

## 4. DESIGN PROCESS & EXAMPLE PROBLEMS

### 4.1 Guide Sign Basics

The following guidelines are simply that – guidelines. Engineering judgment should be used for unique situations based on these guidelines.

1. First, use the guidelines for Font Sizes (Section 3.3.2) to determine correct letter size and route marker size, based on speed, number of lanes, and roadway type (freeway or non-freeway).
2. The matching arrow size can be found in Section 3.8.
3. Vertical spacing between lines:  $\frac{1}{2}$  to  $\frac{3}{4}$  of letter height. This requirement may not be feasible with all overheads due to restrictions caused by existing mounting structures.
4. Vertical spacing between legend and inside of border:  $\frac{1}{2}$  to  $\frac{3}{4}$  of letter height.
5. Horizontal spacing between objects (words, overlays, arrows, etc.): Letter height.
6. Horizontal spacing between legend and inside of border: Approximately  $\frac{3}{4}$  of letter height. Use no less than  $\frac{1}{2}$  of letter height.
7. The appropriate arrow will be larger than the matching font height, but should be considered as font height in calculating vertical spacing. Due to the shapes of arrows compressing space around them doesn't make them appear crowded. There are exceptions to this rule.
8. Vertical spacing around fractions can be compressed somewhat because fractions are much taller than the rest of the legend on the same line.
9. Whenever possible, allow no more than three destinations or street names on a guide sign.

### 4.2 Basic Guide Sign Design Examples

#### 4.2.1 Calculating the vertical size of the sign panel

Use the following formulas and equivalents to determine the specific dimension:

A = Letter height

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2}$  A to  $\frac{3}{4}$  A)

C = Arrow height

D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4}$  A)

E = Vertical spacing from arrow to wording, or from arrow to inside border =  $B - \frac{1}{2}(C - A)$

F = Vertical spacing from arrow (a) to arrow (b) =  $B - \frac{1}{2}(C_a - A) - \frac{1}{2}(C_b - A)$

1. Add the heights of all objects in the sign, including border thickness (twice). The border thickness may have to be estimated if the length of the panel's shortest side – height or width – is not known (typical borders widths are summarized in Table 2). Figure the height of an arrow (C) to be that of the corresponding letter height (A). Route markers, logos, and other graphics should be added at their full height. Also add the thickness of horizontal lines, which will be the

same as the value given for border thickness. On signs with Font size combinations on the same line, average the component font sizes when determining component spacing.

2. Total the number of spaces between legend lines, including the two spaces from legends to borders. Multiply this by a number that is between  $\frac{1}{2}$  and  $\frac{3}{4}$  of letter height. For example, if lettering used is 6", the number could be 4. If lettering is 8", it could be 5.
3. Add the two totals from paragraphs 1 and 2 and round to the nearest number divisible by 6 (6" increment). This figure is the panel height. Bear in mind an adjustment might have to be made in border and horizontal line thickness due to an incorrect estimate of the panel's shortest side.
4. Adjust the paragraph 1 total by any change in border thickness. This difference between the original estimate and the actual figure will be added or subtracted once for the top border, once for the bottom border, and once for each horizontal line, if any, used on the panel.
5. Subtract from the total in paragraph 3 (panel height) the total in paragraph 4. Divide this by the number of spaces from paragraph 2. This gives an exact spacing dimension B.
6. Before applying B to the sign, the additional heights of arrows, which weren't counted in paragraphs 1 and 4, must be subtracted from B. This is done by subtracting letter height (A) from arrow height (C) and dividing by two. This figure is then subtracted from B above and below the arrow.
7.  $[E=B-\frac{1}{2}(C-A)]$
8. It may be preferable, in some cases, to round spaces to whole or half inch increments to simplify fabrication. If so, any excess amounts may be added to the spacing around arrows.

#### 4.2.2 Calculating the horizontal size of the panel

Horizontal spacing, in most cases, is fairly automatic. Primarily, it involves maintaining proper spacing from borders to legend and from legend to vertical lines. The example problems illustrate this in more detail. In the few complicated instances instructions are given as to how horizontal spacing can be done. Spacings from legends to borders and vertical lines should be approximately  $\frac{3}{4}$  letter height.

#### 4.2.3 Review Panel Structure for Proper Supports

Once the panel has been sized using vertical and horizontal spacing guidelines refer to section 3.13.1 to ensure U-Posts will be used versus I-beams.

### 4.3 Example #1, Supplemental Guide Sign

#### Purpose of Example:

- Color selection
- Font and letter height selection
- Vertical spacing
- Horizontal spacing

#### Given Conditions:

- Posted speed limit = 35 mph
- Number of basic lanes = 4 lanes
- Non-Freeway

#### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD, paying particular attention to component location, justification, and spacing. Table 3 provides the components to use.

#### Basic Manual Methods:

Formulas and equivalents for the following example:

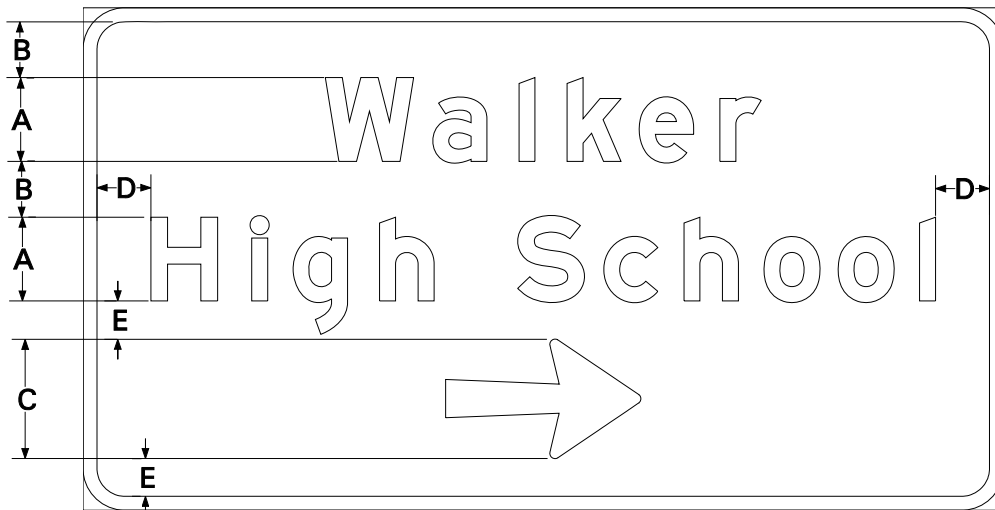
A = Letter height

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

C = Arrow height

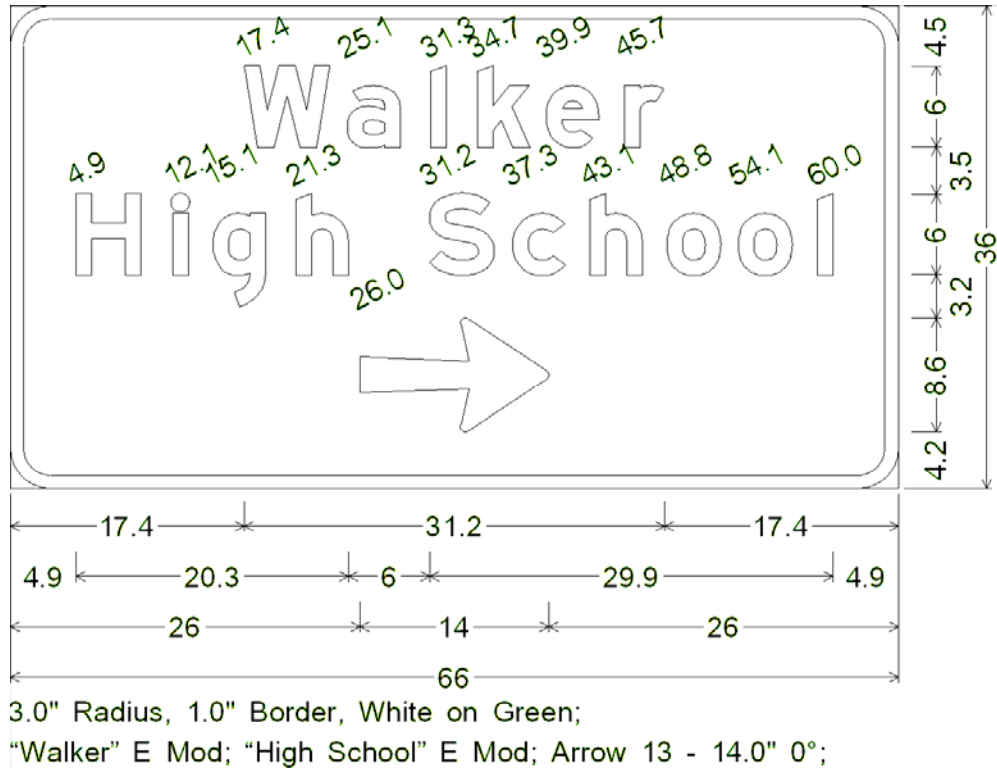
D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )

E = Vertical spacing from arrow to wording, or from arrow to inside border =  $< B$



**SignCAD Methods:**

1. Panel tool -
  - Sign type - guide
  - Panel color - green
  - Border color - white
2. Install components into panel one at a time
3. Text tool –
  - Type the two lines of text (use the enter key to get to the second line)
  - Font - E modified
  - Size - 6-4.5
  - Proper name - Upper-lower case
4. Arrow tool -
  - Angle - 0 degrees
  - Arrowhead - 13 (13-14 arrow)
5. Adjust vertical spacing -
  - Right mouse click on object to be spaced - select object spacing (left click)
  - Aim is  $\frac{1}{2}$  to  $\frac{3}{4}$  letter height
6. Adjust horizontal spacing



**Typical Mistakes**

- Vertical spacing - Left to run automatically
- Horizontal spacing - Legend not centered
- Panel designed without the aid of color - Note color selections in sign description

**Final Sign Panel**



### 4.3.1 Example #1, Supplemental Guide Sign Calculations

#### Vertical Size of Panel and Line Spacing

Given:

- 3 rows of objects, 2 text, 1 arrow
- Font size (**Table 3**) = 6-4.5, based on speed and number of lanes
- Arrow size (**Tables 3 & 6**) = 13-14, based on speed, number of lanes, and sign layout

1. Assume border = 1" (Table 2)

From top to bottom:

1"-top border

6"-top row of text

6"-second line of text

8.6" arrow height

1"-bottom border

total of 22.6" of space needed for objects

2. Four spaces exist (3 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (6") = 3" - 4.5", use 4"

4 (4") = 16" of space required

3.  $22.6" + 16" = 38.6"$

38.6" is between 36" and 42" (valid panel sizes), closest to 36"

4. According to border table for Guide Signs, a sign with a short side of  $\leq 36"$  a border of 1" is used

➔ no change to assumption in step #1

5. Panel height (36") – Object space requirements (22.6") = Spacing distance (13.4")

$13.4" / 4 \text{ spaces} = 3.35" \text{ per vertical space.}$

6. To calculate the correct arrow spacing:

Arrow spacing should be made smaller than legend to legend spacing. #7 of 4.2.1 suggests rounding of spacing amounts. There are several ways to do this. One is to make the arrow spacing 3.2" on each side.  $13.4" - 2(3.2) = 7"$  left to be divided equally between the two remaining spaces, 3.5" each

## 7. Final vertical spacing summary:

1" border

3.5" space

6" text line

3.5" space

6" text line

3.2" space

8.6" arrow

3.2" space

1" border

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sums to 36" (no adjustments)

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest object.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend. Remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts (Section 3.13) to verify desirable installation on a new or existing structure.

The High School line is the longest object; Horizontal spacing defaults to 6" (font size) between the objects. 50.3" of text + 6" space + 2" of borders → 58.3", add in 2 spaces of 4.5" ( $\frac{3}{4}$  letter height) each → 67.3" round to closest 6" increment which is 66". Forces spaces on either side to be reduced to 3.9"

**Key Placement Issues**

- Arrow centered
- All text centered

## 4.4 Example #2, Destination Guide Sign

### Purpose of Example:

- Color selection
- Font and letter height selection
- Vertical spacing
- Horizontal spacing

### Given Conditions:

- Posted speed limit = 55 mph
- Number of basic lanes = 2 lanes
- Non-Freeway

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD, paying particular attention to component location, justification, and spacing. Table 3 provides the components to use.

