AUTOMOTIVE LIFTS

COMMERCIAL STANDARD CS142–47

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OF THE TRADE

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COMMERCIAL STANDARD FOR AUTOMOTIVE LIFTS

On July 12, 1946, at the instance of the Automotive Lift Institute, Inc., a proposed Commercial Standard for Automotive Lifts was circulated to a representative cross section of the trade for comment. A draft adjusted in line with that comment was circulated to interested producers, distributors, testing laboratories, and users on March 14, 1947. The trade subsequently accepted and approved the standard shown herein, which includes relatively minor adjustments proposed by the Automotive Lift Institute, Inc., to bring the draft into line with current action by State regulatory authorities.

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[1] Effective July 1, 1947, the Division of Simplified Practice, organized in 1921, and the Division of Trade Standards, organized in 1927, were combined to form the Commodity Standards Division. Since their organization, both of these Divisions have assisted many industries in the development of Simplified Practice Recommendations and Commercial Standards for a wide variety of commodities. A list of previously established Commercial Standards appears herein. A list of effective Simplified Practice Recommendations may be obtained from the Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

AUTOMOTIVE LIFTS
COMMERCIAL STANDARD CS142–47

PURPOSE

1. The purpose of this commercial standard for automotive lifts is to establish minimum standard specifications for hydraulic, hydropneumatic, and mechanically operated automotive lifts, to promote adequacy and safety in construction and operation and to provide a basis for fair competition, for enhanced public confidence, and for identification of automotive lifts conforming hereto.

SCOPE

2. This standard covers definitions and specifications for automotive lifts in rated capacities up to 75,000 pounds, inclusive.

2a. This standard covers minimum specifications for outside installations as well as inside installations.

2b. This standard covers minimum specifications for automotive lifts powered either by compressed air, oil pumps, or electric motors.

DEFINITIONS

3. *Air-oil tank.*—An air-oil tank is a pressure vessel separate from the actuating chamber of the cylinder assembly.

4. *Bolster.*—The bolster is the cross member connecting the load-supporting members (rails or runways) to the lifting means.

5. *Chassis supports.*—Chassis or axle supports are those moveable or stationary adapters for accommodating a free wheel lift to the vehicle.

6. *Chocks, wheel.*—Wheel chocks are stops to prevent the vehicle from rolling off a roll-on type lift. They are of three kinds:

(a) Automatic,
(b) Manual,
(c) Permanent.

7. *Chock, automatic.*—An automatic chock is a wheel stop operated automatically by the raising or lowering of the lift.

8. *Chock, manual.*—A manual chock is a wheel stop positioned by hand.

9. *Chock, permanent.*—A permanent chock is a vehicle wheel stop permanently affixed to the runway.

10. *Cylinder (casing).*—The cylinder is the casing in which the plunger operates.

11. *Free wheel rails (beams).*—The free wheel rails are the load-supporting members connected by bolster or cross member to the lifting means.

12. *Guide bearing.*—Guide bearings are the bearings which preserve the vertical alinement of the plunger.

13. *Lift, automotive.*—An automotive lift is a vehicle lifting device, the purpose of which is to raise an entire vehicle to provide accessibility for convenient under-chassis service. There are two principal types:

(a) Hydraulic lift,
(b) Mechanical lift.

14. *Lift, hydraulic.*—A hydraulic lift is a vehicle lifting device which employs one or more plungers actuated by a liquid under pressure encased in a cylinder or cylinders, plunger or plungers equipped with suitable load carrying members; the pressure being generated by compressed air, by pump or other suitable means. Hydraulic lifts may be made in either of two classes:

(a) Full hydraulic,
(b) Hydropneumatic (semihydraulic).

15. *Lift, full hydraulic.*—A full hydraulic lift is an automotive lift of the plunger type that employs a liquid under pressure as the direct lifting and load sustaining agent. Such a lift is so designed and constructed that the full weight of the load and the lifting assembly rest on a continuous column of liquid which extends from the cylinder to the liquid control valve.

16. *Lift, hydropneumatic (semihydraulic).*—A hydropneumatic lift is an automotive lift of the plunger type which employs compressed air as the primary lifting and load sustaining agent; such compressed air acts continuously against a column of liquid to provide the lifting and load sustaining effort.

17. *Lift, mechanical.*—A mechanical lift is an automotive lift so designed that the motive power is transmitted to the lifting frame by mechanical means. It is divided into three principal classes:

(a) Cable and drum,
(b) Rack and pinion,
(c) Screw.

18. *Lift, frameless suspension type.*—A frameless suspension type lift is one so designed that the vehicle is raised from above and the lifting members are attached directly to the automobile.

19. *Lift, free-wheel type.*—A free-wheel type lift is one on which a vehicle is raised and supported at points other than its tires and wheels.

20. *Lift, roll-on type (drive-on).*—A roll-on type lift is one on which a vehicle is raised or supported on its tires or wheels.

21. *Manufacturer.*—A manufacturer is a prime fabricator of automotive lifts who affixes his trade mark or trade-name to his product and maintains standards of uniformity in his production of designated models.

22. *Packing.*—The packing is the means of confining the liquid under pressure between the plunger and cylinder casing.

23. *Plunger.*—The plunger of a hydraulic lift is the moving member of the cylinder assembly which raises, lowers, and supports the load.

24. *Plunger stop.*—A plunger stop is a means provided for limiting the vertical travel of a plunger.

25. *Power unit.*—The power unit of a mechanical lift is the prime mover, which, by mechanical means, applies power for raising the vehicle.

26. *Pressure heads (cylinder and plunger).*—Pressure heads are fixed ends of plungers and cylinders subject to fluid pressure.

27. *Pumping unit.*—A pumping unit is a device that supplies liquid under pressure for actuating the plunger or plungers of a hydraulic lift.

28. *Ramp.*—A ramp is the inclined approach to a runway of a roll-on lift.

29. *Rated capacity.*—The rated capacity is the maximum live load for which the lift is designed and labelled with adequate provisions for safety as prescribed herein.

30. *Runways.*—Runways are the load supporting members of a roll-on type lift connected by the bolster or cross member to the lifting means.

31. *Speed control.*—The speed control is an automatic device to control the speed of ascent or descent.

32. *Toe clearance.*—Toe clearance is the clear space provided along the lower edge of the outside of the runways for the protection of the operator's feet.

33. *Transmission.*—A transmission is the gear reduction train assembly of a mechanical lift.

GENERAL REQUIREMENTS

34. *Electric equipment.*—All electric wiring, when furnished, shall be in accordance with the National Electrical Code for ordinary locations.

