Information Display Design
DEA3250/6510

Information Displays

- Any display must give the operator information about the functional status of technology and/or processes.
- 3 classes of information:
  - Need to know - warnings, orders etc.
  - Nice to know - advisory, messages etc.
  - Historical - miles traveled, time elapsed etc.

Displays: Functional Requirements

- Speed - how quickly can the information be acquired?
- Accuracy - is information interpretation unambiguous and error-free?
- Sensitivity - can changes in the displayed variable be detected at the relevant magnitude?

Displays: Design criteria

- Detection - can the user detect the displayed information and any changes in this in context (e.g. see a visual display, hear an auditory display)?
- Recognition - can the user extract the relevant information from the display?
- Comprehension - can the user understand the displayed information?

Displays: Basic Types

- Static display - display content remains unchanged with time (label, traffic sign, graph, symbol etc.).
- Dynamic display - display content changes with time (speedometer, fuel gauge, radar, watch etc.).
- Quantitative display - displays the quantity of some variable (time, speed, temperature etc.).
Qualitative display - displays qualitative information (brake light, battery gauge etc.).

Displays: Types of Information

- Status - system conditions (on/off).
- Warnings - unsafe conditions (brake light).
- Representations - (pictures, maps, graphs).
- Identification - (traffic lanes, color-coded wires).
- Symbolic - (alphanumeric, music, math).
- Time-phased - signal duration/interval (flashers, heart beat monitor, sonar).

Static Displays

- Graphic symbols
- Labels
- Instruction signs
- Industrial and Consumer Safety Signs

Sign Surrounds

- Triangle or diamond (yellow/orange) in black surround - caution
- Circle (white in red surround) – mandatory action
- Circle with line (white in red surround, red line from top left to bottom right) – action prohibited
- Square or rectangle (blue or green) - advisory

Graphic Symbols

- A graphic symbol is an optically perceptible figure produced by means of writing, drawing, printing or other means.
- A good graphic symbol transmits information in an unambiguous manner independently of any language.
- A graphic symbol provides information on conditions, facts or actions.

Graphic Symbols - Functions

- Identity - describe a piece of equipment
- Qualify - describe a variation
- Instruct - describe an operation or use
- Command - indicate what MUST or MUST NOT be done
- Warn - draw attention to danger
- Indicate - give direction to a quantity

**Graphic Symbols: Design Guidelines**
- Image content - Content must be unambiguous.
- Consistency - Symbol elements must not be similar to elements used in other graphic images where the element has a different meaning.
- Easy to Read - Symbol should be easy to read quickly and accurately and provoke a quick response (especially if it's a warning symbol).
- Reproducibility - Symbol must be easy to reproduce at any size and on any print medium.
- Multiple Symbols - Multiple symbols can be used to augment understanding but no more than three should be used in a display.

**Graphic Symbols - Design principles**
- Silhouette/solid shape is preferable to outline. High contrast
- Closed, simple, unified symbol is preferable.
- Only relevant details included.
- Left/right symmetrical symbols are preferred.
- Symbols with similar height and width are preferred.
- Symbols for directional information should permit reversal.
- Symbols should be in enclosures (square; diamond; circle; triangle, in order of preference).

**Graphic Symbols - Dimensions**
- Size of significant details (M) should be at least 1 mm for every meter viewing distance.
- Line width of significant details *should not* be less than 0.5 mm for every meter viewing distance.
Distance between edge of symbol and inner edge of the enclosure should not exceed 1.5 mm, or 2.5 mm if the edges are parallel (per meter distance).

General purpose symbols should be within a 15° viewing angle; if critical symbol, reduce to <5°.

Symbol size, for legibility:
\[
\text{Conspicuity} = 0.025D + 0.012 \quad D=\text{distance (meters)}
\]

Basic Symbol Design Grid (ISO 3461)

Basic grid is used to design symbols.

Graphic Symbols

- Geometric form - square, circle, triangle, diamond
- Abstract symbol
- Pictogram

Safety Signs: 6 characteristics

- Sign should be in the immediate vicinity of the hazard
- Sign should contrast with background.
- Sign should identify the nature of the hazard.
- Sign should indicate the hazard consequences.
- Sign should identify the seriousness of the hazard.
- Sign should indicate how to avoid the hazard.

Safety Sign Design

- Symbol - graphic of the potential accident.
- Signal word - appropriate hazard level:
  - DANGER - immediate hazard which will result in severe personal injury or death.
  - WARNING - immediate hazard which could result in severe personal injury or death.
  - CAUTION - immediate hazard which could result in minor personal injury.
  - NOTICE - potential hazard and safety policy.
- Word message - concise hazard avoidance instructions.
Safety Sign Layouts (ANSI Z535.2)
Safety signs - 3 panel design

Warnings
- Text size and border width are important.
- Background color important (signal word has to be 2x size for black vs. red background).
- White space not important.
- Most effective warning signs not necessarily the most esthetic.

Example: Airplane Safety
- How do you know what you cannot know or see?

Examples: Fire Truck Color
- For optimal visibility day or night a lime-yellow color most closely matches the spectral sensitivity of the day/night retina, making fire trucks easier to see.

Example: Fire Truck Color (Solomon & King, Ergonomics in Design, 5 (2), 4-10, 1997)

Example: Fire exit signs
- Minimalist approach?

Example: Fire exit signs
- Who will instruct me?
- Where are the stairs?
- What if I don’t read English?
Example: Fire exit signs
♠ Turn left or right?

Example: Fire exit signs
♠ Which way to go?

Example: Fire exit signs
♠ Marriott Hotel's use a corporate color scheme - is it a good idea?

Example: Fire exit signs
♠ Unambiguous signs in Human Ecology?

Example: Fire exit signs
♠ Sign location is important.

Example: Fire exit signs
♠ Good readers only apply here!

Example: Emergency signs
♠ So many options?

Example: Fire alarm signs
♠ It's obvious isn't it?

Example: Fire alarm signs
♠ Pushmepullme Doctor Doolittle!

Example: Road Sign Visibility
♠ For road signs, which works best - text or icons?
♠ Is there a difference between day and dusk?
Is there an age difference?

Example: NY Subway
- Subway safety sign.

Example: NY Subway
- Subway safety instructions.

Example: NY Subway
- Subway safety sign - creative redesign.

Example: NY Subway
- Subway safety instructions - creative redesign.

Icon Design:
Graphical User Interface (GUI)

Borders and Backgrounds
- Borders and backgrounds can improve layout legibility.

Diagrams
- Static representational displays (diagrams) are often used on industrial equipment, and in buildings for wayfinding.