USSC **FOUNDATION**

STANDARD LUMINANCE LEVELS OF ON-PREMISE SIGNS

USSCF ON-PREMISE SIGNS / RESEARCH CONCLUSIONS

Standard Luminance Levels of On-Premise Signs

A Research Project Of The
UNITED STATES SIGN COUNCIL FOUNDATION

By
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Visual Communication Research Institute LLC
State College, Pennsylvania

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within the built environment

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Orwigsburg, PA

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Standard Luminance Levels of On-Premise Signs

Philip M. Garvey and M. Jennifer Klena

Background

Research has established the appropriate luminance levels necessary to optimize the visibility and minimize the overlighting of internally illuminated on-premise signs (Garvey, 2005 and Garvey, et al., 2008). As a result of this research, sign codes and ordinances are increasingly requiring sign owners and sign manufacturers to maintain these optimal levels and to provide luminance information on sign permit applications prior to sign installation, sometimes before the signs are actually manufactured, and/or to collect this information after the signs are installed in the field. To comply with these requirements, sign owners and sign manufacturers are being required to take physical measurements of their signs' luminance. To measure sign luminance however, requires a luminance meter (a.k.a. "nit gun"), which ranges in price from about $2,000 to $4,000. These meters must be calibrated regularly, at a cost of approximately $500, and their appropriate use requires training. In addition, it is impossible to measure a sign that has not been manufactured yet. These factors make it impractical for sign owners and sign manufacturers to measure the luminance of their signs, whether in the place they are manufactured or after they have been installed. An alternative method is proposed here to remedy this situation.

Objective

The objective of this research was to determine typical luminance values for variously colored cabinet and channel letter signs that are internally illuminated by either LEDs or fluorescent tubes. The sign cabinets and channel letters were designed and manufactured to insure optimum lighting levels. As sign manufacturing techniques, designs, and standards do not vary greatly among sign manufacturers, the luminance measurements obtained in this study can be applied as a standard in the future to all signs produced by all manufacturers. As long as the manufacturer does not deviate from the manufacturing profiles reported in the study, sign manufacturers and storefront owners can use these luminance levels via look-up tables to quickly and easily estimate the luminance levels of their own signs.

Method

The luminance levels of 243 unique sign configurations were determined in the course of this research. In regard to the sign cabinets tested, twenty-five sign faces of various colors were created in negative contrast (colored letters on a white background) and twenty-five sign faces were created in those same colors in positive contrast (white letters on a colored background). Four sign cabinets total were constructed and the fifty sign faces were slid into the cabinets, one at a time, for photometric measurement. Two of the cabinets were single-faced and two were double-faced. One single-faced and one double-faced cabinet was illuminated using LEDs, and one each was illuminated using fluorescent lamps. In regard to the individual letters tested, forty-three, two-letter LED-illuminated channel letter face combinations were created in various colors. Approximately half of these channel letters had a white border. (Detailed description and diagrams of the test signs and the lighting designs can be found in Appendices A-D.)

Sign cabinets were fabricated using extruded aluminum materials as provided by SignComp, Grand Rapids MI. Single-faced cabinets were 8.25 inches deep and double-sided cabinets at 15 inches deep. Plastic for sign cabinets and channel letter faces was provided by Covestro, Sheffield MA: translucent white #7328 polycarbonate plastic for the sign cabinet faces and translucent white #2447 polycarbonate plastic for the channel letter faces. Fluorescent lamps for sign cabinets were standard T12 daylight 48-inch high output lamps. LED lighting for both sign cabinets and channel letters as manufactured by G2G, Passaic NJ. Translucent vinyl film for the graphics on the signs and letters was provided by 3M, St. Paul MN, in the 3630 series film colors noted in Appendices A-D.

The luminance and illuminance of all sign types were measured at Bartush Signs in Orwigsburg PA, using a Minolta LS-110 luminance meter and a Minolta T-1 illuminance meter. These will hereafter be referred to as the “lab measurements.” In addition, luminance levels were taken of a sample of existing signs mounted on the premises of businesses in State College and the Harrisburg, PA areas. These will hereafter be referred to as the “field measurements.”

Lab Measurements and Calculations

The luminance measurement technique used in this study was similar to that used successfully for an earlier USSCF project that evaluated the potential contribution of on-premise signs to light pollution (Garvey, 2004 and 2005). In the present study, several spot luminance measurements were taken of each color on all signs and the average luminance of these individual measurements was recorded (e.g., Figures 1 and 2).

To calculate mean luminance for the cabinet signs, it was assumed that the letters on the signs represented 40 percent of the sign face, while the background represented 60 percent. These percentages, in combination with the spot luminance readings and the height and width measurements (approximately 4 ft x 4 ft) provided the information necessary to calculate mean sign luminances.

For the channel letter signs that did not have a white border, several spot luminance readings were taken of the two letters for each color and averaged to determine mean channel letter sign luminance. For the white border channel letters it was not possible to use this method, so it was necessary to calculate mean sign luminance based on the illuminance calculation technique described in the next paragraph.

