

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

50 S 2273

May 17th, 1918

GUIDES AND ATTACHMENTS

Superseding
50 S 1892

APPROVED
ENGINEERING
COMMITTEE

1. Use distance between Alligator Guides and width of top and bottom bars, given below; making top and bottom bars same width and omitting recesses in top bars for crosshead shoe flanges:

PISTON ROD DIAMETER	DISTANCE BETWEEN GUIDES	WIDTH OF BARS TOP & BOTTOM
2¾"	15"	4½"
3"	15"	4½"
3¼"	16"	5½"
3½"	16"	5½"
3¾"	17"	5½"
4"	17"	5½"
4¼"	18"	6" 6½" 7½"
4½"	18"	6" 6½" 7½"
4¾"	18"	6½" 7½" 8½"
5"	19"	7½" 8½"
5"	20"	7½" 8½"

Preferred Sizes in Heavy-faced Type

2. Relieve guides from wearing surface through to front end to avoid binding crosshead when it is moved ahead of its normal position.
3. The maximum Fibre Stress in guides must not exceed 8000 lbs. per square inch when calculated in accordance with the following rules:

T = Maximum upward thrust on guide obtained by the formula:

$$T = \frac{P \times \left(\frac{S}{2} + C \right)}{L}$$

P = Piston thrust (For Mallet engines use full boiler pressure in H. P. cylinders).

S = Stroke.

C = Vertical distance of center line of cylinders above center line of driving wheels.

L = Length of main rod.

Assume guide as a simple beam supported at both ends with load "T" applied at middle of guide (half way between points of support). Then the formula for depth of guide is:

$$D = \sqrt{\frac{6 T l}{4 \times 8000 b}}$$

when l = length of guides between supports and B = width of guide.

All dimensions in inches.

NOTE: The above formula applies only to guides supported at or near the ends.

Make guides flat at the maximum depth for a distance (in even inches) of 20% of the length of the guide between supports. Flat spot to begin at a point on guide midway between the point of mid-stroke and the center of guide between supports, and extend equally, front and back. The minimum depth of the ends of guides to be as follows:

American Locomotive Company

ENGINEERING DEPARTMENT

January 31, 1938

STANDARD PRACTICE

51,52 S 2274c

GRATES and DETAILS

Superseding

51,52 S 2274b

APPROVED
ENGINEERING
COMMITTEE

1. When R. R. Companies do not specify design of GRATE, follow the design used on the engines last built for the Road in question, except when the design was substantially different from that of the order under construction or built more than five years previously, in which case use the following for BITUMINOUS COAL engines:

Table type BARS spaced 10" centers, with straight rocking arms allowing (preferably) a movement F. and B. of 45° and giving a minimum clear opening of 4", but a backward movement of 30°, with a minimum clear opening of 3", may be used when clearance for grate levers on backhead is limited. Opening between bars 3/4".

Air openings in bars preferably 3/4".

Omit DUMP grates.

ARRANGE grates as follows:

FIRE BOX			
LOCATION	LENGTH I.S.RING	WIDTH I.S.RING	NO.OF SHAKING SECTIONS
Between wheels	79" and under		One
" "	Over 79"		Two
On top or back of wheels		97" and under	Four
On top or back of wheels		Over 97"	Six

2. Support grate SIDE FRAMES by separate castings studded to bottom of firebox ring. Support grate CENTER FRAME by separate castings studded or bolted to bottom of firebox ring. Studs into firebox sheets must not be used for this purpose, unless construction requires their use.
3. Use malleable iron - SHAKING LEVER LATCH as per Standard Drawings (see Index).

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co's drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

April 15, 1938

STANDARD PRACTICE

53 S 2275a

HANDRAILS AND STEPS - ENGINE

Superseding

53 S 2275

APPROVED
ENGINEERING
COMMITTEE

1. See Group 56 - Laws, Rules, Instructions, I.C.C. Public Service Commission, etc.
2. SAND BOX GRAB IRONS: When steps are required to reach sand box from running board, apply wrought iron GRAB IRONS to both sides of SAND BOX, having 5" clear length, 2" minimum clearance from box, located as high as clearance limitations will permit, and riveted to box with 1/2" rivets.
3. HEADLIGHT STEP: Under no circumstances must a HEADLIGHT STEP be attached to a round smokebox brace by clamps. This construction is dangerous on account of the liability of the clamp to loosen and allow the step to tilt when in use. When the Railway Company's drawings show this construction, question must be raised in every case.
4. See Group 15 - Steps and Grab Iron BOLTS.
5. HANDRAIL COLUMNS: Use design of handrail column with removable cap as shown on Standard Drawings (see index).
Use height of column as determined by largest size of pipe, such as sand pipe, injector delivery pipe, etc. over which handrail passes.
Use same height of column throughout, making handrail parallel with contour of boiler. End of stud to be rounded, and corners rounded on nut and cap to make smooth surface for man's hand.
6. GUIDE STEPS: Avoid using long steps, and where practicable, arrange for steps to be cast on.

QUESTION: Duplicate engines.

EXCEPTIONS: R.R. Co's drawings, specifications, or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

54 S 2276 e

February 26th, 1930

HEADLIGHT, NUMBER PLATE, ETC.

Superseding
54 S 2276 d

APPROVED
ENGINEERING
COMMITTEE

1. **Electric Headlight:** Locate generator on top of boiler in front of cab whenever practicable, otherwise ahead of stack and as close to stack base as possible, obtaining Ry. Co's approval of such location when necessary. See Drawing 642 S 19880-82.
 - Road Engines:** When equipped with two electric Headlights, arrange them to operate independently with single dimmer (when dimmer is required).
 - Switching Engines:** See Group 56, Laws, Rules and Instructions.
 - Wiring:** All wiring should be supervised by a competent electrician. Run flexible (stranded) slow-burning weather-proof wire from generator to headlights, cab lights and signal lights front and back (when required) through conduit. Use left (boiler) handrail of rigid metal conduit where detachable cap type of handrail posts are used. Run wires through separate conduit clamped to handrail posts when handrail is not available. Protect all wiring throughout its length by suitable conduits and in no case allow the wire to come in contact with the smokebox sheet. Make all joints in conduit containing wires with suitable "condulets" or "conduit fittings." Protect insulation of wires at bends from vibration of engine and heat of boiler and smokebox.
2. **Cab Lamps:** Use cast aluminum lamps for cab and water gauge per Standard Drawings. (See Index).
3. **Signal Lamp Fixtures:** When use is specified, and design is not furnished, follow Standard Drawings (See Index).
4. **Number and Name Plates:** Use per Standard Drawings (See Index), of cast iron with letters and numbers cast on and painted black all over. Use small size on engines having boilers under 50" diameter and large size for boilers 50" diameter and over.
5. **Ownership, Lease, Agency, Etc.:** Make these and similar plates of cast iron when supplied by this Company.
6. **Brass Plates:** When specified to be finished all over, secure with copper rivets or brass bolts.
7. **Ownership Plates:** Use per Standard Drawings (See Index) only when required. Locate on each side of smokebox directly below name plate and on each side of tender near center of outside channels.
8. See Group 48, Foreign Locomotives.
9. See Group 56, Laws, Rules and Instructions.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

55 S 2277 a

December 21st, 1922

INJECTORS

Superseding
55 S 2277

APPROVED
ENGINEERING
COMMITTEE

- Use two injectors of equal capacity, each capable of supplying the percentage of the maximum cylinder steam consumption, corresponding to the given fuel and service, as per table below:

CYLINDERS	STEAM	MAXIMUM STEAM CONSUMPTION PER CYLINDER H. P. HOUR		FUEL	SERVICE	% MAXIMUM STEAM CONSUMPTION SUPPLIED BY ONE INJECTOR
		POUNDS	GALLONS			
Simple	Saturated	27.0	3.24	Other than Oil or Pulverized Coal	Road	75%
	Superheated	20.8	2.50		Switching	60%
Compound	Saturated	23.5	2.82	Oil or Pulverized Coal	Road	87%
	Superheated	19.7	2.36		Switching	70%

This method assumes that the boiler and cylinder horse power are equal (a 100% engine). When boiler horse power is less than 90% or over 100% of cylinder horse power, make proportionate decrease or increase in capacity of injectors.

TABLE OF INJECTOR CAPACITIES AT 200 LB. BOILER PRESSURE

SIZE NO.	NATHAN			SELLERS	OHIO		HANCOCK	AVERAGE CAPACITIES GALLONS PER HOUR
	MONITOR & ALL N. L. EXCEPT SIMPLEX	SIMPLEX LIFTING & N. L. EXCEPT H. W.	SIMPLEX N. L. H. W.	ALL TYPES	STD'S A. B. & E.	STD'S C. & D.	TYPES A. B. & D.	
7 7½	1920	1950	1950	2010	1800		2040	1932 2010
8 8½	2340	2580	2580	2587	2300	2700	2710	2535 2587
9 9½	2940	3240	3240	3187	2900 3150	3200	2980 3300	3083 3212
10 10½	3750	3800	3800	3952	3400 3600	3800	4060	3768 3776
11 11½	4150	4550	4550	4725	3800	4200	4420	4278 4725
12 12½	4450	5200	5500	5700	4200	4600		4790 5700
13 13½		6000	6000-7000	6800				6250 6800
14		7500						7500

For pressures less than 200 lb. use percentages of the capacities in table at left as follows:

BOILER PRESSURE	PER CENT
150	92
160	94
170	96
180	98
190	100

- Lifting injectors and inspirators must be so located that bottom of overflow nozzle will be within the limits of 2' to 6' above the highest water line of tank. Non-lifting inspirator operating valves must be located above the highest water line of tank.
- All injectors, whether equipped with open or closed overflow must have overflow pipe securely braced at two or more points along its course between injector and its termination, so that pipe will not be jarred loose from injector.
Lifting injectors located ahead of engineer, and non-lifting injectors having overflow in cab, must have closed over-flow connections when applied to engines built for operation in the United States. Material orders must specify: "closed over-flow pipe connection."
Overflow from non-lifting injectors must not discharge into ash pan, nor at any other point above injectors.
- All classes of engines to have copper steam Pipes and steel suction and over-flow pipes. Use steel delivery pipes outside of boiler, and copper inside of boiler.
When injector checks are attached to backhead of boiler, it is very important that the forward end of the delivery pipe be bent down and always covered with at least six inches of water. Locate check as low as possible.
Locate delivery pipes leading to top-inlet checks so that they will be self-draining to their lowest point.
- Use Line Checks only when specified by R. R. Co., or with injectors where makers furnish same as part of equipment.

QUESTION: Duplicate engines.

EXCEPTIONS; R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

56 S 2328 c

August 25th, 1928

LAWS, RULES AND INSTRUCTIONS United States (Federal Laws).

Superseding
56 S 2328 b

APPROVED
ENGINEERING
COMMITTEE

1. **Locomotive Boilers and Their Appurtenances—Inspection and Test:** The boiler and boiler fittings of all engines built for operation in the United States must conform to the following requirements of Interstate Commerce Commission Order dated June 2, 1911, and Orders amending same dated September 12, 1912, June 9, 1914, and April 7, 1919:

GROUPS 13 & 14. Factor of Safety: "The lowest factor of safety for locomotive boilers shall be 4." (A. L. Co. Standard is $4\frac{1}{2}$: see S. P. Group 13.)

Maximum Allowable Stress on Stays and Braces: "The maximum allowable stress per square inch of net cross-sectional area on firebox and combustion chamber stays shall be 7,500 pounds. The maximum allowable stress per square inch of net cross-sectional area on round, rectangular, or gusset braces shall be 9,000 pounds.

NOTE: Throat stay (back tube sheet to shell) must be considered as "Firebox and Combustion chamber stays," per ruling by Frank McManamy, Chief Inspector, dated January 9, 1915.

