

Further Development of Warnings for Automotive Lifts

Marie Williams
Paul Green
Gretchen Paelke

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16. Abstract: Based on previous UMTRI research on warnings and the human factors literature, warning design guidelines were written for automotive lifts (garage hoists). They included general guidelines (2), legibility rules (6) understandability rules (12), and text rules (5). In addition to the rules, information was provided on the literature supporting each rule as well as comments on how the rules should be applied. Using these guidelines, both graphics and associated text were developed for 56 new warning labels based on draft labels from Safety Management Consultants, Inc. They were for four lift types (Hinged frame-engaging, In-ground, Surface-mounted wheel-engaging, and Movable wheel-engaging). In addition, 16 warnings obtained from previous UMTRI research on two-post surface-mounted lifts were re-examined. Warnings included "Do not operate a damaged lift," "Avoid excessive rocking of vehicle while on lift," "Do not remove oil fill plug before reading manufacturer's manuals," and so forth.			
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INTRODUCTION

This is the second part of a two-part study. In the first part (Eberhard and Green, 1989) warning labels were developed and tested for two-post surface-mounted automotive lifts (popularly referred to as garage hoists). The 14 warnings examined are listed below:

1. Always use safety stands when removing or installing heavy components.
2. Use vehicle manufacturer's lift points.
3. Remain clear of lift when raising or lowering vehicle.
4. Avoid excessive rocking of vehicle while on lift.
5. Clear area if vehicle is in danger of falling.
6. Keep feet clear of lift while lowering.
7. Authorized personnel only in lift area.
8. Lift to be used by trained operator only.
9. Auxiliary adapters may reduce load capacity.
10. Use height extenders when necessary to ensure good contact.
11. Do not exceed weight capacity.
12. Read operating and safety manuals before using lift.
13. Do not operate a damaged lift.
14. Proper maintenance and inspection is necessary for safe operation.

At the beginning of the first study, to get a sense of the problem, six auto mechanics participated in two focus groups. The dialog was recorded on audio tape. Questions were asked about the training of lift users, the frequency and types of injuries lift users experienced, the use of safety equipment, the types of warnings present, the kinds of warnings needed, and general lift design problems.

In the second phase of the first study, 24 mechanics were interviewed at their place of employment, usually one at a time. They were given descriptions of each of the 14 warnings, drew pictures to represent them, and then wrote down text to go along with the picture. Based on these data, 2 to 5 candidate pictures to represent each warning were developed along with several suggestions for the accompanying text.

In the final phase of the first study, 50 mechanics wrote down what they thought the candidate pictures meant, ranked them from best to worst, and selected the most informative text message for each warning. Based on these results, 14 standard warnings were developed.

The purpose of this second part of the project was to conduct a human factors review (applying knowledge gained in the first study) of the 56 new labels developed by Safety Management Consultants Inc. for the 4 additional lift types.

Also, the original warning labels were reviewed and revised to make them consistent. Most of the additional warnings are hazards that were examined in the first part of the project, though the lift design is different. They are extensions or modifications of those developed for two-post surface-mounted lifts and for that reason no additional

experimental work was conducted. See Table 1 for a complete list of the warning labels evaluated.

Table 1. Warning Labels Examined

	Two-post surface-mounted				
	Hinged frame-engaging				
	In-ground				
	Surface-mounted wheel-engaging				
	Movable wheel-engaging				
WARNINGS					
All lifting forks					X
Avoid excessive rocking	X	X	X		
Be sure intended lifts					X
Chock wheel			X	X	
Clear area if falling	X	X	X	X	X
Do not drive over cables					X
Do not override controls	A		X	X	
Do not remove oil fill plug			X		
Keep clear pinch points		X		X	
Keep feet clear of lift	X	X	X	X	X
Locate lift on level surface					X
Position center of gravity	A	X	X		
Remain clear of lift	X	X	X	X	X
Use lift locking device			X		
CAUTIONS					
Always use safety stands	X	X	X		
Authorized personnel	X	X	X	X	X
Auxiliary adapters	X		X		
Check for overhead					X
Lift to be used by trained	X	X	X	X	X
Use height extenders	X		X		
Use vehicle lift points	X	X	X		
When moving lift avoid tipping					X
SAFETY INSTRUCTIONS					
Do not operate damaged	X	X	X	X	X
Proper maintenance	X	X	X	X	X
Read operating manuals	X	X	X	X	X

key: X = existed at start of project, A = added during project

UMTRI was responsible for bringing them in line with the results of the previous research (Eberhard and Green, 1989). To assist in the modification of the new warning labels, a set of human factors design guidelines was created summarizing the previous research. The initial guidelines were supplemented during label evaluation to clarify particular design decisions and to keep the symbol set consistent.

The guidelines consist of a global goal, 2 general guidelines, 6 legibility rules, 12 understandability rules, and 5 rules for text. In each case comments identify exceptions, implementation procedures, and examples from the set developed. The FMC manual (FMC, 1985), a commonly cited source for warning labels, was followed as well. The extent to which the FMC manual is supported by research is unknown.

AUTOMOTIVE LIFT WARNING DESIGN GUIDELINES

Global Goal:

The intent is to design warnings that can be read by lift users under actual viewing conditions and encourage users to comply with the warnings. This implies that the warnings should be legible, discriminable, and understandable.

Implementation: Decisions about warnings should be made rationally relying primarily on specific data for lift symbols, secondarily on general human factors data, and, if both are lacking, on expert opinion.

General Guidelines for Warnings

General Guideline 1 - Legibility: Legibility considerations take precedence over understandability (e.g., coding rules).

Comment: Images must first be perceived before they can be understood.

General Guideline 2 - Consistency: Be consistent.

Comment: Since symbols are viewed as a language, the same graphic element should be used for all warnings for the same idea. For example, for the "run away" warning, the same human figure should be used, though re-sizing may be required for the image to fit within the space available. The graphic elements used for vehicles (car, van, pick up truck, transit bus) and lift operators are in the appendix.

The text and warning should agree. If the text says "do not," then the warning image should show what not to do, or the negative consequences of doing it.

Consistency also implies that the rules should be applied in the same manner for all warnings of a set.

Legibility Rules

Legibility Rule 1 - Text Size: Text should be 0.2 inches high or larger.

Comment: If lift operators are to follow warning messages, they must be able to read them. There is a vast body of human factors literature concerning recommended character size. The Bond Rule (Smith, 1979) is the most general and covers poor viewing conditions and less than normal (20/20) viewer visual acuity. According to the Bond Rule the height of a character divided by its viewing distance should be greater than or equal to 0.007. If the viewing distance is assumed to be 28 inches, then the height should be about 0.2 inches high ($0.007 \times 28 = 0.196$ inches). While the actual viewing distance changes from task to task, 28 inches is assumed to be the standard panel viewing distance in the human factors literature.

Legibility Rule 2 - Typeface: Use a plain typeface such as Helvetica to maximize legibility.

Comment: The human factors literature (e.g., Cornog and Rose, 1967) shows that within the limits of common variation, altering the typeface has less of an effect than altering size, contrast, or other physical characteristics. Plain typefaces (Helvetica, Geneva, etc.) are more legible than ornate ones (London).

Legibility Rule 3 - Line Widths: All lines and most gaps between lines should be at least 0.02 inches wide.

Comment: What people can discriminate is usually determined by critical details, the smallest features of an object, such as identifying the opening of a Landholt c, or the width of a line (Sanders and McCormick, 1987). For a maximally legible character set the height to stroke width ratio is 6:1 to 8:1. That is, the characters are 6 to 8 times taller than they are thick. For Helvetica the ratio typically is 10:1, depending on the weight of the implementation (light vs. medium vs. bold). Therefore, lines should be 1/10 the height of characters or 0.02 inches wide at a minimum. Objects less than this critical size may be difficult to distinguish from the background. In the case of gaps, images blending may not be critical (for example, the image of the car merging with the lift supporting it).

Legibility Rule 4 - Plan Views: Avoid perspective illustrations.

Comment: The Pictorial Catalog in the FMC Manual does not contain any perspective drawings. This is probably because perspectives take up more space than projections in a single view (so details must be smaller to fit the drawing in a fixed size area). Details are thus harder to see. Also, the single bit representation (no grey scale) makes it harder to show depth, which is critical to understanding a perspective image.

Legibility Rule 5 - Details: If fine details are critical to an image, they should be exaggerated.

Comment: It is important to think of the graphics as caricatures rather than pictures and hence key elements should be given emphasis. For example, the pipes on the self-closing controls warning are not identifiable if the pipe flanges are drawn to scale.