35. *Control mechanism.*—The direct control device shall be of a type that will automatically return itself to the neutral or "off" position upon release by the operator for any cause.

36. *Automatic chocks.*—Automatic chocks shall be provided for roll-on runways to a minimum number of one per end of lift, not permanently chocked, and shall operate to lock in the first 12 in. of ascent and shall not unlock automatically before the last 12 in. of descent.

37. *Toe clearance.*—The toe clearance for roll-on runways, except the ends, shall be not less than 4 in. in depth and 2 in. in height.

38. *Ramps.*—The approach ramp angle or slope shall not exceed 20 deg.

39. *Chassis supports.*—Chassis supports shall be constructed of nonbrittle metal, except when subjected to compression only, and designed to support the load safely.

DETAIL REQUIREMENTS

HYDRAULIC LIFTS

40. *Plunger.*—The plunger shall be of steel and if subjected to fluid pressure shall be designed to satisfy the conditions described in 40a, 40b, and 40c.

40a. The maximum allowable stresses of the plungers shall be as follows:

Maximum principal stress, $S_{n(max)}$=11,000 psi.
Maximum tensile stress, S_t=11,000 psi.
Maximum compressive stress, S_c=11,000 psi.
Maximum shear stress, $S_{s(max)}$=6,000 psi.

40b. The plunger shall be designed to satisfy the following formulas for short eccentrically loaded columns supported at one end:

$$S_{n(max)}=\tfrac{1}{2}(S_p+S_t)+\sqrt{\tfrac{1}{4}(S_p-S_t)^2+S_{pt}^2}$$

$$S_{s(max)}=\sqrt{\tfrac{1}{4}(S_p-S_t)^2+S_{pt}^2}$$

$$S_p=\frac{pd_i}{2t}$$

$$S_t=\frac{P_1}{A}\left(\frac{ed_o}{2r^2}-1\right)-\frac{P_2}{A}+\frac{p\pi d_i^2}{4A}$$

$$S_c=-\frac{P_1}{A}\left(1+\frac{ed_o}{2r^2}\right)-\frac{P_2}{A}+\frac{p\pi d_i^2}{4A}$$

$$S_{pt}=\frac{RQ}{bI}=\frac{\frac{RAX_c}{2}}{\frac{2t(d_o^4-d_i^4)}{64}}=\frac{8P_1e(d_o^3-d_i^3)}{3\pi Lt(d_o^4-d_i^4)},$$

because $R=P_1e/L$, where

$S_{n(max)}$=maximum principal stress in pounds per square inch
$S_{s(max)}$=maximum shear stress in pounds per square inch
S_p=tangential stress due to fluid pressure in pounds per square inch
S_t=tensile stress due to combined bending and direct stress in pounds per square inch. See S_c below
S_c=compressive stress due to combined bending and direct stress in pounds per square inch. Note: this stress should be substituted for S_t if thereby larger values of $S_{n(max)}$ and $S_{s(max)}$ are obtained
S_{pt}=shear stress induced on neutral axis at plunger, in pounds per square inch, due to bending
p=design pressure in pounds per square inch=200 psi
d_i=internal diameter of plunger in inches
d_o=finished outside diameter of plunger in inches
t=finished wall thickness of plunger in inches
P_1=eccentric load applied at top in pounds=one-fourth rated capacity of one-post lifts
P_2=total design capacity load minus P_1=central load in pounds
e=eccentricity of P_1 in inches, which is the distance from plunger center to point of application of eccentric load, which is 3 inches in from rail end on one-post lifts

r=radius of gyration of plunger cross section in inches
A=cross-sectional area of finished plunger in square inches=$\pi(d_o^2-d_i^2)/4$
R=external shear on plunger or side thrust in pounds at plunger base due to eccentric loading=P_1e/L
L=minimum separation of plunger guide bearings in inches over-all
Q=static moment of section above plane considered about diameter of plunger in inches cubed
$b=2t$
I=moment of inertia of plunger cross section about diameter axis
X_c=centroid distance from diameter axis of one-half cross section of plunger=$\frac{2(d_o^3-d_i^3)}{3\pi(d_o^2-d_i^2)}$.

40c. The formulas in 40b are applicable to semihydraulic designs where fluid pressure exists within the plunger. For full hydraulic applications where fluid pressure is external to the plunger only there is no head tension term ($p\pi d_i^2/4A$) admissible; accordingly, this term shall be deleted wherever it appears in the formulas for S_c and S_t in computing full hydraulic plunger stresses where the working stroke does not exceed six ($6d_o$) diameters. Where the working stroke is in excess of six diameters ($6d_o$) the semihydraulic formula above shall be used whether the fluid pressure is internal or external.

41. *Allowable stresses* (S).—

41a. *For load carrying members subject to fluid pressure* the allowable maximum stress shall not exceed one-fifth of the ultimate strength of the material for each type of stress considered except for steel which is covered in paragraph 40 above.

41b. *For load carrying members not subject to fluid pressure* the maximum principal stress ($S_{n(max)}$) shall be computed from the following formula:

$$S_{n(max)}=\tfrac{1}{2}(S_t+\sqrt{S_t^2+4S_s^2}),$$

where

S_t=tensile stress due to bending or tension, in pounds per square inch.
S_s=shear stress due to induced or direct shear, in pounds per square inch.

The limiting allowable stresses shall be one-third of the ultimate strength of the material for each type of stress considered. For mild steel the following values shall prevail:

$$S_t=20{,}000 \text{ psi} \quad S_s=10{,}000 \text{ psi} \quad S_{n(max)}=20{,}000 \text{ psi}.$$

41c. *For bolts not subject to shock* the allowable tensile stress shall be 15,000 psi for commercial grade and 20,000 psi for the heat-treated forged or comparable grades.

41d. *For bolts subject to shock* use one-half of the value given in 41c.

42. *Minimum finished wall thickness* (t) for plungers with an outside diameter of less than 12 in. shall be not less than 7/32 in. and for plungers of 12- to 18-in. outside diameter, inclusive, shall be not less than 2 percent of finished outside diameter of plunger. Nothing in

this paragraph shall be interpreted to permit a thinner section than that determined by the actual stress analysis covered in other paragraphs of this standard.

43. *Fastenings.*—

43a. *Guide bearing anchorages.*—

(1) It has become general practice throughout the industry to either fasten the cylinder guide bearing to the cylinder shell by means of welded anchors consisting of studs in shear, or by means of shear loaded shoulders of a removable type, such as piston rings, bayonet locks, etc. In such cases the shear area of section (A_s) required shall be computed as follows:

$$A_s = \frac{p\pi d_o^2}{4S_s},$$

where S_s is the allowable shearing stress, which shall not exceed one-fifth of the ultimate shear strength of the material.

