3.2 Signs

1 Credit: Implement 5 of 11

- All permanent directional and informational signs are readable from the expected viewing distance and not obstructed by objects.
- All permanent signs do not produce direct glare and are protected from reflected glare.
- All permanent directional and informational sings provide all information in visual and tactile and/or audible format (e.g. Braille on room number signs includes room purpose in addition to room numbers).
- All signs with an audio component have a headphone jack and volume control.
- Selected directional and informational signs use pictograms and/or more than one language.
- Provide a directory that lists building users and room numbers under an organization heading (e.g. company, department, specialty, etc.).
- Where permanent directional and informational signs are provided at intersecting routes, they are perpendicular to each direction of approach.
- All intersecting routes have permanent directional signs (e.g. arrows guiding to range of room numbers, organizational headings, areas of primary function, etc.).
- Selected signs link to additional online resources (e.g. QR Code).
- Smart signs are provided on the premises (e.g. signs with radio frequency identifiers, near field communication, or other technology that allows communication with a personal computing device).
- All permanent directional and informational signs located in dark areas or outdoors are backlit, reflective, and/or directly illuminated.

1. Overview

Signs are a key element of environmental communication, aiding in navigation both indoors and outdoors. Signs can confirm that individuals have successfully arrived at their destinations. In unfamiliar and high stress environments, such as hospitals and airports, signs provide crucial information for orientation, wayfinding, safety, and security (Calori & Vanden-Eynden, 2015). Signs also act to communicate the story of a location, create a sense of place for a particular setting, and convey a brand or community identity (Calori & Vanden-Eynden, 2015).

Steinfeld & Maisel (2012) propose that designers should consider four key issues when designing or specifying graphic signs: font, arrangement, environmental factors (e.g., whether a sign is illuminated), and personal factors (e.g., the viewer's awareness). It is imperative that the entire system is legible by all users (Steinfeld et al., 2012). Effective signage, as part of a wayfinding system, contributes to a sense of well-being, safety, and security. In line with the goals of Universal Design, good wayfinding supports environmental awareness, understanding, and wellness.

Sign Types

Identification: Identification signs display the name and the function of a space or building (Gibson, 2009). They help the user confirm that they have arrived at the end of their journey successfully (Calori & Vanden-Eynden, 2015). Identification signs can be placed at the beginning and end of routes to communicate the locations of other destinations (Gibson, 2009). They can also be used to identify the purpose, contents, and occupants of a space, which helps in decision making and maintaining situational awareness. For example, identification signage is used to label emergency exits and communicate the gender(s) that a restroom serves.

Directional: Directional signs provide cues that guide users to their destinations. They assist the user in deciding on the route they should take to a destination (Gibson, 2009). Directional signs typically use icons and arrows to identify important routes (Calori & Vanden-Eynden, 2015).

Orientation/Operational: Orientation or operational signs present information about the environment's function. They provide users with an overview of the surroundings, typically through the use of maps and directories (Gibson, 2009). Signs containing maps should be oriented consistently throughout the building to help avoid user confusion (Gibson, 2009).

Warning: Warning signs alert users to hazards or safety procedures (Calori & Vanden-Eynden, 2015).

Regulatory/Prohibitory: Regulatory or prohibitory signs advise users to the rules of a particular location. Some regulatory signs are mandated by law and contain legal jargon that is irrelevant to the operation of the building. Such signs should be located where they can be read clearly, but do not interfere with the building's function (Gibson, 2009). As with all signs, if they are too intrusive, they can create visual clutter and prevent users from perceiving more important information.

Interpretive: Interpretive signs provide facts and insights into the meaning of a place or object. These can include historical (Calori & Vanden-Eynden, 2015) or educational information, and increase the users' awareness of the significance of a location or site.

Honorific: Honorific signs are typically used to recognize donors. They are sometimes installed as building cornerstones to signify the important role a person played in an organization or building (Calori & Vanden-Eynden, 2015).