Legibility Rule 6 - Discriminability: Make sure that objects are discriminable.

Comment: People may not respond to a message as desired if they mistake one object for another. For example, the lift operator is shown wearing a cap so he or she looks different from a customer or other non-operators.

Understandability Rules

Understandability Rule 1 - Lift Views: Except for the lift point warning, use side views of lifts.

Comment: In Eberhard and Green (1989), lift users were far more likely to draw side views (elevations) of warning scenarios, and preferred candidates showing side views over front views. The only exception was the pickup point warning where a bottom view was preferred.

Understandability Rule 2 - Slashing: Use slashes to communicate "do not."

To keep the text and graphic compatible (a general rule) use slashes as shown below. If only part of the image is wrong, then circle the problem area and put a slash through it. Sometimes deciding if an image communicates a negative idea can be a judgement call. For example, for the rocking message, it is not clear if rocking or excessive rocking (the warning) is being shown. Since some rocking is common and useful, a slash was not used.

Text Says	Graphic Shows	
	What to do	What not to do
Do not	no slash	slash
Do (keep clear, avoid, etc.)	no slash	slash

Where slashing is concerned, the graphic standing alone is most important. The text should be tailored to match the graphic as indicated in the following three steps:

1. Design the graphic so it can function alone.
2. Look at the graphic, what does it say?
3. Make the wording consistent with the graphic.

Finally, there is a tendency for antecedents of problems to warrant slashes, but not consequences of problems. If the slash obscures a key part of the image, break the slash, re-size it, or move it as stipulated by General Guideline #1 (Legibility over understandability). (See Dewar, 1976.)

When the consequences are shown and they are blatant (hand or foot crush), a slash may not be required. If the graphic shows both a negative antecedent and a consequence, such as for the oil fill plug warning (the impact wrench is the antecedent while the flying oil plug is the consequence) the slashing rules for the antecedent apply. Radiating lines (for collisions) are an indicator of consequences and draw attention to that part of the graphic.

Of the rules in the set, this is the most complex and open for interpretation. While the authors have tried to consider all of the exceptions, others may still exist.

Understandability Rule 3 - Arrows: Use arrows and circles to direct attention to key details.

Comment: In some cases a large area must be presented to provide context so that a detail (often the focus of the warning) can be understood. To avoid overlooking the detail, point to it. There are no data linking the size of a detail to performance (warning compliance, the time to match a graphic with text, etc.) but the authors believe directing attention to details is beneficial.

Understandability Rule 4 - Arrow Proliferation: Where arrows or circles are used to highlight details, there should be no more than four.

Comment: There is no data to support this, but in exploring variations of the lift point warning, it became clear that adding too many arrows made the drawing more complex and more difficult to understand. It is not clear if the maximum should be three or four.

Understandability Rule 5 - Motion: Use arrows to show linear or circular motion, curved lines to show shaking/teetering.

Comment: Information on depicting continuous motion appears in Easterby's research (Easterby, 1966). The convention recommended here is widely followed but difficult to document. In brief, arrows should be thin to emphasize directionality but wide enough so they can be seen. They also tend to be oriented vertically or horizontally. Short curved lines indicate where the corner of an unstable object was and usually appear near points with the greatest velocity.

Understandability Rule 6 - Vehicle Type: Where a problem could occur with multiple vehicles, show the vehicle for which it is most likely to occur.

Comment: There are no data to support this rule, only opinion. For example, if a problem for a particular lift is mostly with buses, then it makes sense to show a bus, not a generic large vehicle. If shown generically, then the common warning may be missed. A drawback of this rule is that users may not generalize the warning.

Understandability Rule 7 - Arrow Discriminability: Make arrows for motion discriminable from those used for highlighting.

Explanation: Arrows to highlight should have shorter and fatter heads and shafts. The authors' opinion is that the motion arrowheads should be as thin as possible and the highlighting arrows as fat as possible and still retain their identity. Based on opinion, relative shaft widths of at least 2:1 have been used in this set to assure discriminability.

Exception: If there is no room for a long arrow, make it short. The general rule is legibility takes precedence over understandability.

Understandability Rule 8 - Causation: When arrows show causation, the image sequence should be left to right and top to bottom.

Comment: This is so that the logical flow matches the reading pattern. The image instructing operators to run away if a car starts to fall was constructed accordingly.

Understandability Rule 9 - Postures: Body postures of people should emphasize the motions likely to occur.

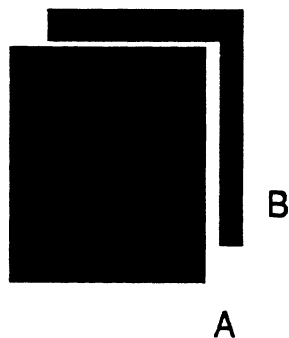
Comment: In the oil plug warning, the head position is exaggerated to show the plug impact. In early versions of the unauthorized users warning, the graphic was misinterpreted as "no dancing under lift," because of the arm positions of the unauthorized persons beneath the lift (Eberhard and Green, 1989).

Understandability Rule 10 - Personnel Depiction: Distinguish the lift operator from other personnel.

Comment: Some efforts were made by participants in the first experiment of this project (Eberhard and Green, 1989) to distinguish between lift operators and visitors. A hat with an enlarged bill and sometimes a badge is used to identify a person as the lift operator. That image should be consistently applied to all graphics (following General Rule #2, be consistent).

Understandability Rule 11 - Depth: Show depth via front to back superposition and gaps between lines.

Comment: In the illustration that follows, A is in front of B. The superposition issue first arose in the design of the safety stands graphic, in particular depicting that the car was between the vertical members.



Understandability Rule 12 - Impact: Show impact using radiating lines from the point or points of contact.

Comment: There should be at least three lines to avoid confusion with the field of view graphic (two lines). Ways of depicting impact were explored by Eberhard and Green (1989) for the foot protection warning.

Text Rules

Text Rule 1 - Verbiage: Use verbiage people prefer.

Example: Eberhard and Green (1989) found people preferred the term safety stands over jack stands.

Text Rule 2 - Message Length: Keep messages short.

Comment: The more complex the expression, the less likely people are to understand it. While the readability literature (Klare, 1963; Williams and Siegel, 1974) emphasizes multiple sentence passages, this point should also hold for simple statements.

Text Rule 3 - Phrasing: Break lines of text across phrase boundaries.

Comment: Splitting lines this way means that readers will not have to regroup them in their head and they will be easier to read (Green and Baker, 1987; Hartley, 1980; Hartley and Trueman, 1981). Grammatically this means keeping adjectives on the same lines as associated nouns, adverbs with verbs, and, where possible, not splitting prepositional phrases.

Example:

Keep clear of pinch
points when lift is
moving.

Should be:

Keep clear
of pinch points
when lift is moving.

Text Rule 4 - Capitalization (Hazard Emphasis): Capitalize words, and then only a key word or words, if the message represents an extremely hazardous situation.

Comment: Text in upper case is more difficult to read than mixed case text and excessive use of upper case will make it less likely, rather than more likely that the message will be communicated.

Text Rule 5 - Capitalization (Verbosity): Capitalize a key word or words if the message is long and the line breaks are suboptimal.

Comment: For long messages it is easy for a key word to be lost. For example, in the case of the oil fill plug message shown below, the key words "Do not," could be forgotten when the end of message is read. This case is worsened by space constraints not allowing proper line breaking. Also since the message is long, it may not be read as carefully, and the basic idea needs to be communicated.

Example:

DO NOT remove oil
fill plug before reading
manufacturer's
manuals.

DEVELOPMENT OF WARNING LABELS

This section describes, in alphabetical order, the recommended warning labels. Associated with each warning are the original graphic and text (from the previous UMTRI study or suggested by Safety Management Consultants, Inc.) and the recommended version. Along with each pair of labels, or set of pairs, is a paragraph describing the changes made, and the reasons and guidelines supporting the changes. The associated lift type (two-post surface-mounted, in-ground, hinged frame-engaging, surface-mounted wheel-engaging, and moveable wheel-engaging) is shown above the label pairs.

Global changes made to all labels include: (1) lines and pertinent gaps were made a minimum of 0.027 inches wide, (2) car, truck, van, and bus graphics were replaced with consistent graphics (shown in the Appendix), (3) hats were put on all operators. The labels produced in the previous study are included in this section and have been updated to be consistent with the new design guidelines.

