Commercial Standard 142-51

SUPERSEDES CS142-47

Automotive Lifts

A RECORDED VOLUNTARY STANDARD OF THE TRADE

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CHARLES SAWYER, Secretary

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For sale by the Superintendent of Documents, U. S. Government Printing Office

Washington 25, D. C. - Price 10 cents

Automotive Lifts

(Second Edition)

[Effective June 1, 1951]

1. PURPOSE

1.1 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 with the standard.

2. SCOPE

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

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

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

3. DEFINITIONS

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

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

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

3.4 *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.

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

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

3.4.3 *Chock, permanent.*—A permanent chock is a vehicle wheel stop permanently affixed to the runway at the end of runway opposite to the approach end.

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

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

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

3.8 *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.

3.8.1 *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).

3.8.1.1 *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.

3.8.1.2 *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.

3.8.2 *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.

3.9 *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.

3.10 *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.

3.11 *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.

3.12 *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.

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

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

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

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

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

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

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

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

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

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

3.23 *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.

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

4. GENERAL REQUIREMENTS

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

4.2 *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.

4.3 *Chocks.*

4.3.1 *Automatic chocks.*—Automatic chocks shall be provided on the approach ends for roll-on runways to a minimum number of two per end of lift, and shall operate to lock in the first 12 in. of ascent and not unlock automatically before the last 12 in. of descent. The automatic chocks shall be of sufficient width to extend from a point 2½ in. from the inner flange of the runway to within 2½ in. of the outer flange of the runway measured on the flat.

4.3.2 *Permanent chocks.*—Where a roll-on lift is installed with one approach end only, the opposite end shall be equipped with permanent chocks. Width of permanent chocks shall be not less than is required for automatic chocks.

4.3.3 *Manual chocks.*—It is not intended to prohibit the use of manual chocks when used in addition to or in combination with automatic chocks.

4.4 *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.

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

4.6 *Chassis supports.*—Chassis supports shall be constructed of non-brittle metal, except when subjected to compression only, and designed to support the load safely.

5. DETAIL REQUIREMENTS

5.1 Hydraulic Lifts

5.1.1 *Plunger.*—The plunger shall be of steel and if subjected to fluid pressure shall be designed for working pressure (in no case less than 200 psi) required at maximum rated capacity to satisfy the conditions described in 5.1.1.1, 5.1.1.2, and 5.1.1.3. Where the hydraulic system is air-oil operated, the working pressure shall not exceed 200 psi.

5.1.1.1 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, $S_{s\,(max)}=8{,}000$ psi.

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

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

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

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

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

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

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

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 minimum),
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$=\dfrac{2(d_o^3-d_i^3)}{3\pi(d_o^2-d_i^2)}$.

5.1.1.3 The formulas in 5.1.1.2 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.

5.1.2 *Allowable stresses* (S).

5.1.2.1 *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 5.1.1, above.

5.1.2.2 *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:

$$S_t=20{,}000 \text{ psi} \quad S_s=15{,}000 \text{ psi} \quad S_{n\,(max)}=20{,}000 \text{ psi}.$$

5.1.2.3 *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.

5.1.2.4 *For bolts subject to shock* use one-half of the value given in 5.1.2.3.

5.1.3 *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, it 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.

5.1.4 *Fastenings.*

5.1.4.1 *Guide bearing anchorages.*

(1) It has become general practice throughout the industry to fasten the cylinder guide bearing to the cylinder shell either 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:

$$A_s = \frac{p\pi d_0^2}{4S_s},$$

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 5.1.2.4, 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 5.1.2.3, above, on the net effective area calculated at root diameter of thread.

5.1.4.2 *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 5.1.1) shall not exceed the limits specified in 5.1.2.3 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.

5.1.4.3 *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 pertinent specifications for filler metal established by the American Welding Society [1] 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 5.1.4.3 (1) (a), complete bond of the joint, and uniform reinforcement 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 5.1.4.3 (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-butt-welded, 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-butt-welded 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 linear 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 (inch)	Allowable stress
	lb/lin in.
1/8	1,000
3/16	1,500
1/4	2,000
5/16	2,500

[1] *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.

5.1.5 *Cylinder (casing).*—The wall thickness of cylinder shall be figured in accordance with the following formula for thin, cylindrical pressure vessels, and designed for the working pressure (in no case less than 200 psi) required at the maximum rated capacity, with a maximum allowable fiber stress of 11,000 psi for steel:

$$T=\frac{Rp}{S},$$

where

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

The cylinder or casing shall have a minimum nominal wall thickness of 7/32 in.