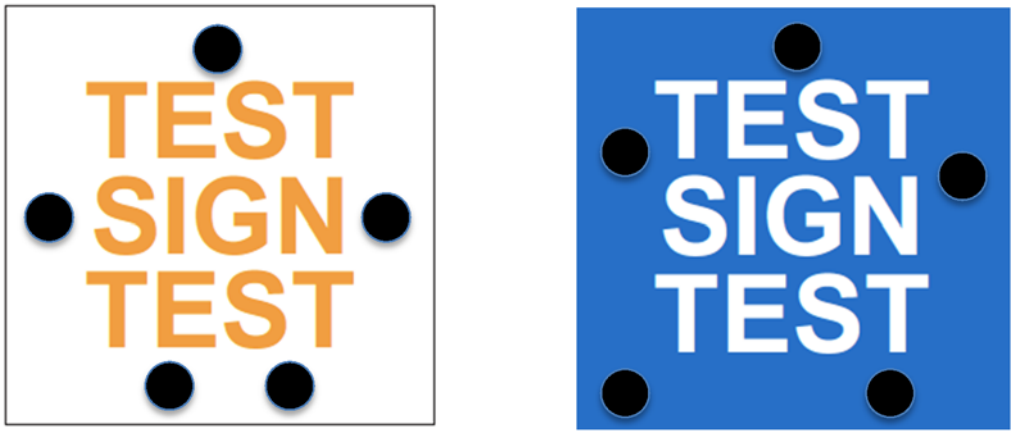

Figure 1. Spot luminance readings of cabinet signs; the black circles illustrate areas where measurements were taken.

Figure 2. Spot luminance readings of channel letter signs; the black circles illustrate areas where measurements were taken.

The lab measurement of sign illuminance was conducted by turning off all lights other than those illuminating the sign and placing the illuminance meter on a tripod 25 feet in front of the cabinet signs and 19 feet in front of the channel letter signs with the photocell at a height of two feet (representing the center of the cabinet and channel letter heights). The illuminance measurements were then converted to average sign luminance and channel letter luminance by taking into account sign area and measurement distance.

Results

Due to the discrete placement of the lighting units within the sign structures, there were large differences among spot luminance measurements across each of the 243 sign faces. This resulted in hot and cold spots that, while not noticeable to the human eye, were measurably detectable with the photometric meters. Because of this, it was decided that the illuminance calculation technique was more stable and reliable method of estimating the typical mean sign luminance levels. The mean luminance values in cd/m^2 established using this technique are displayed in Tables 1 and 2 (see Appendix E) for cabinet signs and channel letter signs, respectively (to obtain Appendix E, please contact the United States Sign Council, Bristol PA).

To summarize the lab measurement results, the following general observations

can be made: single-sided cabinets were brighter than double-sided cabinets; cabinets illuminated by LEDs were brighter than those illuminated by fluorescent lamps; channel letters with a perimeter white outline were brighter than letters with no outline; signs with darker colors (black, duranodic bronze, dark brown, royal blue) were less bright than signs using lighter colors.

Field Measurements and Results

The purpose of the field measurements was to determine whether the signs designed and constructed for the lab portion of this research were similar in luminance to real storefront signs found in the field. A representative sample of existing cabinet and channel letter signs of various colors were targeted for photometric measurement in State College, Lemoyne, and Harrisburg, PA.

Luminance meters can be pointed at a source of light, such as a sign, and will measure that light source alone through the acceptance angle, aperture, or “spot” in the meter, effectively ignoring other nearby light sources, while illuminance meters take in light from all sources without discrimination. Because there are numerous uncontrollable light sources in the built environment in addition to the signs that were selected for measurement, illuminance was not an appropriate measurement and therefore the spot luminance measurement technique discussed above for the lab portion was employed in the field as well.

Ten cabinet signs and seventeen channel letter signs were measured. Thirteen colors were included in the survey. The range in luminance of each of the sign colors within sign type (i.e., cabinet and channel letter) along with the average (in parentheses), are shown in Table 3 (see Appendix E) and compared to the lab spot luminances, averaged across lighting type and number of faces for the cabinet letters (to obtain Appendix E, please contact the United States Sign Council, Bristol PA).

In all but one case (red channel letters), the lab signs were brighter on average than the field signs. This is likely do to the latter being older signs that have been out in the field where they have suffered from ultraviolet bleaching and dirt depreciation. Furthermore, while the lab sign colors were known, the field signs were not labeled and therefore may not be an exact match.

Conclusions

The objective of this study was not to determine optimum sign lighting for motorists at night from the perspective of sign visibility and legibility, as has been previously studied. Rather, the objective was to quantify the brightness of on-premise signs, constructed to industry standards, using a variety of color combinations and lighting methods. The result of the testing has provided standardized lighting values for the vast majority of on-premise signs being constructed and installed today. Sign owners and sign companies can use this information when local municipalities request sign lighting levels as part of a sign permit application, thereby eliminating the necessity of testing a sign before actual construction or testing a sign in the shop or in the field after installation. Information on standardized sign lighting values can be obtained by contacting the United States Sign Council, Bristol PA.

References

Garvey, P.M. (2004). Environmental impact of on-premise sign lighting, with respect to potential light trespass, sky glow, and glare. Final Report to the United States Sign Council Foundation. 26 pages.

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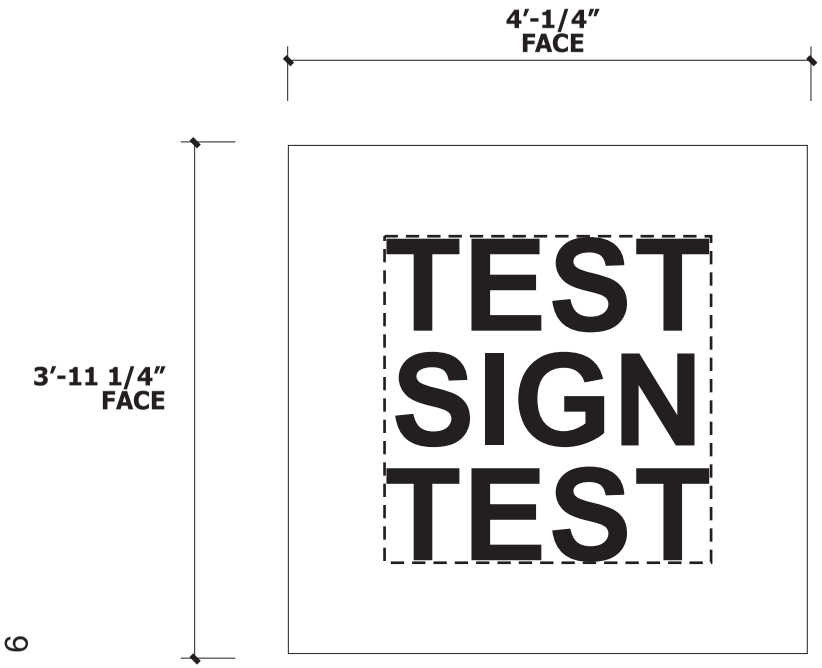
APPENDIX A - SIGN CABINET FACES