Sign Programs

A sign program, or *signage system*, guides us through a space. According to Calori & Vanden-Eyenden (2015), "The primary purpose of a sign program is to communicate information about a given environment to users of that environment […] via graphics displayed on physical sign objects or hardware." Important factors in planning the sign program include: arrival, departure, decision points, and circulation pathways (Gibson, 2009) (both vertical and lateral) (Calori & Vanden-Eynden, 2015). Building plans can be particularly helpful in identifying and planning sign locations within an environment (Calori & Vanden-Eynden, 2015).

Calori developed the *Signage Pyramid Method* (Figure 1), comprised of three interrelated systems. The pyramid represents the balance between the three systems, which are separate elements that are closely related to each other.

1. *Information Content System*: The information displayed on signs, how the signs are worded, where the information is located, and how the various signs in the program work together.
2. *Graphic System*: The two-dimensional graphic elements (e.g. typography, symbols, arrows, and colors), arrangement of graphic elements, and how the graphics are applied to signs (e.g. printed flush, tactile letters).
3. *Hardware System*: The shapes and sizes of the three-dimensional sign objects; the way the signs are mounted; the materials, finishes, and lighting used; and the relationship of the objects to each other and the environment (Calori & Vanden-Eynden, 2015).

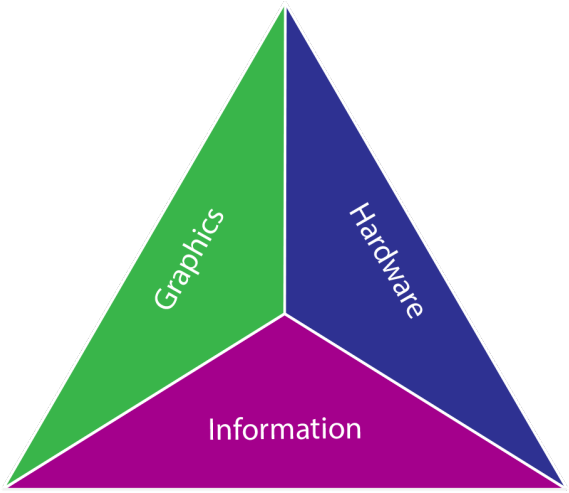

Figure 1: Components of the Signage Pyramid Model (Calori, C., & Vanden-Eynden, D. 2015).

Sign Characteristics

Context: The type of facility and the visitors' or users' state of mind (e.g., distracted, tired, jangled nerves; worried patients) are important when choosing colors and deciding on the size of fonts (Steinfeld et al., 2012). While large capital letters in day-glow yellow may be desirable to warn people about a dangerous area, such a sign is inappropriate in a health care waiting area.

Hierarchy: The most important information within the hierarchy of the sign system should be the easiest to perceive. This can be achieved through emphasis on size, placement, and color of the graphical elements. Calori and Vanden-Eynden (2015) suggest making a list of all destination elements within a project, and ranking them in order of importance from the perspective of the environment's user to help determine sign content and organization (Calori & Vanden-Eynden, 2015).

Proximity: It is helpful to organize and display information on signs in a meaningful way. Proximal arrangement, for example, is a good option for listing a set of destinations on signs, i.e. the order in which the user will encounter them (Calori & Vanden-Eynden, 2015).

Flexibility: Permanent signage can increase the difficulty of keeping signage systems accurate, especially when conditions in the environment change frequently. Modular signs can be updated inexpensively, and provide more flexibility than permanent signage. Digital signage allows changes to be made easily, and have the capability to communicate the same information in audible form.

2. Issues to Consider

Visual Impairment / Low Vision: Low vision refers to imperfect vision that is not corrected or cannot be corrected by glasses, contact lenses, surgery, or medication and often impacts an individual's ability to complete daily tasks (National Institute of Building Science, 2015). A variety of factors can lead to visual impairments, including aging,

injury, and disease, each of which has varying effects on the visual system, thereby creating a variety of signage accommodative needs (National Institute of Building Science, 2015). When designing accommodations for this population, it is important to consider that many of the affected individuals have acquired these visual impairments after birth and may not have yet adapted to their reduced vision (National Institute of Building Science, 2015). Signage that is designed for individuals with low vision must accommodate those who read by sight, by Braille, and by raised characters (U.S. Department of Justice, 2010). Raised characters are important to individuals who have become blind later in life, have lost sensitivity in their finger(s), or are blind individuals that have not learned Braille (Humrickhouse, 2012).