The warning labels include:

- All lifting forks must properly engage vehicle tires or supports.
- Always use safety stands when removing or installing heavy components.
- Authorized personnel only in lift area.
- Auxiliary adapters may reduce load capacity.
- Avoid excessive rocking of vehicle while on lift.
- Be sure intended lifts are moving together evenly.
- Check for overhead obstructions before raising vehicle.
- Chock wheel to prevent vehicle movement.
- Clear area if vehicle is in danger of falling.
- Do not drive over or pinch electrical cables.
- Do not operate a damaged lift.
- Do not override self-closing lift controls.
- Do not remove oil fill plug before reading manufacturer's manuals.
- Keep clear of pinch points when lift is moving.
- Keep feet clear of lift while lowering.
- Lift to be used by trained operator only.
- Locate lift on firm, level surface, preferably concrete.
- Position vehicle center of gravity over lift.
- Position vehicle with center of gravity midway between adapters.
- Proper maintenance and inspection is necessary for safe operation.
- Read operating and safety manuals before using lift.
- Remain clear of lift when raising or lowering vehicle.
- Use height extenders when necessary to ensure good contact.
- Use lift locking device or 4 stands to support vehicle.
- Use vehicle manufacturer's lift points.
- When moving lift, be careful to avoid tipping.

All lifting forks must properly engage vehicle tires or supports

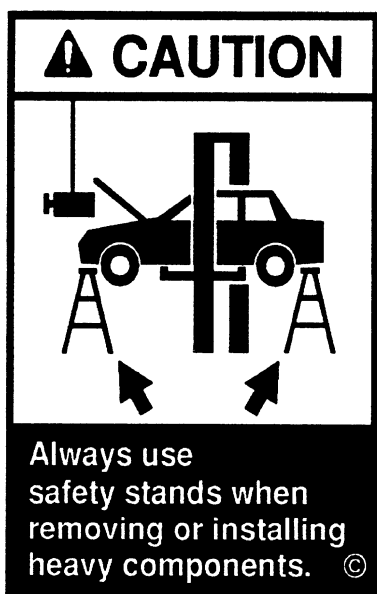
Movable wheel-engaging



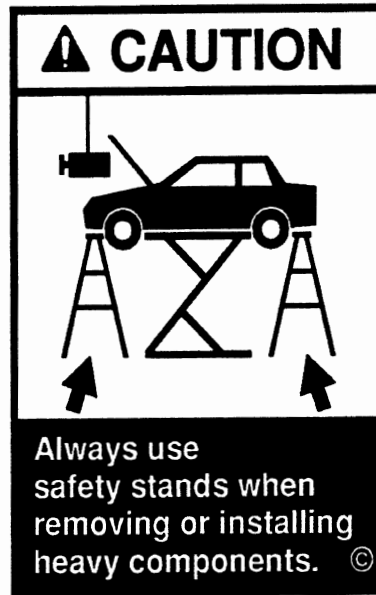
The local slash obscured the detail of the improperly engaged tire. Also, the detail of the improperly engaged tire was too small to see, and was enlarged at the expense of pointing out the properly engaged tire. The local slash is used in accordance with Understandability Rule #2 - Slashing, since the position of the tire is the only negative part of the picture.

Always use safety stands when removing or installing heavy components

Two-post surface-mounted



Hinged frame-engaging



In-ground



The arrowheads were widened (Understandability Rule #7- Arrow Discriminability), to indicate important graphic elements. The engine shape was made consistent for all graphics (General Guideline #2 - Consistency). The message was rearranged for clarity (Text Rule #3 - Phrasing).

Authorized personnel only in lift area

Two-post surface-mounted



Hinged frame-engaging



In-ground



Surface-mounted wheel-engaging



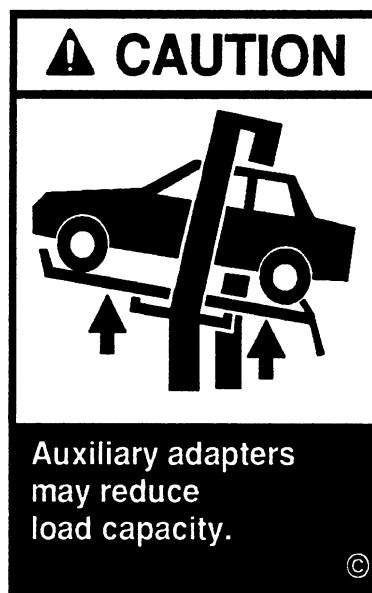
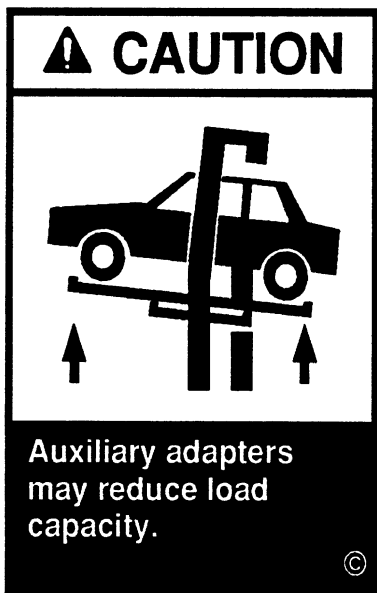
Movable wheel-engaging



The graphic of the slashed family was made large enough to distinguish. The graphic space available was filled more in accordance with FMC Cropping Instruction #1.

Auxiliary adapters may reduce load capacity

Two-post surface-mounted



In-ground



The arrows highlighting the adapter are now wide (Understandability Rule #7 - Arrow Discriminability). The auxiliary adapters now have ramps and chocks. The lifts are more obviously deforming, indicating consequences. No slash is needed since the picture indicates consequences (Understandability Rule #2 - Slashing). The text line breaks were rearranged for clarity (Text Rule #3 - Phrasing).

Avoid excessive rocking of vehicle while on lift

Two-post surface-mounted



Hinged frame-engaging



In-ground



The global slash was removed from all versions of this warning since some rocking of vehicles is appropriate, a global slash would imply no rocking is allowed at all. A cap was added to the mechanic (Understandability Rule #10 - Personnel Depiction).

Be sure intended lifts are moving together evenly

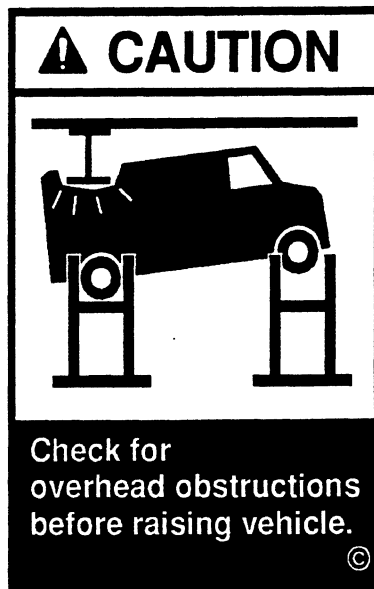
Movable wheel-engaging



A global slash was added (Understandability Rule #2 - Slashing), and motion lines were added (Understandability Rule #5 - Motion). The graphic was enlarged slightly in accordance with the FMC Cropping Instruction #1.

Check for overhead obstructions before raising vehicle

Movable wheel-engaging



This graphic matches the one on the "Keep feet clear of lift while lowering" label. The graphic depicts consequences and does not warrant a slash (Understandability Rule #2 - Slashing). The ceiling was added for clarity of the "I" beam.

Chock wheel to prevent vehicle movement

In-ground
Surface-mounted wheel-engaging



The arrows were widened (Understandability Rule #7 - Arrow Discriminability), and the ramp and truck roof were thickened (Legibility Rule #3 - Line Widths). The text line breaks were changed for clarity (Text Rule #3 - Phrasing).

Clear area if vehicle is in danger of falling

Two-post surface-mounted



Hinged frame-engaging



In-ground



Surface-mounted wheel-engaging



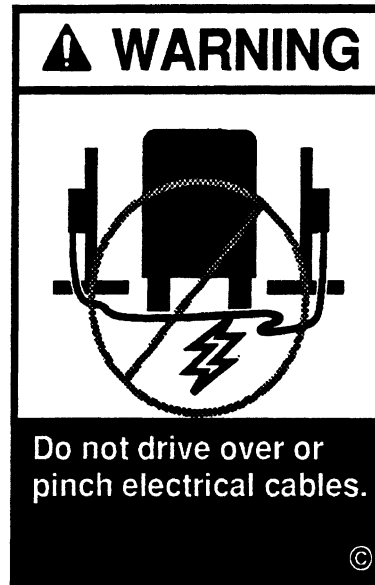
Movable wheel-engaging



These graphics represent causation from left to right: if the vehicle is falling then clear the area. The text on the label is not in this order since the words "clear area" are the most important idea of the message. If the text message was longer, it may have been helpful to capitalize the words "clear area."

