h?} & \text{No} \\
3 \text{ or av34} & & & \\
\text{Is v} & \text{v} & > 1.5 \text{ v/2} & \text{No} \\
3 \text{ or av34} & & 12 & \\
\text{If yes, v} & & & \text{(Equation 25-18)} \\
& 12A & & \\
\end{array}
\]

Flow Entering Diverge Influence Area

\[
\begin{array}{ccc}
\text{v} & \text{Actual} & \text{Max Desirable} & \text{Violation?} \\
12 & 3502 & 4600 & \text{No} \\
\end{array}
\]

\[ D = 4.252 + 0.0086 v - 0.009 L = 16.4 \text{ pc/mi/ln} \]

Level of Service Determination (if not F)

Density,

\[ R \]

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

\[
\begin{array}{ccc}
\text{Intermediate speed variable,} & D = 0.518 \\
S & \text{mph} \\
\text{Space mean speed in ramp influence area,} & S = 55.5 \\
R & \text{mph} \\
\text{Space mean speed in outer lanes,} & S = 75.6 \\
0 & \text{mph} \\
\text{Space mean speed for all vehicles,} & S = 59.8 \\
\end{array}
\]
Phone: 
Fax: 
E-mail: 

--- Merge Analysis ---

Analyst: GSR
Agency/Co.: AIM ENGINEERING
Date performed: 3/25/2012
Analysis time period: AM
Freeway/Dir of Travel: I-75 EB
Junction: SR 951 EB ON
Jurisdiction: 
Analysis Year: 2039 DESOTO
Description: 

--- Freeway Data ---

Type of analysis: Merge
Number of lanes in freeway: 3
Free-flow speed on freeway: 70.0 mph
Volume on freeway: 2169 vph

--- On Ramp Data ---

Side of freeway: Right
Number of lanes in ramp: 1
Free-flow speed on ramp: 35.0 mph
Volume on ramp: 749 vph
Length of first accel/decel lane: 465 ft
Length of second accel/decel lane: ft

--- Adjacent Ramp Data (if one exists) ---

Does adjacent ramp exist? No
Volume on adjacent Ramp: vph
Position of adjacent Ramp:
Type of adjacent Ramp:
Distance to adjacent Ramp: ft

--- Conversion to pc/h Under Base Conditions ---

Junction Components

<table>
<thead>
<tr>
<th>Volume, V (vph)</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>2169</td>
<td>749</td>
<td></td>
<td>vph</td>
</tr>
<tr>
<td>/Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>571</td>
<td>197</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>6</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV 0.971  0.971
Driver population factor, fP  1.00   1.00
Flow rate, vp  2352  812  pcph

_{Estimation of V12 Merge Areas}_

\[ L = \text{EQ} \]
\[ P = 0.591 \text{ Using Equation 1} \]
\[ v = v_{(P)} = \frac{1389 \text{ pc/h}}{12 \text{ F FM}} \]

_{Capacity Checks}_

<table>
<thead>
<tr>
<th>Actual</th>
<th>Maximum</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>3164</td>
<td>7200</td>
</tr>
<tr>
<td>FO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>963 pc/h</td>
<td>(Equation 25-4 or 25-5)</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v</td>
<td>v &gt; 2700 pc/h?</td>
<td>No</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is v</td>
<td>v &gt; 1.5 v /2</td>
<td>No</td>
</tr>
<tr>
<td>3 or av34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, v =</td>
<td>v</td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

_{Flow Entering Merge Influence Area}_

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>1389</td>
<td>4400</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

_{Level of Service Determination (if not F)}_

Density, \( D = 5.475 + 0.00734 v + 0.0078 v - 0.00627 L = 19.4 \text{ pc/mi/ln} \)
\( R \text{ R 12 A} \)

_{Level of service for ramp-freeway junction areas of influence B}_

_{Speed Estimation}_

Intermediate speed variable, \( M = 0.324 \)
\( S \)

Space mean speed in ramp influence area, \( S = 60.9 \text{ mph} \)
\( R \)

Space mean speed in outer lanes, \( S = 68.3 \text{ mph} \)
\( 0 \)

Space mean speed for all vehicles, \( S = 63.0 \text{ mph} \)
HCS+: Ramps and Ramp Junctions Release 5.21