SIGN ELEVATION
1"=1'-0"

PRODUCTION REQUIREMENTS:
QUANTITY OF (1) OF EACH FACE
(DF SIGN CABINET WILL HAVE BLANK FACE ON 2ND SIDE WHEN TESTED)

SIGN DETAILS:

FABRICATE ALL SIGN FACES TO DIMENSIONS SHOWN; TO FIT SIGN CABINETS FABRICATED USING ALUMINUM EXTRUSION AS MANUFACTURED BY SIGNCOMP, GRAND RAPIDS MI; 1.5" RETAINERS;

CABINET OVERALL DIMENSIONS @ 4'-0" HIGH BY 4'-1" WIDE;

FACES CUT 3/4" LESS EACH WAY TO FIT;

MATERIAL: 3/16" WHITE POLYCARBONATE

ALL GRAPHICS TO BE

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

Revised:

DWG# 1 OF 8

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USSCF SIGN FACE INVENTORY: BLUE

4'-1/4"
FACE

3'-11 1/4"
FACE

PMS 274C
3M 3630-87
ROYAL BLUE

PMS 294C
3M 3630-97
BRISTOL BLUE

PMS 300C
3M 3630-127
INTENSE BLUE

PMS 274C
3M 3630-87
ROYAL BLUE

PMS 294C
3M 3630-97
BRISTOL BLUE

PMS 300C
3M 3630-127
INTENSE BLUE

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

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USSCF SIGN FACE INVENTORY: RED

4'-1/4"
FACE

3'-11 1/4"
FACE

TEST
SIGN
TEST

PMS 207C
3M 3630-53
CARDINAL RED

TEST
SIGN
TEST

PMS 485C
3M 3630-33
RED

TEST
SIGN
TEST

PMS 1788C
3M 3630-43
LIGHT TOMATO RED

TEST
SIGN
TEST

PMS 207C
3M 3630-53
CARDINAL RED

TEST
SIGN
TEST

PMS 485C
3M 3630-33
RED

TEST
SIGN
TEST

PMS 1788C
3M 3630-43
LIGHT TOMATO RED

SIGN ELEVATION
1/2"=1'-0"

11

Client:
USSC FOUNDATION

Location:
BRISTOL PA

Date:
06-09-16

Dwg. By:
RBC

Dwg No:
USSCF0609163325

Revised:

DWG# 3 OF 8

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USSCF SIGN FACE INVENTORY: GREEN

TEST
SIGN
TEST

PMS 3435C
3M 3630-126
EMERALD GREEN

TEST
SIGN
TEST

PMS 349C
3M 3630-26
GREEN

TEST
SIGN
TEST

PMS 355C
3M 3630-156
VIVID GREEN

TEST
SIGN
TEST

PMS 3435C
3M 3630-126
EMERALD GREEN

TEST
SIGN
TEST

PMS 349C
3M 3630-26
GREEN

TEST
SIGN
TEST

PMS 355C
3M 3630-156
VIVID GREEN

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

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USSCF SIGN FACE INVENTORY: ORANGE + YELLOW