When accommodating those that read by sight, signage background and character colors should have a high contrast value, signage text should be large enough to be legible, and signage should have little to no glare. Contrast is defined by the level of variation between light and dark values (e.g. white characters on black background). Character sizing and spacing values depend on the distance in which they should be perceived. Recommendations for appropriate text size can be found on Table 1, in Section 4 of this document. Glare is identified by the light reflectance value (LRV), which is often assigned by the manufacturer and is defined by the percentage of light that is reflected off of the surface.

Color blindness or protanopia, limits a person's ability to identify color variations. In the most extreme cases in which individuals have lost their central vision, they may have complete colorblindness, leaving them to only see in black and white (National Institute of Building Science, 2015). In addition to using black and white for signage, Legge and Runin (1989) found that greens or grays were most successful in increasing visibility for individuals with limited color recognition (Legge & Rubin, 1986).

Advanced Aging: Aging adults frequently experience difficulty orienting and navigating within the environment (Laria et al., 2009; Harris & Wolbers, 2012). Confusion is often magnified by varying degrees of vision loss. Although not all older people have significant vision loss, there are some common age related changes in the eye that reduce contrast sensitivity, acuity, color perception, and even lead to blindness (i.e. cataracts, macular degeneration, glaucoma and diabetic retinopathy) (Illuminating Engineering Society, 2012). More frequent signs integrated along the path of travel can aid navigation both indoors and outdoors, and help compensate for low vision and cognitive decline (Harris & Wolbers, 2012). Additionally, implementing a color-coding scheme to all signage can help users identify and memorize environmental cues and support wayfinding (Davis & Weisbeck, 2016; Kim, 2016). Strategies used for accommodating persons with low vision such as increased character size, high contrast, and low levels of glare, are also effective when designing for older individuals.

Variations in cognitive ability, literacy, and language comprehension: A signage system that is understandable and legible by all users is a fundamental part of environmental communications and navigation. Signs should provide only essential information to reduce visual noise, and to accommodate comprehension for persons with cognitive limitations. As mentioned above, signage strategies that follow the rules of *hierarchy* and *proximity* as well as employ color-coding systems can help to support users in wayfinding. Symbols should be used in coordination with written text to accommodate users that have limited reading comprehension skills, or that do not speak the native language of their location.

3. Related Standards

ISO 23601:2009 Safety identification -- Escape and Evacuation Plan Signs states design principles for signs that identify escape routes, and contain information relating to fire safety, escape, evacuation, and rescue of the facility's occupants. These principles should be applied to signs displayed in public areas and workplaces.

Society for Experiential Graphic Design (SEGD) is an association of design professionals that works to connect people to place through graphic and informational design.

4. Measurement and Verification

Recommended Text Characteristics for Large Format Application in Buildings

Characteristic	Recommendation	Research Needs
Letter Height	35 ft./in. (d:lh) (With vision loss, and dependent on the age group, may diminish to between 17 ft./in. to 22 ft./in. for the 85th percentile.)	Existing research on this variable is fairly strong.
Width to Height Ratio	0.7 : 1.0 (w:h)	Existing research for this is fairly strong and supports the use of 5:7 (w:h) character ratio.
Stroke Width to Height Ratio	1:5 (w:h)	Existing research for this is fairly strong and supports the use of 5:7 (w:h) character ratio.
Text Color	Green, yellow or gray letters on high contrast background	Existing research indicates that these two colors provide the best legibility for readers with vision impairments. Red, yellow or green on high contrast backgrounds were read equally well by sighted users.
Font	• 5x7 for Uppercase • 7x9 for Lowercase	Existing research is fairly strong for highway signs but almost non-existent for persons with vision impairments reading commercial signs.
Inter-character Spacing	25 to 40% letter height	Existing research is fairly strong.
Inter-line Spacing	75 to 100% spacing	Existing research is fairly strong.
Case	Uppercase or mixed case for single words Lowercase for longer messages	Existing research is fairly strong.
Contrast Orientation	Positive contrast message (minimum 70%) Legibility is compromised when contrast approaches threshold	Existing research is strong for people without vision impairments. More research is required for persons with vision impairments.
Serifs	Serif or sans serif Sans serif only for tactile signage per ADA	Existing research is strong but results are not conclusive. Variability occurs around first time observers and familiarity with font.

