Fairbanks North Star Borough

Evaluation of Electrostatic Precipitators (ESP) as Retrofit Control Devices
2-YEAR FIELD OPERATION MONITORING OF ELECTROSTATIC PRECIPITATORS FOR RESIDENTIAL WOOD HEATING SYSTEMS

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ABSTRACT: To assess the applicability of ESPs for particulate matter emission reduction in old residential wood heating appliances comprehensive field tests with accompanying ESP operation monitoring and dedicated emission measurement campaigns have been performed in the region of Graz (AT). Three OctoTube ESPs were thereby tested during the heating seasons 2014/2015 and 2015/2016 at different sites with rather old respectively high-PM-emission wood burning devices. Before installing the ESPs at the field testing sites they were checked in the lab regarding functionality and precipitation efficiency. The evaluation of the plant monitoring data collected during the field tests revealed high seasonal ESP availabilities between 80.2% and 97.7%. Dedicated test runs with emission measurements at the different testing sites showed high precipitation efficiencies which were well comparable with those gained during preceding lab-tests. Based on these results it can be concluded, that ESP models like the OctoTube are suitable as retrofit units in old appliances and have due to their high availability and particle precipitation efficiency the potential to contribute to a significant reduction of particulate matter emissions from old residential wood burning systems.

Keywords: gas cleaning, particle emission, small scale application

1 INTRODUCTION AND OBJECTIVES

According to the European Biomass Association (AEBIOM) more than 50% of the bioheat produced in the EU28 is related to residential heating [1]. Logwood stoves, logwood boilers, pellet boilers and wood chip boilers are thereby the most common heating technologies. However, biomass burning in stoves and outdated boiler systems is increasingly criticized as a major source of particulate matter (PM) emissions. With the introduction of the EU directive 1999/30/EC, which limits among others PM10 concentrations in the ambient air, it had to be recognised that in many European regions the related limit value is more frequently exceeded than allowed. As the main sources for PM emissions traffic, industry and domestic heating have been identified. It has furthermore been shown that the contribution of residential biomass combustion to the total PM emissions of the residential heating sector exceeds 80% in some European regions.

Previous research projects dealing with this problem have revealed that especially old wood burning appliances are responsible for the high PM emissions of the residential heating sector [2, 3, 4]. An appropriate solution to the problem would be to exchange old appliances by modern low-emission systems. However, since owners of outdated heating systems cannot be forced to shift to newer ones and since also incentives for replacing old boilers did up to now often not show the desired effect, the application of precipitators for PM emission reduction seems to be the economically most feasible short-term approach.

The city of Graz (AT) is located in a typical basin-shaped region with a low exchange of air especially during winter time. This leads to accumulation of PM in the ambient air and consequently to more frequent exceedances of the PM concentrations allowed. A broad application of particle precipitators in old wood burning appliances could therefore, among others, be one appropriate countermeasure against air pollution. Recent work has shown that especially electrostatic precipitators (ESPs) are suitable for PM emission reduction from residential biomass combustion appliances [5]. However, former research projects such as the ERA-NET Bioenergy project FutureBioTec have also revealed that many ESPs presently available are not designed for a long-term operation at the harsh operation conditions prevailing in old logwood boilers and stoves which are characterized by a flue gas with insufficient burnout as well as high soot and organic aerosol emissions. The reason therefor is that presently ESPs are mainly developed with the aim to safeguard the keeping of the stringent dust emission limits for pellet and wood chip combustion defined in the 1. BImSchV in Germany. Consequently, they are designed for much better burnout conditions than prevailing in old appliances. Moreover, no reliable long-term performance data regarding ESP operation are available.

Thus, the overall objectives of the project presented have been to identify an ESP technology suitable for the application with old high-emission wood burning appliances and to test it over two heating seasons within field tests in the region of Graz. These field tests should be accompanied by a comprehensive monitoring and measurement program.

2 APPROACH

2.1 Selection and description of the ESP technology

At first, an appropriate ESP technology, which is capable to operate at the harsh conditions of old biomass burning appliances had to be identified. Test runs with four different ESPs performed within a former Austrian R&D project have shown that the availability and precipitation efficiency of ESPs may significantly suffer from high concentrations of organic aerosols and soot in the raw gas which lead to problems and failures with ESP operation. In this project, the ESP OctoTubes of the company OekoSolve (CH) has been identified as reliable ESP, which can operate at poor burnout conditions of the biomass boiler resp. stove to which it is connected and achieves very good precipitation efficiencies. Therefore, the OctoTubes were selected for the field tests.

The OctoTube is a typical tube-type electrostatic precipitator. The unit consist of a T-fitting (9 in Figure 1) and a metal tube which are mounted on top of the chimney (chimney-top application). It uses the inner
Adopted November 19, 2019

Surface of the chimney or in case of a non-metallic chimney an extended metal tube (as shown in Figure 1) as precipitation electrode. A 1.6 m long electrode (10) thereby extends downwards in the chimney and is connected with an insulator (5) positioned outside the flue gas stream. The electronic circuit and the control unit (2) are mounted outside and protected with a cover (4) against weathering. The power consumption of the ESP amounts to 20-30 W during operation and the high-voltage power applied is usually in the range of 15-30 kV. The OekoTube is applicable for biomass combustion systems up to 40 kW.

The OekoTube is equipped with a temperature sensor (7 in Figure 1) which measures the flue gas temperature. Based on the exceedance of a predefined temperature the control system identifies the start-up phase of the heating system and automatically activates the ESP. In turn, when the flue gas temperature drops below a certain predefined limit, the ESP is turned off again. These temperature set-values are configured in the control software before the first ESP start with respect to the expected flue gas temperature and can be modified also during operation. Also the installation situation of the thermocouple is hereby considered since its readings may be influenced by cold radiation from the metal tube which is exposed to the ambient.

One advantage of the system, especially for integration in existing heating systems, is its positioning at the top of the chimney which demands for no additional space inside the building. As the precipitator has no automated cleaning system, ESP cleaning is carried out by the chimney sweep during his visits. The cleaning interval thereby depends on operating time and type of furnace. However, as a rule of thumb one additional chimney cleaning per year compared to operation without the OekoTube has to be considered.

Within the project presented also one so-called OekoTube inside has been tested. The ESP technology is the same as for the chimney-top model but the OekoTube inside is designed for an installation in between the heating device and the chimney. The only restriction that has to be taken into account is a maximum flue gas temperature of 200°C during permanent operation.

2.1 Selection of appropriate field testing sites

Identically constructed ESPs have been delivered by OekoSolve and have at first been tested at the testing facilities of BIOS BIOENERGIESYSTEME GmbH to check their principal functionality and to gain benchmark values for the dust precipitation efficiency. These ESPs should then be applied during a comprehensive field testing campaign in the heating season 2014/2015. For the second field testing campaign (heating season 2015/2016) one ESP has been replaced by an OekoTube inside.

Candidates for the field testing campaign have been screened and the most suitable testing sites have been selected. The aim was to select appliances which are suspected to show high particulate emissions and which are typical for the Graz region. Moreover, easy accessibility of the chimney for field measurements was a relevant requirement. Finally, private buildings with the following heating devices have been chosen:

- Site 1: logwood boiler; year of manufacture: 2010; nominal boiler capacity: 25 kW. During the field test season 1 it was equipped with the OekoTube and during field test season 2 with the OekoTube inside technology. Figure 2 shows the OekoTube and the OekoTube inside installed at site 1.

- Site 2: logwood boiler; year of manufacture: 1997; nominal boiler capacity: 18 kW (tested during field test year 1). The ESP tested at this plant was moved to site 3.
during the second testing season.

Site 3: logwood stove, year of manufacture: 2009; nominal capacity 8.4 kW.

As an example for these installations the OekoTube mounted at the top of the chimney at site 2 is presented in Figure 3.

2.1 Performance of field testing and operation monitoring

At these testing sites the ESPs have been continuously operated over the whole heating seasons and relevant ESP operation data have been recorded and evaluated at least once a week. Moreover, two emission measurement (gaseous and particulate emissions) campaigns have been performed per testing site and per heating season.

At the end of the first heating season (2014/2015) the results have been evaluated and possible measures for adaptations respectively optimisations have been communicated to the manufacturer OekoSolve. The modifications have then been implemented for the field testing phase 2 during the heating season 2015/2016.

3 METHODOLOGY

3.2 Performance of pre-tests in the lab

In order to check the performance of the three ESPs delivered and to gain reference values regarding their precipitation efficiencies for TSP (total suspended particulate matter = total dust) and \( \text{PM}_{10} \) (particulate matter with a diameter smaller than 1 \( \mu \text{m} \) = fine \( \text{PM}_{10} \)), at first the ESPs have been tested in the lab under controlled operation conditions of the boiler applied. Therefore, a state-of-the-art pellet boiler (Windhager BioWIN 210, nominal boiler capacity: 21 kW) has been connected to the ESPs.

In order to simulate the later field operation on top of the chimney, a tube with controlled electric trace heating was installed between the boiler and the ESP, so that a flue gas temperature of about 100°C has been achieved at ESP inlet. This tube also contained an isothermal sampling section right at ESP inlet, where TSP and \( \text{PM}_{10} \) measurements upstream the ESP have been performed.

At ESP outlet a second tube was installed for measurements downstream the ESP and for connection to the chimney. This tube has also been equipped with electric trace heating in order to keep the temperatures constant and to avoid possible influences by the condensation of organic vapours on the measurement results. In Figure 4 the experimental setup is schematically described.

The boiler was operated with A1-quality wood pellets (according to EN ISO 17225-2) at three different operation modes, which have been adjusted by appropriate manipulation of the process control settings.

- Normal operation
- Operation at conditions causing high emissions of organic aerosols to simulate the behaviour of an old logwood boiler
- Operation at sooty conditions to simulate the behaviour of a logwood stove.

The content of \( \text{O}_2 \) (paramagnetic sensor), \( \text{CO}, \text{CO}_2 \) (NDIR) and organic gaseous compounds (FID) in the flue gas were measured and on-line recorded. The particulate emissions have been measured in parallel upstream and downstream the ESP. A total dust measurement equipment according to VDI2066 and a Berner-type low-pressure impactor to determine the \( \text{PM}_{10} \) emissions where therefore applied. From these parallel measurements the total dust and the \( \text{PM}_{10} \) precipitation efficiencies were calculated. Moreover, relevant ESP and boiler operation data have been recorded on-line and evaluated.

3.2 Field monitoring

To facilitate a continuous observation of the ESP performance during the field tests, relevant operation data were logged by data acquisition systems installed at each site in 5 second intervals. Each day the data were automatically submitted via GSM to the office of BIOS BIOENERGIESYSTEME GmbH. The data received were evaluated at least once a week in order to detect possible system failures and to decide if appropriate countermeasures have to be taken. The data recorded and evaluated were:

- Operating state of the ESP [ON/OFF]
- ESP voltage [kV]
- ESP current [mA]
- Flue gas temperature at ESP outlet [°C]
- Temperature in the ESP control box [°C]
- Error messages regarding the control hardware
- Error messages indicating operation failures

3.2 Dedicated measurement campaigns

At each ESP at least two dedicated testing campaigns have been performed – one at the beginning and one in the second half of the heating season. Thereby the gaseous and particulate emissions downstream the ESP were determined with the same equipment as applied during the lab tests. To enable a correct measurement downstream the ESP, a “measurement section”, which is a tube with appropriate sampling ports, was connected on top of the ESP. In Figure 5 the measurement setup is presented.

As there has been no possibility to measure the \( \text{PM}_{10} \) emissions upstream the ESP, the \( \text{PM}_{10} \) precipitation efficiency was determined with downstream measurements at two successive days; one day with and one day without ESP operation. It has been taken care that the framework conditions during these two days...
regarding outside temperatures, operation cycles of the biomass combustion systems and duration of the test runs were comparable.

![Figure 5: Measurement setup during the dedicated field measurement campaigns](image)

At the logwood boilers (site 1 and 2) consecutive TSP measurements have been performed in order to cover the whole operation cycle of the boiler including the ignition phase, the main combustion phase and the charcoal burnout phase. At least three short-term impactor measurements (duration of some minutes) have been carried out during the distinct combustion phases to determine the PM₁ emissions. At the stove (site 3) one TSP measurement per batch has been performed and at least 3 impactor measurements were made within one test run day during the main combustion phases of selected batches.

From these data the particle precipitation efficiencies were calculated. However, the main aim of these measurements was to check if relevant changes regarding the precipitation efficiencies in comparison with the lab tests and over the heating seasons occur rather than to get exact data on particle precipitation.

4 RESULTS

4.1 Results of the lab tests performed

The aim of the preliminary lab tests has been to check the ESPs before installing them in the field and to gain data regarding particle precipitation efficiencies under well-controlled lab conditions which can be compared with results from the field tests.

The ESPs generally could be taken into operation without problems. During the two test weeks performed with each ESP also no relevant failures occurred.

At boiler standard operation conditions, which were characterized by a good gas phase burnout with CO emissions below 60 mg/MJ (related to the NCV of the fuel) and low PM emissions at ESP inlet (total dust emissions below 10 mg/MJcv) all ESPs showed precipitation efficiencies of 88 to 93% for total dust and of 88 to 97% for PM₁. The ESP voltage was slightly below 30 kV and the ESP power between 10 and 16 W. Based on experience from former projects and on literature data this has been an expected result.

The boiler operation which aimed at a high amount of organic aerosol emissions was characterized by very high CO emissions (around 4,000 mg/MJcv) and high oxygen contents the flue gas (up to 18 vol% d.b.). Total dust emissions at ESP inlet were in the range between 35 and 50 mg/MJcv. At these conditions precipitation ratios of about 90% could be achieved for total dust and PM₁. The ESP voltage was at about 30 kV and the ESP power between 4 and 10 W. Compared with former experience these values regarding PM₁ precipitation must be assessed as very good.

During the sooty operation the pellet boiler was operated at very low excess air ratios (about 4 vol% O₂ in the dry flue gas) resulting in increased CO emissions (up to in average 2,000 mg/MJcv) and high total dust emissions of up to 50 mg/MJcv. The ESP voltage was at about 30 kV and the ESP power between 3.4 and 8.0 W. For PM₁: a very good precipitation efficiency of up to 96% could be determined. However, regarding total dust at some measurements the emissions downstream the ESP were even higher than upstream the ESP which can be explained by the high soot emissions. Soot particles form rather loose dendritic agglomerates on the electrodes and the filter walls which can easily be re-entrained with the flue gas and cause emissions of rather big (even some millimeter in diameter) soot flakes. After the flue gas exits the chimney these flakes are immediately precipitated by gravitational forces and do not remain in the ambient air.

Summing up, from the lab tests it could be concluded that the ESPs were functional and showed the expected particle precipitation efficiencies. Moreover, the data acquisition systems have been tested and finally the ESPs were released for the field testing.

4.2 Results of the ESP monitoring at the field testing sites

Field monitoring took place over two heating seasons (2014/2015 and 2015/2016). The data gained have been continuously evaluated in order to regularly check the ESP performance.

As an example in Figure 6 a typical ESP operation cycle from one day at site 1 is presented. Due to the increase of the flue gas temperature above 35°C the ESP control identifies the ignition phase of the logwood boiler and turns on the ESP. Immediately, the ESP voltage and power increase. In the following the ESP control tries to maximize the ESP power by increasing the voltage. In the case presented the targeted power of 15 W is reached after 15 seconds. If the voltage is increased too much, sparkovers can occur. In this case the power is reduced and then increased again and a failure message is sent. The occurrence of such sparkovers is accepted in order to achieve a high average ESP power and therefore a high precipitation efficiency.

The precipitation efficiency of the ESP depends, besides the voltage and power also on the flue gas temperature and the particle load at ESP inlet. From Figure 6 it can be derived that during the ignition and the main combustion phase (can be identified by the higher flue gas temperatures) voltage and power remain at about the same level of about 25 kV and up to 16 W respectively. The temperature decrease in the second half of the operation cycle indicates the charcoal burnout phase. As soon as the temperature drops below a certain level, the ESP power decreases. This is related to the decrease of the electric conductivity of the flue gas with decreasing temperatures. At a flue gas temperature of 30°C (set value for this ESP) the ESP control desires the end of the heating cycle and turns off the ESP.

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In Figure 7 the trends regarding the ESP operation parameters during January and February 2015 at site 1 are presented. The logwood boiler at site 1 was typically operated once a day for 7 hours, usually starting the operation cycle in the late evening to load the buffer storage of the heating system during nighttime. From Figure 7 it can be revealed that the voltage (black line) always reaches maximum values between 25 and 30 kV which indicates a good precipitation performance.

Figure 6: Typical daily operation cycle of the ESP at field test site 1

Figure 7: Operation data of the ESP at field testing site 1 during January and February 2015

At site 2 also a logwood boiler was operated and therefore, about the same operation cycles and operation behaviour as for site 1 were observed. However, at this installation very harsh operating conditions prevailed with flue gas temperatures at ESP inlet of more than 300°C and, as the dedicated test runs have shown, high CO, OGC and PM emissions. This was one reason why at this plant the highest number of sparkovers and the lowest average voltage were detected (see Table II). Moreover, the high flue gas temperatures after some weeks of operation led to the deformation of the electrode due to thermal tensions and the electrode had therefore to be replaced a by a more robust one. This was the only failure occurring over the field testing periods with all ESPs which demanded for a revision by the manufacturer.

All data collected during the two heating seasons have finally been evaluated in order to determine the availability of the ESPs as well as the average ESP voltage and power. Therefore, the maximum possible operation hours have been calculated from the periods where the ESP signal indicated operation ("ESP ON"), i.e. the period at which the flue gas temperatures were above the operation threshold values. The availability is calculated by the operation hours of the ESP divided by the maximum possible operating hours. The mean values and standard deviations of the ESP voltage and the ESP power were calculated over all operation cycles (periods between turning on and off the ESP). Moreover, the number of ESP operation cycles and the average duration of an operation cycle has been evaluated. The respective data are presented in Table I and Table II.

In Table I relevant data collected for the ESP operated at site 1 are summarised. During the first heating season the chimney-top version of the OekoTube has been tested. The detailed evaluation of the data has revealed that at each time when the boiler was taken into operation also the ESP was turned on. Due to a low number of operation failures (sparkovers), which led to short-term shut downs of the ESP, a high availability of 97.7% could be reached. The average voltage (24.3 V) is quite close to the maximum voltage of 30 kV and the average power (13.5 W) is within the range determined during the lab-tests (10-16 W). It has been noticed that dust deposits on the electrode and the walls caused a slight but gradual decline of the voltage and the current, however, after an intermediate cleaning by the chimney sweep at the end of February 2015 the initial values could be reached again.

Due to the stable performance, the acceptable precipitation efficiency achieved, and because of the moderate flue gas temperatures at site 1 it was decided to replace the chimney-top OekoTube by an OekoTube inside for the second monitoring season. The idea was to gain additional experience with this model, which is in terms of precipitation technology identical with the chimney-top version but can be installed inside the building. The advantage are the lower installation costs (no crane is needed and no cable has to be laid to the roof top) provided that there is enough space for mounting the ESP between the boiler and the chimney.

Table I: Results of the evaluation of the ESP operation data at site 1

<table>
<thead>
<tr>
<th>Field test period</th>
<th>2014/2015</th>
<th>2015/2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>OekoTube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12/11/2014 - 02/11/2015</td>
<td>3,288 h</td>
<td>3,624 h</td>
</tr>
<tr>
<td>Maximum possible</td>
<td>915.2 h</td>
<td>777.7 h</td>
</tr>
<tr>
<td>operating hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of operation</td>
<td>121</td>
<td>133</td>
</tr>
<tr>
<td>cycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average duration of</td>
<td>452 min</td>
<td>346 min</td>
</tr>
<tr>
<td>an operation cycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESP availability:</td>
<td>97.7 %</td>
<td>81.2 %</td>
</tr>
<tr>
<td>Average voltage:</td>
<td>M: 24.3 kV</td>
<td>M: 21.4 kV</td>
</tr>
<tr>
<td></td>
<td>s: 4.33 kV</td>
<td>s: 5.24 kV</td>
</tr>
<tr>
<td>Average power:</td>
<td>M: 13.5 W</td>
<td>M: 8.2 W</td>
</tr>
<tr>
<td></td>
<td>s: 3.8 W</td>
<td>s: 6.5 W</td>
</tr>
</tbody>
</table>

The heating season 2015/2016 was characterized by a rather calm weather and therefore the maximum possible operating hours decreased from 915.2 in the preceding heating season to 777.7 hours although ESP operation started earlier. Also the average duration of one operation cycle was lower. Compared with the chimney-top version of the OekoTube the availability of the OekoTube inside was with 81.2% lower but still acceptable. The main reason for the lower availability was that the maximum flue gas temperature of 200°C was unexpectedly often exceeded which led to failures and short shutdowns. Also with the OekoTube inside one intermediate cleaning in the mid of February 2016 was sufficient to maintain a stable ESP operation throughout the whole heating season.

In Table II the results for the ESP installed at site 2 and site 3 are presented. During the first heating season it had
been installed at site 2 but problems with the owner regarding access for the dedicated measurement campaigns have led to the decision to change to site 3 during the second heating season.

At site 2 an outdated logwood boiler was operated. Typical features of this boiler were very high flue gas temperatures at boiler outlet leading to temperatures up to more than 300°C in the ESP and very sooty emissions. Analyses of dust samples taken after cleaning by the chimney sweep have revealed elemental carbon contents of 30 to 45 wt% (d.b.). Especially the high temperatures caused thermal deformations of the electrode and as a consequence of that massive sparkovers. Therefore, before the electrode was replaced by a more robust one, it sometimes took more than one attempt of the control system to reach stable operation. These effects are also the reasons for the lower availability (81.7%) and the comparably low average voltage that could be reached in comparison with site 1. However, as measured by these framework conditions, the availability achieved can still be assessed as acceptable. As already noticed at site 1 also at site 2 a gradual decrease of the ESP voltage and the ESP current over time occurred and one intermediate cleaning of the ESP by the chimney sweep was needed.

Table II: Results of the evaluation of the ESP operation data at site 2 and 3

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Oekotube</td>
<td>Oekotube</td>
</tr>
<tr>
<td>site 2</td>
<td>01/12/2014</td>
<td>21/01/2015</td>
</tr>
<tr>
<td></td>
<td>12/04/2015</td>
<td>17/04/2016</td>
</tr>
<tr>
<td>Field test period</td>
<td>3,168 h</td>
<td>4,320 h</td>
</tr>
<tr>
<td>Maximum possible</td>
<td>573 h</td>
<td>1,360 h</td>
</tr>
<tr>
<td>operating hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of operation</td>
<td>137</td>
<td>368</td>
</tr>
<tr>
<td>cycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average duration of</td>
<td>249 min</td>
<td>222 min</td>
</tr>
<tr>
<td>an operation cycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESP availability:</td>
<td>81.7 %</td>
<td>80.2 %</td>
</tr>
<tr>
<td>Average voltage:</td>
<td>M: 18.1 kV</td>
<td>M: 26.1 kV</td>
</tr>
<tr>
<td>s: 5.9 kV</td>
<td>s: 8.8 kV</td>
<td></td>
</tr>
<tr>
<td>Average power:</td>
<td>M: 10.0 W</td>
<td>M: 6.6 W</td>
</tr>
<tr>
<td>s: 6.6 W</td>
<td>s: 4.9 W</td>
<td></td>
</tr>
</tbody>
</table>

Before the heating season 2015/2016 the ESP has been moved from site 2 to site 3. There, a wood stove is operated as primary heating system, and as the data regarding the duration of an average operation cycle and the number of heating cycles confirm, the system was even more in operation than the logwood boiler in the year before. Logwood stoves typically show relatively high soot emissions and the average voltage (26.1 kV) and the average ESP power (6.6 W) reflect the results of the latest tests at sooty conditions (30 kV and 3.4 to 8 W). High amounts of soot deposits on the ESP surfaces caused some problems during continuous operation and therefore the availability of the ESP at site 3 was with 80.2% in the same range as at site 2. Two intermediate cleanings by the chimney sweep were demanded at this site.