Shearing Strength of Rivets: "The maximum shearing strength of rivets per square inch of cross-sectional area shall be taken as follows:

Iron rivets in single shear.....	38,000 pounds
" " " double	76,000 "
Steel " " single	44,000 "
" " " double	88,000 "

"A higher shearing strength may be used for rivets when it can be shown by test that the rivet material used is of such quality as to justify a higher allowable shearing strength."

Boiler Number: "The builder's number of the boiler shall be stamped on the dome."

NOTE: Stamp shop serial number, preceded by the builder's initials, thus; "A. L. Co. No. 99999," in figures $\frac{1}{2}$ " high, horizontally on front side of dome ring near top. On one-piece domes stamp initials and number on front side at upper edge of vertical surface. On Extra Work order boilers, stamp General Order number and serial number on order, thus: "A. L. Co. G. O. 99999-1."

Boiler Test: "Every boiler before being put into service shall be subjected to hydrostatic pressure 25 per cent above the working steam pressure. (See S. P. Group 13).

Staybolts: "Telltale holes.—All staybolts shorter than 8 inches except flexible bolts, shall have telltale holes three-sixteenths inch in diameter and not less than $1\frac{1}{4}$ inches deep in the outer end." (See also S. P. Group 14).

GROUPS 27 & 60. Water Glass, Gauge Cocks and Lubricator Glasses. "Number and location.—Every boiler shall be equipped with at least one water glass and three gauge cocks. The lowest gauge cock and the lowest reading of the water glass shall be not less than 3 inches above the highest part of the crown sheet."

"Water-glass valves—All water glasses shall be supplied with two valves or shut-off cocks, one at the upper and one at the lower connection to the boiler, and also a drain cock, so constructed and located that they can be easily opened and closed by hand."

"Water and lubricator glass shields.—All tubular water glasses and lubricator glasses must be equipped with a safe and suitable shield which will prevent the glass from flying in case of breakage."

GROUP 54. Water-glass Lamps:—"All water glasses must be supplied with a suitable lamp properly located to enable the engineer to easily see the water in the glass."

Badge Plates: "A metal badge plate showing the allowed steam pressure shall be attached to the boiler head in cab. If boiler head is lagged, the lagging and jacket shall be cut away so the plate can be seen."

NOTE: Use boiler pressure Badge and Marker Plate, per Standard Drawing (see Index). This plate shows (in addition to maximum allowable steam pressure) working pressure and builder's number.

GROUP 79. Steam Gauges: "Location of Gauges.—Every boiler shall have at least one steam gauge which will correctly indicate the working pressure. Care must be taken to locate the gauge so that it will be kept reasonably cool, and be conveniently read by the enginemen.

"Siphon.—Every gauge shall have a siphon of ample capacity to prevent steam entering the gauge. The pipe connection shall enter the boiler direct, and shall be maintained steam-tight between boiler and gauge."

"Method of Testing.—Steam gauges shall be compared with an accurate test gauge or dead-weight tester and gauges found inaccurate shall be corrected before being put into service.

NOTE: Gauges must be accurate at working pressure and must not vary more than three pounds above or below true pressure at other points on the gauge.

Safety Valves: "Number and capacity.—Every boiler shall be equipped with at least two safety valves, the capacity of which shall be sufficient to prevent, under any conditions of service, an accumulation of pressure more than 5 per cent above the allowed steam pressure.

"Setting of Safety Valves.—Safety valves shall be set to pop at pressures not exceeding 6 pounds above the working steam pressure. When setting safety valves two steam gauges shall be used, one of which must be so located that it will be in full view of the person engaged in setting such valves; and if the pressure indicated by the gauges varies more than three pounds they shall be removed from the boiler, tested, and corrected before the safety valves are set. Gauges shall in all cases be tested immediately before the safety valves are set or any change made in the setting. When setting safety valves the water level in the boiler shall not be above the highest gauge cock."

NOTE: Set one safety valve at 3 pounds, and the remaining valve or valves at 5 pounds above working pressure. When muffled and open valves are used together, muffled valves must have the lowest setting. In setting safety valves, water level in boiler must not be above second gauge cock.

Provide cock shown on drawing 792 S 1170 for test gauge, applying same in hole in roof sheet over front end of crown used for testing height of crown. Test gauge and piping to be furnished and applied by purchaser. The Interstate Commerce Commission has ruled that this cock must be tapped into boiler direct, therefore, when Railroad Companies specify it to be located in turret (whether inside or outside of cab) question must be raised.

(OVER)

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

56 S 2329 c

Dec. 30th, 1932

LAWS, RULES AND INSTRUCTIONS United States (Federal Laws)

Superseding
56 S 2329 b
56 S 2328 c-Par. 1

APPROVED
ENGINEERING
COMMITTEE

1. **INSPECTION AND TESTING OF STEAM LOCOMOTIVES AND TENDERS.** Steam locomotives and tenders built for operation in the United States must conform with "Rules and Instructions for Inspection and Testing of Steam Locomotives and Tenders," covered in I. C. C. Orders, dated Oct. 11 1915, June 30, 1916, Nov. 13, 1916, Dec. 26, 1916, Dec. 17, 1917, April 7, 1919, May 7, 1928 and Feb. 21, 1929. Below are the portions of these Orders relating to design:

GROUP 10. Ash Pans: "Locomotives built after Jan. 1, 1916, shall have ash pans supported from mudrings or frames. Locomotives built prior to Jan. 1, 1916, which do not have ash pan supported from mudrings or frames, shall be changed when the locomotive receives new firebox. No part of ash pan shall be less than 2½' above the rail.

The operating mechanism of all ash pans shall be so arranged that it may be safely operated."

Use self-dumping ash pans on all locomotives (except Standard contractors' engines with 9'-16" cylinders) built to operate in the United States. (Act of Congress, approved May 30th, 1908.)

GROUP 19. Air Gauges: "Air gauges shall be so located that they may be conveniently read by the engineer from his usual position in the cab."

Piston Travel: "The minimum piston travel shall be sufficient to provide proper brake shoe clearance when the brakes are released."

"The maximum piston travel when locomotive is standing shall be as follows:

Cam type of driving wheel brake.....	3½ inches
Other forms of " " " ".....	6 inches
Engine truck brake	8 inches
Tender brake.....	9 inches"

GROUP 20. Foundation Brake Gear: "No part of the foundation brake gear of the locomotive or tender shall be less than 2½' above the rail."

NOTE: Figure engine drawings as follows, to allow for wear, etc.: with 3' driving tires 6", and with 3½' driving tires, 6½' above rail (minimum).

GROUP 22. Cabs: "Cab windows shall be so located that the enginemen may have a clear view of track and signals from their usual and proper positions in the cab. Road locomotives used in regions where snow storms are generally encountered shall be provided with what is known as a "clear vision" window, which is a window hinged at the top and placed in the glass in each front cab door or window. These windows shall not be less than 5 inches high, located as nearly as possible in line of the enginemen's vision, and so constructed that they may be easily opened or closed."

NOTE: Use design of clear-vision window, single glass, shown on drawings 233 S 72500, 233 S 72510-4 and 233 S 72520-4.

GROUP 23. Cab Back Curtains: Each locomotive used within the States of Colorado, Connecticut, Delaware, District of Columbia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, Nevada, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming, and within that part of California north of an imaginary line drawn from Carson City, Nevada, through Placerville, Oroville, Gerber, California, to Trinidad, California- excepting deckless locomotives and locomotives equipped with a vestibule cab, shall have suitable doors, or a suitable roll or slide-back curtain of sufficient length and width to cover the opening in rear wall of cab. On locomotives not equipped with hood curtain the drop-back curtain if used in lieu of slide curtain shall be of sufficient width to cover the space between the side curtains.

Cab Side Curtains: During the period from Nov. 1 to April 1 each locomotive used within the territory specified, and not equipped with a vestibule cab, shall have suitable side curtains at the gangway in addition to the curtain required. Side curtains shall be of ample length and width, and be properly fitted and attached. Side curtains may be of the wide or narrow type. If wide side curtains extending from rear of cab back alongside of tender are used they shall extend at least 18 inches back of front of tender water legs and the tender handholds at gangway shall be offset at the rear so as to permit the side curtains to extend alongside of tender inside of handholds and not interfere with free and unobstructed use of the handholds. Side curtains shall have a suitable stiffening rod or member at rear of curtain. If narrow side curtains extending from rear of cab to tender are used, they shall be so arranged that a closely fitting joint can readily be formed at the tender when desired. Side curtains shall so be arranged that they can readily be opened, and so as not to interfere with free and unobstructed use of the handholds. Where apron or floor of tender at gangway does not extend full width of tender, side curtains shall be hung as nearly in line with the ends of the apron as is practicable and shall extend not less than 12 inches below apron or tender floor and have attached thereto a flap suitable for placing on apron or tender floor and adequate for closing opening between side curtains and apron or tender floor. Side curtains shall extend to as near cab roof as practicable.

Cab Hood Curtains: Each locomotive, excepting locomotives burning oil as fuel and locomotives equipped with a vestibule cab, used during the period from November 1 to April 1 within the territory specified, excepting the States of Maryland, Virginia, Delaware, Kentucky, West Virginia, California, and the District of Columbia, shall have, in addition to the curtains required above a suitable hood curtain extending around cab overhang so arranged as to close the opening that would otherwise exist between cab overhang and top of tender and between top of side curtains and cab overhang.

Deckless locomotives may have in lieu of the hood curtain a suitable roll curtain attached at or near rear of cab overhang and of sufficient width to cover the space between the side curtains. On coal-burning locomotives the roll curtain shall be so located and of sufficient length that it may be unrolled down in front of coal gates to within 15 inches of floor or tender. The roll curtain shall be so arranged that it may be rolled up to top of tender water legs or to its supporting member and fastened in either position when desired.

LAWS, RULES AND INSTRUCTIONS
ForeignSuperseding
56 S 2331aAPPROVED
ENGINEERING
COMMITTEE

1. **CANADIAN LAWS: Locomotive Boilers and their Appurtenances, Inspection and Test:** The boiler and boiler fittings of all engines built to operate in Canada must conform to the requirements of the Board of Railway Commissioners of Canada, General Order No. 473, dated May 22, 1929, which agree with those of the Interstate Commerce Commission with the following exceptions:

GROUPS 13 & 14. Factor of Safety: No minimum figure specified.

Maximum Allowable Stress on Stays and Braces: Not specified.

Shearing Strength of Rivets: Not specified.

GROUPS 27 & 60. Water and Lubricator Glass Shields: "Water gauge glass mountings on all locomotives must be protected by a strong cage made of aluminum, or brass metal, fitted with heavy specially toughened glass shields $\frac{3}{8}$ of an inch thick; with an outlet pipe attached to the bottom of the water gauge mounting which will allow the flow of steam from broken gauge glass to escape below the foot plate of the locomotive, or close to the foot plate itself."

"These appurtenances must be so located as to insure a correct reading of the level of water in the boiler at all times, and be in full view of both the engineer and fireman, and the lights so placed that there will be a clear and unobstructed view of the water in the mounting."

"The provisions of this rule, in so far as the type of shield is concerned, do not apply to the Central Vermont, Rutland, Great Northern, Delaware & Hudson (Napierville Junction) railways."

GROUP 79. Safety Valves—Setting: Safety valves shall be set by the gauge used on the boiler to pop at pressure not exceeding six pounds above the allowed steam pressure; the gauge in all cases to be tested before the safety valves are set or any changes made in the setting. When safety valves are being set the water level in the boiler must not be above the highest gauge cock.

