

FRA Form 4

BOILER SPECIFICATION CARD

Locomotive No. _____; Boiler No. _____; Date built _____
 Boiler built _____
 by: _____
 Owned by: _____
 Operated by: _____
 Type of boiler: _____; Dome, where located: _____

BOILER SURVEY DATA

Where **condition** is called for, use: **New** - New material at the time of the boiler survey; **Good** - Little or no wear and/or corrosion; **Fair** - Obvious wear and/or corrosion.

Boiler Shell Sheets

Material:	Type of Material (wrought iron, carbon steel, or alloy steel)	Carbon Content	Condition
1st course (front)	_____	_____	_____
_____	_____	_____	_____
2nd course	_____	_____	_____
_____	_____	_____	_____
3rd course	_____	_____	_____
_____	_____	_____	_____
Rivets			_____

			n/a
			n/a

Documentation of how material was determined shall be attached to this form.

Measurements:	At Seam	Thinnest
Front flue sheet,	thickness	n/a
1st course,	thickness _____,	_____
ID _____,	ID _____	
2nd course,	thickness _____,	_____
ID _____,	ID _____	
3rd course,	thickness _____,	_____
ID _____,	ID _____	

When courses are not cylindrical give ID at each end

Is boiler shell circular at all points? _____
 If shell is flattened, state location and amount _____

Are all flattened areas of shell stayed adequately for the pressure allowed by this form? _____

Water Space at Mud Ring: Sides _____, Front _____, Back _____

Width of water space at sides of fire box measured at center line of boiler: Front _____, Back _____

Firebox and Wrapper Sheets

Firebox sheets:	Thickness	Material	Condition
Rear flue sheet	_____	_____	_____
Crown	_____	_____	_____
Sides	_____	_____	_____
Door	_____	_____	_____
Combustion chamber	_____	_____	_____
Inside throat	_____	_____	_____

Wrapper sheets:

Throat	_____	_____	_____
Back head	_____	_____	_____
Roof	_____	_____	_____
Sides	_____	_____	_____

Steam Dome

Dome is made of _____ pieces (not including seam welts, if any), Top opening diameter _____

Middle cylindrical portion - ID _____, Opening in boiler shell, longitudinally - _____

Dome sheets:	Thickness	Material	Condition
Base	_____	_____	_____
Middle cylindrical portion	_____	_____	_____
Top	_____	_____	_____
Lid	_____	_____	_____

Boiler shell liner for steam dome opening:

Is liner part of longitudinal seam? _____

Arch Tubes, Flues, Circulators, Thermic Siphons, Water Bar Tubes, Superheaters, and Dry Pipe

Arch tubes: OD _____, wall thickness _____; number _____; condition _____

Flues:

OD _____, wall thickness _____, length _____; number _____; condition _____

OD _____, wall thickness _____, length _____; number _____; condition _____

OD _____, wall thickness _____, length _____; number _____; condition _____

Circulators: OD _____, wall thickness _____; number _____; condition _____

Thermic siphons: number _____; plate thickness _____; condition _____

neck OD _____, neck thickness _____; condition _____

Water bar tubes: OD _____, wall thickness _____

Superheater units directly connected to boiler with no intervening valve:

Type _____, Tube OD _____, wall thickness _____; number _____; condition _____

Dry pipe subject to pressure:

OD _____, wall thickness _____, material _____; condition _____

Stay Bolts, Crown Bar Rivets, and Braces

Stay bolts:

Smallest crown stay diameter _____, avg. spacing _____ X _____; condition _____

Smallest stay bolt diameter _____, avg. spacing _____ X _____; condition _____

Smallest combustion chamber stay bolt dia. _____, avg. spacing _____ X _____; condition _____

Measurement at smallest diameter

Crown bar bolts & rivets:

Roof sheet rivets, smallest dia. _____, ave. spacing _____ X _____; condition _____