4.3 Results of the dedicated field measurement campaigns

At each testing site two dedicated measurement campaigns per heating season have been carried out to check the precipitation efficiencies of the ESPs. Therefore, measurements have been performed at two successive days, one with and one for comparison without ESP operation. It has been taken care that the framework conditions regarding the operation of the wood heating devices have been comparable during both days. The flue gas temperatures, the duration of the operation cycle and the O2, CO and OGC contents of the flue gas have therefore been evaluated.

As an example for such a measurement campaign a test run performed at site 1 is presented in the following. In Figure 8 the oxygen contents of the flue gas and the flue gas temperatures for two successive testing days are presented whereby the start of the test runs has been synchronised to gain a better comparability of the results. The average oxygen content of the flue gas over the whole test run amounted to 16.7 vol% (with ESP operation) respectively 17.3 vol% d.b. The average flue gas temperatures at ESP were with 98.6°C (with ESP operation) and 106.8°C (without ESP operation) also in the same range. The CO emissions were with in average 4,750 mg/Nm3 during operation with ESP higher than during operation without ESP (3,930 mg/Nm3). The same is true for the OGC emissions (328 resp. 138 mg/Nm3 - all emissions related to dry flue gas and 13 vol% O2). Consequently, during operation of the ESP slightly worse burnout conditions prevailed than during the measurements without ESP operation.

![Figure 8: Comparison of the trends of the O2 concentrations in the dry flue gas and the flue gas temperatures during test runs at site 1 on two successive days](image)

Three consecutive total dust emission measurements have been performed. The total dust emissions varied during operation without ESP between 234.4 mg/Nm3 (during the ignition phase), 45.7 mg/Nm3 (main combustion phase) and 47.8 mg/Nm3 (during the charcoal burnout phase). During ESP operation total dust emissions of 48.0 (ignition phase), 7.2 mg/Nm3 (main combustion phase) and 15.9 mg/Nm3 (charcoal burnout phase) have been measured (all emissions related to dry flue gas and 13 vol% O2). From these single measurements total dust precipitation efficiencies of 80%, 64% and 67% could be calculated for the different combustion phases. Four short term measurements with the Berner-type low-pressure impactor per day revealed PM1 precipitation efficiencies of 86 to 87.5% whereby the PM1 contents in the flue gas...
amounted from 19.4 to 44.8 mg/Nm³ (without ESP operation) and 2.0 to 7.4 mg/Nm³ (with ESP operation). When evaluating these data it has to be considered that the total dust measurements covered the whole operation period whereas the PM₁ measurements are only related to rather short (some minutes) operation phases during which impactor measurements have been performed.

In Table III and Table IV the PM emission data and the precipitation efficiencies achieved at the different testing sites are summarised. The broad variation of the single TSP measurements at the logwood boilers (site 1 and 2) mainly results from the different combustion phases during which the single measurements were performed (ignition phase, main combustion phase, charcoal burnout). It has to be mentioned that during some measurements flaking (re-entrainment of agglomerates of already precipitated soot particles from the precipitator surfaces) occurred. In some cases this caused higher total dust emissions during ESP operation than during operation without ESP. These results have not been considered in Table III and IV.

Moreover, the comparability of the combustion conditions during the different combustion phases between the measurement days with and without ESP operation always is limited which also contributes to the scattering of the data regarding particle precipitation efficiency.

Table III: Results of the dedicated testing campaigns with emission measurements at site 1
Explanations: emissions in mg/Nm³ related to dry flue gas and 13 vol% O₂; TSP: total suspended particulate matter; PM₁: particles <1 μm aerodynamic diameter

<table>
<thead>
<tr>
<th></th>
<th>2014/2015 OekoTube</th>
<th>2015/2016 OekoTube inside</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSP emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>without ESP</td>
<td>33 - 274</td>
<td>15 - 220</td>
</tr>
<tr>
<td>operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSP emissions</td>
<td>4 - 174</td>
<td>2 - 100</td>
</tr>
<tr>
<td>with ESP operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSP precipitation efficiency</td>
<td>30 - 93%</td>
<td>54 - 90%</td>
</tr>
<tr>
<td>PM₁ precipitation efficiency</td>
<td>55 - 96%</td>
<td>46 - 98%</td>
</tr>
</tbody>
</table>

The data regarding site 1 show, that the TSP emissions without ESP operation were in the same range for both heating seasons. For both, the chimney-top and the inside version of the OekoTube acceptable precipitation efficiencies were determined (Table III). The lower values regarding the TSP precipitation efficiency at this boiler are most probably due to re-entrainment of already precipitated soot particles (flaking). The highest precipitation efficiencies (93% resp. 90% for the OekoTube and the OekoTube inside) are well comparable with results gained from the lab tests. The average TSP emissions during operation with filter amounted to 39 mg/Nm³ resp. 22 mg/Nm³ (related to dry flue gas and 13 vol% O₂).

The maximum precipitation efficiencies regarding PM₁ show values of up to 96% respectively 98%, which are well comparable with the results of the lab-test performed. However, since impactor measurements are short term measurements (some minutes). Slightly changing combustion conditions at the two testing days which are compared can have a certain impact on the resulting precipitation efficiencies and therefore, the range mentioned in Table III has to be evaluated with care.

At site 2 (Table IV) the highest PM emissions upstream the ESP of all testing sites have been determined (up to 736 mg/Nm³). Moreover, as chemical analyses of selected TSP samples have shown, the contribution of soot to the TSP emissions was very high (elemental carbon content of the TSP of up to 85 wt%). The latter explains the low minimum value of the TSP precipitation efficiency, which is assumed to be due to re-entrainment of already precipitated soot particles. In fact soot flakes have been found in the vicinity of the chimney which confirms the occurrence of the flaking effect. The maximum precipitation efficiencies for TSP (83%) and PM₁ (93%) however confirm the expectations from the lab-test. The average TSP emission for ESP operation amounted to 84 mg/Nm³ (related to dry flue gas and 13 vol% O₂).

Table IV: Results of the dedicated testing campaigns with emission measurements at site 2 and 3
Explanations: emissions in mg/Nm³ related to dry flue gas and 13 vol% O₂; TSP: total suspended particulate matter; PM₁: particles <1 μm aerodynamic diameter

<table>
<thead>
<tr>
<th></th>
<th>2014/2015 OekoTube site 2</th>
<th>2015/2016 OekoTube site 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSP emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>without ESP</td>
<td>74 - 736</td>
<td>98 - 321</td>
</tr>
<tr>
<td>operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSP emissions</td>
<td>22 - 154</td>
<td>14 - 46</td>
</tr>
<tr>
<td>with ESP operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSP precipitation efficiency</td>
<td>35 - 83%</td>
<td>57 - 93%</td>
</tr>
<tr>
<td>PM₁ precipitation efficiency</td>
<td>44 - 93%</td>
<td>50 - 97%</td>
</tr>
</tbody>
</table>

Also at site 3 very good maximum precipitation efficiencies for TSP (93%) and PM₁ (97%) have been determined. The average TSP emissions for ESP operation amounted to 28 mg/Nm³ (related to dry flue gas and 13 vol% O₂). Summing up, the dedicated field measurement campaigns have shown that the ESPs worked well and that also in field operation precipitation efficiencies comparable with those gained during lab-tests can be achieved. Moreover, no significant differences between the two measurement campaigns at the beginning of the heating season and in its second half could be found.

5 SUMMARY AND CONCLUSIONS

To assess the applicability of ESPs for particulate matter emission reduction in residential wood heating appliances field tests with accompanying ESP operation monitoring and dedicated emission measurement campaigns have been performed in the region of Graz (AT). Three OekoTube ESPs (two chimney-top and one inside version) where thereby tested over the heating seasons 2014/2015 and 2015/2016 at three different sites, two with logwood boilers and one with a logwood stove.

Before being released for the field tests the ESPs were checked within lab-tests regarding functionality and particle precipitation efficiency. At the field testing sites the ESPs could be installed and taken into operation without major problems. Also during the operation over the heating seasons no severe problems occurred at site 1 and site 3. Site 2 however distinguished its self by very high flue gas temperatures of up to 300°C at the ESP which led to a deformation of
characterisation. Final report of the ERA-NET Bioenergy Project “Biomass-PM”, University of Kuopio, ISSN 0786-4728, Kuopio, Finland


7 ACKNOWLEDGEMENTS

The authors gratefully acknowledge the financial support of the Styrian Government and of the City of Graz - Environmental Department who made this project possible.

8 LOGO SPACE

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6 REFERENCES


FORMATION MECHANISMS AND PHYSICAL PROPERTIES OF PARTICLES FROM WOOD COMBUSTION FOR DESIGN AND OPERATION OF ELECTROSTATIC PRECIPITATORS

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ABSTRACT: The particles from biomass combustion are collected in a laboratory electrostatic precipitator (ESP). Three different combustion regimes are maintained by a modified pellet boiler, i.e., high temperature and sufficient oxygen, high temperature and local lack of oxygen, and low temperature. The resulting particles are classified as salts, soot, and condensable organic compounds (COC) based on the particle type expected from the theory of particle formation. The chemical and electrical properties are analysed and confirm the classification: While salts exhibit a low carbon content, soot and COC are high in carbon. Soot and COC can be distinguished by significantly different molar C/H-ratio being 6.44 for soot and 1.24 for COC. The electrical conductivity, which is a key parameter for the precipitation and dust layer built-up in the ESP, is measured at different temperatures and humidities. Significant differences in conductivity are found for salts, soot, and COC, and in addition, a strong influence of the humidity of the flue gas is observed. Salt is confirmed to be ideal for ESP, while soot reveals high conductivity leading to re-entrainment of agglomerated particles, and COC exhibit low conductivity leading to back-corona which can be limiting at low humidity. The presented particle properties can be applied as guideline for ESP design and operation.

Keywords: Aerosol, particle emission, chemical composition, combustion, gas cleaning.

1 INTRODUCTION

1.1 Background
Particulate Matter smaller 10 micron (PM_{10}) is related to adverse health effects. Due to more stringent emission limit values for small and medium scale applications, there is an increasing demand for particle precipitation for biomass combustion plants. Beside applications for industrial plants > 1 MW, where particle precipitation is widely applied nowadays, there is an additional need for small and medium scale applications, i.e.,

a) in residential heating from 5 kW – 70 kW and
b) in automatic boilers from 200 kW – 1 MW.

For both categories, electrostatic precipitators (ESP) have been introduced to the market in the past few years in countries which implemented stringent emission limit values for these categories such as e.g. Switzerland.

The principles for ESP – as shown in Figure 1 – are well known and design parameters are available in the literature for different flue gas composition and particle characteristics [1–3]. However, experiences for ESP so far result mainly from large scale applications as e.g. thermal power stations with constant operation at high flue gas temperatures. In addition, particle characteristics are mainly based on coal, while data from wood particles are scarce [4]. Consequently, the following specific needs have to be considered for applications of ESP in wood combustion devices:

1. Particles from small scale wood combustion consist of different components, which can be basically divided into three fractions, i.e.,
   a) inorganic particulates (salts),
   b) soot (available as solid particles in the flue gas),
   c) condensable organic compounds (COC).
2. The concentration of H_{2}O as well as of CO, CO_{2} and O_{2} can vary in a wide range and consequently the precipitation conditions in the ESP (which are strongly influenced e.g. by the content of H_{2}O).

3. Wood combustion is often applied for heating purposes where on/off-operation and short periods of uninterrupted operation are common [5]. This results in low flue gas temperatures thus potentially enabling condensation of water vapour and – if present in the flue gas – organic condensates in the ESP. To avoid condensation, ESP are usually shut-off at low flue gas temperatures, which can result in a poor availability and consequently increased emissions in real-life operation. In addition, transient conditions during start-up and shut-down, which are not considered in type tests or during on-site acceptance inspection, can play an important role to the operation of the ESP and the clean gas emissions.

Figure 1: Principles of electrostatic precipitator (ESP).

1.2 Aim
The aim of the present investigation is to collect precipitation properties of particles and flue gases from wood combustion under different operation conditions. These data shall be used as a basis for future design and operation parameters for ESP for wood combustion applications. Furthermore, based on these results, ope-
rating problems such as back-ionisation and re-entrainment shall be related to dedicated combustion conditions thus enabling improved operation of the combustion system and the ESP. Back-ionisation is usually referred to as back corona and describes the localized discharge which occurs at the collecting electrode surface, when that surface becomes coated with an electrically insulating layer of poorly conducting particles such as e.g. COC and thus reduce the precipitation performance. Re-entrainment may occur for agglomerates with low electrical resistivity such as soot.

2 THEORY

Biomass combustion is related to three basic types of particles, which are summarized as 'salts', 'soot', and Condensable Organic Compounds (COC), and exhibit completely different chemical and physical properties:

- Inorganic particles, basically salts, are formed from minerals (i.e., ash constituents) in the fuel. These particles are dominant at near-complete combustion
- COC are formed in different processes:
  - At low temperature volatile or condensed organic compounds are formed from wood pyrolysis with characteristic compounds depending on residence time, heating rate, temperature and other operation parameters.
  - At moderate temperatures and local lack of oxygen, organic compounds can be converted to secondary tars, which appear as condensables.
- Soot is formed from organic precursors in zones of high temperatures and lack of oxygen, where volatiles and primary tars react to secondary tars and form polyaromatic hydrocarbons, which consequently can form soot particles by further agglomeration and release of hydrogen.

The formation mechanisms are described in Figure 2. In automatic wood combustion, nearly complete combustion can be achieved and hence salts are dominant as particles. However, during start-up, and in phases of inappropriate operation, condensables or soot can also be emitted from automatic plants.

Incomplete combustion is often found in manual wood combustion, whereby soot or condensables can be the dominant part of the total particulate matter released to the atmosphere. Due to the different temperature regimes and the different influence of the residence time for soot and COC formation, usually either one of the two particle type dominates the particle ensemble.

Table 1 summarizes the main properties of salt, soot, and COC found in biomass flue gases.

Figure 2: Mechanisms of aerosol formation in biomass combustion. *[6], **[7].

Appendix III.D.7.7-5173
3 METHOD

For the experiments, an electrostatic lab-scale precipitator was designed as tube type ESP with a maximum voltage of $U_{\text{max}} = -65$ kV and connected to a pellet boiler (Figure 3). The pellet boiler was modified to enable stationary operation at specific combustion conditions, which normally exist only during transient phases such as during start-up. The ESP was designed to enable precipitation efficiencies as typically found in commercial small and medium scale ESP, i.e., safely > 90% for all particle sizes and > 95% as average precipitation efficiency for typical particle collectives found in biomass combustion (Figure 4). Electrical conductivity was analysed acc. to IEEE Std 548-1984 (due to missing valid standards, the old standard is used). The relevance of the conductivity measurements for ESP is described in [10].

4 RESULTS

4.1 Particle types

In biomass combustion, three combustion regimes can be distinguished which – among other parameters – are related to the level of excess air available in the combustion chamber [11]. Figure 5 shows the particles found in the present laboratory device for different excess air ratios:

At low excess air ratio (regime C), soot is formed in hot zones in the flame as a synthesis product through the release of hydrocarbons containing primary tars from wood pyrolysis, formation of secondary tars in an atmosphere with lack of oxygen, PAH formation, and finally release of hydrogen during particle growth thus resulting in a high C/H ratio as indicated in Table 1.

At optimum excess air (regime B), near complete combustion is achieved, if good mixing of combustible gases with air is guaranteed and quenching of the flame is avoided. Consequently, carbonaceous matter in solid and liquid phase is emitted in very small concentrations, while inorganic particles formed from ash constituents are available as particulate matter (PM) in the flue gas and predominantly found as salts.

At high overall excess air (regime A), the combustion temperature decreases, resulting in incomplete combustion. Due to low temperature, the formation of soot and the release of hydrogen is suppressed, resulting in high concentrations of primary and secondary tars formed during pyrolysis consequently leading to condensable organic compounds (COC) in the flue gas with low C/H ratio.

Since ESP operation is ideal at operation at optimum excess air, nowadays applications are often limited to such combustion conditions, while the ESP is often shut-off during unideal combustion conditions.

Figure 3: Experimental setup.

Figure 4: Calculated precipitation efficiency of the laboratory ESP as function of the particle size and the voltage. Design parameters of the ESP: L 1000 mm, D 100 mm, u 1 m/s, SCA 45 s/m, $U_{\text{max}} = -65$kV.

Figure 5: Three regimes of biomass combustion shown in the diagram CO as function of excess air lambda acc. to [11]. The three combustion regimes are related to three different types of combustion particles, i.e., soot, salts, and COC, depending on the level of excess air and other parameters.
4.2 Particle properties

According to the chemical composition and the physical properties, salts are expected to be suitable for ESP operation, while soot may result in re-entrainment and COC may be related to back-corona (Table 1). Due to the release of hydrogen during soot formation, a significantly different molar ratio of soot and COC is expected, thus enabling to identify and distinguish the two types of aerosols from incomplete combustion (Table 1).

Figure 6 shows the combustion conditions and indicated by emissions, temperature, and excess air as well as the resulting particle composition, Table 2 shows the results from the chemical analysis, while Figure 7 shows the electrical particle properties. The results confirm, that the particle properties are influenced by the excess air ratio \( \lambda \), which enables to distinguish three different combustion regimes.

- At \( \lambda = 1.2 \), a lack of oxygen results in high soot formation (but low content of CO and HC), which leads to re-entrainment of agglomerated particles.
- For \( \lambda = 1.55 \), almost complete combustion is achieved in the pellet boiler thus resulting in mainly inorganic particles.
- By increasing the excess air ratio to 3.5, stable operation at high concentrations of CO and HC is achieved, resulting in COC an leading to back- ionisation, which leads to a slightly reduced precipitation efficiency.

Figure 7 shows the results of analyses of the electrical conductivity as function of the temperature measured from four different types of combustion particles, i.e., soot, salt, and COC from the laboratory equipment, and dust collected in the ESP from a 1 MW industrial wood combustion plant and referred to as “Reference”. As expected, salt particles and reference dust exhibit a favourable conductivity in a relatively broad range of application and hence are potentially well suited for precipitation in ESP. However, the moisture content in the flue gas strongly influences the conductivity of the particle layer and needs to be considered for the design and operation of the ESP. Although measurements are recommended for specific applications, the results in Figure 6 enable a qualitative indication for optimised operation of ESP for different particle types:

- Dry flue gas is favourable for salts in the most relevant temperature range up to 200°C, while for COC, reasonable conditions in dry flue gas are only expected at temperatures above 170°C. In wet flue gas, the precipitation of salts becomes critical for temperatures below 120°C. Consequently, a relatively narrow range of optimum operation may result for practical conditions of biomass combustion with varying excess air and varying fuel moisture content.

4.3 Precipitation mechanisms

Since the electrical conductivity influences the formation of dust layers in the electric field, different dust layers may be formed depending on the particle properties. Soot leads to dendritic build-up with a weak adhesion of the agglomerates as shown in Figure 8, which can cause re-entrainment of agglomerated soot particles. Salt forms a homogeneous layer, which can be safely removed by state-of-the-art dedusters. COC may form a homogeneous, but sticky layer, which is difficult to be removed and may cause operational problems.

4.4 Precipitation efficiency

Table 3 and Figure 9 show the precipitation efficiencies achieved for the three different particle types. While the expected precipitation of 90% can be easily achieved for salt particles, the precipitation of COC is slightly reduced due to back-corona resulting in a limitation of the electric field or the maximum allowable voltage respectively. For soot, slightly reduced precipitation efficiency is achieved indicated by particle number concentration. However, the precipitation efficiency for soot indicated by mass concentration is far lower (i.e., 22%) than the precipitation efficiency indicated by number concentration, which is due to re-entrainment of agglomerated particles.

The particle size distribution in Figure 10 shows that the distribution mode is reduced by about an order of magnitude with the ESP, while the ESP leads to an increase by almost one order of magnitude of the particles larger than 0.5 micron. This confirms the effect of re-entrainment of agglomerated soot particles. Hence the ESP acts partly as an agglomerator and partly as a precipitator. This effect can be relevant for small-scale ESP for wood stoves and boilers, where precipitation efficiencies by mass of less than 80% are common and where measurements of particle mass concentrations can result in unreliable precipitation efficiencies. With respect to health effects, the re-entrainment of coarse particles can be seen as an improvement in comparison to the emission of primary combustion particles in the size range smaller than 10 micron. Nevertheless, the emission of agglomerated soot particles may have negative local impacts and hence needs to be restricted as well. This effect can potentially limit the applicability of ESP for small scale wood combustion related to high soot concentration in the flue gas.

4.5 Electrical behaviour of ESP

In ESP operation at wood combustion plants, the operator usually has no information about the electric dust conductivity. By looking at the current density as a function of the voltage, conclusions can be drawn about the electric conductivity in case of high resistivity. As shown in Figure 11, back corona can occur for COC, characterized by simultaneous increase of the current at constant or even decreasing voltage. Low resistivity from soot cannot be detected by this method.
Table 1: Chemical and electrical properties and suitability for precipitation in ESP of the three particle types as expected from theory and experiences [1,8,9]. *primary tar: isolating, secondary tar and PAH: semiconductiv.

<table>
<thead>
<tr>
<th>Property</th>
<th>Salts</th>
<th>Soot</th>
<th>COC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molar ratio C/H</td>
<td>–</td>
<td>&gt; 6 – 8</td>
<td>≈1 (&lt; 2)</td>
</tr>
<tr>
<td>Electrical conductivity</td>
<td>medium</td>
<td>high</td>
<td>low (electrically insulating)*</td>
</tr>
<tr>
<td>Suitability for ESP</td>
<td>ideal</td>
<td>re-entrainment</td>
<td>back-corona</td>
</tr>
</tbody>
</table>

Table 2: Carbon content (1) and elemental composition (2) of the particles (1) thermal carbon analyses and (2) elemental analyses.

<table>
<thead>
<tr>
<th></th>
<th>Soot</th>
<th>Salt</th>
<th>COC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C (Total C) wt.-%</td>
<td>51.4</td>
<td>15.211</td>
</tr>
<tr>
<td>2</td>
<td>C wt.-%</td>
<td>41.0</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>H wt.-%</td>
<td>0.53</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>N wt.-%</td>
<td>0.28</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>S wt.-%</td>
<td>3.12</td>
<td>5.12</td>
</tr>
</tbody>
</table>

C/H [Mol/Mol] 6.44 1.24

Table 3: Precipitation efficiencies measured by mass and number concentration of 'soot', 'salt', and 'COC' as resulting combustion particles for the three different combustion regimes, i.e., low excess air, ideal excess air, and high excess air.

<table>
<thead>
<tr>
<th>Particle type</th>
<th>low excess air &amp; high temperature [Dim.]</th>
<th>ideal excess air &amp; high temperature</th>
<th>high excess air &amp; low temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess air lambda</td>
<td>[–]</td>
<td>1.2</td>
<td>1.55</td>
</tr>
<tr>
<td>CO [mg/m³] at 13 vol.-% O₂</td>
<td>1000</td>
<td>70</td>
<td>4000</td>
</tr>
<tr>
<td>THC [mg/m³] at 13 vol.-% O₂</td>
<td>20</td>
<td>2</td>
<td>400</td>
</tr>
<tr>
<td>PM mass conc. before ESP [mg/m³] at 13 vol.-% O₂</td>
<td>50</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>PM mass conc. after ESP [mg/m³] at 13 vol.-% O₂</td>
<td>42</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Precipitation efficiency by mass [%]</td>
<td>16</td>
<td>90</td>
<td>86</td>
</tr>
<tr>
<td>PM number conc. before ESP [cm³]</td>
<td>6.0 10⁷</td>
<td>6.0 10⁷</td>
<td>9.6 10⁷</td>
</tr>
<tr>
<td>PM number conc. after ESP [cm³]</td>
<td>7.5 10⁸</td>
<td>4.8 10⁸</td>
<td>9.0 10⁸</td>
</tr>
<tr>
<td>Precipitation efficiency by number [%]</td>
<td>88</td>
<td>92</td>
<td>90</td>
</tr>
</tbody>
</table>
Figure 6: Left: Characteristic of the three operating points maintained with the modified pellet boiler. Right: Results of the chemical analysis of the three particle types. In addition, results from dust sampled in a commercial ESP found after combustion of natural wood chips in an automatic combustion plant are shown and indicated as "Ref" for "Reference".