### Basic Manual Methods:

Formulas and equivalents for the following example:

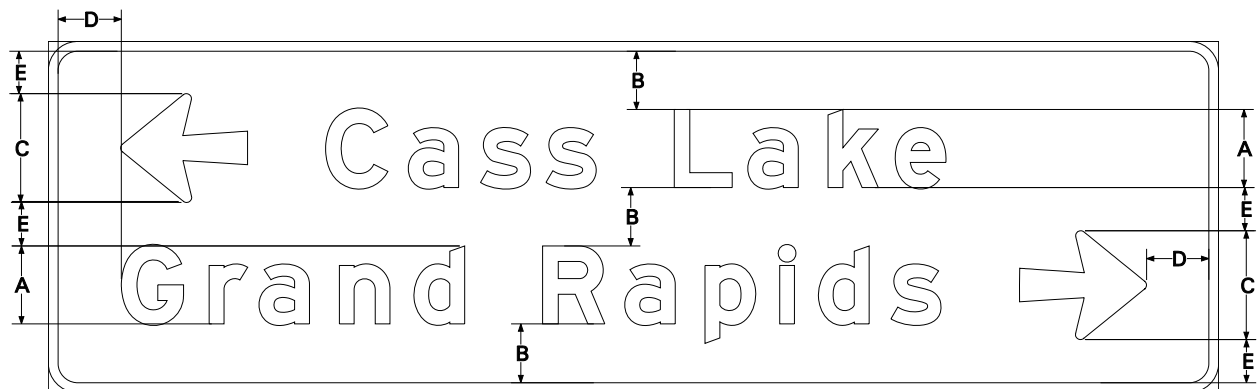
A = Letter height

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

C = Arrow height

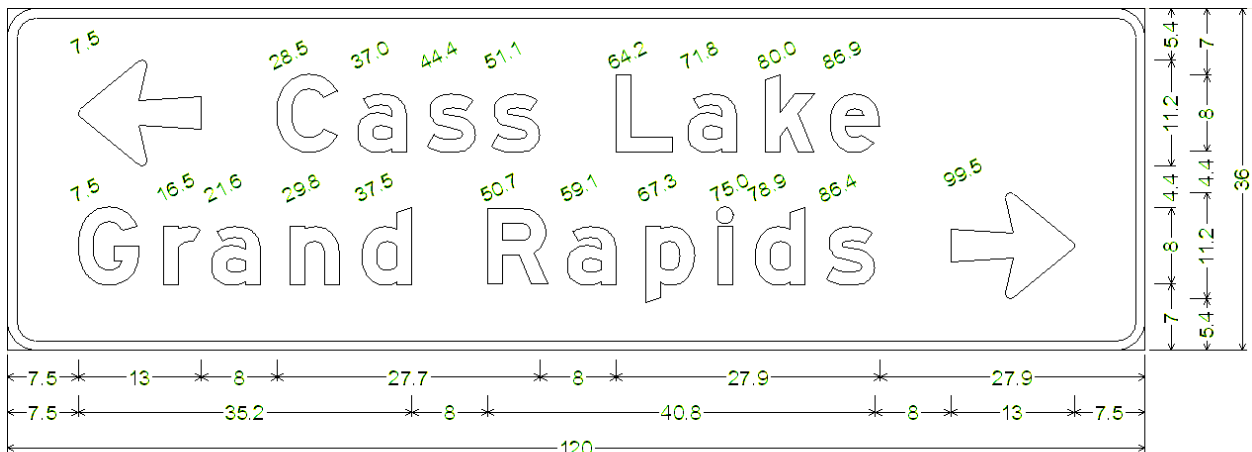
D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )

E = Vertical spacing from arrow to wording, or from arrow to inside border =  $B - \frac{1}{2} (C - A)$



**SignCAD Methods:**

1. Panel tool -
  - Sign type - guide
  - Panel color - green
  - Border color - white
2. Install components into panel one at a time
3. Text tool –
  - Type the two lines of text (use the enter key to get to the second line)
  - Font - E modified
  - Size – 8-6
  - Proper name - Upper-lower case
4. Arrow tool -
  - Angle - 180 degrees and 0 degrees
  - Arrowhead - 5 (5-13 arrow)
5. Adjust vertical spacing -
  - Right mouse click on object to be spaced - select object spacing (left click)
  - Aim is to have equal spaces between borders and city names
6. Adjust horizontal spacing



L CITY NAME CITY NAME R SIZE; 3.0" Radius, 1.0" Border, White on Green;  
 Arrow 5 - 13.0" 180°; "Cass Lake" E Mod; "Grand Rapids" E Mod; Arrow 5 - 13.0" 0°;

**Typical Mistakes**

- Vertical spacing - Left to run automatically
- Horizontal spacing – Longest line not centered
- Panel designed without the aid of color - Note color selections in sign description

**Final Sign Panel**



#### 4.4.1 Example #2, Destination Guide Sign Calculations

##### Vertical Size of Panel and Line Spacing

Given:

- 2 rows of objects, 2 text (Do not count arrows at this stage)
- Font size (**Table 3**) = 8-6, based on speed and number of lanes
- Arrow size (**Tables 3 & 6**) = 5-13, based on speed, number of lanes, and sign layout

1. Assume border = 1" (Table 2)

From top to bottom:

1"-top border

8"-top row of text (Do not count arrows at this stage)

8"-second line of text (Do not count arrows at this stage)

1"-bottom border

total of 18" of space needed for objects

2. Three spaces exist (2 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (8") = 4 - 6", use 5"

3 (5") = 15" of space required

3.  $18" + 15" = 33"$

33" is between 30" and 36" (valid panel sizes), because of arrows round up to 36"

4. According to border Table 2 for Guide Signs, a sign with a short side of <36" a border of 1" is used

➔ no change to assumption in step #1

5. Panel height (36") – Object space requirements (18") = Spacing distance (18")

$18" / 3 \text{ spaces} = 6"$  per vertical space. Spacing is equally divided between borders and city names

6. To calculate the correct arrow spacing:

Arrows are centered vertically on each legend line. Arrow height (11.2") is subtracted from letter height (8") and the remainder is divided by 2.  $(11.2" - 8") / 2 = 1.6"$ . 1.6" is subtracted from the top and bottom spaces ( $6" - 1.6" = 4.4"$ ). 1.6" is subtracted twice from the center space because both arrows encroach on it ( $6" - 2(1.6") = 2.8"$ ).

## 7. Final vertical spacing summary:

1" border  
4.4" space  
11.2" arrow  
2.8" space  
11.2" arrow  
4.4" space  
1" border

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sums to 36" (no adjustments)

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest object.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend. Remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts (Section 3.13) to verify desirable installation on a new or existing structure.

The Grand Rapids with arrow line is the longest object; Horizontal spacing defaults to 8" (font size) between the objects. 105" of text and arrow + 2" of borders → 107", add in 2 spaces of 6" ( $\frac{3}{4}$  letter height) each → 119" round to closest 6" increment which is 120". Forces spaces on either side to be increased to 6.5".

**Key Placement Issues**

- Arrow centered
- All text centered
- Vertical spacing equal between city names and borders

## 4.5 Example #3, Destination Sign With Tabular Arrangement

### Purpose of Example:

- Use of tabular arrangement
- Aligning objects

### Given Conditions:

- Posted speed limit = 55 mph
- Number of basic lanes = 2 lanes
- Non-Freeway, ground mounted

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

### Basic Manual Methods:

Formulas and equivalents for the following example:

A = Letter height

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

C1 = Arrow height

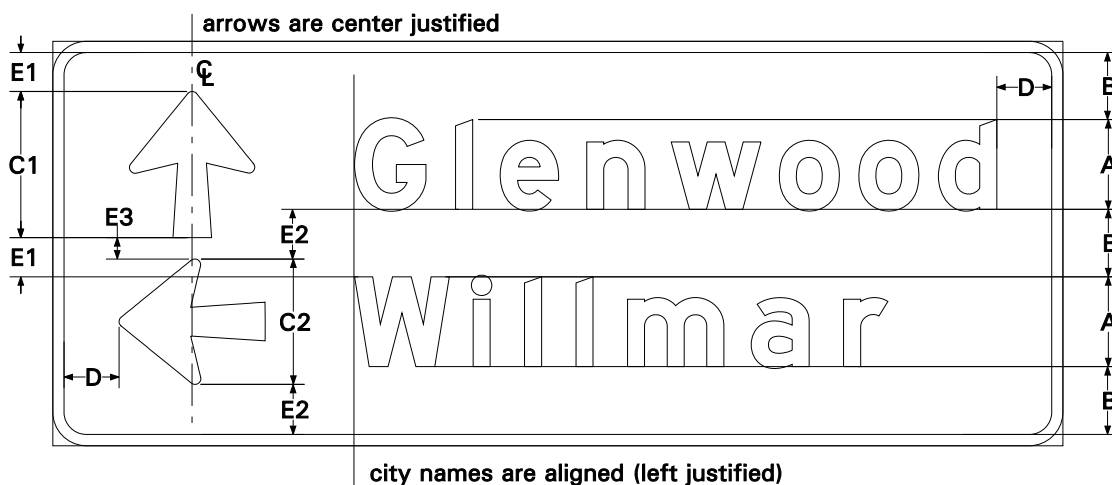
C2 = Arrow height

D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )

E1 = Vertical spacing from arrow to wording, or from arrow to inside border =  $B - \frac{1}{2} (C1 - A)$

E2 = Vertical spacing from arrow to wording, or from arrow to inside border =  $B - \frac{1}{2} (C2 - A)$

E3 = Vertical spacing from arrow to arrow =  $B - \frac{1}{2} (C1 + C2 - 2A)$



**SignCAD Methods:**

## 1. Panel tool -

Sign type - guide

Panel color - green

Border color - white

## 2. Open arrangement tool

Select tabular

Create a 2 column, 2 row arrangement

Install city names and arrows into arrangement

## 3. Align components –

Open Tabular Arrangement window, left align Column 2 (city names). Arrows remain center justified (default)

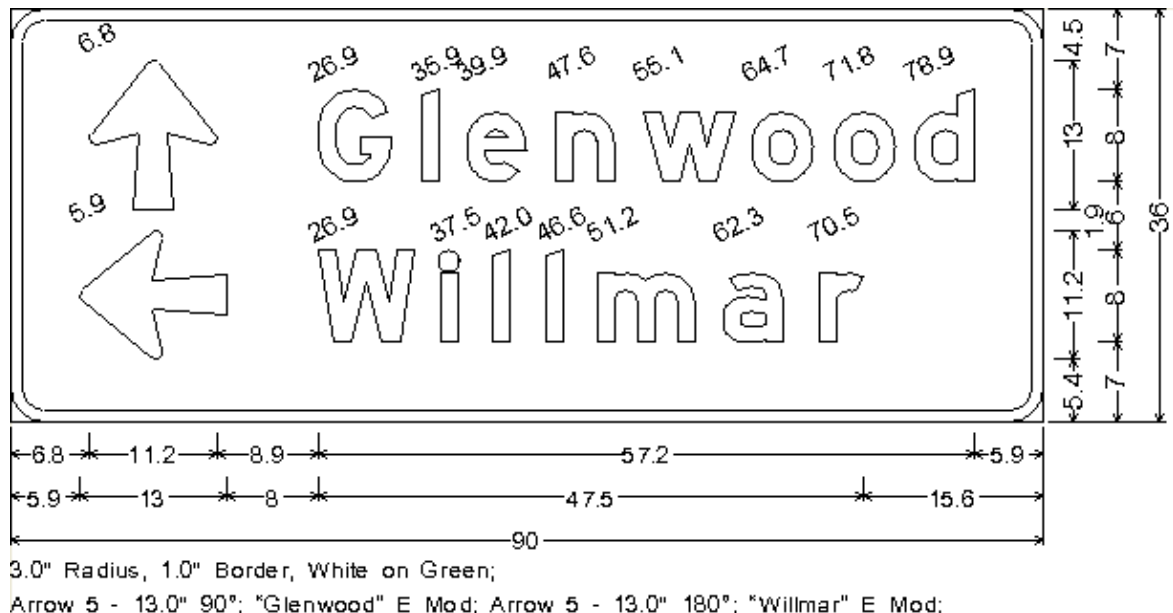
NOTE: Zero out Minimum Space in Tabular Window after all objects are installed

## 4. Vertical spacing –

Deal with tallest objects on lines – Arrows on both lines. Aim for equal vertical spacing between city names and borders

Zero out city name object spacing

## 5. Equalize horizontal spacing of the longest line – Note that default horizontal object spacing of arrow is 4", while default for text is letter height

**Typical Mistakes**

- City names not left justified
- Arrows not center justified

- Tabular arrangement not used
- Tabular Arrangement Minimum Space not zeroed out

**Final Sign Panel**



### 4.5.1 Example #3, Destination Sign With Tabular Arrangement Calculations

#### Vertical Size of Panel and Line Spacing

Given:

- 2 rows of objects, 2 text (Do not count arrows at this stage)
- Font size (**Table 3**) = 8-6, based on speed and number of lanes
- Arrow size (**Tables 3 & 6**) = 5-13, based on speed, number of lanes, and sign layout

1. Assume border = 1" (Table 2)

From top to bottom:

1"-top border

8"-top row of text (Do not count arrows at this stage)

8"-second line of text (Do not count arrows at this stage)

1"-bottom border

total of 18" of space needed for objects

2. Three spaces exist (2 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (8") = 4 - 6", use 5"

3 (5") = 15" of space required

3.  $18" + 15" = 33"$

33" is between 30" and 36" (valid panel sizes), because of arrows round up to 36"

4. According to border Table 2 for Guide Signs, a sign with a short side of <36" a border of 1" is used

➔ No change to assumption in step #1

5. Panel height (36") – Object space requirements (18") = Spacing distance (18")

$18" / 3 \text{ spaces} = 6"$  per vertical space. Spacing is equally divided between borders and city names

6. To calculate the correct arrow spacing:

Arrows are centered vertically on each legend line. Top arrow height (13") is subtracted from letter height (8") and the remainder is divided by 2.  $(13" - 8") / 2 = 2.5"$ . 2.5" is subtracted from the top and middle spaces ( $6" - 2.5" = 3.5"$ ). Bottom arrow height (11.2") is subtracted from letter height (8") and the remainder is divided by 2.  $(11.2" - 8") / 2 = 1.6"$ . 1.6" is subtracted from the bottom space ( $6" - 1.6" = 4.4"$ ) and also from the remainder of the middle space ( $3.5" - 1.6" = 1.9"$ ).