Table 1: Recommended text characteristics for large format applications. Compliments of Center for Inclusive Design and Environmental Access, University at Buffalo School of Architecture and Planning (Steinfeld et al., 2012).

Figure 2: Character measurements parameters. Image courtesy of New York City Transit Authority.

Light Reflectance Value Formula

ADAAG signage guidelines require a character to background contrast of 70%. To calculate this value, designers can input the manufacturer assigned LRV values for desired colors and materials into the following equation:

$$Contrast = (B1 - B2) \times 100 / B1$$

B1 = light reflectance value (LRV) of lighter area

B2 = light reflectance value (LRV) of darker area

LRV online calculator provided by ASI signage

5. Design Considerations

1. *All permanent directional and informational signs are readable from the expected viewing distance and not obstructed by objects.* To ensure maximum visibility of signage and informational displays, the information presented on signage should be clear, concise, and absent of non-essential information. The most important characteristics in signage legibility are character size/spacing, line spacing, and character contrast to background. Designers can refer to Table 1 in the previous section for guidance on effective text and contrast characteristics.
2. *All permanent signs do not produce direct glare and are protected from reflected glare.* Non-glare materials help to prevent reflection, making the information on the sign easier to see. Signs with matte finishes can help reduce the likelihood of glare occurring. Adjacent lighting is a factor in sign placement and orientation, as artificial and natural lighting surrounding the sign can impact glare. Artificial lighting can improve the legibility of signs, but must not produce glare (Miller & Lewis, 2005). The light reflectance value, or LRV, is a value (ranging from 0-100%) that represents the amount of light reflected off of a material. The lower

the reflectance value, the less reflective the material, meaning a decreased risk of reflected glare, yielding improved visibility. LRV values lower than 20% are recommended for minimal glare. LRV formula and online calculator can be found in section 4.

Figure 3: On the left are directional signs printed on a wall that does not cast glare. On the right, the building maps are behind a reflective glass, causing glare. Images courtesy of IDEA Center.

3. *All permanent directional and informational sings provide all information in visual and tactile and/or audible format (e.g. Braille on room number signs includes room purpose in addition to room numbers).* The majority of the population with vision impairments rely on the tactility of text to help identify a location or destination (Ross & Kelly, 2009). All capitalization lettering, larger lettering sizes, and appropriate mounting heights make tactile use easier for the blind. (See article 2.4 Reach Targets for appropriate mounting heights.)

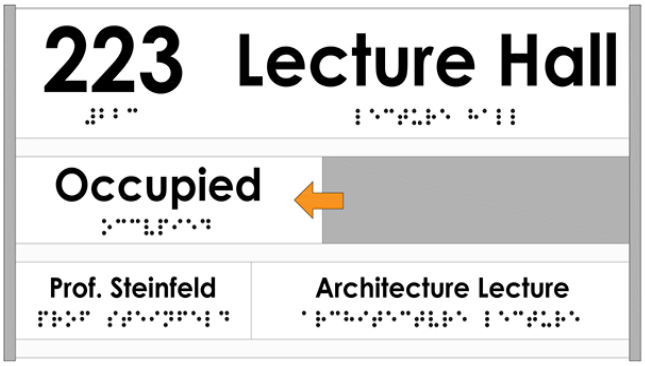

Figure 4: Example room designation sign

4. *All signs with an audio component have a headphone jack and volume control.* Kiosks and digital directory systems with a headphone jack allow users to locate various objects and locations on the premises. This functionality is specifically helpful for those with visual impairments. A system such as Step-Hear enables users to access information about a location, and assists with orientation.