Figure 7: Electrical conductivity measured for soot, salts, and COC sampled in the laboratory equipment during combustion conditions as described. In addition, results from dust sampled in a commercial ESP found after combustion of natural wood chips in an automatic combustion plant are shown and indicated as "Ref" for "Reference". The optimum range for precipitation in ESP is indicated according to Parker [2].
**Figure 8:** Mechanisms of dust layer built-up due to electric field (acc. to [12]) for conductive particles (left) and isolating particles (right). The pictures below show the resulting dust layers found in the ESP.

From left to right:
1. Dendritic coarse soot agglomerates from combustion with insufficient air (black carbon, mainly elemental carbon),
2. Homogeneous grey dust layer from combustion with ideal air supply, and
3. Sticky brown dust layer from combustion with high air excess (brown carbon, mainly organic carbon).

**Figure 9:** Particle mass concentration in the raw gas from the different combustion regimes measured by gravimetric method, precipitation efficiency measured by particle number concentration, and precipitation efficiency measured by particle mass concentration of ‘soot’, ‘salt’ and ‘COC’.

**Figure 10:** Particle size distribution for soot measured with SMPS and OPC after the laboratory ESP.
5 CONCLUSIONS

Particles from different combustion conditions have been collected in a laboratory ESP and were analysed with respect to chemical and electrical properties to deduce recommendations on the ESP design and operation leading to the following conclusions:

- Three different particle types from wood combustion have been identified which correspond to different combustion regimes, i.e.,
  - soot resulting from combustion at high temperature but with low excess air and consequently local lack of oxygen,
  - particles which consist dominantly of mineral matter such as salts found at high combustion temperature and with sufficient local excess air
  - condensable organic compounds (COC) resulting from low temperature combustion conditions at high excess air.
- The three particle types exhibit completely different physical and chemical properties, among which the electrical conductivity is most relevant for ESP operation. The identified properties confirm the particle type and the particle properties as expected from the proposed theory of the particle formation mechanisms.
- Particles from good combustion (mainly inorganic compounds such as salts) exhibit ideal conductivity for ESP.
- Soot reveals high conductivity thus enabling high precipitation efficiency but severe re-entrainment of agglomerated particles
- Condensable organic compounds (COC) exhibit low conductivity thus leading to back-corona which limits ESP operation
- ESP operation for good and stationary conditions during wood combustion with mainly inorganic particles enables uncritical operation, while ESP operation can be critical e.g.
  - during start-up due to COC from low temperatures
  - during throttled air, either due to COC released at low temperatures or due to soot formed at high temperatures in zones with lack of oxygen.

Both undesired conditions are often found in small scale biomass combustion applications for heating.

These results show, that ESP alone will usually only guarantee low particle emissions when the combustion device is properly operated, while during transient conditions, the clean gas emissions can be increased not only due to increased raw gas concentrations, but additionally due to reduced precipitation efficiency. Detailed information on the influence of combustion conditions on particle characteristics enable improved ESP design and operation for the specific needs for small and medium scale wood combustion devices.

6 RECOMMENDATIONS AND OUTLOOK

ESP availability is crucial and needs to be improved by optimum plant design, system integration, and plant operation based on the following three measures:

1. Optimum design and system integration of combustion and ESP enabling stationary operation, e.g. by plant design with two boilers and two ESP for variable load.

2. Process integrated control of ESP with specific information as indicators for the particle properties
   - flue gas temperature (as today) plus:
     - excess air ratio
     - combustion temperature
     - water content of the fuel
   This increases the operation regime of the ESP.

3. Measures to avoid re-entrainment:
   - Limitation of gas velocity to < 1.5 m/s
   - optimised shape of collecting plates
   - shorter dedusting intervall during re-entrainment regimes.

Figure 11: Current density as function of the voltage depending on the particle type
7 LITERATURE


Acknowledgments

Swiss Federal Office for Energy (SFOE)
Commission for Technology and Innovation (CTI)
Inspection office for stoves • Dürerstrasse 92 • 50228 Frechen

Approved inspection office in accordance with the Construction Products Act, notified body number: 1427
Approved inspection office in accordance with the State construction regulations, key number: NRW 16
Approved inspection office in the approval procedure of authorities in charge of construction supervision
Approved DIN CERTCO inspection office

Report on testing of an installation of type "OekoTube OT-2" for removing dust from the flue gases of domestic stoves

<table>
<thead>
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<th>File no.</th>
<th>FSPS-Wa 2011-08</th>
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<td>Client</td>
<td>OekoSolve AG, Essanestr. 127, LI-9492 Eschen</td>
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<tr>
<td>Test object</td>
<td>Appliance for removing dust from the flue gases of domestic stoves Type: OekoTube OT-2</td>
</tr>
<tr>
<td>Scope of testing</td>
<td>Testing of an electrical appliance for removing dust from the flue gases of domestic stoves fired with lignite briquettes in extension of national technical approval Z-7.4-3451 dated 03.08.2011</td>
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<tr>
<td>Test period</td>
<td>November and December 2011</td>
</tr>
<tr>
<td>Test basis</td>
<td>DIBt Preliminary Test Programme for &quot;Dust Separators for Hand-Stoked Small Combustion Facilities&quot; - draft 2008 September -</td>
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Abstract prepared by the inspection office for stoves:
The electrostatic dust separator type OekoTube OT-2 manufactured by OekoSolve has been granted technical approval for use for separating dusts from the flue gases of wood-fired stoves. The present study was performed to check whether this secondary appliance is also suitable for use with lignite briquettes as fuel.

The dust separating appliance was tested on three stoves (two intermittent burning appliances and one continuous burning stove) at different load levels. Dust separation efficiencies in the region of 42 to 97% were obtained when burning lignite briquettes. Smooth operation and the high dust separation performance obtained in the test phase attest that the OekoTube OT-2 is also suitable for separating dust from the flue gases of lignite-briquette-fired domestic stoves.

This test report is prepared notwithstanding any rights of third parties, especially private property rights relative to the client or manufacturer.

The test report with pages 1 to 13 and the annexed test documents a to g contain the results of the test in compliance with this standard.

Frechen, 13.12.2011

Dipl.-Ing. Joachim Wawrzinek
Name of head of inspection office

VOR WEG GEHEN

Appendix III.D.7-5181
1 Purpose of testing

The purpose of the test was to assess the operating performance of the electrical dust separator when burning lignite briquettes in domestic stoves. The sootfire resistance, the dependability, ease of cleaning, the aerodynamic flow resistance, the mechanical strength and the malfunction response of the appliance have already been tested by TÜV SÜD in Report No. S 1138-00/11 dated 14.02.2011. The electrical safety in accordance with the requirements of DIN EN 60730-1 was assessed and the expert appraisal of the test specimen submitted was performed in Report No. S-E 1136-00/11.

2 Test basis

DIBt Preliminary Test Programme for "Dust Separators for Hand-Stoked Small Combustion Facilities"

3 Attachments

Annex a Sketch of the test set-up
Annex b Photos of the test set-up
Annex c Technical documentation
Annex c Criteria for approval
Annex e Prerequisites for installation in stainless steel flue gas system
Annex f Installation instructions
Annex g Operating instructions

4 Description of the test object

The dust separator ÖecoTube OT-2, comprising the following parts:
- an external control unit (black box) for generating the voltage of -15 to -30 kV
- the flexible electrode made of spring steel
- the insulator
- the spring-mounted electrode holder
- the mains plug
- the T-fitting for installation
- a temperature sensor
- the fixtures and fasteners

is intended for installation in a sootfire-proof brick or metal flue gas system and operation at sub-atmospheric pressure with non-condensing flue gases.

The high-voltage electrode is inserted centrally in the flue gas system through a circular opening in the T-fitting with a diameter of 130 mm. The ionization electrode is 1,550 mm long and consists of bossed spring steel (16 mm wide). The electrode is axially aligned in the flue gas system by means of an adjustable guide and a weight.

A temperature sensor on the separator detects the temperature rise in the flue gas system, switches the separator from standby mode to on-line and activates generation of the high voltage.

According to the manufacturer's data, the separator can be installed in systems up to 40 kW with a flue gas pipe diameter of 150 mm to 400 mm.

The separator is intended for outdoor installation only, at the outlet from the flue gas system.
According to the manufacturer, the separator is suitable for use up to a flue gas temperature of 400°C and is fitted for connection to a 230 V power supply. The power consumption is, according to the manufacturer's data, 20 to 30 W in on-line operation and 0.7 W in standby mode. The housing material according to the manufacturer's information is steel 1.4404 or 1.4301.

Fig. 1: Control unit (black box) with enclosure and electrode penetration

Fig. 2: Parts of the dust separator
1 Control unit with springs, nuts and an insulator
2 Mounting bracket
3 Flexible electrode with hexagonal holder
4 Temperature sensor (cable and holder)
5 Mains plug (230 v AC)
6 Cover
7a Anchor elements for brick stack
7b Anchor elements for steel stack
5 Test method and discussion of the results

5.1 Test set-up for checking the efficacy of the separator

An intermittent burning appliance (A) with a rated output of 9 kW, tested in accordance with DIN EN 13240 for firing with wood billets or lignite briquettes, was used to determine the separating efficiency. By way of comparison, a corresponding intermittent burning appliance (B) with a rated output of 8 kW and a continuous burning appliance (C) tested to DIN 18890 in 1991 with an automatic controller and a rated output of 4.5 kW were also used.

The dust measurements were performed in parallel using two Afriso STMG 40 dust monitors according to DIN SPEC 1101: 2010-02.

The flue gas system having an inside diameter of 150 mm was installed upright (see attachments a and b). The distance between the stove outlet and the separator was 1.7 m. The dust was measured in the vertical flue gas line about 0.3 m upstream of and about 0.5 m downstream of the separating module.

In all tests (except the zero test), the electronic controller of the OecoTube OT-2 was in normal operation with a maximum voltage setting of 27 kV and a maximum power setting of 16 W. The dust measurements were started in parallel three minutes after each new fuel input and continued for 30 minutes at a time. The flue gas composition and the temperatures were recorded over the entire test period.

The results of calibration of the test set-up ("zero test") are shown in Tables 1 and 2.

Tables 3 to 6 show the equipment settings and operating modes in the tests to determine the separating efficiency.

The separating efficiencies achieved are shown in Tables 7 to 10 and the associated charts.

Section 5.5 includes photos of the dust deposits in the flue gas system.
### 5.2 Calibration of the test set-up ("zero test")
with the dust separator installed but not operating

Table 1: Settings and operating modes of the intermittent burning appliance A during zero test

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Test fuel</td>
<td>BB 7°</td>
<td>BB 7°</td>
<td>BB 7°</td>
</tr>
<tr>
<td>Primary air</td>
<td>cm²</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Secondary air</td>
<td>cm³</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Lower heating value</td>
<td>MJ/kg</td>
<td>19,365</td>
<td>19,365</td>
</tr>
<tr>
<td>Feed mass</td>
<td>each</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Test duration</td>
<td>min</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Hourly burning rate</td>
<td>kg/h</td>
<td>2.14</td>
<td>2.16</td>
</tr>
<tr>
<td>Furnace capacity</td>
<td>kW</td>
<td>11.6</td>
<td>11.2</td>
</tr>
<tr>
<td>Space heating output</td>
<td>kW</td>
<td>8.9</td>
<td>9.2</td>
</tr>
<tr>
<td>Mean flue draught</td>
<td>Pa</td>
<td>11.2</td>
<td>11.2</td>
</tr>
<tr>
<td>Mean flue gas temperature</td>
<td>K</td>
<td>288</td>
<td>281</td>
</tr>
<tr>
<td>Mean CO₂ content</td>
<td>%</td>
<td>10.40</td>
<td>10.67</td>
</tr>
<tr>
<td>Mean CO content based on 13 % O₂</td>
<td>%</td>
<td>0.085</td>
<td>0.046</td>
</tr>
<tr>
<td>Flue gas mass flow</td>
<td>g/s</td>
<td>7.6</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Table 2: Dust levels in the zero test

<table>
<thead>
<tr>
<th>Test</th>
<th>Upstream of the separator mg/m³</th>
<th>Downstream of the separator mg/m³</th>
<th>Difference mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>47.3</td>
<td>52.2</td>
<td>4.9</td>
</tr>
<tr>
<td>2</td>
<td>36.0</td>
<td>40.6</td>
<td>4.6</td>
</tr>
<tr>
<td>3</td>
<td>52.7</td>
<td>58.5</td>
<td>5.8</td>
</tr>
</tbody>
</table>
## 5.3 Settings and operating modes of the stoves

### Table 3: Settings and operating modes of the intermittent burning appliance A during rated and heavy-duty operation

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Test</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Test fuel</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
</tr>
<tr>
<td>Primary air cm²</td>
<td>16</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>16</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Secondary air cm²</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Feed mass</td>
<td>each</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Test duration</td>
<td>min</td>
<td>53</td>
<td>59</td>
<td>76</td>
<td>75</td>
<td>52</td>
<td>60</td>
<td>52</td>
</tr>
<tr>
<td>Hourly burning rate kg/h</td>
<td>2.93</td>
<td>2.45</td>
<td>2.20</td>
<td>2.13</td>
<td>3.48</td>
<td>2.71</td>
<td>2.71</td>
<td>2.48</td>
</tr>
<tr>
<td>Furnace capacity kW</td>
<td>15.8</td>
<td>13.2</td>
<td>11.8</td>
<td>11.4</td>
<td>18.7</td>
<td>14.6</td>
<td>14.7</td>
<td>13.4</td>
</tr>
<tr>
<td>Space heating output kW</td>
<td>11.2</td>
<td>9.4</td>
<td>9.0</td>
<td>8.8</td>
<td>13.9</td>
<td>10.6</td>
<td>10.7</td>
<td>10.0</td>
</tr>
<tr>
<td>Mean flue draught Pa</td>
<td>13.6</td>
<td>12.5</td>
<td>10.7</td>
<td>10.2</td>
<td>16.2</td>
<td>14.4</td>
<td>15.4</td>
<td>14.0</td>
</tr>
<tr>
<td>Mean flue gas temperature K</td>
<td>349</td>
<td>321</td>
<td>286</td>
<td>274</td>
<td>381</td>
<td>338</td>
<td>386</td>
<td>351</td>
</tr>
<tr>
<td>Mean CO₂ content %</td>
<td>9.43</td>
<td>8.65</td>
<td>9.41</td>
<td>9.52</td>
<td>12.01</td>
<td>9.76</td>
<td>11.91</td>
<td>11.38</td>
</tr>
<tr>
<td>Mean CO content based on 13 % O₂ %</td>
<td>0.095</td>
<td>0.128</td>
<td>0.100</td>
<td>0.098</td>
<td>0.118</td>
<td>0.040</td>
<td>0.226</td>
<td>0.149</td>
</tr>
<tr>
<td>Flue gas mass flow g/s</td>
<td>11.4</td>
<td>10.3</td>
<td>8.5</td>
<td>8.2</td>
<td>10.7</td>
<td>10.3</td>
<td>8.3</td>
<td>8.0</td>
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</table>

### Table 4: Settings and operating modes of the intermittent burning appliance A under part load

<table>
<thead>
<tr>
<th>Test date</th>
<th>05.12. 2011</th>
<th>05.12. 2011</th>
<th>05.12. 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Test fuel</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
</tr>
<tr>
<td>Primary air cm²</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Secondary air cm²</td>
<td>2</td>
<td>1 closed</td>
<td></td>
</tr>
<tr>
<td>Lower heating value MJ/kg</td>
<td>19.365</td>
<td>19.365</td>
<td>19.365</td>
</tr>
<tr>
<td>Feed mass</td>
<td>each</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Test duration</td>
<td>min</td>
<td>60</td>
<td>63</td>
</tr>
<tr>
<td>Hourly burning rate kg/h</td>
<td>1.06</td>
<td>1.06</td>
<td>1.06</td>
</tr>
<tr>
<td>Furnace capacity kW</td>
<td>5.7</td>
<td>5.7</td>
<td>5.7</td>
</tr>
<tr>
<td>Space heating output kW</td>
<td>4.4</td>
<td>4.5</td>
<td>4.7</td>
</tr>
<tr>
<td>Mean flue draught Pa</td>
<td>10.6</td>
<td>8.5</td>
<td>7.2</td>
</tr>
<tr>
<td>Mean flue gas temperature K</td>
<td>244</td>
<td>189</td>
<td>173</td>
</tr>
<tr>
<td>Mean CO₂ content %</td>
<td>8.00</td>
<td>7.38</td>
<td>8.38</td>
</tr>
<tr>
<td>Mean CO content based on 13 % O₂ %</td>
<td>0.083</td>
<td>0.170</td>
<td>0.200</td>
</tr>
<tr>
<td>Flue gas mass flow g/s</td>
<td>4.8</td>
<td>5.1</td>
<td>4.5</td>
</tr>
</tbody>
</table>
### Table 5: Settings and operating modes of the intermittent burning appliance B during rated and heavy-duty operation

<table>
<thead>
<tr>
<th>Test date</th>
<th>23.11.2011</th>
<th>23.11.2011</th>
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<tbody>
<tr>
<td>Test</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Test fuel</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
</tr>
<tr>
<td>Primary air</td>
<td>cm²</td>
<td>9</td>
</tr>
<tr>
<td>Secondary air</td>
<td>cm²</td>
<td>4</td>
</tr>
<tr>
<td>Lower heating value</td>
<td>MJ/kg</td>
<td>19.365</td>
</tr>
<tr>
<td>Feed mass</td>
<td>each</td>
<td>5</td>
</tr>
<tr>
<td>Test duration</td>
<td>min</td>
<td>69</td>
</tr>
<tr>
<td>Hourly burning rate</td>
<td>kg/h</td>
<td>2.32</td>
</tr>
<tr>
<td>Furnace capacity</td>
<td>kW</td>
<td>12.5</td>
</tr>
<tr>
<td>Space heating output</td>
<td>kW</td>
<td>10.4</td>
</tr>
<tr>
<td>Mean flue draught</td>
<td>Pa</td>
<td>14.8</td>
</tr>
<tr>
<td>Mean flue gas temperature</td>
<td>K</td>
<td>350</td>
</tr>
<tr>
<td>Mean CO₂ content</td>
<td>%</td>
<td>10.18</td>
</tr>
<tr>
<td>Mean CO content based on 13 % O₂</td>
<td>%</td>
<td>0.250</td>
</tr>
<tr>
<td>Flue gas mass flow</td>
<td>g/s</td>
<td>8.2</td>
</tr>
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</table>

### Table 6: Settings and operating modes of the continuous burning appliance C during rated duty

<table>
<thead>
<tr>
<th>Test date</th>
<th>29.11.2011</th>
<th>29.11.2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Test fuel</td>
<td>BB 7&quot;</td>
<td>BB 7&quot;</td>
</tr>
<tr>
<td>Primary air automatic</td>
<td>pos.</td>
<td>max.</td>
</tr>
<tr>
<td>Secondary air</td>
<td>pos. closed</td>
<td>closed</td>
</tr>
<tr>
<td>Lower heating value</td>
<td>MJ/kg</td>
<td>19.365</td>
</tr>
<tr>
<td>Feed mass</td>
<td>each</td>
<td>8</td>
</tr>
<tr>
<td>Test duration</td>
<td>min</td>
<td>192</td>
</tr>
<tr>
<td>Hourly burning rate</td>
<td>kg/h</td>
<td>1.36</td>
</tr>
<tr>
<td>Furnace capacity</td>
<td>kW</td>
<td>7.3</td>
</tr>
<tr>
<td>Space heating output</td>
<td>kW</td>
<td>5.3</td>
</tr>
<tr>
<td>Mean flue draught</td>
<td>Pa</td>
<td>11.2</td>
</tr>
<tr>
<td>Mean flue gas temperature</td>
<td>K</td>
<td>321</td>
</tr>
<tr>
<td>Mean CO₂ content</td>
<td>%</td>
<td>9.67</td>
</tr>
<tr>
<td>Mean CO content based on 13 % O₂</td>
<td>%</td>
<td>0.306</td>
</tr>
<tr>
<td>Flue gas mass flow</td>
<td>g/s</td>
<td>4.9</td>
</tr>
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</table>
5.4 Findings of the dust measurements

Table 7: Dust levels in intermittent burning appliance A during rated duty

<table>
<thead>
<tr>
<th>Test</th>
<th>CO₂ %</th>
<th>Dust mg/m³</th>
<th>CO₂ %</th>
<th>Dust mg/m³</th>
<th>Difference mg/m³</th>
<th>Separating efficiency %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12.25</td>
<td>71.1</td>
<td>12.27</td>
<td>4.6</td>
<td>66.5</td>
<td>93.5</td>
</tr>
<tr>
<td>2</td>
<td>12.32</td>
<td>65.2</td>
<td>12.33</td>
<td>5.5</td>
<td>59.7</td>
<td>91.6</td>
</tr>
<tr>
<td>3</td>
<td>14.45</td>
<td>50.2</td>
<td>14.25</td>
<td>4.9</td>
<td>45.3</td>
<td>93.2</td>
</tr>
<tr>
<td>4</td>
<td>13.95</td>
<td>44.5</td>
<td>13.75</td>
<td>6.2</td>
<td>38.3</td>
<td>86.1</td>
</tr>
<tr>
<td>5</td>
<td>15.29</td>
<td>45.1</td>
<td>14.88</td>
<td>6.5</td>
<td>38.6</td>
<td>91.0</td>
</tr>
<tr>
<td>6</td>
<td>13.21</td>
<td>49.0</td>
<td>12.90</td>
<td>1.6</td>
<td>47.4</td>
<td>96.5</td>
</tr>
<tr>
<td>7</td>
<td>15.70</td>
<td>85.8</td>
<td>15.39</td>
<td>14.0</td>
<td>71.8</td>
<td>83.7</td>
</tr>
<tr>
<td>8</td>
<td>17.10</td>
<td>66.2</td>
<td>16.46</td>
<td>11.7</td>
<td>54.5</td>
<td>82.3</td>
</tr>
</tbody>
</table>

Mean 89.4

Chart to Table 7

Intermittent burning appliance A
Dust measurement upstream and downstream of Oeko Tube

mg/m³

upstream

downstream

removed

Dust sample
Table 8: Dust levels in intermittent burning appliance B during rated duty

<table>
<thead>
<tr>
<th>Test</th>
<th>CO₂ %</th>
<th>Dust mg/m³</th>
<th>CO₂ %</th>
<th>Dust mg/m³</th>
<th>Difference mg/m³</th>
<th>Separating efficiency %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15.27</td>
<td>84.1</td>
<td>14.74</td>
<td>22.2</td>
<td>61.9</td>
<td>73.6</td>
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<tr>
<td>2</td>
<td>16.26</td>
<td>61.1</td>
<td>15.53</td>
<td>8.8</td>
<td>52.3</td>
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<tr>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>79.6</td>
</tr>
</tbody>
</table>

Chart to Table 8

Intermittent burning appliance B
Dust measurement upstream and downstream of Oeko Tube

<table>
<thead>
<tr>
<th>mg/m³ and %</th>
<th>upstream</th>
<th>downstream</th>
<th>removed</th>
</tr>
</thead>
</table>

0.0, 10.0, 20.0, 30.0, 40.0, 50.0, 60.0, 70.0, 80.0, 90.0, 100.0, 110.0, 120.0

Dust sample
Table 9: Dust levels in continuous burning appliance C during rated duty

<table>
<thead>
<tr>
<th>Test</th>
<th>Upstream of separator</th>
<th>Downstream of separator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO₂ %</td>
<td>Dust mg/m³</td>
</tr>
<tr>
<td>1</td>
<td>12.79</td>
<td>116.0</td>
</tr>
<tr>
<td>2</td>
<td>9.11</td>
<td>82.8</td>
</tr>
</tbody>
</table>

Chart to Table 9

Continuous burning appliance C
Dust measurement upstream and downstream of Oeko Tube
Table 10: Dust levels in intermittent burning appliance A under part load

<table>
<thead>
<tr>
<th>Test</th>
<th>CO₂ %</th>
<th>Dust mg/m³</th>
<th>CO₂ %</th>
<th>Dust mg/m³</th>
<th>Difference mg/m³</th>
<th>Separating efficiency %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.88</td>
<td>30.5</td>
<td>9.90</td>
<td>2.1</td>
<td>28.4</td>
<td>93.1</td>
</tr>
<tr>
<td>2</td>
<td>8.93</td>
<td>36.1</td>
<td>8.98</td>
<td>7.7</td>
<td>28.4</td>
<td>78.7</td>
</tr>
<tr>
<td>3</td>
<td>10.27</td>
<td>49.1</td>
<td>10.29</td>
<td>10.5</td>
<td>38.6</td>
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<tr>
<td>Mean</td>
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<td></td>
<td></td>
<td>83.5</td>
</tr>
</tbody>
</table>

All dust levels stated in the report relate to 13 % O₂ at 1013 mbar and 0°C.
5.5 Photos of adhering dust in the flue gas pipe

After about 9 hours in operation and 20 kg fuel combustion
about 500 mm above the electrode

After about 27 hours in operation and 65 kg fuel combustion
about 500 mm above the electrode

After about 55 hours in operation and 160 kg fuel combustion
about 500 mm above the electrode
In the vicinity of the electrode

In the course of operation, significant adhesion of dust agglomerates was observed on the inside of the pipe in and above the effective range of the electrode. The deposits were less pronounced on the electrode itself.
5.6 Discussion of the results

The particle separation test on the OecoTube OT-2 yielded the following findings:

- A separating efficiency of 82.3 % to 96.5 % (on average 89.4 %) was achieved with intermittent burning appliance A in the nominal duty range and in the heavy-duty range and a separation of 78.6 % to 93.1 % (on average 83.5 %) in the part-load range.
- The separating efficiency in the nominal duty range with the intermittent burning appliance B was between 73.6 % and 85.6 % (on average 79.8 %), about 10 % lower.
- The separating efficiency downstream of the continuous burning appliance C was between 79.7 % and 42.3 % (on average 61 %).