4'-1/4" FACE

4'-1/4" FACE

3'-11 1/4" FACE

3'-11 1/4" FACE

TEST SIGN TEST

PMS 1655C
3M 3630-44
ORANGE

TEST SIGN TEST

PMS 1375C
3M 3630-74
KUMQUAT

TEST SIGN TEST

PMS 109C
3M 3630-015
YELLOW

TEST SIGN TEST

PMS 123C
3M 3630-156
SUNFLOWER

TEST SIGN TEST

PMS 1655C
3M 3630-44
ORANGE

TEST SIGN TEST

PMS 1375C
3M 3630-74
KUMQUAT

TEST SIGN TEST

PMS 109C
3M 3630-015
YELLOW

TEST SIGN TEST

PMS 123C
3M 3630-156
SUNFLOWER

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

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USSCF SIGN FACE INVENTORY: BLUE/GREEN + PURPLE

4'-1/4"
FACE

3'-11 1/4"
FACE

TEST
SIGN
TEST

PMS 3282C
3M 3630-236
TURQUOISE

TEST
SIGN
TEST

PMS 322C
3M 3630-246
TEAL

TEST
SIGN
TEST

PMS 2622C
3M 3630-328
PLUM PURPLE

TEST
SIGN
TEST

PMS 220C
3M 3630-133
RASPBERRY

TEST
SIGN
TEST

PMS 3282C
3M 3630-236
TURQUOISE

TEST
SIGN
TEST

PMS 322C
3M 3630-246
TEAL

TEST
SIGN
TEST

PMS 2622C
3M 3630-328
PLUM PURPLE

TEST
SIGN
TEST

PMS 220C
3M 3630-133
RASPBERRY

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

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USSCF SIGN FACE INVENTORY: GRAY + BURGUNDY + GOLD

4'-1/4" FACE

3'-11 1/4" FACE

TEST SIGN TEST

PMS 430C
3M 3630-51
SILVER GRAY

TEST SIGN TEST

PMS 877C
3M 3630-121
SILVER

TEST SIGN TEST

PMS 188C
3M 3630-49
BURGUNDY

TEST SIGN TEST

PMS 873C
3M 3630-131
METALLIC GOLD

TEST SIGN TEST

PMS 430C
3M 3630-51
SILVER GRAY

TEST SIGN TEST

PMS 877C
3M 3630-121
SILVER

TEST SIGN TEST

PMS 188C
3M 3630-49
BURGUNDY

TEST SIGN TEST

PMS 873C
3M 3630-131
METALLIC GOLD

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

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USSCF SIGN FACE INVENTORY: BROWN + BLACK + OPAQUES

4'-1/4" FACE

3'-11 1/4" FACE

TEST SIGN TEST

PMS 483C
3M 3630-63
RUST BROWN

TEST SIGN TEST

PMS 4625C
3M 3630-59
DARK BROWN

TEST SIGN TEST

PMS 7C
3M 3630-69
DURANODIC

TEST SIGN TEST

PMS C
3M 3630-22
BLACK

TEST SIGN TEST

PMS 483C
3M 3630-63
RUST BROWN

TEST SIGN TEST

PMS 4625C
3M 3630-59
DARK BROWN

TEST SIGN TEST

PMS 7C
3M 3630-69
DURANODIC

TEST SIGN TEST

PMS C
3M 3630-22
BLACK

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

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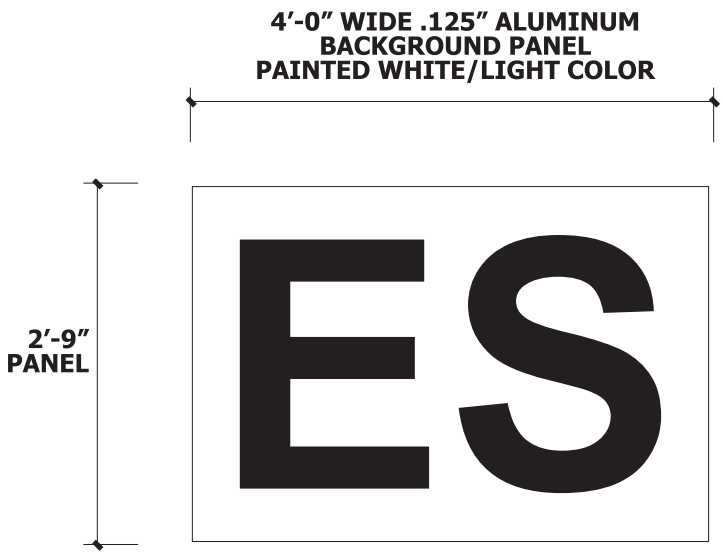
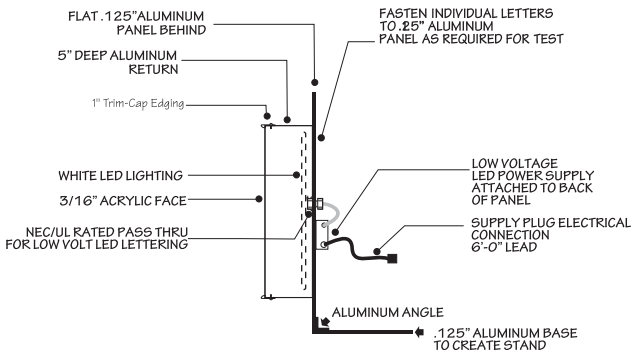
APPENDIX B - CHANNEL LETTER FACES



SIGN ELEVATION

1"=1'-0"



CHANNEL LETTER DETAIL

NOT TO SCALE

SIGN DETAILS:

FABRICATE (2) 24" HIGH CHANNEL LETTERS, TO BE MOUNTED SIDE-BY-SIDE ON AN ALUMINUM BACKER PANEL;

DETAILS AS SHOWN;

LETTER RETURN COLOR: DARK BRONZE OR BLACK;

1" TRIM CAP: ANY COLOR;

FACES TO BE 3/16" ACRYLIC PLASTIC WITH 3M 3630 TRANSLUCENT VINYL OVERLAYS AS SHOWN IN THIS FILE;

SUPPLY A CORD & PLUG FOR ELECTRICAL CONNECTION;

MOUNT ALL WIRING ON THE BACKSIDE OF THE ALUMINUM PANEL;

PROVIDE A WAY TO MAKE THE PANEL & LETTERS FREESTANDING;

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

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USSCF CHANNEL FACE INVENTORY: BLUE

24"
LETTERS

PMS 274C
3M 3630-87
ROYAL BLUE

PMS 294C
3M 3630-97
BRISTOL BLUE

PMS 300C
3M 3630-127
INTENSE BLUE

PMS 274C
3M 3630-87
ROYAL BLUE OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 294C
3M 3630-97
BRISTOL BLUE OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 300C
3M 3630-127
INTENSE BLUE OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

Revised:

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USSCF SIGN FACE INVENTORY: RED

24"
LETTERS

PMS 207C
3M 3630-53
CARDINAL RED

PMS 485C
3M 3630-33
RED

PMS 1788C
3M 3630-43
LIGHT TOMATO RED

PMS 207C
3M 3630-53
CARDINAL RED OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 485C
3M 3630-33
RED OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 1788C
3M 3630-43
LIGHT TOMATO RED OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

Revised:

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PHONE 215-345-1481
E-Mail: rcmercer@verizon.net
Web Address: www.mercersignconsultants.com