5.1.6 *Pressure heads.*

5.1.6.1 The pressure heads of cylinders and immersed plungers shall be designed for the working pressure (in no case less than 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—

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

where K=0.25. Where the superstructure is attached to the pressure head (see 5.1.6.4), use K=0.50.

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

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

where

T=thickness of heads, in inches,
d_i=diameter of head between the supporting edges in inches,
p=design pressure (200 psi minimum).
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, 5.1.6.1 (1) and 5.1.6.1 (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.

5.1.6.2 *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.

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

5.1.6.4 *For flat, unreinforced pressure heads with added integral bolt holes, studs, or other fastenings,* T shall be derived in accordance with 5.1.6.1.

5.1.6.5 *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 5.1.2.2, and the plunger head shall be considered under 5.1.2.1 and all foregoing sections of 5.1.6, above.

5.1.7. *Rails and runways.*

5.1.7.1 *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.

5.1.7.2 *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.

5.1.7.3 *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.

5.1.8 *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.

5.1.9 *Bearings.*

5.1.9.1 *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.

5.1.9.2 *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.

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

5.1.11 *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 3 in. of usable oil in the storage tank.

5.1.12 *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.

5.1.13 *Air-oil tanks.*—All separate 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 [2] 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.

5.2 Mechanical Lifts

5.2.1 *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.

5.2.2 *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.

5.2.3 *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.

5.2.4 *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.

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

5.2.6 *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.

5.2.7 *Cable and drum class.*

5.2.7.1 *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, with a factor of safety not less than that recommended by the manu-

[2] The American Society of Mechanical Engineers.

facturer 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.

5.2.7.2 *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.

5.2.7.3 *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.

5.2.8 *Rack and pinion class.*

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

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

5.2.9 *Screw class.*

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

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

5.2.10 *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.

5.2.11 *Rails and runways.*—Same as for hydraulic lifts. See 5.1.7.

5.3 Frameless Suspension Lifts

5.3.1 *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.

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

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

6. TESTS

6.1 Cylinders (casings) and plungers or hydraulic lift cylinder assemblies, as well as air-oil tanks, shall be pressure tested at a pressure of not less than 150 percent of maximum rated operating pressure, and in no case at less than 300 psi.

7. IDENTIFICATION

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

7.2 In order that buyers may be assured that automotive lifts purchased actually comply with all requirements of this 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 CS142–51, as developed by the trade under the procedure of the Commodity Standards Division, and issued by the U. S. Department of Commerce.
>
> ------------------------------
> (Name of manufacturer)

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

Complies with CS142–51.

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

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

8. EFFECTIVE DATE

8.1 Having been passed through the regular procedure of the Commodity Standards Division, and approved by the acceptors hereinafter listed, this commercial standard was issued by the United States Department of Commerce, effective from June 1, 1951.

EDWIN W. ELY,
Chief, Commodity Standards Division.

HISTORY OF PROJECT

First edition.—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 others for advance comment.

A recommended standard, adjusted in accordance with the composite comment received from the industry, was submitted on March 14, 1947, to producers, distributors, users, and 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 standard into agreement with action taken by State regulatory authorities. These adjustments were submitted to the acceptors of the recommended standard on June 13, 1947.

Pursuant to acceptance and approval by the trade of the adjusted standard, the National Bureau of Standards announced that Commercial Standard 142–47, Automotive Lifts, would become effective as a voluntary standard of the trade from October 1, 1947.

First revision.—On June 13, 1950, the Automotive Lift Institute, at a meeting held in Chicago, Ill., proposed changes in CS142–47 to include additional safety features and to bring the standard in line with current practices in the industry. On approval by the standing committee, the recommended changes were submitted on August 27, 1950, to the trade for written acceptance. The establishment of the revision as CS142–51 was announced on May 1, 1951, to become effective for new production from June 1, 1951.

Project Manager: E. C. Barrett, Commodity Standards Division, Office of Industry and Commerce.
Technical Adviser: Samuel Levy, Mechanics Division, National Bureau of Standards.

STANDING COMMITTEE

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, Office of Industry and Commerce, U. S. Department of Commerce, which acts as secretary for the committee.

