

# The Legibility of the Clearview Typeface System versus Standard Highway Alphabets on Negative- and Positive-Contrast signs



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<b>16. Abstract</b> The main objective of this research was to compare the legibility distance of the negative-contrast (i.e., darker letters on a lighter background) Clearview Typeface System with that of comparable Standard Highway Alphabets on black-on-white signs in the daytime and nighttime for older and younger motorists. Mixed-case Clearview was compared to both mixed and all-uppercase Standard Highway Alphabets Series C, D, and E. (Mixed-case words have an initial capital letter followed by all lower-case letters. All uppercase words are the standard condition of regulatory, warning, and work zone signs.) These typefaces were selected for study, as they are the most commonly used typefaces in negative-contrast applications. In addition, the researchers at the Thomas D. Larson Pennsylvania Transportation Institute at Penn State evaluated the effects of inter-letter spacing and letter height on the legibility distance of mixed-case Clearview 2-B, 3-B, and 4-B. A small set of white-on-green (positive contrast) signs were displayed as well, comparing Clearview Typefaces 2-W, 3-W, and 4-W with Standard Highway Alphabet Series C, D, and E, all in mixed-case. This research was planned as Part 1 of a three-part study effort into the readability of negative-contrast highway signs. Part 1 would identify the relative legibility of various typefaces and mixed versus all uppercase words. Part 2 would address recognition, or the understanding of messages, using various typefaces in both uppercase and mixed case. Part 3 would address figure/field and format to learn how display variables may enhance sign readability.					
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## **Objective**

The main objective of this research was to compare the legibility distance of the negative-contrast (i.e., darker letters on a lighter background) Clearview Typeface System with that of comparable Standard Highway Alphabets on black-on-white signs in the daytime and nighttime for older and younger motorists. Mixed-case Clearview 2-B, 3-B, and 4-B were compared to both mixed and all-uppercase Standard Highway Alphabets Series C, D, and E. (Mixed-case words have an initial capital letter followed by all lower-case letters. All-uppercase words are the standard condition of negative-contrast regulatory, warning, and work zone signs.) These typefaces were selected for study as they are the most commonly used typefaces in negative-contrast applications, with many being used on safety-critical messages.

In addition, the researchers evaluated the effects of inter-letter spacing and letter height on the legibility distance of the mixed-case Clearview Typefaces. A small set of white-on-green signs (positive contrast) were reviewed as well, comparing Clearview 2-W, 3-W, and 4-W with Standard Highway Alphabet Series C, D, and E; all of these positive-contrast signs were in mixed-case.

This research was planned as Part 1 of a three-part study effort into the readability of negative-contrast highway signs. Part 1 would identify the relative legibility of various typefaces and mixed-case versus all-uppercase words. Part 2 would address recognition, or the understanding of messages, using various typefaces in both uppercase and mixed case. Part 3 would address figure/field and format to learn how display variables may enhance sign readability.

## **Background**

The development of the Clearview typeface began in response to a Federal Highway Administration (FHWA) study that recommended a 20-percent increase in sign letter height to provide greater reading distances for aging drivers (Mace et al., 1994). This 20-percent letter height increase would result in an approximately 50-percent increase in sign area. The original Clearview studies, however, showed that it was possible to obtain significant improvements in guide sign reading distances for older drivers without increasing sign size by using mixed-case Clearview typefaces in place of all-uppercase Standard Highway Alphabets (Garvey et al., 1997). Furthermore, the positive-contrast, mixed-case Clearview typefaces were found to be

significantly more readable than the mixed-case Standard Highway Series E(M) in several independent studies (Garvey et al., 1997, 1998; Hawkins et al., 1999; and Carlson and Brinkmeyer, 2002), particularly in recognition tasks at night with poor-vision drivers. This body of research led to the FHWA's 2004 interim approval of Clearview on positive-contrast guide signs. To date, 26 state DOTs have been granted interim approval to use the Clearview Typeface (FHWA, 2014).

Clearview was specifically designed to improve guide sign readability at night for older drivers when used with high-brightness sign materials, by creating letter forms designed for viewing at a distance, enhancing word pattern recognition, and by crafting the letters to reduce or eliminate the negative effects of halation and overglow. However, the Clearview Typeface System also includes negative-contrast versions for use on regulatory and warning signs. The difference between negative-contrast and positive-contrast versions of Clearview is limited to stroke width, with negative contrast being heavier, to counterbalance the halation effect of the lighter background when viewed at a distance with high-brightness retroreflective materials. While the research discussed above led to the development of guidelines and approval for the use of Clearview in positive contrast, research results using negative-contrast Clearview have been limited to a single study, the results of which were less encouraging (Holick et al., 2006).

In 2002, the final Clearview positive-contrast design was shown to representatives from the FHWA Office of Highway Safety at the test track of the Thomas D. Larson Pennsylvania Transportation Institute at Penn State. At that meeting and in subsequent conversations that coincided with the 2004 interim approval, the design team was encouraged to extend the research to Clearview in negative contrast. The present study is the first of a series designed by researchers at Penn State's Larson Institute to accomplish that request from FHWA.

## **Task 1: Coordination with FHWA's MUTCD Team**

Prior to beginning data collection, the research team contacted the Federal Highway Administration's *Manual on Uniform Traffic Control Devices* (MUTCD) team, providing them with the study plans and an invitation to offer input to "ensure that our goals parallel the goals of the FHWA in the design of effective postings of safety-critical information." The MUTCD Team Leader replied that the FHWA was more interested in efforts aimed at improving the Standard Highway Series than in conducting further research on Clearview (e.g., Miles, et al.,

2014). The Penn State research team provided additional information to the Team Leader, but received no response. Given the importance of Clearview in many states' efforts to enhance drivers safety, and the earlier request by FHWA to provide this study for the advancement of knowledge in the field, the research team decided to continue with the research project as proposed, with the goal of developing additional information to aid the FHWA in its decision-making regarding the use of Clearview as an alternative typeface for negative-contrast applications.

## **Task 2: Interviews with State and Local DOTs**

The research team conducted an electronic survey, with follow-up telephone interviews when necessary, of state and local DOT use of the Clearview typeface. The survey was conducted in three phases. First, each agency was contacted by telephone. During this phase, the purpose of the survey was explained, a request for participation was made, and, if accepted, the relevant member of the agency staff was identified. A questionnaire was then emailed to each agency (Appendix A), which agency staff either filled in and emailed back or answered during the follow-up telephone interview. The questionnaire determined whether or not the agency used the Clearview typeface, how long the agency had used it, for what applications, and any positive or negative experiences the agency could report. Agencies that had elected not to use positive-contrast Clearview were asked to explain this decision and all agencies were asked if they would use negative-contrast Clearview if it were approved.

## ***Results***

As with most surveys of this kind, the completion rate was less than 100 percent. Fifty states and one Canadian province were contacted and 32 states and the Canadian province responded. This response rate of 64-percent of state DOTs was considered sufficient to include the results in this report.

While it is impossible to determine the exact extent and nature of Clearview's use based on this survey alone, or even when supplemented with the list of approved states provided by FHWA (2014), the following summary gives an informative indication of the state-of-practice. Appendix B contains a spreadsheet with the detailed data from the 33 responses.



*Does your agency use the Clearview typeface on its highway signs?*

Yes    **21**    64-percent

No    **12**    36-percent

Those who responded “yes” answered the related follow-up questions (see Appendix A). In summary, most of those who are using Clearview have a blanket jurisdiction for positive-contrast signs and are using them as guide signs. Most experiences have been favorable and what feedback has been received has been generally positive and includes: improved legibility and public approval. Negative responses include: problems with Clearview numbers and fractions; some necessary sign size increases; and software issues.

Those states not using Clearview chose not to because of the following reasons: cost of the software; because it was not upgraded beyond Interim Approval status in the 2009 MUTCD; the potential benefits did not justify making the change; sign size would need to be increased, often causing the state to replace the sign; and the proprietary nature of the Clearview font.

*If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?*

Yes                    **10**    30-percent

No                     **5**    15-percent

Don't Know        **14**    42-percent

No Response       **4**    12-percent

Four states did not reply to this question. The eight states that answered positively, said that they would evaluate the research and would be inclined to use it if it had been established by the research to be more legible and if it was supported by the FHWA and used nationwide. The five states that said they would not use it based their responses on the current research and stated that they were not convinced of its effectiveness in negative-contrast applications.

## **Task 3: Typeface Legibility**

### ***Objective***

Using a procedure developed, tested, and replicated at the Larson Institute at Penn State, the legibility distances of three weights of mixed-case, negative-contrast Clearview (with three inter-letter spacings and two letter heights) were compared to three mixed-case and all-uppercase FHWA Standard Highway Alphabets Series. These signs were white with black legends and border. White-on-green signs were also displayed in the Clearview Typeface and Standard Highway Alphabets in the same panel format.

### ***Method***

#### **Overview**

Whereas reading a guide sign is primarily a recognition task (e.g., a viewer looking for “Richmond” couples his mental image of the word with the legend on the sign and so differentiates it from “Washington”), this is not the case with regulatory signs, where motorists must often read each sign completely without knowledge of its content before processing the specific command (this is known as a legibility task). For over 60 years, research has shown that using mixed-case words can improve recognition distance (Forbes et al., 1950). The present study evaluated whether the use of mixed-case Clearview could improve *legibility* distance over all-uppercase and mixed-case Standard Highway Alphabets on regulatory-type signs.

#### **Subjects**

One hundred and fourteen subjects were paid \$50.00 each to participate in 1-hour test sessions. The details of the participants’ ages and genders are provided in the analysis section below. All subjects held valid driver’s licenses and their visual acuity was measured using a standardized test (GOOD-LITE Co. light box using Sloan Letters at 3 meters).

