

The boiler shall be connected with a short, direct smoke-pipe to a chimney flue of suitable size, height and construction to give proper draft.

The water spaces of the boiler shall be thoroughly boiled out with a solution of sal soda, potassium hydrate or sodium hydrate and then thoroughly rinsed with clean water.

The heating surface, firebox, ashpit, flues and chimney shall be clean and free from soot, ashes and dust at beginning of test.

APPARATUS AND INSTRUMENTS

Apparatus and instruments must be reliable and be arranged in such a way as to insure correct data.

Tanks for measuring the feed water may be calibrated with weighed quantities of water at the temperature to be used during the test, or mounted on accurate weighing scales. The water may be fed to the boiler by gravity, by air pressure or by feed pumps, from feed-water tanks supplied from the measuring tanks by gravity.

Accurate scales of suitable size shall be provided for weighing separator water, fuel and all refuse removed from the grate and ashpit.

Three draft gages shall be provided and so arranged as to determine the pressure difference at the level of inserting the pipe between the outside and the ashpit, between the outside and the firebox, and the outside and the smokehood. Draft measurements shall be made with draft gages reading to 0.01 in.

Accurately calibrated instruments shall be provided for measuring temperatures of gases, water and steam.

An Orsat apparatus shall be used for determining the flue gas composition. If recording carbon dioxide (CO₂) instruments are provided, they shall be checked every hour with the Orsat apparatus.

A Ringelmann chart shall be used for smoke observations.

Weather Bureau reports from the immediate vicinity may be used to determine the barometric pressure. When such reports are not available, a calibrated aneroid barometer or mercury column shall be used for determining the barometric pressure.

A calibrated steam gage or a mercury column shall be used for determining the steam pressure.

A log of the test shall be kept on record sheets similar to those provided by this Code.

DURATION OF TEST

The test shall continue for at least 16 hours if operated at the normal manufacturer's rating; if operated at other ratings it shall continue until as much fuel has been burned as would have been burned in a 16-hour test at normal rating.

METHOD OF STARTING AND STOPPING TEST

The New Fire Method of starting and stopping test may be used on any boiler when anthracite coal is used as fuel. All tests using other fuels shall be started and stopped by the Continuous Firing Method.

New Fire Method.—A preliminary fire shall be made and the boiler operated under test conditions for at least one hour before starting the test. The preliminary fire shall then be dumped, the ashpit thoroughly cleansed and dried wood placed on the grate and kindled. The test shall be considered started at the time of firing the charge of wood. On this charge of wood, fuel shall be placed. The wood shall be considered as having a heating value of 5000 B.t.u. per lb. The height of water line in gage glass and feed tank shall be noted and recorded at the time the preliminary fire is dumped. The water level in the boiler shall be kept at this level as nearly as possible throughout

the test and the water level in the boiler and feed tank must stand at this same height when the test closes. At the end of test the fire shall be dumped. The residual fire when dumped shall be placed in tightly covered cans, weighed and left to cool. After cooling it shall be forwarded for analysis and determination of its heat value and ash content. The total fuel fired shall be taken as the total weight of fuel exclusive of the wood used for kindling, to which shall be added the fuel equivalent of the wood and from which shall be subtracted the fuel equivalent of the residual fire. The weight of the ash content of the residual fire shall be added to the weight of ash and refuse removed from the ashpit and the sum recorded as ash and refuse removed from the ashpit.

Continuous Firing Method.—A preliminary fire shall be made and the boiler operated under test conditions for at least one firing period and not less than one hour before starting the test.

The fire shall then be burned low, thoroughly cleansed and the remaining live fuel spread evenly over the grate as the foundation for the first test fuel charge. The thickness of the fuel bed and the extent to which it has been burned through shall be quickly estimated or measured. The height of water line in gage glass and feed tank shall be noted and recorded. The test shall start at the time of making these observations. A weighed charge of fuel shall then be fired. The ashpit shall be thoroughly cleansed immediately and the test allowed to proceed.

A constant water level and rate of steaming shall be maintained throughout the test.

At the end of the test the fire should be burned low and cleansed so as to leave the same amount of live fuel on the grate as at the start. When this condition is reached and the water level in the boiler and feed tank are at the same height as at the start, record the time and this time shall be the time of stopping. The contents of the ashpit shall be removed promptly on stopping and placed in airtight cans, weighed and left to cool. The boiler shall be charged with all fuel charged during test.

METHOD OF FIRING

The method and frequency of firing shall be as agreed upon by the manufacturer and purchaser.

FUEL SAMPLING

During the progress of the test, fair samples at regular intervals shall be taken with a shovel from the fuel charge, stored in a covered vessel in a cool place, and after crushing and quartering, two one-pint glass jars or other airtight vessels shall be filled. The gross sample for slack coal and small sizes of anthracite in which the impurities do not exist in abnormal quantities or in pieces larger than $\frac{3}{4}$ in., should weigh approximately 500 lb. and not less than 1000 lb. for other solid fuels.¹

The small samples shall be preserved for determinations of the proximate analysis, ultimate analysis and calorific value.

The refuse taken from the ashpit and grate shall be reduced by crushing and quartering to a quantity sufficient to fill two one-pint jars or other airtight vessels for determining its combustible content in the laboratory. Care must be taken to crush and quarter the coal, ash, and refuse on a clean floor; to avoid contaminating the sample a metal plate is to be preferred to a concrete floor. Care must be taken to see that the ash and refuse does not burn after removal from the grate or ashpit.

¹As recommended by the American Society for Testing Materials, D21-16, p. 756, 1921.

The Committee on Code for Testing Low-Pressure Heating Boilers of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS is prepared to interpret the meaning of any items on the Code.

It is requested that all tests be filed with the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.