SAFETY APPLIANCE STANDARDS: Number, kind, location and clearance of **Safety Appliances** on all engines and tenders built for operation in Canada, must be in accordance with the following General Orders of the Board of Railway Commissioners for Canada: No. 102 dated Feb. 17, 1913, No. 140, dated April 13, 1915, No. 404, dated July 9, 1924, No. 405, dated Aug. 6, 1924 and No. 406, dated Aug. 19, 1924, which agree with the requirements of Interstate Commerce Commission Order dated March 13, 1911, with the following exceptions:

ROAD SERVICE: Group 53.—Pilot Sill-Steps.

Dimensions: (None given.)

Location: "Foot rests shall be provided on the pilot of every such engine, sufficient in width for a man to stand on."

SWITCHING SERVICE: Group 53.—Foot Boards.

Manner of Application: (Additional requirements in the following quotation in heavy face type):

"..... space on each side of coupler is filled, and inner ends are protected with guard of same height as back-stop, each section shall not"

ALL STEAM LOCOMOTIVES: Group 53.—Handrails and Steps for Headlights as in heavy face type in the following quotation: "..... from such headlights and headlight equipment."

Cab and Tank Handrails: "That the railway companies subject to the jurisdiction of the Board, with the exception of the Boston and Maine, Maine Central, Rutland, and New York Central Railroad Companies, and the Central Vermont, Northern Pacific and Great Northern Railway Companies (which are engaged in international traffic), be, and they are hereby, directed to equip all locomotives of 100,000 pounds, or over, with handrails on the sides of the cabs above the windows, near the top of the cab, and running the entire length of the same, and to continue across the front of the cab. Where it is not practicable to extend the railing across the front of the cab, suitable handholds shall be provided; the rails to have a clearance of two inches between the inner side of the rail and the outside wall of the cab, and to be supported by columns to make them secure."

"That where the running boards do not project beyond the side of the cab, an additional piece be added, to project not less than one inch from the side of the cab, and running the full length of same."

"That all locomotive tenders of the coal-hopper type, equipped with hoppers 24 inches and over, shall have a hand railing on both sides of the coal hopper, to run the full length of the same and across the back end—the same to have a clearance of not less than two inches between the inner side of the rail and the outside wall of the fuel well, and to be located near the top, but not to project above. Hoppers less than 24 inches high shall be equipped with a railing on both sides and across the back, on the top of the hopper, to measure 8 inches over all from top of hopper, back walls sloping towards the front of hoppers excepted."

"That when necessary to renew equipment now in service, and for all future construction, coal hoppers must be designed so as to provide a sidewalk the full length of the hopper, with a minimum width of eight inches."

"That all locomotive tenders of the open-top type be equipped with a railing on both sides, on top of the coping to measure eight inches over all from top of coping, the said rails to run the full length of the fuel storage well, or clear of the back coal wall, on the tender."

"That on the spaces back of the coal wall, where the water manhole is located, a railing be provided projecting eight inches above the top of the tank and running around both sides and back of the tank. Where tenders of engines are equipped with a coping eight inches high, on the space back of the coal wall, the coping will be accepted as a railing."

"That the said railings (see two preceding paragraphs) if made of round iron or iron pipe, be not less than one inch in diameter, supported by columns." (NOTE: Pipe, when used, to be 1" nominal diameter. Letter J. Oglivie, Mechanical Expert, Dec. 5, 1916.)

"That top of the tender behind the fuel space and the running-boards on the coal-hopper type be kept clean; that suitable covers be provided for the filling holes; and that, where a coping is in use behind the fuel space, means must be provided to carry off waste water."

"That plans showing the proposed foot rests and the railing on tenders be filed for the approval of the Board."

(OVER)

INSPECTION OF STEAM LOCOMOTIVES AND TENDERS: Steam locomotives and tenders built for operation in Canada must conform with "Rules and Instructions for Inspection of Steam Locomotives and Tenders," covered in Board of Railway Commissioners for Canada Orders No. 6535, dated March 18th, 1909, No. 12287, dated November 3rd, 1910, and No. 15988, dated February 17th, 1912; and General Orders No. 289, dated March 24th, 1920, No. 362, dated April 19th, 1922, No. 385, dated November 9th, 1923, No. 403, dated June 6th, 1924, No. 412, dated December 19th, 1924, No. 415, dated April 25th, 1925, No. 434, dated November 16th, 1926, No. 436, dated December 15th, 1926, and No. 463, dated September 19th, 1928, which agree with Interstate Commerce Commission requirements with the following exceptions:

GROUP 10. Ash Pans: Use self-dumping ash pans on all locomotives built to operate in Canada, (except Standard engines with 9"-16" cylinders.) "The openings of ash pans of locomotives (except for oil-burning locomotives) with narrow fireboxes shall be covered with metal dampers. Ash pan slides and doors of locomotives, when closed, shall be secured in that position by a heavy spring or by any other positive method. Locomotive ash pan draft ports or openings shall be protected by solid deflecting plates, netting, or perforated plates, so placed as to protect the opening. Where netting is used, it shall be protected by deflecting plates. On locomotives where rods pass through the ash pan, the opening for operation shall be no longer than is actually necessary, and shall be protected wherever practicable by deflecting aprons or hoods, so placed as to prevent the escape of ashes and fire."

"Overflow pipes from injectors, or a separate pipe from boiler, or water pipes from injector delivery pipe, shall be fitted into the ash pans with the necessary valve and other fixtures to supply water to all hoppers of the ash pan at the same time."

GROUP 12. Bell: "Apply air-operated bell ringer."

GROUP 54. Classification Lamps: For all roads except the Boston and Maine, arrange for electric lighting of classification lamps. "In all cases in which a locomotive is electrically equipped, the back-up light, or centre lamp, on the back of the tender should be an electric light of sufficient candle power to give light to the "man-hole" or "water-hole" on the tender and at the same time throw light on the track immediately at the rear of the tender, as well as at a distance behind it."

GROUP 62. Pilots: "All locomotives in road service shall be equipped with pilots projecting not less than 24½ inches from the back of the upright which the pilot is built on, to the nose of the pilot; except on locomotives operating in strictly international service on the lines of the Boston and Maine, Delaware and Hudson, and Rutland Railroad Companies, and the Northern Pacific, Central Vermont, Great Northern, and New York Central Railway Companies."

GROUP 74. Smoke Boxes (except for oil-burning locomotives): "Every locomotive boiler equipped with an extension Smoke Box shall have installed therein, so as to extend completely over the aperture through which the smoke ascends, a double-crimped wire netting, the mesh of which shall not be larger than 2½ by 2½ per inch of No. 10 Birmingham wire gauge; the openings of such mesh not to exceed a quarter of an inch and one sixty-fourth (that is seventeen sixty-fourths or 0.265625") of an inch square."

"Manhole, and door openings of superheater type next to the tube sheet, shall be securely closed and held in place by cotters or keys, so constructed that they cannot fall out. All dead plates and nettings shall be securely fastened to the smokebox shell by angle irons of sufficient width to hold the same in position. In no case must there be an opening in the dead plates where fitted around steam pipes or superheater doors, or any joints, in excess of one-eighth of an inch in width. Cement or asbestos must not be used to fill openings in the fitting of fire-protective appliances."

GROUP 75. Smoke Stack (except for oil-burning locomotives): "Every locomotive equipped with a diamond Stack shall be fitted with a cast-iron deflecting cone and double-crimped wire netting, with a mesh not more than 3 by 3 per inch of No. 10 Birmingham wire gauge, placed in the flare of the diamond of the stack, so as to cover the same completely; the openings of the said mesh not to exceed three-sixteenths and one sixty-fourth (that is thirteen sixty-fourths or 0.203125") of an inch square."

GROUP 95. Wheels: "Use steel-tired or rolled-steel tender truck wheels on passenger tenders weighing 100,000 lb. or over (loaded)."

American Locomotive Company

ENGINEERING DEPARTMENT

October 5, 1936

STANDARD PRACTICE

57 S 2280-f

LAGGING & JACKET

Superseding

57 S 2280-e

APPROVED
ENGINEERING
COMMITTEE

1. **LAGGING:** Apply lagging to the following parts on all engines, using sectional magnesia unless otherwise specified:
- Boiler shell, from back end of smoke box to firebox (under sandbox, see Group 73)
 - Roof and Sides of boiler above runboards.
 - Cylinder Barrels.
 - Valve Chambers (Piston Valve).
 - Outside Steam Pipes (when used).
 - Front and Back Cylinder Heads.
 - Sides and top of slide Valve Steam Chests.
 - All outside surfaces of live steam passages in Cylinders.

Lag the following additional parts on engines of the types noted below:

- Coal-burning engines with wide firebox and with engineer's cab at rear and all oil-burning engines.
- Backhead of boiler above center of fire door.

Passenger engines with firebox back of wheels.

- Sides of firebox below runboards, only when specified.

Compound engines (Two-cylinder and Mallet):

- Outside Receiver Pipes.
- Sides and top of L.P. Steam Chests (when slide valve).
- Front and Back Cylinder Heads. - H.P. & L.P.
- Valve Chamber Heads.
- All outside surfaces of live or receiver steam passages in both H.P. & L.P. Cylinders.
- Surfaces of all live or receiver steam passages inside H.P. & L.P. cylinder saddle; the openings in bottom of saddles to be covered with 1/4" plates.

2. **PIPE COVERING:** Cover pipes named below with asbestos listing:

All pipes under steam pressure as follows:

- Inside of cab, whenever location is such as to endanger crew.
 - Outside of cab, when outside of jacket, including steam heat pipes on engine, but not including booster steam pipe.
 - Steam pipes to non-lifting injectors.
 - Other steam pipes when requested by Ry. Co's inspector or required by specifications.
- Obtain ordering length from table, multiplying length in feet of each section of pipe by length required to wrap one foot, and adding to this product the amount required to close both ends of covering, in last column.

IRON PIPE NOMINAL I. D.	COPPER PIPE ACTUAL O. D.	ASBESTOS-LISTING			
		SIZE WIDTH x THICKNESS	LENGTH IN FEET REQUIRED TO WRAP ONE LINEAL FOOT OF PIPE	LENGTH IN FEET REQUIRED FOR CLOSING ENDS	
1/4	3/8	1' x 1/8"	2 1/2	1/2	
	1/2	1' x 1/8"	3 1/4	1/2	
	5/8	1' x 1/8"	4	1/2	
	3/4	1' x 1/8"	5	1/2	
	7/8	1' x 1/8"	5 1/2	1/2	
	1	1' x 1/8"	6	1/2	
1/2	1 1/8	1' x 1/8"	6 1/2	1/2	
	1 1/4	1' x 1/8"	7	1/2	
	1 1/2	1 3/4	2' x 1/8"	4 1/2	1
		2	2' x 1/8"	4 3/4	1
3/4	1 1/2	2' x 1/8"	5 1/4	1	
		2' x 1/8"	5 3/4	1	
1	1 3/4	2' x 1/8"	6	1	
		2' x 1/8"	6 1/2	1	
1 1/4	2	2' x 1/8"	6 3/4	1	
		2' x 1/8"	7	1	
1 1/2	2 1/4	3' x 1/8"	5	1 1/2	
		3' x 1/8"	5 1/2	1 1/2	
	2 1/2	3' x 1/8"	5 1/2	1 1/2	
		3' x 1/8"	6	1 1/2	
2 3/4	3	3' x 1/8"	6 1/2	1 1/2	
		3' x 1/8"	6 3/4	1 1/2	
3	3 1/4	3' x 1/8"	6 1/2	1 1/2	
		3' x 1/8"	7 1/2	1 1/2	

3. BOILER JACKETS: Use for regular practice, boiler jackets of hot rolled and annealed steel sheets with copper content, No. 18 U.S.S.G. thick and 40" or 42" wide; length of sheet to suit boiler shell course, but must not exceed 84", the width and length of sheet to run circumferentially and longitudinally respectively. Sheets must be free from buckles and surface defects.
4. JACKET BANDS: Use the following widths of Boiler jacket bands.