Verification of the separating efficiency values when installed in a flue gas system made of mineral substances was not the subject of the test.

5.7 References to other tests

The following checks and assessments were already done by TÜV SÜD in Report No. S 1136-00/11 and were not the subject of the present test:

- safety check
- check for sootfire resistance
- check for dependability
- assessment of ease of cleaning
- assessment of mechanical strength
- aerodynamic flow assessment
- assessment of the malfunction response

The electrical safety in accordance with the requirements of DIN EN 60730-1 was assessed and the expert appraisal of the test specimen submitted was performed by TÜV_SÜD in Test Report No. S-E 1136-00/11.
OekoTube Test Report

Tests run August thru September 2013.

Summary
A small scale electrostatic precipitator (ESP) was mounted on the top exterior of a 20 foot tall lined chimney. This chimney was cleaned before use. The charge generator was within a weatherproof box (supplied) that was mounted with adjustable metal bands. A metal “tee” (supplied) of 10” diameter was secured on top of the chimney lining. The collection electrode coming out of the charge generator was centered within the chimney. The collection electrode is approximately 60” long with a weighted end.

A wood boiler connected to the bottom of the chimney was fueled with cord wood at fairly consistent moisture, tree type and quantity. The wood boiler combustion was run at a range of air inlet levels (20%, 40%, 60%, 80%, 100% stoichiometric rates)

A baseline test was run at each range of air inlet level with the electrostatic precipitator “off”.

After each test run (both with the ESP off as well as on) the collection electrode was removed with condition and particulate coverage amounts noted. The chimney was also inspected after each run, and condition noted.

Results

More extensive testing is needed; however initial testing demonstrates that with equivalent quantities of wood—the ESP is effective for the capture of particulates for exhausts that are at “starved” stoichiometric levels.

The exhaust flow rate may be too “fast” for more effective particulate capture at the higher “burn” rates.

It is assumed that the increase of resistivity of the ESP collection electrode (or size) would also increase the particulate capture.
Wood Boiler Type

HS Tarm Model 404
Inlet air controlled via valve
Digital temperature probes within firebox and at exhaust
Boiler Pressure Relief Valve (PRV) at 15 PSI- with automatic water recharge

Fuel

2 kg. Hardwood- maple and oak- kindling split to approx. ½” either direction.

23 kg. Hardwood- maple and oak
Split wood- no rounds
Typical size- 16” long by 8” square
20%-30% moisture content
No bark

Test Runs

Each start consisted of “warm up” of the wood boiler at room temperature with full air inlet opening- using 2 kg of hardwood kindling- after 30 minutes 23 additional kg of hardwood added to the fuel box and air inlet opening valve adjusted.

Time for each test was noted to nearest 15 minutes- determined when firebox temperature was reduced to 150 degrees F.

The ESP was removed and all particulates lightly brushed with soft cloth to be weighed- and compared against tare weight of cloth.

The ESP and chimney cleaned before each test run.

Outside ambient temperature ranged from 60 to 85 degrees F.
## Results

<table>
<thead>
<tr>
<th>Test</th>
<th>Time</th>
<th>Particulates</th>
<th>Other Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% ESP off</td>
<td>10 hours 30 min.</td>
<td>1.4 grams</td>
<td>Creosote liquid on chimney lining</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 120-130 degrees F</td>
</tr>
<tr>
<td>20% ESP on</td>
<td>11 hours 5 min.</td>
<td>8.5 grams</td>
<td>Creosote liquid on chimney lining</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 120-130 degrees F</td>
</tr>
<tr>
<td>40% ESP off</td>
<td>8 hours 15 min.</td>
<td>1.2 grams</td>
<td>Creosote liquid on chimney lining</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 125-150 degrees F</td>
</tr>
<tr>
<td>40% ESP on</td>
<td>8 hours 15 min.</td>
<td>6.2 grams</td>
<td>Creosote liquid on chimney lining</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 125-150 degrees F</td>
</tr>
<tr>
<td>60% ESP off</td>
<td>6 hours 45 min.</td>
<td>1.4 grams</td>
<td>No creosote</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 140-150 degrees F</td>
</tr>
<tr>
<td>60% ESP on</td>
<td>6 hours 30 min.</td>
<td>4.0 grams</td>
<td>No creosote</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 140-150 degrees F</td>
</tr>
<tr>
<td>80% ESP off</td>
<td>5 hours 15 min.</td>
<td>1.2 grams</td>
<td>No creosote PRV release @ 3 hr. mark</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 140-170 degrees F</td>
</tr>
<tr>
<td>80% ESP on</td>
<td>5 hours 15 min.</td>
<td>4.8 grams</td>
<td>No creosote PRV release at 3 hr. mark</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 140-180 degrees F</td>
</tr>
<tr>
<td>100% ESP off</td>
<td>4 hours 15 min.</td>
<td>None observed</td>
<td>No creosote PRV release @ 2 hr. 15 min mark</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 150-180 degrees F</td>
</tr>
<tr>
<td>100% ESP on</td>
<td>4 hours 30 min.</td>
<td>2 grams (very light)</td>
<td>No creosote PRV release @ 2 hr. mark</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exhaust Temp at chimney top 150-180 degrees F</td>
</tr>
</tbody>
</table>
AN ORDINANCE AMENDING THE FY 2018-19 BUDGET BY APPROPRIATING $458,000 FROM THE GENERAL FUND FUND BALANCE TO THE TRANSIT ENTERPRISE PROJECTS FUND FOR WOOD STOVE/PELLET STOVE RETROFIT EMISSIONS CONTROL DEVICE TESTING

WHEREAS, Due to the high and varying cost of fuel oil, there is considerable interest in identifying technologies capable of reducing PM$_{2.5}$ emissions from wood and pellet stoves in order to allow them to operate during air quality stage alerts; and

WHEREAS, Retrofit emissions control devices such as electrostatic precipitators that are used in conjunction with a solid fuel burning appliance (SFBA) may be one way of reducing emissions to levels equal to or less than levels emitted by residential fuel oil boilers and furnaces; and

WHEREAS, The administration is actively working with the Environmental Protection Agency to establish protocols for quantifying emission reductions of after-market emission control devices for residential wood burning stoves; and

WHEREAS, Additional data is required to quantify emission reductions from retrofit emissions control devices and this appropriation will fund the testing and allow it to happen in an expedient manner.

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

Section 1. **Classification.** This ordinance is not of a general and permanent nature and shall not be codified.

Section 2. **General Fund Appropriation.** The FY 2018-19 budget is hereby amended by appropriating $458,000 to the General Fund budgetary guideline entitled...
“Contribution to Transit Enterprise Projects Fund” and by increasing Contribution from Fund Balance by a like amount.

Section 3. Transit Enterprise Projects Fund Appropriation. The FY 2018-19 budget is hereby amended by appropriating $458,000 to the Transit Enterprise Projects Fund budgetary guideline entitled “Retrofit Emissions Control Device Testing” and by increasing Contribution from General Fund by a like amount.

Section 4. Contingency. This appropriation is contingent upon completion of a competitive process for selecting a retrofit emissions control device, designed for residential wood and/or pellet stoves, to undergo a testing program approved by the Environmental Protection Agency so that such devices can be considered as a successful part of the Borough’s Air Quality Program. The process will be open to any manufacturer of a retrofit emissions control device that is currently in production; this process is not intended to be used for research and development of devices. The scoring matrix of the proposal process will include consumer price, existing test data demonstrating particulate matter reductions, number of existing installations, and financial contributions of the manufacturer.

Section 5. Lapse of Funds. Upon completion or abandonment of the project, any unencumbered, unexpended funds will lapse back to the General Fund fund balance.

Section 6. Effective date. This ordinance shall be effective at 5:00 p.m. on the first Borough business day following its adoption.

PASSED AND APPROVED THIS 13TH DAY OF SEPTEMBER, 2018.

[Signature]
Kathryn Dodge
Presiding Officer

ATTEST:

[Signature]
April Trickey, CMC
Borough Clerk

Yeses: Roberts, Tacke, Gray, Major, Quist, Cooper, Lawrence, Dodge
Noes: None
Other: Lojewski (Excused)
FAIRBANKS NORTH STAR BOROUGH

ORDINANCE NO 2015 - 01

AN ORDINANCE AMENDING CHAPTER 8.21 OF THE FNSB CODE OF ORDINANCES REGARDING THE PM2.5 AIR QUALITY CONTROL PROGRAM, AMENDING 2.48.120 REGARDING THE AIR POLLUTION CONTROL COMMISSION’S DUTIES, AND AMENDING 1.04.050 REGARDING THE FINE SCHEDULE TO ADD VIOLATIONS OF THE PM2.5 AIR QUALITY CONTROL PROGRAM

WHEREAS, EPA, on December 22, 2008, declared part of the Fairbanks North Star Borough a non-attainment area for fine particulate pollution (PM2.5); and

WHEREAS, in the winter, PM2.5 concentrations in the non-attainment area routinely exceed the allowable limit, thereby violating the federal health-based standards; and

WHEREAS, an excessive level of PM2.5 impacts the health and well-being of borough residents; and

WHEREAS, air quality issues could impact large scale economic development, including military expansion; and

WHEREAS, studies have identified wood burning as a significant contributor of PM2.5, particularly wood with high moisture content; and

WHEREAS, the combined effort of an educational program concerning the importance of burning only dry wood and an increase in the availability of dry wood could significantly reduce Borough PM2.5 levels; and

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT

Text to be added is underlined
Text to be deleted is [BRACKETED & CAPITALIZED]
WHEREAS, PM$_{2.5}$ emissions from solid fuel burning appliances can be significantly reduced through the selection and proper use of modern, EPA rated models designed to meet more stringent emissions standards and by operating in accordance with “best practices”, including selection of appropriate fuel sources; and

WHEREAS, voluntary, incentive-based programs coupled with comprehensive education programs have been employed in other communities to help reduce PM$_{2.5}$ emissions; and

WHEREAS, voluntary measures may enable the Borough to model attainment, however, it is likely that they would take more than five years to reach this goal and they would not address local neighborhood problems arising from one or two significant polluters, neither of which is acceptable; and

WHEREAS, the State of Alaska, through a Memorandum of Agreement with the Borough, has authorized the Fairbanks North Star Borough to establish and administer an area-wide local PM$_{2.5}$ air quality control program that will operate in lieu of and consistent with the State’s air quality program; and

WHEREAS the State of Alaska Department of Environmental Conservation has issued draft regulations intended to be part of the State Implementation Plan (SIP) as required by the EPA; those regulations provide some new restrictions on the sale of solid fuel burning appliances and firewood, and authorize the borough to take on additional regulatory responsibility related to the SIP; and

WHEREAS, at the recent “Town Hall” on the PM$_{2.5}$ problem, more than 50 citizens provided testimony indicating that our air quality was not acceptable and that they expected the Assembly to act to put into place programs that will improve the air quality in the borough.

WHEREAS, it is the intent of the Fairbanks North Star Borough Assembly to respond to calls for regulations that will help improve the air quality within the borough by adopting a program that balances the need for clean air with the needs for economically heating our buildings; and

WHEREAS, in adopting this clean air program, it is the intent of the Assembly that it be enforced by concentrating on the most significant sources of PM2.5 pollution first, both for attainment within the Non-Attainment area and for significant local sources of pollution that affect adjacent and nearby properties; and
WHEREAS, in enforcing this clean air program, it is the intent of the Assembly that the focus be on assisting violators to come into compliance through the use of warning, education, and assistance provided through programs such as the enhanced solid fuel burning device change-out program.

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

Section 1. This ordinance is of a general and permanent nature and shall be codified.

Section 2. The following definitions in FNSBC 8.21.010 Definitions are amended or added as follows:

“Advisory” means a notice issued by the FNSB Air Quality division when the division determines, using available data, that a PM2.5 concentration of 25 ug/m³ has, or will likely occur.

“Air Quality Control Zone” means the area of the Borough currently contained in the EPA designated non-attainment area, which uses the non-attainment area southern, western and eastern boundaries as modified by their respective intersection with the following northern boundary described as: beginning at the intersection of Isberg Road with Chena Ridge Road on the western boundary of the EPA designated non-attainment area, then following Chena Ridge Road back to Chena Pump Road and continuing north on the Parks Highway to Sheep Creek Road, then Sheep Creek Road to Miller Hill Road, then north on Miller Hill Road, then east on Yankovich, then north from Yankovich Road along the east boundary of the Large Animal Research Station to a point just north of its intersection with Nottingham drive and follows the ridge crest across Nottingham Estates to approximately the point where Swallow Drive intersects Dalton Trail to north on Dalton Trail to the crest of the Farmer’s Loop Ridge, then follow the geographic crest of Farmer’s Loop Ridge to its intersection with the New Steese Highway, then south east on Bennet Road, and along Steel Creek Road to the intersection of Chena Hot Springs Road, and Chena Hot Springs Road to the eastern boundary of the EPA designated non-attainment area.

“Alert” means a notice issued by the FNSB air quality division when the division determines, using available data, that a PM$_{2.5}$ violation of the 35 [MICROGRAMS PER CUBIC METER] ug/m$^3$ has, or will likely occur.

“Clean wood” means natural wood that has not been painted, varnished, or coated with a similar material, has not been treated with preservatives, and does not contain resins or glues as in plywood or other composite wood products.

“Construction and demolition debris” means a conglomeration of materials from construction, repair, remodeling or demolition of buildings and structures containing any prohibited fuels.

“Episode” means when conditions reach or are predicted to reach advisory or alert status.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
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“Forecast” means a description of the current dispersion conditions described as good, fair, or poor and including the expected PM$_{2.5}$ concentrations expressed in micrograms per cubic meter.

“Opacity” means the reduction in transmitted light through a column of smoke as measured by an observer certified in using EPA Reference Method 9 as defined by federal law.

Section 3. Section 8.21.020 Borough listed appliances shall be amended as follows:

A[N] solid fuel burning appliance shall be listed by the borough if:

A. The solid fuel burning appliance is certified by the U.S. Environmental Protection Agency as meeting the federal emissions [LIMIT STANDARD APPROPRIATE FOR THAT APPLIANCE OR IN THE CASE OF HYDRONIC HEATERS IS AT LEAST PHASE II QUALIFIED] rate of 2.5 grams of PM$_{2.5}$ per hour or less or for hydronic heaters, meets Phase II qualifications and has an annual average emission level rating equal to or less than 2.5 grams of PM$_{2.5}$ per hour. For purposes of this section, "certified" means that the solid fuel burning appliance meets emission performance standards when tested by an accredited independent laboratory and labeled according to procedures specified by the EPA in 40 CFR 60 Subpart AAA; or

B. The solid fuel burning appliance is tested, including by use of a handheld or other portable device, by an accredited independent laboratory, or other qualified person or entity approved by the borough, establishing that it meets an [THE EPA] emissions [LIMIT STANDARD APPROPRIATE FOR THAT APPLIANCE OR AN EMISSIONS LIMIT STANDARD EQUIVALENT TO THAT OF A LISTED APPLIANCE IN A SIMILAR CATEGORY] rate of 2.5 grams of PM$_{2.5}$ per hour or less or for hydronic heaters the appliance has an annual average emission level rating equal to or less than 2.5 grams of PM$_{2.5}$ per hour.

Section 4. Section 8.21.025 Prohibited acts shall be amended as follows:

[THE BOROUGH SHALL NOT, IN ANY WAY, REGULATE, PROHIBIT, CURTAIL, NOR ISSUE FINES OR FEES ASSOCIATED WITH THE SALE, DISTRIBUTION, OR OPERATION OF HEATING APPLIANCES OR ANY TYPE OF COMBUSTIBLE FUEL.]

A. Installation of certain solid fuel burning appliances in the non-attainment area. Within the non-attainment area no person shall install or allow the installation of a solid fuel burning appliance unless it is listed by the Borough as qualifying under this chapter and the installation complies with all other requirements imposed in this chapter. It is a separate violation to fail to remove a solid fuel burning appliance installed in violation of this chapter.

B. All persons owning and selling their property within the Air Quality Control Zone with an unlisted installed solid fuel burning appliance that will not be removed before sale must, if the solid fuel burning appliance was not listed by the Borough as qualifying

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
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Fairbanks North Star Borough, Alaska ORDINANCE NO. 2015-01
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Appendix III.D.7.7-5202
at the time of installation, provide a written disclosure to the buyer and to the Division prior to closing.

C. Visible Emissions Standard in the Air Quality Control Zone.
   1. Standard. No person shall cause, permit, or allow the emission from a solid fuel burning appliance in the Air Quality Control Zone to create opacity greater than 20 percent for a period or periods aggregating more than 10 minutes in any hour except during the first 30 minutes after the initial firing of a cold unit when the opacity limit shall be less than 50 percent.
   2. Procedures and Enforcement. When ambient weather and light conditions permit, methods and procedures specified by the EPA in 40 CFR 60 Appendix A reference method 9 (Visual determination of the Opacity of Emissions From Stationary Sources), or an alternative technology that replaces method 9, when the technology is available and the choice is feasible, upon request of the person being investigated, shall be used to determine compliance with this section. Smoke visible from a chimney, flue or exhaust duct in excess of the opacity standard for a period in excess of 30 minutes shall constitute prima facie evidence of unlawful operation of an applicable solid fuel burning appliance.

D. PM$_{2.5}$ Emissions Crossing Property Lines. No person shall cause or permit emissions from a solid fuel burning appliance to impact the resident(s) of a neighboring property through the creation of an emissions plume that:
   1. crosses a property line
   2. is observable using EPA method 22 (40 CFR 60 Appendix A), and
   3. is 25µg/m$^3$ greater than the surrounding immediate vicinity background PM$_{2.5}$ level using methods defined by the Borough Division of Air Quality. For purposes of this subsection, the surrounding “immediate vicinity” means land within an area measured 1,200 feet in all directions from the boundaries of the emitting property.

E. Borough-Wide Installation Requirements for Hydronic Heaters.
   1. Setback. Unless permitted by a variance, installing an approved pellet fuel burning appliance, or replacing an existing hydronic heater with a listed appliance, no person shall install or allow the installation of a hydronic heater located less than:
      a. 330 feet from the closest property line, or
      b. 660 feet from a school, clinic, hospital, or senior housing unit.
   2. Any hydronic heater installed in violation of this section shall be immediately remedied or made inoperable and removed as soon as practicable; however, in no case shall the time of removal be longer than 180 days after notice from the Division of a violation.

F. Prohibited Fuels.
   No person shall burn in the Borough any fuel, except coal in an appliance designed to use coal, which is not listed in the manufacturer’s owner’s manual as an acceptable fuel for that device or any of the following items in a solid fuel burning appliance:
   1. Any wood that does not meet the definition of clean wood or has more than 20% moisture content.
2. Garbage,
3. Tires,
4. Materials containing plastic or rubber,
5. Waste petroleum products,
6. Paints and paint thinners,
7. Chemicals,
8. Glossy or colored papers,
9. Construction and demolition debris,
10. Plywood,
11. Particleboard,
12. Saltwater driftwood,
13. Manure,
14. Animal carcasses,
15. Asphalt products,
16. Flooring products.

G. Sales or Leasing of Solid Fuel Burning Appliances.

1. No person shall sell or lease a solid fuel burning appliance or barrel stove kit in the borough that does not meet the emissions limits established in 8.21.020 A. unless the buyer signs an affidavit, on a form prescribed by the Borough, that the appliance will not be installed or used in the Air Quality Control Zone. This section does not apply to appliances or stoves that transfer pursuant to a sale of property.

2. No person shall commercially sell or offer for sale or lease a solid fuel burning appliance in the borough unless the commercial seller or dealer provides the prospective buyer or lessee, prior to any sales or lease agreement, with a written notice, prepared or approved by the Division, that includes, but is not limited to, the following:

   a. The fuel restrictions imposed in this chapter;
   b. Proper installation, property location, operation, and maintenance of the appliance;
   c. An advisory statement noting that operation of solid fuel burning appliances may not be appropriate in some areas due to terrain, meteorological conditions, or other relevant conditions that render the operation of the appliance a public nuisance or health hazard even though it is otherwise legally installed and operated, and

3. The written notice required in this section shall be signed and dated by the prospective buyer or lessee prior to purchase or lease to indicate receipt of the notification requirements of this section.

4. The commercial dealer or seller shall mail or otherwise provide a copy of the notice, any required affidavit, to the Division within thirty days of the sale. All commercial dealers or sellers shall also include with the notice documentation showing whether the appliance sold or leased meets the Borough’s emissions standard.

H. Nuisance. No person within the Fairbanks North Star Borough shall cause or allow emissions of a solid fuel or waste oil burning appliance that are injurious to human life or property or that unreasonably interfere with the comfortable enjoyment of life or

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
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property. No person within the Fairbanks North Star Borough shall operate a solid fuel or 
waste oil burning appliance in a manner so as to create a public or private nuisance. A 
violation of a provision of this chapter is hereby declared to be a nuisance.

I. Other laws. Nothing in this section precludes other local jurisdictions from having 
more restrictive codes.

J. Penalties. Upon first conviction of an offense in this chapter, the 
penalty(ies)/fines(s) set forth in FNSBC Title 1 regarding violations of the PM2.5 air 
quality control program may be satisfied by completion within 60 days of a borough 
approved class covering PM2.5 health concerns, non-attainment, importance of dry 
wood and proper operation of solid fuel burning appliances. The borough may on its 
own initiative file notice of satisfaction of attendance requirements with the court, or the 
defendant may file a certificate of completion with the court within the applicable time 
frame.

Section 5. Section 8.21.040, Forecasting exceedances and voluntary 
restrictions in the non-attainment area during an alert, shall be amended as follows:

8.21.040 Forecasting exceedances and [VOLUNTARY] restrictions in the Air 
Quality Control Zone [NON-ATTAINMENT AREA] during an alert

A. During the winter months of October through March, the Borough shall issue a 
daily PM$_{2.5}$ forecast [at] by 4:30 p.m. [MONDAY THROUGH FRIDAY]. When the PM$_{2.5}$ 
concentration reaches the onset level for an episode and is expected to remain at that 
level for 12 hours or more, an alert or advisory will be declared. An alert or advisory may 
apply to the Air Quality Control Zone as a whole, or to one or more sub-areas 
designated by the division. Once an alert or advisory is declared, PM$_{2.5}$ control 
measures set forth in this section shall be implemented and continued until the alert or 
advisory is cancelled. There are three levels of episodes: Stage 1, 2 and 3. The 
obligations imposed in this sub-section do not require, absent specific funding for that 
purpose, any actions to be taken outside of the borough’s normal business days and 
hours of operation.