5. *Selected directional and informational signs use pictograms and/or more than one language.* Pictograms and symbols communicate information visually, and aid in identifying services (Gibson, 2009). Pictograms are especially helpful for limited-reading populations, and for those who do not speak the native language of the location (Gibson, 2009; Knapp, 2013). The pictograms developed by the AIGA for the United States Department of Transportation, are considered standard for wayfinding, (see figure 2) and are available for free download, here. Additionally, the SEGD offers full sets of universal symbols for Accessibility, Healthcare, Recreation, and Transportation for no charge.

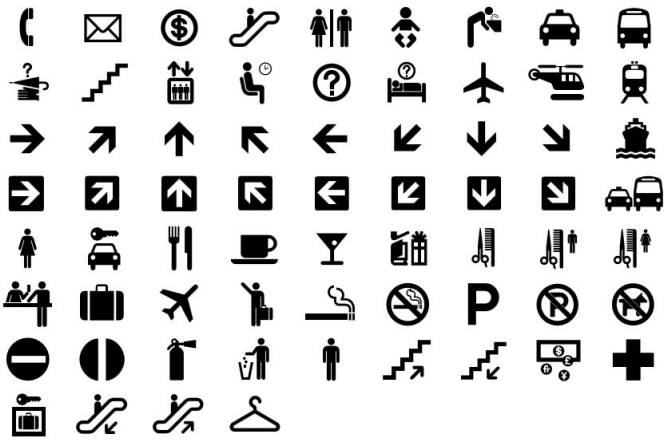

Figure 5: Transportation pictograms. Components of AIGA, the professional association for design.

6. *Provide a directory that lists building users and room numbers under an organization heading (e.g. company, department, specialty, etc.).* A locator map

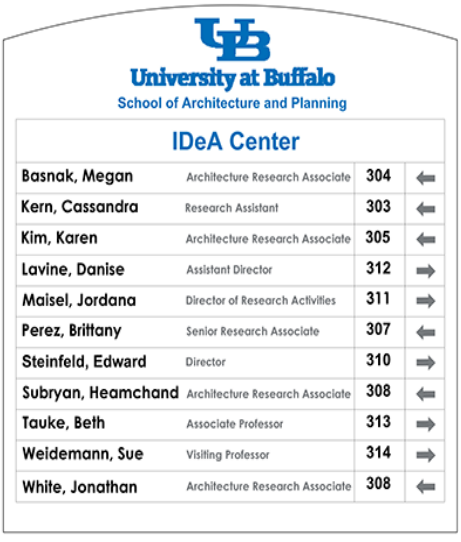

Figure 6: Example building directory. Image courtesy of IDEA Center.

designed in close proximity to the directory is helpful for users to find specific locations quickly and easily (Calori & Vanden-Eynden, 2015).

7. *Where permanent directional and informational signs are provided at intersecting routes, they are perpendicular to each direction of approach.* Signs and informational displays should be positioned perpendicular to people's movement and sight to ensure maximum visibility for all users (Calori & Vanden-Eynden, 2015).

