EE28: EXPAND BOILER EFFICIENCY TESTING & TUNING

Administrative Code of the City of New York
Proposal developed by the Energy & Ventilation Committee

Summary

Issue:
The Department of Environmental Protection tests boiler combustion efficiency only in very large boilers, and only every three years. Annual testing would detect malfunctions, permit tuning, and result in more efficient boiler operation.

Recommendation:
Require annual testing of boilers that generate more than 2 million BTU per hour or are located in buildings larger than 50,000 square feet. Also require boiler cleaning, tuning and repairs as necessary. The issue addressed by this proposal is already under consideration by the City.

Proposed Legislation, Rule or Study

Amendments to the Administrative Code of the City of New York:

1. Add new a subchapter 10 to title 24 as follows:

   Subchapter 10
   Annual Combustion Efficiency Test Requirements

   § 24-190 Definitions. When used in this subchapter 10, the following terms shall have the following meaning:

   (a) Efficiency test shall mean a combustion efficiency test carried out by means of a portable flue gas analyzer capable of detecting oxygen and carbon monoxide concentrations and stack gas temperature.

   (b) Fuel burning equipment shall include all boiler/burner combinations of fuel oil fired burning equipment and gas fired installations.

   § 24-191 Permanent criteria and standards. No later than July 1, 2010, the commissioner shall establish criteria and or standards for:

   (a) Combustion efficiency testers. Such criteria shall at a minimum consider professional heating contractor experience, emissions/equipment testing experience, boiler safety inspection experience or a combination of the foregoing.

   (b) Portable combustion analyzers that directly measure and display flue gas oxygen, carbon monoxide, nitrogen oxide, stack temperature, draft, differential pressure, combustion air temperature, and calculate carbon dioxide. The analyzer shall have a means for calculating efficiency for the specific fuel used.

   (c) Test protocol, which shall include criteria that is included in present fuel burning criteria, including location of test ports, specific boiler operational parameters, steady state and firing rates.

   § 24-192 Interim criteria and standards. Prior to establishing permanent criteria and standards, the department may establish an interim list of acceptable combustion efficiency testers, portable combustion analyzers, and test protocol. These interim criteria and or standards may be utilized to conduct the testing as required by section 24-193 until superseded by permanent criteria and standards.

   § 24-193 Annual test requirement. 
   (a) Effective January 1, 2011 for all boilers in buildings greater than 50,000 square feet, the building owner shall conduct an annual combustion efficiency test utilizing the portable combustion analyzer and submit the results to the department.
(b) Effective January 1, 2011 for any boiler requiring renewal of the department’s triennial certification (for boilers greater than 2.8 million btu/hr), the department shall conduct the combustion efficiency test utilizing the portable combustion analyzer technology.

(c) Effective January 1, 2012 for all boilers greater than 2 million btu/hr in buildings smaller than 50,000 square feet, the building owner shall conduct the annual combustion efficiency test utilizing the portable combustion analyzer and submit the results to the department.

§ 24-194 Electronic Submission of Test Results. Effective January 1, 2011, the results of the annual testing required under section 24-193 shall be electronically submitted to both the department and the department of Buildings. The department shall establish the template and format that the building owner shall complete and submit. The template shall include a calculation of the annual savings in energy costs if the boiler were functioning at the acceptable passing score, and a calculation of the annual savings in energy costs if the boiler were replaced with a new, high-efficiency boiler.

§ 24-195 Acceptable Passing Score.
(a) Effective January 1, 2011, the acceptable passing score for the SSE (Steady State Efficiency) shall be: for atmospheric gas fired boilers 79%, for all other gas fired boilers 81%; for all oil fired boilers 83%.

(b) If a boiler burner combination is below the passing score, the building owner shall have the boiler and burner repaired, retuned and retested, with the results submitted within sixty days. The building owner shall also complete a ‘work order summary’ to be submitted to the department indicating the work completed prior to the second testing.

(c) By January 1, 2014, the department shall evaluate the state of boiler and burner technology and combustion efficiency test results received between January 1, 2011 and January 1, 2013 and:
   (1) determine the passing score threshold for combustion efficiency tests commencing thereafter; and
   (2) analyze whether any other efficiency criteria or requirements should be established.

§ 24-196 Filing Fees.

Effective January 1, 2011, the department shall establish filing fees sufficient to cover the costs of administering and enforcing the boiler testing program and the electronic filing system.