Roof sheet bolts, smallest dia. _____, ave. spacing _____ X _____; condition _____
 Crown sheet rivets, smallest dia. _____, ave. spacing _____ X _____; condition _____
 Crown sheet bolts, smallest dia. _____, ave. spacing _____ X _____; condition _____

Braces:

	Number	Total Area Stayed	Total Cross Sectional Area of Braces Actual	Equivalent Direct Stay
Backhead	_____	_____	_____	_____
Throat sheet	_____	_____	_____	_____
Front tube sheet	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Safety Valves, Heating Surface, and Grate Area

Safety valves: Total number of safety valves on locomotive _____

Valve Size	Manufacturer	No. valves of this size and manufacture
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Heating Surface:

Heating surface, as part of a circulating system in contact on one side with water or wet steam being heated and on the other side with gas or refractory being cooled, shall be measured on the side receiving heat.

Firebox and Combustion Chamber	_____	square feet
Flue Sheets (less flue ID areas)	_____	square feet
Flues	_____	square feet
Circulators	_____	square feet
Arch Tubes	_____	square feet
Thermic Siphons	_____	square feet
Water Bar Tubes	_____	square feet
Superheaters (front end throttle only)	_____	square feet
Other	_____	square feet
Total Heating Surface	_____	square feet

Grate area: _____ square feet

Water Level Indicators, Fusible Plugs, and Low Water Alarms

Height of lowest reading of gauge glasses above crown sheet: _____

Height of lowest reading of gauge cocks above crown sheet: _____

Is boiler equipped with fusible plug(s)? _____,
number _____

Is boiler equipped with low water alarm(s)? _____,
number _____

Calculations

Staybolt stresses:

Stay bolt under greatest load, maximum stress
_____psi
Location _____

Crown stay under greatest load, maximum stress
_____psi
Location _____

Combustion chamber stay bolt under greatest load, maximum stress
_____psi
Location _____

Braces:

Round or rectangular brace under greatest load, maximum stress
_____psi
Location _____

Gusset brace under greatest load, maximum stress
_____psi
Location _____

Shearing stress on rivets:

Greatest shear stress
on rivets in
longitudinal seam

_____psi
i
Location (course #) _____ ; Seam Efficiency _____

Boiler shell plate tension:

Greatest tension on
net section of plate in
longitudinal seam

Location (course #) _____ ; Seam Efficiency _____

Boiler plate and components, minimum thickness required @ tensile strength:

Front tube sheet _____ @ _____ _____ @ _____	Rear flue sheet
1st course at seam _____ @ _____	1st course not at seam _____ @ _____
2nd course at seam _____ @ _____ _____ @ _____	2nd course not at seam
3rd course at seam _____ @ _____	3rd course not at seam _____ @ _____
Roof sheet _____ @ _____ _____ @ _____	Crown sheet
Side wrapper sheets _____ @ _____ _____ @ _____	Firebox side sheets
Back head _____ @ _____ _____ @ _____	Door sheet
Throat sheet _____ @ _____ _____ @ _____	Inside throat sheet
Combustion chamber _____ @ _____ _____ @ _____	Dome, top
Dome, middle _____ @ _____	Dome, base _____ @ _____
Arch tubes _____ @ _____ _____ @ _____	Dome, lid
Water bar tubes _____ @ _____ _____ @ _____	Thermic siphons
Dry pipe _____ @ _____ _____ @ _____	Circulators

Notes. 1. If tensile strength used is greater than 50,000 psi for steel or greater than 45,000 psi for wrought iron, supporting documentation must be furnished.

2. Any shell dimension less than 1/4" in thickness may not be adequate for support of or by other structures, particularly where threads or staybolts are concerned. Applicable codes should be consulted.

Boiler Steam Generating Capacity: _____ pounds per hour

The following may be used as a guide for estimating steaming capacity:

Pounds of Steam Per Hour Per Square Foot of Heating Surface:

Hand fired	8 lbs. per hr.
Stoker fired	10 lbs. per hr.
Oil, gas or pulverized fuel fired	14 lbs. per hr.

Record of Alterations

Description of Alteration

Date of

