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Submitted for recognition as an American National Standard

INSTRUMENT FACE DESIGN AND LOCATION FOR CONSTRUCTION AND INDUSTRIAL EQUIPMENT

Foreword—This Reaffirmed Document has been changed only to reflect the new SAE Technical Standards Board Format.

1. Scope

- 1.1 The instrument design criteria and grouping described are recommended to manufacturers of construction and industrial equipment for all new designs.
- 1.2 Adherence to these recommendations will promote improved performance and ease of machine operation, protect machine and operator, and simplify instrument design and production.

2. References

—There are no referenced publications specified herein

3. Instrument Face Design

—To promote ease of machine operation, gages must be quickly readable and understandable. To accomplish this, the following face design criteria should be adhered to:

- 3.1 Dial size should be large enough for the viewing distance. At the optimum 28 in viewing distance, a 1-3/4 in diameter dial such as shown in Figure 1 is satisfactory; with this size dial, major scale graduations should be 0.030 in wide and 0.22 in long, intermediate graduations should be 0.025 in wide and 0.16 in long. For shorter or longer viewing distances, consult standard texts to determine gage size required.
- 3.2 Colored zone type dials are preferred, except where numerical information is required by the operator.
 - 3.2.1 Color choice of background, labels, graduations, and pointer should promote reading ease provided by high contrast; for example, black on white or white on black.
 - 3.2.2 It is preferred that operating zone colors be limited to green for the normal zone and red for the danger or stop zone.
 - 3.2.3 Green zones may be labeled NORMAL and red zones may be labeled DANGER or STOP, preferably within the colored zone.

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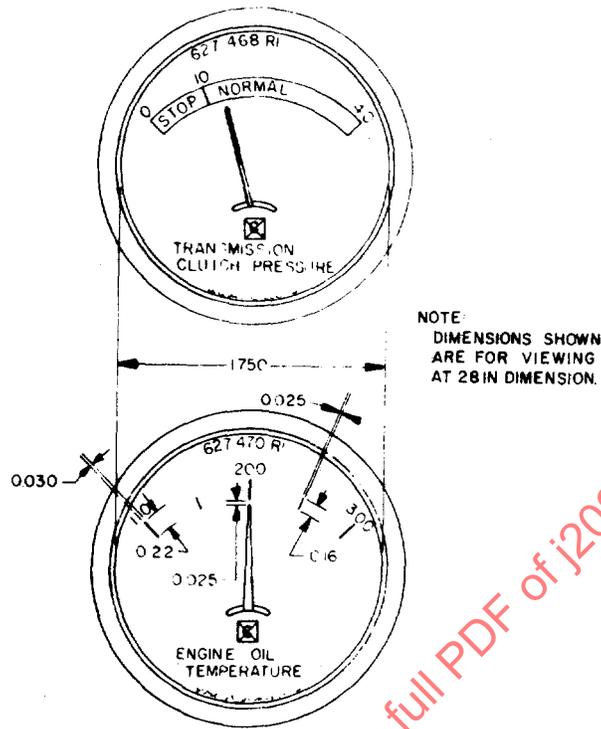


FIGURE 1—TYPICAL GAGES

- 3.3** Where a numerical scale is needed, use the simplest scale that will give sufficient information.
- 3.3.1 Scale divisions should be limited in number to the accuracy desired and should not exceed the error of the instrument system.
 - 3.3.2 Scale graduation intervals should be 1, 2, or 5, and decimal multiples thereof.
 - 3.3.3 Numbers should be placed over the scale marks or colored zones. Numbers should be oriented to read in a horizontal or in an arcuate arrangement.
 - 3.3.4 The dial scale should increase from low to high readings in a clockwise direction.
 - 3.3.5 The arc or length of the scale should be approximately the same for all grouped instruments. The normal operating zone should be approximately in the same angular position, generally vertical, so that the pointers are all in a similar position to permit rapid checking.
- 3.4** All instruments should be labeled to identify their function.
- 3.4.1 Labeling is preferred on the face of the dial, so that it is not obscured by repainting the vehicle or panel damage.
 - 3.4.2 The label should convey exactly what is being measured, such as BRAKE AIR PRESSURE, ENGINE WATER TEMPERATURE, etc., or equivalent international symbols.
 - 3.4.3 The label should be located so as not to be obscured at any pointer position.

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- 3.4.4 The manufacturer's monogram and part number should not be so placed or so large as to detract from the reading or appearance of the instrument.
- 3.4.5 A simple letter and number style should be used; the letters should be large enough for easy viewing without obscuring or detracting from other markings on the instrument face.
- 3.5 The pointer should be a simple symmetrical shape.
 - 3.5.1 The pointer end should be approximately the width of the smallest graduation mark.
 - 3.5.2 The pointer should terminate just short of the dial graduations.
 - 3.5.3 The pointer should be mounted close to the reading surface to eliminate parallax at acute viewing angles.
- 3.6 Instruments should be properly illuminated for night time operation.
- 4. **Instrument Grouping**—Grouped gages should be consistent in size, color scheme, pointer design, and label style and size. Gages required and their location are to be determined by the manufacturer.
 - 4.1 Instrument arrangement should consist of subgroups monitoring from left to right: engine, operational, and power train performance. See Figure 2.