#### **Site and Apparatus**

The test site was a straight, flat, 12-ft-wide section of the Larson Institute’s test track (Figure 1). The signs were mounted on a series of signposts placed 200 ft apart. This allowed multiple signs to be tested with each subject pass. As per MUTCD recommendations for

comparable highway signs, the test signs were mounted at a height of 7 ft from the road surface with a lateral offset of 2 ft to the right of the edgeline. The observation vehicle was a 2006 Dodge Stratus.

The signs were based on a 6-inch capital letter height with panel heights and widths that allowed adequate space around the test words. Clearview signs used mixed-case lettering while Standard Highway Alphabets used either all-uppercase or mixed-case letters. Each of the Clearview weights was also reduced in size by 20 percent (from 6.0-inch capital letter height to 4.8-inch height) to evaluate smaller versions of the Clearview typeface versus larger Standard Highway Alphabet signs. The sign panels were displayed with high-intensity prismatic retroreflective white background sheeting and black non-reflective letters and borders. Additional white-on-green guide signs were displayed in the Clearview Typeface using high-intensity white sheeting and a green transparent overlay.



**Figure 1. Photograph of the Typeface Legibility Experiment**

Eighteen words were selected to evaluate the negative-contrast application in this study: Forgan, Lompoc, Helena, Fulton, Dunnel, Luning, Dorsey, Harney, Larned, Frazee, Harper, Lowery, Hosper, Dupree, Lavaca, Borger, Linsey, Dassel. This set of 18 words was used successfully in developing and evaluating NPS Rawlinson, the U.S. National Park Service's new guide sign font (Garvey et al., 2004). Six additional words were selected to evaluate the positive-contrast applications: Purcel, Dorset, Conyer, Bergen, Ordway, and Gurley. These

were the words used in the original development and testing of the Clearview Typeface (Garvey et al., 1997). The words were selected to be emotionally neutral and easy to read, but not commonly known.

With the exception of the use of black legend and white backgrounds, the negative-contrast test signs were not intended to replicate standard regulatory signs, but rather were designed to evaluate the threshold distances at which motorists could read the various typefaces, inter-letter spacings, and letter heights, and thereby determine whether negative-contrast Clearview would provide the kind of improvements in legibility over the Standard Highway Alphabets that it did in positive contrast.

## **Procedure**

The subjects drove the vehicle with an experimenter in the front passenger seat. At night, low-beam headlamps were used. The vehicle was parked in the center of the travel lane around a horizontal curve in the test track, such that the participants were not able to see the signs. Each subject drove the vehicle at 15 mph toward the first sign until he or she read it correctly. Using the Microdynamics DOT-Z1 distance-measuring instrument, the experimenter recorded that distance as the legibility threshold for that sign condition. The subject continued driving and the experimenter asked him or her to read the next sign. This was repeated until all signs were evaluated.

## **Variables**

The dependent variable was legibility distance threshold, defined as the maximum distance at which a subject was able to correctly read the sign.

The independent variables were typeface (Clearview 2-B, 3-B, and 4-B and Standard Highway Alphabets C, D, and E), case (mixed case and all uppercase), time-of-day (daytime and nighttime), inter-letter spacing (standard, reduced one, reduced two), capital letter height (6.0 inches and 4.8 inches), and subject age group (young, middle, old). There were 18 negative-contrast typeface/spacing/letter height conditions and 9 positive-contrast conditions (Figure 2, where 0 spacings are standard spacings for that typeface and negative spacings are percent reduced from standard).

To control for learning and/or fatigue effects, the order of sign presentation was counterbalanced across subjects. To control for the possibility of a “word superiority effect,” (where some words are easier to read than others), the words were randomly assigned to typeface/spacing conditions and each word was presented on three separate condition-combinations across subjects.

**Negative Contrast**

**BERGAULTS**

6" FHWA series C, 0 spacing, uppercase

**BERGAULTS**

6" FHWA series D, 0 spacing, uppercase

**BERGAULTS**

6" FHWA series E, 0 spacing, uppercase

**Bergaults**

6" FHWA series C, 0 spacing, mixed-case

**Bergaults**

6" FHWA series D, 0 spacing, mixed-case

**Bergaults**

6" FHWA series E, 0 spacing, mixed-case

**Bergaults**

6" Clearview 2-B, 0 spacing, mixed-case

**Bergaults**

6" Clearview 3-B, 0 spacing, mixed-case

**Bergaults**

6" Clearview 4-B, 0 spacing, mixed-case

**Bergaults**

6" Clearview 2-B, -35 spacing, mixed-case

**Bergaults**

6" Clearview 3-B, -40 spacing, mixed-case

**Bergaults**

6" Clearview 4-B, -50 spacing, mixed-case

**Bergaults**

6" Clearview 2-B, -80 spacing, mixed-case

**Bergaults**

6" Clearview 3-B, -80 spacing, mixed-case

**Bergaults**

6" Clearview 4-B, -80 spacing, mixed-case

**Bergaults**

4.8" Clearview 2-B, 0 spacing, mixed-case

**Bergaults**

4.8" Clearview 3-B, 0 spacing, mixed-case

**Bergaults**

4.8" Clearview 4-B, 0 spacing, mixed-case

**Positive Contrast**

**Bergaults**

6" FHWA series C, 0 spacing, mixed-case

**Bergaults**

6" FHWA series D, 0 spacing, mixed-case

**Bergaults**

6" FHWA series E, 0 spacing, mixed-case

**Bergaults**

6" Clearview 2-W, 0 spacing, mixed-case

**Bergaults**

6" Clearview 3-W, 0 spacing, mixed-case

**Bergaults**

6" Clearview 4-W, 0 spacing, mixed-case

**Bergaults**

4.8" Clearview 2-W, 0 spacing, mixed-case

**Bergaults**

4.8" Clearview 3-W, 0 spacing, mixed-case

**Bergaults**

4.8" Clearview 4-W, 0 spacing, mixed-case

**Figure 2. Stimuli Used in the Research Study**

## *Analyses and Results*

There were 61 participants in the daytime test sessions, including 23 younger (age 18 to 34), 19 middle age (age 35 to 64), and 19 older drivers (age 65 and older). The proportions of the male and female participants were 51 and 49 percent, respectively. For nighttime test sessions, 13 younger, 18 middle age, and 22 older drivers participated in the experiment (a total of 53 participants). The proportions of the male and female participants were again 51 and 49 percent, respectively (Table 1). The IBM SPSS Statistics 22 and Minitab 17 statistical software were used in this analysis.

**Table 1. Classification of Participants**

	Daytime		Nighttime	
	Male	Female	Male	Female
Younger Drivers (18-34)	17	6	7	6
Middle Age Drivers (35-64)	7	12	5	13
Older Drivers (65+)	7	12	15	7
<b>Total (114 participants)</b>	<b>31</b>	<b>30</b>	<b>27</b>	<b>26</b>

## **Descriptive Statistics**

The mean legibility distances of the 18 negative-contrast sign conditions are presented in Table 2 with other statistical information such as median and standard deviation. Table 3 shows the mean legibility distances of the six positive-contrast sign conditions. Table 4 and Table 5 provide comparisons of mean legibility distances between age groups for negative- and positive-contrast, respectively.

### *Negative Contrast*

#### **Inter-character Spacing**

Overall, the Clearview signs with the widest inter-character spacing (i.e., “standard” or “0” spacing in Figure 2 and the tables) outperformed the two condensed spacings in the daytime and at night.

#### **Typeface**

Overall, the standard spacing mixed-case Clearview signs were legible at equivalent distances to the comparable all-uppercase FHWA Standard Highway Alphabets, but had longer mean legibility distances than the mixed-case FHWA Standard Alphabets. The uppercase

FHWA Standard Alphabet series had longer legibility distances than the mixed-case FHWA Standard Alphabets.

*Positive Contrast*

**Typeface and Letter Height**

Overall, the 6.0-inch Clearview Typefaces outperformed the comparable 6.0-inch FHWA Standard Alphabets. The legibility distances of the 4.8-inch Clearview Typefaces were equivalent to the comparable 6.0-inch FHWA Standard Alphabets.

*Age Group and Time of Day*

Not surprisingly, overall, legibility distances were shorter at night than in the daytime and were shorter for older participants than younger participants.

**Table 2. Negative-Contrast Legibility**

Typeface	Capital Height (inch)	Spacing	Daytime			Nighttime		
			Mean (ft)	Median (ft)	Standard Deviation	Mean (ft)	Median (ft)	Standard Deviation
Clearview 2-B (mixed-case)	6	0	202.25	207.00	77.56	159.73	170.00	73.41
	6	-35	181.33	177.00	69.67	152.87	178.00	68.66
	6	-80	166.43	162.50	73.72	127.56	127.00	68.16
	4.8	0	186.64	175.00	71.77	133.28	146.00	62.39
Standard Highway series C (uppercase)	6	0	212.07	215.00	77.45	161.62	160.50	70.80
Standard Highway series C (mixed-case)	6	0	187.28	189.50	67.86	131.71	138.50	64.87
Clearview 3-B (mixed-case)	6	0	241.01	237.00	91.40	185.06	186.00	80.46
	6	-40	217.27	223.50	70.10	157.02	164.00	61.28
	6	-80	212.87	223.00	75.96	161.74	149.00	73.00
	4.8	0	192.24	197.00	80.83	133.53	148.00	68.63
Standard Highway series D (uppercase)	6	0	227.64	241.00	86.44	193.10	201.50	67.06
Standard Highway series D (mixed-case)	6	0	185.04	200.00	72.43	164.98	187.00	64.93
Clearview 4-B (mixed-case)	6	0	261.00	262.00	90.95	200.29	224.00	82.75
	6	-50	256.41	255.00	91.21	194.64	204.00	69.23
	6	-80	233.48	237.00	104.44	179.28	192.00	65.21
	4.8	0	213.14	219.00	213.14	143.43	151.00	80.79
Standard Highway series E (uppercase)	6	0	269.81	272.00	91.53	198.87	212.00	75.50
Standard Highway series E (mixed-case)	6	0	199.68	208.00	81.87	161.92	159.5	76.39