Do not drive over or pinch electrical cables

Movable wheel-engaging

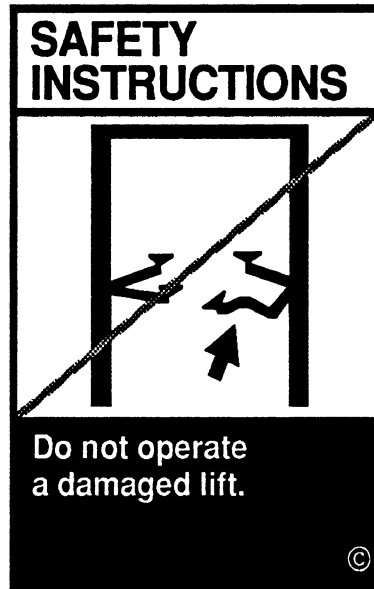


The line width of the cables was increased (Legibility Rule #3 - Line Widths). An electrical bolt was added to indicate consequences and to reinforce that the cable is electrical and has been damaged (which helps the graphic stand alone). This warning

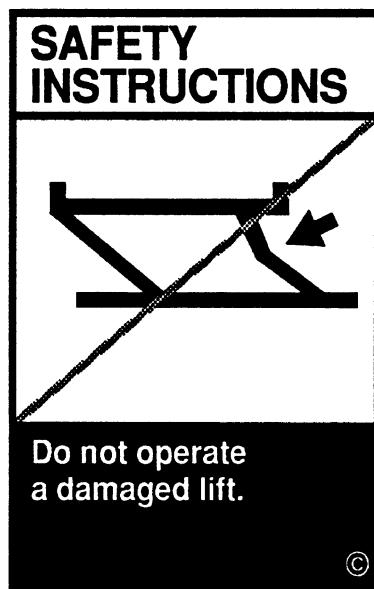
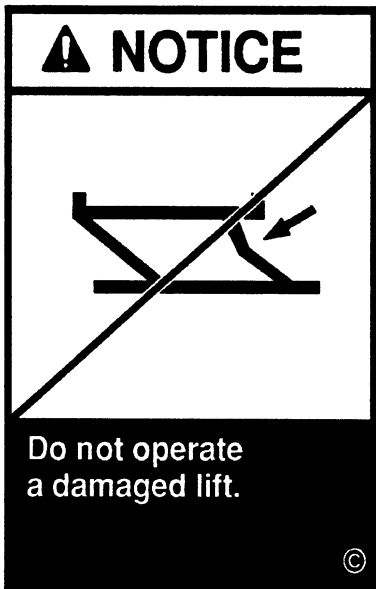
is similar to "Do not remove oil fill plug before reading manufacturer's manuals" in that it depicts consequences and antecedents. The antecedent in this case is the vehicle driving over the cable.

Do not operate a damaged lift

Two-post surface-mounted



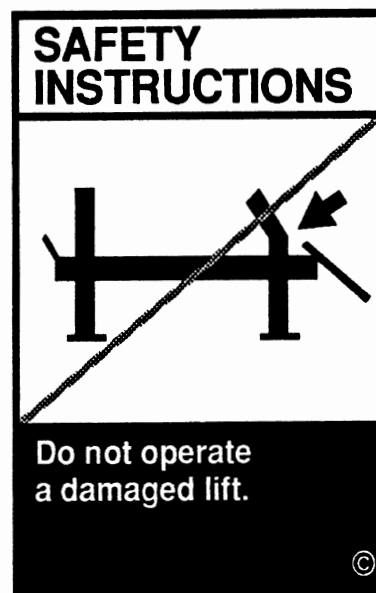
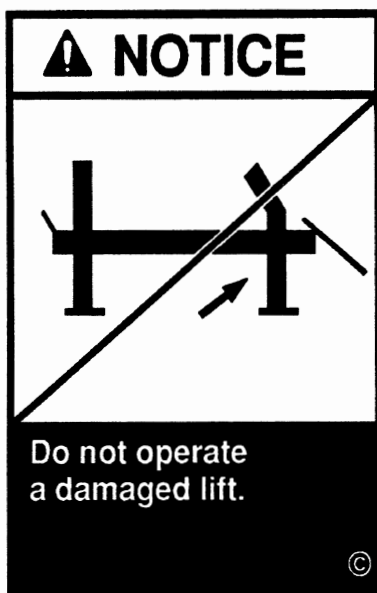
Hinged frame-engaging



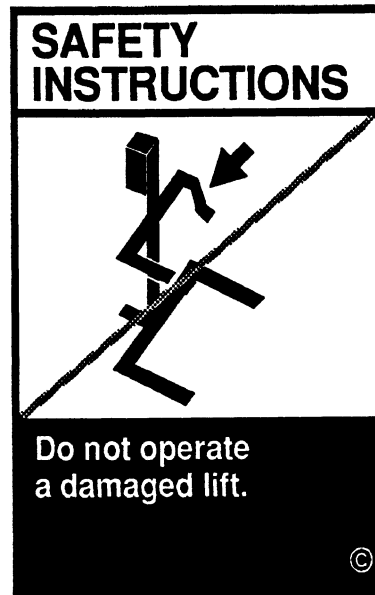
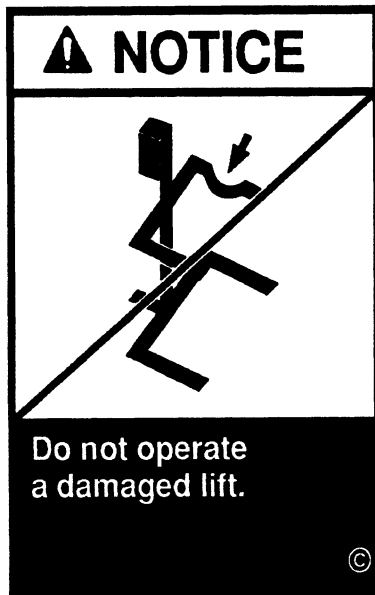
In-ground



Surface-mounted wheel-engaging



Movable wheel-engaging



The label type was changed to "Safety Instructions" for consistency with FMC label types. The lifts in this set were enlarged for clarity and the arrows were widened (Understandability Rule #7 - Arrow Discriminability). The damage on the movable wheel-engaging was altered to make it more likely. The label type was changed for consistency with FMC label types.

Do not override self-closing lift controls

Two-post surface-mounted



In-ground



Surface-mounted wheel-engaging



On the in-ground lift warning, only half of the car and lift are shown to decrease the complexity of the image without losing the context. The local slash was enlarged to keep the slash from obscuring the details of the controls and to make it consistent with the surface-mounted wheel-engaging warning.

The wrenches in all graphics were enlarged to increase their legibility.

Do not remove oil fill plug before reading manufacturer's manuals

In-ground



The fill plug was made non-perspective, (Legibility Rule #4 - Plan View), was given more motion, and was made to do damage. The perspective of the floor detail was shifted to a less complex flat view. The slash is localized on the impact wrench since that is part of the causation, while the rest of the graphic depicts consequences (Understandability Rule #2 - Slashing). The leg detail was modified to clarify the body position (Understandability Rule #11 - Depth). "Do not" was changed to all caps to emphasize compliance with the warning (Text Rules #4 and #5).

Keep clear of pinch points when lift is moving

Hinged frame-engaging
Surface-mounted wheel-engaging



The graphic was enlarged to show the detail of the pinching action, along with impact lines (Understandability Rule #12 - Impact), which makes this warning consistent with the "Keep feet clear of lift while lowering" warning. The text line breaks were changed for clarity (Text Rule #3 - Phrasing).