O.D. FIRST COURSE OF BOILER	WIDTH OF JACKET BANDS
60" and under	3"
61" - 100"	4"
101" and over	5"

5. JACKET CLAMPS: Use jacket clamps in accordance with Standard drawings, (see Index).
6. See GROUP 48 - FOREIGN LOCOMOTIVES.

QUESTION: Duplicate engines.

EXCEPTIONS: R.R. Co's drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

58 S 2281g

April 27, 1938

LINK MOTION

Superseding

58 S 2281f

APPROVED
ENGINEERING
COMMITTEE

1. VALVE SETTING: For simple engines with Walschaerts gear to be in accordance with Standard Drawings (see Index).

2. LINKS - WALSCHAERTS GEAR: Make widths as follows:

VALVE DIAMETER	SINGLE PORTED VALVES		
	TWO CYLINDER ENGINES		THREE CYLINDER ENGINES
	Travel 7" and under	Travel over 7"	Travel 7" and under
9"	2"		2-1/4"
10"	2-1/4"		2-1/2"
11"	2-1/4"		3"
12"	2-1/2"	3"	3"
13"	2-1/2"	3"	3"
14"	3"	3-1/2"	3-1/2"

LINK BLOCK: Arrange motion work so that link block will be in bottom portion of link in forward motion.

3. COMBINATION LEVER PROPORTIONS: To be in accordance with Standard Drawings (see Index).
4. TAPER PINS: See Group 15.
5. WALSCHAERTS LINK OIL CUPS: See Group 60.
6. PISTON VALVE DIAMETERS: See Group 94.

QUESTION: Duplicate engines.

EXCEPTIONS: R.R. Co's drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

March 2, 1936

STANDARD PRACTICE

60 S 2282-1-c

Sheet 1

OIL CUPS AND LUBRICATION

Superseding

60 S 2282b

APPROVED
ENGINEERING
COMMITTEE

1. CYLINDER LUBRICATION:

SLIDE VALVES: Apply single oil plug direct to center of steam chest cover as per standard arrangement drawing (see index), except for L.P. cylinders of Articulated compound engines use standard arrangement drawing, (See Group 64.)

PISTON VALVE: INTERNAL ADMISSION - Apply one oil plug in center at top of steam chest when vacuum valve is not located at this point, and when inside steam pipes are used, as per standard arrangement drawing. (See index).

On all engines with piston valves, having vacuum valves located on top and center of chest; or with outside steam pipes (regardless of location of vacuum valve); apply one oil plug leading into steam passage in saddle when inside steam pipes are used - and leading into steam pipe with plug extending into center of pipe, when outside steam pipes are used; standard arrangement drawing (see index).

Apply oil plug to rear of steam pipe instead of side, to avoid pockets in oil pipes. When railway companies specify a different location, raise question.

When two plugs are specified, apply one at each end at top of steam chest and leading into steam passage, connected to oil pipe with inverted "Y" connection as per standard arrangement drawing. (See index).

On superheater engines for road service in addition to above, single plug to be applied in top and center of cylinder. Oil hole to be drilled through cylinder wall on vertical center line.

External admission - Apply two oil plugs, one at either end at top of steam chest and leading into steam passage, and connected to oil pipe by an inverted "Y" connection, as per standard arrangement drawing. (See index).

2. OIL PIPES:

Oil pipes for all cylinder lubricators to be in one piece, copper 1/2" O.D., 0.083 inches thick, laid under boiler jacket. Front end to terminate about 8 inches beyond jacket and be provided with union connections for coupling to short piece of pipe leading to steam chest. Back end to terminate about 12 inches ahead of backhead and extend through jacket about 6 inches and be provided with union connections for coupling to short piece of pipe to lubricator. Steam chest oil pipes to be copper 1/2" O.D., 0.083 inches thick.

Where two oil plugs are used, pipes leading from inverted "Y" connection must slope 30 degrees toward oil plugs to insure equal and steady flow of oil to either end.

3. LUBRICATOR PIPES:

See Groups 63 and 64.

(over)

4. LUBRICATOR FEEDS:

Use the following arrangements, which are given in order from left to right, facing lubricator. Name of part oiled by each feed must be stamped on lubricator by manufacturers, as shown on detail marking cards referred to below, and the proper card numbers covered on material orders in each case.

TWO-CYLINDER SIMPLE Saturated	TWO-CYLINDER SIMPLE Superheated (Road)	TWO-CYLINDER SIMPLE Superheated (Switching)
One triple lubricator 1. Valve 2. Pump 3. Valve Marking as per standard drawing (See index Group 99)	One five-feed lubricator 1. Valve 2. Cylinder 3. Pump 4. Cylinder 5. Valve, Marking as per standard drawing. (See index Group 99)	One three-feed lubricator 1. Valve 2. Pump 3. Valve
TWO-CYLINDER COMPOUND Saturated	ARTICULATED COMPOUND Saturated	ARTICULATED COMPOUND Superheated
One triple lubricator 1. H.P. Valve 2. Pump 3. L.P. Valve and Intercepting Valve Marking as per standard drawing (See index Group 99)	Two triple lubricators L.H. 1. H.P. Valve 2. Pump 3. L.P. Valve Marking as per standard drawing (See index Group 99) R.H. 1. L.P. Valve 2. Intercepting Valve 3. H.P. Valve Marking as per standard drawing (See index Group 99) OR One six-feed lubricator 1. H.P. Valve 2. L.P. " " 3. Pump 4. Intercepting Valve 5. L.P. Valve 6. H.P. " " Marking as per standard drawing (See index Group 99)	Two four-feed lubricators L.H. 1. H.P. Cylinder 2. L.P. Valve 3. Pump 4. H.P. Valve Marking as per standard drawing (See index Group 99) R.H. 1. H.P. Valve 2. Intercepting Valve 3. L.P. Valve 4. H.P. Cylinder Marking as per standard drawing (See index Group 99) OR One eight-feed lubricator 1. H.P. Valve 2. H.P. Cylinder 3. L.P. Valve 4. Pump 5. Intercepting Valve 6. L.P. Valve 7. H.P. Cylinder 8. H.P. Valve Marking as per standard drawing (See index Group 99)

American Locomotive Company

ENGINEERING DEPARTMENT

March 2, 1936

STANDARD PRACTICE

60 S 2282-2-c

Sheet 2

OIL CUPS AND LUBRICATION

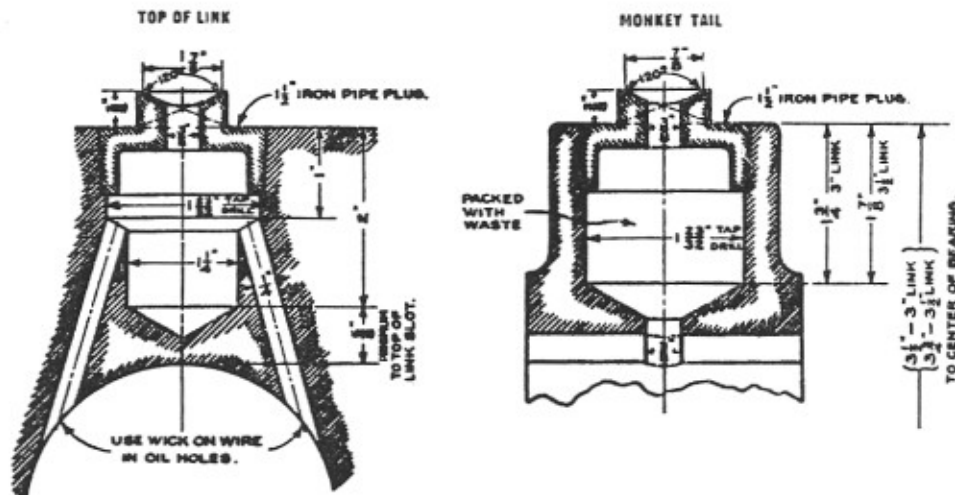
Superseding

60 S 2282b

APPROVED
ENGINEERING
COMMITTEE

Continued from Sheet 1

5. WALSCHAERT LINK OIL CUPS: Use cups shown below on links 3" and 3-1/2" wide.



6. ROD CUPS: Use grease cups per standard drawings, (see Index.)

OIL CUPS: When specified, use per standard drawings, 1-3/4" diameter on all rod bearings of engines with back end main rod journals under 8" diameter, and 2" diameter cups when back end main rod journals are 8" diameter and over.

7. ECENTRIC ROD CUPS: Use same method of lubrication for eccentric rod bearing on crank as used on side rods.

8. OIL CUP for PISTON ROD PACKING SWAB CUP: Tap into center of top guide wherever practicable, and use straight pipe leading directly into top of swab cup.

See Group 65 - Piston Rod Extension Packing swab cup.

9. GUIDE LUBRICATION: Use cast iron oil cups per standard drawings, (see Index.)

10. MISCELLANEOUS OIL CUPS: When separate cup is not used, apply pipe plugs with hole through center as shown on Drawing 602 S 7980-5, filling oil cavity with a mixture of curled hair and waste.

QUESTION: Duplicate engines.

EXCEPTIONS: R.R.Co's drawings, specifications or instructions to contrary.

American Locomotive Company
ENGINEERING DEPARTMENT

STANDARD PRACTICE

61 S 2335

June 19th, 1917

OIL BURNING, ATTACHMENTS.

Superseding

APPROVED
ENGINEERING
COMMITTEE

See Group 56.—Laws, Rules, Instructions, I. C. C., Public Service Commission, &c.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

62 S 2326

June 19th, 1917

PILOT

Superseding

APPROVED
ENGINEERING
COMMITTEE

See **Group 56.**—Laws, Rules and Instructions, I. C. C., Public Service Commission, &c.

American Locomotive Company

ENGINEERING DEPARTMENT

July 1, 1936

STANDARD PRACTICE

63,64 -S- 2283-1-c

Sheet 1

PIPE FITTINGS
PIPING ARRANGMENT

Superseding

63,64-S-2283-b

APPROVED
ENGINEERING
COMMITTEE

I. PIPE FITTINGS:

Pipe - Use LAP-WELDED iron or steel pipe (all sizes over 1") and specify: "lap-welded" on all material orders for this pipe. Butt-welded 1-1/4" and 1-1/2" pipe may be used in case required delivery can not be obtained on lap-welded pipe in these sizes.

Extra Strong - the following pipe and fittings must be EXTRA STRONG:

All nipples,

All fittings and pipes in cab subject to boiler pressure,

Steam Heat line from turret to back of tender,

Train pipe 1-1/4" for brake,

Power Reverse Gear.

Joints - Ends of pipes, couplings, and connections must have perfect fitting threads.

Burrs and other obstructions must be removed.

Tap sleeve couplings for pipes 1-1/2" and under, straight thru and for pipes over 1-1/2" use reinforced ends or taper threads.

Do not relieve threads at ends of any couplings.

Malleable iron Fittings - Use pipe fittings of malleable iron except as follows:

Reducing bushings differing by more than one pipe size ---- Cast Iron,

Sleeve couplings ----- wrought Iron.

Copper Pipe Unions - Design coupling nuts to bear on collar formed on sleeve - not to bear on end of sleeve.

Rolled Mechanical Joints - Use on unspecified work, the fittings being made of stick brass.

Street Ells - Do not use in steam or air piping.

Pipe Clamps - As per Standard Drawings, see index.

Use the following:

Iron Pipe I-D	Clamp Bolts		Clamp Drawing
	Diam.	Spaced not over	
1/2"	1/2"	4'-6"	632 S 201230-31
3/4"	5/8"	5'-0"	632 S 201232-33
1"	5/8"	5'-6"	632 S 201234-35
1-1/4"	5/8"	6'-0"	632 S 201240-41
1-1/2"	5/8"	6'-6"	632 S 201242-43
2"	3/4"	7'-0"	632 S 201244-45

Use Drawing 632 S 20120-21 for all 1 1/16" O.D. Copper Pipe.