USSCF SIGN FACE INVENTORY: ORANGE + YELLOW

24"
LETTERS

PMS 1655C
3M 3630-44
ORANGE

PMS 1375C
3M 3630-74
KUMQUAT

PMS 109C
3M 3630-015
YELLOW

PMS 123C
3M 3630-156
SUNFLOWER

PMS 1655C
3M 3630-44
ORANGE OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 1375C
3M 3630-74
KUMQUAT OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 109C
3M 3630-015
YELLOW OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 123C
3M 3630-156
SUNFLOWER OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

Revised:

DWG# 5 OF 8

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USSCF SIGN FACE INVENTORY: GREEN

24"
LETTERS

PMS 3435C
3M 3630-126
EMERALD GREEN

PMS 349C
3M 3630-26
GREEN

PMS 355C
3M 3630-156
VIVID GREEN

PMS 3435C
3M 3630-126
EMERALD GREEN OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 349C
3M 3630-26
GREEN OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 355C
3M 3630-156
VIVID GREEN OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

SIGN ELEVATION
1/2"=1'-0"

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

Revised:

DWG# 4 OF 8

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USSCF SIGN FACE INVENTORY: BLUE/GREEN + PURPLE

24"
LETTERS

PMS 3282C
3M 3630-236
TURQUOISE

PMS 322C
3M 3630-246
TEAL

PMS 2622C
3M 3630-328
PLUM PURPLE

PMS 220C
3M 3630-133
RASPBERRY

PMS 3282C
3M 3630-236
TURQUOISE OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

SIGN ELEVATION
1/2"=1'-0"

PMS 322C
3M 3630-246
TEAL OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 2622C
3M 3630-328
PLUM PURPLE OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 220C
3M 3630-133
RASPBERRY OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

Revised:

DWG# 6 OF 8

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USSCF SIGN FACE INVENTORY: GRAY + BURGUNDY + GOLD

24"
LETTERS

PMS 430C
3M 3630-51
SILVER GRAY OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

SIGN ELEVATION
1/2"=1'-0"

PMS 188C
3M 3630-49
BURGUNDY

PMS 188C
3M 3630-49
BURGUNDY OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

PMS 873C
3M 3630-131
METALLIC GOLD OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

Revised:

DWG# 7 OF 8

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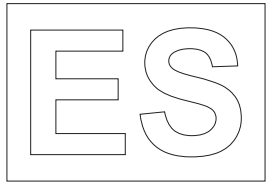
USSCF SIGN FACE INVENTORY: BROWN + BLACK + OPAQUES

24"
LETTERS

PMS 483C
3M 3630-63
RUST BROWN OVERLAY
WITH 1/2 PERIMETER
WHITE BORDER



WHITE PLEX FACE

IVORY PLEX FACE
3M 3630-005

SIGN ELEVATION
1/2"=1'-0"

PMS C
3M 3630-22
3M PERFORATED
DAY/NITE BLACK
FILM

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163325

Revised:

DWG# 8 OF 8

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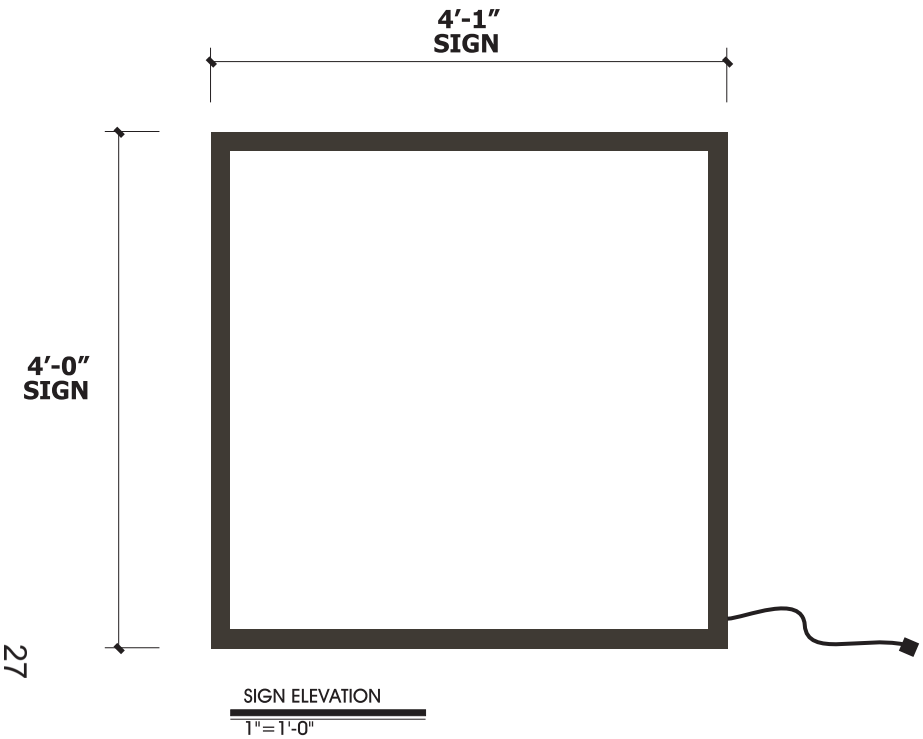
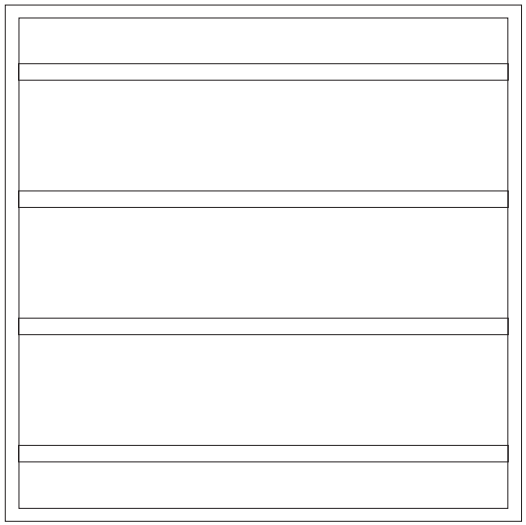
APPENDIX C - SIGN CABINETS - FLUORESCENT