Keep feet clear of lift while lowering

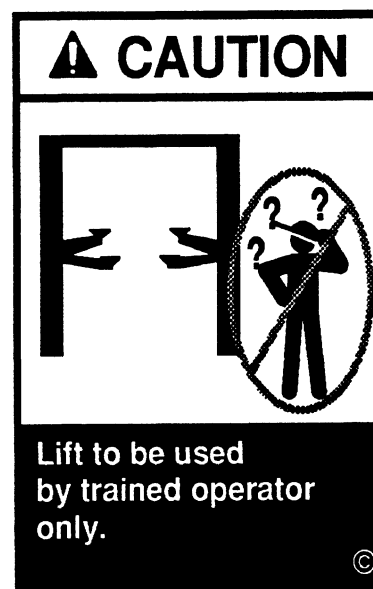
Two-post surface-mounted
Hinged frame-engaging
In-ground
Surface-mounted wheel-engaging
Movable wheel-engaging



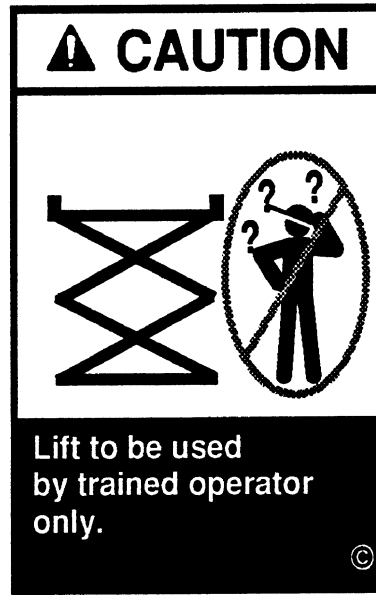
The label was changed from caution to warning since it represents severe injury and for consistency with the "Keep clear of pinch points when lift is moving" label. The lowering lift was made generic for use with all lift types.

Lift to be used by trained operator only

Two-post surface-mounted



Hinged frame-engaging



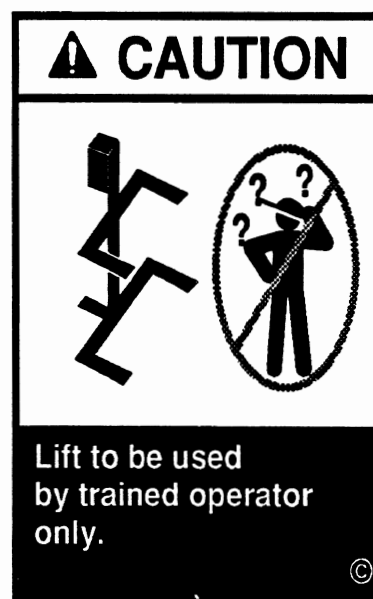
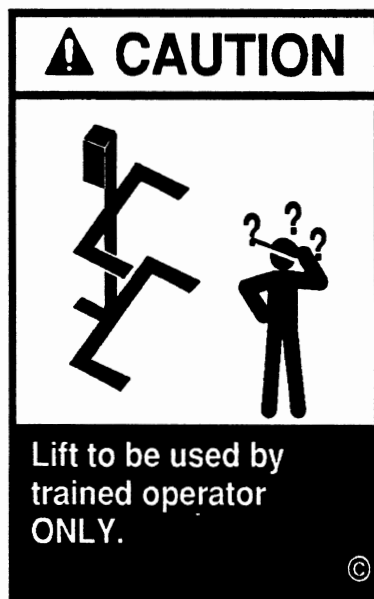
In-ground



Surface-mounted wheel-engaging



Movable wheel-engaging



The confused operator was slashed to match the text message, (Understandability Rule #2 - Slashing). The word "only" was made lower case to eliminate undue emphasis (Text Rules #4 and #5 - Capitalization).

Locate lift on firm, level surface, preferably concrete

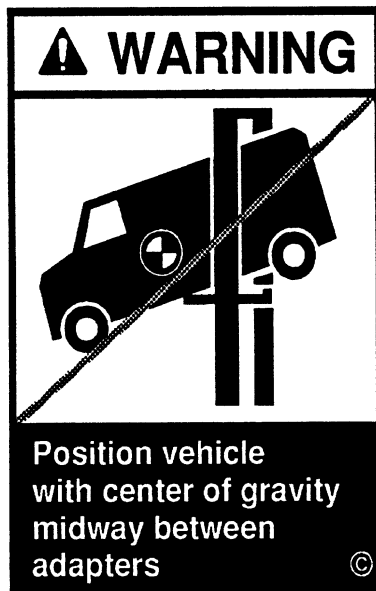
Movable wheel-engaging



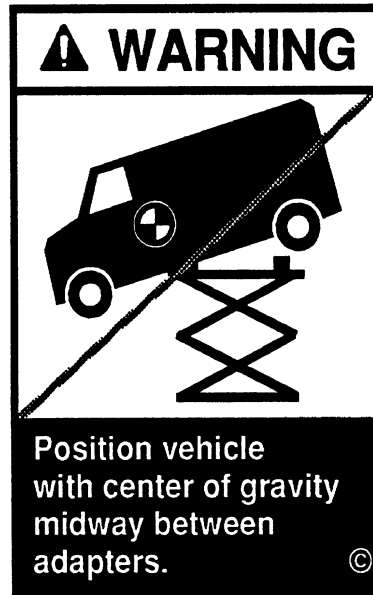
The lift base was enlarged to better show the detail of the uneven ground causing the tipping, and to help keep the slash from obscuring the detail.

Position vehicle center of gravity over lift

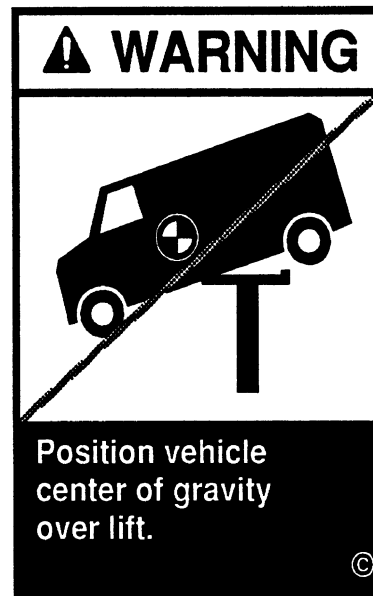
Two-post surface-mounted



Hinged frame-engaging



In-ground

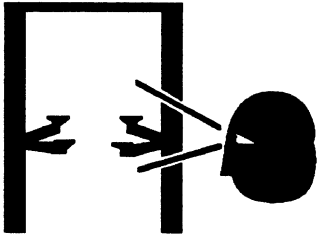


The van was tilted toward the engine to represent the more likely center of gravity point of an unloaded van. The center of gravity symbol was enlarged to improve legibility. The text on the two-post surface-mount and the hinged frame-engaging was modified for clarity in consultation with J. Terrence Grisim of Safety Management Consultants, Inc.

Proper maintenance and inspection is necessary for safe operation

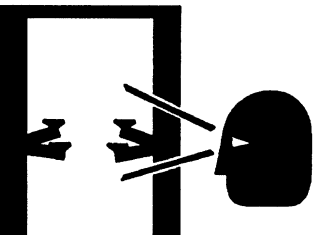
Two-post surface-mounted

⚠ NOTICE



Proper maintenance and inspection is necessary for safe operation. ©

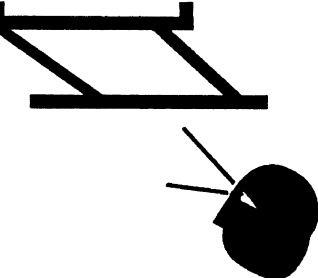
SAFETY INSTRUCTIONS



Proper maintenance and inspection is necessary for safe operation. ©

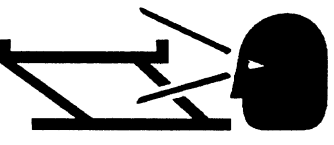
Hinged frame-engaging

⚠ NOTICE



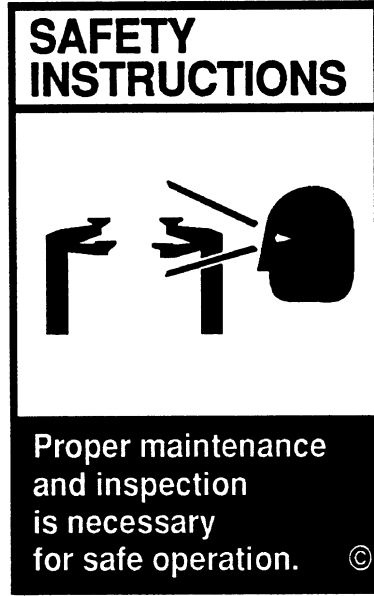
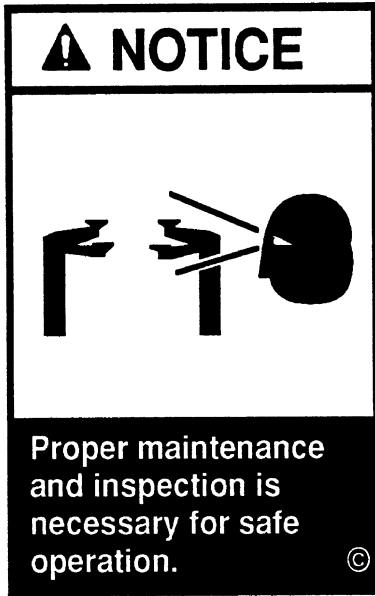
Proper maintenance and inspection is necessary for safe operation. ©