Multiple Pipe Clamps - When required, piping drawing will be furnished by the General Drawing Room. On all other orders, Local Works Managers will see that best possible piping arrangements are made with particular reference to neatness of appearance.

Pipe Thimbles - For openings in cab wall, use design shown on Drawing 632 S 9880 for domestic engines only. For foreign engines, use as per Standard Drawing, see index.

Pipe Saddles - For outlets off of iron or steel pipe, make from pipe couplings, as per Standard Drawing, see Index.

Oil Pipe Fittings - Use as per Standard Drawings, see index.

(over)

II. PIPING ARRANGMENTS:

General - All engine and tender piping must be carefully arranged. For duplicate orders, photographs of right side, left side, and backhead will be furnished, which should be followed, unless instructions are issued to the contrary. Allow ample clearance for removal and replacement of washout plugs and moving parts of machinery. Close all openings around pipes that pass thru engine and tender decks. Where possible, avoid using elbows or sharp bends. In general, the shortest practical bend in copper and iron pipes equals a radius at inner turn of twice the outside diameter of the pipe. When absolutely necessary, in order to avoid the use of a brass elbow, or pipe fitting, an inner radius of 1-1/2 times the diameter may be used, for pipes 1-1/4" OD and over, but for pipes under 1-1/4" OD this radius must not be less than twice the outside diameter. All pipes must be jarred while blown out with steam or air (preferably steam) and tested under pressure to meet the requirements of Rule 114 (a) and (b) of the I.C.C. Rules and Regulations, as follows:

Leakage from main reservoir and related piping shall not exceed an average of 3 pounds per minute, in a test of three minutes duration, made after the pressure has been reduced 40% below maximum pressure.

Brake pipe leakage shall not exceed 5 pounds per minute.

Clamping - Clamp all pipes solidly to prevent vibration when engine is running. For spacing of clamps, see table in Paragraph 1. Clamps to be placed throughout as near as possible to each end and at regular intervals. Lubricator and other small copper pipes under boiler jacket to have clamps at each end and spaced from 4 to 6 feet, throughout. Each clamps to be secured by one 1/2" bolt and one thin nut. Use as per Standard Drawing, see index. Pipe clamp supports must be secured by two bolts to runboard or other rigid metal part. Bolts for clamps and supports to have two nuts on each, except for pipes under boiler jacket.

Brake Piping - All piping for air brakes must be strictly in accordance with Air Brake Company's diagrams and instructions. Where these require iron or steel pipe, use Standard Weight except for train pipe. When Flexible Joints are specified between engine and tender, order from Brake Company, instead of manufacturer. Locate brake pipe, signal line, and steam heat line as per Standard Drawing, see index.

Air Pump Steam Piping - Use copper pipe in one piece when turret is inside of cab, otherwise, use extra strong iron or steel pipe, Locate pipe under jacket, if possible, and apply lagging when located outside.

Drifting Valve Piping - See Group 34.

Injector Piping - See Group 55.

Lubricator Oil Pipes - Provide uniform slope from lubricator to smokebox, avoiding pockets or other hindrances to the flow of oil. Lubricator and other small copper pipes under boiler jacket to be encased in short iron pipe thimble, where passing under cab front sheet.

Lubricator Steam Piping - See Group 60.

Low Pressure Oil Pipe - Mallet Locomotives - as per Standard Drawing, see index.

Oil Pipes, Miscellaneous - When pipe is required between cup and part to be oiled, use 3/8" minimum diameter.

American Locomotive Company

ENGINEERING DEPARTMENT

July 1, 1936

STANDARD PRACTICE

63,64 S 2283-2-c

Sheet 2

PIPE FITTINGS
PIPING ARRANGEMENTS

Superseding

63,64 S 2283-b

APPROVED
ENGINEERING
COMMITTEE

(Continued from Sheet 1)

Blower Piping - Use the following sizes for Soft Coal burning engines:

Grate Area	Blower Pipe (Iron or Steel Sizes)
35 sq. ft. and under	3/4"
Over 35 sq. ft. to 50 sq. ft.	1"
" 50 sq. ft.	1-1/4"

Run blower pipe from angle valve in turret to malleable iron blower, elbow screwed into smokebox, over table plate, providing intermediate globe valve on left side of backhead within easy reach of fireman. Pipe must be drained.

Use the following:

Blower Pipe sizes	Angle Valve in turret	Intermediate Globe Valve	Elbow at Smokebox	
			Smokebox not jacketed	Smokebox jacketed
3/4"	Standard Drawing see index Group 25		632 S 30360-81	632 S 30365-86
1"			632 S 30375-76	632 S 30370-71
1-1/4"			632 S 30380-81	632 S 30390-91

When throttle is located between superheater and cylinders, and steam flow through superheater units when throttle is closed is not otherwise provided for, use superheated steam for blower running pipe line, directly from header and arranging to operate from cab.

Air Piping Turret - Use as per Standard Drawing, see index. This turret is for distribution of air to air gauge, bell ringer, sander, pneumatic blow-off cock and other small air connections, and is to be used only when more than three connections are required.

Coal Sprinkler - Use on all coal burning engines (except powdered coal) hose fittings and arrangement as follows:

6 ft. - 3/4" 3-ply Rubber Stm. Hose	1-Hose fitting, Drg. 631 S 9160
1 " " Hose clamp	1-Hose bracket " 631 S 9910
1 " 1/2" Globe Valve	Arrangement " 642 S 15350

Connect to left hand delivery pipe, using saddle as per Standard Drg. on iron pipe and brazing flange on copper pipe as per table.

Copper Pipe O.D.	Brazing Flange Drawing Number
1-3/4"	631 S 10800
2"	631 S 10801
2-1/4"	631 S 10802

Steam Heat - Use 1-1/2" diameter when flexible metallic joints are specified between engine and tender. Locate regulator inside cab. Omit train connection and piping from front of engine and raise question on duplicate designs where base engine for same road had this piping.

Power Reverse Gear - See Groups 56 and 68.

Sand Pipes - Must have a minimum angle of 40° from the horizontal, to insure flow of sand by gravity and arranged to deliver sand to rail under wheels on either curved or straight track. See Group 73.

Sander Air Pipes - Use 3/8" pipe under jacket with 1/4" nipples at ends for attachment to sander valve and trap.

QUESTION: Duplicate engines.

EXCEPTIONS: R.R. Co's drawings, specifications, or instructions to contrary

5. **Piston Rod and Valve Stem Packing:** Use fibre or metallic packing for piston rods and valve stems as called for in table below, with red or white metal packing rings as noted. All red metallic packing for superheated steam must withstand a temperature of 650° F.

PISTON ROD OR VALVE STEM	TYPE OF ENGINE		PACKING RING MATERIAL		
			SUPERHEATED STEAM	SATURATED STEAM	
Piston Rod	Simple		Red Metal	White Metal	
	Compound	H. P.			
		L. P.	White Metal		
Valve Stems	Simple	Inside Admission Valve	White Metal	Fibre	
		Outside Admission Valve	Red Metal	White Metal	
	Compound	H.P.	Outside Admission Valve	White Metal	White Metal
			Inside Admission Valve	Red Metal	
		L. P.	White Metal		

Cross-Indexed in Group 78.

6. See Group 60.—Piston Rod and Valve stem Packing Oil Cups.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

66 S 2286 a

April 28th, 1921

PLUGS, HANDHOLES & WASHOUTS

Superseding
66 S 2286

APPROVED
ENGINEERING
COMMITTEE

1. All plugs screwed into boiler must have 12 threads per inch, taper $\frac{3}{4}$ " in 12".
2. Use **Washout Plugs** and **Thimbles** per Standard drawings (see Index).
2" plain plugs to be used wherever possible; 2" countersunk plugs only where clearances will not permit use of plain. Plugs other than 2" diameter to be used in special cases only.

Location:—1 each corner of firebox near ring.

1 over fire door.

3 in backhead over crown.

3 each side over crown.

2 in barrel, center at bottom—1 near throat, 1 near front tube sheet.

When outside firebox plates are dished to clear driving box saddle, or the water space is contracted for any purpose, place one additional washout plug in the nearest corner of firebox as nearly as possible in horizontal line with top of contracted space, so that same can be thoroughly washed.

3. Do **not** apply **Fusible Plugs** to Firebox Crown Sheets unless distinctly specified. If specified and of no particular design, use Standard drawings (see Index).

See **Group 48.**—Foreign Locomotives.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

March 30, 1938

STANDARD PRACTICE

68 S 2287c

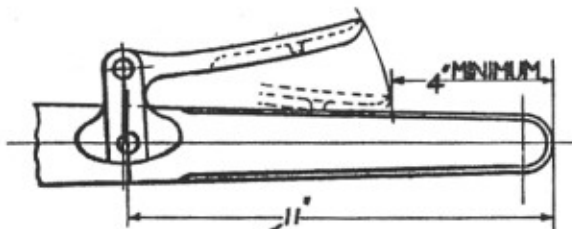
REVERSE LEVER

Superseding

68 S 2287b

APPROVED
ENGINEERING
COMMITTEE

1. Make vertical distance from top of runboard (or flooring ever same, if any) to end of Hand Reverse Lever HANDLE, 45" and to end of Power Reverse Lever HANDLE, 43".
Travel at end of hand lever must not be less than 48" nor more than 52".
See Group 48 - Foreign Locomotives.
2. Use hand reverse lever LATCH and HANDLE in accordance with Standard drawings (see Index).
Cylinders under 21" dia. four teeth in latch 1/2" pitch, 5/16" deep.
Style per Drawing 682 S 2610.
Cylinders 21" dia. and over, four teeth in latch 3/4" pitch, 1/2" deep.
Locate Handle Fulcrum Pin 11" from end of lever. Minimum distance between end of lever and end of handle 4". See sketch below.



For Handle, use Standard Drawings (see Index)

3. When SCREW REVERSE GEAR is specified, use gear per Standard Drawings (see Index) with guide located preferably inside of cab, for engines with cylinders 20" diameter or over.
Use WHEEL not less than 18" diameter, center 28" above top of cab runboard and located as far ahead as possible, consistent with proper room for engineer's brake valves, brake pipe, etc.
Provide 2" minimum clearance all around rim of wheel for engineer's hand.

QUESTION: Duplicate engines.

EXCEPTIONS: R.R. Co's drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

April 15, 1938

STANDARD PRACTICE

69 S 2288e

REVERSE SHAFT and REACH ROD

Superseding

69 S 2288d

APPROVED
ENGINEERING
COMMITTEE

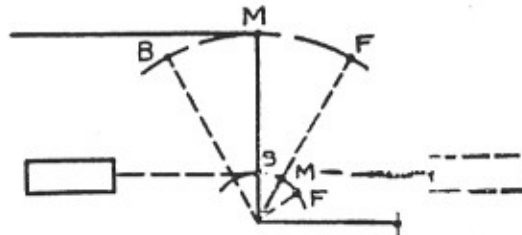
1. REVERSE SHAFT: Make diameter as follows, using keyed arms whenever possible.