B. The Division will notify local media to ensure the declared alert or advisory is 
broadcast. The Division shall also use social media and methods of direct 
communication such as text messages as feasible. Information within the notification 
will contain the PM$_{2.5}$ forecast, Stage level for areas, and actions required to reduce 
Sources of PM$_{2.5}$. The obligations imposed in this sub-section do not require, absent 
specific funding for that purpose, any actions to be taken outside of the borough’s 
normal business days and hours of operation.

[B]C. Stage 1: Voluntary Restrictions in the Air Quality Control Zone [NON-

1. A Stage 1 air advisory is implemented when concentrations exceed or are 
forecasted to exceed 25ug/m$^3$.

[1]2. Residents shall be requested to voluntarily stop operation of solid fuel 
[BURNING APPLIANCES], pellet [STOVES], and waste oil burning appliances, [AND] 
as well as masonry heaters and all outdoor burning that includes recreational fires such
as bonfires, campfires and the use of fire pits, non-permitted incinerators and burn
barrels in the Air Quality Control Zone [NON-ATTAINMENT AREA].

[2. THE DIVISION WILL NOTIFY LOCAL MEDIA TO ENSURE THE DECLARED ALERT IS BROADCAST. INFORMATION WITHIN THE NOTIFICATION WILL CONTAIN THE PM FORECAST AND PROCEDURES TO REDUCE SOURCES OF PM.]

D. Stage 2: Required Restrictions in the Air Quality Control Zone During an Alert

1. A Stage 2 air alert is implemented when concentrations exceed or are forecasted to exceed 35ug/m³.

2. Burning is permitted in all borough listed appliances. No fuel source may be added to the combustions chamber or firebox of any non-listed solid fuel burning appliance or waste oil burning appliance. Residents should rely instead on their home’s alternate, cleaner source of heat (such as a gas or fuel oil fired furnace or boiler or electric baseboard heaters) until the Stage 2 air alert is cancelled.

3. If a building owner or other person with a property or managerial interest in the building has an approved “No Other Adequate Source of Heat” designation, the building owner is exempted from complying with the Stage 2 air alert restrictions for that building.

4. Outdoor burning is prohibited including non-permitted incinerators and burn barrels. This does not include recreational fires such as bonfires, campfires or ceremonial fires and the use of fire pits.

5. These restrictions shall not apply during a power failure.

E. Stage 3: Required Restrictions in the Air Quality Control Zone During an Alert.

1. A Stage 3 air alert is implemented when concentrations exceed or are forecasted to exceed 55ug/m³.

2. No fuel source may be added to the combustions chamber or firebox of any solid fuel burning appliances, masonry heaters, pellet fuel burning appliances, cook stoves, fireplaces, or waste oil burning appliances. No waste oil may be added to a waste oil burning appliance. Residents should rely instead on their home’s alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) the Stage 3 air alert is cancelled.

3. If a building owner or other person with a property or managerial interest in the building has an approved “No Other Adequate Source of Heat” designation the building owner is exempted from complying with the Stage 3 air alert restrictions for that building.

4. Outdoor burning is prohibited including non-permitted incinerators and burn barrels. This does not include recreational fires such as bonfires, campfires or ceremonial fires and the use of fire pits.

5. These restrictions shall not apply during a power failure or to listed appliances, masonry heaters or pellet fuel burning appliances when the temperature is below -15 as recorded at the Fairbanks International Airport.

Section 6. FNSB 2.48.120 Powers and duties of the Air Pollution Control Commission are amended as follows:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
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Text to be deleted is [BRACKETED & CAPITALIZED]
F. The commission may [SHALL] develop or review comprehensive plans for the prevention, abatement, and control of air pollution in the borough. Such plans may include recommendations on subjects including, but not limited to, transportation control measures, zoning, taxation, research, and public relations.

H. After a public hearing, the commission shall determine whether a person may receive a variance from the installation requirements of FNSB 8.21.020 E allowing them to install a hydronic heater. In determining whether to grant the variance, the commission shall consider the proposed location of the appliance, impact on surrounding neighborhood, emission levels of the appliance, terrain, meteorological conditions, and other relevant conditions that may render the operation of the appliance at that location a nuisance or a health hazard.

Section 7. A new section, Section 8.21.043, No other adequate source of heat determination, shall be added as follows:

A. A building-owner or other person with a property or managerial interest in the building may obtain a "No Other Adequate Source of Heat" determination from the Division if:

1. The building-owner(s) or other person with a property or managerial interest in the building applies with the Division on a form developed by the Division.
2. The building-owner(s) or other person with a property or managerial interest in the building files an affidavit with the application that the subject structure must be heated and the structure has no adequate heating source without using a solid fuel or waste oil burning appliance or that economic hardships require the applicant’s use of a solid fuel or waste oil burning appliance or complying with a restriction would result in damage to property including damage to the appliance itself and its heating system components.

B. There shall be no fee for applying for or obtaining a determination.

C. It shall be a violation to submit a false affidavit for a "no other adequate source of heat" determination.

D. If the "no other adequate source of heat" appliance does not meet the standards set in this chapter, the Division shall provide the applicant with information concerning the borough’s voluntary removal, replacement and repair program.

E. Applications denied by the division may be appealed to the Air Pollution Control Commission.

Section 8. FNSB 1.04.050 Fine schedule is amended to add the following:

<table>
<thead>
<tr>
<th>Code Section</th>
<th>Offense</th>
<th>Penalty/Fine</th>
<th>Mandatory Warning Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.21.025(A)</td>
<td>Installation of an unlisted appliance</td>
<td>$500.00</td>
<td>No</td>
</tr>
</tbody>
</table>

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED & CAPITALIZED]
<table>
<thead>
<tr>
<th>Ordinance Code</th>
<th>Description</th>
<th>Fee</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.21.025(A)</td>
<td>Failure to remove an unlisted appliance</td>
<td>$500.00</td>
<td>Yes</td>
</tr>
<tr>
<td>8.21.025(B)</td>
<td>Failure to disclose an unlisted appliance before sale</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>8.21.025(C)</td>
<td>Violation of visible emissions standard 1&lt;sup&gt;st&lt;/sup&gt; offense</td>
<td>$100.00</td>
<td>Yes</td>
</tr>
<tr>
<td>8.21.025(C)</td>
<td>Violation of visible emissions standard 2&lt;sup&gt;nd&lt;/sup&gt; offense</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>8.21.025(D)</td>
<td>Emissions crossing property lines 1&lt;sup&gt;st&lt;/sup&gt; offense</td>
<td>$500.00</td>
<td>Yes</td>
</tr>
<tr>
<td>8.21.025(D)</td>
<td>Emissions crossing property lines 2&lt;sup&gt;nd&lt;/sup&gt; offense</td>
<td>$1000.00</td>
<td>No</td>
</tr>
<tr>
<td>8.21.025(E)</td>
<td>Illegal installation of hydronic heaters</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>8.21.025(E)</td>
<td>Failure to remove hydronic heaters</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>8.21.025(F)</td>
<td>Use of prohibited fuels--1&lt;sup&gt;st&lt;/sup&gt; offense</td>
<td>$100.00</td>
<td>Yes</td>
</tr>
<tr>
<td>8.21.025(F)</td>
<td>Use of prohibited fuels--2&lt;sup&gt;nd&lt;/sup&gt; offense</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>8.21.025(G)</td>
<td>Violation of commercial sale requirements</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>8.21.040(D)</td>
<td>Violation of a stage 2 air alert restriction</td>
<td>$500.00</td>
<td>Yes</td>
</tr>
<tr>
<td>8.21.040(D)</td>
<td>Violation of a stage 3 air alert restriction</td>
<td>$1000.00</td>
<td>Yes</td>
</tr>
<tr>
<td>8.21.043</td>
<td>Filing a false affidavit</td>
<td>$500.00</td>
<td>No</td>
</tr>
</tbody>
</table>

Section 9. Effective Date. Except for FNSBC 8.21.025 G (Commercial Sales) which shall be effective 30 days after adoption, and FNSBC 8.21.025 B (sale of property) which shall be effective on May 1<sup>st</sup>, 2015, and FNSBC 8.21.025(F)(1) (requirement wood be 20% moisture content) which shall be effective on October 1, 2015. This ordinance shall be effective at 5:00 pm on the first Borough business day

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following its adoption and shall have only prospective application, meaning no provision shall apply to any act, including installation or purchase of a solid fuel appliance completed prior to the effective date.

PASSED AND APPROVED THIS 27TH DAY OF FEBRUARY, 2015.

_______________________________
Nanci Ashford-Bingham
Borough Clerk

ATTEST:

_______________________________
Nanci Ashford-Bingham, MMC
Borough Clerk

Ayes: Golub, Hutchison, Lawrence, Dodge, Quist, Davies, Kassel
Noes: Sattley, Roberts
Note: The Approved Air Quality Control Zone is approximately 158.9 square miles.

Fairbanks North Star Borough
ORD 2015-001
Approved Air Quality Control Zone

PM 2.5 Regulatory Area
Air Quality Control Zone (approved 2-26-15)
Note: The Approved Air Quality Control Zone is approximately 158.9 square miles

for Clerk's Office
GIS Division, kpf
March 2nd, 2015

Appendix III.D.7.7-5210
AN ORDINANCE AMENDING FNSB 8.21.025 TO REQUIRE THE REMOVAL OF CERTAIN UNLISTED HYDRONIC HEATERS IN THE AIR QUALITY CONTROL ZONE, AMENDING THE FY 2015-16 BUDGET BY APPROPRIATING $500,000 FROM THE GENERAL FUND FUND BALANCE TO THE TRANSIT ENTERPRISE PROJECTS FUND TO PAY FOR THE REMOVAL OF THE UNLISTED HYDRONIC HEATERS AND SUSPEND ALL OTHER PAYMENTS FROM THE VOLUNTARY REMOVAL AND REPLACEMENT PROGRAM UNTIL MAY 1, 2017

WHEREAS, Hydronic heaters that do not have an emissions rating of 0.10 pounds per million BTU or less cannot, under existing code, be legally installed in the borough’s nonattainment area; and

WHEREAS, Certain hydronic heaters significantly contribute to the borough’s air quality problem; and

WHEREAS, The Borough has offered in past years and continues to offer a removal program that pays homeowners to remove or replace these hydronic heaters; and

WHEREAS, The Borough needs to increase funding of the removal program and temporarily preclude other program spending in order to ensure funds are available to pay owners who are required to remove these unlisted hydronic heaters; and

WHEREAS, The imminent reclassification by the EPA of the Fairbanks North Star Borough from a Moderate to a Serious non-attainment area will result in the imposition of control measures, including expensive technology upgrades for power plants and other stationary sources, which will lead to insignificant improvement to air quality but will significantly increase utility rates; and
WHEREAS, The Borough's continued failure to significantly reduce PM2.5 pollution will further result in offset sanctions which will strangle economic development in the non-attainment area and highway sanctions eliminating federal funding of road projects within the non-attainment area; and

WHEREAS, These sanctions will be lifted if and when air quality violations cease.

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

Section 1. Sections 2, 3 and 4 are of a general and permanent nature and shall be codified. Sections 5, 6 and 7 shall not be codified.

Section 2. FNSBC 8.21.025 B. is hereby amended as follows:
B. No person who has been convicted of or pled no contest to two or more violations of this chapter involving visible emissions or emissions crossing property lines shall, in the air quality control zone, operate, use or keep installed a hydronic heater unless the hydronic heater is:
   1. Borough listed or was listed at the time of installation,
   2. A closed combustion system with automatic components that feed solid fuel, including wood pellets, into a firebox where the combustion is enhanced by an active airflow system, or
   3. Connected to a thermal mass system that is certified by the contractor or installer as sufficient to allow the hydronic heater to burn at maximum capacity minimizing on/off cycling. The division may require an owner to provide documentation supporting the certification.

This prohibition shall be effective 90 days after the 2nd conviction or entry of a no contest plea.

All persons owning and selling their property within the air quality control zone with an installed non-EPA-certified solid fuel burning appliance[; OR FOR HYDRONIC HEATERS NON-EPA PHASE II QUALIFICATIONS, ]that will not be removed before sale must provide a written disclosure to the buyer prior to closing, and a copy to the division no later than 10 days after the recording of the sale.
Section 3. FNSBC 1.04.050, fine schedule, is amended to add the following:

<table>
<thead>
<tr>
<th>Code Section</th>
<th>Offense</th>
<th>Penalty/Fine</th>
<th>Mandatory Warning Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.21.025(B)</td>
<td>Failure to remove, using or operating a prohibited hydronic heater. 1st offense.</td>
<td>$500</td>
<td>Yes, with removal as soon as practicable.</td>
</tr>
<tr>
<td>8.21.025(B)</td>
<td>Failure to remove, using or operating a prohibited hydronic heater. 2nd offense.</td>
<td>$1,000</td>
<td>No.</td>
</tr>
</tbody>
</table>

Section 4. General Fund Appropriation. The FY 2015-16 budget is hereby amended by appropriating $500,000 to the General Fund budgetary guideline entitled “Contribution to Transit Enterprise Projects Fund” and by increasing Contribution from Fund Balance by a like amount.

Section 5. Transit Enterprise Projects Fund Appropriation. The FY 2015-16 budget is hereby amended by appropriating $500,000 to the Transit Enterprise Projects Fund budgetary guideline entitled “Enhanced Voluntary Removal, Replacement, and Repair Program” and by increasing Contribution from General Fund by a like amount.

Section 6. Limited Use of Funds. All unencumbered funds remaining in the removal, replacement and repair program on the effective date of this ordinance may be spent only on payments to applicants within the air quality control zone who are (1) removing or replacing an unlisted hydronic heater or (2) removing or replacing a woodstove [THAT HAS BEEN THE SUBJECT OF MORE THAN ONE SUBSTANTIATED NEIGHBORHOOD COMPLAINT AND] meeting [ADDITIONAL] criteria established by the Mayor. This restriction shall continue until May 1, 2017 or until the assembly appropriates additional funds to pay for the other removal, replacement or repairs authorized under the program, whichever occurs first.

Section 7. Lapse of Funds for the “Enhance Voluntary Removal, Replacement, and Repair Program”. Upon completion or abandonment of the program, any unexpended and unencumbered funds will lapse to the General Fund fund balance.

Section 8. Effective Date. Sections 2, 3 and 4 of this ordinance shall be effective on October 1, 2016. The remaining sections shall be effective at 5:00 pm. on the first Borough business day following its adoption.
PASSED AND APPROVED THIS 4TH DAY OF MAY, 2016 AND AMENDED BY ORDINANCE NO. 2016-33 ADOPTED JUNE 23, 2016.

John Davies
Presiding Officer

ATTEST:

Nanci Ashford-Bingham
Borough Clerk

Adopted on May 4, 2016:
Yeses: Sattley, Hutchison, Cooper, Westlind, Lawrence, Dodge, Quist, Davies
Noes: Roberts

Amended on June 23, 2016:
Yeses: Sattley, Hutchison, Cooper, Roberts, Westlind, Lawrence, Dodge, Quist, Davies
Noes: Roberts

CODE AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED AND CAPITALIZED]
FAIRBANKS NORTH STAR BOROUGH

ORDINANCE NO. 2016-37

AN ORDINANCE AMENDING TITLE 21 REGARDING NO OTHER ADEQUATE SOURCE OF HEAT DETERMINATIONS

WHEREAS, Borough code exempts qualifying buildings with no other adequate source of heat from compliance with certain air quality regulations; and

WHEREAS, Granting these exemptions only to buildings constructed prior to December 31, 2016 will encourage property owners to include an alternative source of heat in new construction for use during times of exceedances.

WHEREAS, Because borough codes imposing restrictions on the use of solid fuel and other appliances during air alerts apply only to the air quality zone, only owners within the air quality zone need to apply for a “no other adequate source of heat” determination;

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

Section 1. This ordinance is of a general and permanent nature and shall be codified.

Section 2. FNSBC 21.28.060 No other adequate source of heat determination is amended to read as follows:

A. A building owner or other person with a property or managerial interest in [THE] a building located within the air quality control zone may obtain a “no other adequate source of heat” determination from the division if:

1. The building owner(s) or other person with a property or managerial interest in the building applies with the division on a form developed by the division[.];

2. The building owner(s) or other person with a property or managerial interest in the building files an affidavit with the application that the subject structure must be heated and the structure has no adequate heating source without using a solid fuel or waste oil burning appliance or that economic hardships require the applicant’s use of a solid fuel or waste oil burning appliance or complying with a restriction would

CODE AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED AND CAPITALIZED]

Fairbanks North Star Borough, Alaska

ORDINANCE NO. 2016-37

Appendix III.D.7.7-5215
result in damage to property including damage to the appliance itself and its heating 
system components[.]; and

3. The building was constructed on or before December 31, 2016.

B. There shall be no fee for applying for or obtaining a determination.

C. It shall be a violation to submit a false affidavit for a “no other adequate source of 
heat” determination.

D. If the “no other adequate source of heat” appliance does not meet the standards 
set in this chapter, the division shall provide the applicant with information concerning 
the borough’s voluntary removal, replacement and repair program.

E. Applications denied by the division may be appealed to the air pollution control 
commission.

Section 3. Effective Date. This ordinance shall be effective at 5:00 p.m. 
of the first Borough business day following its adoption.

PASSED AND APPROVED THIS 28TH DAY OF JULY, 2016.

ATTEST:

Nanci Ashford-Bingham, MMC
Borough Clerk

Yeses: Cooper, Sattley, Hutchison, Westlind, Lawrence, Dodge, Davies
Noes: Roberts
Other: Quist (Excused)
WHEREAS, The United States Environmental Protection Agency (EPA), on December 22, 2008, declared part of the Fairbanks North Star Borough a non-attainment area for fine particulate pollution (PM2.5); and

WHEREAS, On December 16, 2016 the EPA published public notice in the Federal Register of its intent to reclassify the Fairbanks North Star Borough’s non-attainment area from Moderate to Serious status; and

WHEREAS, Reclassification to Serious non-attainment status triggers the mandate that Best Available Control Measures be implemented as mitigation measures within the non-attainment area; and

WHEREAS, The State of Alaska, through a Memorandum of Agreement with the Borough, has authorized the Fairbanks North Star Borough to establish and administer an area-wide local PM2.5 air quality control program that will operate in lieu of and consistent with the State’s air quality program; and

WHEREAS, In the winter, PM2.5 concentrations in the non-attainment area routinely exceed the allowable limit, thereby violating the federal health-based standards; and

WHEREAS, An excessive level of PM2.5 impacts the health and well being of borough residents; and

WHEREAS, Air quality issues could negatively impact large scale economic development, including military expansion, in the Fairbanks North Star Borough.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

Section 1. This ordinance is of a general and permanent nature and shall be codified.

Section 2. FNSBC 21.28.010, Definitions, shall be amended as follows:

["ADVISORY" MEANS A NOTICE ISSUED BY THE FNSB AIR QUALITY DIVISION WHEN THE DIVISION DETERMINES, USING AVAILABLE DATA, THAT A PM$_{2.5}$ CONCENTRATION OF 25 µG/M$^3$ HAS OCCURRED, OR WILL LIKELY OCCUR.]

["AIR QUALITY ALERT" MEANS AN ADVISORY, ALERT OR EPISODE CONCERNING AIR QUALITY WHETHER ISSUED BY THE FAIRBANKS NORTH STAR BOROUGH OR THE STATE OF ALASKA.]

“Air quality control zone” means the area of the borough currently contained in the EPA designated nonattainment area, which uses the nonattainment area southern, western and eastern boundaries as modified by their respective intersection with the following northern boundary described as: beginning at the intersection of Isberg Road with Chena Ridge Road on the western boundary of the EPA designated nonattainment area, then following Chena Ridge Road back to Chena Pump Road and continuing north on the Parks Highway to Sheep Creek Road, then Sheep Creek Road to Miller Hill Road, then north on Miller Hill Road, then east on Yankovich, then north from Yankovich Road along the east boundary of the Large Animal Research Station to a point just north of its intersection with Nottingham Drive and follows the ridge crest across Nottingham Estates to approximately the point where Swallow Drive intersects Dalton Trail to north on Dalton Trail to the crest of the Farmer’s Loop Ridge, then follow the geographic crest of Farmer’s Loop Ridge to its intersection with the New Steese Highway, then southeast on Bennet Road, and along Steel Creek Road to the intersection of Chena Hot Springs Road, and Chena Hot Springs Road to the eastern boundary of the EPA designated nonattainment area.

“Air Quality Index” (AQI) is an index for reporting daily air quality, which indicates how polluted the air currently is or how polluted it is forecast to become. The higher the AQI value, the greater the level of air pollution and the greater the health concern. AQI is divided into six categories with correspondingly higher levels of health concern as outlined in the table below:
"Alert" means a notice issued by the [FNSB AIR QUALITY] division when the division determines, using available data or modeling, that [A] PM$_{2.5}$ [VIOLATION OF THE 35 µg/m³ HAS OCCURRED OR WILL LIKELY OCCUR] concentration levels have reached or are forecasted to reach 25µg/m³ or higher for at least 12 consecutive hours.

"Appliance" means a device or apparatus that is manufactured and designed to utilize energy and which does not require a stationary source air quality permit from the state of Alaska under 18 AAC 50.

"Clean wood" means natural wood that has not been painted, varnished, or coated with a similar material, has not been treated with preservatives, and does not contain resins or glues as in plywood or other composite wood products.

"Construction and demolition debris" means a conglomeration of materials from construction, repair, remodeling or demolition of buildings and structures containing any prohibited fuels.

"Cook stove" means a wood burning appliance that is designed primarily for cooking food and that has the following characteristics:

1. An oven, with a volume of 0.028 cubic meters (one cubic foot) or greater, and an oven rack;
2. A device for measuring oven temperatures;
3. A flame path that is routed around the oven;
4. A shaker grate;
5. An ash pan;

<table>
<thead>
<tr>
<th>AQI (Air Quality Index)</th>
<th>AQI Category</th>
<th>Cautionary Statement</th>
<th>Health Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-50</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>51-100</td>
<td>Moderate</td>
<td>Unusually sensitive people should consider reducing prolonged or heavy exertion.</td>
<td>None</td>
</tr>
<tr>
<td>101-150</td>
<td>Unhealthy for Sensitive Groups</td>
<td>People with respiratory or heart disease, the elderly, and children should limit prolonged exertion.</td>
<td>Increasing likelihood of respiratory symptoms in sensitive individuals; aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.</td>
</tr>
<tr>
<td>151-200</td>
<td>Unhealthy</td>
<td>People with respiratory or heart disease, the elderly, and children should avoid prolonged exertion; everyone else should limit prolonged exertion.</td>
<td>Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly: increased respiratory effects in general population.</td>
</tr>
<tr>
<td>201-300</td>
<td>Very Unhealthy</td>
<td>People with respiratory or heart disease, the elderly, and children should avoid outdoor activity; everyone else should avoid prolonged exertion.</td>
<td>Significant aggravation of the heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly: significant increase in respiratory effects in the general population.</td>
</tr>
<tr>
<td>301-500</td>
<td>Hazardous</td>
<td>Everyone should avoid any outdoor exertion; people with respiratory or heart disease; the elderly and children should remain indoors.</td>
<td>Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly: significant increase in respiratory effects in the general population.</td>
</tr>
</tbody>
</table>

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
6. An ash clean-out door below the oven; and
7. The absence of a fan or heat channels to dissipate heat from the device.

“Division” means the Fairbanks North Star Borough air quality division.

“Emergency Power System” is an independent source of electrical power that supports important electrical systems on loss of normal power supply. An emergency power system may include a standby generator, batteries, and other apparatus. Emergency power systems are installed to protect life and property from the consequences of loss of normal electric power supply.

