

10—Human Factors Engineering

- 1 Usually controls cannot be operated in-correctly
- 2 System designers can usually capitalize on compatible relationships

With such a system the following undesirable features are associated

- 1 The control must be activated before operator knows if correct control has been selected
- 2 Specific design might have to incorporate incompatible relationships

Regardless of the type of coding used, all controls and displays should be labeled. Labeling is crucial where the operators change often or equipment is shared. The use of labels may also reduce operator training time.

Arrangement

Remember that a system is task-oriented and that its components act and interact with each other to perform this task. Consequently, the various elements and components of the system need to be arranged with these considerations in mind.

- **FUNCTIONAL PRINCIPLE** This principle provides for the grouping of elements or components according to their function—those having related functions are grouped together.

- **IMPORTANCE PRINCIPLE** Components can be arranged by their importance. Items of some type (displays, controls, components) should be grouped in terms of how critical they are in carrying out a set of operations. The important controls should be positioned in the best locations for rapid and easy use.

Relative importance, of course, is largely a matter of judgement. So, to apply this principle one must be in a position to obtain judgements of persons who are knowledgeable about the equipment. This can be done by either interview or questionnaire.

- **OPTIMUM-LOCATION PRINCIPLE** This principle provides for the arrangement of items so that each one is in its "optimum" location in terms of some criterion of usage (convenience, accuracy, speed, strength to be applied, etc.).

- **SEQUENCE-OF-USE PRINCIPLE** In using controls, sequences or patterns of relationship

typically or frequently occur. In applying this principle, then, items can be so arranged as to take advantage of such patterns, thus, items used in sequence typically would be in close physical relationship with each other.

- **FREQUENCY-OF-USE PRINCIPLE** To arrange items in terms of frequency of use, first obtain information about how often different items might be expected to be used. Then place the less frequently used items in more distant locations.

In the event there is conflict among principles some trading-off must be done. Although no one principle should be held rigorously, frequency of use and sequence of use should be given major consideration.

Seek to avoid arrangements on which frequent transfers (of the entire body, or of the eye, hand, or other body member) from place to place would be required.

Control evaluations

The following questions should be considered in assessing the human element in the design of controls.

- What bodily limbs are involved? Is any one muscle overloaded?
- Where are the controls placed? Can they be reached? Are they spaced far enough apart? Are they labeled and coded?
- What type of control is used? Is it compatible?
- Do the controls themselves present a hazard?
- Are similar control operations similar in design and function? How standardized are the controls?

Conclusions

Every organization is obliged to improve its safety performance where it can. The safety professional and his management are evading the issue if either ignores the smaller accident problems and continually harps upon the total accident problem that cannot be solved by a single action.

Most occupational safety counter-measures deal with a bit of the entire occupational safety problem. Slowly, but surely, the im-