Phone:          Fax:          
E-mail:        

Diverge Analysis

Analyst:        GSR
Agency/Co.:  AIM ENGINEERING
Date performed:  3/25/2012
Analysis time period: AM
Freeway/Dir of Travel: I-75 WB
Junction:       SR 951 OFF RAMP
Jurisdiction:  
Analysis Year:  2039 DESOTO
Description:  

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
<td></td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>3711 vph</td>
<td></td>
</tr>
</tbody>
</table>

Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>45.0 mph</td>
<td></td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>953 vph</td>
<td></td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>220 ft</td>
<td></td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>ft</td>
<td></td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent ramp</td>
<td>vph</td>
</tr>
<tr>
<td>Position of adjacent ramp</td>
<td></td>
</tr>
<tr>
<td>Type of adjacent ramp</td>
<td></td>
</tr>
<tr>
<td>Distance to adjacent ramp</td>
<td>ft</td>
</tr>
</tbody>
</table>

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>3711</td>
<td>953</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>977</td>
<td>251</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>0.00</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>0.00  mi</td>
<td>0.00 mi</td>
<td>%</td>
</tr>
<tr>
<td>Trucks and buses PCE, BT</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Estimation of V12 Diverge Areas

\[ L = \text{EQ} \]
\[ P = 0.612 \text{ Using Equation 5} \]
\[ v = v + (v - v) P = 2863 \text{ pc/h} \]
\[ 12 \text{ R F R FD} \]

Capacity Checks

\[ v = v \]
\[ \text{Actual} \quad 4024 \quad \text{Maximum} \quad 7200 \quad \text{LOS F?} \quad \text{No} \]
\[ v = v - v \]
\[ \text{FO F R} \quad 2991 \quad 7200 \quad \text{No} \]
\[ v \]
\[ \text{R} \quad 1033 \quad 2100 \quad \text{No} \]
\[ v = 1161 \text{ pc/h} \quad \text{(Equation 25-15 or 25-16)} \]
\[ 3 \text{ or av34} \]

Is \[ v > 2700 \text{ pc/h?} \quad \text{No} \]

Is \[ v > 1.5 \frac{v}{2} \]
\[ 3 \text{ or av34} \quad \text{No} \]

If yes, \[ v = \]
\[ 12A \]

Flow Entering Diverge Influence Area

\[ v \]
\[ 2863 \quad \text{Max Desirable} \quad 4600 \quad \text{Violation?} \quad \text{No} \]
\[ 12 \]

Level of Service Determination (if not F)

\[ D = 4.252 + 0.0086 v - 0.009 L = 26.9 \text{ pc/mi/ln} \]
\[ R \quad 12 \quad D \]

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, \[ D = 0.391 \]
\[ S \]
Space mean speed in ramp influence area, \[ S = 59.1 \text{ mph} \]
\[ R \]
Space mean speed in outer lanes, \[ S = 76.2 \text{ mph} \]
\[ 0 \]
Space mean speed for all vehicles, \[ S = 63.1 \text{ mph} \]
**Merge Analysis**

**Analyst:** GSR  
**Agency/Co.:** AIM ENGINEERING  
**Date performed:** 3/25/2012  
**Analysis time period:** AM  
**Freeway/Dir of Travel:** I-75 WB  
**Junction:** SR 951 WB ON  
**Jurisdiction:**  
**Analysis Year:** 2039 DESOTO  
**Description:**

---

### Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Merge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>2758 vph</td>
</tr>
</tbody>
</table>

### On Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-flow speed on ramp</td>
<td>35.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>2869 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>1000 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>500 ft</td>
</tr>
</tbody>
</table>

---

### Adjacent Ramp Data (if one exists)

<table>
<thead>
<tr>
<th>Does adjacent ramp exist?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume on adjacent Ramp</td>
<td>vph</td>
</tr>
<tr>
<td>Position of adjacent Ramp</td>
<td></td>
</tr>
<tr>
<td>Type of adjacent Ramp</td>
<td></td>
</tr>
<tr>
<td>Distance to adjacent Ramp</td>
<td>ft</td>
</tr>
</tbody>
</table>