(2) In cases where plunger impact is taken only by bolts in tension, maximum tensile stress on net bolt area calculated at root diameter of thread at the design thrust load shall not exceed that allowed in 41d above.

(3) Where removable guide bearing, stuffing box or packing gland assemblies transfer impact loads to cylinder shell by shear fastenings, the maximum tensile stress at design pressure in attachment screws, bolts, or studs shall not exceed that allowed in 41c above on the net effective area calculated at root diameter of thread.

43b. *Superstructure fastenings.*—Wherever attachment bolts, screws or studs securing superstructures to plunger are subjected to stress from eccentric loading, the maximum allowable tensile stress at rated capacity loading (as per par. 40) shall not exceed the limits specified in paragraph 41c for bolts as calculated by the following empirical formula:

$$S_B = \frac{2P_1\left(e - \frac{D}{2}\right)}{DNa},$$

where

S_B = tensile stress in bolt, screw, or stud on root area, in pounds per square inch

D = diameter of bearing area between superstructure and plunger head or flange

N = number of attachment bolts, screws, or studs

a = area of attachment bolt, screw, or stud at thread root diameter in square inches.

43c. *Welding requirements.*—

(1) *Procedure:*

(a) *Preparation of base metal.*—The edges or surfaces of the parts to be joined by welding shall be prepared by shearing, machining, grinding or flame cutting, and shall be cleaned of all oil, greases, cutting slag and excessive amounts of scale, rust and foreign matter. Particular care shall be taken in alining and fit up of edges to be joined so that requisite weld penetration for transference of maximum design stress through the base metal juncture will be provided in addition to fillet welds, where necessary to reduce stress concentration.

(b) *Filler metal.*—The filler metal used shall comply with perti-

nent specifications for filler metal established by the American Welding Society [2] and certified to by the electrode manufacturers.

(c) *Weldings.*—Each manufacturer or contractor shall be responsible for the quality of the welding done by his organization and shall use only competent men qualified to perform the work required. The current amperage, voltage, and manner of depositing the weld metal shall be such that the beads of welding as deposited shall have requisite penetration as defined in 43c (1) (a), complete bond of the joint, and uniform reenforcement free of valleys, grooves, depressions, undercutting, and slag inclusions. Where multiple pass welding is employed, particular care shall be taken to see that all slag is removed before laying the next successive bead.

(d) *Defects.*—Cracks, blow-holes, slag inclusions, or any defect that appears on any surface of any bead of welding shall be completely removed by chipping, grinding, or flame gouging before rewelding, and the patch shall blend with, and have the same appearance as the adjoining welds.

(2) *Design.*—

(a) All welded joints shall be at least of equivalent strength and quality to those produced by the fusion method with bare or thin-coated rod of mild steel. All inserted flat heads shall be beveled before welding and all heads shall be welded to requisite penetration as defined in 43c (1) (a) with final fillet throat of 1.25 times surrounding shell thickness.

(b) For joints subjected to fluid pressure the stress allowable shall conform to table 1 wherever bare or thin coated rods are used.

TABLE 1.—*Allowable stresses in welds subject to fluid pressure*

Description	Allowable stress
	psi
Single "V", square-groove, square-buttwelded, or single-welded fillet joints for girth or head seams	[1] 6,500
Plug or intermittent welds for girth or head joints	5,600
Single "V", square-groove, or square-buttwelded joints for longitudinal seams	[1] 5,600
Double full fillet lap welds for girth or head joints of material 7/32" to 3/8" thick	7,000

[1] See definition of square-groove welds on page 33, *Procedure Handbook of Arc Welding Design and Practice*, seventh edition, published by The Lincoln Electric Co., Cleveland, Ohio.

(c) For fillet welds of mild steel subject only to static stress, the stress allowable shall be 8,000t lb per lineal inch (where t is the fillet size or the thickness of the thinnest section joined) in accordance with table 2.

TABLE 2.—*Allowable stresses in welds subject to static stress only*

Fillet size	Allowable stress
In.	*Lb/lin in.*
1/8	1,000
3/16	1,500
1/4	2,000
5/16	2,500

[2] *Welding Handbook*, 1942 edition, published by the American Welding Society, 33 West 39th Street, New York, N. Y.

(d) Where inset cylinder or plunger head joints are to be made, the head shall be inset at least $2t$ below the end, where t is the wall thickness of the shell.

(e) Where alloy rod of higher strength or shielded arc is used, the allowable stress shall be increased by the ratio representing the proportion of yield strength of weld metal to 30,000 psi for mild-steel rod.

44. *Cylinder* (*casing*).—The cylinder or casing shall have a minimum wall thickness of nominally $\frac{7}{32}$ in. for corrosion resistance. The cylinder shall be figured in accordance with the formula shown below for thin, cylindrical pressure vessels and designed for a pressure of 200 psi with a maximum allowable fiber stress of 11,000 psi for steel.

$$T=\frac{Rp}{S}=\frac{200}{11{,}000}R=0.0181R,$$

where

T=thickness of shell plate in inches
R=inside radius of shell in inches
p=design pressure=200 psi
S=maximum fiber stress in shell plate, in pounds per square inch.

45. *Pressure heads.*—

45a. The pressure heads of cylinders and immersed plungers shall be designed for a pressure of 200 psi in accordance with the following formulas, except that steel heads shall in no case have a thickness of less than the required thickness of the adjoining shell.

(1) For flat unreinforced heads of steel and subject to fluid pressure loads only

$$T=d_i\sqrt{\frac{Kp}{S}}=0.0674d_i,$$

where $K=0.25$. Where the superstructure is attached to the pressure head (see par. 45d), use $K=0.50$, which would make $T=0.0953\ d_i$.

(2) For dished seamless heads concave to pressure, where l is not greater than d_i,

$$T=\frac{5pl}{6S}.$$

When $l=d_i$, the formula is simplified to $T=0.01515d_i$, where

T=thickness of heads, in inches
d_i=diameter of head between the supporting edges in inches
p=design pressure=200 psi
S=maximum allowable fiber stress, 11,000 psi for steel
l=radius to which head is dished, measured on concave side of head, in inches.

(3) For heads made of material other than steel, the above formulas 45a (1) and 45a (2) shall apply when a value of S is substituted which does not exceed one-fifth of the ultimate tensile strength, in pounds per square inch, of the material.

45b. *Dished heads* convex to pressure shall have a maximum allowable working pressure equal to 60 percent of that for heads of the same dimensions with the pressure on the concave side.

45c. *Reinforced flat heads* when used, shall have strength equivalent to dished heads, concave to pressure.