VALVE DIAMETER	SIMPLE ENGINES	
	Travel 7" and under	Travel over 7"
9"	3-1/2"	-
10"	3-1/2"	-
11"	3-1/2"	-
12"	3-3/4"	4"
13"	3-3/4"	4-1/2"
14"	4"	4-1/2"

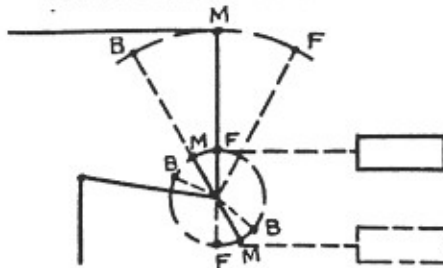
2. REVERSE SPRING ARRANGEMENT: Use 6" Standard pipe spring casing as shown on Standard Drawings (see Index). Make spring rod to suit conditions on locomotive as shown on Standard Drawings (see Index). Use Spring Washer as per Standard Drawings (see Index). Use spring capacities as shown in Index to Standard Drawings in Group 76

Use lug of cast steel, clamped and keyed on, of design similar to Drawing 692 S 3780 length not to exceed 5", except that lug is to be welded on when reverse shaft is bent or arms are welded on. Locate lug on shaft to stand at right angles with casing when link or radius bar is in its highest position

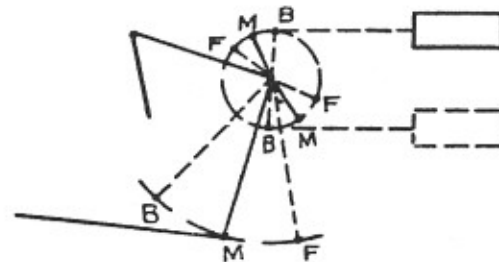
STEPHENSON GEAR, AND WALSCHAERT GEAR
WITH SLIDING RADIUS BAR LIFTER.



WALSCHAERT GEAR WITH LINK
RADIUS BAR LIFTER.



WALSCHAERT GEAR WITH INVERTED
ARM LINK RADIUS BAR LIFTER.



(OVER)

3. REACH RODS: Use extra strong steel pipe, with wrought iron or soft steel plugs welded into ends.

NOMINAL INSIDE DIA.	OUTSIDE DIAMETER	THICKNESS	USED FOR
2"	2-3/8"	0.22"	Engines with piston valves 12" dia. and under.
2-1/2"	2-7/8"	0.28"	Engines with piston valves over 12" dia.

Use STRAIGHT reach rods, and if the use of offset rod is found necessary, raise question before proceeding.

Provide INTERMEDIATE GUIDE on all offset reach rods and on straight rods 18 ft. long and over. When offset is slight, raise question.

Reach rods made of FLAT BARS should be used for power reverse gears, because they are short and straight, (minimum length 30"). Flat bars may also be used on small engines with cylinders under 17" dia. when the length is not over 12 feet.

4. FOREIGN LOCOMOTIVES: See Group 48.

QUESTION: Duplicate engines.

EXCEPTIONS: R.R. Co's drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

71 S 2289 a

September 9th, 1925

RUNBOARDS & WHEEL COVERS

Superseding
71 S 2289

APPROVED
ENGINEERING
COMMITTEE

1. RUNBOARD BRACKETS:

Maximum Spacing: Wood or $\frac{1}{4}$ " Steel Plate Runboards 6 ft. maximum, 5 ft. preferred.
 $\frac{3}{16}$ " " " " " 5 ft. " " 4 ft. "

Dimensions: To provide proper stiffness in bar iron or steel brackets, use 1" minimum bending radius and make length "L" from end of bracket to boiler not to exceed figures given in table for various widths and depths.

DEPTH	MAXIMUM LENGTH "L"				
	WIDTH				
	3"	*3 $\frac{1}{2}$ "	*4"	*5"	6"
$\frac{3}{4}$ "	11 $\frac{1}{4}$ "	12 "	13 "
$\frac{7}{8}$ "	14 $\frac{1}{4}$ "	15 $\frac{1}{4}$ "	16 $\frac{1}{2}$ "	18 $\frac{1}{4}$ "
*1 "	17 $\frac{1}{4}$ "	18 $\frac{3}{4}$ "	20 "	22 $\frac{1}{4}$ "	24 $\frac{1}{2}$ "
*1 $\frac{1}{4}$ "	24 $\frac{1}{4}$ "	26 $\frac{1}{4}$ "	28 "	31 $\frac{1}{4}$ "	34 $\frac{1}{4}$ "
1 $\frac{1}{2}$ "	31 $\frac{3}{4}$ "	34 $\frac{1}{4}$ "	36 $\frac{1}{4}$ "	41 "	45 "

* Preferred.

Location: When located over flexible staybolts, use regular flexible bolts (not flush head) with continuous cast iron filling piece under bracket foot, per Standard drawing, see Index. Do not use ferrules.

- Do not use Driving and Truck Wheel Covers on any type of engine. Arrange runboards or plates so that inside edge or extension thereof projects over inside of driving wheel flange to form splashier.
- AUXILIARY RUNBOARDS:** Apply below sides of cab with horizontal hand-hold above windows on large locomotives where size of boiler and clearance limitations do not allow sufficient room for exit at front of cab. Auxiliary runboards are not required when front door opening can be made with a minimum width of 5' at the bottom, increasing uniformly to a minimum of 11" at a point not more than 39" above top of deck, and passage-way through cab is unobstructed.
- ROUGHENED RUNBOARDS:** When specified, use buttoned plate made in our own shops, with $\frac{3}{4}$ " dia. buttons $\frac{1}{16}$ " high, spaced approximately 2 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ "; instead of roughening same with diamond-pointed chisel.
- See Group 56.—Laws, Rules and Instructions, I. C. C., Public Service Commission, &c.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

RODS

Superseding
72 S 2290

APPROVED
ENGINEERING
COMMITTEE

1. **Maximum Stresses:** Calculated stresses in main and side rods must not exceed limits given in table below:

MAXIMUM STRESSES (Pounds Per Sq. Inch).									
ROD	PART	DIRECT TENSION	BENDING	CENTRIFUGAL FORCE AT DIAMETER-SPEED	CENTRIFUGAL FORCE + DIRECT TENSION	CENTRIFUGAL FORCE + COLUMN VERTICAL	COLUMN SIDEWISE	SHEAR IN BOLTS	BEARING PRESSURE
MAIN	Body	8000		10000		12000 See Note Below	9000		
	Front Stub	6500	24000						
	Back End—Strap	6500	19000					8600	
	Back End—Foulder or similar type	4500	11200						
	Back End—Open-end type, top and bottom members ahead of crank pin	4500							
SIDE	Body—I Section, Engines other than Four-coupled	8000		8000	12000				
	Body—I Section, Four-coupled Engines	8000		10000	14000				
	Body—Rectangular Section	7000		10000	14000				
	Eyes and Knuckle Joints	5000							
	Knuckle Joint Pins								5500
	Strap	6500	19000					8600	

Main Rod: In calculations (except centrifugal force or as column vertical) use the following loads:

Simple Engines: Piston thrust (area of cylinder by full boiler pressure).

Mallet Compound Engines: Piston thrust of an equivalent simple engine of one-half the tractive force.

For load as column vertical, use piston thrust figured with one-half boiler pressure.

Figure bending stress in main or side rod straps as follows:

$$H^2 = \frac{PL}{SK}$$

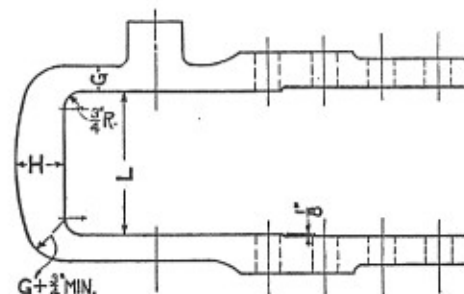
where H = see Sketch

P = Piston thrust (or proper percentage of same, if side rod strap).

L = see Sketch.

S = Maximum fibre stress = 19000 lbs.

K = Width of strap.



Side Rod: In calculations for two-cylinder locomotives use percentages of piston thrust given in table below:

TYPE OF ENGINE	MAIN ROD CONNECTION TO DRIVING WHEEL	SIDE RODS				SIDE ROD EYES AT				KNUCKLE PIN JOINTS AT			
		FRONT INT.	BACK INT.	FRONT	BACK	MAIN PIN	FRONT INT. PIN	BACK INT. PIN	FRONT PIN	BACK PIN	MAIN PIN	FRONT INT. PIN	BACK INT. PIN
Four-coupled	1st pair				.6 P	.6 P			.6 P	.6 P			
	2nd "			.6 P	.6 P	.6 P			.6 P	.6 P			
Six-coupled	2nd "			.5 P	.5 P	.5 P			.5 P	.5 P	.5 P		
	3rd "	.8 P		.5 P		.8 P	.8 P		.5 P			.5 P	
Eight-coupled	2nd "		.8 P	.4 P	.4 P	.8 P		.8 P	.4 P	.4 P	.4 P		.4 P
	3rd "	.8 P		.4 P	.4 P	.8 P	.8 P		.4 P	.4 P	.4 P	.4 P	
Ten-coupled	2nd "	.9 P	.7 P	.35 P	.35 P	.9 P	.9 P	.7 P	.35 P	.35 P	.35 P	.7 P	.35 P
	3rd "	.7 P	.7 P	.35 P	.35 P	.7 P	.7 P	.7 P	.35 P	.35 P	.35 P	.35 P	.35 P

(OVER)

2. **Fillets and Edges:** On I section rods use not less than $\frac{5}{8}$ " fillet radius at corners of web. Round edges of all rods with $\frac{1}{8}$ " radius.
3. **Main Rods:** Use front and back end stubs per Standard drawings (see Index). Use grease grooves on all back stub brasses when main crank pin is 7" x 7" or over.
4. **Side Rods:** Use rectangular section on all locomotives, except 462 and 442 class fast passenger locomotives, when length between centers of longest rod used on the given design does not exceed the following limits:

STROKE	MAX. LENGTH OF ROD
26"	80"
28"	76"
30"	74"
32"	72"

Length Between Centers: Bore exact, except for engines with firebox between frames and drivers, when over seven feet long, bore $\frac{1}{2}$ " longer than actual length between centers of axles.

Rod Eyes: Thickness of metal around eyes must not be less than shown in table below:

FOUR-COUPLED		SIX, EIGHT AND TEN-COUPLED			
O. D. BUSHING	THICKNESS OF METAL AROUND EYE	O. D. BUSHING	THICKNESS OF METAL AROUND EYE	O. D. BUSHING	THICKNESS OF METAL AROUND EYE
5	1 $\frac{1}{8}$	5	1	10	1 $\frac{5}{8}$
5 $\frac{1}{4}$	1 $\frac{1}{8}$	5 $\frac{1}{4}$	1	10 $\frac{1}{4}$	1 $\frac{5}{8}$
5 $\frac{1}{2}$	1 $\frac{1}{4}$	5 $\frac{1}{2}$	1 $\frac{1}{8}$	10 $\frac{1}{2}$	1 $\frac{5}{8}$
5 $\frac{3}{4}$	1 $\frac{1}{4}$	5 $\frac{3}{4}$	1 $\frac{1}{8}$	10 $\frac{3}{4}$	1 $\frac{5}{8}$
6	1 $\frac{3}{8}$	6	1 $\frac{1}{4}$	11	1 $\frac{3}{4}$
6 $\frac{1}{4}$	1 $\frac{3}{8}$	6 $\frac{1}{4}$	1 $\frac{1}{4}$	11 $\frac{1}{4}$	1 $\frac{3}{4}$
6 $\frac{1}{2}$	1 $\frac{1}{2}$	6 $\frac{1}{2}$	1 $\frac{1}{4}$	11 $\frac{1}{2}$	1 $\frac{3}{4}$
6 $\frac{3}{4}$	1 $\frac{1}{2}$	6 $\frac{3}{4}$	1 $\frac{1}{4}$	11 $\frac{3}{4}$	1 $\frac{3}{4}$
7	1 $\frac{9}{16}$	7	1 $\frac{9}{16}$	12	1 $\frac{3}{8}$
7 $\frac{1}{4}$	1 $\frac{9}{16}$	7 $\frac{1}{4}$	1 $\frac{9}{16}$	12 $\frac{1}{4}$	1 $\frac{3}{8}$
7 $\frac{1}{2}$	1 $\frac{9}{16}$	7 $\frac{1}{2}$	1 $\frac{9}{16}$	12 $\frac{1}{2}$	1 $\frac{3}{8}$
7 $\frac{3}{4}$	1 $\frac{9}{16}$	7 $\frac{3}{4}$	1 $\frac{9}{16}$	12 $\frac{3}{4}$	1 $\frac{3}{8}$
8	1 $\frac{7}{8}$	8	1 $\frac{3}{8}$	13	2
8 $\frac{1}{4}$	1 $\frac{7}{8}$	8 $\frac{1}{4}$	1 $\frac{3}{8}$	13 $\frac{1}{4}$	2
8 $\frac{1}{2}$	1 $\frac{7}{8}$	8 $\frac{1}{2}$	1 $\frac{3}{8}$	13 $\frac{1}{2}$	2
8 $\frac{3}{4}$	1 $\frac{7}{8}$	8 $\frac{3}{4}$	1 $\frac{3}{8}$	13 $\frac{3}{4}$	2
9	1 $\frac{3}{4}$	9	1 $\frac{1}{2}$	14	2 $\frac{1}{8}$
9 $\frac{1}{4}$	1 $\frac{3}{4}$	9 $\frac{1}{4}$	1 $\frac{1}{2}$		
9 $\frac{1}{2}$	1 $\frac{3}{4}$	9 $\frac{1}{2}$	1 $\frac{1}{2}$		
9 $\frac{3}{4}$	1 $\frac{3}{4}$	9 $\frac{3}{4}$	1 $\frac{1}{2}$		