**Table 3. Positive-Contrast Legibility**

Typeface (All mixed-case)	Capital Height (inch)	Spacing	Daytime			Nighttime		
			Mean (ft)	Median (ft)	Standard Deviation	Mean (ft)	Median (ft)	Standard Deviation
Clearview 2-W	4.8	0	189.97	191.00	68.54	134.52	130.50	65.46
Clearview 2-W	6	0	211.56	209.00	84.55	173.35	185.50	71.85
Standard Highway series C	6	0	162.58	153.00	67.19	135.11	133.00	59.45
Clearview 3-W	4.8	0	190.66	193.00	66.77	143.85	162.00	62.92
Clearview 3-W	6	0	231.22	214.00	100.15	188.15	202.50	73.10
Standard Highway series D	6	0	178.51	172.00	66.81	154.29	154.00	63.57
Clearview 4-W	4.8	0	202.63	200.00	72.80	147.98	161.00	70.56
Clearview 4-W	6	0	227.69	232.00	99.51	187.68	192.00	66.86
Standard Highway series E	6	0	203.59	208.00	72.00	159.28	168.00	70.73

**Table 4. Negative-Contrast Mean Legibility Distance in Feet (Age Groups)**

Typeface	Capital Height (inch)	Spacing	Daytime			Nighttime		
			18-34	35-64	65+	18-34	35-64	65+
Clearview 2-B (mixed-case)	6	0	228.17	224.32	148.81	207.69	187.13	106.65
	6	-35	202.61	192.18	145.87	191.54	186.28	102.68
	6	-80	192.77	171.47	131.40	153.15	157.72	85.86
	4.8	0	212.83	182.68	159.89	170.54	162.28	87.55
Standard Highway series C (uppercase)	6	0	242.30	226.74	160.82	199.15	199.94	109.82
Standard Highway series C (mixed-case)	6	0	217.96	203.47	131.00	162.25	166.22	86.82
Clearview 3-B (mixed-case)	6	0	284.65	250.84	178.36	226.00	225.33	127.91
	6	-40	228.78	240.33	181.48	199.62	185.56	111.09
	6	-80	247.91	217.32	166.01	200.77	178.39	125.05
	4.8	0	217.35	190.63	163.47	167.23	153.56	97.23
Standard Highway series D (uppercase)	6	0	267.17	236.00	171.42	230.46	214.47	154.50
Standard Highway series D (mixed-case)	6	0	201.22	216.11	136.02	200.00	198.44	116.91
Clearview 4-B (mixed-case)	6	0	291.35	284.89	200.36	261.08	237.29	135.77
	6	-50	298.96	249.47	211.84	223.00	240.28	140.55
	6	-80	263.43	256.00	171.44	219.77	209.72	130.45
	4.8	0	237.04	231.05	163.47	189.77	160.83	101.82
Standard Highway series E (uppercase)	6	0	305.91	289.58	206.33	238.38	226.72	152.73
Standard Highway series E (mixed-case)	6	0	234.09	210.11	147.61	203.77	173.94	127.91

**Table 5. Positive-Contrast Mean Legibility Distances in Feet (Age Groups)**

Typeface (All mixed-case)	Capital Height (inch)	Spacing	Daytime			Nighttime		
			18-34	35-64	65+	18-34	35-64	65+
Clearview 2-W	4.8	0	220.27	203.89	146.10	185.00	147.88	94.36
Clearview 2-W	6	0	242.00	228.63	157.63	202.08	221.29	116.76
Standard Highway series C	6	0	186.74	176.11	114.79	172.46	151.78	99.41
Clearview 3-W	4.8	0	218.45	191.44	157.81	162.69	175.44	106.86
Clearview 3-W	6	0	287.91	229.68	163.57	242.62	214.17	132.14
Standard Highway series D	6	0	208.61	189.74	128.19	180.38	184.38	117.00
Clearview 4-W	4.8	0	230.17	204.11	167.81	174.85	174.76	111.41
Clearview 4-W	6	0	275.59	234.89	161.54	224.77	216.39	142.27
Standard Highway series E	6	0	225.74	230.89	149.47	203.00	182.28	114.64

## **Inferential Statistics**

Analysis of variance (ANOVA) statistical techniques were used to determine whether the differences in mean legibility distances for inter-letter spacing, typeface, and letter height reported in the descriptive statistics section above were statistically significant. A p-value of 0.05 was selected and any findings below that were considered statistically significant. This means that there is 95 percent confidence that the results are a function of the independent variables themselves and not a matter of chance variation. The discussion is divided into “overall,” where all age groups are combined, and “age group,” where the three age groups are analyzed separately.

### ***Overall***

#### **Negative-Contrast**

##### ***Spacing***

Each negative-contrast Clearview Typeface included one standard inter-character spacing sign and two reduced-spacing signs. Pairwise combinations were analyzed (Table 6). In the few

cases where spacing had a significant effect, the standard sign spacing had longer legibility distances than the reduced-spacing signs.

There was a statistically significant difference between Clearview 2-B standard spacing and -80 spacing ( $p = 0.011$  during daytime and  $p = 0.024$  at night). The Clearview 3-B standard spacing signs also provided significantly longer nighttime legibility distances (160 ft) than the -40 spacing signs (128 ft), with a  $p = 0.049$ . Other pairs did not show significant differences between groups. Based on these results and the findings in the descriptive statistics, the Clearview Typefaces using standard spacing were selected for all further analyses with the comparable Standard Highway fonts.

**Table 6. Negative-Contrast Clearview Comparison between Inter-letter Spacing Groups**

Typeface	Capital Height (inch)	Spacing	Daytime		Nighttime	
			F-value	p-value	F-value	p-value
Clearview 2-B	6	0	2.412	0.123	0.238	0.627
	6	-35				
Clearview 2-B	6	0	6.664	<b>0.011*</b>	5.217	<b>0.024*</b>
	6	-80				
Clearview 2-B	6	-35	1.267	0.263	3.592	0.061
	6	-80				
Clearview 3-B	6	0	2.566	0.112	3.974	<b>0.049*</b>
	6	-40				
Clearview 3-B	6	0	3.422	0.067	2.442	0.121
	6	-80				
Clearview 3-B	6	-40	0.109	0.741	0.127	0.722
	6	-80				
Clearview 4-B	6	0	0.077	0.782	0.144	0.705
	6	-50				
Clearview 4-B	6	0	2.391	0.125	2.091	0.151
	6	-80				
Clearview 4-B	6	-50	1.658	0.200	1.382	0.242
	6	-80				

\*Statistically Significant Effect  
 $p < 0.05$

*Typeface*

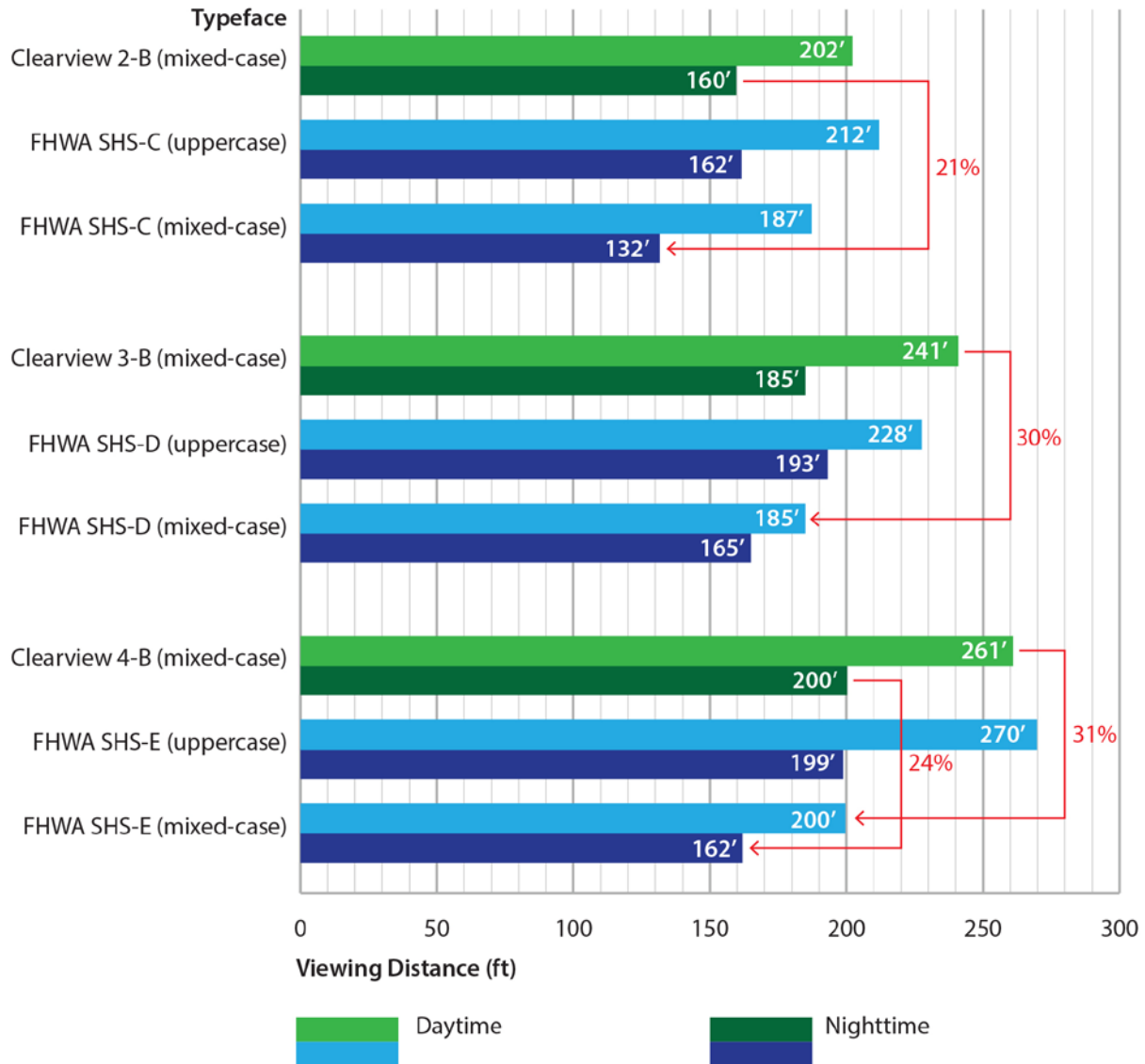
Clearview 2-B, 3-B, and 4-B were paired with the FHWA Standard Highway Series C, D, and E, respectively. Table 7 shows the ANOVA results (Figure 3 shows the results graphically, with red arrows indicating statistical significance and red text showing percent improvement).