SAFETY INSTRUCTIONS

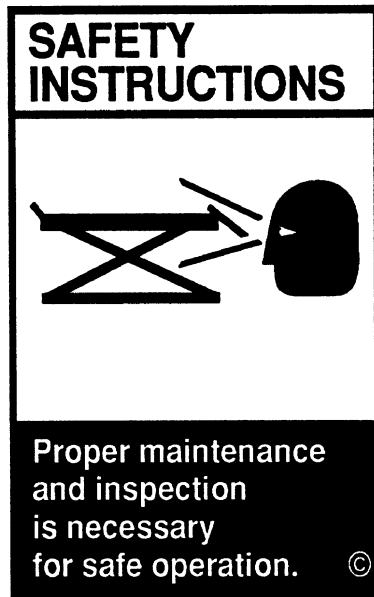
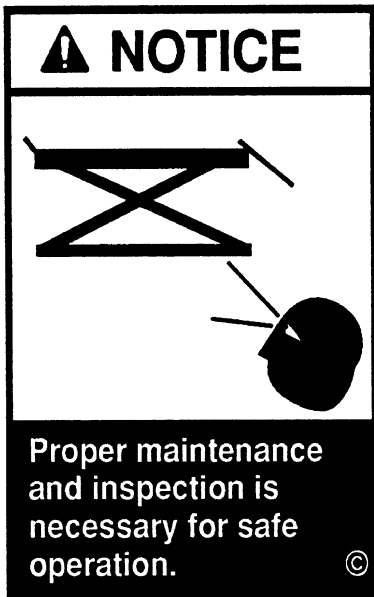


Proper maintenance and inspection is necessary for safe operation. ©

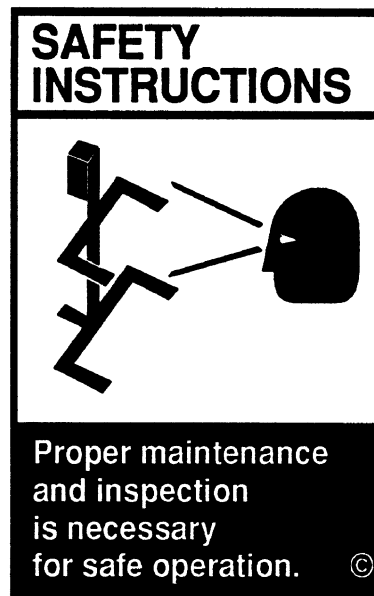
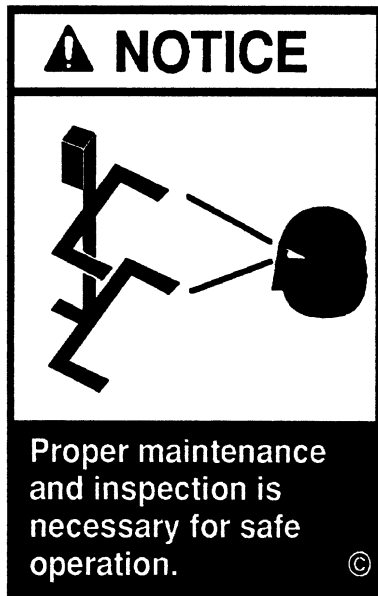
In-ground



Surface-mounted wheel-engaging



Movable wheel-engaging



The label type was changed for consistency with FMC label types. The head was modified to match the FMC profile head. The text line breaks were changed to enhance readability (Text Rule #3 - Phrasing).

Read operating and safety manuals before using lift

- Two-post surface-mounted
- Hinged frame-engaging
- In-ground
- Surface-mounted wheel-engaging
- Movable wheel-engaging



The label type was changed for consistency with FMC label types.

Remain clear of lift when raising or lowering vehicle

Two-post surface-mounted



Hinged frame-engaging



In-ground



Surface-mounted wheel-engaging



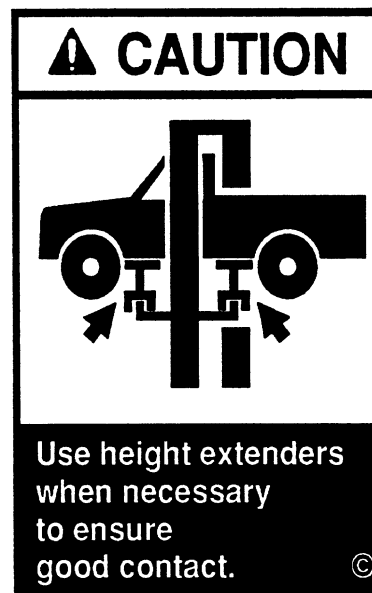
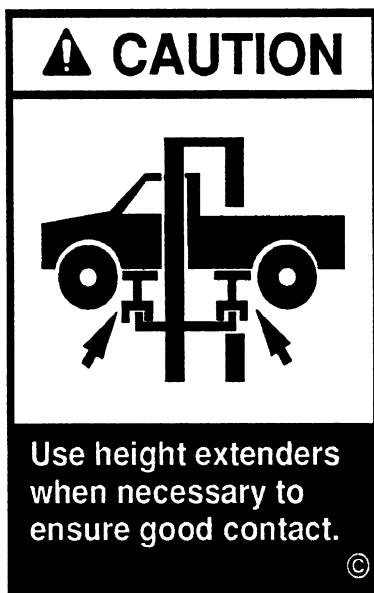
Movable wheel-engaging



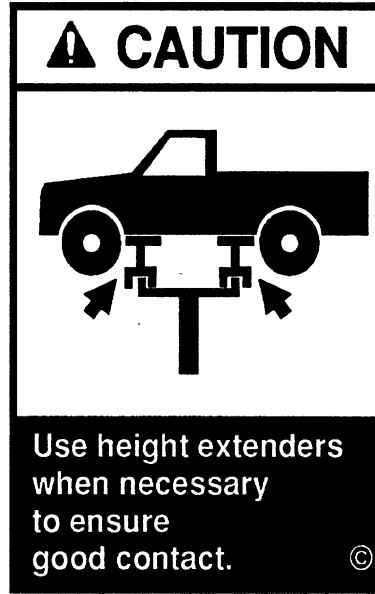
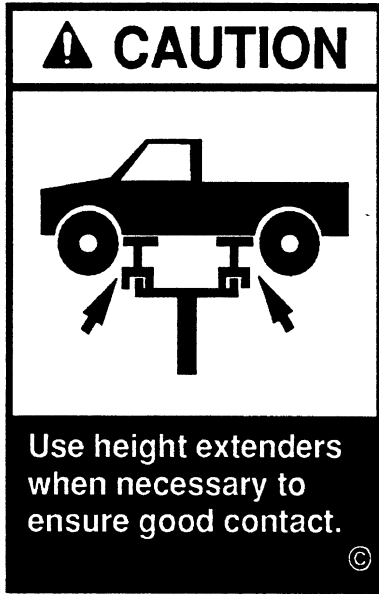
Hats were put on all operators for consistency with the label set (Understandability Rule #10 - Personnel Depiction). The slashed operator was made straight-legged and the position under the lift made consistent for all labels.

Use height extenders when necessary to ensure good contact

Two-post surface-mounted



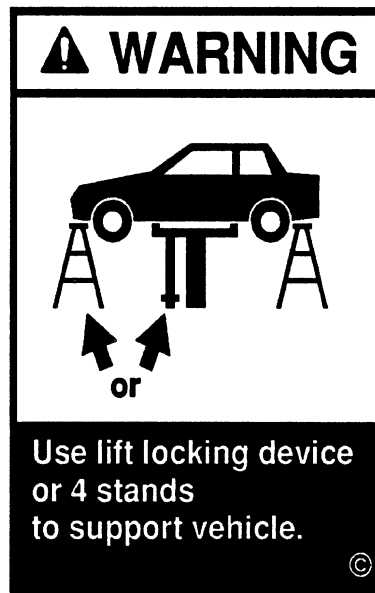
In-ground



The text line breaks were changed to enhance readability (Text Rule #3 - Phrasing). The arrows were widened (Understandability Rule #7 - Arrows).