“EPA” means the United States Environmental Protection Agency.

“EPA certified” means that the solid fuel burning appliance meets emission performance standards when tested by an accredited independent laboratory and is labeled according to procedures specified by the EPA in 40 CFR Part 60 Subpart AAA or QQQQ.

"EPISODE" MEANS WHEN CONDITIONS REACH OR ARE PREDICTED TO REACH ADVISORY OR ALERT STATUS.

“Fireplace” means an assembly consisting of a hearth and open fire chamber of noncombustible factory-built or masonry materials and provided with a chimney, for use with solid fuels, which cannot be operated with an air to fuel ratio of less than 35 to one.

“Fireplace insert” means a solid fuel burning appliance similar in function and performance to a freestanding wood burning stove, which is made from cast iron or steel designed to be installed in an existing masonry or prefabricated fireplace.

“Forecast” means a description of the current dispersion conditions described as good, fair, or poor and including the expected PM$_{2.5}$ [CONCENTRATIONS EXPRESSING IN MICROGRAMS PER CUBIC METER] NowCast AQI categorized as good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, or hazardous.

“Heating appliances” means, but is not limited to: [OIL FURNACES, GAS FURNACES, WOOD STOVES, COAL STOVES, WOOD-FIRED HYDRONIC HEATERS, WOOD-FIRED FURNACES, COAL-FIRED HYDRONIC HEATERS, COAL-FIRED FURNACES] wood, coal, or pellet fired hydronic heaters, stoves, and furnaces; oil or gas fired boilers and furnaces; and masonry heaters, pellet stoves, cook stoves, and fireplaces.

“Hydronic” means having to do with a system moving heat from one location to another by means of the circulation of a heat transfer liquid through piping or tubing.
“Hydronic heater” means a fuel burning appliance designed to (1) burn wood or other solid fuels and (2) heat building space and/or domestic hot water via the distribution, typically through pipes, of a fluid heated in the appliance.

“Masonry heater” means a wood burning appliance that complies with the guidelines of ASTM E1602-08, Standard Guide for Construction of Masonry Heaters, and:

1. Is designed and intended for operation only in a closed combustion chamber configuration; and
2. Has enough thermal storage capacity to maintain no less than 50.0 percent of the maximum masonry-mass temperature for at least four hours after the maximum masonry-mass temperature has been reached; and
3. The masonry heater design and installation has been confirmed and documented by a qualified person or entity approved by the borough.

“Nonattainment area” is the area depicted on the map attached to the ordinance codified in this chapter and is further defined as follows:

Township Range Delineated Boundary for the Fairbanks Nonattainment Area

MTRS F001N001 – All Sections, MTRS F001N001E – Sections 2-11, 14-23, 26-34, MTRS F001N002 – Sections 1-5, 8-17, 20-29, 32-36, MTRS F001S001E – Sections 1, 3-30, 32-36, MTRS F001S001W – Sections 1-30, MTRS F001S002E – Sections 6-8, 17-20, 29-36, MTRS F001S002W – Sections 1-5, 8-17, 20-29, 32-33, MTRS F001S003E – Sections 31-32, MTRS F002N001E – Sections 31-35, MTRS F002N001 – Sections 28, 31-36, MTRS F002N002 – Sections 32-33, 36, MTRS F002S001E – Sections 1-2, MTRS F002S002E – Sections 1-17, 21-24, MTRS F002S003E – Sections 5-8, 18.

“NowCast” means a weighted average of hourly air monitoring data used by the EPA for real-time reporting of the AQI for PM.

“Opacity” means the reduction in transmitted light through a column of smoke as measured by an observer certified in using EPA Reference Method 9 as defined by federal law or EPA approved Alternative Method 82 which is defined as American Society for Testing and Materials (ASTM) D 7520-09.

“Particulate matter” or “PM” means total particulate matter including PM$_{10}$ and PM$_{2.5}$ (condensable and noncondensable fraction) and is a complex airborne mixture of extremely small particles and liquid droplets that are made up of a number of components, including acids, organic chemicals, metals, soil, or dust.
“Pellet fuel burning appliance” or “pellet stove” means a closed combustion, vented pellet burning appliance with automatic components creating an active air flow system, sold with the hopper and auger combination as integral parts, and designed, warranted, safety listed, and advertised by the manufacturer specifically to be fueled by pellets of sawdust, wood products and other biomass materials while prohibiting the use of cordwood.

“PM$_{2.5}$” means particulate matter comprised of particles that have diameters of two and one-half microns or less.

“Sale” means the transfer of ownership or control.

“Solid fuel burning appliance” (SFBA) means any appliance[, UNLESS SPECIFICALLY EXCLUDED FROM THIS DEFINITION,] designed to produce heat by burning nongaseous and nonliquid fuels. This definition includes, but is not limited to:

1. Wood stoves;
2. Coal stoves;
3. Wood-fired hydronic heaters;
4. Wood-fired furnaces;
5. Coal-fired hydronic heaters;
6. Coal-fired furnaces; [AND]
7. Fireplace inserts[.];
8. Pellet fuel burning appliances;
9. Masonry Heaters;
10. Cook Stoves; and
11. Fireplaces.

THE FOLLOWING APPLIANCES ARE SPECIFICALLY EXCLUDED FROM THIS DEFINITION:

1. MASONRY HEATERS;
2. PELLET FUEL BURNING APPLIANCES;
3. COOK STOVES; AND
4. FIREPLACES.]

“Waste oil burning appliance” means an appliance that burns used or waste oil.

Section 3. FNSBC 21.28.020, Borough listed appliances, shall be amended as follows:

A solid fuel burning appliance shall be listed by the borough if:

A. The solid fuel burning appliance is EPA certified [CERTIFIED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)] as meeting the federal emissions rate of 2.5 grams of PM$_{2.5}$ per hour or less, or for hydronic heaters, [MEETS PHASE II
QUALIFICATIONS] is EPA certified and has an emission rating of 0.10 pounds per million BTU or less. FOR PURPOSES OF THIS SECTION, “CERTIFIED” MEANS THAT THE SOLID FUEL BURNING APPLIANCE MEETS EMISSION PERFORMANCE STANDARDS WHEN TESTED BY AN ACCREDITED INDEPENDENT LABORATORY AND LABELED ACCORDING TO PROCEDURES SPECIFIED BY THE EPA IN 40 CFR 60 SUBPART AAA; or

B. The solid fuel burning appliance is a masonry heater, cook stove, or fireplace; or

C. The solid fuel burning appliance is tested, including by use of a handheld or other portable device, by an accredited independent laboratory, or other qualified person or entity approved by the borough, establishing that it meets the emissions rate of 2.5 grams per hour or less. [OR FOR HYDRONIC HEATERS THE APPLIANCE HAS AN EMISSION RATING OF 0.1 POUNDS PER MILLION BTU OR LESS.]

Section 4. FNSBC 21.28.030, Prohibited acts, shall be amended as follows:

A. Installation of Certain Solid Fuel Burning Appliances in the Nonattainment Area. Within the nonattainment area no person shall install or allow the installation of a solid fuel burning appliance unless it is listed by the borough as qualifying under this chapter and the installation complies with all other requirements imposed in this chapter. It is a separate violation to fail to remove a solid fuel burning appliance installed in violation of this chapter.

B. No person who has been convicted of or pled no contest to two or more violations of this chapter involving visible emissions or emissions crossing property lines shall, in the air quality control zone, operate, use or keep installed a hydronic heater unless the hydronic heater is:

1. Borough listed or was listed at the time of installation,
2. A closed combustion system with automatic components that feed solid fuel, including wood pellets, into a firebox where the combustion is enhanced by an active airflow system, or
3. Connected to a thermal mass system that is certified by the contractor or installer as sufficient to allow the hydronic heater to burn at maximum capacity minimizing on/off cycling. The division may require an owner to provide documentation supporting the certification.

This prohibition shall be effective 90 days after the second conviction or entry [OR] of a no contest plea.

[ALL PERSONS OWNING AND SELLING THEIR PROPERTY WITHIN THE AIR QUALITY CONTROL ZONE WITH AN INSTALLED NON-EPA-CERTIFIED SOLID FUEL BURNING APPLIANCE THAT WILL NOT BE REMOVED BEFORE SALE MUST PROVIDE A WRITTEN DISCLOSURE TO THE BUYER PRIOR TO CLOSING, AND A

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]

Fairbanks North Star Borough, Alaska

ORDINANCE NO. 2017-18

Appendix III.D.7.7-5223
COPY TO THE DIVISION NO LATER THAN 10 DAYS AFTER THE RECORDING OF THE SALE.)

C. Visible Emissions Standard in the Air Quality Control Zone.
   1. Standard. No person shall cause, permit, or allow particulate emissions from a nonmobile source in the air quality control zone to create opacity greater than 20 percent for a period or periods aggregating more than 10 minutes in any hour except during the first 40[30] minutes after the initial firing when the opacity limit shall be less than 50 percent.
   2. Procedures and Enforcement. When ambient weather and light conditions permit, methods and procedures specified by the EPA in 40 CFR 60 Appendix A Reference Method 9 (Visual determination of the Opacity of Emissions From Stationary Sources), or an alternative technology that replaces Method 9, when the technology is available and the choice is feasible, upon request of the person being investigated, shall be used to determine compliance with this section. Smoke visible from a chimney, flue or exhaust duct in excess of the opacity standard for a period in excess of 30 minutes shall constitute prima facie evidence of unlawful operation of an applicable solid fuel burning appliance.

D. PM$_{2.5}$ Emissions Crossing Property Lines. No person shall cause or permit particulate emissions from a nonmobile source to impact the resident(s) of a neighboring property through the creation of an emissions plume that:
   1. Crosses a property line;
   2. Is observable using EPA Method 22 (40 CFR 60 Appendix A); and
   3. Is 25 g/m$^3$ greater than the surrounding immediate vicinity background PM$_{2.5}$ level using methods defined by the borough division of air quality. For purposes of this subsection, the surrounding “immediate vicinity” means land within an area measured 1,200 feet in all directions from the boundaries of the emitting property.

E. Borough-Wide Installation Requirements for Hydronic Heaters.
   1. Setback. Unless permitted by a variance, [INSTALLING AN APPROVED PELLET FUEL BURNING APPLIANCE]or if replacing an existing hydronic heater with a listed appliance, no person shall install or allow the installation of a hydronic heater located less than:
      a. Three hundred thirty feet from the closest property line; or
      b. Six hundred sixty feet from a school, clinic, hospital, or senior housing unit.
   2. Any hydronic heater installed in violation of this section shall be immediately remedied or made inoperable and removed as soon as practicable; however, in no case shall the time of removal be longer than 180 days after notice from the division of a violation.

F. Prohibited Fuels. No person shall burn in the borough any fuel, except coal in an appliance designed to use coal, which is not listed in the manufacturer’s owner’s

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
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manual as an acceptable fuel for that device or any of the following items in a solid fuel burning appliance:

1. Any wood that does not meet the definition of clean wood or has more than 20 percent moisture content;
2. Garbage;
3. Tires;
4. Materials containing plastic or rubber;
5. Waste petroleum products;
6. Paints and paint thinners;
7. Chemicals;
8. Glossy or colored papers;
9. Construction and demolition debris;
10. Plywood;
11. Particleboard;
12. Saltwater driftwood;
13. Manure;
14. Animal carcasses;
15. Asphalt products;
16. Flooring products.

G. Sales or Leasing of Solid Fuel Burning Appliances.
1. No person shall sell or lease an unlisted solid fuel burning appliance or barrel stove kit in the borough [THAT DOES NOT MEET THE EMISSIONS LIMITS ESTABLISHED IN FNSBC 21.28.020(A)] unless the buyer signs an affidavit, on a form prescribed by the borough, attesting that the appliance will not be installed or used in the air quality control zone. This section does not apply to appliances or stoves that transfer pursuant to a sale of property;
2. No person shall commercially sell or offer for sale or lease a solid fuel burning appliance in the borough unless the commercial seller or dealer provides the prospective buyer or lessee, prior to any sales or lease agreement, with a written notice, prepared or approved by the division, that includes, but is not limited to, the following:
   a. The fuel restrictions imposed in this chapter;
   b. Proper installation, property location, operation, and maintenance of the appliance;
   c. An advisory statement noting that operation of solid fuel burning appliances may not be appropriate in some areas due to terrain, meteorological conditions, or other relevant conditions that render the operation of the appliance a public nuisance or health hazard even though it is otherwise legally installed and operated;
3. The written notice required in this section shall be signed and dated by the prospective buyer or lessee prior to purchase or lease to indicate receipt of the notification requirements of this section;
4. The commercial dealer or seller shall mail or otherwise provide a copy of the notice[,] and any required affidavit[,] to the division within 30 days of the sale. All

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
commercial dealers or sellers shall also include with the notice documentation showing whether the appliance sold or leased meets the borough’s emissions standard.

H. **Nuisance.** No person within the Fairbanks North Star Borough shall cause or allow particulate emissions from a nonmobile source that are injurious to human life or to property or that unreasonably interfere with the comfortable enjoyment of life or property. No person within the Fairbanks North Star Borough shall operate a solid fuel or waste oil burning appliance in a manner so as to create a public or private nuisance. A violation of a provision of this chapter is hereby declared to be a nuisance.

I. **Other Laws.** Nothing in this section precludes other local jurisdictions from having more restrictive codes.

J. **Penalties.** Upon first conviction of an offense in this chapter, the penalty(ies)/fine(s) set forth in FNSBC Title 1 regarding violations of the PM2.5 air quality control program may be satisfied by completion within 60 days of a borough-approved class covering PM2.5 health concerns, nonattainment, importance of dry wood and proper operation of solid fuel burning appliances. The borough may on its own initiative file notice of satisfaction of attendance requirements with the court, or the defendant may file a certificate of completion with the court within the applicable time frame.

Section 5. FNSBC 21.28.040, **Enhanced voluntary removal, replacement and repair program**, shall be amended as follows:

The Fairbanks North Star Borough shall, to the extent funds are available and appropriated by the assembly, offer an enhanced removal, replacement and repair program to help offset the costs of removing, replacing or repairing a solid fuel burning appliance (SFBA) or fireplace. This program shall be subject to the following eligibility requirements, conditions, and criteria:

A. **General Requirements.**

1. **Application.** An application approved by the division and signed by all property owner(s) must be submitted along with any documentation required by the division. Applications for either the removal of a solid fuel burning appliance (SFBA), or replacement of a SFBA with an emergency power system, or an appliance designed to use natural gas, propane, or home heating oil shall include a signed recordable document restricting future installations of SFBAs[SOLID FUEL BURNING APPLIANCES] and requiring appropriate notice to purchasers in the seller’s disclosure statement. Applicants must fully comply with the division’s inspection process which shall verify the existence of a qualifying SFBA [OR FIREPLACE].

2. **Priority Ranking.** Applications may be prioritized and may be limited by the division in its discretion based on geographical location, the overall air quality benefit and the type of SFBA or fireplace being removed, replaced or repaired.
3. Eligibility. The program is limited to properties within the air quality control zone boundary in which a qualifying SFBA or fireplace is installed. If an application is approved for the program, the applicant will be given up to 90 days to meet all of the requirements. Applicants must have no delinquent property tax or penalty or interest owing at the time of application and at completion of the program requirements.

4. Additional Requirements. In addition to the general requirements set forth in this section, applicants must also meet the following requirements:
   a. Fully comply with the inspection process required by the division that shall ensure that the existence of the qualifying appliance to be removed, replaced or repaired is properly documented.
   b. Removal of appliance.
   c. Delivery of appliance to an authorized decommission station.
   d. Certificate of destruction delivered to the division, if applicable.
   e. Final installation of a qualified appliance visually verified.
   f. All aspects of this section may be performed by borough-approved personnel or a borough-approved vendor.

5. Payments. Applicants will be eligible for reimbursements or, at the option of the applicant, payment may be made directly to a borough-approved vendor. Reimbursements and payments shall be available as follows:
   a. Replacement of a hydronic heater:
      i. With either an EPA-certified wood or pellet stove with an emission rate less than or equal to two grams of PM$_{2.5}$ per hour, or an EPA phase II certified pellet burning hydronic heater with an emission rate equal to or less than 0.1 pounds per million BTU, or an emergency power system, up to $10,000 for purchase and installation [OF THE APPLIANCE].
      ii. With an appliance designed to use home heating oil (excluding waste or used oil) or a masonry heater (including parts, labor and any costs associated with upgrading the chimney to the extent required by the manufacturer of the appliance for proper installation), up to $12,000 for purchase and installation of the appliance.
      iii. With an appliance designed to use natural gas, propane, hot water district heat, or electricity, up to $14,000 for purchase and installation of the appliance.
   b. Replacement of a non-borough-listed SFBA [OR FIREPLACE]:
      i. With either an EPA-certified wood stove, or fireplace insert that has an emission rate less than or equal to two grams of PM$_{2.5}$ per hour, or in the case of an EPA-certified wood stove, PM$_{2.5}$ emissions must be reduced by 50 percent and emit two grams of PM$_{2.5}$ per hour or less, up to $4,000 for purchase and installation of the appliance.
      ii. With an EPA certified pellet stove that has an emission rate less than or equal to two grams of PM$_{2.5}$ per hour, [APPLIANCE DESIGNED TO USE PELLETS], up to $5,000 for purchase and installation of the appliance.
iii. With an appliance designed to use home heating oil (excluding waste oil), hot water district heat, electricity, or a masonry heater (including parts, labor and any costs associated with upgrading the chimney to the extent required by the manufacturer of the appliance for proper installation), or an emergency power system, up to $6,000 for the purchase and installation [OF THE APPLIANCE].

iv. With an appliance designed to use natural gas or propane, up to $10,000 per purchase and installation of the appliance. Multiple non-borough-listed solid fuel burning appliances or fireplaces, or combinations thereof, may be replaced with a single heating device that meets the requirements above, except for those that are fired by solid fuels. Payment will be based on the number of devices removed, up to a maximum of three, and may not exceed the replacement cost.

c. Removal of a SFBA (limited to a one-time participation in this program per property).

i. Removal of a hydronic heater through a one-time payment of $5,000.

ii. Removal of other SFBAs through a one-time payment of $2,000.

[CASH PAYMENT

$5,000 – IF REMOVING HYDRONIC HEATER
$2,000 – IF REMOVING OTHER SFBAS]

d. Repair Program.

i. The repair program will pay for the:

(A) Replacement of a wood stove’s catalytic converter that has exceeded its life span through the one-time payment of up to $750.00.

(B) Replacement of any emissions-reducing component of an EPA-certified wood stove up to the maximum amount of $750.00.

ii. In addition to the general requirements set forth in this section, applicants must fully comply with any inspection process required by the division, which may be performed by a borough-approved vendor.

Section 6. FNSBC 21.28.050, Forecasting exceedances and restrictions in the air quality control zone during an alert, shall be amended as follows:

A. During the winter months of October through March, the borough shall issue a daily PM$_{2.5}$ forecast by 4:30 p.m. When the PM$_{2.5}$ concentration reaches the onset level for an alert [EPISODE] and is expected to remain at that level for 12 hours or more, an alert [OR ADVISORY] will be declared. An alert [OR ADVISORY] may apply to the air quality control zone as a whole, or to one or more sub-areas designated by the division. Once an alert [OR ADVISORY] is declared, PM$_{2.5}$ control measures set forth in this section shall be implemented and continued until the alert [OR ADVISORY] is cancelled. There are [THREE] two levels of [EPISODES] alerts: Stage 1[,] and Stage 2 [AND 3]. The obligations imposed in this subsection do not require, absent specific funding for that purpose, any actions to be taken outside of the borough’s normal

*AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT*

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business days and hours of operation. These restrictions shall not apply during a power
failure. When an alert is in effect, outdoor burning is prohibited, including nonpermitted
incinerators and burn barrels. This outdoor burning prohibition does not include
recreational fires such as bonfires, campfires, or ceremonial fires and the use of fire
pits.

B. The division will notify local media to ensure the declared alert [OR ADVISORY] is broadcast. The division shall also use social media and methods of direct communication such as text messages as feasible. Information within the notification will contain the PM\textsubscript{2.5} forecast, stage level for areas, and actions required to reduce sources of PM\textsubscript{2.5}. The obligations imposed in this subsection do not require, absent specific funding for that purpose, any actions to be taken outside of the borough’s normal business days and hours of operation.


1. A Stage 1 AIR ADVISORY IS IMPLEMENTED WHEN CONCENTRATIONS EXCEED OR ARE FORECASTED TO EXCEED 25 µG/M\textsuperscript{3}.

2. RESIDENTS SHALL BE REQUESTED TO VOLUNTARILY STOP OPERATION OF SOLID FUEL, PELLET, AND WASTE OIL BURNING APPLIANCES, AS WELL AS MASONRY HEATERS AND ALL OUTDOOR BURNING THAT INCLUDES RECREATIONAL FIRES SUCH AS BONFIRES, CAMPFIRES AND THE USE OF FIRE PITS, NONPERMITTED INCINERATORS AND BURN BARRELS IN THE AIR QUALITY CONTROL ZONE.

D. STAGE 2: REQUIRED RESTRICTIONS IN THE AIR QUALITY CONTROL ZONE DURING AN ALERT.]

1. A Stage 1 [2] air alert is implemented when concentrations exceed or are forecasted to exceed 25 [35] µg/m\textsuperscript{3}.

2. Burning is permitted in all EPA-certified solid fuel burning appliances, and EPA [PHASE II QUALIFIED] certified hydronic heaters, [WITH AN ANNUAL AVERAGE EMISSION RATING OF 2.5 GRAMS OR LESS] masonry heaters, [PELLET FUEL BURNING APPLIANCES,] and cook stoves, [AND FIREPLACES]. No fuel source may be added to the combustion chamber or firebox of any solid fuel burning appliance or waste oil burning appliance not listed above. Residents should rely instead on their home’s alternate, cleaner source of heat (such as a gas or fuel oil fired furnace or boiler or electric baseboard heaters) until the Stage 1 [2] air alert is cancelled.

3. If a building owner or other person with a property or managerial interest in the building has an approved “no other adequate source of heat” designation, the building owner is exempted from complying with the Stage 1 [2] air alert restrictions for that building.

4. OUTDOOR BURNING IS PROHIBITED INCLUDING NONPERMITTED INCINERATORS AND BURN BARRELS. THIS DOES NOT INCLUDE...
RECREATIONAL FIRES SUCH AS BONFIRES, CAMPFIRES OR CEREMONIAL FIRES AND THE USE OF FIRE PITS.

5. THESE RESTRICTIONS SHALL NOT APPLY DURING A POWER FAILURE.]

D[E]. Stage 2 [3]: Required Restrictions in the Air Quality Control Zone during an Alert.

1. A Stage 2 [3] air alert is implemented when concentrations exceed or are forecasted to exceed 35 [55] µG/M³.

2. No fuel source may be added to the combustion [S] chamber or firebox of any solid fuel burning appliance [S, MASONRY HEATERS, PELLET FUEL BURNING APPLIANCES, COOK STOVES, FIREPLACES] or waste oil burning appliance [S. NO WASTE OIL MAY BE ADDED TO A WASTE OIL BURNING APPLIANCE]. Residents should rely instead on their home’s alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) until the Stage 2 [3] air alert is cancelled.

3. If a building owner or other person with a property or managerial interest in the building has an approved “no other adequate source of heat” designation the building owner is exempted from complying with the Stage 2 [3] air alert restrictions for that building.

4. OUTDOOR BURNING IS PROHIBITED INCLUDING NONPERMITTED INCINERATORS AND BURN BARRELS. THIS DOES NOT INCLUDE RECREATIONAL FIRES SUCH AS BONFIRES, CAMPFIRES OR CEREMONIAL FIRES AND THE USE OF FIRE PITS.