---

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>2758</td>
<td>2869</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>726</td>
<td>755</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>6</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type: Grade</td>
<td>Level</td>
<td>Level</td>
<td>%</td>
</tr>
<tr>
<td>Length</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV
Driver population factor, fP
Flow rate, vp

<table>
<thead>
<tr>
<th></th>
<th>0.971</th>
<th>0.971</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>2990</td>
<td>3111</td>
</tr>
</tbody>
</table>

---

**Estimation of V12 Merge Areas**

\[
L = \text{EQ} \\
P = 0.555 \quad \text{Using Equation 0} \\
v = v \left(\frac{P}{FM}\right) = 1659 \quad \text{pc/h} \\
12 \quad F \quad \text{FM}
\]

---

**Capacity Checks**

\[
\begin{align*}
v & = 6101 \quad \text{pc/h} \\
\text{FO} & \quad v = 1331 \quad \text{pc/h} \\
3 \quad \text{or av34} & \\
\text{Is} \quad v & > 2700 \quad \text{pc/h?} \quad \text{No} \\
3 \quad \text{or av34} & \\
\text{Is} \quad v & > 1.5 \frac{v}{2} \quad \text{Yes} \\
3 \quad \text{or av34} & \\
\text{If yes, } v & = 1708 \quad \text{(Equation 25-8)} \\
12A & \\
\end{align*}
\]

---

**Flow Entering Merge Influence Area**

\[
\begin{align*}
v & = 1708 \quad \text{pc/h} \\
12A & \\
\end{align*}
\]

---

**Level of Service Determination (if not F)**

\[
D = 5.475 + 0.00734 \quad v + 0.0078 \quad v - 0.00627 \quad L = 26.0 \quad \text{pc/mi/ln} \\
R \quad R \quad 12 \quad A \\
\text{Level of service for ramp-freeway junction areas of influence} \quad C
\]

---

**Speed Estimation**

\[
\begin{align*}
\text{Intermediate speed variable,} & \quad M = 0.629 \\
\text{Space mean speed in ramp influence area,} & \quad S = 52.4 \quad \text{mph} \\
\text{Space mean speed in outer lanes,} & \quad S = 67.2 \quad \text{mph} \\
\text{Space mean speed for all vehicles,} & \quad S = 54.9 \quad \text{mph}
\end{align*}
\]
RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst: AL
Agency or Company: AIM ENGINEERING
Date Performed: 3/8/2012
Analysis Time Period: AM

Site Information

Freeway/Dir of Travel: I-75 NB
Junction: GGP NB OFF RAMP
Jurisdiction: Analysis Year: 2039 DESOTO

Inputs

- Upstream Adj Ramp: Yes
- Acceleration Lane Length, L_A: 310 ft
- Freeway Volume, V_F: 5627 veh/h
- Ramp Volume, V_R: 916 veh/h
- Freeway Free-Flow Speed, S_FF: 70.0 veh/h
- Ramp Free-Flow Speed, S_FR: 45.0 veh/h

- Downstream Adj Ramp: Yes
- Deceleration Lane Length L_D: ft
- Freeway Volume, V_F: 5627 veh/h
- Ramp Volume, V_R: 916 veh/h
- Freeway Free-Flow Speed, S_FF: 70.0 veh/h
- Ramp Free-Flow Speed, S_FR: 45.0 veh/h

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>(pc/h)</th>
<th>V (Veh/hr)</th>
<th>PHF</th>
<th>Terrain</th>
<th>%Truck</th>
<th>%Rv</th>
<th>f_HV</th>
<th>f_p</th>
<th>v = V/PHF x f_HV x f_p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>5627</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>6101</td>
</tr>
<tr>
<td>Ramp</td>
<td>916</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>993</td>
</tr>
</tbody>
</table>

Estimation of v_12

- V_{12} = V_F (P_{FM})
- L_{EQ} = (Equation 13-6 or 13-7)
- P_{FM} = using Equation (Exhibit 13-6)
- V_{12} = pc/h
- V_{3 or V_{av34}} = pc/h (Equation 13-14 or 13-17)

Capacity Checks

<table>
<thead>
<tr>
<th>Actual</th>
<th>Capacity</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{FO}</td>
<td>Exhibit 13-8</td>
<td></td>
</tr>
<tr>
<td>V_{R12}</td>
<td>Exhibit 13-8</td>
<td></td>
</tr>
</tbody>
</table>

Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{R12}</td>
<td>Exhibit 13-8</td>
<td></td>
</tr>
</tbody>
</table>

Level of Service Determination (if not F)

- D_r = 5.475 + 0.00734 V_{12} + 0.0078 V_{12} - 0.00627 L_A
- D_r = (pc/mln)
- LOS = (Exhibit 13-2)

Level of Service Determination (if not F)

- D_r = 4.252 + 0.0086 V_{12} - 0.009 L_D
- D_r = (pc/mln)
- LOS = D (Exhibit 13-2)
<table>
<thead>
<tr>
<th>General Information</th>
<th>Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst</td>
<td>AL</td>
</tr>
<tr>
<td>Agency or Company</td>
<td>AIM ENGINEERING</td>
</tr>
<tr>
<td>Date Performed</td>
<td>3/16/2012</td>
</tr>
<tr>
<td>Analysis Time Period</td>
<td>AM</td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>GOLDEN GATE PKWY NB ON</td>
</tr>
<tr>
<td>Analysis Year</td>
<td>2039 DESOTO</td>
</tr>
</tbody>
</table>

**Inputs**

- **Upstream Adj Ramp**
  - Number of Lanes, N: 3
  - Acceleration Lane Length, L_A: 500 ft
  - Deceleration Lane Length, L_D: ft
  - Freeway Volume, V_F: 4711 veh/h
  - Ramp Volume, V_R: 1725 veh/h
  - Ramp Free-Flow Speed, S_FF: 70.0 veh/h
  - Ramp Free-Flow Speed, S_FR: 35.0 veh/h

- **Downstream Adj Ramp**
  - Number of Lanes, N: 3
  - Acceleration Lane Length, L_A: 500 ft
  - Deceleration Lane Length, L_D: ft
  - Freeway Volume, V_F: 4711 veh/h
  - Ramp Volume, V_R: 1725 veh/h
  - Ramp Free-Flow Speed, S_FF: 70.0 veh/h
  - Ramp Free-Flow Speed, S_FR: 35.0 veh/h

**Conversion to pc/h Under Base Conditions**

<table>
<thead>
<tr>
<th>(pc/h)</th>
<th>V</th>
<th>PHF</th>
<th>Terrain</th>
<th>%Truck</th>
<th>%Rv</th>
<th>f_HV</th>
<th>f_p</th>
<th>V = V/PHF x f_HV x f_p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>4711</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>5108</td>
</tr>
<tr>
<td>Ramp</td>
<td>1725</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>1870</td>
</tr>
<tr>
<td>UpStream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DownStream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Merge Areas**

**Diverge Areas**

**Estimation of v_{12}**

\[
V_{12} = V_F \left( P_{FM} \right)
\]

**Capacity Checks**

<table>
<thead>
<tr>
<th>V_{FO}</th>
<th>Actual</th>
<th>Capacity</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>6978</td>
<td>Exhibit 13-8</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

**Flow Entering Merge Influence Area**

<table>
<thead>
<tr>
<th>V_{R12}</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>4891</td>
<td>Exhibit 13-8</td>
<td>4600:All</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Level of Service Determination (if not F)**

\[
D_R = 5.475 + 0.00734 V_R + 0.0078 V_{12} - 0.00027 L_A
\]

\[
D = 39.6 \text{ (pc/mi/ln)}
\]

**Flow Entering Diverge Influence Area**

<table>
<thead>
<tr>
<th>V_{12}</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exhibit 13-8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Level of Service Determination (if not F)**

\[
D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D
\]

\[
D = (\text{pc/mi/ln})
\]
HCS+: Ramps and Ramp Junctions Release 5.21

Phone: 
E-mail: 
Fax: 

Diverge Analysis

Analyst: AL
Agency/Co.: AIM ENGINEERING
Date performed: 3/8/2012
Analysis time period: AM
Freeway/Dir of Travel: I-75 SB
Junction: GGP SB OFF RAMP
Jurisdiction: 
Analysis Year: 2039 DESOTO
Description: 

Freeway Data

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Diverge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in freeway</td>
<td>3</td>
</tr>
<tr>
<td>Free-flow speed on freeway</td>
<td>70.0 mph</td>
</tr>
<tr>
<td>Volume on freeway</td>
<td>5935 vph</td>
</tr>
</tbody>
</table>