FLUORESCENT LAMP CONFIGURATION

SIGN DETAILS:

FABRICATE (1) SINGLE SIDED SIGN CABINET; SIGN CABINET FABRICATED USING ALUMINUM EXTRUSION AS MANUFACTURED BY SIGNCOMP, GRAND RAPIDS MI; SINGLE FACE BODY 8 1/4" DEEP OVERALL USING 1.5" RETAINERS;

ALUM BACK IN SIGN = WHITE;

SIGN TO BE INTERNALLY ILLUMINATED; INTERNAL ILLUMINATION BY 800MA HIGH-OUTPUT DL FLUORESCENT LAMPS & COLD WEATHER-RATED BALLASTS;

SIGN FACES TO BE 3/16" HIGH IMPACT POLYCARBONATE; GRAPHICS IN COMPUTER-CUT 3M 3630 SERIES TRANSLUCENT VINYL FILM;

FABRICATE EACH SIGN CABINET WITH PLUG FOR CONNECTION TO ELECTRIC; 6'-0" LONG LEAD;

SIGN CABINET TO BE UL LISTED & LABELED & TO BE NEC COMPLIANT;

COLORS

SIGN CABINET TO BE DURANODIC / DARK BRONZE SIGNCOMP PREFINISH

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163324

Revised:

DWG# 1 OF 2

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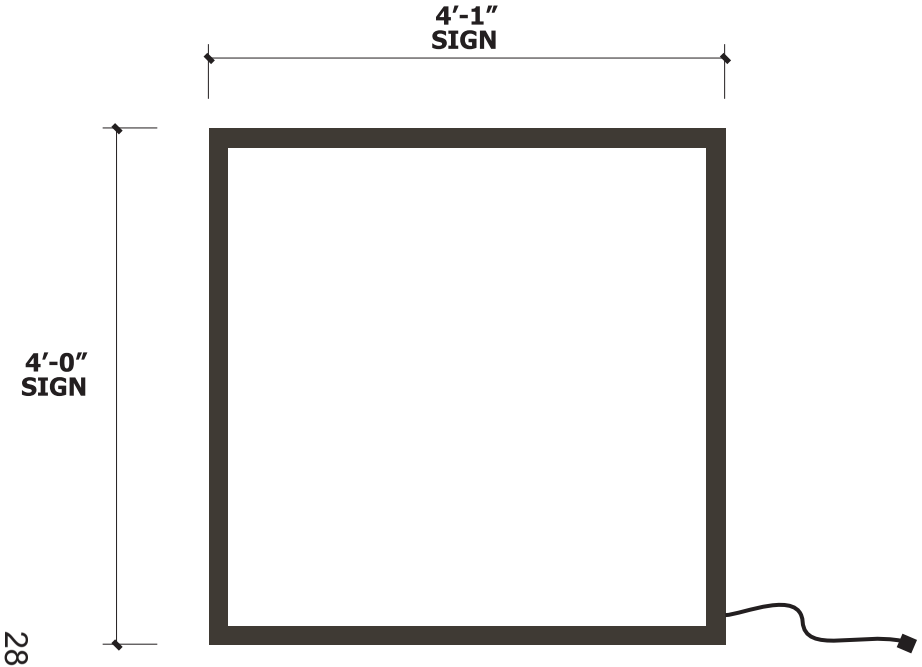
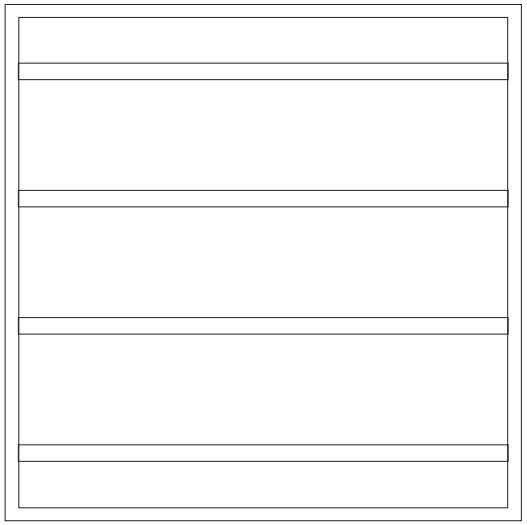


SIGN ELEVATION
1"=1'-0"



FLUORESCENT LAMP CONFIGURATION

SIGN DETAILS:

FABRICATE (1) DOUBLE SIDED SIGN CABINET; SIGN CABINET FABRICATED USING ALUMINUM EXTRUSION AS MANUFACTURED BY SIGNCOMP, GRAND RAPIDS MI; DOUBLE FACE BODY 15″ DEEP USING THE WIDE BODY EXTRUSION & 1.5″ RETAINERS;

SIGN TO BE INTERNALLY ILLUMINATED; INTERNAL ILLUMINATION BY 800MA HIGH-OUTPUT DL FLUORESCENT LAMPS & COLD WEATHER-RATED BALLASTS;

SIGN FACES TO BE 3/16″ HIGH IMPACT POLYCARBONATE; GRAPHICS IN COMPUTER-CUT 3M 3630 SERIES TRANSLUCENT VINYL FILM;