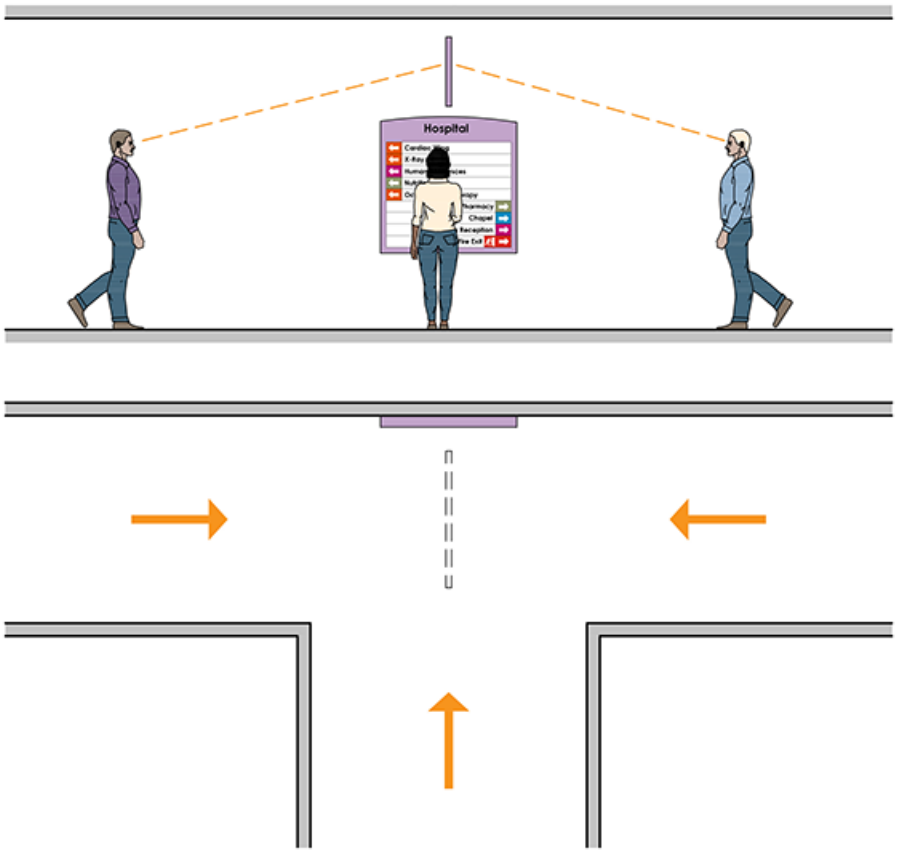

Figure 7: Signs at intersecting routes. Image courtesy of IDEA Center.

8. *All intersecting routes have permanent directional signs (e.g. arrows guiding to range of room numbers, organizational headings, areas of primary function, etc.).* Directional signs should be placed along long paths and at decision points to minimize backtracking (U.S. Department of Justice, 2010; Calori & Vanden-Eynden, 2015).
9. *Selected signs link to additional online resources (e.g. QR Code).* Online resources and QR codes help users interact with the environment. These can be especially helpful to communicate important announcements or changing conditions.
10. *Smart signs are provided on the premises (e.g. signs with radio frequency identifiers, near field communication, or other technology that allows communication with a personal computing device).* Visitors have the ability to scan a sign and listen to the visual information in an audio format. This feature is

particularly helpful for people who are blind or have low vision. When a user scans a sign, an application opens that provides the person with additional information about that location. RFID signs can also help guide users through a building when placed along a path or route.

11. *All permanent directional and informational signs located in dark areas or outdoors are backlit, reflective, and/or directly illuminated.* Lighting can increase visibility and legibility of signage. Reflective signage is especially helpful for use in outdoor environments, such as along a road or highway (Calori & Vanden-Eynden, 2015).

Figure 8: Backlit tactile map. Image courtesy of IDEA Center.

6. Definitions

Environmental Graphic Design (EGD)	"[Multidisciplinary field] including graphic, architectural, interior, landscape, and industrial design all concerned with the visual aspects of wayfinding, communicating identity and information, and shaping the idea of creating experiences that connect people to place" (Society for Experiential Graphic Design (SEGD)).
Placemaking	Creates a distinctive image for a site (Calori & Vanden-Eynden, 2015), and helps to create a memorable place for the user.
Signage	"A major component of all wayfinding, placemaking and identity systems, and exhibitions" (Society for Experiential Graphic Design (SEGD)).
Wayfinding	Spatial problem solving in the context of indoor and outdoor environments, comprised of decision-making, decision

	executing, and information processing. This includes knowing where you are in a building or an environment, knowing where your desired location is, and knowing how to get there from your present location (Arthur & Passini, 1992).

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