Use lift locking device or 4 stands to support vehicle

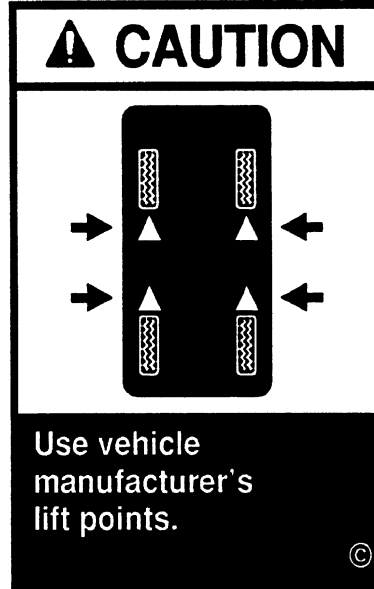
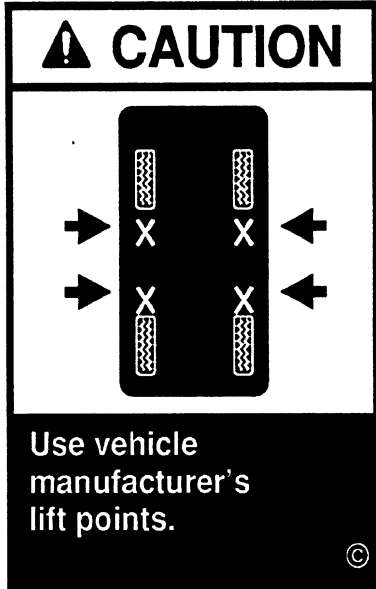
In-ground



The operator image was removed since the context did not require it. The lift locking device was enlarged (Legibility Rule #5 - Details). The arrows were widened (Understandability Rule #7 - Arrow Discriminability).

Use vehicle manufacturer's lift points

Two-post surface-mounted
Hinged frame-engaging
In-ground



One label is now used for all applicable lift types. Changes made were made by ALI graphic artist to be consistent with the forthcoming SAE Recommended Practice J2184 for lift points.

When moving lift, be careful to avoid tipping

Movable wheel-engaging



The radiating lines were replaced with teetering motion lines (Understandability Rule #5 - Motion and General Guideline #2 - Consistency). The bump was changed to a hole, a more likely hazard, and was moved to the front wheels which depicts the initial shaking of the lift. A localized slash was added to indicate which part of the picture is incorrect (Understandability Rule #2 - Slashing). This makes this label consistent with the warning for "Locate lift on firm, level surface, preferably concrete." Slashing the whole picture would imply that pulling the lift around was incorrect.

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Appendix A - Two-Post Surface-Mounted Lifts: Warning Labels

⚠ WARNING



Avoid excessive rocking of vehicle while on lift.

©

⚠ WARNING



Clear area if vehicle is in danger of falling.

©

⚠ WARNING



Do not override self-closing lift controls.

©

⚠ WARNING



Keep feet clear of lift while lowering.

©

⚠ WARNING



Position vehicle with center of gravity midway between adapters.

©

⚠ WARNING



Remain clear of lift when raising or lowering vehicle.

©

Two-Post Surface-Mounted Lifts: Caution Labels

⚠ CAUTION



Always use safety stands when removing or installing heavy components. ©

⚠ CAUTION



Authorized personnel only in lift area. ©

⚠ CAUTION



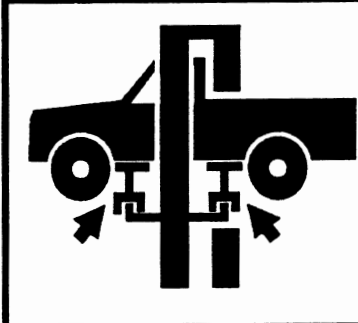
Auxiliary adapters may reduce load capacity. ©

⚠ CAUTION



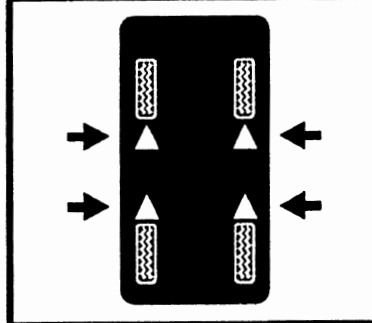
Lift to be used by trained operator only. ©

⚠ CAUTION



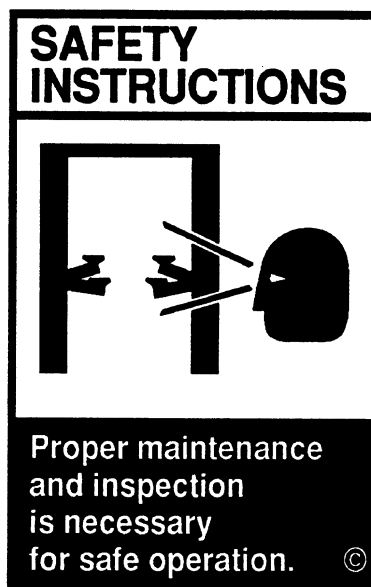
Use height extenders when necessary to ensure good contact. ©

⚠ CAUTION



Use vehicle manufacturer's lift points. ©

Two-Post Surface-Mounted Lifts: Safety Instructions Labels



Hinged Frame-Engaging Lifts: Warning Labels

⚠ WARNING



A silhouette of a car is shown on a scissor lift. A person is standing behind the lift, pushing and pulling the car to rock it. Motion lines around the car indicate its movement.

Avoid excessive rocking of vehicle while on lift.

©

⚠ WARNING



A silhouette of a car is shown on a scissor lift. A person is running away from the lift, indicated by a large arrow pointing in the direction of the person's movement.

Clear area if vehicle is in danger of falling.

©

⚠ WARNING



A silhouette of a hand is shown being pinched between two moving parts of a lift mechanism. Motion lines indicate the direction of movement.

Keep clear of pinch points when lift is moving.

©

⚠ WARNING

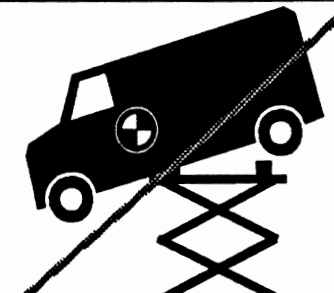


A silhouette of a foot is shown being crushed by a vertical component of a lift. A downward arrow indicates the direction of force.

Keep feet clear of lift while lowering.

©

⚠ WARNING



A silhouette of a car is shown on a scissor lift. A diagonal line passes through the center of the car, representing the center of gravity. The car is tilted, indicating instability.

Position vehicle with center of gravity midway between adapters.

©

⚠ WARNING



A silhouette of a car is shown on a scissor lift. A person is standing next to the lift. A vertical double-headed arrow indicates the height of the lift. A circle with a diagonal line through it surrounds the person, indicating a restricted zone.

Remain clear of lift when raising or lowering vehicle.

©

Hinged Frame-Engaging Lifts: Caution Labels

⚠ CAUTION



Always use safety stands when removing or installing heavy components. ©

⚠ CAUTION



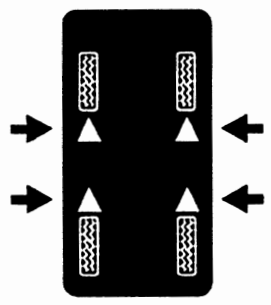
Authorized personnel only in lift area. ©

⚠ CAUTION



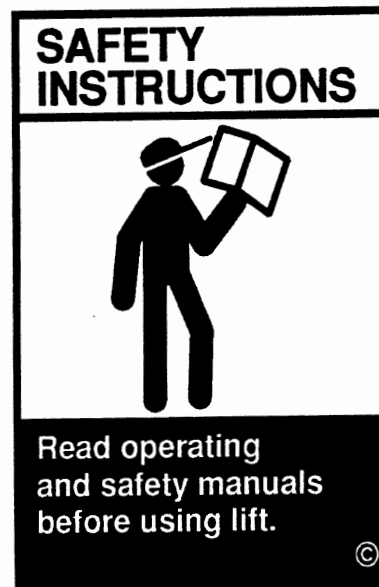
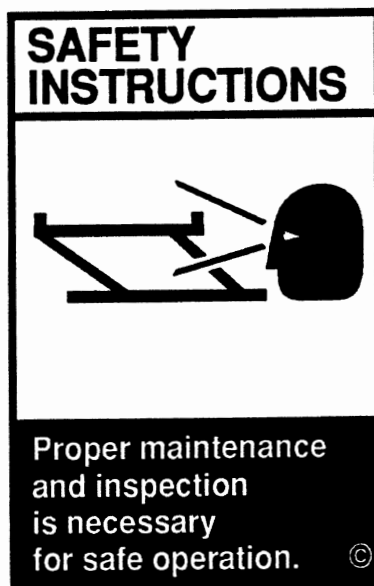
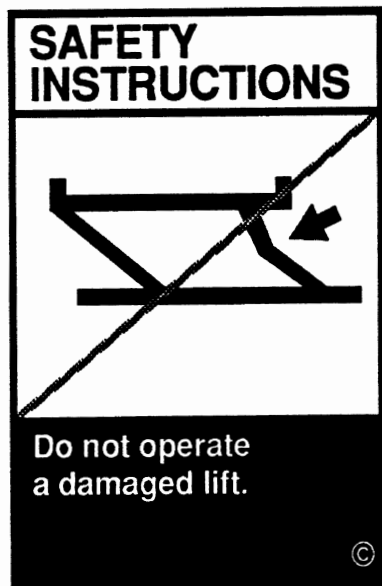
Lift to be used by trained operator only. ©

