

"Improving Heat Transfer Efficiency at the Least Cost"

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INSTALLATION INSTRUCTIONS FOR BROCK TURBULATORS

The guidance offered here is mechanical and supplements the statements of thermal principles outlined in the "FUEL EFFICIENCY" brochures and manuals. Consult your manual for clarity if necessary.

SIZES:

Turbulators are available for all tube diameters. Order by tube inches OD. We make necessary allowances for metal widths and lengths.

Normally 2 – 4 lengths are furnished for a given size boiler. There are exceptions and special Turbulators and instructions for these will be furnished.

POSITION IN TUBE:

Observe that each Turbulator is uniform in size and shape except the two ends. The short plane is the entering end. The other, or handle end, is substantially longer, and terminates in an off-set "tab" of approx. 1 inch. The entire length except the tab is inserted; and the extra length of the handle plane holds by friction against the roll of the tube. Typically the tab end should come to rest at either the 10 o'clock or the 2 o'clock position. (Shown on Boiler Drawings)

LOCATION OF TURBULATORS:

For HRT's, Scotch Marines or Locomotive types, Turbulators are installed at the stack end of tubes. In fire-boxes, at the entering end of the last pass, but only in one pass. (Shown on Boiler Drawing) Generally, closer to the stack end is most desirable. If stack is at rear of boiler (as in 3 pass boilers) and if there is access to **last pass** tubes from the stack end, it may be preferable to locate the turbulators at the rear of the boiler.

INSERTING TURBULATORS:

Lay out all bundles of Turbulators by size, break bands with edge of screwdriver, entering ends toward boiler. Start with longest at top, shorter next, shortest last. Work "close", pushing 12 to 15 inches at a move, not 3 or 4 feet. In clean tubes they will enter freely. Don't force, or the Turbulators will kink.

REMOVAL FOR CLEANING:

To keep area uncluttered and recognize lengths easily, stand Turbulators in ash or trash barrel. To minimize handling, if hand-punching tubes, remove from two vertical rows, clean; then move Turbulators over, thus handling once. Ignore original Turbulators until last rows are clean, and install there. Turbulators, themselves, will not usually require any cleaning.

TESTING & ADJUSTING:

Turbulators supplied for each boiler will be the longest lengths used in these boilers, and can be cut to shorter lengths to match any draft or stack temperature conditions.

After properly installing all Turbulators supplied, check the stack temperature with a thermometer in the center of the boiler outlet. The minimum stack temperature should be 265° F for gas or 240° F for oil plus ½° F for each foot of travel to the top of the chimney, to prevent condensation.

Example: 25' of smoke pipe and 75' of chimney = 100' of travel or 50° temperature loss.
Minimum temperature at boiler outlet for gas = 265° plus 50 = 315°.

If stack temperature is below the minimum, remove the Turbulators and cut off the small entering end of each Turbulator about 6" for each 25° increase in stack temperature needed, then recheck the stack temperature.

In large boilers the longest Turbulators in the top rows can be removed and all of the other rows moved up. Then cut off the longer Turbulators equal to the shortest lengths and install them in the lower rows.

Check the overfire draft, and if it is below the minimum draft required for this burner operation, then check as follows:

1. Check to see if the barometric damper can have weight added to close it and increase the draft needed.
2. Check to see if the boiler outlet damper or overfire draft damper can be opened more to increase the draft needed.
3. Check to see if the induced draft fan can be speeded up to increase draft. Check for any unnecessary openings in the chimney that can be closed.
4. If the draft cannot be increased, then the Turbulators can be cut off to shorter lengths until the draft is permissible for proper burner operation.
5. Where the purpose of installation is fuel savings alone, and the present output is adequate, draft can be gained by reducing fuel input. 90% of the previous input will produce 100% of the previous output, with 10% savings.

DESIRABILITY OF TESTING EQUIPMENT:

Where available, the services of a burner specialist with full testing equipment is a fine investment. At a point close to the exit end of the tubes a quarter-inch test hole should be drilled for this purpose.

CO² readings reveal how well the boiler is doing its job, and what the air/fuel ratio is. Too little air is intolerable, too much air is wasteful because it cools the entire boiler system and performs no work.

Stack temperature reveals how well the boiler is absorbing the available heat. Depending on the type and material of the stack, 50 to 100 degrees above the water/steam temperature is average Turbulator performance.

Excessive draft is wasteful. Zero smoke on gas or light oil is a must; the lighter the smoke on heavy oil, the better. With gas, any carbon monoxide is too much. In non-pressurized burner equipment, some overfire draft is a must.

WHAT ARE GOOD READINGS?

In a gas fired boiler operating at 75 to 90 psig, with Turbulators: CO² about 9 ½%. O² about 4 ½%. No CO. Stack temp 375° to 425° F. Stack draft .10 to .15" WC overfire draft .01 to .02" WC.

Light oil will require up to .05" WC overfire draft, and yield higher CO².

Desirable testing equipment: CO² indicator, chemical or constant-reading electric. Long stem thermometer. Draft gauge .0 to .25" WC reading. Smoke tester for oil only. Oxygen and Monoxide indicator for gas only.