There were no statistically significant differences between Clearview and the comparable all-uppercase Standard Highway Alphabets; however, overall the Clearview signs showed significantly longer legibility distances than those using the mixed-case Standard Highway Alphabets. Clearview 2-B performed significantly better during nighttime (160 ft) than the mixed-case FHWA Series C (132 ft), with  $p = 0.044$ . The difference between Clearview 3-B (241 ft) and FHWA series D (185 ft) during daytime was also significant,  $p = 0.000$ . Clearview 4-B was legible significantly further away than FHWA Series E during both daytime and nighttime, with  $p = 0.000$  and  $0.016$ , respectively. In this case, the mean legibility distance of Clearview 4-B was 261 ft during daytime and 200 ft during nighttime, compared to the mixed-case FHWA series E, which was legible at 200 ft during daytime and 162 ft during nighttime.

**Table 7. Comparison of Negative-Contrast 6-inch Clearview and FHWA Alphabets**

Typeface	Capital Height (inch)	Spacing	Daytime		Nighttime	
			F-value	p-value	F-value	p-value
Clearview 2-B (mixed-case) FHWA series C (uppercase)	6 6	0 0	0.490	0.485	0.017	0.896
Clearview 3-B (mixed-case) FHWA series D (uppercase)	6 6	0 0	0.690	0.408	0.309	0.580
Clearview 4-B (mixed-case) FHWA series E (uppercase)	6 6	0 0	0.284	0.595	0.008	0.927
Clearview 2-B (mixed-case) FHWA series C (mixed-case)	6 6	0 0	1.277	0.261	4.144	<b>0.044*</b>
Clearview 3-B (mixed-case) FHWA series D (mixed-case)	6 6	0 0	13.915	<b>0.000*</b>	1.998	0.160
Clearview 4-B (mixed-case) FHWA series E (mixed-case)	6 6	0 0	14.324	<b>0.000*</b>	6.035	<b>0.016*</b>

\*Statistically Significant Effect  
 $p < 0.05$



**Figure 3. Comparison of Negative-Contrast 6-inch Clearview and FHWA Alphabets (Means for All Participants)**

***Letter Height***

To compare the reduced letter height Clearview mixed-case typefaces to the Standard Highway Alphabets, the mean values of the 4.8-inch Clearview fonts were compared with both all-uppercased and mixed-case Standard Alphabets (Table 8). Not surprisingly, most of the all-uppercased 6.0-inch Standard Alphabets provided statistically significantly longer legibility distances than the 4.8-inch mixed-case Clearview fonts. One exception was the uppercase

FHWA series C (212 ft), which outperformed the mixed-case 4.8-inch Clearview 2-B (187 ft) in daytime.

On the other hand, the 4.8-inch mixed-case Clearview signs performed as well as the 6.0-inch mixed-case Standard Highway Alphabets, with the single exception of a significant improvement with mixed-case FHWA series D (165 ft) compared to the 4.8-inch Clearview 3-B (134 ft) during nighttime.

**Table 8. Comparison of Negative-Contrast 4.8-inch Clearview and FHWA Alphabets**

Typeface	Capital Height (inch)	Spacing	Daytime		Nighttime	
			F-value	p-value	F-value	p-value
Clearview 2-B (mixed-case) FHWA series C (uppercase)	4.8 6	0 0	3.542	0.062	4.737	<b>0.032*</b>
Clearview 3-B (mixed-case) FHWA series D (uppercase)	4.8 6	0 0	5.456	<b>0.021*</b>	20.225	<b>0.000*</b>
Clearview 4-B (mixed-case) FHWA series E (uppercase)	4.8 6	0 0	13.505	<b>0.000*</b>	13.315	<b>0.000*</b>
Clearview 2-B (mixed-case) FHWA series C (mixed-case)	4.8 6	0 0	0.140	0.709	0.016	0.900
Clearview 3-B (mixed-case) FHWA series D (mixed-case)	4.8 6	0 0	0.267	0.606	5.873	<b>0.017*</b>
Clearview 4-B (mixed-case) FHWA series E (mixed-case)	4.8 6	0 0	0.861	0.355	1.451	0.231

\*Statistically Significant Effect  
 $p < 0.05$

**Positive Contrast (all mixed case)**

The mean legibility distances of the positive-contrast (white-on-green) Clearview Typefaces were compared with the Standard Alphabets. Table 9 presents six comparisons for the 6-inch sign conditions (Figure 4 shows the results graphically, with red arrows indicating statistical significance and red text showing percent improvement).

Overall, the positive-contrast, 6-inch Clearview typefaces had significantly longer legibility distances than the comparable Standard Alphabets, with the single exception being the

comparison between the Clearview 4-W (228 ft) and the FHWA Series E (204 ft) during daytime, which did not reach statistical significance.

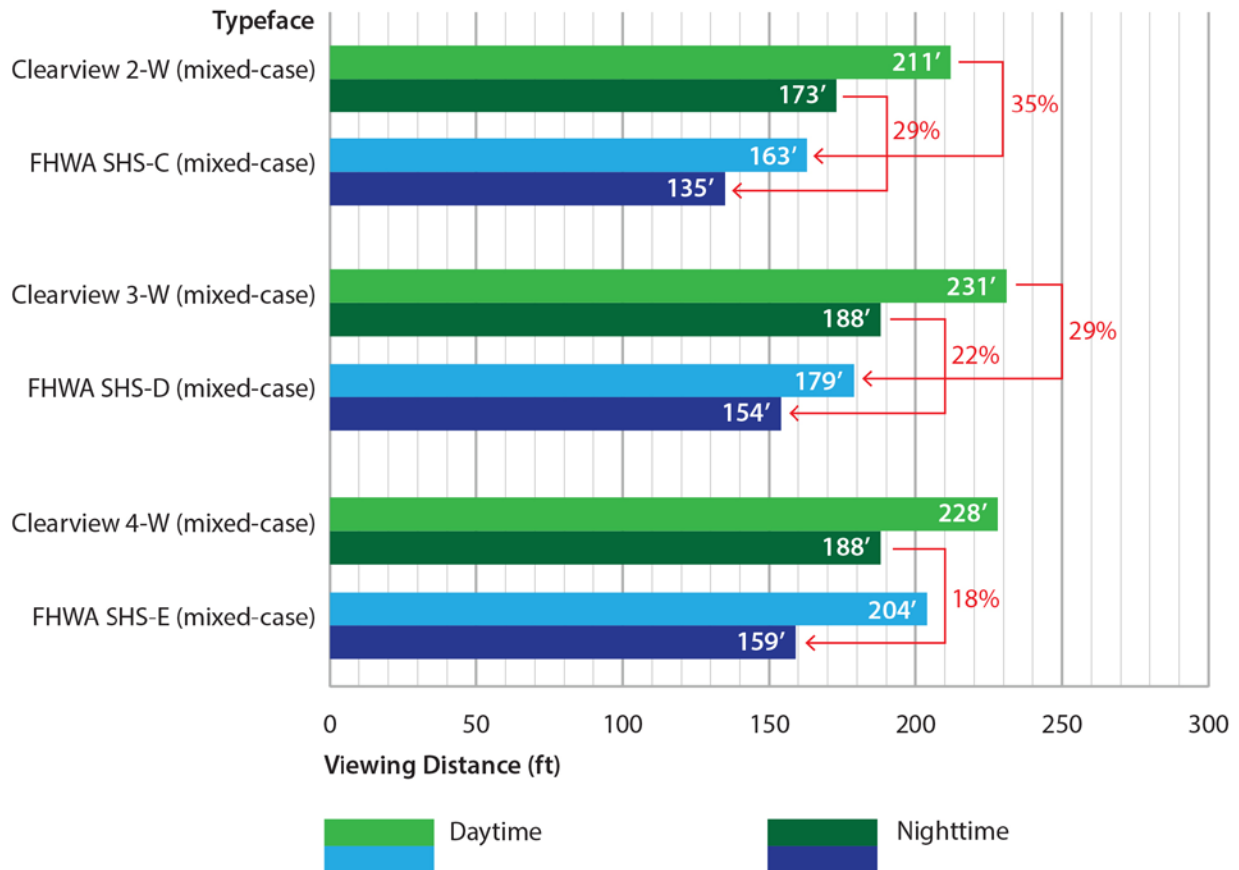
Table 9 also shows that most of the 4.8-inch Clearview Typefaces had equivalent legibility to the Standard Alphabets 6.0-inch fonts, with the notable exception being the 4.8-inch Clearview 2-W, which had significantly longer (16.8-percent improvement) mean legibility distance (190 ft) than the FHWA Series C (163 ft) during daytime ( $p = 0.021$ ).