FABRICATE EACH SIGN CABINET WITH PLUG FOR CONNECTION TO ELECTRIC; 6′-0″ LONG LEAD;

SIGN CABINET TO BE UL LISTED & LABELED & TO BE NEC COMPLIANT;

COLORS

SIGN CABINET TO BE DURANODIC / DARK BRONZE SIGNCOMP PREFINISH

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163324

Revised:

DWG# 2 OF 2

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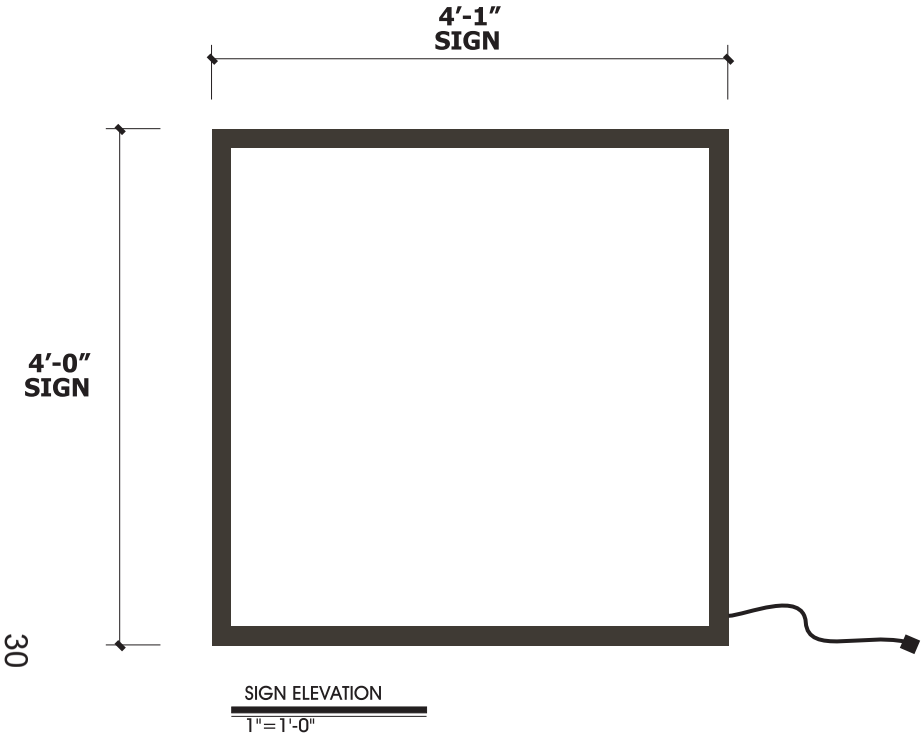
APPENDIX D - SIGN CABINETS - LED



LED CONFIGURATION AS SHOWN IN PHOTOS

COLORS

SIGN CABINET TO BE DURANODIC DARK BRONZE SIGNCOMP PREFINISH

SIGN DETAILS:

FABRICATE (1) SINGLE SIDED SIGN CABINET; SIGN CABINET FABRICATED USING ALUMINUM EXTRUSION AS MANUFACTURED BY SIGNCOMP, GRAND RAPIDS MI; SINGLE FACE BODY 8 1/4″ DEEP OVERALL USING 1.5″ RETAINERS;

ALUM BACK IN SIGN = WHITE;

SIGN TO HAVE LED ILLUMINATION USING LEDS BY G2G & LED POWER SUPPLIES;

SIGN FACES TO BE 3/16″ HIGH IMPACT POLYCARBONATE; GRAPHICS IN COMPUTER-CUT 3M 3630 SERIES TRANSLUCENT VINYL FILM;

FABRICATE EACH SIGN CABINET WITH PLUG FOR CONNECTION TO ELECTRIC; 6′-0″ LONG LEAD;

SIGN CABINET TO BE UL LISTED & LABELED & TO BE NEC COMPLIANT;

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163324

Revised:

DWG# 1 OF 2

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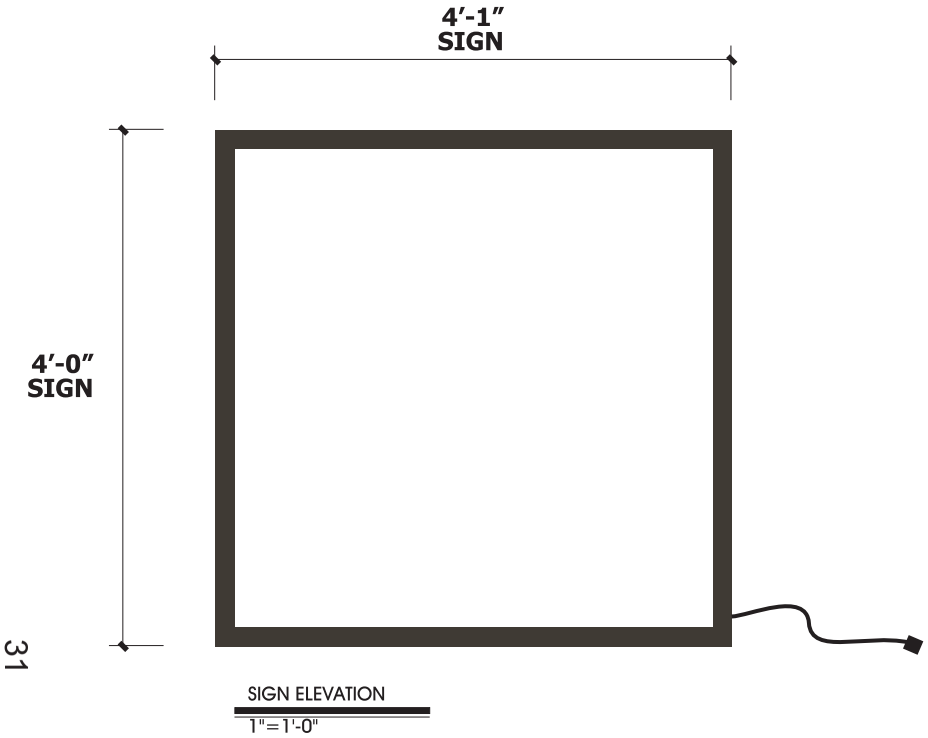