45d. *For flat unreinforced pressure heads with added integral bolt holes, studs, or other fastenings T* shall be derived in accordance with paragraph 45a.

45e. *Wherever plungers are not immersed and carry bottom sealing plunger head,* the plunger may be considered a static load member subject to the stresses allowed in 41b, and the plunger head shall be considered under 41a and all foregoing sections of paragraph 45 above.

46. *Rails and runways.*—

46a. *Free-wheel rails and roll-on runways* shall be designed for a maximum allowable fiber stress of 20,000 psi for a maximum loading of one-fourth of the rated capacity situated 3 in. from the extreme end of each load-supporting member (rail), with the cantilever computed as the free unsupported length from the bolster to the point of loading. For connecting-rail, multiple-plunger lifts the point of loading shall be considered at one-fourth of the span between plunger centers.

46b. *For single-plunger and mechanical lifts* of 8,000-lb. capacity (for standard passenger automobiles) the length of free-wheel rails shall be not less than 14½ ft. Roll-on runways shall be not less than 15 ft.

46c. *For roll-on lifts.*—The runways shall be so designed that the flat surfaces on which the vehicle is driven are not less than 15 in. wide across the flat section, exclusive of reinforcement flanges. The height of the inside wheel flange shall be not less than 2½ in., except for a distance of 2 ft. at each end. The runways shall be so designed that the tires of the vehicle will not be exposed to sharp edges.

47. *Lowering speeds.*—The maximum lowering speed of a hydraulic lift shall be controlled by a valve, orifice or passage restriction mounted on or placed integral in the cylinder assembly to restrict the flow of oil exchange to storage when the plunger descends at the maximum rate of 20 fpm with rated load so that if failure occurs in hydraulic piping, the lift will descend no faster than at the above safe rate.

48. *Bearings.*—

48a. *For plungers subjected to eccentricity of loading in excess of 12 in.,* the minimum over-all length of plunger bearing, or the minimum over-all distance across plunger bearing surfaces from top of upper bearing to bottom of lower bearing where the bearing surface is not continuous, shall be not less than two times the outside diameter of the plunger for sizes less than 12 in. in diameter. For plungers 12 to 18 in., inclusive, in diameter, the ratio shall be not less than one and one-half times the outside diameter of the plunger.

48b. *For plungers subjected to eccentricity of loading of not more than 12 in.,* the minimum over-all length of plunger bearing, or the minimum over-all distance across plunger bearing surfaces from the top of upper bearing to bottom of lower bearing, where the bearing surface is not continuous, shall be not less than one and one-half times the outside diameter of the plunger for sizes up to 18 in., inclusive, in diameter.

49. *Packings.*—The packings shall be easily removable for replacement and arranged to provide either automatic or manual adjustment to compensate for normal wear.

50. *Pumping unit.*—The pump shall be designed to withstand a static test pressure of not less than 150 percent of that required to

raise the lift when loaded to rated capacity. A pressure regulator or a relief valve shall be provided, factory set at a pressure no more than the maximum design pressure of the hydraulic system. The pump motor when loaded at rated lift capacity shall not exceed the pump motor manufacturer's recommended loading for short period operation. The pump reservoir capacity shall be such that with the plunger or plungers in a fully elevated position there shall remain not less than three inches of usable oil in the storage tank.

51. *Air-pocket elimination.*—If air pockets, which interfere with safe operation, due to entrapped air are not automatically eliminated, a positive means for conveniently venting same shall be provided.

52. *Air oil tanks.*—Except when installed below floor level, all tanks for liquid storage under pressure, not an integral part of the cylinder assembly, shall comply with the provisions of paragraph U–70, 1943 ASME [3] Code for Unfired Pressure Vessels, for a working pressure of 200 psi. The storage capacity shall be such that with the plunger or plungers in fully elevated position there shall remain not less than 3 in. of usable oil in the storage tank. Adequate means of determining that the oil level in reservoir, with plunger or plungers in the lowest position, is at or above the manufacturer's prescribed safe minimum operating level shall be provided.

MECHANICAL LIFTS

53. *Structural members.*—All structural members except rails and runways shall be so designed that when the lift is loaded to full capacity, the allowable maximum fiber stress shall not exceed one-third of the ultimate tensile strength of the material.

54. *Load transfer device.*—Every mechanical four-post lift shall be equipped with adequate safety devices that, in case of failure of elevating mechanisms when the frame is at the top position, will automatically transfer the load to the corner posts.

55. *Limit stop.*—Every mechanical automotive lift shall be equipped with a device that automatically causes the motor to stop before the lifting frame reaches the safe limits of travel.

56. *Holding brake.*—Every mechanical automotive lift in which the friction of the gear train is insufficient to hold the load shall be equipped with a brake of adequate friction to hold a load of rated capacity. This brake shall be so designed that it automatically holds the load at any point as soon as lifting ceases for any cause.

57. *Lowering speed.*—Every mechanical automotive lift shall be equipped with a device that will control the descent of the lift so it will not exceed a speed of 20 feet a minute with rated capacity load.

58. *Stopping brake.*—Every mechanical automotive lift having structural members that will interfere with an open door of a vehicle while it is being raised, shall be equipped with a quick-acting automatic device that will stop the ascent of the vehicle on contact with an obstruction.

59. *Cable and drum class.*—

59a. *Wire cables.*—If wire rope or cables are used, they shall be of such strength as to support the lifting frame loaded to full capacity

[3] The American Society of Mechanical Engineers.

with a factor of safety not less than that recommended by the manufacturer of the wire cables used. In establishing this factor of safety, the fleet angle, the number of bends, reverse bends, and drum and sheave ratio to rope diameter shall be taken into consideration.

59b. *Drums.*—On all lifts operated by means of wire rope or cables, the drums shall have a pitch diameter not less than that recommended by the manufacturer of the wire cables used. The drums shall be grooved to support the cables. The fleet angle of the cable and the helix angle of the drum grooves shall be of such proportions that the cable at no time will contact the cable in the adjacent groove nor contact the flares of the groove itself.

59c. *Sheaves.*—On cable-operated lifts, the pitch diameter of the sheaves for lifting cables shall be not less than that recommended by the manufacturer of the wire cables used. The grooves in the sheaves shall be so designed as to properly support the cable. The depth of the groove shall be at least one and one-half times the cable diameter and the throat angle of the groove shall be of such dimensions that the cable will at no time contact the flares.

60. *Rack and pinion class.*—

60a. *All lifting members* shall have a safety factor of not less than 3 to 1.

60b. *The rack engagement* shall be so designed that same will be released when obstruction on the floor prevents downward movement of lifting frame.