Knuckle Connections: Make jaws on ends of rod bodies (not on stubs) and taper ends of tongue and jaws, leaving straight portion at bushings. Use bronze bushing in tongue and oil cup of style shown on Drawing 723 S 24130. Use pins as shown on Standard drawings (see Index). Length of smaller tapered portion of pin may be increased not to exceed $\frac{1}{4}$ " without requiring new forming tool. See Group 15.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

72 S 2291 c

December 2nd, 1931

RODS

Superseding
72 S 2291 b

APPROVED
ENGINEERING
COMMITTEE

- Rod Bushings:** Accurately fit and force into place with pressures as per Standard drawing (see Index).
Use the following sizes for Side Rods, without collar: Thicknesses given are minimum.

INSIDE DIAM.	OUTSIDE DIAM.	THICK- NESS	INSIDE DIAM.	OUTSIDE DIAM.	THICK- NESS	INSIDE DIAM.	OUTSIDE DIAM.	THICK- NESS	INSIDE DIAM.	OUTSIDE DIAM.	THICK- NESS	INSIDE DIAM.	OUTSIDE DIAM.	THICK- NESS
4	5¼	⅝	5½	7¼	⅞	7	9	1	8½	11	1¼	10	12¼	1⅝
4¼	5½	⅝	5¾	7½	⅞	7¼	9¼	1	8¾	11¼	1¼	10¼	13	1⅝
4½	6	¾	6	7¾	⅞	7½	9¾	1⅝	9	11½	1¼	10½	13½	1½
4¾	6¼	¾	6¼	8	⅞	7¾	10	1⅝	9¼	11¾	1¼	10¾	13¾	1½
5	6½	¾	6½	8½	1	8	10¼	1⅝	9½	12¼	1⅝	11	14	1½
5¼	6¾	¾	6¾	8¾	1	8¼	10½	1⅝	9¾	12½	1⅝			

Whenever possible, apply collar ¼" larger in diameter than bushing and at least ¼" thick to inside end of side rod bushings on Main pin, to prevent bushing slipping through and reducing clearance between rods and other parts.

- Straps:** Make sectional area of forging billet not less than three times area of strap. Make all vertical keyways in rod straps semicircular on both ends.
- Rod Drawings:** Make complete; omit only details of knuckle pins and oil cups, and show same on separate drawings. Show bushings complete in position.
- Side Rod Knuckle Pins:** Use per Standard drawings (see Index).
- Rod Oil and Grease Cups.** See Group 60.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

Nov. 7, 1935

STANDARD PRACTICE

73 S 2292 a

SAND BOXES

Superseding 73 S 2944
73 S 2407f, Par.2 & 7
73 S 2292

APPROVED
ENGINEERING
COMMITTEE

1. ARRANGEMENT: Sand pipes to sand the following pairs of wheels:

Type & Service	Two-Cylinder		Three-Cylinder			
			Crank on 1 Axle		Crank on 2 Axles	
	Front of	Back of	Front of	Back of	Front of	Back of
6-Coupled Road & Sw.	1st	3rd	1st	3rd	--	--
8-Coupled Switching	1st	4th	1st & 3rd	3rd & 4th	--	--
8-Coupled Road	1st & Main	* 4th	1st & 2nd	* 4th	2nd & 3rd	* 4th
10-Coupled Road & Sw.	1st & Main	* Main	--	--	2nd & 3rd	* 3rd
12-Coupled Road & Sw.	--	--	--	--	2nd & 3rd	* 3rd

* Sanding is to be provided for backing on six-coupled switching and road locomotives and eight-coupled switching locomotives only, and not on other types unless specified, in which case locate as indicated above.

2. TEN-COUPLED LOCOMOTIVES: Use one sand box located at front as standard arrangement.
3. ARTICULATED LOCOMOTIVES: Arrange for sanding front of front drivers and back of main drivers for both the front and back engines. Provide separate sander valves for the front and back engines.
4. ANGLE OF SAND PIPES: Not to be less than forty degrees from horizontal.
5. PNEUMATIC SANDERS: Apply to all classes of locomotives having cylinders 16" in diameter and larger.
6. BOOSTER: Sand the trailing wheels on all locomotives equipped with booster.

Question: Duplicate engines.

Exceptions: R.R.Co's drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

STANDARD PRACTICE

74 S 2293 f

December 28th, 1931

SMOKE BOX

Superseding
74 S 2293 e

APPROVED
ENGINEERING
COMMITTEE

1. **Front and Door:** Use Standards of Pressed Steel as follows:

FRONT			DOOR		DRAWING	DETAILS	
DIAMETER FROM	TO	THICK	DIAMETER OUTSIDE	THICK		CLAMP	HINGE
43½"	48½"	¾"	26½"	5½"	742 A 2100-5	742 S 23790	742 S 23791
49½"	53½"	¾"	32½"	¾"	742 A 2110-4	742 S 23790	742 S 23792
54¾"	68¾"	1½"	32¾"	¾"	742 S 23780	742 S 23790	742 S 23791
60 "	89 "	1½"	45 "	1½"	743 S 23600	743 S 23600	742 S 23793
90 "	up	¾"	45 "	1½"	743 S 23601	743 S 23601	743 S 23600

NOTE: For interchangeability on engines for same road, where diameters of fronts lap figures given above, raise question as to using lighter sizes for larger diameters than those given.

- Netting:** Use arrangement of netting and deflecting plate per Standard drawing (see Index). Use 1¼" x ¼" bar iron strips instead of washers on netting where bolted to angles. Strips in all cases to be made as long as possible.
- Cleaning Holes:** Omit from sides of smokebox, and apply plug of same size as washout plugs in bottom for draining, except when cinder hopper is specified.
- Inspection Hand-hole:** Apply as per Standard drawing (see Index) with bushing welded to smoke box, right and left, for inspection of superheater joints on all superheater engines. This arrangement will withstand smoke box water test.
- Wood-burning Locomotives:** When equipped with Radley & Hunter stack, use short smoke box with low exhaust pipe and adjustable petticoat pipe, but omit the following:
Cinder hopper, smoke box cleaning hole, smoke box netting, and deflecting plates.
See Drawing 743 S 14120 for general style.
- See **Group 48.** Foreign Locomotives.
- See **Group 56.**—Laws, Rules and Instructions, I. C. C., Public Service Commission, &c.
- See **Group 99.**—Boiler Front Cement.

QUESTION: Duplicate engines.

EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

June 1, 1937

STANDARD PRACTICE

75 S 2294b

SMOKE STACK

Superseding

75 S 2294a

APPROVED
ENGINEERING
COMMITTEE

1. STACK DESIGN: Follow Standard drawings, (see Index).
2. STACK DIAMETER: Determine by means of the following table:

COAL-BURNING ENGINES				
STACK DIAMETER	BOILER HORSE-POWER			
	SUPERHEATED		SATURATED	
	COMPOUND (Four-Cylinder)	SIMPLE	COMPOUND (Four-Cylinder)	SIMPLE
12 "	1000	920	860	750
12½"	1080	1000	930	810
13 "	1170	1080	1010	880
13½"	1270	1170	1090	950
14 "	1370	1260	1170	1020
14½"	1490	1370	1270	1110
15 "	1610	1490	1380	1210
15½"	1750	1620	1500	1310
16 "	1900	1750	1630	1420
16½"	2100	1940	1800	1570
17 "	2320	2140	1990	1740
17½"	2570	2370	2200	1920
18 "	2820	2610	2420	2120
18½"	3100	2860	2660	2330
19 "	3400	3140	2910	2550
19½"	3720	3440	3190	2790
20 "	4070	3760	3490	3060
20½"	4450	4100	3810	3340
21 "	4840	4460	4150	3630

WOOD-BURNING ENGINES	
STACK DIAMETER	BOILER HORSE-POWER
	SATURATED
	SIMPLE
10 "	300
10½"	350
11 "	400
11½"	450
12 "	500
12½"	550
13 "	600
13½"	660
14 "	720
14½"	790
15 "	860
15½"	940
16 "	1020
16½"	1110
17 "	1210
17½"	1330
18 "	1460

The above stack sizes are suitable for the inner tube of Radley & Hunter and the straight part of Diamond Stacks and for taper stacks ½" in 12". For straight stacks (not Diamond or R. & H.) add 1" to diameter.

The above stack sizes are based on taper of 1" in dia. in 12".

For STRAIGHT stacks, add 1-1/2" to diameter.

Obtain boiler horse power from Form ED 324 and use the nearest corresponding diameter of stack in table.

Stack diameters vary by half inches. Use the nearest diameter above or below normal size required by rule.

3. STACK HEIGHT: Make as great as is consistent with R.R. Co's clearance and good appearance of engines.
4. See Group 56- Laws, Rules, and Instructions, I.C.C. Public Service Commission, etc.

QUESTION: Duplicate engines,

EXCEPTIONS: R.R. Co's drawings, specifications, or instructions to contrary.

SPRINGS

Superseding
76 S 2332 g

APPROVED
ENGINEERING
COMMITTEE

1. **Engine Truck, Tender Truck, Reverse, Coupler Centering, Relief Valve, and Trailing Truck Centering Springs:**
Use in accordance with Standard drawings (see Index).
2. **Elliptic and Helical Springs:** Use the following method of calculating and ordering:
Actual Load: To obtain net static load, deduct actual weights of parts constituting dead load (such as wheels, axles, boxes, etc.), instead of taking a certain arbitrary percentage.
Required Capacity: As it is generally advisable to use springs having capacity in excess of net actual load, arrange as follows:
Driving Springs: Use calculated static load plus 500 to 1000 lbs., or about 5 per cent.
Engine Truck Springs—Elliptic: Use calculated static load plus 10 to 20 per cent as follows:
 38" length centers and under 10%
 40"-48" " " " 15%
 50" " " " over 20%
Total deflection on four-wheel trucks should not be less than that of the driving springs on the same engine, when transverse centers of truck and driving springs are equal or approximately equal.
Helical: Use calculated static load plus 5 to 15%, preferably 15%.
Underhung Driving Springs: For passenger engines, use calculated static load plus 20 per cent.
Trailing Springs—Elliptic: Use calculated static load plus 10 to 15 per cent. Order springs to stand at working height under calculated load (without overload).
Helical: Use calculated static load plus 15 per cent.
NOTE: When engine and trailing trucks are interchangeable, use for trailing springs the overload allowance given above for engine truck springs.
Tender Springs—Elliptic and Helical: Use calculated static load taken with maximum load of coal and water.
3. **Spring Tables, Semi-Elliptic Springs:** Table gives load (maximum working capacity) at 80,000 lb. fibre stress of one plate 1" wide, for varying thicknesses and lengths between centers.
To obtain required number of plates, multiply "Load" by width of spring in inches and divide required capacity by this product. The quotient gives number of plates required.
NOTE: Where quotient gives decimal greater than 0.3 add one plate to whole number.
Depth: Depth (not including band) should not exceed 25% of length between centers. Raise question if width of spring cannot be increased sufficiently to keep depth within this limit.
Make number of full length plates for springs other than bulb end, in accordance with Standard Drawings (see Index).
Deflection given in table is difference between free and loaded height, irrespective of width or number of plates; for full elliptics number of plates and deflection given are for each half of spring.