⚠ CAUTION



Use vehicle manufacturer's lift points. ©

Hinged Frame-Engaging Lifts: Safety Instructions Labels



In-Ground Lifts: Warning Labels

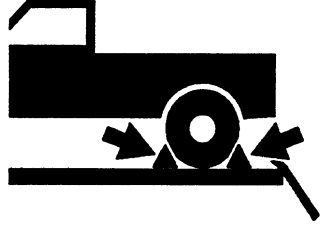
⚠ WARNING



Avoid excessive rocking of vehicle while on lift.

©

⚠ WARNING



Chock wheel to prevent vehicle movement.

©

⚠ WARNING



Clear area if vehicle is in danger of falling.

©

⚠ WARNING



Do not override self-closing lift controls.

©

⚠ WARNING



DO NOT remove oil fill plug before reading manufacturer's manuals.

©

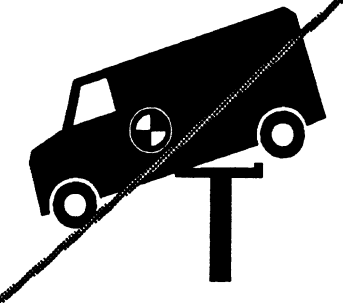
⚠ WARNING



Keep feet clear of lift while lowering.

©

⚠ WARNING



Position vehicle center of gravity over lift.

©

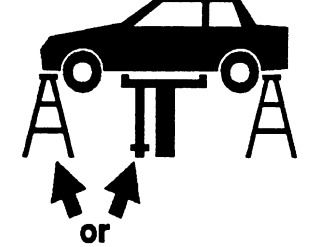
⚠ WARNING



Remain clear of lift when raising or lowering vehicle.

©

⚠ WARNING



Use lift locking device or 4 stands to support vehicle.

©

In-Ground Lifts: Caution Labels

⚠ CAUTION



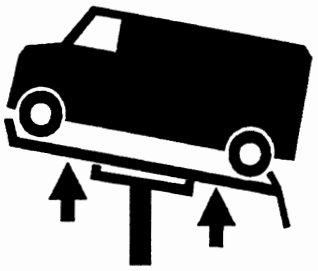
Always use safety stands when removing or installing heavy components. ©

⚠ CAUTION



Authorized personnel only in lift area. ©

⚠ CAUTION



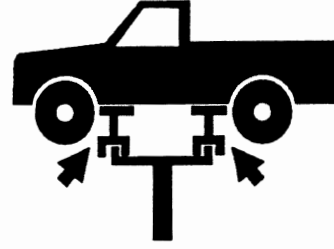
Auxiliary adapters may reduce load capacity. ©

⚠ CAUTION



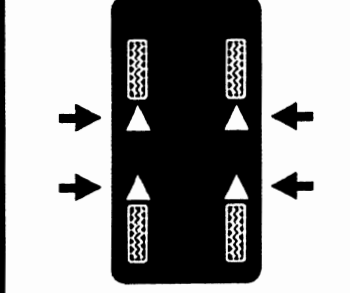
Lift to be used by trained operator only. ©

⚠ CAUTION



Use height extenders when necessary to ensure good contact. ©

⚠ CAUTION



Use vehicle manufacturer's lift points. ©

In-Ground Lifts: Safety Instructions Labels



Surface-Mounted Wheel-Engaging Lifts: Warning Labels

⚠ WARNING



Chock wheel to prevent vehicle movement.

©

⚠ WARNING



Clear area if vehicle is in danger of falling.

©

⚠ WARNING



Do not override self-closing lift controls.

©

⚠ WARNING



Keep clear of pinch points when lift is moving.

©

⚠ WARNING



Keep feet clear of lift while lowering.

©

⚠ WARNING



Remain clear of lift when raising or lowering vehicle.

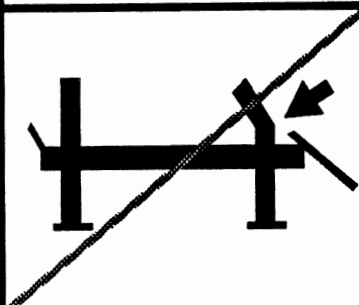
©

Surface-Mounted Wheel-Engaging Lifts: Caution Labels



Surface-Mounted Wheel-Engaging Lifts: Safety Instructions Labels

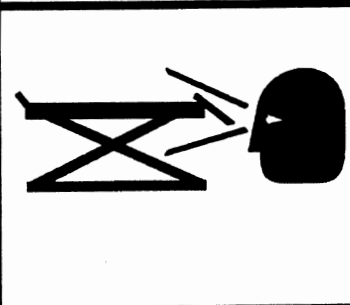
SAFETY INSTRUCTIONS



Do not operate a damaged lift.

©

SAFETY INSTRUCTIONS



Proper maintenance and inspection is necessary for safe operation.

©

SAFETY INSTRUCTIONS



Read operating and safety manuals before using lift.

©

Movable Wheel-Engaging Lifts: Warning Labels

⚠ WARNING



All lifting forks must properly engage vehicle tires or supports.

©

⚠ WARNING



Be sure intended lifts are moving together evenly.

©

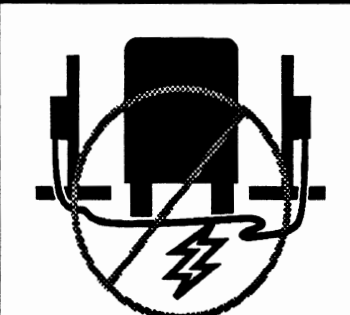
⚠ WARNING



Clear area if vehicle is in danger of falling.

©

⚠ WARNING



Do not drive over or pinch electrical cables.

©

⚠ WARNING



Keep feet clear of lift while lowering.

©

⚠ WARNING



Locate lift on firm, level surface, preferably concrete.

©

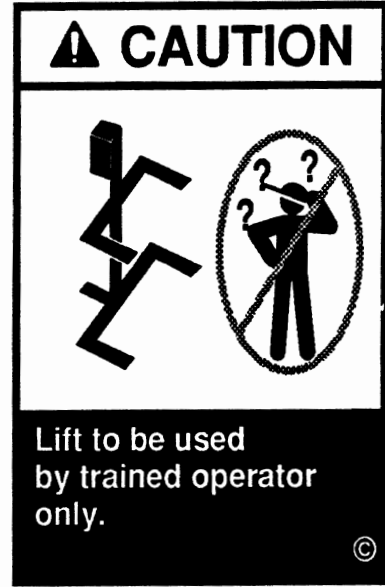
⚠ WARNING



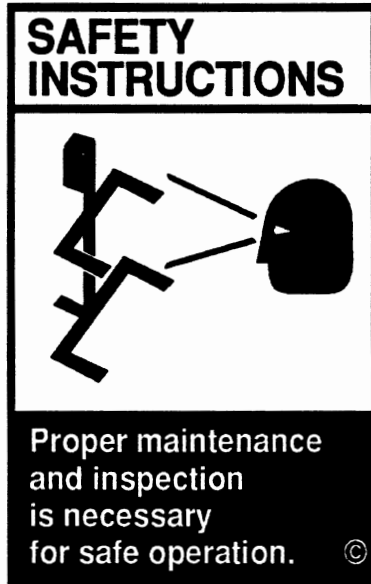
Remain clear of lift when raising or lowering vehicle.

©

Movable Wheel-Engaging Lifts: Caution Labels



Movable Wheel-Engaging Lifts: Safety Instructions Labels



Appendix B - Vehicles and Operators Used