61. *Screw class.*—

61a. *Either the screw* or nut may rotate to lift load.

61b. *Automatic lubrication* shall be provided to keep screw well lubricated.

62. *Transmissions.*—The gears for the transmission shall be so designed that the beam stress in no case exceeds one-half of the yield point of the material. Consideration shall be given to the dynamic load and the wear limit load.

63. *Rails and runways.*—Same as for hydraulic lifts. See paragraph 46.

FRAMELESS SUSPENSION LIFTS

64. *A frameless suspension lift* may be hydraulically or mechanically operated and the mechanism shall comply with either hydraulic or mechanical prime movers as outlined in the appropriate specifications for automotive lifts of these types.

65. *Flexible lifting means*, if used, shall be stabilized against excessive lateral movement when in maximum up position.

66. *A safety device* shall be provided on each supporting member which will hold the load independent of the lifting means at maximum up position.

TESTS

67. Cylinders (casings) and plungers or hydraulic lift cylinder assemblies as well as separate oil tanks shall be pressure tested at a pressure of not less than 300 psi.

IDENTIFICATION

68. The name of the manufacturer, model number, serial number, and rated capacity shall be shown in a conspicuous place on each automotive lift.

69. In order that purchasers may be assured that automotive lifts purchased actually comply with all requirements of the Commercial Standard, it is recommended that manufacturers include the following statement in conjunction with their name and address on labels, invoices, sales literature, etc.:

> "This automotive lift complies with all requirements of Commercial Standard CS142–47, as issued by the National Bureau of Standards of the United States Department of Commerce."

70. When space limitations require an abbreviated statement, the following is recommended:

"Complies with CS142–47."

71. Figure 1 illustrates the label adopted by the Automotive Lift Institute, Inc., for its members' use in stating compliance.

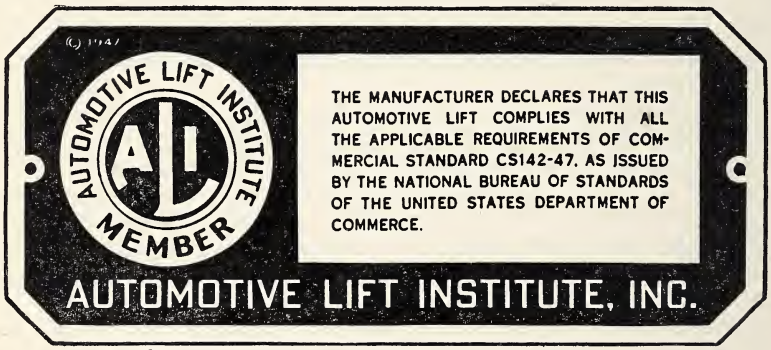

FIGURE 1.—*Label of Automotive Lift Institute, Inc.*

EFFECTIVE DATE

72. The standard became effective as a voluntary standard of the trade from October 1, 1947.

Edwin W. Ely,
Chief, Commodity Standards Division.

STANDING COMMITTEE

73. The following individuals comprise the membership of the standing committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Comment concerning the standard and suggestions for revision may be addressed to any member of the committee or to the Commodity Standards Division, National Bureau of Standards, which acts as secretary for the committee.

HARRY D. SMITH, *chairman*

Manufacturers:

JOHN G. DORWARD, SR., Dorward Pump Co., 210 Mission Street, San Francisco, Calif.

J. B. HARRISON, Rotary Lift Co., Memphis 2, Tenn.

A. H. HOWES, Gilbert & Barker Manufacturing Co., West Springfield, Mass.

DAVID LAINE, Automotive Lift Institute, Inc., 366 Madison Avenue, New York 17, N. Y.

P. I. SCHULTZ, The United States Air Compressor Co., 5300 Harvard Avenue, Cleveland 5, Ohio.

HARRY D. SMITH, Globe Hoist Co., East Mermaid Lane at Queen Street, Philadelphia 18, Pa.

Distributors:

W. B. MCCULLOUGH, JR., J. H. McCullough & Son, 1248 North Broad Street, Philadelphia 21, Pa.

J. J. SUSSEN, Sussen Rubber & Supply Co., 2017 East Sixty-fifth Street, Cleveland 3, Ohio.

Users:

W. A. COURTENAY, JR., Sun Oil Co., 1608 Walnut Street, Philadelphia 3, Pa.

H. W. HOLLAND, The Texas Co., 135 East Forty-second Street, New York, N. Y.

CLARENCE F. REINHARDT, Phillips Petroleum Co., Bartlesville, Okla.

Laboratories and general interests:

LEVAN GRIFFIS, Armour Research Foundation of Illinois Institute of Technology, Technology Center, Chicago 16, Ill.

JAMES W. REARDON, American Automobile Association, Seventeenth and Pennsylvania Avenue, NW., Washington 6, D. C.

SEVERN A. WHITE (alternate, A. H. Hallam), Sun Indemnity Company of New York, 55 Fifth Avenue, New York 3, N. Y. (Representing National Conservation Bureau.)

HISTORY OF PROJECT

74. On July 23, 1945, the Automotive Lift Institute, Inc. requested the cooperation of the National Bureau of Standards in the development by the trade of a commercial standard for automotive lifts. On July 12, 1946, a draft prepared by the Institute was circulated to all known producers and to a representative group of distributors, users, and related interests for advance comment.

75. A recommended standard, adjusted in accordance with the composite comment received from the above mentioned circulation was submitted on March 14, 1947, to producers, distributors, users, and to related interests for written acceptance. This recommended standard was accepted by the trade. Subsequently, the Automotive Lift Institute proposed some relatively minor adjustments to bring the development into agreement with action taken by State regulatory authorities. These adjustments were submitted to the acceptors of the recommended standard on June 13, 1947.

76. Pursuant to acceptance and approval by the trade of the adjusted standard, the National Bureau of Standards announced that Automotive Lifts, Commercial Standard CS142–47, would become effective as a voluntary standard of the trade from October 1, 1947.

ACCEPTANCE OF COMMERCIAL STANDARD

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this commercial standard.

Date_____

National Bureau of Standards,
Commodity Standards Division,
Washington 25, D. C.

Gentlemen:

We believe that the Commercial Standard CS142–47 constitutes a useful standard of practice, and we individually plan to utilize it as far as practicable as a

☐ Manufacturer [1] ☐ Distributor [1]
☐ Testing Laboratory [1] ☐ User [1]

of *Automotive Lifts*. We reserve the right to depart from it as we deem advisable.

We understand, of course, that only those articles which actually comply with the standard in all respects can be identified or labeled as conforming thereto.

Signature of authorized officer_____
(in ink)

(Kindly typewrite or print the following lines)

Name and title of above officer_____

Organization [2]_____
(Fill in exactly as it should be listed)

Street address_____

City, Zone, and State_____

(Cut on this line)

[1] In the case of related interests, trade associations, trade papers, etc., desiring to record their general support, the words "General support" should be added after the signature.
[2] Please see that separate acceptances are filed for all subsidiary companies and affiliates which should be listed separately as acceptors.

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial standards are commodity specifications voluntarily established by mutual consent of those concerned. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions, but since they represent the will of the interested groups as a whole, their provisions through usage soon become established as trade customs, and are made effective through incorporation into sales contracts by means of labels, invoices, and the like.

2. *The acceptor's responsibility.*—The purpose of commercial standards is to establish for specific commodities, nationally recognized grades or consumer criteria and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the commercial standard where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function performed by the Department of Commerce in the voluntary establishment of commercial standards on a Nation-wide basis is fourfold; first, to act as an unbiased coordinator to bring all interested parties together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptances and adherence to the standard on the part of producers, distributors, and users, and fourth, after acceptance, to publish and promulgate the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement and promulgation.*—When the standard has been endorsed by a satisfactory majority of production or consumption in the absence of active valid opposition, the success of the project is announced. If, however, in the opinion of the Standing Committee or the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

ACCEPTORS

77. The organizations and individuals listed below have accepted this standard as their standard of practice in the production, distribution, testing, or purchase of automotive lifts. In accepting the standard, they reserved the right to depart therefrom as they individually deem advisable. It is expected that articles which actually comply with the requirements of this standard in all respects will be regularly identified or labeled as conforming thereto, and that purchasers will require such specific evidence of conformity.

ASSOCIATIONS

(General Support)

American Association of Engineers, Chicago, Ill.
American Automobile Association, Washington, D. C.
American Institute of Architects, The, Washington, D. C.
American Trucking Associations, Inc., Washington, D. C.
Automotive Lift Institute, Inc., New York, N. Y.
Building Officials Conference of America, Inc., Boston, Mass.
Dairymen's League Co-Operative Association, Inc., New York, N. Y.
N. A. P. A. Cleveland Warehouse, Cleveland, Ohio.
Northwest Petroleum Association, Minneapolis, Minn.
Southern Building Code Congress, Birmingham, Ala.

FIRMS AND OTHER INTERESTS

Acme Steel Co., Chicago, Ill.
Alexander-Seewald Co., Atlanta, Ga.
Amco Corp., The, Chicago, Ill., and Detroit, Mich.
Anders & Jervis Chevrolet Co., Philadelphia, Pa.
Anderson, Peter, Co., Inc., Lafayette, Ind.
Arbor Auto Service, LaMott, Philadelphia, Pa.
Arizona Highway Department, Phoenix, Ariz.
Arkansas State Highway Department, Little Rock, Ark.
Armour Research Foundation, Chicago, Ill.
Auto Compressor Co., The, Wilmington, Ohio.
Auto Electric Shop, Inc., Pontiac, Mich.
Auto Equipment Co., Denver, Colo.
Automotive Supply Co., Inc., Bluefield, W. Va.
Badger Auto Service Co., Milwaukee, Wis.
Baltimore, City of, Bureau of Buildings, Baltimore, Md.
Barker, Rose & Kimball, Inc., Elmira, N. Y.
Beard & Stone Electric Co., Inc., Dallas, Tex.
Birmingham, City of, Birmingham, Ala.
Borden-Aicklen Auto Supply Co., Inc., New Orleans, La.
Brightwood Auto Supply Garage, Washington, D. C
Brown's Auto Supply, Decatur, Ill.
Cadillac Motor Car Division, General Motors Corp., Detroit, Mich.
California, State of, Division of Industrial Safety, Department of Industrial Relations, San Francisco, Calif. (General support.)
Chanslor & Lyon Co., San Francisco, Calif.
Clark's Service Co., Inc., Muncie, Ind.
Cochin, J. D., Manufacturing Co., South San Francisco, Calif.
Connecticut State Department of Motor Vehicles, Hartford, Conn. (General support.)
Curtis Manufacturing Co., Curtis Pneumatic Machinery Division, St. Louis, Mo.
D & S Repair Service, Detroit, Mich.
Denver City and County of, Building Department, Denver, Colo.
Detroit, City of, City Engineer's Office, Detroit, Mich.
Divco Corp., Detroit, Mich.
Dunson Supply Co., The, Sidney, Ohio.
Eaton Metal Products Co., Denver, Colo.
Firestone Tire & Rubber Co., The, Akron, Ohio.
Franklin Supply Co., Providence, R. I.
Gadsden, City of, Gadsden, Ala.
Gilbert & Barker Manufacturing Co., West Springfield, Mass.
Globe Hoist Co., Philadelphia, Pa.
Goodrich, B. F., Co., The, Akron, Ohio.
Harrisburg Autoparts Co., Harrisburg, Pa.
Hayward Hallett Equipment Co., Los Angeles, Calif.
Herberg Auto Service, Inc., Burlington, Vt.
Highland Park Motors, Inc., Highland Park, Mich.
Highway Trailer Co., Edgerton, Wis.
Hockaday & Phillips, Inc., Santa Ana, Calif.
Houser Elevator Co., The, Syracuse, N. Y.
Humble Oil & Refining Co., Houston, Tex.
Illinois, State of, Department of Public Works and Buildings, Division of Highways, Springfield, Ill.
Jamestown, City of, Building Inspector, Jamestown, N. Y.
Joyce-Cridland Co., The, Dayton, Ohio.
Kansas, State Highway Commission of, Topeka, Kans.
Kendall Refining Co., Bradford, Pa.
Kentucky Department of Highways, Equipment Division, Frankfort, Ky.
Lambert Co., Ltd., Los Angeles, Calif.
Marshall Elevator Co., Pittsburgh, Pa.
Massachusetts, Commonwealth of, Department of Public Works Maintenance Shop, Boston, Mass.
McCullough, J. H., & Son, Philadelphia, Pa.
Michigan State Purchasing Division, Lansing, Mich.
Mid-Continent Petroleum Corp., Tulsa, Okla.
Milwaukee Testing Laboratory, Milwaukee, Wis.
Minnesota Department of Highways, St. Paul, Minn.
Montgomery Ward, Chicago, Ill.
Motor Parts & Equipment, Inc., Tacoma, Wash.
New England Truck Co., Fitchburg, Mass.
New Mexico State College of A. & M. A., State College, N. Mex. (General support.)
Newark College of Engineering, Newark, N. J.
Oldsmobile Division, General Motors Corp., Lansing, Mich.
Ozburn, Crow & Yantis Co., Memphis, Tenn.
Petroleum Equipment Co., Washington, D. C.
Phillips Petroleum Co., Bartlesville, Okla.
Pittsburgh Auto Equipment Co., Pittsburgh, Pa.
Pittsburgh & Weirton Bus Co., Weirton, W. Va.
Pontiac, City of, Pontiac, Mich. (General support.)
Portland, City of, Portland, Maine.
Red Dot Oil Co., The, Denver, Colo.
Richfield Oil Corp., Los Angeles, Calif.