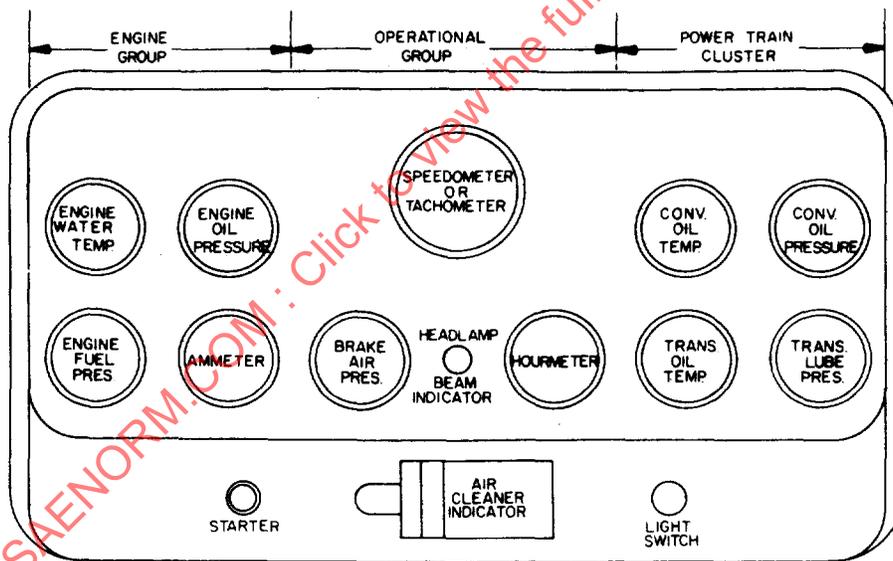


FIGURE 2—INSTRUMENT PANEL GROUPING

- 4.1.1 The engine subgroup should have ENGINE WATER TEMPERATURE and ENGINE OIL PRESSURE in that order.
- 4.1.2 The operational subgroup should have SPEEDOMETER and/or TACHOMETER, etc.
- 4.1.3 The power train gage cluster should have TRANSMISSION or CONVERTER OIL TEMPERATURE and TRANSMISSION or CONVERTER OIL PRESSURE in that order.

4.1.4 Additional instruments required should be located side by side, with the more important gage to the left, in successive rows if necessary, in the subgroup indicated. Instrument dials are more effective when separated more horizontally than vertically.

4.2 The location of secondary instruments and dash-mounted controls, such as fuel level gage, light switches, etc., is optional with the manufacturer but they should not be so placed as to disturb the primary indicator arrangement.

5. Instrument Panel Location

5.1 The distance from the operator's eye to the instruments usually mounted in an instrument panel should be consistent with quick readability without detracting from the operator's visibility or handling of the vehicle.

5.1.1 Optimum instrument panel location is 28 in from the operator's eyes, as close to the line of sight as possible, and consistent with SAE reach recommendations. See Figure 3.

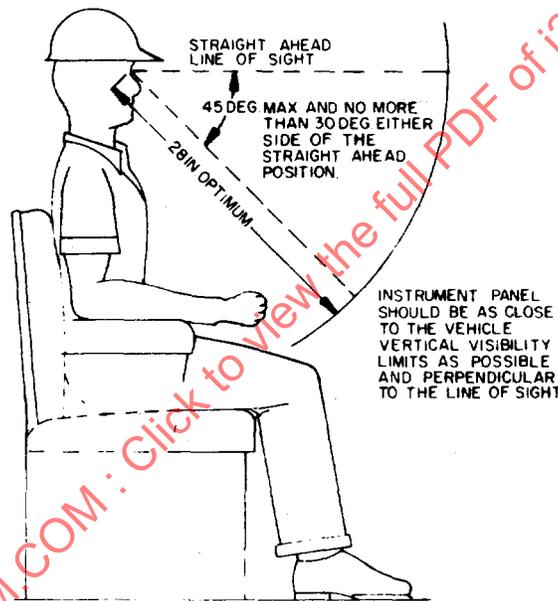


FIGURE 3—PREFERRED INSTRUMENT PANEL LOCATION

5.1.2 Instruments should be placed so that they are least obstructed by controls such as the steering wheel, etc.

5.2 Instruments should not be placed more than 45 deg below the horizontal line of sight.

5.3 Instruments should not be placed more than 30 deg either side of a straight-ahead position.

5.4 The instrument panel face, or isolated individual instruments, should be positioned so that they are perpendicular to the line of sight.

5.5 It may be necessary to compromise the above parameters for vehicles which are bi-directional or in which the operator has the option of sitting or standing while operating.

5.6 The instrument panel or other mounting surface should have a finish to minimize reflections.