5. THESE RESTRICTIONS SHALL NOT APPLY DURING A POWER FAILURE. OR TO EPA-CERTIFIED SOLID FUEL BURNING APPLIANCES, EPA PHASE II QUALIFIED HYDRONIC HEATERS WITH AN ANNUAL AVERAGE EMISSION RATING OF 2.5 GRAMS OR LESS, MASONRY HEATERS OR PELLET FUEL BURNING APPLIANCES WHEN THE TEMPERATURE IS BELOW -15 FAHRENHEIT AS RECORDED AT THE FAIRBANKS INTERNATIONAL AIRPORT.]

Section 7. FNSBC 21.28.060, **No other adequate source of heat determination**, shall be amended as follows:

A. A building owner or other person with a property or managerial interest in a building located within the air quality control zone may obtain a “no other adequate source of heat” determination from the division if:

1. [1] The SFBA being used to heat the structure is EPA certified, unless an application has been made to the Enhanced Voluntary Removal, Replacement and Repair Program (FNSBC 21.28.040) to remove or replace the non-certified SFBA and it has been denied, a pellet fuel burning appliance installed prior to April 1, 2017, a masonry heater, or a cook stove;

2. The building owner(s) or other person with a property or managerial interest in the building applies with the division on a form developed by the division;

3. The building owner(s) or other person with a property or managerial interest in the building files an affidavit with the application that the subject structure must be heated and the structure has no adequate heating source without using a solid
fuel or waste oil burning appliance or that economic hardships require the applicant’s use of a solid fuel or waste oil burning appliance or complying with a restriction would result in damage to property including damage to the appliance itself and its heating system components; and

[3]4. The building was constructed on or before December 31, 2016.

B. There shall be no fee for applying for or obtaining a determination.

C. It shall be a violation to submit a false affidavit for a “no other adequate source of heat” determination.

D. If the “no other adequate source of heat” appliance does not meet the standards set in this chapter, the division shall provide the applicant with information concerning the borough’s voluntary removal, replacement and repair program.

E. Applications denied by the division may be appealed to the air pollution control commission within 30 days of the decision.

F. An applicant that has been denied a “no alternative source of heat determination” by the division because the appliance does not meet the criteria of this section may apply to the air pollution control commission for a variance within 10 days of this decision. A temporary “no alternative source of heat” determination shall be granted pending the decision of the commission. In determining whether to grant a variance, the commission shall consider the location of the appliance, impact on surrounding neighborhood, emission levels of the appliance, the financial investment and ability of the applicant to replace the appliance and any other relevant conditions that indicate the operation of the appliance at that location is not a nuisance or health-hazard. If the commission denies a variance, the “no alternative source of heat” determination shall expire 60 days from the date of denial.

Section 8. FNSBC 21.28.070, Voluntary burn cessation program, is repealed as follows:

[THE FAIRBANKS NORTH STAR BOROUGH WILL, TO THE EXTENT FUNDS ARE AVAILABLE AND APPROPRIATED BY THE ASSEMBLY, ESTABLISH A PROGRAM TO ENCOURAGE, INCENTIVIZE, AND FACILITATE THE VOLUNTARY CESSATION OF THE USE OF WOOD BURNING APPLIANCES (I.E., WOOD STOVES, WOOD-FIRED HYDRONIC HEATERS, WOOD-FIRED FURNACES, FIREPLACES, FIREPLACE INSERTS, MASONRY HEATERS OR PELLET FUEL BURNING APPLIANCES) IN THE AIR QUALITY CONTROL ZONE DURING AIR QUALITY ALERTS. IT IS RECOGNIZED THAT IT WILL BE DIFFICULT OR IMPOSSIBLE FOR SOME HOUSEHOLDS TO PARTICIPATE IN THIS PROGRAM (E.G., THOSE THAT HEAT SOLELY WITH WOOD OR FOR WHICH WOOD IS A NECESSARY SUPPLEMENT DURING PERIODS OF COLD WEATHER).]
THEREFORE, THIS PROGRAM IS INTENDED FOR HOUSEHOLDS THAT ARE ABLE TO USE SPACE HEATING ALTERNATIVES WITH SIGNIFICANTLY LOWER PM$_{2.5}$ EMISSIONS, INCLUDING THOSE FUELED BY GAS, OIL, ELECTRICITY, PROPANE OR DISTRICT HEAT, BUT NOT WOOD OR PELLET STOVES OR OTHER WOOD BURNING APPLIANCES. THIS PROGRAM WILL AT A MINIMUM CONSIST OF THE FOLLOWING COMPONENTS:

A. THE BOROUGH MAY CONTRACT WITH AN AGENCY THAT WILL PROVIDE SERVICES TO PROMOTE THE PROGRAM. THIS AGENCY MUST HAVE THE STANDING, EXPERIENCE, AND CAPABILITY TO CARRY OUT A CAMPAIGN TO ADVERTISE, REACH OUT, AND ATTRACT A LARGE NUMBER OF PARTICIPANTS IN THE NONATTAINMENT AREA WHO ARE WILLING TO CEASE THE USE OF A WOOD BURNING APPLIANCE DURING AIR QUALITY ALERTS.

B. FACILITATION OF THIS PROGRAM BY THE BOROUGH WILL INCLUDE, BUT NOT BE LIMITED TO, THE PROVISION OF NOTICE OF AIR QUALITY ALERTS TO INDIVIDUAL HOUSEHOLDS BY METHODS SUCH AS ELECTRONIC MAIL MESSAGES, TEXT MESSAGES, AUTOMATED PHONE CALLS, NOTICES TO RADIO AND TELEVISION STATIONS, AND INFORMATION POSTED ON ELECTRONIC READER OR DISPLAY BOARDS LOCATED THROUGHOUT THE BOROUGH IN LOCATIONS BEST SUITED TO NOTIFY RESIDENTS OF AIR QUALITY ALERTS.

C. PRIVATE CONTRIBUTIONS, INCLUDING GOODS AND/OR SERVICES, WILL BE SOUGHT FOR ALL APPROPRIATE ELEMENTS OF THE PROGRAM. IN GENERAL THIS WILL FOCUS ON THE PROVISION OF MATERIALS, EQUIPMENT, AND CERTAIN ONE-TIME SERVICES, BUT NOT TO FUND BOROUGH STAFF POSITIONS.]

Section 9. FNSBC 1.20.080, Fine Schedule, is hereby amended as follows:

<table>
<thead>
<tr>
<th>Code Section</th>
<th>Offense</th>
<th>Penalty/Fine</th>
<th>Mandatory Warning Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>[21.28.030(B)</td>
<td>FAILURE TO DISCLOSE AN UNLISTED APPLIANCE BEFORE SALE</td>
<td>$500.00</td>
<td>NO</td>
</tr>
<tr>
<td>21.28.050<a href="C">(D)</a></td>
<td>Violation of a Stage [2]1 air alert restriction.</td>
<td>$500</td>
<td>Yes</td>
</tr>
<tr>
<td>21.28.050<a href="D">(E)</a></td>
<td>Violation of a Stage [3]2 air alert restriction.</td>
<td>$1,000</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Section 10. Effective Date. This ordinance shall be effective thirty days following its adoption.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
PASSED AND APPROVED THIS 9TH DAY OF MARCH, 2017.

___________________________
Kathryn Dodge
Presiding Officer

ATTEST:

Nanci Ashford-Bingham
Borough Clerk

Yeses: Cooper, Quist, Gray, Lawrence, Dodge, Davies
Noes: Roberts, Sattley
Other: Tacke (Excused)
FAIRBANKS NORTH STAR BOROUGH

ORDINANCE NO. 2017-44

AN ORDINANCE AMENDING CHAPTER 21.28 FNSBC REGARDING THE PM2.5 AIR QUALITY CONTROL PROGRAM, AMENDING TITLE 4 REGARDING AIR POLLUTION CONTROL COMMISSION DUTIES, AMENDING FNSBC 1.20.080, FINE SCHEDULE, AND AMENDING APPENDIX E—USER FEE SCHEDULE/TRANSPORTATION OF ORDINANCE NO. 2017-20 (FY 2017-18) TO ADD PERMIT APPLICATION FEES FOR SOLID FUEL BURNING APPLIANCES IN NEW CONSTRUCTION

WHEREAS, The United States Environmental Protection Agency (EPA) in December 2009, declared part of the Fairbanks North Star Borough (Borough) a non-attainment area for fine particulate pollution (PM2.5); and

WHEREAS, On December 16, 2016 the EPA published public notice in the Federal Register of its intent to reclassify the Borough non-attainment area from Moderate to Serious status, and the Final Rule was signed on April 28, 2017; and

WHEREAS, The serious non-attainment designation requires a new serious State Implementation Plan (SIP) to be submitted to the EPA by December 31, 2017 which must include implementation of all Best Available Control Measures (BACM); and

WHEREAS, The Borough should consider implementing some of the control measures by June 2017 so goodwill for these control measures can be recognized in the Serious SIP.

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
Section 1. Sections 2, 3, 4, 5, 6, 7, and 8 of this ordinance are of a general and permanent nature and shall be codified. Sections 9 and 10 of this ordinance are not of a general and permanent nature and shall not be codified.

Section 2. FNSBC 21.28.010, Definitions, shall be amended as follows:

"Air quality control zone" means the area of the borough currently contained in the EPA designated nonattainment area, which uses the nonattainment area southern, western and eastern boundaries as modified by their respective intersection with the following northern boundary described as: beginning at the intersection of Isberg Road with Chena Ridge Road on the western boundary of the EPA designated nonattainment area, then following Chena Ridge Road back to Chena Pump Road and continuing north on the Parks Highway to Sheep Creek Road, then Sheep Creek Road to Miller Hill Road, then north on Miller Hill Road, then east on Yankovich, then north from Yankovich Road along the east boundary of the Large Animal Research Station to a point just north of its intersection with Nottingham Drive and follows the ridge crest across Nottingham Estates to approximately the point where Swallow Drive intersects Dalton Trail to north on Dalton Trail to the crest of the Farmer's Loop Ridge, then follow the geographic crest of Farmer's Loop Ridge to its intersection with the New Steese Highway, then southeast on Bennett Road, and along Steele Creek Road to the intersection of Chena Hot Springs Road, and Chena Hot Springs Road to the eastern boundary of the EPA designated nonattainment area.

"Air quality index" (AQI) is an index for reporting daily air quality, which indicates how polluted the air currently is or how polluted it is forecast to become. The higher the AQI value, the greater the level of air pollution and the greater the health concern. AQI is divided into six categories with correspondingly higher levels of health concern as outlined in the table below:

<table>
<thead>
<tr>
<th>AQI (Air Quality Index)</th>
<th>AQI Category</th>
<th>Cautionary Statement</th>
<th>Health Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 50</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>51 – 100</td>
<td>Moderate</td>
<td>Unusually sensitive people should consider reducing prolonged or heavy exertion.</td>
<td>None</td>
</tr>
<tr>
<td>101 – 150</td>
<td>Unhealthy for Sensitive Groups</td>
<td>People with respiratory or heart disease, the elderly, and children should limit prolonged exertion.</td>
<td>Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and</td>
</tr>
</tbody>
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*AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT*

Text to be *added* is underlined
Text to be *deleted* is [BRACKETED, CAPITALIZED]
<table>
<thead>
<tr>
<th>AQI (Air Quality Index)</th>
<th>AQI Category</th>
<th>Cautionary Statement</th>
<th>Health Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>151 – 200</td>
<td>Unhealthy</td>
<td>People with respiratory or heart disease, the elderly, and children should avoid prolonged exertion; everyone else should limit prolonged exertion.</td>
<td>Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.</td>
</tr>
<tr>
<td>201 – 300</td>
<td>Very Unhealthy</td>
<td>People with respiratory or heart disease, the elderly, and children should avoid outdoor activity; everyone else should avoid prolonged exertion.</td>
<td>Significant aggravation of the heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in the general population.</td>
</tr>
<tr>
<td>301 – 500</td>
<td>Hazardous</td>
<td>Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.</td>
<td>Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in the general population.</td>
</tr>
</tbody>
</table>

"Alert" means a notice issued by the division when the division determines, using available data or modeling, that PM2.5 concentration levels have reached or are forecasted to reach 25 μg/m³ or higher for at least 12 consecutive hours.

"Appliance" means a device or apparatus that is manufactured and designed to utilize energy and which does not require a stationary source air quality permit from the state of Alaska under 18 AAC 50.

"Clean wood" means natural wood that has not been painted, varnished, or coated with a similar material, has not been treated with preservatives, and does not contain resins or glues as in plywood or other composite wood products.

"Commence" means (i) begin, or cause to begin, actual on-site construction or (ii) enter into binding agreements or contractual obligations to begin construction, which cannot be cancelled or modified without substantial loss to the owner.

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“Construction and demolition debris” means a conglomeration of materials from construction, repair, remodeling or demolition of buildings and structures containing any prohibited fuels.

“Cook stove” means a wood burning appliance that is designed primarily for cooking food and that has the following characteristics:

1. An oven, with a volume of 0.028 cubic meters (one cubic foot) or greater, and an oven rack;
2. A device for measuring oven temperatures;
3. A flame path that is routed around the oven;
4. A shaker grate;
5. An ash pan;
6. An ash clean-out door below the oven; and
7. The absence of a fan or heat channels to dissipate heat from the device.

“Division” means the Fairbanks North Star Borough air quality division.

“Emergency power system” is an independent source of electrical power that supports important electrical systems on loss of normal power supply. An emergency power system may include a standby generator, batteries, and other apparatus. Emergency power systems are installed to protect life and property from the consequences of loss of normal electric power supply.

“EPA” means the United States Environmental Protection Agency.

“EPA certified” means that the solid fuel burning appliance meets emission performance standards when tested by an accredited independent laboratory and is labeled according to procedures specified by the EPA in 40 CFR Part 60 Subpart AAA or QQQQ.

“Fireplace” means an assembly consisting of a hearth and open fire chamber of noncombustible factory-built or masonry materials and provided with a chimney, for use with solid fuels, which cannot be operated with an air to fuel ratio of less than 35 to one.

“Fireplace insert” means a solid fuel burning appliance similar in function and performance to a freestanding wood burning stove, which is made from cast iron or steel designed to be installed in an existing masonry or prefabricated fireplace.

“Forecast” means a description of the current dispersion conditions described as good, fair, or poor and including the expected PM2.5 NowCast AQI categorized as good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, or hazardous.
"Heating appliances" means, but is not limited to: wood, coal, or pellet fired hydronic heaters, stoves, and furnaces; oil or gas fired boilers and furnaces; and masonry heaters, pellet stoves, cook stoves, and fireplaces.

"Hydronic" means having to do with a system moving heat from one location to another by means of the circulation of a heat transfer liquid through piping or tubing.

"Hydronic heater" means a fuel burning appliance designed to (1) burn wood or other solid fuels and (2) heat building space and/or domestic hot water via the distribution, typically through pipes, of a fluid heated in the appliance.

"Masonry heater" means a wood burning appliance that complies with the guidelines of ASTM E1602-08, Standard Guide for Construction of Masonry Heaters, and:
1. Is designed and intended for operation only in a closed combustion chamber configuration; and
2. Has enough thermal storage capacity to maintain no less than 50.0 percent of the maximum masonry-mass temperature for at least four hours after the maximum masonry-mass temperature has been reached; and
3. The masonry heater design and installation has been confirmed and documented by a qualified person or entity approved by the borough.

"New Construction" means construction of entirely new structures designed for heated occupancy and any structural alteration that adds heated square footage to an existing structure whether or not the structure was previously occupied.

"Nonattainment area" is the area depicted on the map attached to the ordinance codified in this chapter and is further defined as follows:

Township Range Delineated Boundary for the Fairbanks Nonattainment Area

MTRS F001N001 – All Sections, MTRS F001N001E – Sections 2-11, 14-23, 26-34, MTRS F001N002 – Sections 1-5, 8-17, 20-29, 32-36, MTRS F001S001E – Sections 1, 3-30, 32-36, MTRS F001S001W – Sections 1-30, MTRS F001S002E – Sections 6-8, 17-20, 29-36, MTRS F001S002W – Sections 1-5, 8-17, 20-29, 32-33, MTRS F001S003E – Sections 31-32, MTRS F002N001E – Sections 31-35, MTRS F002N001 – Sections 28, 31-36, MTRS F002N002 – Sections 32-33, 36, MTRS F002S001E – Sections 1-2, MTRS F002S002E – Sections 1-17, 21-24, MTRS F002S003E – Sections 5-8, 18.

"NowCast" means a weighted average of hourly air monitoring data used by the EPA for real-time reporting of the AQI for PM.

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“Opacity” means the reduction in transmitted light through a column of smoke as measured by an observer certified in using EPA Reference Method 9 as defined by federal law or EPA approved Alternative Method 82 which is defined as American Society for Testing and Materials (ASTM) D 7520-09.

“Particulate matter” or “PM” means total particulate matter including PM10 and PM2.5 (condensable and noncondensable fraction) and is a complex airborne mixture of extremely small particles and liquid droplets that are made up of a number of components, including acids, organic chemicals, metals, soil, or dust.

“Pellet fuel burning appliance” or “pellet stove” means a closed combustion, vented pellet burning appliance with automatic components creating an active air flow system, sold with the hopper and auger combination as integral parts, and designed, warranted, safety listed, and advertised by the manufacturer specifically to be fueled by pellets of sawdust, wood products and other biomass materials while prohibiting the use of cordwood.

“PM2.5” means particulate matter comprised of particles that have diameters of two and one-half microns or less.

“Proper Wood Storage” means specific and dedicated space to store clean wood in such a manner that the clean wood is not in contact with soil, the top of the clean wood is adequately protected from precipitation, and with airflow available to the clean wood.

“Sale” means the transfer of ownership or control.

“Solid fuel burning appliance” (SFBA) means any appliance designed to produce heat by burning nongaseous and nonliquid fuels. This definition includes, but is not limited to:

1. Wood stoves;
2. Coal stoves;
3. Wood-fired hydronic heaters;
4. Wood-fired furnaces;
5. Coal-fired hydronic heaters;
6. Coal-fired furnaces;
7. Fireplace inserts;
8. Pellet fuel burning appliances;
9. Masonry heaters;
10. Cook stoves; and
11. Fireplaces.

“Waste oil burning appliance” means an appliance that burns used or waste oil.

Section 3. FNSBC 21.28.030 Prohibited acts, shall be amended as follows:

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A. Installation of Certain Solid Fuel Burning Appliances in the Nonattainment Area. Within the nonattainment area no person shall install or allow the installation of a solid fuel burning appliance unless it is listed by the borough as qualifying under this chapter and the installation complies with all other requirements imposed in this chapter. It is a separate violation to fail to remove a solid fuel burning appliance installed in violation of this chapter.

B. No person who has been convicted of or pled no contest to two or more violations of this chapter involving visible emissions or emissions crossing property lines shall, in the air quality control zone, operate, use or keep installed a hydronic heater unless the hydronic heater is:

1. Borough listed or was listed at the time of installation,
2. A closed combustion system with automatic components that feed solid fuel, including wood pellets, into a firebox where the combustion is enhanced by an active airflow system, or
3. Connected to a thermal mass system that is certified by the contractor or installer as sufficient to allow the hydronic heater to burn at maximum capacity minimizing on/off cycling. The division may require an owner to provide documentation supporting the certification.

This prohibition shall be effective 90 days after the second conviction or entry of a no contest plea.

C. Visible Emissions Standard in the Air Quality Control Zone.

1. Standard. No person shall cause, permit, or allow particulate emissions from a nonmobile source in the air quality control zone to create opacity greater than 20 percent for a period or periods aggregating more than 10 minutes in any hour except during the first 40 minutes after the initial firing when the opacity limit shall be less than 50 percent.

2. Procedures and Enforcement. When ambient weather and light conditions permit, methods and procedures specified by the EPA in 40 CFR 60 Appendix A Reference Method 9 (Visual determination of the Opacity of Emissions From Stationary Sources), or an alternative technology that replaces Method 9, when the technology is available and the choice is feasible, upon request of the person being investigated, shall be used to determine compliance with this section. Smoke visible from a chimney, flue or exhaust duct in excess of the opacity standard for a period in excess of 30 minutes shall constitute prima facie evidence of unlawful operation of an applicable solid fuel burning appliance.

D. PM$_{2.5}$ Emissions Crossing Property Lines. No person shall cause or permit particulate emissions from a nonmobile source to impact the resident(s) of a neighboring property through the creation of an emissions plume that:

1. Crosses a property line;

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2. Is observable using EPA Method 22 (40 CFR 60 Appendix A); and
3. Is 25 µg/m³ greater than the surrounding immediate vicinity background PM2.5 level using methods defined by the borough division of air quality. For purposes of this subsection, the surrounding "immediate vicinity" means land within an area measured 1,200 feet in all directions from the boundaries of the emitting property.

E. Requirements for Installation of Solid Fuel Burning Appliances in New Construction.

1. For all new construction that commences on or after January 1, 2018 and is located within the air quality control zone the following will apply:

   a. Installation of a solid fuel burning appliance is prohibited unless a permit has been issued by the division. A permit must be obtained for any solid fuel burning appliance installed in new construction prior to installation of the appliance.

   b. Application. The permit application will require the owner(s) to certify they will meet the following requirements:

      i. The proposed solid fuel burning appliance meets all federal, state, and borough air quality regulations;

      ii. The proposed solid fuel burning appliance meets the requirements of this chapter;

      iii. The proposed solid fuel burning appliance is properly sized for the structure in the opinion of a Borough listed vendor/installer;

      iv. The proposed solid fuel burning appliance will be installed by a Borough listed vendor/installer attesting to proper installation of the device based on the manufacturer's installation manual;

      v. Proper wood storage will be available; and

      vi. Training will be provided to the occupants on proper wood burning techniques.

   c. Permit. An installation permit will be issued upon receipt of an application meeting the requirements of subsection (b) and payment of any required fee. Within 24 months of issuance, the owner must verify with supporting documentation that the requirements of subsection (b) have been completed, upon which an operating permit will be issued. If verification has not been submitted or approved within 24 months the permit application will automatically expire.

   d. After a public hearing, and prior to installation of the solid fuel burning appliance, the air pollution control commission may grant a variance, the commission shall consider any alternate proposal that the applicant submits, the location of the appliance, impact on surrounding neighborhood of the requested variance, emission levels of the appliance, and any other relevant conditions that indicate the operation of the appliance at that location or the requirement that is being varied will not result in a nuisance or health-hazard.

F. Borough-Wide Installation Requirements for Hydronic Heaters.

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Fairbanks North Star Borough, Alaska

ORDINANCE NO. 2017-44
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Appendix III.D.7.7-5241
1. Setback. Unless permitted by a variance, or if replacing an existing hydronic heater with a listed appliance, no person shall install or allow the installation of a hydronic heater located less than:
   a. Three hundred thirty feet from the closest property line; or
   b. Six hundred sixty feet from a school, clinic, hospital, or senior housing unit.
2. Any hydronic heater installed in violation of this section shall be immediately remedied or made inoperable and removed as soon as practicable; however, in no case shall the time of removal be longer than 180 days after notice from the division of a violation.
3. Variance. After a public hearing, the commission shall determine whether a person may receive a variance from the installation requirements of this subsection allowing them to install a hydronic heater. In determining whether to grant the variance, the commission shall consider the proposed location of the appliance, impact on surrounding neighborhood, emission levels of the appliance, terrain, meteorological conditions, and other relevant conditions that may render the operation of the appliance at that location a nuisance or a health hazard.

Prohibited Fuels. No person shall burn in the borough any fuel, except coal in an appliance designed to use coal, which is not listed in the manufacturer’s owner’s manual as an acceptable fuel for that device or any of the following items in a solid fuel burning appliance:
1. Any wood that does not meet the definition of clean wood or has more than 20 percent moisture content;
2. Garbage;
3. Tires;
4. Materials containing plastic or rubber;
5. Waste petroleum products;
6. Paints and paint thinners;
7. Chemicals;
8. Glossy or colored papers;
9. Construction and demolition debris;
10. Plywood;
11. Particleboard;
12. Saltwater driftwood;
13. Manure;
14. Animal carcasses;
15. Asphalt products;
16. Flooring products.