LED CONFIGURATION AS SHOWN IN PHOTOS

COLORS

SIGN CABINET TO BE DURANODIC DARK BRONZE SIGNCOMP PREFINISH

Client: USSC FOUNDATION

Location: BRISTOL PA

Date: 06-09-16

Dwg. By: RBC

Dwg No: USSCF0609163324

Revised:

DWG# 2 OF 2

SIGN DETAILS:

FABRICATE (1) DOUBLE SIDED SIGN CABINET; SIGN CABINET FABRICATED USING ALUMINUM EXTRUSION AS MANUFACTURED BY SIGNCOMP, GRAND RAPIDS MI; DOUBLE FACE BODY 15″ DEEP USING THE WIDE BODY EXTRUSION & 1.5″ RETAINERS;

SIGN TO HAVE LED ILLUMINATION USING LEDS BY G2G & LED POWER SUPPLIES;

SIGN FACES TO BE 3/16″ HIGH IMPACT POLYCARBONATE; GRAPHICS IN COMPUTER-CUT 3M 3630 SERIES TRANSLUCENT VINYL FILM;

FABRICATE EACH SIGN CABINET WITH PLUG FOR CONNECTION TO ELECTRIC; 6′-0″ LONG LEAD;

SIGN CABINET TO BE UL LISTED & LABELED & TO BE NEC COMPLIANT;

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APPENDIX E - SIGN LUMINANCE VALUES FROM STUDY

Please contact the USSC Foundation with any questions on how to apply or how to interpret these findings as they relate to any specific sign or color scheme that you are considering or examining; contact information on the back cover or at usscfoundation.org.

Appendix E. Measured Values.

Table 1. Cabinet Sign Mean Luminance Values (cd/m²).

	LED				Fluorescent			
	Single-Face		Double-Face		Single-Face		Double-Face	
	Positive Contrast	Negative Contrast	Positive Contrast	Negative Contrast	Positive Contrast	Negative Contrast	Positive Contrast	Negative Contrast
Red	134	402	107	338	131	408	81	257
Plum Purple	106	387	86	326	101	394	72	250
Metallic Gold	132	399	107	335	132	411	92	258
Orange	165	410	134	341	168	423	115	263
Teal	145	404	118	337	145	417	100	261
Silver	157	409	127	339	157	421	108	260
Turquoise	173	414	139	340	174	422	119	263
Sunflower	260	439	209	359	268	448	180	279
Royal Blue	104	395	84	326	102	407	71	256
Duranodic	99	389	80	321	94	405	66	252
Yellow	375	469	304	382	371	487	151	297
Kumquat	155	409	125	335	154	430	103	264
Intense Blue	110	391	89	323	107	417	73	254
Silver Grey	154	404	125	334	151	432	102	260
Raspberry	139	397	94	329	133	427	89	256
Dark Brown	102	390	82	323	98	424	66	255
Light Tomato Red	131	397	107	328	127	432	85	257
Black	99	387	80	321	94	427	63	256
Bristol Blue	111	391	90	321	106	434	72	256
Green	173	408	141	336	165	460	111	266
Emerald Green	143	400	116	330	134	458	91	261
Rust Brown	105	392	86	322	100	459	68	255
Vivid Green	144	402	116	328	136	491	91	261
Burgundy	108	393	87	320	100	479	67	256
Cardinal Red	120	395	98	323	111	512	75	259

Table 2. Channel Letter Sign Mean Luminance Values (cd/m²).

	Solid Color	White Outline
RED	75	209
PLUM PURPLE	18	161
METALIC GOLD	N/A	215
ORANGE	126	262
TEAL	108	241
TURQUOISE	160	283
SUNFLOWER	309	422
ROYAL BLUE	19	162
YELLOW	563	603
KUMQUAT	95	245
INTENSE BLUE	31	180
SILVER GREY	N/A	265
RASPBERRY	81	210
LIGHT TOMATO RED	63	203
BLACK	N/A	151
BRISTOL BLUE	30	181
GREEN	179	292
EMERALD GREEN	108	238
RUST BROWN	N/A	169
VIVID GREEN	103	240
BURGANDY	23	171
CARDINAL RED	49	186
WHITE PLEX FACE	768	N/A
IVORY PLEX FACE	343	N/A
DAY/NITE BLACK FILM	N/A	337

Table 3. Spot Field and Lab Luminance Values (cd/m²).

	Cabinet Signs		Channel Letters	
	Field	Lab	Field	Lab
RED	9-35 (18)	34	18-160 (78)	75
WHITE	50-450 (255)	392	150-500 (319)	700
BLUE	4.5-13 (9)	12	8-38 (19)	24
LIGHT BLUE	N/A	N/A	23	N/A
MEDIUM BLUE	N/A	N/A	140	N/A
DARK BLUE	N/A	5.6	10	12
YELLOW	40-200 (120)	250	270	525
ORANGE	11	58	35-46 (41)	106
GREEN	14	78	25-70 (43)	170
BURGANDY	.75	10	8	16
BLACK	.4	.5	N/A	1.5
PURPLE	N/A	7	12	12

USSC **FOUNDATION**

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