**Table 9. Comparison of Positive-Contrast Clearview and FHWA Series Alphabets**

Typeface	Capital Height (inch)	Spacing	Daytime		Nighttime	
			F-value	p-value	F-value	p-value
Clearview 2-W FHWA series C	6 6	0 0	12.284	<b>0.001*</b>	8.773	<b>0.004*</b>
Clearview 3-W FHWA series D	6 6	0 0	11.440	<b>0.001*</b>	6.282	<b>0.014*</b>
Clearview 4-W FHWA series E	6 6	0 0	2.323	0.130	4.512	<b>0.036*</b>
Clearview 2-W FHWA series C	4.8 6	0 0	5.485	<b>0.021*</b>	0.002	0.961
Clearview 3-W FHWA series D	4.8 6	0 0	0.965	0.328	0.709	0.402
Clearview 4-W FHWA series E	4.8 6	0 0	0.005	0.941	0.672	0.414

\*Statistically Significant Effect  
 $p < 0.05$





**Figure 4. Comparison of Positive-Contrast 6-Inch Clearview and FHWA Alphabets (Mean for All Participants)**

**Age Group**

**Negative Contrast**

***Typeface Comparison***

Given that previous research has shown the Clearview Typeface to have some of its greatest effects on older drivers, these next few sections examine the age-group effect. Comparing the 6-inch Clearview fonts with the Standard Alphabets, as shown in Table 10, resulted in the finding that younger drivers had significantly longer legibility distances when using Clearview 2B during nighttime (208 ft), Clearview 3B during daytime (285 ft), and Clearview 4B during both daytime and nighttime (291 ft and 261 ft, respectively).

The middle-age drivers also had significantly longer legibility distances with Clearview 4B during daytime (285 ft) and nighttime (237 ft) than with Standard Highway Series E.

For older drivers, however, even though the descriptive statistics indicated that the 6-inch Clearview Typefaces resulted in longer legibility distances than the mixed-case FHWA Alphabets, only the comparison of the Clearview 4-B (200 ft) and the mixed FHWA Series E (148 ft) resulted in statistical significance ( $p = 0.029$ ).

**Table 10. Negative Contrast 6-inch Clearview and FHWA Series by Age Groups**

Age group	Typeface	Capital Height (inch)	Spacing	Daytime		Nighttime	
				F-value	p-value	F-value	p-value
Younger Drivers (18-34)	Clearview 2-B (mixed-case)	6	0	0.475	0.494	0.210	0.651
	FHWA series C (uppercase)	6	0				
	Clearview 3-B (mixed-case)	6	0	0.544	0.464	0.033	0.857
	FHWA series D (uppercase)	6	0				
	Clearview 4-B (mixed-case)	6	0	0.329	0.569	1.171	0.290
	FHWA series E (uppercase)	6	0				
	Clearview 2-B (mixed-case)	6	0	0.305	0.583	6.334	<b>0.019*</b>
	FHWA series C (mixed-case)	6	0				
	Clearview 3-B (mixed-case)	6	0	12.216	<b>0.001*</b>	2.203	0.151
	FHWA series D (mixed-case)	6	0				
Middle-Age Drivers (35-64)	Clearview 2-B (mixed-case)	6	0	0.014	0.905	0.385	0.539
	FHWA series C (uppercase)	6	0				
	Clearview 3-B (mixed-case)	6	0	0.439	0.512	0.267	0.609
	FHWA series D (uppercase)	6	0				
	Clearview 4-B (mixed-case)	6	0	0.038	0.846	0.225	0.638
	FHWA series E (uppercase)	6	0				
	Clearview 2-B (mixed-case)	6	0	1.663	0.205	1.392	0.247
	FHWA series C (mixed-case)	6	0				
	Clearview 3-B (mixed-case)	6	0	2.764	0.105	1.732	0.197
	FHWA series D (mixed-case)	6	0				
Older Drivers (65+)	Clearview 4-B (mixed-case)	6	0	10.298	<b>0.003*</b>	10.453	<b>0.003*</b>
	FHWA series E (mixed-case)	6	0				
	Clearview 2-B (mixed-case)	6	0	0.228	0.636	0.028	0.868
	FHWA series C (uppercase)	6	0				
	Clearview 3-B (mixed-case)	6	0	0.060	0.808	1.994	0.165
	FHWA series D (uppercase)	6	0				
	Clearview 4-B (mixed-case)	6	0	0.047	0.830	0.698	0.408
	FHWA series E (uppercase)	6	0				
	Clearview 2-B (mixed-case)	6	0	0.496	0.486	0.991	0.325
	FHWA series C (mixed-case)	6	0				
Clearview 3-B (mixed-case)	6	0	3.199	0.082	0.328	0.570	
FHWA series D (mixed-case)	6	0					
Clearview 4-B (mixed-case)	6	0	5.183	<b>0.029*</b>	0.111	0.741	
FHWA series E (mixed-case)	6	0					

\*Statistically Significant Effect  
 $p < 0.05$

### **Positive Contrast (All Uppercase)**

The age-group comparison of legibility distances between positive-contrast Clearview and the Standard Highway Alphabets are shown in Table 11. According to the descriptive statistics, the 6-inch Clearview fonts had longer mean legibility distances than the Standard Alphabets. Significant differences were found in younger and middle-age drivers' legibility distances; however, there were no statistically significant difference found in the ANOVA results for older drivers, despite the results of previous research and the large mean differences in this age group.

### **Percentiles**

There were a number of instances with the older subjects where large mean differences did not result in statistical significance. To probe this further, as a final analysis, each older subject's individual legibility distances for the relevant typeface pairs (e.g., Clearview 2-B versus FHWA series C) were compared to determine the percentage of older subjects who read the Clearview Typefaces further away versus the percentage who read the FHWA Standard Alphabets further away (Figure 5 (a-c) and Figure 6 (a-c)).

### **Negative Contrast**

The result shows that, for negative contrast, from about 60-90 percent of the subjects had longer legibility distances while reading the Clearview fonts. The largest difference occurred in the comparison of the Clearview 4-B versus FHWA E, where 89 percent of older drivers read the Clearview 4-B signs further away during daytime.

### **Positive Contrast**

For positive-contrast signs, over 70 percent of older subjects had longer legibility distances while reading the Clearview fonts compared to the FHWA Standard Alphabets. The percentages are especially high (approaching 90-percent) in the Clearview 2-B versus FHWA Series C comparison during both daytime and nighttime conditions.

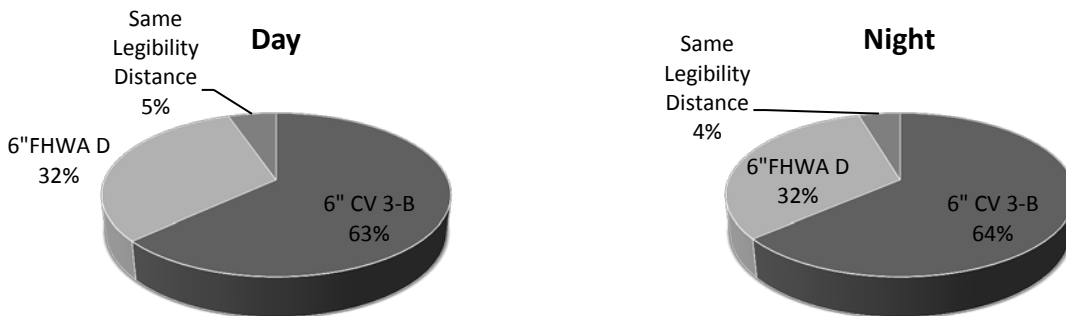
**Table 11. Comparison of Positive-Contrast Clearview and FHWA Series Alphabets in Different Age Groups**

Age Group	Typeface	Capital Height (inch)	Spacing	Daytime		Nighttime	
				F-value	p-value	F-value	p-value
Younger Drivers (18-34)	Clearview 2-W	6	0	6.039	<b>0.018*</b>	2.603	0.120
	FHWA series C	6	0				
	Clearview 3-W	6	0	9.290	<b>0.004*</b>	7.344	<b>0.012*</b>
	FHWA series D	6	0				
	Clearview 4-W	6	0	3.894	0.055	0.941	0.342
	FHWA series E	6	0				
	Clearview 2-W	4.8	0	2.600	0.114	0.499	0.487
	FHWA series C	6	0				
	Clearview 3-W	4.8	0	0.249	0.620	0.694	0.413
	FHWA series D	6	0				
	Clearview 4-W	4.8	0	0.047	0.829	2.253	0.146
	FHWA series E	6	0				
Middle-Age Drivers (35-64)	Clearview 2-W	6	0	15.967	<b>0.000*</b>	11.340	<b>0.002*</b>
	FHWA series C	6	0				
	Clearview 3-W	6	0	3.124	0.086	2.866	0.100
	FHWA series D	6	0				
	Clearview 4-W	6	0	0.003	0.955	3.073	0.089
	FHWA series E	6	0				
	Clearview 2-W	4.8	0	3.140	0.085	0.034	0.855
	FHWA series C	6	0				
	Clearview 3-W	4.8	0	0.009	0.925	0.240	0.628
	FHWA series D	6	0				
	Clearview 4-W	4.8	0	2.128	0.153	0.184	0.671
	FHWA series E	6	0				
Older Drivers (65+)	Clearview 2-W	6	0	4.099	0.051	1.352	0.252
	FHWA series C	6	0				
	Clearview 3-W	6	0	2.519	0.122	0.733	0.397
	FHWA series D	6	0				
	Clearview 4-W	6	0	0.273	0.605	2.488	0.122
	FHWA series E	6	0				
	Clearview 2-W	4.8	0	2.395	0.131	0.116	0.735
	FHWA series C	6	0				
	Clearview 3-W	4.8	0	2.257	0.142	0.337	0.565
	FHWA series D	6	0				
	Clearview 4-W	4.8	0	0.634	0.431	0.020	0.888
	FHWA series E	6	0				

