

Chapter 7. Workspace Design

In this chapter are guidelines for designing workspaces.

348. GENERAL METHODS FOR CONTROL AND DISPLAY PLACEMENT:

Controls and displays should be placed within the vehicle at locations that promote efficient procedures, safe operation, and maximum user awareness of the current system conditions. There are three general methods for achieving these conditions:

- a. **Grouping by task sequence.** All controls that operate sequentially to accomplish a particular task should be grouped together, along with their associated displays.
 - Displays that are observed in a specific sequence should be located so they are read in a left to right, top to bottom sequence, or other natural sequence.
 - Controls that are operated in a specific sequence should be located so they are used in a left to right, top to bottom sequence, or other natural sequence.
- b. **Grouping by system function.** Within the constraints of grouping by task sequence, controls and displays should be assigned to control-display panels or areas within a panel in functional groups (e.g., all controls related to entering a destination should be grouped together).
- c. **Grouping by importance and frequency of use.** The most important or frequently used controls should be placed in the primary position with respect to ease of reaching or grasping, and the center-most or closest visual position to the user (i.e., the visual position is: horizontally within $\pm 15^\circ$ of a line of sight straight ahead or the nominal line of sight, and vertically between the horizontal line of sight and 30° below it). Place these controls where visibility and accessibility are high and activation is easy. (Based on references 14,48.)

349. WHEN THERE ARE RELATED CONTROLS AND DISPLAYS:

When there is a set of related controls and displays, the layout of displays should be symmetrical with the controls they represent.⁽⁴⁸⁾

350. MULTIPLE CONTROL ACTIONS FOR A SINGLE FUNCTION:

Controls should be combined to eliminate the need for multiple control actions to perform a single function. For example, if two or more controls are operated in the exact same sequence each time they are used

and they perform only one task in this sequence, then combine the controls into one that performs all the steps.⁽¹⁴⁾

351. LOCATIONS OF FREQUENTLY USED DISPLAYS AND CONTROLS:

No frequently monitored visual display should be located where the user must continually turn his/her head or body to view it; no frequently used control should be located where the user continually has to reach a long distance for it.⁽¹⁰⁾

352. GENERAL ARRANGEMENT OF CONTROLS AND DISPLAYS:

Arrangement of controls and displays should be logical, but should not compromise the sequence of operation or functional integrity. Logical arrangements should be based on user expectations. These expectations will typically be met when components have a left to right and/or top to bottom arrangement and are identified in alphabetic or numeric sequence. For example, four related displays in a row should be designated A, B, C, D or 1,2,3,4; correspondingly, controls related to these displays should also be designated A, B, C, D or 1,2,3,4. Where other user expectations can be identified, components should be arranged to match those expectations.⁽⁴⁸⁾

353. LOCATION OF DISPLAYS REQUIRING ACCURATE READ-OUT:

Displays requiring accurate read-out should be closer to the user's line of sight than displays needing only gross monitoring.⁽⁴⁸⁾

354. GENERAL LOCATION OF CONTROLS AND DISPLAYS:

All controls and displays (including legends) should be readable from the user's normal head position, allowing for normal head rotation.⁽¹⁴⁾

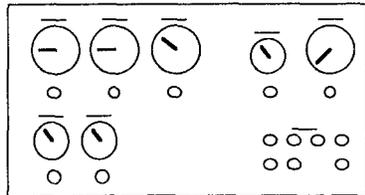
355. ENHANCEMENT TECHNIQUES FOR GROUPS OF CONTROLS AND DISPLAYS:

Use enhancement techniques for setting apart groups of controls and displays. Preferred techniques for enhancement are (see figure 27):

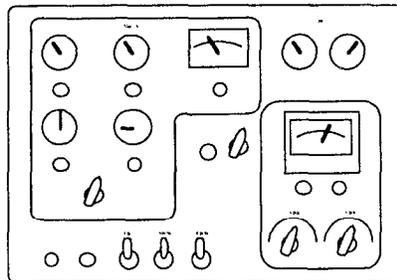
- a. Spacing, which consists of physically separating groups of components on a panel with enough space between groups so that the boundaries of each group are obvious. Spacing between groups should be at least the width of a typical control or display in the group.
- b. Demarcation, which consists of circumscribing functional or selected groups with contrasting lines. Demarcation outline borders should not be wider than the character stroke width in the associated function labels, except for areas containing emergency or critical functions, where the border width should be twice the character

stroke width. Demarcation borders on light colored or gray panels should be black, while emergency panels should use a red border.

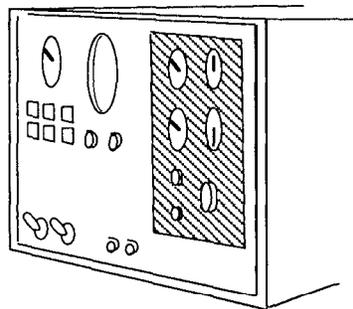
- c. Color shading, which should be used to enhance recognition if it provides adequate contrast and is consistent with other color coding of controls and displays.^(14,48)



(a) Spacing



(b) Demarcation



(c) Color Shading

Figure 27. Enhancement techniques for control-display panels.

356. NONOBSCURATION OF DISPLAYS:

Controls and displays should be located so that displays are not obscured during control operation.⁽⁴⁸⁾

357. LOCATION OF EMERGENCY DISPLAYS AND CONTROLS:

Emergency displays and controls should be located where they can be seen and reached with minimal delay. Warning lights should be within a 15° cone around the user's nominal line of sight, and

emergency controls should be close to the nearest available hand in its nominal operating position.⁽¹⁴⁾

358. ENHANCEMENT OF EMERGENCY DISPLAYS AND CONTROLS:

Emergency displays and controls should have distinctive enhancement techniques applied to them (see guideline 355), as well as multimodal alarms (auditory and visual). A visual alarm should be located above the related control or display that is to be used for corrective action.⁽⁴⁸⁾

359. LIGHTING FOR CRITICAL DISPLAYS:

Artificial lighting should be provided for all critical displays (including control labels) so that they can be read in the day or at night.⁽¹⁰⁾

360. GLARE:

Highly reflective or glossy materials should be avoided in the general forward viewing area.⁽¹⁰⁾

361. ILLUMINATED DISPLAYS AND CONTROLS:

Illuminated displays and controls should be designed and located so that they do not reflect upon the windshield.⁽¹⁰⁾