SEMI-ELLIPTIC SPRINGS														
ONE PLATE, ONE INCH WIDE														
LENGTH BETWEEN CENTERS	1/8" PLATE		3/16" PLATE		1/4" PLATE		5/16" PLATE		3/8" PLATE		1/2" PLATE		3/4" PLATE	
	LOAD	DEFL.	LOAD	DEFL.	LOAD	DEFL.	LOAD	DEFL.	LOAD	DEFL.	LOAD	DEFL.	LOAD	DEFL.
20	167	0.98	260	0.78										
22	152	1.19	235	0.95	341	0.79	464	0.67						
24	139	1.41	217	1.13	312	0.94	425	0.80						
26	128	1.66	200	1.32	288	1.10	393	0.95						
28	119	1.92	186	1.53	268	1.28	365	1.10						
30	111	2.20	173	1.76	250	1.47	341	1.26	444	1.10				
32			163	2.00	234	1.67	319	1.43	416	1.25				
34			153	2.26	220	1.88	301	1.62	392	1.41				
36			144	2.53	208	2.12	284	1.81	372	1.58				
38					197	2.35	269	2.03	350	1.76				
40					187	2.60	255	2.24	333	1.95	421	1.73		
42					178	2.87	243	2.47	317	2.16	401	1.91		
44					170	3.15	232	2.71	303	2.37	383	2.10		
46					163	3.45	222	2.96	290	2.58	366	2.29		
48					156	3.75	213	3.22	277	2.82	351	2.50		
50							204	3.49	266	3.06	337	2.71	416	2.44
52							197	3.78	256	3.30	324	2.93	400	2.64
54							189	4.08	247	3.57	312	3.16	385	2.85
56									238	3.83	301	3.40	372	3.06
58									230	4.12	291	3.65	359	3.23
60											281	3.91	347	3.52
62													336	3.75
64													325	4.00
66													315	4.25
68													306	4.52

FORMULE USED IN COMPUTING TABLE:

$$P = \frac{53333 H^2}{L}$$

$$\Delta = 0.000611 \frac{L^2}{H}$$

P = net static load.
 Δ = deflection.
 H = thickness of plates
 L = length between centers.

SPRINGS

2. Spring Tables, Semi-Elliptic Springs: (Continued).

Table at right gives thickness of plates in relation to their length.

Use plates as wide as practicable. Use widths of steel as follows: 3', 3½', 4', 4½', 5', 5½', 6', 7' and 8'.

Preferred Sizes in Heavy-faced Type.

THICKNESS OF PLATES	LENGTH OF PLATES, CENTERS	
	HALF ELLIPTIC	FULL ELLIPTIC
¼"	18 to 24"	16 to 18"
⅜"	25 to 30"	19 to 20"
½"	31 to 36"	21 to 24"
⅝"	36 to 42"	25 to 28"
¾"	43 to 48"	29 to 32"
⅞"	49 to 54"	
1"	55 to 60"	

Where springs are located between engine frames it may be necessary occasionally, to use thicker plates than provided for in table, on account of limited space, but question should be raised in such cases. 36" lengths of plates are given for ⅝" and ¾" thicknesses on account of Standard engine truck springs 36" x ⅞". For 36" length ⅞" thickness is preferred.

3. Spring Tables, Helical Springs: Table gives load which will bring spring solid at 90,000 lb. fibre stress, from any free height. Use one-half this load as the working capacity of spring (corresponding to fibre stress of 45,000 lbs). "Active height free" given in table is per inch of active solid height. To each active height calculated, add 1½ times the diameter of steel to obtain the total height corresponding. Preferred minimum ratio of outside diameter of coil to diameter of steel, 5:1.

HELICAL SPRINGS																				
O. S. Dia. of Coil	⅜" Steel		7/16" Steel		½" Steel		9/16" Steel		5/8" Steel		11/16" Steel		¾" Steel		13/16" Steel		15/16" Steel			
	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free		
2	1140	1.50	1900	1.34	2940	1.24	3780	1.24												
2½	1000	1.67	1640	1.46	2520	1.33	3240	1.32												
2½	880	1.86	1440	1.60	2200	1.43	3240	1.32	4600	1.24										
2½	780	2.08	1290	1.75	1960	1.54	2880	1.41	4060	1.31	5600	1.24								
3	710	2.32	1160	1.92	1760	1.67	2580	1.51	3640	1.39	5000	1.30	6600	1.24						
3½			1060	2.11	1600	1.81	2340	1.61	3280	1.47	4500	1.37	6000	1.30	7800	1.24				
3½			960	2.32	1480	1.97	2140	1.73	3000	1.57	4100	1.45	5400	1.36	7100	1.29	9000	1.24		
3½					1360	2.14	1980	1.86	2760	1.67	3750	1.53	5000	1.43	6500	1.35	8200	1.29	10400	
4					1260	2.32	1820	2.00	2560	1.78	3450	1.62	4600	1.51	5900	1.41	7600	1.34	9500	
4½							1700	2.16	2380	1.90	3200	1.72	4300	1.59	5500	1.48	7000	1.40	8800	
4½							1600	2.32	2220	2.03	3000	1.83	4000	1.67	5100	1.55	6500	1.46	8200	
4½									2100	2.17	2820	1.94	3700	1.76	4800	1.63	6100	1.53	7600	
5									1980	2.32	2660	2.06	3500	1.86	4500	1.71	5700	1.60	7200	
5½											2520	2.18	3300	1.97	4300	1.80	5400	1.67	6800	
5½												2380	2.32	3150	2.08	4000	1.89	5100	1.75	6400
5½													2980	2.20	3850	1.99	4900	1.83	6100	
6														2840	2.32	3650	2.10	4600	1.92	5800
6½																3350	2.32	4200	2.11	5200
7																		3850	2.32	4800
7½																				4400

O. S. Dia. of Coil	1" Steel		1 1/16" Steel		1 1/8" Steel		1 1/4" Steel		1 3/8" Steel		1 1/2" Steel		1 5/8" Steel	
	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free
4	11800	1.24												
4½	10900	1.28	13300	1.24										
4½	10100	1.33	12300	1.28	14900	1.24								
4½	9400	1.38	11500	1.32	13900	1.28	16600	1.24						
5	8800	1.43	10800	1.37	13000	1.32	15500	1.28	18400	1.24				
5½	8300	1.49	10100	1.42	12200	1.36	14600	1.32	17200	1.27	20300	1.24		
5½	7800	1.55	9500	1.47	11500	1.40	13700	1.36	16200	1.31	19100	1.27	22300	1.24
5½	7400	1.61	9000	1.52	10900	1.45	13000	1.40	15300	1.35	18000	1.31	21000	1.27
6	7100	1.67	8600	1.58	10300	1.50	12300	1.44	14500	1.39	17000	1.34	19900	1.30
6½	6400	1.81	7800	1.70	9400	1.61	11100	1.54	13100	1.47	15400	1.42	17900	1.37
7	5900	1.97	7100	1.84	8600	1.73	10200	1.64	12000	1.57	14000	1.51	16300	1.45
7½	5400	2.14	6600	1.99	7900	1.86	9400	1.76	11000	1.67	12900	1.60	15000	1.53
8	5000	2.32	6100	2.15	7300	2.00	8700	1.89	10200	1.78	11900	1.70	13900	1.62
8½			5700	2.32	6800	2.16	8100	2.02	9500	1.90	11100	1.81	12900	1.72
9					6400	2.32	7600	2.16	8900	2.03	10400	1.92	12000	1.83
9½							7100	2.32	8400	2.17	9800	2.04	11300	1.94
10									7900	2.32	9700	2.18	10900	2.06

O. S. Dia. of Coil	1 3/8" Steel		1 1/2" Steel		1 5/8" Steel	
	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free	Load Solid	Act. Hg't Free
6½	31100	1.24				
7	28200	1.29	32000	1.27	36100	1.24
7½	25800	1.35	29200	1.32	32900	1.29
8	23800	1.41	26900	1.38	30300	1.34
8½	22100	1.48	24900	1.44	28100	1.40
9	20400	1.55	23200	1.50	26100	1.46
9½	19300	1.63	21700	1.57	24400	1.53
10	18100	1.71	20400	1.65	23000	1.60

QUESTION: Duplicate engines.
EXCEPTIONS: R. R. Co.'s drawings, specifications or instructions to contrary.

American Locomotive Company

ENGINEERING DEPARTMENT

Nov. 30, 1936.

STANDARD PRACTICE

76,77 S 2333-d

SPRINGS AND SPRING RIGGING

Superseding

76,77 S 2333-c

APPROVED
ENGINEERING
COMMITTEE

1. All SLOTTED-END Springs, 3-1/2" wide and over to have slots in accordance with Standard Drawing (see Index).
Wherever possible, LENGTH between centers of plate springs should not be less than the following minimum figures:
 Driving 27"
 Tender 24"
2. For DRIVING and TRAILER SPRINGS and when necessary for clearance in engine and tender TRUCKS, use springs having NEGATIVE camber when loaded, with clips as shown on Standard Spring Drawings, (see Index).
Malleable iron or cast steel spring clips are to be ordered with springs of negative or positive camber, from the spring makers in all cases. If spring makers will not furnish clips, order them separately.
3. Use GIB HANGER at both ends of outside bearing trailing truck springs.
4. Full-elliptic TENDER TRUCK Springs to have clearance of 1-1/2" between bands, with maximum load. Minimum clearance permissible, one inch (1"). Use POTTER ENDS of cast iron. For lateral motion tender truck bolsters, use POTTER ENDS of cast steel or malleable iron.
All plates should be preferably made 3/8" thick, but must not exceed the following thickness:
 Springs 22" and 24" centers 3/8"
 " 26" and 28" " 7/16"
See also Group 89.
5. R. R. Co's. DRAWINGS of springs which are specified for use on engine orders, must be carefully checked over and approved by Calculating Department and particular care taken by that Department to see that all Railroad Company's requirements as covered on such drawings are shown on the A. L. Co's drawings, made for them.
6. For SPRING BAND material, see Group 99¹. Use SPRING BANDS of increased thickness for new designs, maintaining former thickness for duplicate designs and replacements, in order to fit existing clearances, as per Standard Drawing, (see Index).
7. Arrange SPRING RIGGING and equalizers, as far as practicable on the three-point principle; so that the engine will adjust itself to uneven track and at the same time, have sufficient lateral stability to right itself after rolling to one side or the other.
This is especially necessary for locomotives having two-wheel leading and trailing trucks which are equalized with the drivers. The preferred arrangement of equalization of such engines is to arrange the front equalizer to the leading truck with center bearing and use two equalizers to connect the rear drivers to the trailing truck.
For inside-bearing trailing trucks, having center pins, the rear ends of