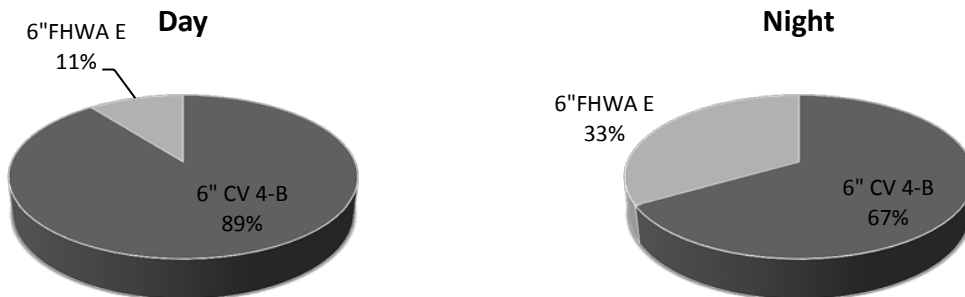
\*Statistically Significant Effect  
 $p < 0.05$



(a) Clearview 2-B vs. FHWA C

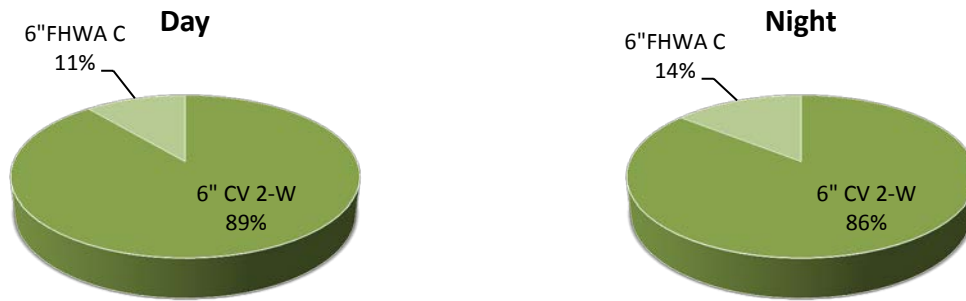


(b) Clearview 3-B vs. FHWA D

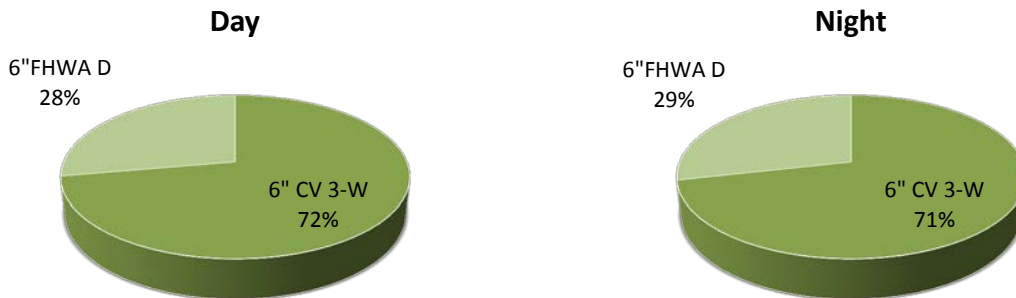


(c) Clearview 4-B vs. FHWA E

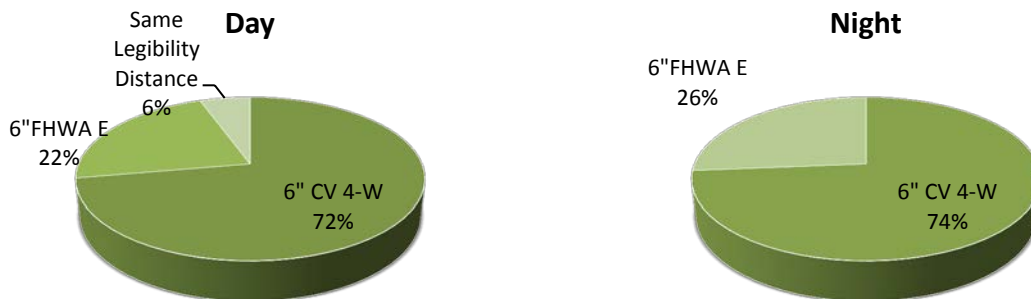
**Figure 5. Percent of Older Drivers Who Read the Sign Further Away: Negative-Contrast Conditions, Mixed Case, Standard Spacing.**



(a) Clearview 2-W vs. FHWA C



(b) Clearview 3-W vs. FHWA D



(c) Clearview 4-W vs FHWA E

**Figure 6. Percent of Older Drivers Who Read the Sign Further Away: Positive-Contrast Conditions.**

## **Summary of Results**

The main objective of this research was to compare the legibility distance of the negative-contrast Clearview Typeface System in the three weights most commonly used for regulatory and warning sign applications with comparable negative-contrast Standard Highway Alphabets. This was done in a test track environment with full-sized signs using black-on-white retroreflective materials under day and night conditions for older and younger subjects. To assess the possibility of using mixed-case words on regulatory and warning signs, mixed-case Clearview was compared to all-uppercase Standard Highway Alphabets Series C, D, and E.

Clearview inter-letter spacing was also evaluated to determine whether small changes in spacing would impact legibility distances, and a 20 percent reduction in letter height was evaluated to determine whether smaller Clearview words would perform as well as larger Standard Highway Alphabet words.

A small set of white-on-green signs were displayed as well, to determine whether Clearview in positive contrast would result in improvements in legibility distance, as it has in the past been shown to provide improvements over Standard Highway Alphabets in a recognition task.

### ***Daytime***

#### **Negative Contrast**

With all the subjects combined, Clearview mixed-case performed as well as Standard Highway all uppercase for all comparisons (i.e., Clearview 2-B, 3-B, 4-B, compared to Standard Highway Series C, D, E, respectively). This is true even though the overall footprint of the mixed-case Clearview Typefaces compared to the respective uppercase Standard Highway Alphabets C, D, E was consistently and considerably smaller.

Clearview mixed-case performed significantly better than Standard Highway mixed-case for Clearview 3-B versus Standard Highway D (30 percent improvement), and Clearview 4-B versus Standard Highway E (31 percent improvement).

Looking at only the older participants, Clearview mixed-case performed as well as Standard Highway all uppercase for all comparisons and Clearview 4-B performed statistically significantly better than Standard Highway Series E (a 35 percent improvement). It was also shown that Clearview 2-B was read further away than Standard Highway Series C by 56 percent

of the subjects, Clearview 3-B was read further away than Series D by 63 percent of the subjects, and 89 percent of the subjects read Clearview 4-B further away than Series E.

### **Positive Contrast**

In the positive-contrast comparisons with all the subjects combined, Clearview 2-W performed significantly better than Standard Highway Series C (a 30 percent improvement), and Clearview 3-W performed significantly better than Standard Highway Series D (a 29 percent improvement).

Looking at only the older participants, even though no statistically significant differences between Clearview and Standard Highway were found in the ANOVA analyses, Clearview 2-W was read further away than Standard Highway Series C by 89 percent of the subjects and 72 percent of the subjects read Clearview 3-W and Clearview 4-W further away than Standard Highway Series E and Series D.

### ***Nighttime***

#### **Negative Contrast**

In the negative-contrast comparisons with all the subjects combined, Clearview mixed-case performed as well as Standard Highway all uppercase for all comparisons (i.e., Clearview 2-B, 3-B, 4-B, versus Standard Highway C, D, E, respectively), Clearview mixed-case performed significantly better than Standard Highway mixed-case for Clearview 2-B versus Standard Highway Series C (21 percent improvement) and Clearview 4-B versus Standard Highway Series E (24 percent).

Looking at only the older participants, there were no significant differences between Clearview mixed-case and Standard Highway uppercase, or Clearview mixed-case versus Standard Highway mixed-case. However, Clearview 2-B was read further away than Standard Highway Series C by 60 percent of the subjects, and 64 and 67 percent of the subjects read Clearview 3-B and Clearview 4-B further away than Standard Highway Series E and Series D, respectively.



## **Positive Contrast**

In the positive-contrast comparisons with all the subjects combined, Clearview 2-W performed significantly better than Standard Highway Series C (28 percent improvement), Clearview 3-W performed significantly better than Standard Highway Series D (22 percent improvement), and Clearview 4-W performed significantly better than Standard Highway Series E (18 percent improvement).

Looking at only the older participants in this case as well as the other earlier evaluations above, the mean differences found were large (ranging from about 25 to 40 percent) but resulted in non-significant p-values in the 0.15 range during the ANOVA testing. These results are likely due to the large variances in legibility distances found with the oldest participants. That there were improvements with the Clearview font in this case were again borne out by the percentage evaluations, where Clearview 2-W was read further away than Standard Highway Series C by 86 percent of the subjects, Clearview 3-W was read further away than Series D by 71 percent of the subjects, and 74 percent of the subjects read Clearview 4-W further away than Series E.