Supporting Information

Issue - Expanded
Recent developments in portable technology for testing boiler efficiency now make it feasible to test boilers the way that automobiles have been tested for many years. The current testing program of the Department of Environmental Protection utilizes older technology, limiting testing to the very largest boilers in the city - those over 3.5 million Btu/yr - and it only does so every three years. This proposal enables the use of the newer technology and then expands the city’s boiler efficiency testing to cover more boilers -- those larger than 2 million Btu/yr or boilers in buildings larger than 50,000 square feet -- and to test those annually. Combined, these boilers cover buildings larger than roughly 30,000 sq. ft. so this proposal will impact well over half of the energy used for space and hot water heating in the city.

Most of these boilers are not tuned and cleaned frequently to keep them operating close to peak efficiency. This proposal requires the boilers to be tested annually. If any boiler cannot achieve a sufficiently high Steady State Efficiency (SSE) score, it must be cleaned and tuned, and then retested, with the scores for both tests being submitted to DEP. Note that the SSE is a measure of how well a boiler is operating, and is not a measure of the underlying efficiency of the boiler model. Therefore it is expected that, with very few exceptions, all boilers can be cleaned, tuned, and repaired sufficiently to enable them to achieve a passing score. It should be understood that boilers that do not achieve passing scores after having been tuned, will not be required to perform further work that year, nor will they need to be replaced.

As part of the process, each building owner will be informed of the dollar savings that would accrue if the boilers were operating at the passing score, and if the boiler were replaced with a high-efficiency model. It is anticipated that such transparency will help building owners make better decisions and investments in their boilers. In addition, the information obtained about boiler efficiencies across the city will enable DEP to fine-tune its requirements after several years.
It is estimated that an average efficiency improvement of between 3% and 5% will be obtained through the regular tuning of boilers, which translates into decreased energy consumption of 4% to 5%. This will save considerable energy and money.

**Environmental & Health Benefits**

There should be sizable reductions in soot, also known as PM 2.5 (or particulate matter 2.5), which is a pollutant that causes serious damage to the human respiratory tract because of its tendency to lodge deep in the lungs. PM 2.5 is contained in the smoky emissions resulting from the incomplete combustion within poorly tuned boilers.

The citywide impact on CO2 emissions can be estimated as follows:

Buildings are responsible for 78% of the city’s CO2 emissions. Of that, heat and hot water are responsible for 59% of the carbon emissions. The large to medium size boilers targeted generate roughly 55% of the city’s heat and hot water. If we assume, on average, that the regular retuning of boilers (in excess of that which is currently occurring) will reduce consumption by 4-5% on average, that only 15% of boilers are currently being tuned, and that the city will achieve a 90% compliance, the CO2 savings across the city would be:

\[0.78 \times 0.59 \times 0.55 \times (0.04 \text{ to } 0.05) \times 0.85 \times 0.90 = 0.77 \text{ to } 0.97\% \text{ of the city’s carbon emissions or 485,100 to 604,800 tons of carbon per year. This reduction would occur within a year of beginning to implement the program, and it is equivalent to removing 133,230 to 589,895 cars from the road.}\]

This proposal was found to have a low positive environmental impact per building and to impact a large number of buildings. It was thus given and environmental score of 2.

This proposal was found to have a positive indirect health impact.

**Cost & Savings**

As described in the Executive Summary, Bovis Lend Lease prepared cost estimates for each Task Force proposal in the context of well-defined construction projects in specific buildings. Where possible, members of the Technical Committees prepared savings estimates for some of these projects and buildings. These cost and savings estimates are presented in the February 1st draft version of Appendix A. The innate uncertainty in how construction and operation will vary from one building to another, the complexity of the Task Force proposals, and the wide range of applications in which the proposals may be realized mean these figures are truly estimates.

This proposal was estimated to cost $0.00 to $0.01/square foot annually. It was thus categorized as incurring no cost increment. This proposal was also estimated to generate financial savings that will exceed the costs.

**Precedents**

1. The European Union has a similar testing requirement (EN5037) for gas-fired boilers that have been in place since early 2007.

2. There is also a British standard for these appliances.

3. For many years, automobile owners have been required to perform an annual emissions test, which is the equivalent of the efficiency test now being proposed for boilers.

**LEED**

This proposal has no direct LEED implications.

**Implementation & Market Availability**

There are a significant number of national manufacturers marketing the necessary equipment.