Robert & Co., Atlanta, Ga.
Rock Island, City of, Rock Island, Ill.
Rotary Lift Co., Memphis, Tenn.
Russell, J., & Co., Inc., Holyoke, Mass.
Sacramento, Inc., Better Business Bureau of, Sacramento, Calif.
Safety Engineering Magazine, New York, N. Y.
Sanford, City of, Building Department, Sanford, Fla.
Schiebel Bros., Manchester, Conn.
Scott Motor Sales, Greenville, N. C.
Severin Supply Co., Oklahoma City, Okla.
Shell Oil Co., Inc., New York, N. Y.
Shriber-Slates Co., The, Akron, Ohio.
Siferd-Hossellman Co., The, Lima, Ohio.
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Specification Record, Chicago, Ill.
Springfield, City of, Department of Public Safety, Springfield, Mass.
Spun Steel Corp., The, Canton, Ohio.
Standard Oil Co. of California, San Francisco, Calif.
Standard Oil Co. of New Jersey, New York, N. Y.
Standard Oil Co. (Ohio), Cleveland, Ohio.
Sterling Electric Co., Omaha, Nebr. (General support.)
Stevens Institute of Technology, Hoboken, N. J.
Strauss-Frank Co., Houston, Tex.
Sun Oil Co., Philadelphia, Pa.
Sussen Rubber & Supply Co., Cleveland, Ohio.
Tide Water Associated Oil Co., New York, N. Y.
Tower Service Co., San Diego, Calif.
United Auto Sales, Inc., Aurora, Ill.
United States Air Compressor Co., Cleveland, Ohio.
United States Testing Co., Inc., Hoboken, N. J.
Virginia Department of Highways, Richmond, Va.
Washington, University of, Seattle, Wash. (General support.)
Waterloo, City of, Waferloo, Iowa.
Wayne Pump Co., The, Ft. Wayne, Ind.
Weaver Manufacturing Co., Springfield, Ill.
Welliver Auto Parts Co., Bloomsburg, Pa.
West Bend Equipment Corp., West Bend, Wis. (General support.)
West Side Equipment Co., Inc., Mt. Vernon, N. Y.
Western Automotive Service (Trade Magazine), San Francisco, Calif. (General support.)
Western Electric Co., Inc., New York, N. Y.
Whipple's Automotive Equipment, Inc., Binghamton, N. Y.
White Motor Co., Cleveland, Ohio.
Whitey's Auto Repair, Chicago, Ill.
Winston-Salem, City of, Winston-Salem, N. C. (General support.)
Yakie Supply Co., Port Arthur, Tex.

UNITED STATES GOVERNMENT

Agriculture, U. S. Department of, Washington, D. C.
Veterans' Administration, Washington, D. C.
War Department, Washington, D. C.

COMMERCIAL STANDARDS

CS No. Item

0-40. Commercial standards and their value to business (third edition).
1-42. Clinical thermometers (third edition).
2-30. Mopsticks.
3-40. Stoddard solvent (third edition).
4-29. Staple porcelain (all-clay) plumbing fixtures.
5-46. Pipe nipples; brass, copper, steel and wrought-iron (second edition).
6-31. Wrought-iron pipe nipples (second edition). Superseded by CS5-46.
7-29. Standard weight malleable iron or steel screwed unions.
8-41. Gage blanks (third edition).
9-33. Builders' template hardware (second edition).
10-29. Brass pipe nipples. Superseded by CS5-46.
11-41. Moisture regains of cotton yarns (second edition).
12-40. Fuel oils (fifth edition).
13-44. Dress patterns (fourth edition).
14-43. Boys' button-on waists, shirts, junior and sport shirts (made from woven fabrics) (third edition).
15-46. Men's pajama sizes (made from woven fabrics) (third edition).
16-29. Wall paper.
17-47. Diamond core drill fittings (fourth edition).
18-29. Hickory golf shafts.
19-32. Foundry patterns of wood (second edition).
20-47. Staple vitreous china plumbing fixtures (fourth edition).
21-39. Interchangeable ground-glass joints, stopcocks, and stoppers (fourth edition).
22-40. Builders' hardware (nontemplate) (second edition).
23-30. Feldspar.
24-43. Screw threads and tap-drill sizes.
25-30. Special screw threads. Superseded by CS24-43.
26-30. Aromatic red cedar closet lining.
27-36. Mirrors (second edition).
28-46. Cotton fabric tents, tarpaulins and covers (second edition).
29-31. Staple seats for water-closet bowls.
30-31. Colors for sanitary ware.
31-38. Wood shingles (fourth edition).
32-31. Cotton cloth for rubber and pyroxylin coating.
33-43. Knit underwear (exclusive of rayon) (second edition).
34-31. Bag, case, and strap leather.
35-47. Hardwood plywood (third edition).
36-33. Fourdrinier wire cloth (second edition).
37-31. Steel bone plates and screws.
38-32. Hospital rubber sheeting.
39-37. Wool and part wool blankets (second edition). (Withdrawn as commercial standard, July 14, 1941).
40-32. Surgeons' rubber gloves.
41-32. Surgeons' latex gloves.
42-43. Structural fiber insulating board (third edition).
43-32. Grading of sulphonated oils.
44-32. Apple wraps.
45-45. Douglas fir plywood (sixth edition).
46-40. Hosiery lengths and sizes (third edition).
47-34. Marking of gold-filled and rolled-gold plate articles other than watchcases.
48-40. Domestic burners for Pennsylvania anthracite (underfeed type) (second edition).