## **Conclusions**

While this research study produced interesting findings about inter-character spacing, letter height, and positive contrast signs, the ultimate goal of this research was to evaluate negative-contrast Clearview. As such, it was the first in a three-part study to improve the readability of negative-contrast highway signs, in particular regulatory and warning signs. This first step was to identify the relative legibility of the Clearview negative-contrast typeface compared to Standard Highway Series Alphabets and to evaluate the effect of using mixed-case versus all-uppercase words (the current standard) on signs that require a legibility task. The research showed that overall the Clearview Typeface in mixed case is as legible as Standard Highway Alphabets in all uppercase, and takes up less sign space. Part 2 will address recognition, or the understanding of messages, using Clearview in mixed case verses Standard Highway in all uppercase on actual standard regulatory and warning signs, and Part 3 will address figure/field and format to learn how display variables may enhance standard highway sign readability (Figure 7).

Column 1 of Figure 7 illustrates five standard regulatory signs. Some use a combination of FHWA Standard Alphabets and others use reduced letter spacing to accommodate the

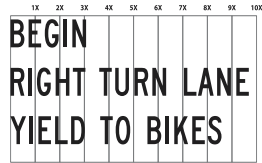
messages on a standard sign blank. Columns 2 and 3 compare overall footprint of the uppercase Standard Alphabets and a mixed-case Clearview, respectively. Column 4 illustrates the same legends as the signs in Column 1, but using mixed-case Clearview with no letter space reduction or font variability. The signs in Column 5 incorporate the “chunking” of legends with a combination of negative contrast with a positive-contrast legend. The concept uses graphic devices that may aid glance legibility and improve the readability of safety-critical applications.

Part 1 and Part 2

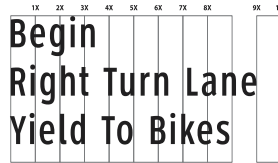
Part 3



Code: R4-4  
Sign Size: 36" x 30"



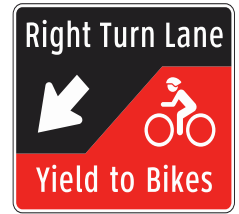
Typeface: Standard Alphabet Series C  
Size: 4"



Typeface: ClearviewHwy 2-8  
Size: 4"



Sign Size: 36" x 30"  
Type height reduced from 4" to 3.5"  
Spacing reduced by -35  
Negative contrast switched to Positive contrast



PHASE III Objective



Code: R5-1  
Sign Size: 24" x 30"



Typeface: Standard Alphabet Series B  
Size: 4"



Typeface: ClearviewHwy 1-B  
Size: 4"



Sign Size: 24" x 30"



PHASE III Objective



Code: R4-3  
Sign Size: 24" x 30"



Typeface: Standard Alphabet Series D  
Size: 4"



Typeface: ClearviewHwy 3-B  
Size: 4"



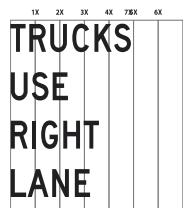
FHWA Sign Size: 24" x 30"



PHASE III Objective



Code: R4-5  
Sign Size: 24" x 30"



Typeface: Standard Alphabet Series D  
Size: 4"



Typeface: ClearviewHwy 3-B  
Size: 4"



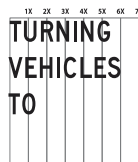
Sign Size: 24" x 30"



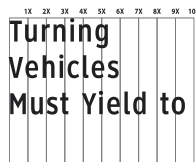
PHASE III Objective



Code: R10-15  
Sign Size: 30" x 30"



Typeface: Standard Alphabet Series D  
Size: 3"



Typeface: ClearviewHwy 3-B  
Size: 3"



Sign Size: 30" x 30"  
Spacing reduced by -40

Figure 7. Examples of Stimuli That May Be Tested in Phases 2 and 3.

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## Appendix A:

### Department of Transportation Questionnaire

This questionnaire is part of a study being conducted by the Larson Transportation Institute at The Pennsylvania State University for research purposes. The participants included in this research are all employees of U.S. state departments of transportation. For further information about this research, you may contact Philip Garvey at 814-574-0803 or [pmg4@psu.edu](mailto:pmg4@psu.edu)

#### Questions:

1. Does your agency use the Clearview typeface on its highway signs? (Yes) (No)

If yes:

- a. When did you start using Clearview?
- b. Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).
- c. How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, &c)?
- d. Please describe any positive or negative experiences you have had with the Clearview typeface.
- e. Please describe any positive or negative feedback you have received about the Clearview typeface from the public.

If no:

- f. Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?

2. If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?  
(Yes) (No) (Don't Know)

If yes explain why:

If no explain why not:

**Appendix B:**

**Department of Transportation Questionnaire Detailed Responses**



State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Alabama	Yes	2009	Don't know, really	Interstate, directional, state routes	Positive and negative	Positive: legibility a bonus. Negative: too squigly
Arizona	Yes	2005-6	Yes, for some positive-contrast guide signs in accordance with IA-5.	Entire state	<p><b>Negative:</b></p> <ul style="list-style-type: none"> <li>• Fractions built into Clearview are unusable - ADOT is using Federal Series for fractions and whole numerals associated with fractions.</li> <li>• "Learning curve" regarding placement of non-uniform letter heights in Clearview.</li> <li>• Local agencies using Clearview for negative-contrast signs in violation of IA.5.</li> <li>• Prohibition on spacing adjustments - there are times when it would seem a wider letter with slightly reduced spacing would be preferable to a narrower letter.</li> <li>• Legal disagreements between Terminal Design and sign software vendors.</li> <li>• The proprietary nature of some electronic font implementations of Clearview (even though the letterforms and spacings are in the public domain).</li> </ul>	<ul style="list-style-type: none"> <li>• Some anecdotal positive reports during early deployment.</li> <li>• Anecdotal reports of improved legibility.</li> </ul>

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Arkansas	Yes		Blanket approval	All guide signs	None	Isolated positive comments  No negative comments known to me
British Columbia, Canada	Yes		Jurisdiction-wide approval for guide signs	Guide signs	Works well in positive contrast situations - white lettering on a green background. Not as good in negative contrast situations - black lettering on a orange or white background. This is mostly due to the high reflectivity we use - ASTM type 9. Another negative experience would be the number series for Clearview which is difficult to read as well as the shapes which are odd at best.	None.
Connecticut	Yes	2009	No approval - only used it on 4 or 5 signs	Just on an interstate ramp	No feedback	

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Delaware	Yes	2005	Blanket	Specific use has been the overhead guide signs on freeways. That work is basically complete. Implementation also included street name signs and conventional road guide signs.	Nothing comes to mind.	No comments from the public. Mr. Lutz did present this change to the media and that was the only public presentation other than the signs themselves.
Florida	No					
Georgia	No	N/A				

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Idaho	No	N/A				
Illinois	Yes		Blanket	Legend in uppercase/lowercase letters on expressway and freeway guide signs.	Neutral	Virtually none
Indiana	No	N/A				

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Iowa	Yes		It is statewide.	All guide signs. The cities are responsible for street name signs, so it is up to them on whether they use Clearview.	Negative experience would be the slightly larger sign sizes are necessary for Clearview font. And, working out the details for the use of fractions on the signs.	We have not received any comments, positive or negative, from the public.

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Kentucky	Yes		Blanket approval.	<p>Originally, the Cabinet approved the use of Clearview on all design projects with panel signs that were positive contrast guide signs. This primarily resulted in its use on the primary guide sign sequence at interchanges and any supplemental guide signs as well. At the time, the font was used for the "entire" sign legend.</p> <p>In recent months, we have become aware that the font was only approved by FHWA for the "destination" message on such signs. As a result, we have tried to modify our designs so that the destination is the only part of the sign using Clearview.</p>	None. There was some original concern with the size of signs when we were thinking about using the font on non-freeway signing such as smaller guide signs. However, we are no longer considering this option due to the FHWA limitations on use of Clearview.	None.
Maine	No	N/A				

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Maryland	Yes		Blanket jurisdiction-wide for positive	All guide signs	We had a slight problem getting the font for our CASM software. There is also a learning curve required for the spacing of Clearview.	None.
Massachusetts	No	N/A				
Michigan	Yes		Blanket approval statewide	All guide signs on state trunkline	Minimal experience in the beginning getting the module for our sign signing program but that has been it.	Overall the comments have been minimal but supported as MDOT's effort to aid elderly drivers. Effort was showcased at the National Elderly Mobility Conference.
Mississippi	No	N/A				

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Missouri	No	N/A				



State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Nevada	Yes		Site specific.  Reno, NV: I-580 northbound from Moana Lane to I-80, overhead only. US-95 from Rainbow Avenue to Ann Road, overhead only.	Overhead guidesigns	n/a	n/a
New Hampshire	No	N/A				
New York	Yes	2007 or 2008	Statewide approval	Conventional road guide signs	Positive feedback.	Used initially on a limited access road and there was resistance to change the signs; once changed, the individuals who were resistant were pleasantly surprised and pleased.
North Carolina	No	N/A				

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Ohio	Yes	2006	Yes, Clearview is the standard for all weights from 1W to 5W and includes the use of all uppercase letters in applications that use mixed case and uppercase.	All positive contrast applications that include: freeway guide (overhead and side mount), all conventional road guide signs and miscellaneous signs.	All positive.	Early in the implementation at a location around Columbus, a complex sign was installed at the same size as the sign being replaced. " The city traffic engineer called me and asked why the new sign was so much larger?" The response was: "this was not larger, but looked larger because it was more readable."
Oregon	Yes	2009	Site specific	Guide signs	Have had no feedback.	
Pennsylvania	Yes	2004	Jurisdiction-wide	Clearview is used for all mixed case legend. All upper case legend is still fabricated from hi-way gothic.		Some sign fabricators have complained that the software from Termial Design is too expensive. Reaction from the public has lagely been positive.
South Dakota	No				We have never tried Clearview.	