Harry D. Smith, *chairman*

Manufacturers:

- C. A. Bening, The United States Air Compressor Co., 5300 Harvard Avenue, Cleveland 5, Ohio.
- 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.
- 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:

- P. J. Milo, The Texas Co., 135 East Forty-second Street, New York, N. Y.
- H. S. Mount, Sun Oil Co., 1608 Walnut Street, Philadelphia 3, Pa.
- 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).

ACCEPTORS

The organizations listed below have individually accepted this standard for use as far as practicable in the production, distribution, testing, or purchase of automotive lifts. In accepting the standard, they reserved the right to depart from it 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 Specification Institute, Chicago, Ill.
American Trucking Associations, Inc., Washington, D. C.
Automotive Lift Institute, Inc., New York, N. Y.
Pneumatic Automotive Equipment Association, Pittsburgh, Pa.

FIRMS AND OTHER INTERESTS

Alexander-Seewald Co., Atlanta, Ga.
Amco Corp., Chicago, Ill.
Amco Corp., Detroit, Mich.
American Motor Specialties Co., Newark, N. J.
Arbor Auto Service, Philadelphia, Pa.
Automotive Distributors, Inc., Boston, Mass.
Borden-Aicklen Auto Supply Co., Inc., New Orleans, La.
Brown's Auto Supply, Decatur, Ill.
Buffalo (N. Y.), Department of Public Works, Division of Buildings, Architectural Service.
Cochin, J. D., Manufacturing Co., South San Francisco, Calif.
Commercial Automotive Service, Inc., Seattle, Wash.
Corey's, Ray, Texaco Service, Dekalb, Ill.
Corpus Christi, City of, Inspection Section, Corpus Christi, Tex.
Curtis Manufacturing Co., Curtis Pneumatic Machinery Division, St. Louis, Mo.
Delaware State Highway Department, Dover, Del.
Detroit (Mich.), Department of Public Works, City Engineer's Office.
Detroit, University of, Engineering Research Council, Detroit, Mich.
Eaton Metal Products Co., Denver, Colo.
Ford Motor Co., Dearborn, Mich.
Franklin Supply Co., Providence, R. I.
Gilbert & Barker Manufacturing Co., West Springfield, Mass.
Globe Hoist Co., Philadelphia, Pa.
Haire Murray Co., Inc., Fresno, Calif.
Hockaday & Phillips, Inc., Santa Ana, Calif.
Hudson-Tucker, Inc., San Diego, Calif.
Joyce-Cridland Co., Dayton, Ohio.
Kaiser-Frazer Sales Corp., Ypsilanti, Mich.
Kansas State Highway Commission, Topeka, Kans.
Kendall Refining Co., Bradford, Pa.
Lambert Co., Ltd., Los Angeles, Calif.
Marr, Charles J., New Philadelphia, Ohio.
Marshall Elevator Co., Pittsburgh, Pa.
Maryland, State of, State Roads Commission, Baltimore, Md.
McCullough, J. H., & Son, Philadelphia, Pa.
Miami, City of, Miami, Fla.
Motive Parts Company of America, Inc., Chicago, Ill.
Motor Mart, Dallas, Tex.
Mountjoy Co., San Antonio, Tex.
Nichols Equipment Co., Little Rock, Ark.
Northern Supply Co., Bay City, Mich.
Omaha, City of, Omaha, Nebr.
Oregon State Highway Commission, Salem, Oreg.
Phillips Petroleum Co., Bartlesville, Okla.
Pittsburgh (Pa.), Board of Public Education, Veterans Training Program.
Revolvator Co., North Bergen, N. J.
Rotary Lift Co., Memphis, Tenn.
Russell, J., & Co., Inc., Holyoke, Mass.
Service Supply Corp., Philadelphia, Pa.
Severin Supply Co., Oklahoma City, Okla.
Siferd-Hossellman Co., Lima, Ohio.
Socony-Vacuum Oil Co., Inc., New York, N. Y.
South Carolina State Highway Department, Columbia, S. C.
Standard Automotive Supply Co., Inc., Washington, D. C.
Standard Oil Company of California, San Francisco, Calif.
Standard Oil Co. (Ohio), Cleveland, Ohio.
Straus-Frank Co., San Antonio, Tex.
Sun Oil Co., Philadelphia, Pa.
Texas Co., New York, N. Y.
Tide Water Associated Oil Co., San Francisco, Calif.
Twining Laboratories, Fresno, Calif.
Union Oil Company of California, Los Angeles, Calif.
United States Air Compressor Co., Cleveland, Ohio.
United States Testing Co., Inc., Hoboken, N. J.
University City, City of, University City, Mo.
Virginia Department of Highways, Richmond, Va.
Ward Motor Vehicle Co., Mount Vernon, N. Y.
Washington, University of, Seattle, Wash.
Wayne Pump Co., Fort Wayne, Ind.
Weaver Manufacturing Co., Springfield, Ill.
Western Electric Co., Inc., New York, N. Y.
Western Manufacturing Co., San Jose, Calif.
Wethersfield, Town of, Building Department, Wethersfield, Conn.
Wichita, City of, Wichita, Kans.
Wisconsin, State Highway Commission of, Madison, Wis.