Sales or Leasing of Solid Fuel Burning Appliances.
1. No person shall sell or lease an unlisted solid fuel burning appliance or barrel stove kit in the borough unless the buyer signs an affidavit, on a form prescribed by the borough, attesting that the appliance will not be installed or used in the air quality...
control zone. This section does not apply to appliances or stoves that transfer pursuant
to a sale of property;

2. No person shall commercially sell or offer for sale or lease a solid fuel
burning appliance in the borough unless the commercial seller or dealer provides the
prospective buyer or lessee, prior to any sales or lease agreement, with a written notice,
prepared or approved by the division, that includes, but is not limited to, the following:

a. The fuel restrictions imposed in this chapter;

b. Proper installation, property location, operation, and maintenance
of the appliance;

c. An advisory statement noting that operation of solid fuel burning
appliances may not be appropriate in some areas due to terrain, meteorological
conditions, or other relevant conditions that render the operation of the appliance
a public nuisance or health hazard even though it is otherwise legally installed
and operated;

3. The written notice required in this section shall be signed and dated by
the prospective buyer or lessee prior to purchase or lease to indicate receipt of the
notification requirements of this section;

4. The commercial dealer or seller shall mail or otherwise provide a copy of
the notice and any required affidavit to the division within 30 days of the sale. All
commercial dealers or sellers shall also include with the notice documentation showing
whether the appliance sold or leased meets the borough’s emissions standard.

J[H]. Nuisance. No person within the Fairbanks North Star Borough shall cause or
allow particulate emissions from a nonmobile source that are injurious to human life or
to property or that unreasonably interfere with the comfortable enjoyment of life or
property. No person within the Fairbanks North Star Borough shall operate a solid fuel
or waste oil burning appliance in a manner so as to create a public or private nuisance.
A violation of a provision of this chapter is hereby declared to be a nuisance.

J[I]. Other Laws. Nothing in this section precludes other local jurisdictions from having
more restrictive codes.

K[J]. Penalties. Upon first conviction of an offense in this chapter, the
penalty(ies)/fine(s) set forth in FNSBC Title 1 regarding violations of the PM2.5 air
quality control program may be satisfied by completion within 60 days of a borough-
approved class covering PM2.5 health concerns, nonattainment, importance of dry
wood and proper operation of solid fuel burning appliances. The borough may on its
own initiative file notice of satisfaction of attendance requirements with the court, or the
defendant may file a certificate of completion with the court within the applicable time
frame.

Section 4. 21.28.040 Enhanced voluntary removal, replacement and
repair program, shall be amended as follows:

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The Fairbanks North Star Borough shall, to the extent funds are available and appropriated by the assembly, offer an enhanced removal, replacement and repair program to help offset the costs of removing, replacing or repairing a solid fuel burning appliance (SFBA) or fireplace. This program shall be subject to the following eligibility requirements, conditions, and criteria:

A. General Requirements.

1. Application. An application approved by the division and signed by all property owner(s) must be submitted along with any documentation required by the division. Applications for either the removal of a solid fuel burning appliance (SFBA), or replacement of a SFBA with an emergency power system, or an appliance designed to use natural gas, propane, or home heating oil shall include a signed recordable document restricting future installations of SFBAs and requiring appropriate notice to purchasers in the seller’s disclosure statement. Applicants must fully comply with the division’s inspection process which shall verify the existence of a qualifying SFBA.

2. Priority Ranking. Applications may be prioritized and may be limited by the division in its discretion based on geographical location, the overall air quality benefit and the type of SFBA or fireplace being removed, replaced or repaired.

3. Eligibility. The program is limited to properties within the air quality control zone boundary in which a qualifying SFBA or fireplace is installed. If an application is approved for the program, the applicant will be given up to 90 days to meet all of the requirements. Applicants must have no delinquent property tax or penalty or interest owing at the time of application and at completion of the program requirements.

4. Additional Requirements. In addition to the general requirements set forth in this section, applicants must also meet the following requirements:

a. Fully comply with the inspection process required by the division that shall ensure that the existence of the qualifying appliance to be removed, replaced or repaired is properly documented.

b. Removal of appliance.

c. Delivery of appliance to an authorized decommission station.

d. Certificate of destruction delivered to the division, if applicable.

e. Final installation of a qualified appliance visually verified.

f. The qualified appliance must be properly installed by a Borough listed vendor/installer attesting to proper installation of the device based on manufacturer’s installation manual, compliance with any building code requirements, and that the device is properly sized for the building in question.

g. The applicant will be required to demonstrate proper wood storage.

h. The applicant will be required to complete training with the vendor, ensuring that they understand how their particular device operates, including education on proper wood burning techniques.

i. All aspects of this section may be performed by borough-approved personnel or a borough-approved vendor.
5. Payments. Applicants will be eligible for reimbursements or, at the option of the applicant, payment may be made directly to a borough-approved vendor. Reimbursements and payments shall be available as follows:

a. Replacement of a hydronic heater:
   i. With either an EPA certified wood or pellet stove with an emission rate less than or equal to two grams of PM2.5 per hour, or an EPA phase II certified pellet burning hydronic heater with an emission rate equal to or less than 0.1 pounds per million BTU, or an emergency power system, up to $10,000 for purchase and installation.
   ii. With an appliance designed to use home heating oil (excluding waste or used oil) or a masonry heater (including parts, labor and any costs associated with upgrading the chimney to the extent required by the manufacturer of the appliance for proper installation), up to $12,000 for purchase and installation of the appliance.
   iii. With an appliance designed to use natural gas, propane, hot water district heat, or electricity, up to $14,000 for purchase and installation of the appliance.

b. Replacement of a non-borough-listed SFBA:
   i. With either an EPA certified wood stove, or fireplace insert that has an emission rate less than or equal to two grams of PM2.5 per hour, or in the case of an EPA certified wood stove, PM2.5 emissions must be reduced by 50 percent and emit two grams of PM2.5 per hour or less, up to $4,000 for purchase and installation of the appliance.
   ii. With an EPA certified pellet stove that has an emission rate less than or equal to two grams of PM2.5 per hour, up to $5,000 for purchase and installation of the appliance.
   iii. With an appliance designed to use home heating oil (excluding waste oil), hot water district heat, electricity, or a masonry heater (including parts, labor and any costs associated with upgrading the chimney to the extent required by the manufacturer of the appliance for proper installation), or an emergency power system, up to $6,000 for the purchase and installation.
   iv. With an appliance designed to use natural gas or propane, up to $10,000 per purchase and installation of the appliance. Multiple non-borough-listed solid fuel burning appliances or fireplaces, or combinations thereof, may be replaced with a single heating device that meets the requirements above, except for those that are fired by solid fuels. Payment will be based on the number of devices removed, up to a maximum of three, and may not exceed the replacement cost.

c. Removal of a SFBA (limited to a one-time participation in this program per property):
   i. Removal of a hydronic heater through a one-time payment of $5,000.
ii. Removal of other SFBAs through a one-time payment of $2,000.

d. Repair Program.
i. The repair program will pay for the:
(A) Replacement of a wood stove’s catalytic converter that has exceeded its life span through the one-time payment of up to $750.00.
(B) Replacement of any emissions-reducing component of an EPA certified wood stove up to the maximum amount of $750.00.
ii. In addition to the general requirements set forth in this section, applicants must fully comply with any inspection process required by the division, which may be performed by a borough-approved vendor.

Section 5. FNSBC 21.28.050, Forecasting exceedances and restrictions in the air quality control zone during an alert, shall be amended as follows:

A. During the winter months of October through March, the borough shall issue a daily PM2.5 forecast by 4:30 p.m. When the PM2.5 concentration reaches the onset level for an alert and is expected to remain at that level for 12 hours or more, an alert will be declared. An alert may apply to the air quality control zone as a whole, or to one or more sub-areas designated by the division. Once an alert is declared, PM2.5 control measures set forth in this section shall be implemented and continued until the alert is cancelled. There are two levels of alerts: Stage 1 and Stage 2. The obligations imposed in this subsection do not require, absent specific funding for that purpose, any actions to be taken outside of the borough’s normal business days and hours of operation. These restrictions shall not apply during a power failure. When an alert is in effect, outdoor burning is prohibited, including nonpermitted incinerators and burn barrels. This outdoor burning prohibition does not include recreational fires such as bonfires, campfires, or ceremonial fires and the use of fire pits.

B. The division will notify local media to ensure the declared alert is broadcast. The division shall also use social media and methods of direct communication such as text messages as feasible. Information within the notification will contain the PM2.5 forecast, stage level for areas, and actions required to reduce sources of PM2.5. The obligations imposed in this subsection do not require, absent specific funding for that purpose, any actions to be taken outside of the borough’s normal business days and hours of operation.

C. Stage 1: Restrictions in the Air Quality Control Zone during an Alert.
1. A Stage 1 air alert is implemented when concentrations exceed or are forecasted to exceed 25 µg/m³.
2. No fuel source may be added to the combustion chamber of a firebox of any solid fuel burning appliance or waste oil burning appliance. Residents should rely

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instead on their home's alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) until the Stage 1 air alert is cancelled [BURNING IS PERMITTED IN ALL EPA CERTIFIED SOLID FUEL BURNING APPLIANCES, AND EPA CERTIFIED HYDRONIC HEATERS, MASONRY HEATERS, AND COOK STOVES. NO FUEL SOURCE MAY BE ADDED TO THE COMBUSTION CHAMBER OR FIREBOX OF ANY SOLID FUEL BURNING APPLIANCE OR WASTE OIL BURNING APPLIANCE NOT LISTED ABOVE. RESIDENTS SHOULD RELY INSTEAD ON THEIR HOME'S ALTERNATE, CLEANER SOURCE OF HEAT (SUCH AS A GAS OR FUEL OIL FIRED FURNACE OR BOILER OR ELECTRIC BASEBOARD HEATERS) UNTIL THE STAGE 1 AIR ALERT IS CANCELLED.]

3. If a building owner or other person with a property or managerial interest in the building has an approved "no other adequate source of heat" designation, the building owner is exempted from complying with the Stage 1 air alert restrictions for that building.

4. If a building owner or other person with a property or managerial interest in the building has an approved Stage 1 Waiver the building owner is exempted from complying with the Stage 1 air alert restrictions for that building. A Stage 1 Waiver will be granted if the person with property or managerial interest verifies that the SFBA being operated during a Stage 1 air alert is a Borough listed appliance. A Stage 1 Waiver may be obtained by completing an application on a form developed by the division, that includes the following information:
   a. Documentation of approved appliance must be submitted, including pictures, make and model.
   b. Documentation of the applicant's ability to properly store wood.
   c. Documentation the applicant has taken a class or training in proper wood burning techniques.

D. Stage 2: Required Restrictions in the Air Quality Control Zone during an Alert.

1. A Stage 2 air alert is implemented when concentrations exceed or are forecasted to exceed 35 µg/m³.

2. No fuel source may be added to the combustion chamber or firebox of any solid fuel burning appliance or waste oil burning appliance. Residents should rely instead on their home's alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) until the Stage 2 air alert is cancelled.

3. If a building owner or other person with a property or managerial interest in the building has an approved "no other adequate source of heat" designation the building owner is exempted from complying with the Stage 2 air alert restrictions for that building.

Section 6. FNSBC 21.28.060 No other adequate source of heat determination, shall be amended as follows:

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A. A building owner or other person with a property or managerial interest in a
building located within the air quality control zone may obtain a "no other adequate
source of heat" determination from the division if:

1. The SFBA being used to heat the structure is a Borough listed
appliance:[EPA CERTIFIED UNLESS AN APPLICATION HAS BEEN MADE TO THE
ENHANCED VOLUNTARY REMOVAL, REPLACEMENT AND REPAIR PROGRAM TO
REMOVE OR REPLACE THE NONCERTIFIED SFBA AND HAS BEEN DENIED, A
PELLET FUEL BURNING APPLIANCE INSTALLED PRIOR TO APRIL 1, 2017, A
MASONRY HEATER, OR A COOK STOVE.]

a. 

2. The building owner(s) or other person with a property or managerial
interest in the building applies with the division on a form developed by the division,
including the following:

a. Documentation of approved appliance must be submitted, including
pictures, make, model, and serial number.

b. Documentation of the applicant's ability to properly store wood.

c. Documentation the applicant has taken a class or training in proper
wood burning techniques;

3. The building owner(s) or other person with a property or managerial
interest in the building files an affidavit with the application that the subject structure
must be heated and the structure has no adequate heating source without using a solid
fuel [OR WASTE OIL] burning appliance or that economic hardships require the
applicant's use of a solid fuel [OR WASTE OIL] burning appliance or complying with a
restriction would result in damage to property including damage to the appliance itself
and its heating system components. If economic hardship is the reason the applicant
has no other adequate source of heat, validating documentation is required. Validating
documentation may be established by showing approval for assistance from a list of
agencies or programs that provide economic assistance (e.g., programs based on HHS
poverty guidelines, unemployment insurance, nutrition assistance) to be made available
by the division;

4. The building was constructed on or before December 31, 2016.

B. There shall be no fee for applying for or obtaining a determination.

C. It shall be a violation to submit a false affidavit for a "no other adequate source
of heat" determination.

D. If the "no other adequate source of heat" appliance does not meet the standards
set in this chapter, the division shall provide the applicant with information concerning
the borough's voluntary removal, replacement and repair program.

E. Applications denied by the division may be appealed to the air pollution control
commission within 30 days of the decision.

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F. An applicant that has been denied a “no alternative source of heat determination” by the division because the appliance does not meet the criteria of this section may apply to the air pollution control commission for a variance within 10 days of this decision. A temporary “no alternative source of heat” determination shall be granted pending the decision of the commission. In determining whether to grant a variance, the commission shall consider the location of the appliance, impact on surrounding neighborhood, emission levels of the appliance, the financial investment and ability of the applicant to replace the appliance and any other relevant conditions that indicate the operation of the appliance at that location is not a nuisance or health hazard. If the commission denies a variance, the “no alternative source of heat” determination shall expire 60 days from the date of denial.

Section 7. FNSBC 1.20.080, Fine Schedule, is hereby amended as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Fine</th>
<th>Repeatable</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.28.030(E)</td>
<td>Failure to obtain, submit and execute a permit for installing a SFBA in new construction.</td>
<td>$1,000</td>
<td>No</td>
</tr>
<tr>
<td>21.28.030(F[E])</td>
<td>Illegal installation of hydronic heaters.</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>21.28.030(F[E])</td>
<td>Failure to remove hydronic heaters.</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>21.28.030(G[F])</td>
<td>Use of prohibited fuels.</td>
<td>$100.00</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>1st offense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.28.030(G[F])</td>
<td>Use of prohibited fuels.</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>2nd offense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.28.030(H[G])</td>
<td>Violation of commercial sale requirements.</td>
<td>$500.00</td>
<td>No</td>
</tr>
</tbody>
</table>

Section 8. Subsection G of FNSBC 4.12.110 shall be amended as follows:


AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
Section 9. Appendix E- User Fee Schedule of the FY 2017-18 budget is hereby amended to add the following to the Transportation User Fee Schedule:

**Air Quality**

- Permit application fee for SFBA in new construction $375.00

Section 10. Effective Date. This ordinance shall be effective at 5:00 p.m. of the first Borough business day following its adoption.

PASSED AND APPROVED THIS 19th DAY OF JUNE, 2017.

Kathryn Dodge
Presiding Officer

ATTEST:

Nanci Ashford-Bingham, MMC
Borough Clerk

Yeses: Tacke, Davies, Cooper, Quist, Gray, Lawrence, Dodge
Noes: Roberts, Sattley
FAIRBANKS NORTH STAR BOROUGH

ORDINANCE NO. 2017-44

AN ORDINANCE AMENDING CHAPTER 21.28 FNSBC REGARDING THE PM2.5 AIR QUALITY CONTROL PROGRAM, AMENDING TITLE 4 REGARDING AIR POLLUTION CONTROL COMMISSION DUTIES, AMENDING FNSBC 1.20.080, FINE SCHEDULE, AND AMENDING APPENDIX E—USER FEE SCHEDULE/TRANSPORTATION OF ORDINANCE NO. 2017-20 (FY 2017-18) TO ADD PERMIT APPLICATION FEES FOR SOLID FUEL BURNING APPLIANCES IN NEW CONSTRUCTION

WHEREAS, The United States Environmental Protection Agency (EPA) in December 2009, declared part of the Fairbanks North Star Borough (Borough) a non-attainment area for fine particulate pollution (PM2.5); and

WHEREAS, On December 16, 2016 the EPA published public notice in the Federal Register of its intent to reclassify the Borough non-attainment area from Moderate to Serious status, and the Final Rule was signed on April 28, 2017; and

WHEREAS, The serious non-attainment designation requires a new serious State Implementation Plan (SIP) to be submitted to the EPA by December 31, 2017 which must include implementation of all Best Available Control Measures (BACM); and

WHEREAS, The Borough should consider implementing some of the control measures by June 2017 so goodwill for these control measures can be recognized in the Serious SIP.

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
Section 1. Sections 2, 3, 4, 5, 6, 7, and 8 of this ordinance are of a
general and permanent nature and shall be codified. Sections 9 and 10 of this
ordinance are not of a general and permanent nature and shall not be codified.

Section 2. FNSBC 21.28.010, Definitions, shall be amended as follows:
“Air quality control zone” means the area of the borough currently contained in the EPA
designated nonattainment area, which uses the nonattainment area southern, western
and eastern boundaries as modified by their respective intersection with the following
northern boundary described as: beginning at the intersection of Isberg Road with
Chena Ridge Road on the western boundary of the EPA designated nonattainment
area, then following Chena Ridge Road back to Chena Pump Road and continuing
north on the Parks Highway to Sheep Creek Road, then Sheep Creek Road to Miller Hill
Road, then north on Miller Hill Road, then east on Yankovich, then north from
Yankovich Road along the east boundary of the Large Animal Research Station to a
point just north of its intersection with Nottingham Drive and follows the ridge crest
across Nottingham Estates to approximately the point where Swallow Drive intersects
Dalton Trail to north on Dalton Trail to the crest of the Farmer’s Loop Ridge, then follow
the geographic crest of Farmer’s Loop Ridge to its intersection with the New Steese
Highway, then southeast on Bennett Road, and along Steele Creek Road to the
intersection of Chena Hot Springs Road, and Chena Hot Springs Road to the eastern
boundary of the EPA designated nonattainment area.

“Air quality index” (AQI) is an index for reporting daily air quality, which indicates how
polluted the air currently is or how polluted it is forecast to become. The higher the AQI
value, the greater the level of air pollution and the greater the health concern. AQI is
divided into six categories with correspondingly higher levels of health concern as
outlined in the table below:

<table>
<thead>
<tr>
<th>AQI (Air Quality Index)</th>
<th>AQI Category</th>
<th>Cautionary Statement</th>
<th>Health Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 50</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>51 – 100</td>
<td>Moderate</td>
<td>Unusually sensitive people should consider reducing prolonged or heavy exertion.</td>
<td>None</td>
</tr>
<tr>
<td>101 – 150</td>
<td>Unhealthy for Sensitive Groups</td>
<td>People with respiratory or heart disease, the elderly, and children should limit prolonged exertion.</td>
<td>Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and</td>
</tr>
</tbody>
</table>

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
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<table>
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<tr>
<th>AQI (Air Quality Index)</th>
<th>AQI Category</th>
<th>Cautionary Statement</th>
<th>Health Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>151 – 200</td>
<td>Unhealthy</td>
<td>People with respiratory or heart disease, the elderly, and children should avoid prolonged exertion; everyone else should limit prolonged exertion.</td>
<td>Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.</td>
</tr>
<tr>
<td>201 – 300</td>
<td>Very Unhealthy</td>
<td>People with respiratory or heart disease, the elderly, and children should avoid outdoor activity; everyone else should avoid prolonged exertion.</td>
<td>Significant aggravation of the heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in the general population.</td>
</tr>
<tr>
<td>301 – 500</td>
<td>Hazardous</td>
<td>Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.</td>
<td>Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in the general population.</td>
</tr>
</tbody>
</table>

“Alert” means a notice issued by the division when the division determines, using available data or modeling, that PM2.5 concentration levels have reached or are forecasted to reach 25 μg/m³ or higher for at least 12 consecutive hours.

“Appliance” means a device or apparatus that is manufactured and designed to utilize energy and which does not require a stationary source air quality permit from the state of Alaska under 18 AAC 50.

“Clean wood” means natural wood that has not been painted, varnished, or coated with a similar material, has not been treated with preservatives, and does not contain resins or glues as in plywood or other composite wood products.

“Commence” means (i) begin, or cause to begin, actual on-site construction or (ii) enter into binding agreements or contractual obligations to begin construction, which cannot be cancelled or modified without substantial loss to the owner.
"Construction and demolition debris" means a conglomeration of materials from construction, repair, remodeling or demolition of buildings and structures containing any prohibited fuels.

"Cook stove" means a wood burning appliance that is designed primarily for cooking food and that has the following characteristics:

1. An oven, with a volume of 0.028 cubic meters (one cubic foot) or greater, and an oven rack;
2. A device for measuring oven temperatures;
3. A flame path that is routed around the oven;
4. A shaker grate;
5. An ash pan;
6. An ash clean-out door below the oven; and
7. The absence of a fan or heat channels to dissipate heat from the device.

"Division" means the Fairbanks North Star Borough air quality division.

"Emergency power system" is an independent source of electrical power that supports important electrical systems on loss of normal power supply. An emergency power system may include a standby generator, batteries, and other apparatus. Emergency power systems are installed to protect life and property from the consequences of loss of normal electric power supply.

"EPA" means the United States Environmental Protection Agency.

"EPA certified" means that the solid fuel burning appliance meets emission performance standards when tested by an accredited independent laboratory and is labeled according to procedures specified by the EPA in 40 CFR Part 60 Subpart AAA or QQQQ.

"Fireplace" means an assembly consisting of a hearth and open fire chamber of noncombustible factory-built or masonry materials and provided with a chimney, for use with solid fuels, which cannot be operated with an air to fuel ratio of less than 35 to one.

"Fireplace insert" means a solid fuel burning appliance similar in function and performance to a freestanding wood burning stove, which is made from cast iron or steel designed to be installed in an existing masonry or prefabricated fireplace.

"Forecast" means a description of the current dispersion conditions described as good, fair, or poor and including the expected PM2.5 NowCast AQI categorized as good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, or hazardous.
"Heating appliances" means, but is not limited to: wood, coal, or pellet fired hydronic heaters, stoves, and furnaces; oil or gas fired boilers and furnaces; and masonry heaters, pellet stoves, cook stoves, and fireplaces.

"Hydronic" means having to do with a system moving heat from one location to another by means of the circulation of a heat transfer liquid through piping or tubing.

"Hydronic heater" means a fuel burning appliance designed to (1) burn wood or other solid fuels and (2) heat building space and/or domestic hot water via the distribution, typically through pipes, of a fluid heated in the appliance.

"Masonry heater" means a wood burning appliance that complies with the guidelines of ASTM E1602-08, Standard Guide for Construction of Masonry Heaters, and:

1. Is designed and intended for operation only in a closed combustion chamber configuration; and

2. Has enough thermal storage capacity to maintain no less than 50.0 percent of the maximum masonry-mass temperature for at least four hours after the maximum masonry-mass temperature has been reached; and

3. The masonry heater design and installation has been confirmed and documented by a qualified person or entity approved by the borough.

"New Construction" means construction of entirely new structures designed for heated occupancy and any structural alteration that adds heated square footage to an existing structure whether or not the structure was previously occupied.

"Nonattainment area" is the area depicted on the map attached to the ordinance codified in this chapter and is further defined as follows:

Township Range Delineated Boundary for the Fairbanks Nonattainment Area

MTRS F001N001 – All Sections, MTRS F001N001E – Sections 2-11, 14-23, 26-34, MTRS F001N002 – Sections 1-5, 8-17, 20-29, 32-36, MTRS F001S001E – Sections 1, 3-30, 32-36, MTRS F001S001W – Sections 1-30, MTRS F001S002E – Sections 6-8, 17-20, 29-36, MTRS F001S002W – Sections 1-5, 8-17, 20-29, 32-33, MTRS F001S003E – Sections 31-32, MTRS F002N001E – Sections 31-35, MTRS F002N001 – Sections 28, 31-36, MTRS F002N002 – Sections 32-33, 36, MTRS F002S001E – