

## SECTION 8

# ACCIDENT PREVENTION SIGNS, TAGS, LABELS, SIGNALS, PIPING SYSTEM IDENTIFICATION, AND TRAFFIC CONTROL

### 08.A SIGNS, TAGS, LABELS, AND PIPING SYSTEMS

08.A.01 Signs, tags, and labels shall be provided to give adequate warning and caution of hazards and instruction and directions to workers and the public.

08.A.02 Signs, tags, and labels shall be visible at all times when the hazard or problem exists and shall be removed or covered when the hazard or problem no longer exists.

08.A.03 All employees shall be informed as to the meaning of the various signs, tags, and labels used throughout the workplace and what special precautions are required: all employees shall be instructed that danger signs and tags indicate immediate danger and shall be informed of any special precautions that may be required.

08.A.04 Signs, Tags, Placards, Labels, and Piping Systems shall be in accordance with the following standards:

- a. ANSI/IEEE C95.2.
- b. ANSI Z136.1.
- c. ANSI Z535.1.
- d. ANSI Z535.2.
- e. ANSI Z535.5.
- f. 29 CFR 1910.145.

EM 385-1-1  
3 Nov 03

g. DOT Federal Highway Administration's, *Manual on Uniform Traffic Control Devices for Streets and Highways*

h. ANSI/American Society of Mechanical Engineers (ASME) A13.1.

08.A.05 The type of sign or tag used in a particular situation shall be appropriate for the degree of hazard or intent of message.

**> See Figure 8-1 for Sign and Tag Signal Word Headings. See Figure 8-2 for Example Tag Layout. See Figure 8-3 for Example Sign Layout. See Table 8-1 for Accident Prevention Sign Requirements.**

a. **DANGER SIGNS:** Danger signs must conform to the following requirements:

(1) Danger signs will be used only when the circumstances indicate an imminently hazardous situation that, if not avoided, will result in death or serious injury.

(2) Danger signs must have the signal word "DANGER" in white letters placed at the top of a rectangular safety red background placed at the top of the sign. The safety alert symbol shall precede the signal word. The base of symbol shall be on the same horizontal level as the base of the letters of the signal word – the height equaling or exceeding the signal word height. > See Figure 8-1.

Alternative: As an alternative, danger signs may have "DANGER" in white letters on a safety red oval background with a white border on a black rectangular field. This distinctive panel shall appear in the uppermost portion of the sign. No other signal word or symbol shall be used within this distinctive shape and color arrangement.

(3) The message panel shall be in black on a white background or white letters on a black background and the symbol/pictorial panel, if used, shall be square with a black

safety red, or black and safety red symbol on a white back background.

**b. WARNING SIGNS:** Warning signs must conform to the following requirements:

(1) Warning signs may be used only when the circumstances indicate a potentially hazardous situation that, if not avoided, **could** result in death or serious injury.

(2) Warning signs must have the signal word "**WARNING**" in black letters on a rectangular orange background placed at the top of the sign. The safety alert symbol shall precede the signal word. The base of symbol shall be on the same horizontal level as the base of the letters of the signal word – the height equaling or exceeding the signal word height.  
> **See Figure 8-1.**

Alternative: As an alternative, warning signs may have the signal word "**WARNING**" in black letters within a safety orange truncated diamond on a black rectangular background. The distinctive panel shall be located at the uppermost portion of the sign. No other word or symbol shall be used within this distinctive shape or color arrangement.

(3) The message panel should be in black letters on a white background or white letters on a black background. The message may, as an alternative, be in black letters on a safety orange background. The symbol/pictorial panel, if used, shall be square with a black symbol on a white background. The symbol panel used as an alternative may be square with a black symbol on an orange background.

**c. CAUTION SIGNS:** Caution signs must conform the to following requirements:

(1) Caution signs may be used only when circumstances indicate a potentially hazardous situation that, if not avoided,

may result in a minor or moderate injury. It may also be used to alert against unsafe practices that may result in property damage.

(2) Caution signs should have the signal word “CAUTION” in black letters on a rectangular yellow background placed at the top of the sign. The safety alert symbol shall precede the signal word if the hazard is a potential personal injury hazard. (The alert symbol is not used when the situation is used to indicate property damage, only accidents.) The base of symbol shall be on the same horizontal level as the base of the letters of the signal word – the height equaling or exceeding the signal word height. > See Figure 8-1.

Alternative: As an alternative, caution signs may have the signal word “CAUTION” in safety yellow letters within a black rectangular background, and this distinctive panel shall be located in the uppermost portion of the sign. No other signal word or symbol shall be used with this distinctive color or signal shape arrangement.

(3) The message panel should be in black letters on a white background or white letters on a black background. The message may, as an alternative, be in black letters on a safety yellow background. The symbol/pictorial panel, if used, shall be square with a black symbol on a white background. As an alternative, it may be square with a black symbol on a safety yellow background.

d. **NOTICE SIGNS:** Notice signs should conform to the following requirements:

(1) Notice signs may be used to indicate a statement of company policy directly or indirectly related to the safety of personnel or protection of property. The signal word SHOULD NOT be associated directly with a hazard or hazardous situation and shall not be used in place of “DANGER,” “WARNING,” or “CAUTION.”

(2) Notice signs shall have the signal word “NOTICE” in white italic letters on a safety blue background on a rectangular field and this distinctive panel shall be located in the uppermost portion of the visual alerting device. No other signal word or symbol shall be used within this distinctive shape and color arrangement.

(3) The message shall be in safety blue or black letters on a white background. The symbol/pictorial panel, if used, shall be square with a safety blue or black symbol on a white background.

e. **GENERAL SAFETY SIGNS:** General safety signs should conform to the following requirements:

(1) General safety signs may be used to indicate general instructions relative to safe work practices, remind of proper safety procedures, and indicate the location of safety equipment.

(2) They may have the signal words “SAFETY FIRST,” “BE CAREFUL,” “THINK,” “SAFETY INSTRUCTIONS,” etc. in white letters on a safety green background on a rectangular field, and this distinctive panel shall appear in the uppermost portion of this sign.

(3) The message panel shall be in safety green or black letters on a white background and the symbol/pictorial panel, if used, shall be square with a safety green or black symbol on a white background.

f. **FIRE SAFETY SIGNS:** Fire safety signs should conform to the following requirements:

(1) Fire safety signs may be used to indicate the location of emergency firefighting equipment

(2) These signs do NOT have a signal word.

EM 385-1-1  
3 Nov 03

(3) The message panel shall be in safety red letters on a white background in either a square or rectangular field and the symbol/pictorial panel, if used, shall be safety red on white or white on safety red.

g. **DIRECTIONAL ARROW SIGNS:** Directional arrow flow signs should conform to the following requirements:

(1) Directional arrow signs may be used to indicate the direction to emergency equipment, safety equipment, and other locations important to safety.

(2) The arrow symbol shall be in white on a black or colored background on a rectangular field and this distinctive symbol shall appear in the uppermost portion of the visual alerting device when used by itself or in conjunction with general safety or fire safety signs.

h. Color coding shall be in accordance with Table 8-2.

i. Piping systems shall be identified: it is recommended that the identification of piping systems (including pipes, fittings, valves, and pipe coverings) be in accordance with Table 8-3.

j. The RF radiation hazard-warning symbol specified in Figure 8-4 shall be used in the identification of RF radiation hazards.

k. Laser caution and warning signs shall be in accordance with ANSI Z136.1. **See Figure 8-5 and 8-6 for examples.**

l. Ionizing radiation warning signs, labels, and signals shall contain the symbol show in Figure 8-7.

m. Vehicles or equipment that, by design, move at 25 miles per hour (mph) (1.1 meters per second (m/s)) or less on public roads shall display the slow-moving vehicle emblem specified in Figure 8-8.

08.A.06 Safety sign finishes shall be of durable materials with colors in accordance with ANSI Z 535.1.

08.A.07 Safety signs shall be so placed to alert and inform the viewer in sufficient time to take appropriate evasive actions to avoid the potential harm from the hazard. They shall be legible, non-distracting; and not hazardous in themselves. They shall be displayed with illumination or retro-reflectorization as needed for adequate legibility under normal and emergency operating conditions.

08.A.08 Each container of hazardous material shall be labeled, tagged, or marked with the identity of the material(s), appropriate hazard warnings, potential health effects, and the name and address of the manufacturer, importer, or other responsible party.  
> **See 06.B.01**

a. Signs, placards, process sheets, batch tickets, operating procedures, or other written means may be used in lieu of affixing labels to stationary process containers if the alternative method identifies the containers to which it is applicable and conveys the information required above. The written information shall be readily available to employees in their work area throughout each work shift.

b. Portable containers into which hazardous material(s) are transferred from labeled containers and which are intended only for the immediate use by the employee who performs the transfer are not required to be labeled. However, there shall be a means of indicating that the hazardous material has been used in the container.

08.A.09 Signs, tags, and labels shall be located as close as safely possible to their respective hazards. Tags will be affixed by a positive means (such as wire, string, or adhesive) that prevents their loss or unintentional removal.

08.A.10 Signs, tags, and labels shall be legible and in English. When there are employees who speak a language other than

EM 385-1-1  
3 Nov 03

English and to whom the information is to be conveyed, the information may also be presented in their language if it is presented in English as well. > **See 01.A.04.**

08.A.11 Signs shall be furnished with rounded or blunt corners and shall be free from sharp edges, burrs, splinters, or other sharp projections. The ends or heads of bolts or other fastening devices shall be located so that they are not a hazard. Wording shall be easily read, concise, and accurate. The sign should contain sufficient information to be understood.

08.A.12 Construction areas shall be posted with legible traffic signs at points of hazard.

08.A.13 Signs required to be seen at night shall be lighted or reflectorized.

08.A.14 Accident prevention tags (Figure 8-9) shall be used only as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, and lockout. > **See Section 12 for tagout requirements.**

08.A.15 Tags shall contain a signal word (either "**danger**" or "**caution**") and a major message (presented in either pictographs, written text, or both) to indicate the specific hazardous condition or the instruction to be communicated to the employee. The signal word shall be readable at a minimum distance of 5 feet or such greater distance as warranted by the hazard. The signal word and major message shall be understandable to all employees who may be exposed to the hazard. > **See 08.A.05 for basic design criteria.**

08.A.16 Accident prevention tags shall be rectangular in shape and shall be no smaller than 3 in x 5 in (7.6 cm x 12.7 cm). The corners may be square cut, chamfered, or rounded.

08.A.17 Kerosene lamps and open flame pots shall not be used for or with warning signs or devices.



08.A.18 Warning signs shall be placed on unattended Government-owned floating plant and land-based heavy equipment accessible to the public and shall read “**WARNING - NO TRESPASSING US GOVERNMENT PROPERTY.**”

## **08.B SIGNAL SYSTEMS, PERSONNEL, AND PROCEDURES**

08.B.01 A standard signal system shall be used on all operations.

- a. Hand signals for crane operations shall conform to ANSI/ASME B30 series. > **See Figure 8-10.**
- b. Traffic flagging procedures shall be in accordance with the DOT Federal Highway Administration's "Manual on Uniform Traffic Control Devices for Streets and Highways."
- c. For Marine signals, see Section 19.
- d. For helicopter hand signals, see Figure 8-11.

08.B.02 Standard hand signals shall be posted at the operator's position, signal control points, and other points as necessary to inform those concerned.

08.B.03 Manual (hand) signals may be used when the distance between the operator and signal person is not more than 100 ft (30.4 m). Radio, telephone, or a visual and audible electrically-operated system shall be used when the distance between operator and signal person is more than 100 ft (30.4 m) or when they cannot see each other.

08.B.04 A signal person shall be provided when the point of operation (includes area of load travel and area immediately surrounding the load placement) is not in full view of the vehicle, machine, or equipment operator; when vehicles are backed more than 100 ft (30.4 m); when terrain is hazardous; or when two or more vehicles are backing in the same area.

EM 385-1-1  
3 Nov 03

08.B.05 A flag person or other controls shall be provided when operations or equipment on or next to a highway create a traffic hazard. An exception shall be made only when an adequate mechanical signaling or control device is provided for safe direction of the operation.

08.B.06 Where manual (hand) signals are used, only one person shall be designated to give signals to the operator. This signal person shall be located to see the load and be clearly visible to the operator at all times.

08.B.07 Flag signaling shall be accomplished by use of red flags at least 18 in (45.7 cm) square or sign paddles. In periods of darkness, red lights shall be used.

08.B.08 High visibility vests shall be worn by flag and signal persons. > **See Section 5.A.11.**

08.B.09 Signal systems shall be protected against unauthorized use, breakage, weather, or interference: any malfunction shall be cause to stop all work.

08.B.10 Only persons who are competent and qualified by experience and/or training with the operations being directed shall be used as signal persons.

08.B.11 Signal persons shall back one vehicle at a time. While under control of a signal person, the driver shall not back or maneuver until directed, and the driver shall stop when visual contact with the signal person is lost.

08.B.12 The signal person shall have a warning device of clear range and penetrating sound to warn persons when the load is coming in so they have time to get in the clear.

## **08.C TRAFFIC CONTROL**

08.C.01 Traffic control shall be accomplished in accordance with DOT Federal Highway Administration's "Manual on Uniform Traffic Control Devices for Streets and Highways."

08.C.02 The Contractor shall conduct his/her operations in such a manner as to offer the least possible obstruction to the safe and satisfactory movement of traffic over the existing roads during the life of the contract.

08.C.03 The Contractor shall be responsible for providing, erecting, maintaining, and removal of all traffic signs, barricades, and other traffic control devices necessary for maintenance of traffic.

08.C.04 All barricades, warning signs, lights, temporary signals, other devices, flagmen, and signaling devices shall meet or exceed the minimum requirements of the local DOT requirements.

08.C.05 Prior to the commencement of construction operations the Contractor shall submit for acceptance the complete details of the proposed traffic control plan for the maintenance of traffic and access through the construction area.

08.C.06 The Contractor shall coordinate with the GDA and obtain approval from local authorities prior to closing or restricting any roads.

08.C.07 Barricades, danger, warning and detour signs, as required, shall be erected before any roads are closed.

## **08.D HAUL ROADS**

08.D.01 Access/haul roads shall be designed in accordance with current engineering criteria. Prior to construction, the Contractor shall provide the GDA with a copy of the plan for review and acceptance. Work on the haul road shall not commence until the

EM 385-1-1  
3 Nov 03

GDA has accepted the plan. The plan shall address the following items:

- a. Equipment usage, traffic density, and hours of operation;
- b. Road layout and widths, horizontal and vertical curve data, and sight distances;
- c. Sign and signalperson requirements, road markings, and traffic control devices;
- d. Drainage controls;
- e. Points of contact between vehicles and the public, and safety controls at these points of contact;
- f. Maintenance requirements, including roadway hardness and smoothness and dust control; and
- g. Hazards adjacent to the road such as bodies of water, steep embankments, etc.

08.D.02 No employer shall move, or cause to be moved, any equipment or vehicle upon an access or haul road unless the roadway is constructed and maintained to safely accommodate the movement of the equipment or vehicle involved.

08.D.03 When road levels are above working levels, berms, barricades, or curbs shall be constructed to prevent vehicles overrunning the edge or end of embankment. Berms/curbs shall be constructed to one-half the diameter of the tires of the largest piece of equipment using the roadway.

08.D.04 Roadways shall have a crown and ditches for drainage. Water shall be intercepted before reaching a switch back or large fill and be led off.

08.D.05 Haul roads shall be constructed to widths suitable for safe operation of the equipment at the travel speeds proposed by the Contractor and accepted by the GDA.

08.D.06 All roads, including haul roads, shall be posted with maximum speed limits.

08.D.07 An adequate number of turn-outs shall be provided on single lane roads haul roads with two-way traffic. When turn-outs are not practical, the Contractor shall provide a traffic control system to prevent accidents.

08.D.08 Whenever possible, use a right-hand traffic pattern on two-way haul roads.

08.D.09 Curves.

a. All curves shall have open sight line and as great a radius as practical.

b. Vehicle speed shall be limited on curves so that vehicles can be stopped within one-half the visible distance of the roadway.

c. The design of horizontal curves shall consider vehicle speed, roadway width and surfacing, and super elevation.

08.D.10 Grades.

a. When necessary, based on grade and machine and load weight, machines shall be equipped with retarders to assist in controlling downgrade descent.

b. Truck haul roads should be kept to less than a 10% grade. There should be no more than 400 ft (121.9 m) of grade exceeding 10%.

c. The maximum allowable grade shall not exceed 12% .

EM 385-1-1  
3 Nov 03

08.D.11 Lighting shall be provided as necessary.

08.D.12 Traffic control lights, barricades, road markings, signs, and signalpersons for the safe movement of traffic shall be provided in accordance with the DOT Federal Highway Administration's "Manual on Uniform Traffic Control Devices" and this Section.

08.D.13 Roadway hardness, smoothness, and dust control shall be used to maintain the safety of the roadway.

08.D.14 All roads shall be maintained in a safe condition and eliminate or control dust, ice, and similar hazards.

08.D.15 The deposition of mud and or other debris on public roads shall be minimized to the extent possible and in accordance with local requirements.

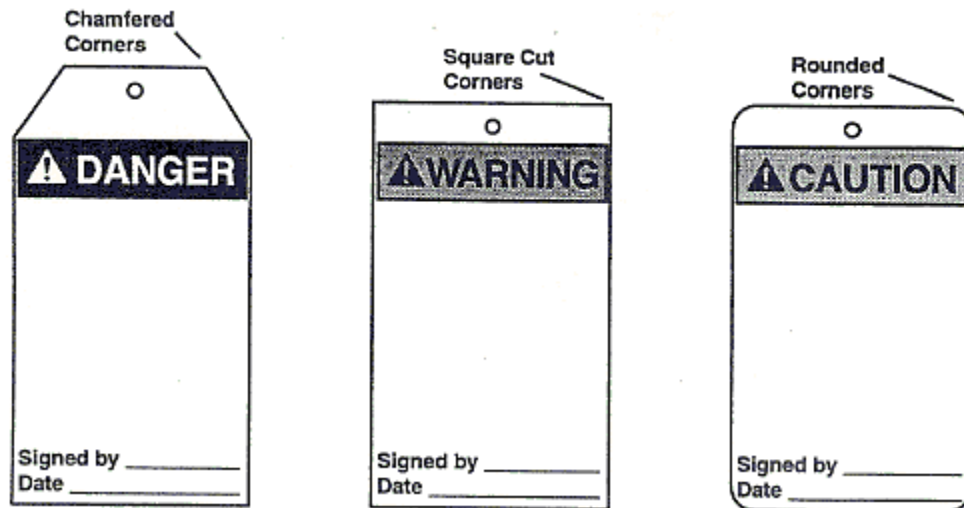
**FIGURE 8-1**

**SIGN AND TAG SIGNAL WORD HEADINGS**



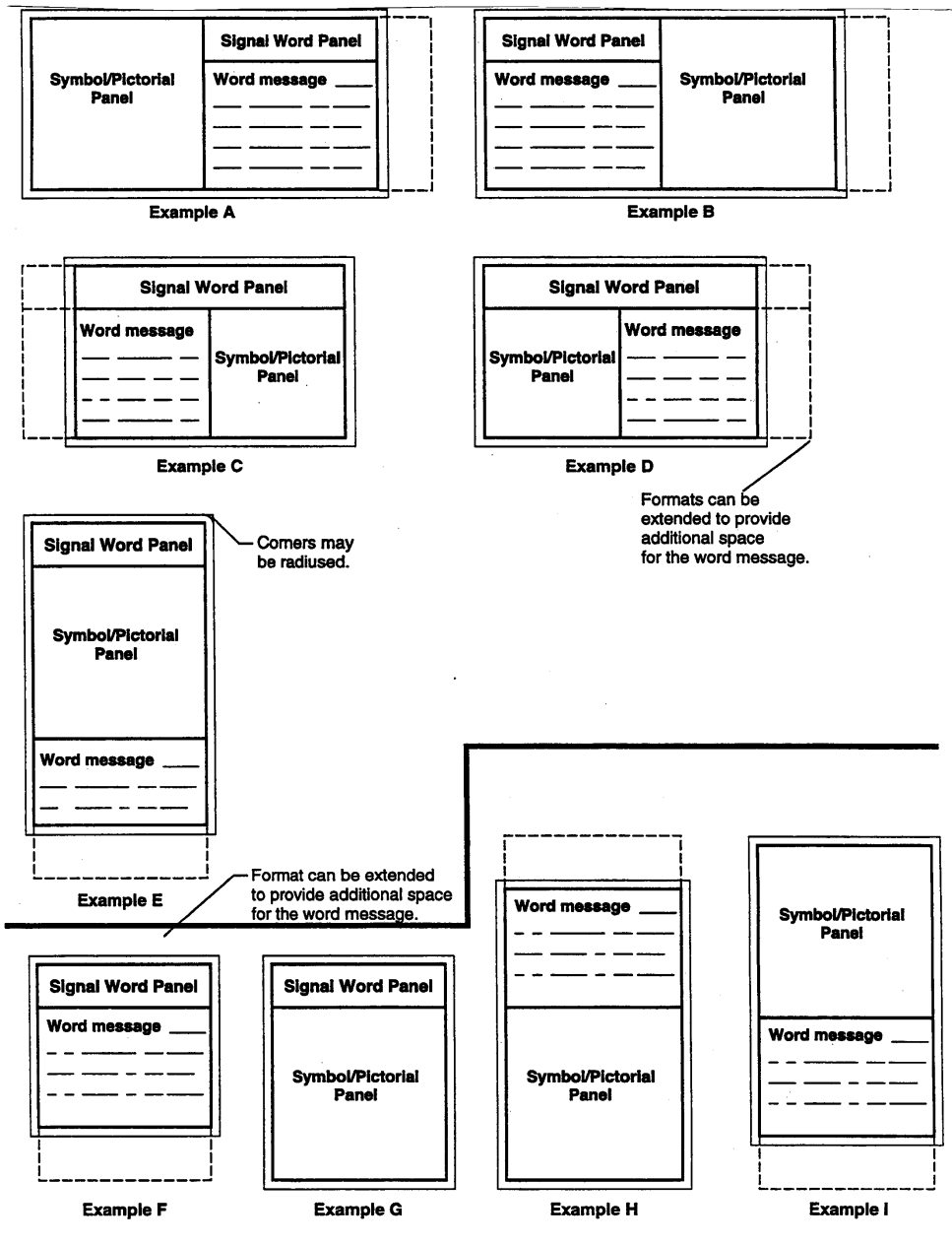
**FIGURE 8-2**

**EXAMPLE TAG LAYOUT**



**FIGURE 8-3**

**EXAMPLE SIGN LAYOUT**





**TABLE 8-1**  
**ACCIDENT PREVENTION SIGN REQUIREMENTS**

<b>TYPE</b>	<b>PURPOSE</b>	<b>DESIGN</b>
DANGER	Indicates a specific immediate and grave danger, a hazard capable of producing irreversible damage or injury, and prohibition against harmful activity.	Layout as shown in Fig 8-1. Shall have the word "DANGER" in white within a red oval outlines in white on a black rectangular background in the upper panel and a lower panel for additional wording or symbols in black or red on white for additional wording or symbols in black or red on a white background.
CAUTION	Call attention to a specific potential hazard capable of resulting in severe, but not irreversible, injury or damage.	Layout as shown in Fig 8-1. Shall have the word "CAUTION" in yellow on a black background and a lower panel for additional sign wording in black on a yellow background.
GENERAL SAFETY	Includes notices of general practice and rules relating to health, first aid, medical equipment, sanitation, housekeeping, and general safety.	Layout as shown in Fig 8-1 or consisting of a single panel. Shall have the appropriate keyword as the signal word in white on a green background in the upper panel and a lower panel for additional sign wording or symbols in black or green on a white background. Alternatively, the entire sign may be white letters on a green background.
FIRE AND EMERGENCY	Used only to label or points the way to fire extinguishing equipment, fire escapes and exits, gas shutoff valves, sprinkler drains, and emergency procedures.	Layout as shown in Fig 8-1 or consisting of a single red panel. Shall have the appropriate keyword as the signal word in white on a red background in the upper panel and a lower panel for additional sign wording or symbols in red on a white background. Alternatively, the entire sign may be white letters on a red background.
INFORMATION	Provide information of a general nature, such as designation of facilities or services, in order to avoid confusion or misunderstanding.	Layout as shown in Fig 8-1 or consisting of a single panel. Should have the signal word "NOTICE" in white on a blue background in the upper panel and a lower panel for additional wording or symbols in blue or black on a white background. Alternatively, the entire sign may be in white letters on a blue background.
EXIT	Used to indicate exits.	Lettered in legible letters, not less than 6 in (15.2 cm) high, on a white field. The principal stroke of the letters shall be at least 3/4 in (5.1 cm) in width.

**TABLE 8-2**  
**ACCIDENT PREVENTION COLOR CODING**

<b>COLOR</b>	<b>PURPOSE</b>
Red	Red shall be the color used for identifying dangerous conditions, emergency controls, fire detection equipment and fire suppression systems, and containers of flammable liquids.
Orange	Orange shall be the color used for designating dangerous parts of machines and energized equipment.
Yellow	Yellow shall be the color for designating conditions requiring caution, marking dangerous chemicals, marking physical hazards, and markings for ionizing radiation.
Green	Green shall be the color for designating safety equipment and operator devices and the location of first-aid and safety equipment (other than firefighting equipment).
Blue	Blue shall be the color used for designating information of a non-safety nature.
Purple	Purple shall be the color used to designate ionizing radiation hazards.

**TABLE 8-3**  
**IDENTIFICATION OF PIPING SYSTEMS**

<b>Outside diameter of pipe or covering</b>	<b>Length of color field "A"</b>	<b>Size of letters "B"</b>
3/4 to 1 1/4 inches	8 inches	1/2 inch
1 1/2 to 2 inches	8 inches	3/4 inch
2 1/2 to 6 inches	12 inches	1 1/4 inch
8 to 10 inches	24 inches	2 1/2 inch
over 10 inches	32 inches	2 1/2 inch



FIGURE 8-4

RADIO FREQUENCY WARNING SYMBOL



D = scaling unit

Lettering: ratio of letter height to thickness of letter lines

Upper triangle: 5 to 1 = large

6 to 1 = medium

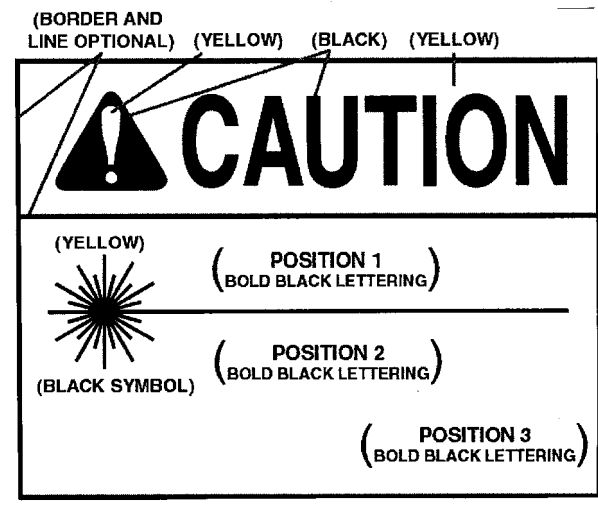
Lower triangle: 4 to 1 = small

6 to 1 = medium

Symbol is square, triangles are right-angle isosceles

**FIGURE 8-5**

**LASER CAUTION SIGN**



**FIGURE 8-6**

**LASER WARNING SIGN**

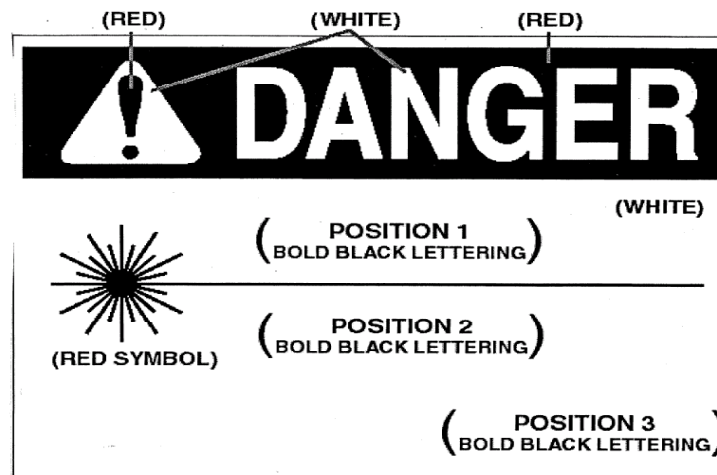
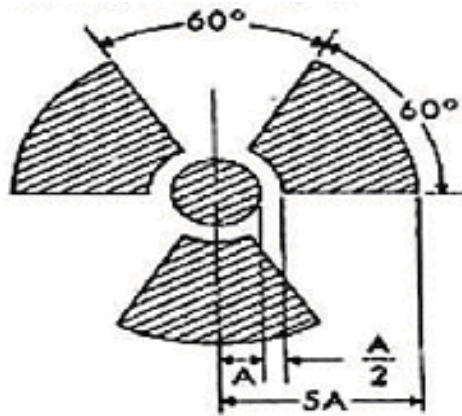