UNITED STATES GOVERNMENT

Agriculture, Department of, Division of Purchase, Sales and Traffic, Washington, D. C.
Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio.
Army, Department of the, Office of the Assistant Chief of Staff, Standards Branch, Washington, D. C.
Indian Affairs, Bureau of, Department of the Interior, Washington, D. C.

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________________________

Commodity Standards Division,
Office of Industry and Commerce,
U. S. Department of Commerce,
Washington 25, D. C.

Gentlemen:

We believe that the Commercial Standard 142–51 constitutes a useful standard of practice, and we individually plan to utilize it as far as practicable in the

production [1] distribution [1] use [1] testing [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________________________________
(Fill in exactly as it should be listed)

Street address________________________________

City, zone, and State________________________________

[1] Underscore which one. Please see that separate acceptances are filed for all subsidiary companies and affiliates which should be listed separately as acceptors. 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.

(Cut on this line)

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 acceptance 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 of the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

COMMERCIAL STANDARDS

CS No.

0–40. Commercial standards and their value to business.
1–42. Clinical thermometers.
2–30. Mopsticks.
3–40. Stoddard solvent.
4–29. Staple porcelain (all-clay) plumbing fixtures.
5–46. Pipe nipples; brass, copper, steel, and wrought-iron.
6–31. Wrought-iron pipe nipples. Superseded by CS5–46.
7–29. Standard weight malleable iron or steel screwed unions.
8–51. Gage blanks.
9–33. Builders' template hardware.
10–29. Brass pipe nipples. Superseded by CS–546.
11–41. Moisture regains of cotton yarns.
12–48. Fuel oils.
13–44. Dress patterns.
14–51. Boys' sport and dress shirt (woven fabrics) size measurements.
15–46. Men's pajama sizes (made from woven fabrics).
16–29. Wallpaper.
17–47. Diamond core drill fittings.
18–29. Hickory golf shafts.
19–32. Foundry patterns of wood.
20–49. Vitreous china plumbing fixtures.
21–39. Interchangeable ground-glass joints, stopcocks, and stoppers.
22–40. Builders' hardware (nontemplate).
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.
28–46. Cotton fabric tents, tarpaulins and covers.
29–31. Staple seats for water-closet bowls.
30–31. (Withdrawn.)
31–38. Wood shingles.
32–31. Cotton cloth for rubber and pyroxylin coating.
33–43. Knit underwear (exclusive of rayon).
34–31. Bag, case, and strap leather.
35–49. Hardwood plywood.
36–33. Fourdrinier wire cloth.
37–31. Steel bone plates and screws.
38–32. Hospital rubber sheeting.
39–37. (Withdrawn.)
40–32. Surgeons' rubber gloves.
41–32. Surgeons' latex gloves.
42–49. Structural fiber insulating board.
43–32. Grading of sulphonated oils.
44–32. Apple wraps.
45–48. Douglas fir plywood.
46–49. Hosiery lengths and sizes.
47–34. Marking of gold-filled and rolled-gold-plate articles other than watchcases.
48–40. Domestic burners for Pennsylvania anthracite (underfeed type).
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.
56–49. Oak flooring.
57–40. Book cloths, buckrams, and impregnated fabrics for bookbinding purposes except library bindings.
58–36. Woven elastic fabrics for use in overalls (overall elastic webbing).
59–44. Textiles—testing and reporting.
60–48. Hardwood dimension lumber.
61–37. Wood-slat venetian blinds.

CS No.