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Texas	Yes	2003		It is a statewide standard that includes freeways and all conventional roads, and overhead street name signs at signalized intersections.	Originally we had some difficulty with the overall width of some words using optimal spacing. We worked with the designers and they developed Clearview 5-W-R that equals the width of E-modified in most all cases without significant loss of legibility. This has gone forward statewide. Our signs are more legible and more consistent statewide.	It has been 12 years since we started. With the first introduction there were public reviews. All were positive: both in individual comments from citizens and a great deal of television news coverage. It has been a success.
Vermont	Yes	2010	Yes	Used primarily on overhead and side mouted guide signs on freeways and some smaller signs associated with the freeway.	No experiance of note.	No comment other than they replaced some very old signs that were button copy and a washed out background.

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Virginia	Yes	2005	Blanket approval. Used statewide for the applications noted.	Primary destination legend on expressway overhead signs and ground mouted signs, post mounted street name signs and overhead streetname signs at signalized intersection.	None.	None. Our experience is that if the signs are working we do not get approving comments. When comparisons are shown in public presentations, the examples using Clearview are notable and clearly preferred by the audiences at the meetings.
Washington State	No	N/A				
Wisconsin	Yes	2008	Yes	Limited to Madison Beltway. About 50 overhead signs.	N/A	We had favorable comments from the public.

State or Territory	Does your agency use the Clearview typeface on its highway signs?	When did you start using Clearview?	Do you have blanket jurisdiction-wide approval for the use of Clearview or is it site specific. If site specific, please provide the site(s).	How are you using Clearview (e.g., conventional road guide signs, streetname sign, all guide signs, etc.)?	Please describe any positive or negative experiences you have had with the Clearview typeface.	Please describe any positive or negative feedback you have received about the Clearview typeface from the public.
Wyoming	Yes		We use Clearview on all Mainline Inte	See above.	None.	Not aware of any feedback.

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Alabama		Don't know			Alabama, phone contact
Arizona	ADOT still uses Federal Series alphabets for all negative-contrast signs and for many standard positive-contrast marker and guide signs. There are no plans to shift these to Clearview for the foreseeable future.	Not unless there were significant, compelling, and independently verified advantages to Clearview over Federal Series sufficient to justify such a changeover, and there was a commitment from FHWA (concurring by NCUTCD) to convert standard highway sign designs to such a typeface at a national level.			Richard C. Moeur, PE Traffic Standards Engineer Arizona Department of Transportation 1615 W. Jackson St., MD 061R Phoenix, AZ 85007 602.712.6661 (office) 602-909-8451 (mobile) rmoeur@azdot.gov

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Arkansas		Don't know			John Mathis john.mathis@ahtd.ar.gov Arkansas State Highway and Transportation Department
British Columbia, Canada		No		There are issues w/negative contrast as explained earlier, basically when you use ASTM type 9 reflectivity or higher, the reflect actually washes the messaging out.	Ross McLean Ross.McLean@gov.bc.ca Provincial Sign Program Ministry of Transportation 127-447 Columbia Street Kamloops British Columbia V2C2 2T3
Connecticut	Too expensive to make the signs because they have to be replaced with bigger signs.	No			Connecticut

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Delaware	This work was based on the advocacy at the time (2004-2005) by the FHWA. If we can make our roads safer, and this is a help, then we will do so. Since that time, the message from the FHWA has been more ambiguous but the work we are doing with Clearview in positive guidance is continuing with attrition.	If it is an option and is validated it will be considered. If it is in the MUTCD it will be followed.	If instructed to do so we would.		Bob Hutson, Sign Shop, and Mark Lutz, Traffic Section Engineer, Delaware DOT
Florida	Cost involved to implement.	Don't know	We would need to review the research and determine whether there would be a cost benefit to implement the change based on the findings.		
Georgia	Current policy is "E" mod.	Don't know			Ken Werho kwerho@dot.ga.gov Georgia Department of Transportation



State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Idaho	When used the sign size has to be increased, sometimes resulting in the sign structure needing to be replaced.	No		Screens and equipment for producing signs are set up for our current font style, unless it can be shown changing font would increase safety we would not invest in making a change at this time.	Ethan Griffiths ethan.griffiths@itd.idaho.gov Idaho Transportation Department
Illinois		Don't know			Lawrence Gregg, PE Acting Engineer of Traffic Operations Illinois Department of Transportation Lawrence.Gregg@illinois.gov
Indiana	1. Approved only on an interim basis  2. Start up cost	Don't know			David Boruff dboruff@indot.in.gov State of Indiana- Department of Transportation

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Iowa		Don't know			Tim Crouch tim.crouch@dot.iowa.gov Iowa Department of Transportation Office of Traffic and Safety Ames, Iowa 50010

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Kentucky		Don't know			Jeff Wolfe jeff.wolfe@ky.gov Kentucky Transportation Cabinet
Maine	Have not seen a need to invest in the software, as yet.	Don't Know			Bruce Ibarguen State Traffic Engineer Maine DOT bruce.ibarguen@maine.gov Augusta, ME. 04333

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Maryland		Yes	For the same reasons we use it on positive contrast signs...readability.		Paul Stout Pstout@sha.state.md.us Maryland State Highway Administration Office of Traffic and Safety 7491 Connelley Drive Hanover, Maryland 21076
Massachusetts					Massachusetts
Michigan		Yes	The font for these signs has not been established by research to be the most appropriate.		Mark Bott bottm@michigan.gov Michigan Department of Transportation
Mississippi	Primarily, because we understand there's a fee associated with using Clearview which we are not willing to pay. Also, I understand Clearview provides a marginal benefit on Interstate/expressway guide sign legibility; however, based on my personal observation, I would question the legibility performance on lower speed roadways that use smaller letters.	Don't know			James Sullivan, jssullivan@mdot.ms.gov, Mississippi DOT

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Missouri	<p>MoDOT originally viewed Clearview as the next opportunity to improve visibility of its guide signs, but was not prepared to pursue this as long as the font only had interim approval. We believed it would be adopted into the next version of the MUTCD and were planning on looking into adopting the legend at that time. Our other concern was the proprietary nature of the font as compared to the standard highway fonts. We were surprised when this legend, which was supposed to have such a higher level of legibility, didn't make it into the new MUTCD. As a member of the Guide and Motorist Information subcommittee of the National Committee on Uniform Traffic Control Devices I began learning why the font wasn't adopted. Information brought to light from FHWA and the Turner Fairbank research facility and the human factors testing didn't appear to support the</p>	No		<p>Given the current research we are not convinced such a change would be warranted or result in significant benefit. While signs with Clearview would look different, we now question its true effectiveness. In addition, we originally had considered it for guide sign application, but not for warning and regulator uses.</p>	<p>Tom Honich thomas.honich@modot.mo.gov Missouri Department of Transportation</p>

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Nevada		Don't know			David Partee dpartee@dot.state.nv.us Nevada Department of Transportation
New Hampshire	Don't know				New Hampshire
New York		Don't know	They would have to, as with the positive contrast, do their research and see if it is as effective or moreso.		Kevin Rossman
North Carolina	It is our understanding that the jury is still out on Clearview. We do not feel the need to spend the money to change without a compelling reason to change. We are waiting for more information.				Ron King, PE, Signing and Deliniation Unit, North Carolina DOT

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Ohio		Yes	We are impressed with the impact of the positive contrast, our signs are more readable and if the impact is the same for negative contrast, that is better for the motorist.		Jim Roth, PE, State Sign Engineer, Ohio Department of Transportation, jim.roth@odot.state.oh.us
Oregon		no, too difficult to have some signs federal hw and clearview			Lewis Wardrip, Oregon DOT
Pennsylvania		Yes	We believe the Clearview font provides improved legibility and would consider its use for non standard negative contrast signs.		Mark Alexander, PennDOT
South Dakota	We stick to what is in the MUTCD. Our guide signs use E-modified and Series D.				Christina Bennett, Operations, South Dakota Department of Transportation, 605-773-4759

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Texas		We are very interested in the improvement that may impact on regulatory sign clutter and improved performance of signs. Earlier studies into negative contrast Clearview initiated by our department were not encouraging. This is much different from guide signing and if current studies show improvement we would be very interested in learning more.	We have an obligation to motorists to make the roads as safe as we can. Any improvement we can make is important.		Michael Chacon, PE, Policy and Standards Engineer, Traffic Operations Division, Texas DOT, Michael Chacon Michael.Chacon@txdot.gov
Vermont	At the time, this was advocated by the FHWA. If we can improve the safety of the road and this will help, we want to do so.	We would review the recommendations. We are on board if this will be an improvement.			Bruce Nyquist, PE VTrans Traffic & Safety Engineer One National Life Drive Montpelier, VT 05633 (802) 828-2696 Fax:(802) 828-2437 e-mail:bruce.nyquist@state.vt.us



State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Virginia	N/A	We would look at the research with great interest.	We certainly want to entertain any option to something that has better target value and is easier to read. We are keenly interested in this research. We want to know how the older driver reacts to signs and what their needs are.		Harry A. Campbell, PE, Traffic Control Devices Engineering Manager Virginia DOT L31+L29
Washington State	Concerns with Clearview being a proprietary font and not included in the 2009 MUTCD.	Don't know			Rick Mowlds mowldsr@wsdot.wa.gov Washington State Department of Transportation
Wisconsin	We have been waiting for more research.	Yes	If the research was positive, we would take a serious look. We are always interested in anything that helps safety.		Matt Rauch, Signing and Marking Engineer, Traffic Operations, WisconsinDOT

State or Territory	Please list the reasons why your agency has chosen not to switch from Standard Highway to Clearview?	If Clearview were approved for negative contrast applications (that is, regulatory, warning, and construction signs), would your agency be inclined to use it on these signs?	Explain why.	Explain why not.	Contact Information
Wyoming		Don't know			Doug Hatch doug.hatch@wyo.gov WYDOT (Wyoming Dept. of Transportation) - Signing Design