FIGURE 8-7

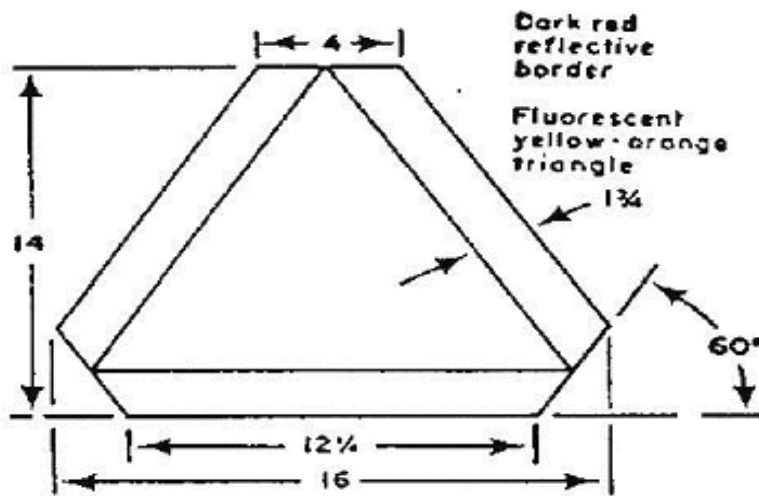
RADIOLOGICAL WARNING SYMBOL



1. Cross-hatched area is to be magenta or purple.
2. Background is to be yellow.

FIGURE 8-8

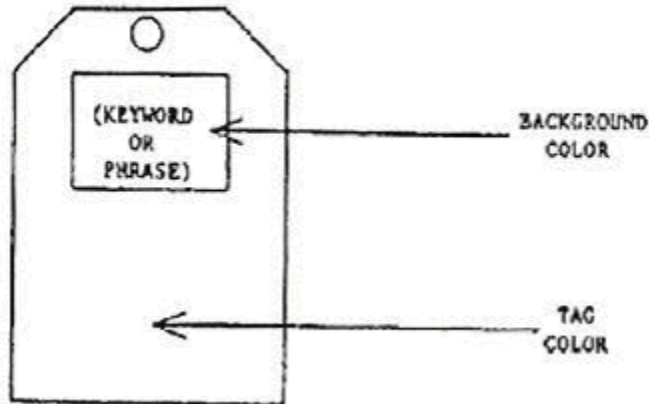
SLOW-MOVING VEHICLE EMBLEM



NOTE: All dimensions are in inches

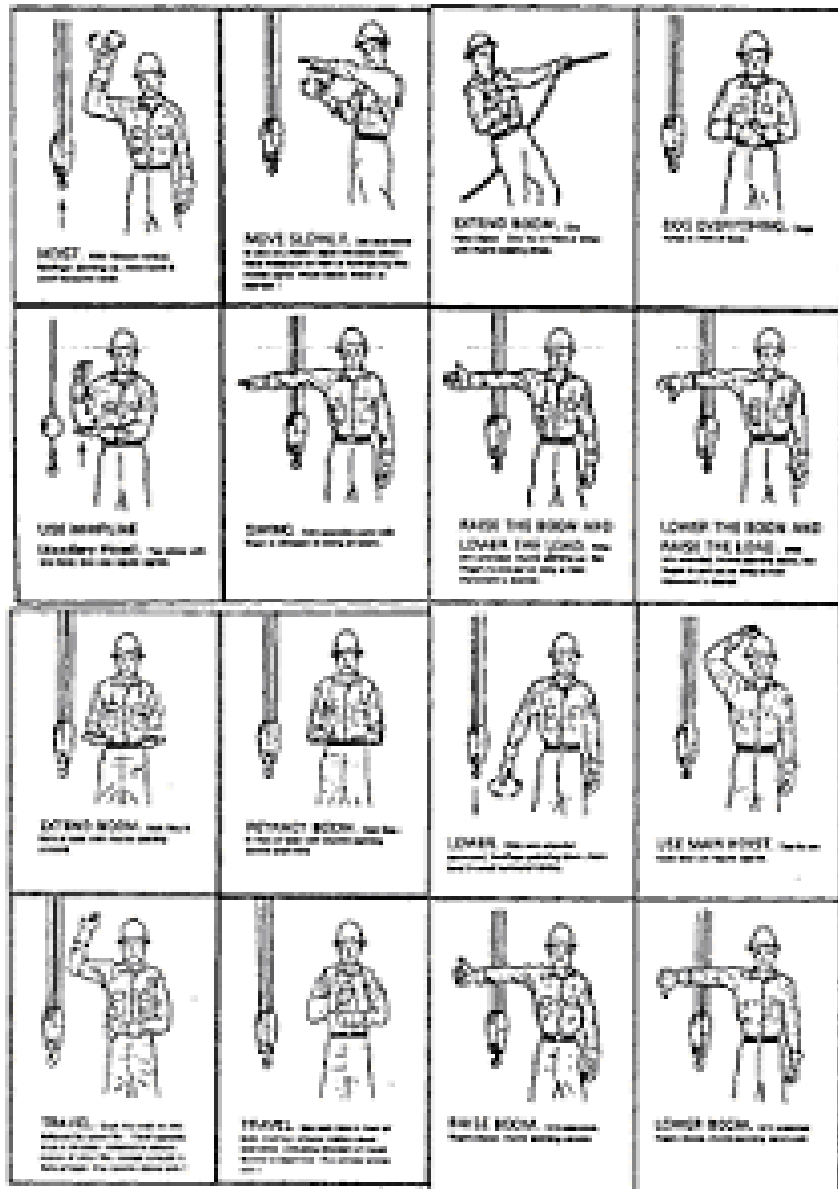
EM 385-1-1  
3 Nov 03

**FIGURE 8-9**  
**ACCIDENT PREVENTION TAGS**

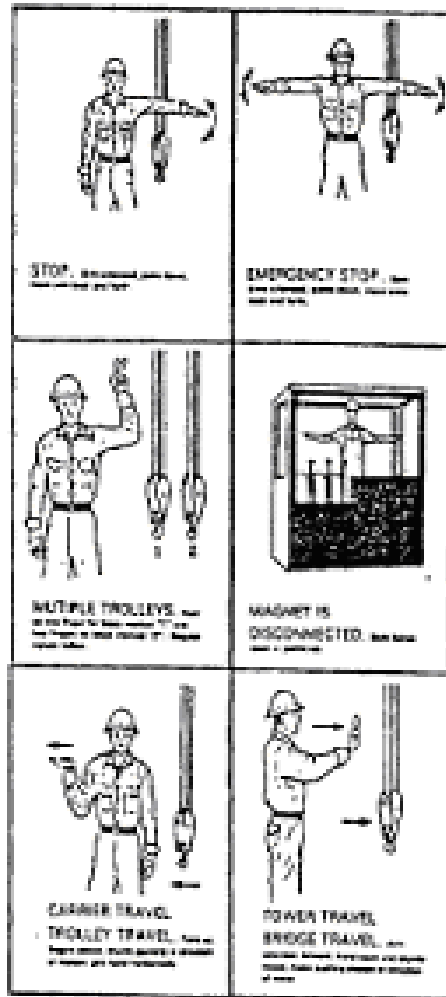


Keyword/Phrase	Keyword/Phrase Print Color	Background Color	Tag Color
"DANGER"	White in red oval	Black	White
"CAUTION"	Yellow	Black	Yellow
"DO NOT OPERATE"	White	Red	White
"OUT OF ORDER"	White	Black	White
"DO NOT USE"			
Informational message or inspection	Black or green	N/A	Green or white White or black

**FIGURE 8-10**  
**CRANE HAND SIGNALS**



**FIGURE 8-10, continued**  
**CRANE HAND SIGNALS**



NOTE: Crane signals taken from ANSI/ASME B30 series standards with permission of ASME.



FIGURE 8-11

HELICOPTER HAND SIGNALS