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.
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) (published with CS71–41).
71–41. Phenolic disinfectant (soluble type) (published with CS70–41).
72–38. Household insecticide (liquid spray type).
73–48. Old growth Douglas fir, Sitka spruce, and Western hemlock standard stock doors.
74–39. Solid hardwood wall paneling.
75–42. Automatic mechanical draft oil burners designed for domestic installations.
76–39. Hardwood interior trim and molding.
77–48. Enameled cast-iron plumbing fixtures.
78–40. Ground-and-polished lenses for sun glasses (published with CS79–40).
79–40. Blown, drawn, and dropped lenses or sun glasses (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.
89–40. Hardwood stair treads and risers.
90–49. Power cranes and shovels.
91–41. Factory-fitted Douglas fir entrance doors.
92–41. Cedar, cypress, and redwood tank stock lumber.
93–50. 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.
100–47. Porcelain-enameled steel utensils.
101–43. Flue-connected oil-burning space heaters equipped with vaporizing pot-type burners.
102 . (Reserved for "Diesel and fuel-oil engines.")
103–48. Rayon jacquard velour (with or without other decorative yarn).
104–49. Warm-air furnaces equipped with vaporizing-type oil burners.
105–48. Mineral wool insulation for low temperatures.
106–44. Boys' pajama sizes (woven fabrics).
107–45. (Withdrawn.)
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.
113–51. 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.

CS No.

117–49. Mineral wool insulation for heated industrial equipment.
118–44. Marking of jewelry and novelties of silver.
(E) 119–45.[1] Dial indicators (for linear measurements).
120–48. Standard stock ponderosa pine doors.
121–45. Women's slip sizes (woven fabrics).
122–49. Western softwood plywood.
123–49. Grading of diamond powder.
(E) 124–45.[1] Master disks.
125–47. Prefabricated homes.
126–45. Tank-mounted air compressors.
127–45. Self-contained mechanically refrigerated drinking water coolers.
128–49. Men's sport shirt sizes—woven fabrics (other than those marked with regular neckband sizes).
129–47. Materials for safety wearing apparel.
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.)
137–51. Size measurements for men's and boys' shorts (woven fabrics).
138–49. Insect wire screening.
139–47. Work gloves.
140–47. Testing and rating convectors.
141–47. Sine bars, blocks, plates, and fixtures.
142–51. 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.
146–47. Gowns for hospital patients.
147–47. Colors for molded urea plastics.
148–50. Men's circular flat- and rib-knit rayon underwear.
149–48. Utility type house dress sizes.
150–48. Hot-rolled rail steel bars (produced from Tee-section rails).

CS No.

151–48. Body measurements for the sizing of apparel for infants, babies, toddlers, and children (for the knit underwear industry).
152–48. Copper naphthenate wood-preservative (spray, brush, dip application).
153–48. Body measurements for the sizing of apparel for girls (for the knit underwea industry).
154– . (Reserved for "Wire rope.")
155–50. Body measurements for the sizing of boys' apparel (knit underwear, shirts, trousers).
156–49. Colors for polystyrene plastics.
157–49. Ponderosa pine and sugar pine plywood.
158–49. Model forms for girls' apparel.
159–49. Sun glass lenses made of ground and polished plate glass, thereafter thermally curved.
160–49. Wood-fiber blanket insulation (for building construction).
161–49. "Standard grade" hot-dipped galvanized ware (coated after fabrication).
162–49. Tufted bedspreads.
163–49. Standard stock ponderosa pine windows, sash and screens.
164– . (Reserved for "Concrete mixers.")
165–50. Zinc naphthenate wood-preservative (spray, brush, dip application).
166–50. Size measurements for men's work trousers.
167–50. Automotive and general service copper tube.
168–50. Polystyrene plastic wall tiles, and adhesives for their application.
169–50. Galvanized ware fabricated from *pregalvanized* steel sheets.
170–50. Cotton flour-bag (sack) towels.
171–50. Hardwood veneered doors.
172–50. Brass trim for water-closet bowls, tanks, and urinals (dimensional standards).
173–50. Heavy-duty alpha-cellulose-filled melamine tableware.
174–51. 140–F Dry-cleaning solvent.
175–51. Circular-knitted gloves and mittens.
176–51. Prefinished wall panels.
177–51. Bituminous-coated metal septic tanks (single compartment, residential).

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

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, Office of Industry and Commerce, U. S. Department of Commerce, Washington 25, D. C

U. S. GOVERNMENT PRINTING OFFICE: 1951