CS No. Item

49-34. Chip board, laminated chip board, and miscellaneous boards for bookbinding purposes.
50-34. Binders board for bookbinding and other purposes.
51-35. Marking articles made of silver in combination with gold.
52-35. Mohair pile fabrics (100-percent mohair plain velvet, 100-percent mohair plain frieze, and 50-percent mohair plain frieze).
53-35. Colors and finishes for cast stone.
54-35. Mattresses for hospitals.
55-35. Mattresses for institutions.
56-41. Oak flooring (second edition).
57-40. Book cloths, buckrams, and impregnated fabrics for bookbinding purposes except library bindings (second edition).
58-36. Woven elastic fabrics for use in overalls (overall elastic webbing).
59-44. Textiles—testing and reporting (fourth edition).
60-36. Hardwood dimension lumber.
61-37. Wood-slat venetian blinds.
62-38. Colors for kitchen accessories.
63-38. Colors for bathroom accessories.
64-37. Walnut veneers.
65-43. Methods of analysis and of reporting fiber composition of textile products (second edition).
66-38. Marking of articles made wholly or in part of platinum.
67-38. Marking articles made of karat gold.
68-38. Liquid hypochlorite disinfectant, deodorant, and germicide.
69-38. Pine oil disinfectant.
70-41. Phenolic disinfectant (emulsifying type) (second edition) (published with CS71-41).
71-41. Phenolic disinfectant (soluble type) (second edition) (published with CS70-41).
72-38. Household insecticide (liquid spray type).
73-45. Old growth Douglas fir standard stock doors (third edition).
74-39. Solid hardwood wall paneling.
75-42. Automatic mechanical draft oil burners designed for domestic installations (second edition).
76-39. Hardwood interior trim and molding.
77-40. Sanitary cast-iron enameled ware.
78-40. Ground-and-polished lenses for sun glasses (second edition) (published with CS79-40).
79-40. Blown, drawn, and dropped lenses for sun glasses (second edition) (published with CS78-40).
80-41. Electric direction signal systems other than semaphore type for commercial and other vehicles subject to special motor vehicle laws (after market).
81-41. Adverse-weather lamps for vehicles (after market).
82-41. Inner-controlled spotlamps for vehicles (after market).
83-41. Clearance, marker, and identification lamps for vehicles (after market).
84-41. Electric tail lamps for vehicles (after market).
85-41. Electric license-plate lamps for vehicles (after market).
86-41. Electric stop lamps for vehicles (after market).
87-41. Red electric warning lanterns.
88-41. Liquid-burning flares.

CS No.	Item
89–40.	Hardwood stair treads and risers.
90– .	(Reserved for power shovels and cranes).
91–41.	Factory-fitted Douglas fir entrance doors.
92–41.	Cedar, cypress and redwood tank stock lumber.
93–41.	Portable electric drills (exclusive of high frequency).
94–41.	Calking lead.
95–41.	Lead pipe.
96–41.	Lead traps and bends.
97–42.	Electric supplementary driving and passing lamps for vehicles (after market).
98–42.	Artists' oil paints.
99–42.	Gas floor furnaces—gravity circulating type.
100–44.	Porcelain-enameled steel utensils (second edition).
101–43.	Flue-connected oil-burning space heaters equipped with vaporizing pot-type burners.
102– .	(Reserved for Diesel and fuel-oil engines).
103–42.	Cotton and rayon velour (jacquard and plain).
104–46.	Warm-air furnaces equipped with vaporizing pot-type oil burners (second edition).
105–43.	Mineral wool; loose granulated, or felted form, in low-temperature installations.
106–44.	Boys' pajama sizes (woven fabrics) (second edition).
107–45.	Commercial electric-refrigeration condensing units (second edition).
108–43.	Treading automobile and truck tires.
109–44.	Solid-fuel-burning forced-air furnaces.
110–43.	Tire repairs—vulcanized (passenger, truck, and bus tires).
111–43.	Earthenware (vitreous-glazed) plumbing fixtures.
112–43.	Homogeneous fiber wallboard.
113–44.	Oil-burning floor furnaces equipped with vaporizing pot-type burners.
114–43.	Hospital sheeting for mattress protection.
115–44.	Porcelain-enameled tanks for domestic use.
116–44.	Bituminized-fibre drain and sewer pipe.
117–44.	Mineral wool; blankets, blocks, insulating cement, and pipe insulation for heated industrial equipment.
118–44.	Marking of jewelry and novelties of silver.
(E) 119–45.[1]	Dial indicators (for linear measurements).
120–46.	Standard stock ponderosa pine doors (second edition).
121–45.	Women's slip sizes (woven fabrics).
122–45.	Western hemlock plywood.
123–45.	Grading of diamond powder.
(E) 124–45.[1]	Master disks.
125–45.	Prefabricated homes.
126–45.	Tank mounted air compressors.
127–45.	Self-contained mechanically refrigerated drinking water coolers.
128–45.	Men's sport shirt sizes—woven fabrics (other than those marked with regular neckband sizes).
129–47.	Materials for safety wearing apparel (second edition).
130–46.	Color materials for art education in schools.
131–46.	Industrial mineral wool products, all types—testing and reporting.
132–46.	Hardware cloth.
133–46.	Woven wire netting.
134–46.	Cast aluminum cooking utensils (metal composition).
135–46.	Men's shirt sizes (exclusive of work shirts).
136–46.	Blankets for hospitals (wool, and wool and cotton).
137–46.	Size measurements for men's and boys' shorts (woven fabrics).
138–47.	Insect wire screening.
139–47.	Work gloves.
140–47.	Convectors: testing and rating.
141–47.	Sine bars, blocks, plates and fixtures.
142–47.	Automotive lifts.
143–47.	Standard strength and extra strength perforated clay pipe.
144–47.	Formed metal porcelain enameled sanitary ware.
145–47.	Testing and rating hand-fired hot-water supply boilers.

NOTICE—Those interested in commercial standards with a view toward accepting them as a basis of everyday practice may secure copies of the above standards, while the supply lasts, by addressing the Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

[1] Where "(E)' precedes the CS number, it indicates an emergency commercial standard, drafted under war conditions with a view toward early revision.

U. S. GOVERNMENT PRINTING OFFICE: 1947

July 14, 1948
TS-4660

nsert between pages
and 5, CS142-47)

P:GLS

AMENDMENT TO

AUTOMOTIVE LIFTS

COMMERCIAL STANDARD CS142-47

APPROVED BY THE INDUSTRY

ON RECOMMENDATION OF THE STANDING COMMITTEE

EFFECTIVE DATE, JULY 14, 1948

- - - - -

Values for allowable shear stress are amended as

ollows:

Par. 40a. (Maximum allowable plunger stresses). In line 4 in the tabulation, change th figure for maximum shear stress $S_{s(max}$ from 6,000 psi to 8,000 psi.

Par. 41b. (Loaded members not under fluid pressure). At the end of this paragraph, change the value for induced or direct shear S_s from 10,000 psi to 15,000 psi.

COMMODITY STANDARDS DIVISION
NATIONAL BUREAU OF STANDARDS