Off Ramp Data

<table>
<thead>
<tr>
<th>Side of freeway</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lanes in ramp</td>
<td>2</td>
</tr>
<tr>
<td>Free-Flow speed on ramp</td>
<td>45.0 mph</td>
</tr>
<tr>
<td>Volume on ramp</td>
<td>2232 vph</td>
</tr>
<tr>
<td>Length of first accel/decel lane</td>
<td>165 ft</td>
</tr>
<tr>
<td>Length of second accel/decel lane</td>
<td>465 ft</td>
</tr>
</tbody>
</table>

Adjacent Ramp Data (if one exists)

| Does adjacent ramp exist? | No |
| Volume on adjacent ramp | vph |
| Position of adjacent ramp | |
| Type of adjacent ramp | |
| Distance to adjacent ramp | ft |

Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>Junction Components</th>
<th>Freeway</th>
<th>Ramp</th>
<th>Adjacent Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume, V (vph)</td>
<td>5935</td>
<td>2232</td>
<td>vph</td>
</tr>
<tr>
<td>Peak-hour factor, PHF</td>
<td>0.95</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Peak 15-min volume, v15</td>
<td>1562</td>
<td>587</td>
<td>v</td>
</tr>
<tr>
<td>Trucks and buses</td>
<td>6</td>
<td>6</td>
<td>%</td>
</tr>
<tr>
<td>Recreational vehicles</td>
<td>0</td>
<td>0</td>
<td>%</td>
</tr>
<tr>
<td>Terrain type:</td>
<td>Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0.00</td>
<td>%</td>
<td>0.00 %</td>
</tr>
<tr>
<td>Length</td>
<td>0.00</td>
<td>mi</td>
<td>0.00 mi</td>
</tr>
<tr>
<td>Trucks and buses PCE, ET</td>
<td>1.5*</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicle PCE, ER</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>
Heavy vehicle adjustment, fHV 0.971 0.971
Driver population factor, fP 1.00 1.00
Flow rate, vp 6435 2420 pcph

--- Estimation of V12 Diverge Areas ---

\[ L = \] (Equation 25-8 or 25-9)

\[ EQ \]
\[ P = 0.450 \text{ Using Equation 0} \]
\[ FD \]
\[ v = v + (v - v) P = 4227 \text{ pc/h} \]
\[ 12 R F R FD \]

--- Capacity Checks ---

\[ v = v \]
\[ 6435 \]
\[ Fi F \]
\[ v = v - v \]
\[ 4015 \]
\[ FO F R \]
\[ v \]
\[ 2420 \]
\[ R \]
\[ v \]
\[ 2208 \text{ pc/h} \] (Equation 25-15 or 25-16)
\[ 3 \text{ or av34} \]
\[ Is v \]
\[ v > 2700 \text{ pc/h?} \]
\[ 3 \text{ or av34} \]
\[ Is v \]
\[ v > 1.5 v /2 \]
\[ 3 \text{ or av34} \]
\[ 12 \]

If yes, \[ v = \]
\[ 12A \]

--- Flow Entering Diverge Influence Area ---

\[ v = 4227 \]
\[ 12 \]

Max Desirable
\[ 4600 \]

Violation?
\[ \text{No} \]

--- Level of Service Determination (if not F) ---

\[ D = 4.252 + 0.0086 v - 0.009 L = 33.4 \text{ pc/mi/ln} \]
\[ 12 R D \]

Density, \[ D \]

Level of service for ramp-freeway junction areas of influence \[ D \]

--- Speed Estimation ---

Intermediate speed variable, \[ S = 0.516 \]

Space mean speed in ramp influence area, \[ S = 55.6 \text{ mph} \]

Space mean speed in outer lanes, \[ S = 72.1 \text{ mph} \]

Space mean speed for all vehicles, \[ S = 60.3 \text{ mph} \]
## RAMPS AND RAMP JUNCTIONS WORKSHEET

### General Information
- **Analyst**: AL
- **Agency or Company**: AIM ENGINEERING
- **Date Performed**: 3/16/2012
- **Analysis Time Period**: AM
- **Jurisdiction**: GOLDS/GATE PKWY SB ON
- **Analysis Year**: 2039 DESOTO

### Site Information
- **Freeway/Dif of Travel**: I-75 SB
- **Junction**: GOLDEN GATE PKWY SB ON

## Inputs
- **Upstream Adj Ramp**
  - Number of Lanes, N: 3
  - Acceleration Lane Length, \( L_A \): 550 ft
  - Deceleration Lane Length, \( L_D \): ft
  - Freeway Volume, \( V_F \): 3703 veh/h
  - Ramp Volume, \( V_R \): 720 veh/h
  - Freeway Free-Flow Speed, \( S_{FF} \): 70.0 veh/h
  - Ramp Free-Flow Speed, \( S_{FR} \): 35.0 veh/h
  - Downstream Adj Ramp
  - Freeway Volume, \( V_D \): 4015 veh/h

### Conversion to pc/h Under Base Conditions

<table>
<thead>
<tr>
<th>(pc/h)</th>
<th>V (Veh/hr)</th>
<th>PHF</th>
<th>Terrain</th>
<th>%Truck</th>
<th>%Rv</th>
<th>f_{HV}</th>
<th>f_p</th>
<th>( v = V/PHF \times f_{HV} \times f_p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>3703</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>4015</td>
</tr>
<tr>
<td>Ramp</td>
<td>720</td>
<td>0.95</td>
<td>Level</td>
<td>6</td>
<td>0</td>
<td>0.971</td>
<td>1.00</td>
<td>781</td>
</tr>
</tbody>
</table>

### Estimation of \( v_{12} \)

\[
V_{12} = V_F \left( P_{PM} \right) \\
L_{EQ} = \frac{V_{12}}{0.593} \text{ using Equation (Exercise 13-6)} \\
V_{12} = 2380 \text{ pc/h} \\
V_3 = \text{pc/h (Exercise 13-14 or 13-17)} \\
V_3 \text{ or } V_{av34} > 2700 \text{pc/h?} \quad \text{Yes} \quad \text{No} \\
V_3 \text{ or } V_{av34} > 1.5 \times V_{12}/2 \quad \text{Yes} \quad \text{No} \\
\text{If } V_{12a} = \text{pc/h (Exercise 13-16, 13-18, or 13-19)}
\]

### Estimation of \( v_{12} \)

\[
V_{12} = V_R + (V_F - V_R)P_{FD} \\
V_{12} = \text{pc/h} \\
V_3 \text{ or } V_{av34} > 2700 \text{pc/h?} \quad \text{Yes} \quad \text{No} \\
V_3 \text{ or } V_{av34} > 1.5 \times V_{12}/2 \quad \text{Yes} \quad \text{No} \\
\text{If Yes}, V_{12a} = \text{pc/h (Exercise 13-16, 13-18, or 13-19)}
\]

### Capacity Checks

<table>
<thead>
<tr>
<th>Capacity Checks</th>
<th>Actual</th>
<th>Capacity</th>
<th>LOS F?</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{FO} )</td>
<td>4796</td>
<td>Exhibit 13-8</td>
<td>No</td>
</tr>
</tbody>
</table>

### Flow Entering Merge Influence Area

<table>
<thead>
<tr>
<th>( V_{R12} )</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3161</td>
<td>Exhibit 13-8</td>
<td>4600:All</td>
<td>No</td>
</tr>
</tbody>
</table>

### Level of Service Determination (if not F)

\[
D_R = 26.3 \text{ (pc/mi/ln)} \\
D_R = 5.475 + 0.00734 V_R + 0.0078 V_{12} - 0.00627 L_A \\
V_{12} = \frac{D_R}{5.475 + 0.00734 V_R + 0.0078 V_{12} - 0.00627 L_A} \\
L_A = 26.3 \text{ (pc/mi/ln)}
\]

### Flow Entering Diverge Influence Area

<table>
<thead>
<tr>
<th>( V_{12} )</th>
<th>Actual</th>
<th>Max Desirable</th>
<th>Violation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{12a} )</td>
<td>Exhibit 13-8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Level of Service Determination (if not F)

\[
D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D \\
D_R = \text{(pc/mi/ln)}
\]

\[
\text{LOS} = \text{C (Exercise 13-2)}
\]