7. Final vertical spacing summary:

1" border

3.5" space

13" arrow

1.9" space

11.2" arrow

4.4" space

1" border

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sums to 36" (no adjustments)

**Key Placement Issues**

- Tabular arrangement used
- Text left justified
- Arrows centered over each other

## 4.6 Example #4, Destination Guide Sign (Freeway)

### Purpose of Example:

- Font and letter height selection
- Color Selection

### Given Conditions:

- Freeway supplemental sign
- Ground mounted

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.
- Tip: Note the spacing between EXIT and 147: it is halfway between the 10" EXIT and the 15" 147.

### Basic Manual Methods:

Formulas and equivalents for the following example:

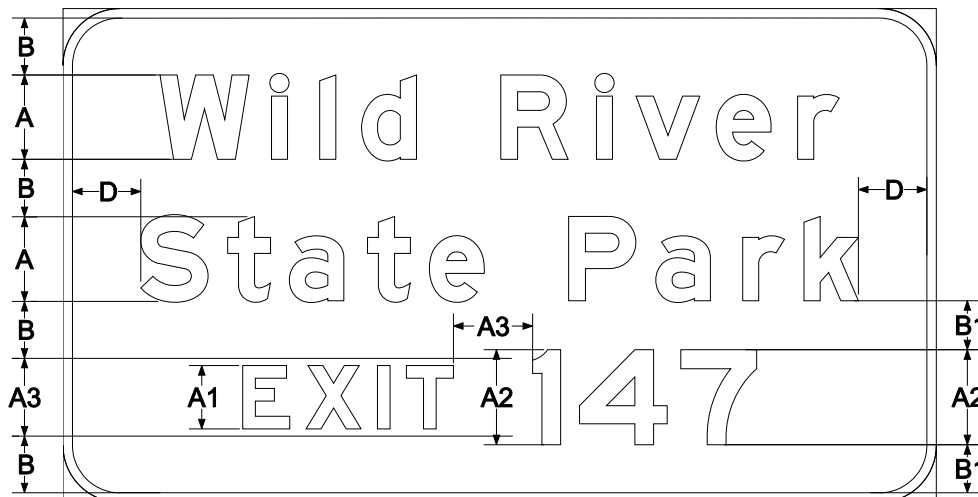
A, A1, A2 = Letter (text) height

A3 = The average of the two letter heights on the action line =  $(A1 + A2)/2$

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

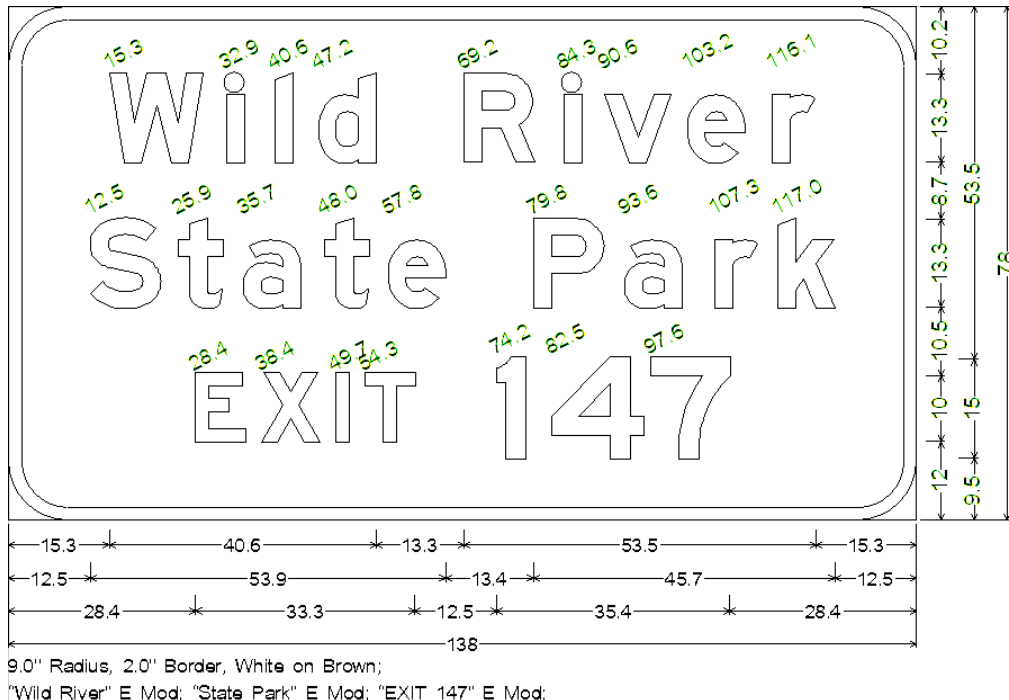
B1 = Vertical spacing above and below the exit number =  $B - (A2 - A3)/2$

D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )



**SignCAD Methods:**

1. Panel tool -
  - Sign type - guide
  - Panel color - brown
  - Border color - white
2. Install components into panel one at a time
3. Text tool –
  - Type the two lines of text (use the enter key to get to the second line)
  - Enter EXIT and 147 separately using the text tool (this provides the ability to size and space these components separately)
  - Font - E modified
  - Size – 13.3-10 for first 2 lines, 10 for EXIT and 15 for 147
  - Proper name - Upper-lower case
  - EXIT is capitalized
4. Adjust vertical spacing -
  - Right mouse click on object to be spaced - select object spacing (left click)
  - Aim is ½ to ¾ letter height
5. Adjust horizontal spacing



**Typical Mistakes**

- Vertical spacing - Left to run automatically
- Horizontal spacing - Legend not centered
- Not using applicable font sizes

**Final Sign Panel**



#### 4.6.1 Example #4, Supplemental Guide Sign (Freeway) Calculations

##### Vertical Size of Panel and Line Spacing

Given:

- 3 rows of objects
- Font size (**Table 4**) = 13.3-10 for the Place/name, 10 for the word (in this case EXIT), and 15 for the exit number 147. Based on the Freeway Font Sizes Supplemental Guide Sign (Type A).

##### 1. Assume border = 2" (**Table 2, Note 2**)

From top to bottom:

2"-top border

13.3"-top row of text

13.3"-middle line of text

12.5"-bottom line of text (average of the 15 and 10 sizes)

2"-bottom border

total of 43.1" of space needed for objects

##### 2. Four spaces exist (3 objects) @ $\frac{1}{2}$ to $\frac{3}{4}$ of font size (13.3") = 6.65"- 9.975", use 8.3" (the average)

4 (8.3") = 33.2" of space required

##### 3. $43.1" + 33.2" = 76.3"$

76.3" is NOT divisible by 6 → use closest divisible by 6 → 78

##### 4. According to Table 2, Note 2, a Type A sign with 13.3 text uses a border of 2"

→ no change to assumption in step #1

##### 5. Panel height (78") – Object space requirements (43.1") = Spacing distance (34.9")

$34.9" / 4 \text{ spaces} = 8.7"$  per vertical space. Spacing may be rounded to  $\frac{1}{2}"$  increments (As is shown in the dimensioned drawing)

##### 6. To calculate the correct arrow spacing:

N/A

## 7. Final vertical spacing summary:

2" border

8.7" space

13.3" text line

8.7" space

13.3" text line

7.5" space,  $B1 = 8.7 - (15 - 12.5)/2$ ,

15" text line

7.5" space,  $B1 = 8.7 - (15 - 12.5)/2$ ,

2" border

---

sums to 78" (no adjustments required)

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest object.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments.

The State Park line is the longest object; Horizontal spacing defaults to 13.3" (font size) between the objects.  $99.6"$  of text +  $13.3"$  space +  $4"$  of borders  $\rightarrow 116.9"$ , add in 2 spaces of  $10"$  ( $\frac{3}{4}$  letter height) each  $\rightarrow 136.9"$  round to closest 6" increment which is  $138"$ . Allows spaces on either side to be increased to  $10.5$  and  $10.6"$ .

**Key Placement Issues**

- None

## 4.7 Example #5, Split Panel Destination Sign

### Purpose of Example:

- Use of horizontal line
- Aligning objects
- Arrangement tool – column alignment

### Given Conditions:

- Posted speed limit = 35 mph
- Number of basic lanes = 2 lanes
- Non-Freeway, ground mounted

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

### Basic Manual Methods:

Formulas and equivalents for the following example:

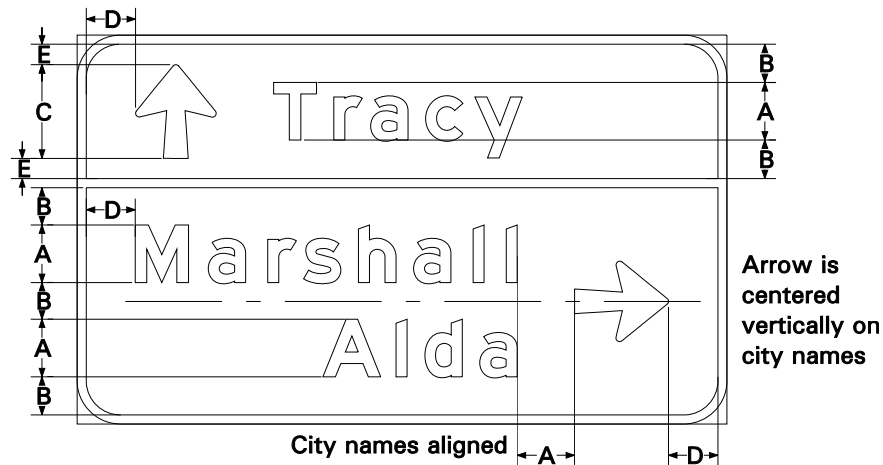
A = Letter height

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

C = Arrow height

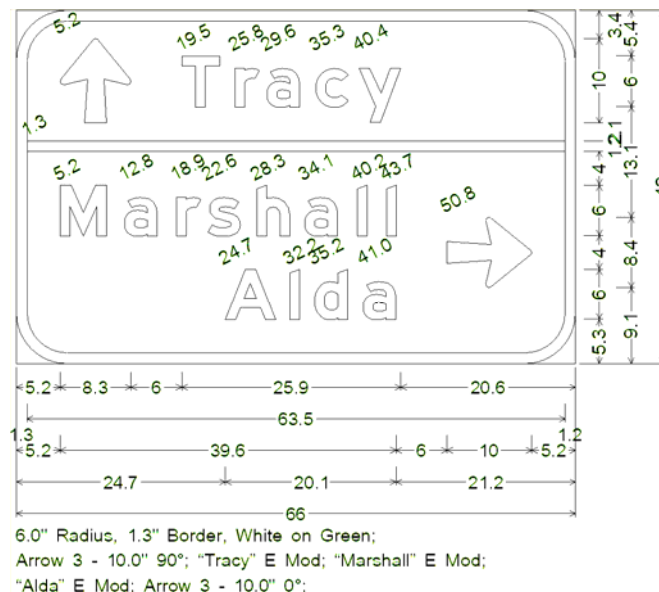
D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )

E = Vertical spacing from arrow to wording, or from arrow to inside border =  $B - \frac{1}{2} (C - A)$



**SignCAD Methods:**

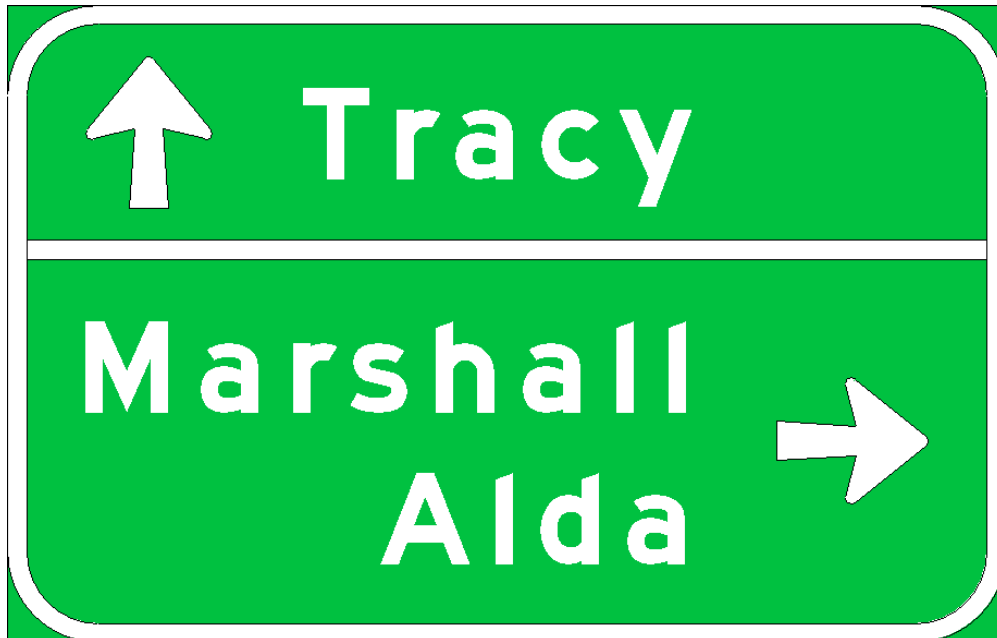
1. Panel tool -
  - Sign type - guide
  - Panel color - green
  - Border color - white
2. Draw horizontal line – right mouse click on line to show edit features
3. Open arrangement tool
  - Select column
  - Install Marshall and Alda into column
4. Install remaining components into panel – note how to “grab” column
5. Align components –
  - Right mouse click on objects to be aligned – select object align
  - Left for vertical arrow
  - Right for Alda
6. Vertical spacing –
  - Deal with tallest objects on lines – Arrow on line with Tracy. Zero out Tracy’s vertical spacing
  - Zero out object spacing of horizontal line
  - Vertical object spacing of horizontal arrow has no effect on panel height so ignore
  - Set vertical spacing for Marshall and Alda
7. Equalize horizontal spacing of the longest line – Note that default horizontal object spacing of arrow is 4”, while default for text is letter height



**Typical Mistakes**

- Top line not left justified
- Longest line not centered

**Final Sign Panel**



#### 4.7.1 Example #5, Split Panel Destination Sign Calculation

Vertical Size of Panel and Line Spacing

Given:

- 3 rows of objects; 1 arrow, 2 text
- Font size (**Table 3**) = 6-4.5, based on speed and number of lanes
- Arrow size (**Tables 3 & 6**) = 3-10, based on speed, number of lanes and sign layout

1. Assume border = 1.25"

From top to bottom:

1.25"-top border

6"-arrow height (assumed at this point)

1.25"-horizontal line

6"-row of text

6"-row of text

1.25"-bottom border

total of 21.75" of space needed for objects. Round to 21.8"

2. Five spaces exist (4 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (6") = 3 – 4.5", use 4"

5 (4") = 20" of space required

3. 21.8" + 20" = 41.8"

41.8" is not divisible by 6, round to closest, use 42" → valid panel side

4. According to Table 2, a sign with a short side of 42" a border of 1.25" is used

→ no change to assumption in step #1

5. Panel height (42") – Object space requirements (21.8") = Spacing distance (20.2")

20.2" / 5 spaces = 4.04" per vertical space, used 4"

6. To calculate the correct arrow spacing:

$E = B - \frac{1}{2}(C - A)$  or the arrow vertical spacing is equal to the standard spacing (4" from 5 above) minus  $\frac{1}{2}$  of the difference between the exact arrow height (10" for a 3-10 arrow) and the font size.

Arrow spacing =  $4 - \frac{1}{2}(10 - 6) = 2"$ .

## 7. Final vertical spacing summary:

<b>Calculated</b>	<b>Adjustments</b>
1.3" border	
2" space	use 2.1"
10" arrow	
2" space	use 2.1"
1.3" horizontal line	
4" space	
6" text	
4" space	
6" text	
4" space	
1.2" border	
sums to 41.8" (add 0.1" to the arrow spaces)	sums to 42"

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest object.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts (Section 3.13) to verify desirable installation on a new or existing structure.

The Marshall and arrow line is the longest object; Horizontal spacing defaults to 6" (font size) on both sides of Marshall. The Sign CAD arrow default spacing is 4". Equalize the left side spacing of Marshall and the right side spacing of the arrow to  $\frac{3}{4}$  letter height (4.5").  $4.5" + 39.6"$  of text +  $6" + 10"$  arrow +  $4.5" + 2.5"$  borders →  $67.1"$ . Round to nearest 6" increment, which is 66". Adjust spacings to incorporate loss of 1.1"

**Key Placement Issues**

- Start with horizontal line to divide panel
- Use the arrangement tool to establish a column for the Marshall/Alda text
- Alda should be right justified

## 4.8 Example #6, Directional Sign

### Purpose of Example:

- Use of indented horizontal line
- This is a standardized format

### Given Conditions:

- Posted speed limit = 45 mph
- Number of basic lanes = 4 lanes
- Non-Freeway

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

### Basic Manual Methods:

Formulas and equivalents for the following example:

A = Letter height

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

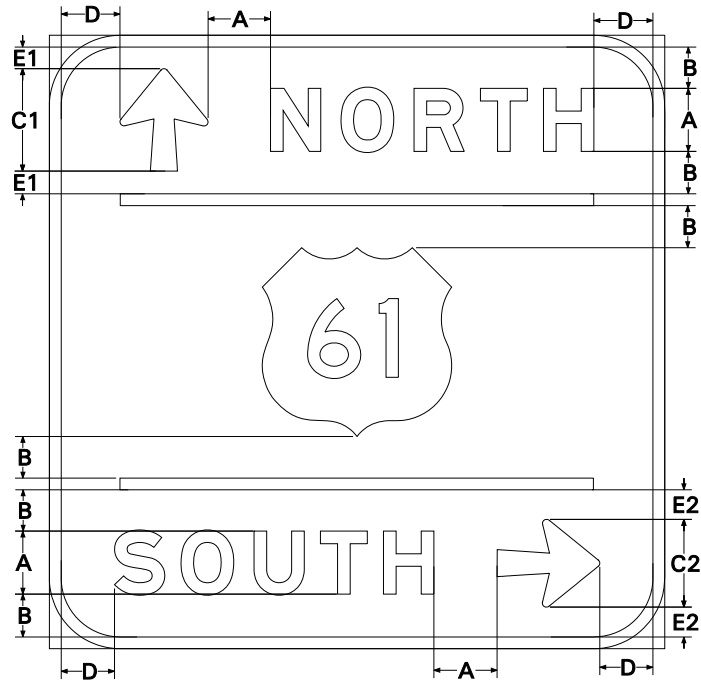
C1 = Arrow height of a vertical (90 degree) arrow.

C2 = Object height of a horizontal (0 degree) arrow.

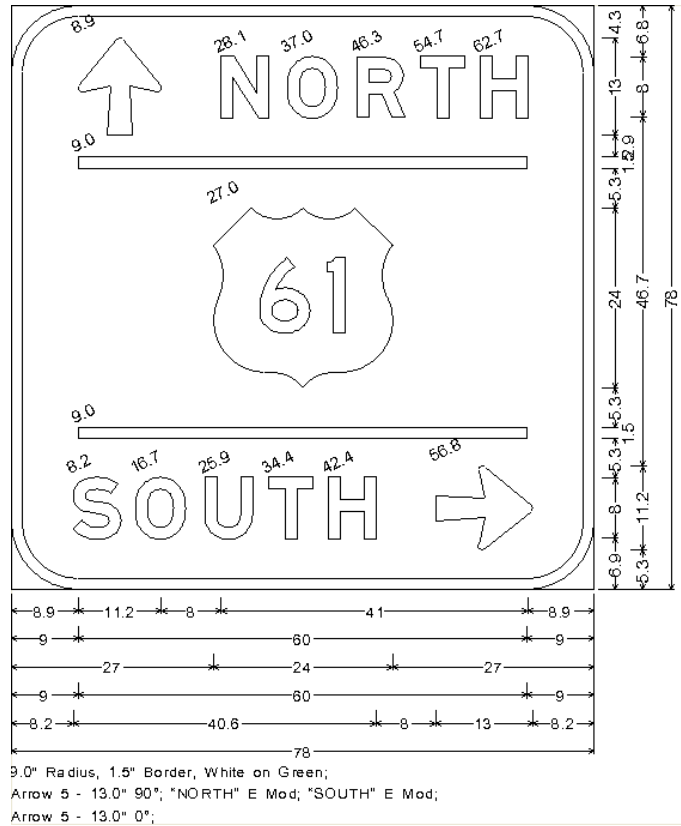
D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )

E1 = Vertical spacing from arrow to wording, or from arrow to inside border =  $B - \frac{1}{2} (C1 - A)$

E2 = Vertical spacing from arrow to wording, or from arrow to inside border =  $B - \frac{1}{2} (C2 - A)$

**SignCAD Methods:**

1. Panel tool -
  - Sign type - guide
  - Panel color - green
  - Border color - white
2. Install lines
3. Right mouse click on line
  - Select edit
    - Choose Indent: Radius
4. Install remaining components, NOTE: Use 5-13 arrow since only text on sign is 8".
5. Zero out object spacing of lines and vertical spacing of arrows
6. Adjust NORTH, SOUTH, and route marker vertical object spacing
7. Adjust horizontal spacing so top and bottom legends are centered on panel (standardized format)



Final Sign Panel



### 4.8.1 Example #6, Directional Sign Calculations

#### Vertical Size of Panel and Line Spacing

Given:

- 5 rows of objects, 2 arrows, 1 route marker, 2 horizontal lines
- Route marker (**Table 3**) = 24 OL, based on roadway, speed and number of lanes
- Cardinal Direction font size (**Table 3**) = 8, based on roadway, speed and number of lanes
- Arrow size (**Tables 3 & 6**) = 5-13, Table 3 would indicate use of a 6 or 15 head arrow, this example demonstrates a standardized sign that varies slightly from the established tables. Note that the only text on sign is 8", therefore the arrow used is a 5 head.

1. Border = 1.5" (This is a standardized 78" x 78" panel layout, so border size is known)

From top to bottom:

1.5"-top border

8"- font size

1.5"-horizontal line

24"-route marker

1.5"-horizontal line

8"- font size

1.5"-bottom border

total of 46" of space needed for objects

2. Six spaces exist (5 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (8") = 4"- 6", use 5"  
6 (5") = 30" of space required

3.  $46" + 30" = 76"$

76" is not divisible by 6, round to closest, use 78" → valid panel side

4. No border thickness adjustment is necessary, as it is already known

5. Panel height (78") – Object space requirements (46") = Vertical spacing amount (32")  
 $32" / 6 \text{ spaces} = 5.33"$ , use 5.3" per vertical space

6. To calculate the correct arrow spacing:

$E = B - \frac{1}{2}(C - A)$  or the arrow vertical spacing is equal to the standard spacing (5.3", from 5 above) minus  $\frac{1}{2}$  of the difference between the exact arrow height (13" for a 5-13 arrow) and the font size.

Arrow spacing (upper vertical) =  $5.3 - \frac{1}{2}(13 - 8) = 2.8"$ . Arrow spacing (lower horizontal) =  $5.3 - \frac{1}{2}(11.16 - 8) = 3.7"$

7. Final vertical spacing summary:

<u>Calculated</u>	<u>Adjustments</u>
1.5" border	
5.3" space	
8" NORTH	
5.3" space	5.4"
1.5" horizontal line	
5.3" space	
24" route marker	
5.3" space	
1.5" horizontal line	
5.3" space	
8" SOUTH	
5.3" space	5.4"
1.5" border	
sums to 77.8"	sums to 78"

An alternative spacing method decreases the vertical spacing between the horizontal bars and the route marker, putting the excess in the top and bottom areas which appear more crowded. This also has the effect of rounding the spacings to  $\frac{1}{2}"$  increments.

<u>Calculated</u>	<u>Adjustments</u>
1.5" border	
5.5" space	
8" NORTH	
5.5" space	
1.5" horizontal line	
5.0" space	
24" route marker	
5.0" space	

1.5" horizontal line

5.5" space

8" SOUTH

5.5" space

1.5" border

---

sums to 78"

### Horizontal Size of Panel and Spacing

Once the vertical spacing is determined the horizontal spacing is based on the longest horizontal object line. Ignore the indented horizontal lines, as they do not control panel length, but in fact automatically adjust to panel size.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts (Section 3.13) to verify desirable installation on a new or existing structure.

SOUTH = 40.6", arrow = 13", 8" space between, 2-spaces ( $\sim \frac{3}{4}$  font size), 3" in border  $\rightarrow$  76.6". The right and left side spacings are adjusted equally until 78" is reached.

### Key Placement Issues

- Cardinal directions are centered vertically on arrows
- Route marker is centered
- Maintaining 78" x 78" panel size

NOTE: The vertical spacing of this sign may be computed by alternately zeroing out the NORTH and SOUTH and using the arrow heights. In this case use formulas  $E1 = B - \frac{1}{2} (C1 - A)$  and  $E2 = B - \frac{1}{2} (C2 - A)$

### 4.9 Example #7, Three Line Distance Sign

**Purpose of Example:**

- Typical distance sign
- Alignment features

**Given Conditions:**

- Posted speed limit = 55 mph
- Number of basic lanes = 2 lanes
- Non-Freeway

**Example Task:**

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

**Basic Manual Methods:**

Formulas and equivalents for the following example:

A = Letter height

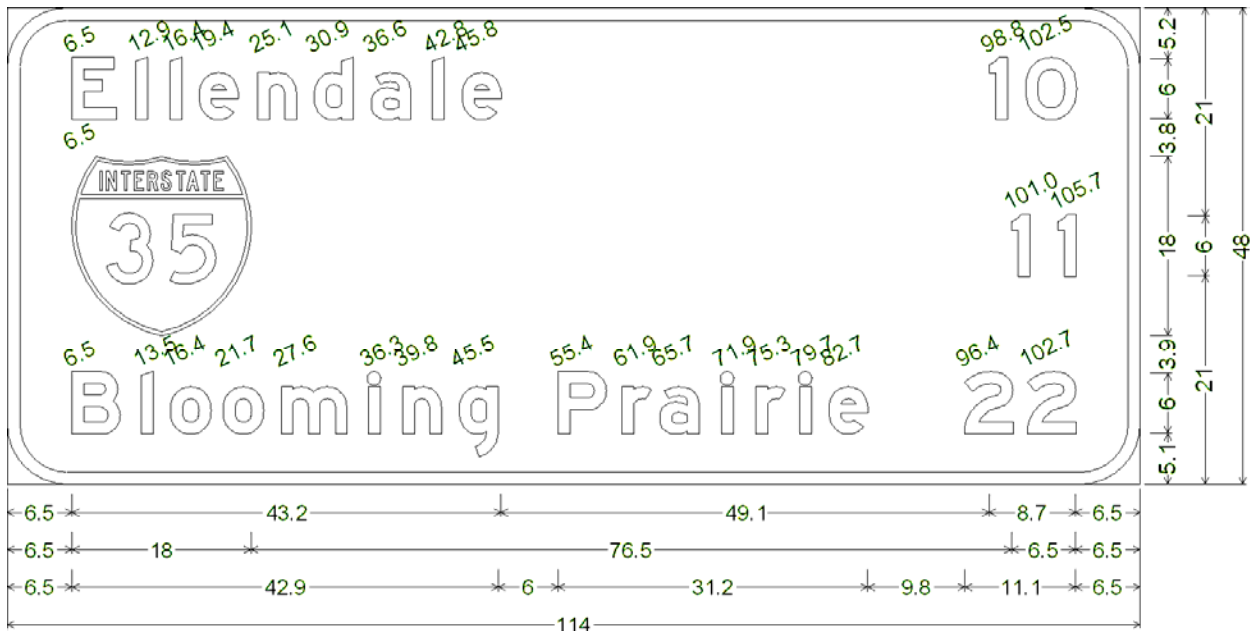
B = Vertical spacing from wording to wording, from wording to route marker overlay, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4}$  to 1 times A)



**SignCAD Methods:**

1. Panel tool -
  - Sign type - guide
  - Panel color - green
  - Border color - white
2. Install sign components as individual entries (so that they can be aligned later)
3. Right mouse click on each item
  - Select Object Align Left or Right
4. Adjust vertical spacing
5. Adjust horizontal spacing
6. Move excess space from edges into middle by adjusting horizontal spacing to the right of "Prairie"



6.0" Radius, 1.3" Border, White on Green;  
 "Ellendale" E Mod; "10" E Mod; "11" E Mod 150% spacing; "Blooming Prairie" E Mod; "22" E Mod;

**Typical Mistakes**

- Cardinal direction top justified, should be middle justified since it's a Distance Sign
- Spacing from border to legend not equal on each side

Final Sign Panel



#### 4.9.1 Example #7, Three Line Distance Sign Calculations

##### Vertical Size of Panel and Line Spacing

Given:

- 3 rows of objects, 1 route marker, 2 text
- Route marker (**Table 3**) = 18 OL, based on speed and number of lanes
- Font size (**Table 3**) = 6-4.5, based on speed and number of lanes

1. Assume border (**Table 2**) = 1.25" (Make one border 1.3" and the other 1.2")

From top to bottom:

1.3"-top border

6"-text

18"-route marker

6"-text

1.2"-bottom border

total of 32.5" of space needed for objects

2. Four spaces exist (3 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (6") = 3" - 4.5", use 4"

4 (4") = 16" of space required

3.  $32.5" + 16" = 48.5"$

48.5" is not divisible by 6, round to closest, use 48" → valid panel side

4. According to Border Table 2 for Guide Signs, a sign with a short side of 48" a border of 1.25" is used

→ no change to assumption in step #1

5. Panel height (48") – Object space requirements (32.5") = Spacing distance (15.5")

$15.5" / 4 \text{ spaces} = 3.875"$ , use 3.9" per vertical space

6. No arrows

## 7. Final vertical spacing summary:

<u>Calculated</u>	<u>Adjustments</u>
1.3" border	
3.9" space	3.8"
6" text	
3.9" space	
18" route marker	
3.9" space	
6" text	
3.9" space	
1.2" border	
<hr/>	
sums to 48.1" (reduce upper space by 0.1")	sums to 48"

Alternative spacing: Because the route marker presents such a small horizontal area, the vertical spacing may be decreased above and below it, with the excess spacing placed below and above the border:

<u>Calculated</u>	<u>Adjustments</u>
1.3" border	
4.7" space	
6" text	
3" space	
18" route marker	
3" space	
6" text	
4.8" space	
1.2" border	
<hr/>	
sums to 48"	

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest horizontal legend line.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts (Section 3.13) to verify desirable installation on a new or existing structure.

The Blooming Prairie 22 is the longest horizontal line; Horizontal distance is based on  $\frac{3}{4}$  6" (font size) space on both sides. Blooming = 42.9", one space 6", Prairie = 31.1", one 6" space, 22 = 11.1", 2.5" in borders and 9" in outside spaces → 108.6". A minimum of the font size (6") shall be used between the city name and the mileage. Because of that the next size panel, 114", is chosen. The excess space (5.4") is added to the space between the city name and mileage => 11.4". This number may have to be adjusted further to maintain  $\frac{3}{4}$  spacing on the left and right.

**Key Placement Issues**

- Cardinal directions are middle justified on Route Markers on Distance Signs
- Cardinal directions are always capitalized
- Mileage entered as separate objects so they can be justified, 11 spacing can be expanded to 150%
- Text is left justified and distances are right justified

## 4.10 Example #8, Three Line Distance Sign (Freeway Overhead)

### Purpose of Example:

- Illustrates a typical freeway distance sign, incorporating route markers, fractions and whole numbers.

### Given Conditions:

- Freeway Overhead distance sign

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

### Basic Manual Methods:

Formulas and equivalents for the following example:

A = Letter height

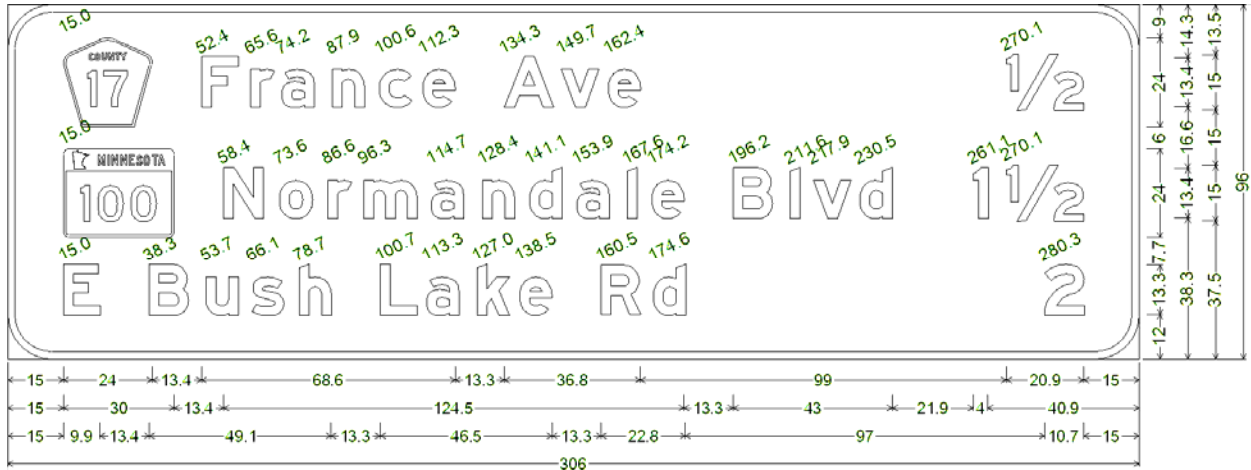
D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4}$  to 1 times A)



### SignCAD Methods:

1. Panel tool -
  - Sign type - guide
  - Panel color - green
  - Border color - white
2. Install sign components as individual entries (so that they can be aligned later), keep in mind the number preceding the fraction is 13.3" (Table 7) and the fractions are 15".
3. Right mouse click on each item
  - Select Object Align Left or Right
4. Adjust vertical spacing

5. Adjust horizontal spacing
6. Move excess space from edges into middle by adjusting horizontal spacing



12.0" Radius, 2.0" Border, White on Green:  
 "France Ave" E Mod; "1/2" E Mod; "Normandale Blvd" E Mod; "1 1/2" E Mod; "E Bush Lake Rd" E Mod; "2" E Mod;

**Typical Mistakes**

- Not following the freeway distance sign layout combinations listed in **Table 5** of Section 3.5.

**Final Sign Panel**



#### 4.10.1 Example #8, Three Line Distance Sign (Freeway Overhead) Calculations

##### Vertical Size of Panel and Line Spacing

Given:

- 3 rows of objects, 3 route markers
- Route marker (**Table 4**) = 24 OL, based on Freeway application
- Font size (**Table 4**) = 13.3-10, based on Freeway application
- Follow **Table 5** in section 3.5 for the spacing requirements (this is a standard sign application)

According to section 3.5, Combination # 6, the following object and spacing requirements exist

From top to bottom:

2"-top border

7" space

24"-route marker

6" space

24"-route marker

7.7" space

13.3" text

10" space

2"-bottom border

Vertical panel size is 96"

##### Horizontal Size of Panel and Spacing

The left horizontal spaces for the left aligned components and the right horizontal spaces for the right aligned components will be set equally to 13". Excess amounts on the right and left are added to the horizontal space between left and right legend columns. A minimum of 24" space is required between a destination and its corresponding mileage, while a minimum of 20" horizontal space is maintained between the longest destination line and the longest mileage.

##### Key Placement Issues

- Mileage entered as separate objects so they can be justified
- Text is left justified and distances are right justified
- Route Markers are middle justified on text
- Follow standard vertical spacing tables

## 4.11 Example #9, Vertical Split Panel Directional Sign

### Purpose of Example:

- Illustrates use of tabular arrangement
- Illustrates vertical and horizontal spacing in this type of sign

### Given Conditions:

- Signal mast arm mounted sign

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

### Basic Manual Methods:

Formulas and equivalents for the following example:

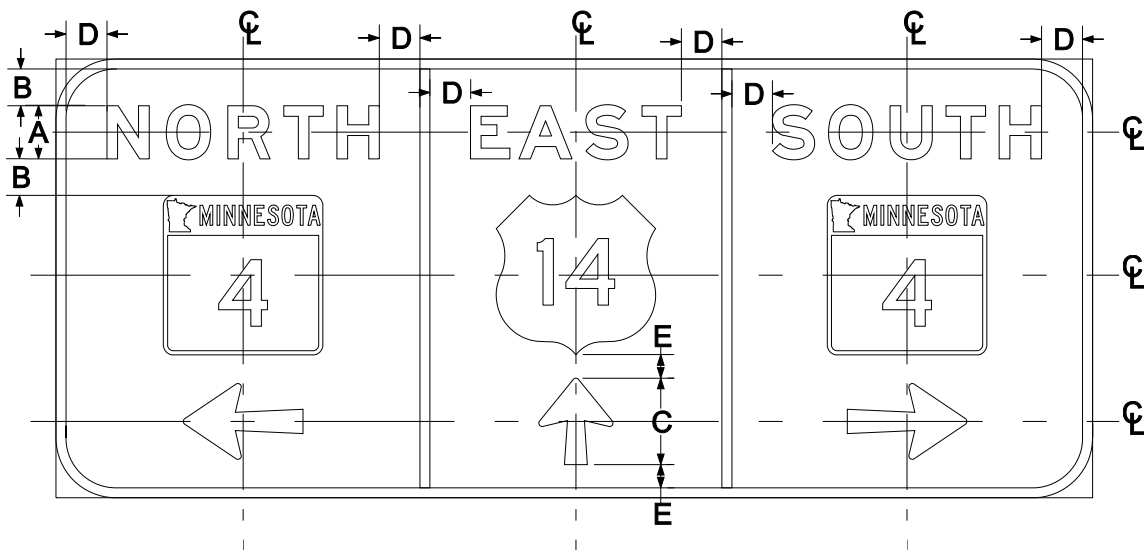
A = Letter height

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

C = Arrow height

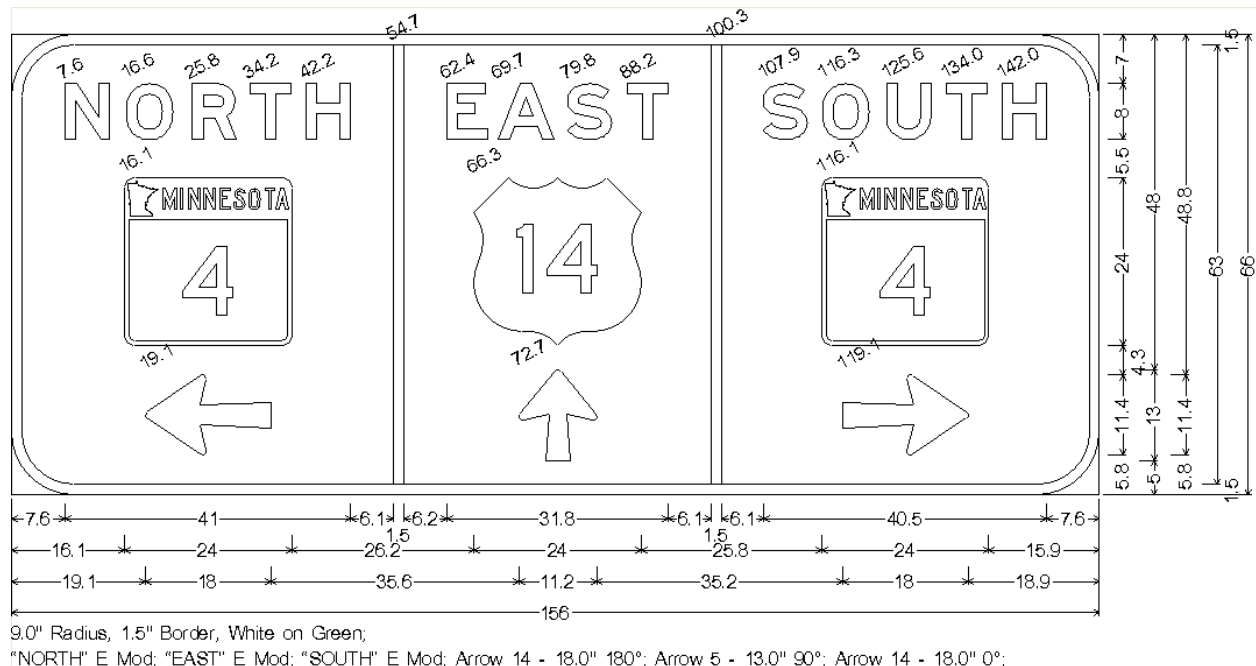
D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )

E = Vertical spacing from arrow to wording or OL, or from arrow to inside border ( $< B$ )



**SignCAD Methods:**

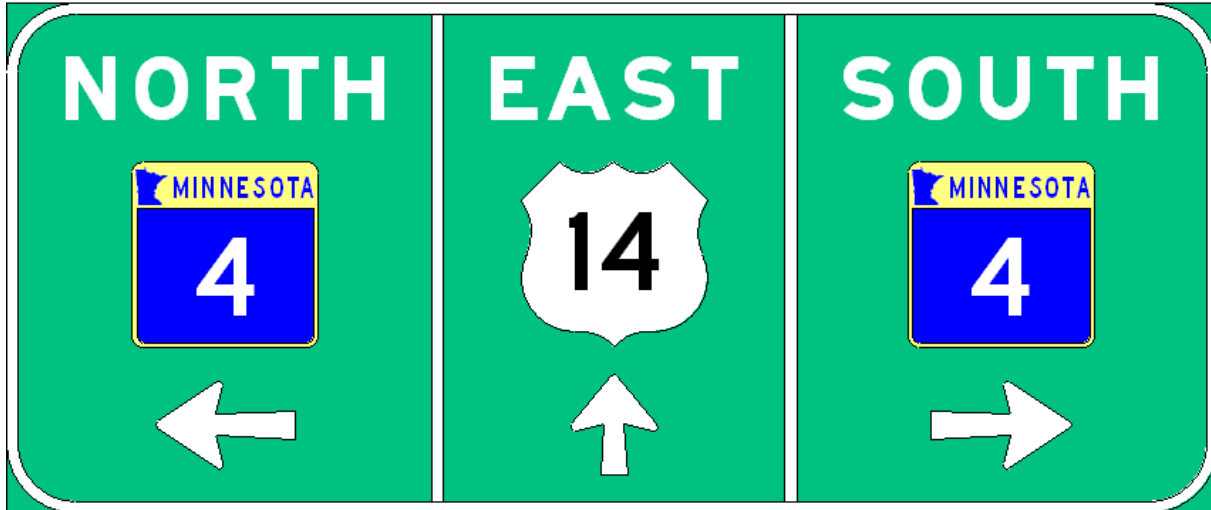
1. Panel tool -
  - Sign type - guide
  - Panel color - green
  - Border color - white
2. Create tabular arrangement - 3 Columns, 3 Rows
3. Install all components in arrangement
4. Move whole arrangement into panel
5. Double click or right click/edit on dashed lines created by arrangement
  - Minimum Space - Change all values to 0
  - Lines - Check Show Vertical Lines
6. Adjust vertical spacing - Panel should be 66" tall. Work with tallest component on each horizontal line. The only item to specifically use is the vertical arrow in the middle. It's taller than the two horizontal arrows - 13" to 11.4".
7. Horizontal spacing - Adjust evenly across by adding the longest components of each column, borders, and vertical lines together. Then add to this sum ¼ letter height for each space between legend and border or legend and vertical bars. Round to the nearest 6" increment, and split up difference between spaces. Zero out any horizontal spaces that may interfere with this procedure.



Typical Mistakes

- Arrow size choice incorrect for layout

Final Sign Panel



### 4.11.1 Example #9, Vertical Split Panel Directional Sign Calculations

#### Vertical Size of Panel and Line Spacing

Given:

- 3 rows of objects (center column controls - default), 1 cardinal direction, 1 route marker, 1 arrow
- Route marker (**Table 3**) = 24 OL, based on mounting
- Cardinal direction font height (**Table 3**) = 8, based on mounting
- Arrows (**Tables 3 & 6**) = 5-13 for vertical and 14-18 for horizontal, based on layout and mounting

1. Assume border = 1.5"

From top to bottom:

1.5"-top border

8"-text

24"-route marker

13" arrow (tallest arrow on row)

1.5"-bottom border

total of 48" of space needed for objects

2. Four spaces exist (3 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (8") = 4" - 6", use 5"

4 (5") = 20" of space required

3.  $48" + 20" = 68"$

68" is not divisible by 6, round to closest, use 66" → valid panel side

4. According to border table for Guide Signs, a sign with a short side of 66" a border of 1.5" is used

→ no change to assumption in step #1

5. Panel height (66") – Object space requirements (48") = Spacing distance (18")

$18" / 4 \text{ spaces} = 4.5" \text{ per vertical space.}$

6. To calculate the correct arrow spacing:

Arrow spacing should be made smaller than legend to overlay spacing. #7 of 4.2.1 suggests rounding of spacing amounts. There are several ways to do this. One is to make the arrow spacing 3.5" on each side.  $18" - 2(3.5) = 11"$  left to be divided equally between the two remaining spaces, 5.5" each

## 7. Final vertical spacing summary:

<b>Calculated</b>	<b>Adjustments</b>
1.5" border	
4.5" space	5.5"
8" text	
4.5" space	5.5"
24" route marker	
4.5" space	3.5
13" arrow	
4.5" space	3.5"
1.5" border	
sums to 66"	sums to 66"

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest objects in each column.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts (Section 3.13) to verify desirable installation on a new or existing structure.

NORTH, EAST, SOUTH are the longest objects in each column; Horizontal distance is based on  $\frac{3}{4}$  8" (font size) space = 6" on both sides.  $1.5" + 6" + 41" \text{ (NORTH)} + 6" + 1.5" + 6" + 31.8" \text{ (EAST)} + 6" + 1.5" + 6" + 40.5" \text{ (SOUTH)} + 6" + 1.5" = 155.3"$ . Round to the closest 6" increment, use 156". The 0.7" remainder can be divided up and added equally to all six 6" spacings.

**Placement Issues**

- Use a 3 column and 3 row tabular arrangement to place objects in, and then place matrix on panel
- Objects in each column should be horizontally aligned.
- Equal spacing between legend and border and legend and vertical bars

## 4.12 Example #10, Split Panel Two Color Destination Sign

### Purpose of Example:

- Incorporating different colored panels into the same sign

### Given Conditions:

- Posted speed limit = 40 mph
- Number of basic lanes = 2 lanes
- Non-Freeway

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

### Basic Manual Methods:

Formulas and equivalents for the following example:

A = Letter height

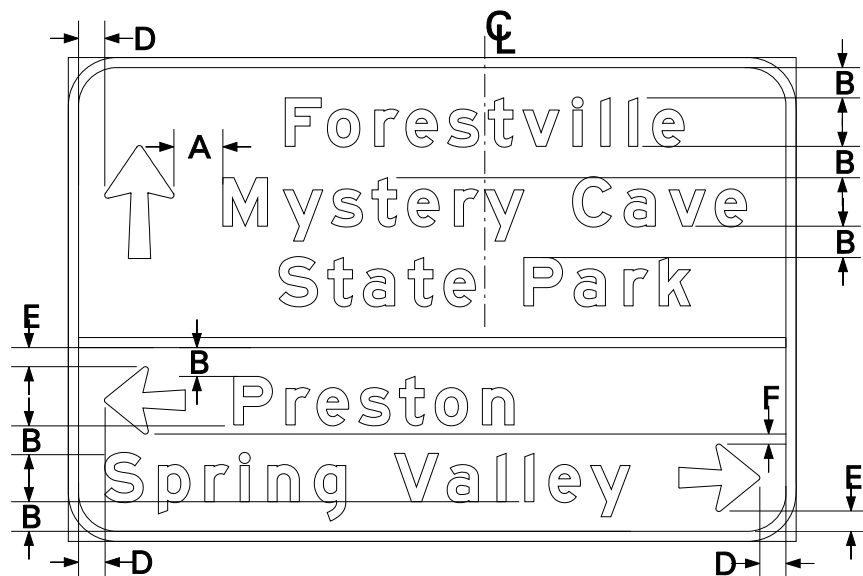
B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

C = Arrow height

D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )

E = Vertical spacing from arrow to wording, or from arrow to inside border =  $B - \frac{1}{2} (C - A)$

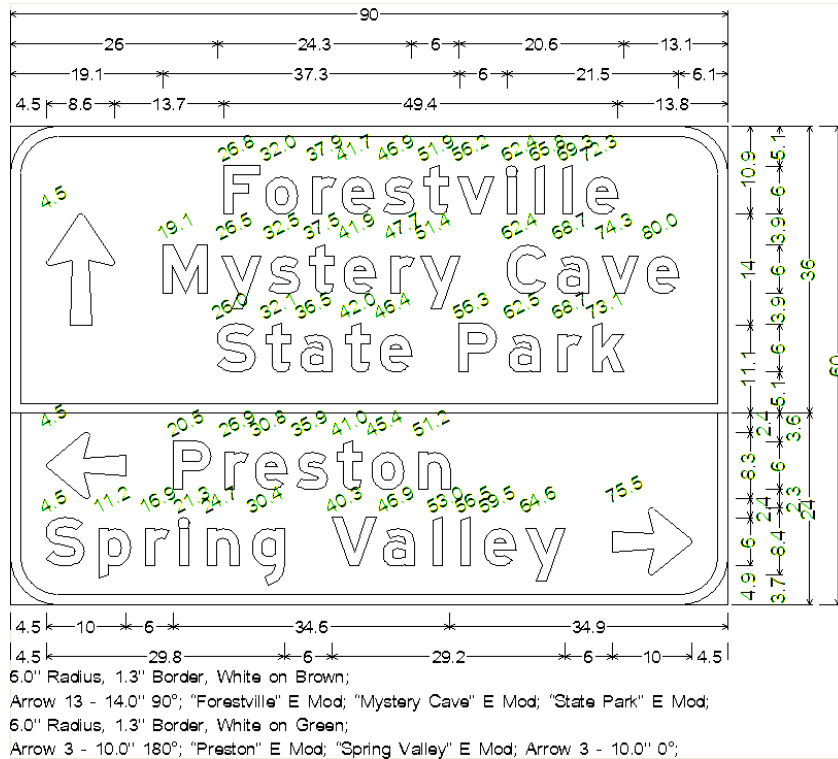
F = Vertical spacing from arrow (1) to arrow (2) =  $B - \frac{1}{2} (C1 - A) - \frac{1}{2} (C2 - A)$



\* Forestville is centered above State Park

**SignCAD Methods:**

1. Panel tool -
  - Sign type - guide
  - Panel color – green (city directions) and brown (recreational), create one panel of each
  - Border color – white
2. Install components in the two panels
3. Double click on brown panel
  - Border
    - Custom - Check Square corner lower left and lower right
4. Double click on green panel
  - Border
    - Custom - Uncheck Display Border Top
5. Place the panels next to each other, brown bottom to green top (this enables the multipanel functions)
6. Open each panel edit
  - General
    - Edit multipanel – Check Dimension as unit
  - Size
    - Enlarge to Fit when in Multipanel – Check Column width
7. Adjust alignment
  - Left justify the lower left side arrow by right clicking on the arrow and Preston –
    - Object align left
  - Move top arrow and Forestville Mystery Cave State Park to left by adjusting left and right object spacing
8. Adjust vertical spacing
9. Adjust horizontal spacing



Typical Mistakes

- Forestville left-justified instead of centered



Final Sign Panel

### 4.12.1 Example #10, Split Panel Two Color Destination Sign Calculations

#### Vertical Size of Panel and Line Spacing

Given:

- 5 rows of objects (text on top and arrows on bottom control), 3 lines of text, 2 horizontal arrows
- Font size (**Table 3**) = 6-4.5, based on roadway, speed and number of lanes
- Arrow (**Tables 3 & 6**) = 3-10 for horizontal arrows and 13-14 for vertical arrow, based on roadway, speed, and layout

1. Assume border = 1.25"

From top to bottom:

1.3"-top border

6"-text

6"-text

6"-text

1.2" horizontal line

6" arrow (assumed at this point)

6" arrow (assumed at this point)

1.3"-bottom border

total of 33.8" of space needed for objects

2. Seven spaces exist (6 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (6") = 3"- 4.5", use 4"

7 (4") = 28" of space required

3.  $33.8" + 28" = 61.8"$

61.8" is not divisible by 6, round to closest, use 60" → valid panel side

4. According to border table for Guide Signs, a sign with a short side of 60" a border of 1.25" is used

→ no change to assumption in step #1

5. Panel height (60") – Object space requirements (33.8") = Spacing amount (26.2")

$26.2" / 7$  spaces = 3.742", use 3.7".

6. To simplify the design, make each color section divisible by 6 while making vertical spacing approximately equal throughout:

Brown section – Panel height (36") – Object space requirements (20.5") = Spacing amount (15.5")

$15.5"/4 \text{ spaces} = 3.875"$ , use 3.9".

Green section – Panel height (24") – Object space requirements (13.3") = Spacing amount (10.7")

$10.7"/3 \text{ spaces} = 3.567"$ , use 3.6". Remember only one border in the green section.

7. To calculate the correct arrow spacing:

$E = B - \frac{1}{2}(C-A)$  or the arrow vertical spacing is equal to the standard spacing (3.6", from 6 above) minus  $\frac{1}{2}$  of the difference between the exact arrow height (8.4" for a 3-10 arrow) and the font size.

Arrow spacing =  $3.6 - \frac{1}{2}(8.4-6) = 2.4"$ . Spacing between Preston and Spring Valley lines is arrow (1) to arrow (2)  $\rightarrow B - \frac{1}{2}(C1-A) - \frac{1}{2}(C2-A) = 3.6 - \frac{1}{2}(8.4-6) - \frac{1}{2}(8.4-6) = 1.2"$ .

8. Final vertical spacing summary:

<u>Calculated</u>	<u>Adjustments</u>
Brown Section	
1.3" border	
3.9" space	
6" text	
3.9" space	
6" text	
3.9" space	
6" text	
3.9" space	
1.2" horizontal line	
Subtotal 36.1" (subtract 0.1" from lower space)	Sums to 36"
Green section	
2.4" space	
8.4" horizontal arrow	
1.2" space	
8.4" horizontal arrow	
2.4" space	2.3"
1.3" border	
Subtotal 24.1" (subtract 0.1" from lower space)	Sums to 24"
<hr/>	
Total to 60"	

### Horizontal Size of Panel and Spacing

Once the vertical spacing is determined the horizontal spacing is based on the longest object.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts (Section 3.13) to verify desirable installation on a new or existing structure.

The Spring Valley and horizontal arrow is the longest object; Horizontal distance is based on  $\frac{3}{4}$  8" (font size) space on both sides. Spring = 29.8", one space 6", Valley = 29.2", one 6" space, horizontal arrow = 10", 2.5" in border and 9" in outside spaces → 92.5", use 90", decrease outer spaces by 1.2" and 1.3".

### Key Placement Issues

- Create 2 separate panels, one green, one brown
- Place the Forestville and State Park text lines in a column
- Join the two signs and under Edit multipanel check Dimension as unit.
- The top legend can be left justified by adjusting horizontal object spacing

### 4.13 Example #11, Junction with Fraction Sign

#### Purpose of Example:

- Creation of fraction

#### Given Conditions:

- Posted speed limit = 55 mph
- Number of basic lanes = 2 lanes
- Non-Freeway

#### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

#### Basic Manual Methods:

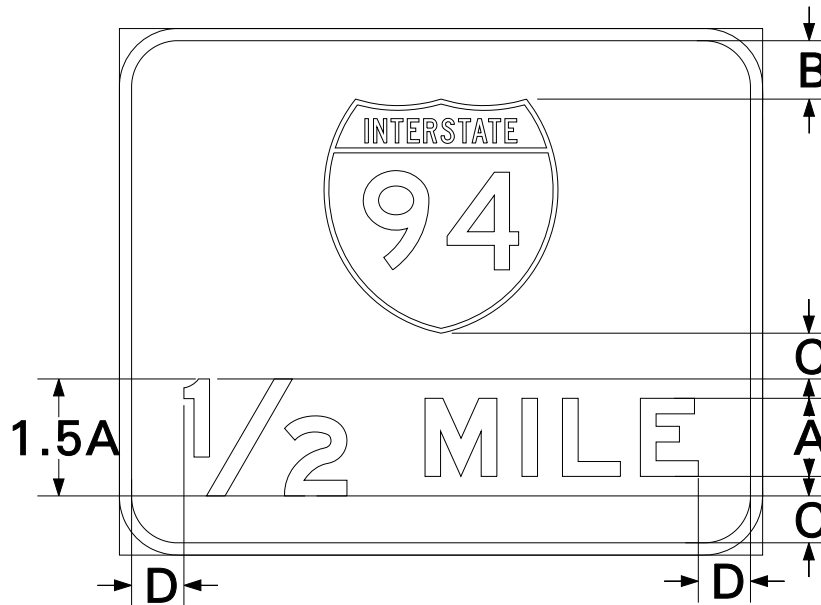
Formulas and equivalents for the following example:

A = Letter height

B = Vertical spacing from route marker overlay to inside border ( $\frac{1}{2} A$  to  $\frac{3}{4} A$ )

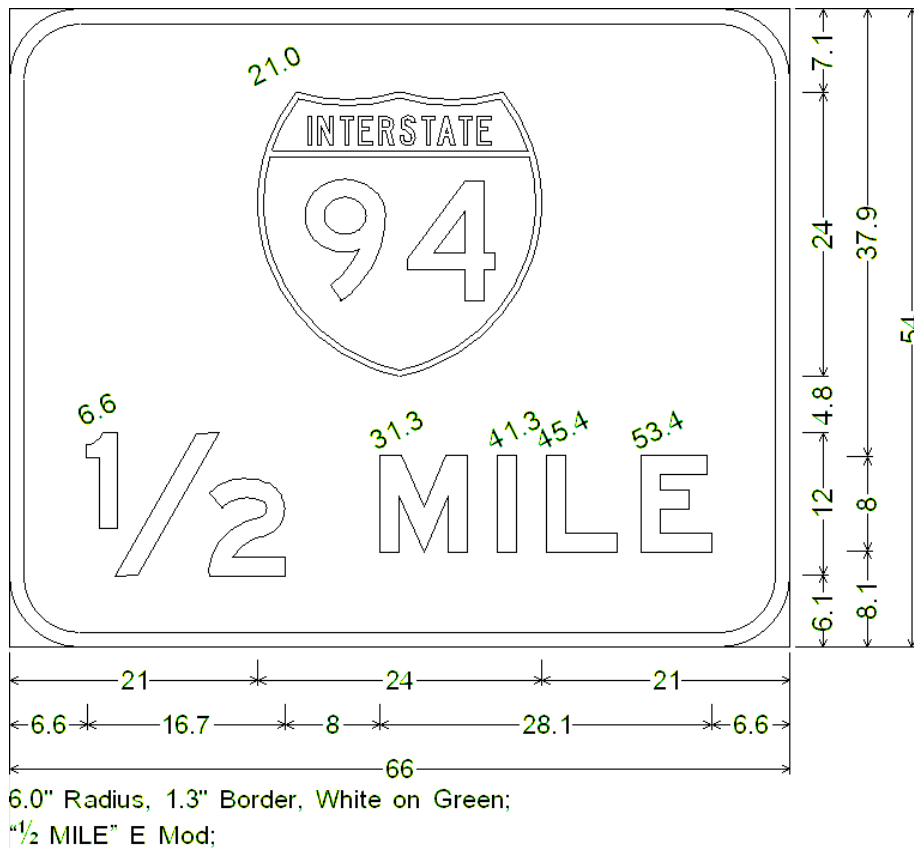
C = Vertical spacing around the fraction

D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4} A$ )



**SignCAD Methods:**

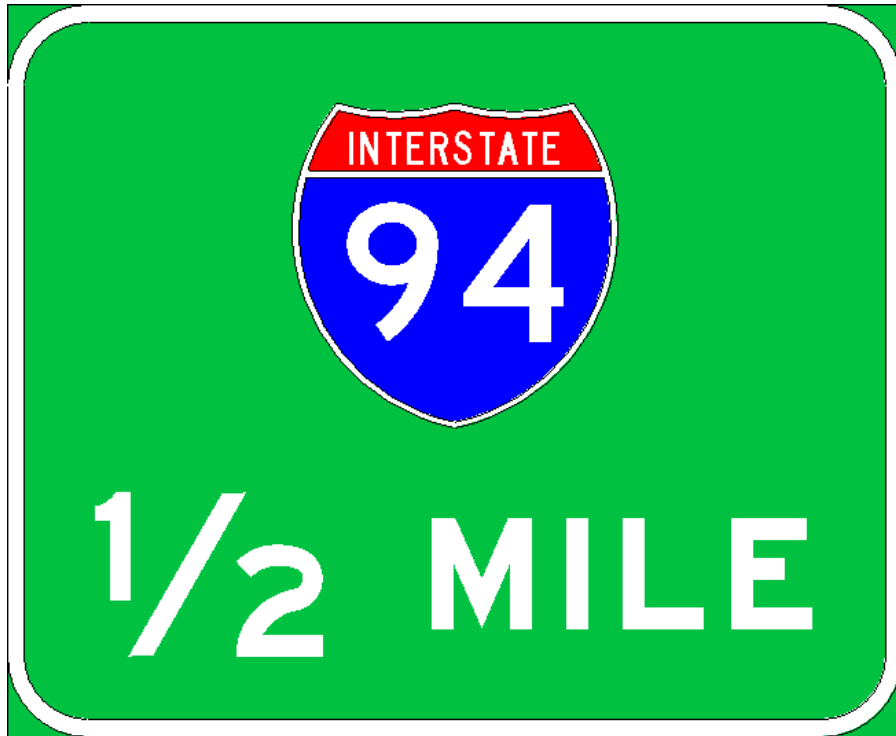
1. Panel tool -
  - Sign type - guide
  - Panel color – green
  - Border color – white
2. Install components (JCT text and route marker)
3. Install ¼ MILE text
  - Select text tool
  - Adjust height – Fraction is 1.5 times larger than the numerals within it and also 1.5 times larger than MILE. This fraction is 12” tall
  - Space 1 / 2 space will create the fraction. Delete initial space after fraction is created
  - Adjust height back to 8” before typing MILE. Use text tool to change space after fraction to 8”.
4. When computing vertical spacing the fraction may be treated more as letter height (8”) than fraction height (12”).



**Typical Mistakes**

- Incorrect fraction design

**Final Sign Panel**



### 4.13.1 Example #11, Junction with Fraction Sign Calculations

#### Vertical Size of Panel and Line Spacing

Given:

- 3 rows of objects (fraction controls)
- Font size (**Table 3**) = 8, based on roadway, speed and number of lanes
- Route marker (**Table 3**) = 24, based on roadway, speed and number of lanes

1. Assume border = 1.25"

From top to bottom:

1.3"-top border

24" route marker

10"-average between fraction and MILE heights (12" and 8")

1.2"-bottom border

total of 36.5" of space needed for objects

2. Three spaces exist (3 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (8") = 4" - 6", use 5"

3 (5") = 15" of space required

3.  $36.5" + 15" = 51.5"$

51.5" is not divisible by 6, round to closest, use 54" → valid panel side

4. According to Table 2 for Guide Sign Borders, a sign with a short side of 54" a border of 1.25" is used

→ no change to assumption in step #1

5. Panel height (54") – Object space requirements (36.5") = Spacing amount (17.5")

$17.5"/3$  spaces = 5.83". use 5.8".

6. No arrows. The value for the bottom line is 10" (Average of 12" fraction height and 8" MILE height). However, the fraction is 12". Spacing is adjusted downward by 1" top and bottom. 4.8" used.

## 7. Final vertical spacing summary:

<u>Calculated</u>	<u>Adjustments</u>
1.3" border	
5.8" space	
24" route marker	
4.8" space	
12" fraction	
4.8" space	4.9"
1.2" border	
sums to 53.9" (add 0.1" to fraction spacings)	sums to 54"

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest object.

Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing between inside of border and legend, remember that panels are sized in 6" increments. Additionally, be sure to check panel size against U-Post Spacing charts (Section 3.13) to verify desirable installation on a new or existing structure.

The  $\frac{1}{4}$  MILE is the longest object; Horizontal distance is based on  $\frac{3}{4}$  8" (font size) space on both sides.  $\frac{3}{4}$  = 16.7", one space 8", MILE = 28.1", 2.5" in border and 12" in outside spaces → 67.3", use 66", decrease outer spaces by 0.6" and 0.7"

**Key Placement Issues**

- Spaces used on each side of 1 / 4 to create correct fraction design
- Fraction is coded with a font size of 12"

## 4.14 Example #12, Freeway Overhead Sign

### Purpose of Example:

- Freeway example
- Diagonal arrow

### Given Conditions:

- Overhead mounted
- Freeway 60 mph
- 4 lanes
- Ramp

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

### Basic Manual Methods:

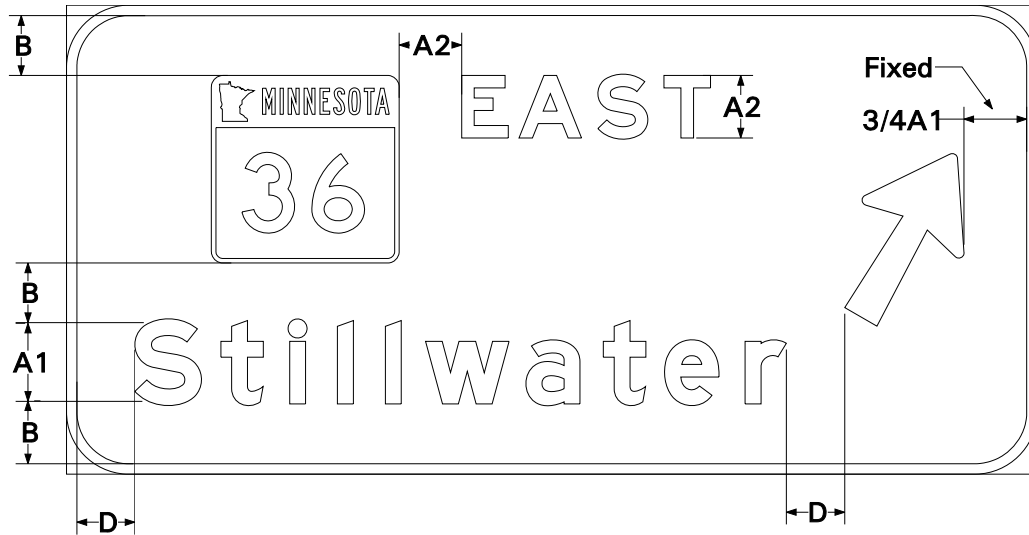
Formulas and equivalents for the following example:

A1 = Letter height

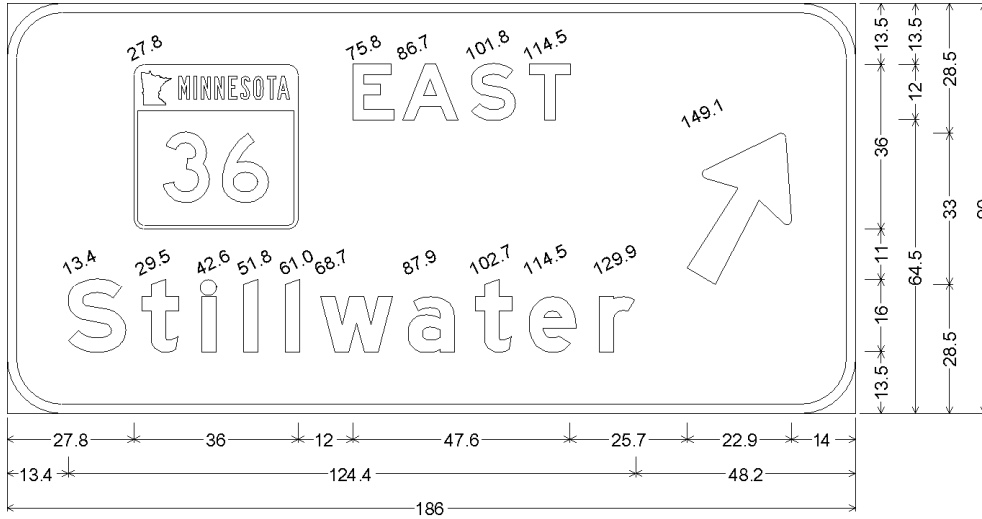
A2 = Cardinal direction letter height

B = Vertical spacing from wording to wording, or from wording to inside border ( $\frac{1}{2}$  A to  $\frac{3}{4}$  A)

D = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4}$  A)

**SignCAD Methods:**

1. Panel tool –
  - Sign type – guide
  - Panel color – green
  - Border color - white
2. Text tool –
  - Font – E modified
  - Size – 12 E modified for EAST, 16-12 E modified for Stillwater
  - Proper name – Upper-lower case
3. Arrow tool –
  - Angle – 60 degrees
  - Arrowhead – 17 (17-36 arrow)
4. Install components into panel one at a time with the arrow last
5. Right justify arrow and adjust right object spacing to 12
6. Top align EAST – Right/click object align top
7. Adjust vertical spacing –
  - Right mouse click on object to be spaced – select object spacing (left click)
  - Aim is  $\frac{3}{4}$  letter height
8. Horizontal spacing – Left and right of Stillwater adjusted to approximately  $\frac{3}{4}$  of letter height



OH 39-694(R); 12.0" Radius, 2.0" Border, White on Green;  
 "EAST" E Mod 125% spacing; "Stillwater" E Mod; Arrow 17 - 36.0" 60°;

**Typical Mistakes**

- Arrow angle incorrect
- Cardinal not top justified on route marker

**Final Sign Panel**



#### 4.14.1 Example #12, Freeway Overhead Sign Calculations

##### Vertical Size of Panel and Line Spacing

Given:

- 2 rows of objects: Route marker and text control
- Route marker (**Table 4**) = 36, based on freeway and overhead position
- Font size (**Table 4**) = 16-12, based on freeway and overhead position
- Cardinal Direction Font Size (**Table 4**) = 12
- Arrow (**Table 4**) = 17-36, based on roadway and sign type

1. Assume border = 2"

From top to bottom:

2"-top border

36" route marker

16" legend

2"-bottom border

total of 56" of space needed for objects

2. Three spaces exist (2 objects) @  $\frac{3}{4}$  of font size (16") = 12"

3 (12) = 36" of space required

3.  $56" + 36" = 92"$

92" is not divisible by 6, round to closest, use 90" → valid panel side

4. According to border table for Guide Signs, a sign with a short side of 90" a border of 2" is used

→ no change to assumption in step #1

5. Panel height (90") – Object space requirements (56") = Spacing distance (34")

$34" / 3 \text{ spaces} = 11.33"$ , use 11.3".

6. Not applicable

## 7. Final vertical spacing summary:

<u>Calculated</u>	<u>Adjustments</u>
2" border	
11.3" space	
36" route marker	
11.3" space	11.4"
16" text	
11.3" space	
2" border	
sums to 89.9" (add 0.1" to space between objects)	sums to 90"

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest object. The arrow is spaced 12" from inside the right border. Use approximately  $\frac{3}{4}$  of the font size as horizontal spacing, remember that panels are sized in 6" increments.

Stillwater and the arrow are the longest objects; Horizontal distance is based on  $\frac{3}{4}$  16" (font size) space on both sides. 2" (border) + 12" space + 124.4" (Stillwater) + 12" space + 22.9" (arrow) + 12" (fixed) + 2" (border) = 187.3" => 186" used. 1.3" excess is removed from the spacing right and left of Stillwater => 11.35"

**Key Placement Issues**

- Sequence of installing components: Arrow installed last
- Fixing arrow position to right side
- EAST is top justified

## 4.15 Example #13, Freeway OH Exit Direction Sign w/ Exit Panel

### Purpose of Example:

- Freeway design
- Exit only, split panel

### Given Conditions:

- Overhead mounted
- Freeway

### Example Task:

- Using the given conditions listed above and the sign components illustrated below, develop the guide sign using SignCAD paying particular attention to component location, justification, and spacing.

### Basic Manual Methods:

Formulas and equivalents for the following example:

A1 = City/street name letter height

A2 = Cardinal direction letter height

A3 = EXIT ONLY letter height

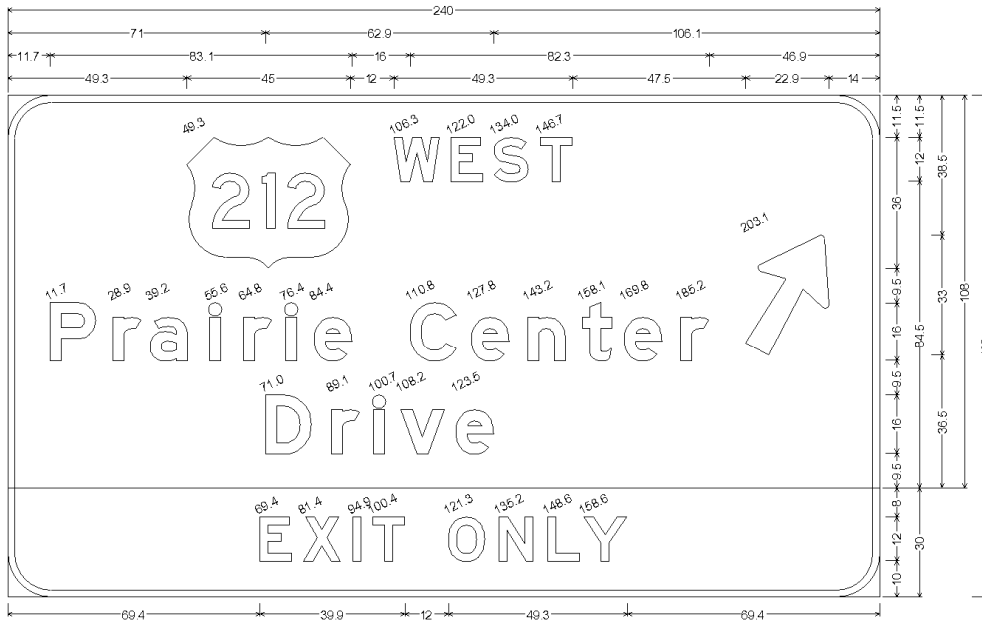
B1 = Vertical spacing from legend to legend, or from legend to inside border ( $\frac{1}{2}$  A to  $\frac{3}{4}$  A)

B3 = Vertical spacing from legend to legend, or from legend to inside border ( $\frac{1}{2}$  A to  $\frac{3}{4}$  A)

D1 = Horizontal spacing from inside border to legend (approximately  $\frac{3}{4}$  A)

E = Vertical spacing from arrow to inside border





12.0" Radius, 2.0" Border, White on Green;  
 "WEST" E Mod 125% spacing, "Prairie Center" E Mod, "Drive" E Mod, Arrow 17 - 36.0" 60";  
 12.0" Radius, 2.0" Border, White on Yellow;  
 "EXIT ONLY" Black E Mod 125% spacing;

**Typical Mistakes**

- Cardinal direction not top justified
- Incorrect arrow and rotation

**Final Sign Panel**



#### 4.15.1 Example #13, Freeway Exit OH Direction Sign w/ Exit Panel Calculations

##### Vertical Size of Panel and Line Spacing

Given:

- 3 rows of objects: Route marker and text control
- Route marker (**Table 4**) = 36, based on freeway and overhead position
- Font size (**Table 4**) = 16-12, based on freeway and overhead position
- Cardinal direction font size (**Table 4**) = 12 based on freeway and overhead position
- EXIT ONLY (**Table 4**) = 12 based on freeway and overhead position
- Arrow (**Table 4**) = 17-36, based on roadway, mounting and sign layout

##### Main Panel

1. Assume border = 2"

From top to bottom:

2" top border

36" route marker

16" legend

16" legend

total of 70" of space needed for objects

2. Four spaces exist (3 objects) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (16"). Use 10"  
 $4(10) = 40"$
3.  $70" + 40" = 110"$   
110" is not divisible by 6, round to closest, use 108"
4. According to border table for Guide Signs, a sign with a short side of 108" a border of 2" is used  
➔ no change to assumption in step #1
5. Panel height (108") – object space requirements (70") = spacing distance (38")  
 $38"/4 \text{ spaces} = 9.5"$
6. Not applicable

## 7. Final vertical spacing summary:

<u>Calculated</u>	<u>Adjustments</u>
2" border	
9.5" space	
36" route marker	
9.5" space	
16" text	
9.5" space	
16" text	
9.5" space	
2" border	
<hr/>	
sums to 108" (no adjustments required)	

**Horizontal Size of Panel and Spacing**

Once the vertical spacing is determined the horizontal spacing is based on the longest object.

Prairie Center and the arrow are the longest objects; Horizontal distance is based on  $\frac{3}{4}$  16" (font size) space on both sides. 2" (border) + 12" space + 181.4" (Prairie Center) + 12" space + 22.9" (arrow) + 12" (fixed) + 2" (border) = 244.3", 246" used. 1.7" additional is added to the left and right of Prairie Center.

**Exit Panel**

1 row of objects: Text

Font size = 12, based on freeway and overhead

## 1. Border is 2" based on previous green panel calculations

From top to bottom:

12" text

2" border

Total of 14" of space needed for objects

2. Two spaces exist (1 object) @  $\frac{1}{2}$  to  $\frac{3}{4}$  of font size (12"). Use 8"

2(8) = 16" of space required

## 3. 14" + 16" = 30", divisible by 6".

## 4. Border matches attached panel, no changes

## 5. Panel height (30") – Object space requirements (14") = Spacing distance (16")

$16''/2 = 8''$  per vertical space

- 6. Not Applicable
- 7. Final vertical spacing summary:

<u>Calculated</u>	<u>Adjustments</u>
-------------------	--------------------

8'' space	
-----------	--

12'' text	
-----------	--

8'' space	
-----------	--

2'' border	
------------	--

---

sums to 30'' (no adjustments)

### Horizontal Size of Panel and Spacing

Matches attached panel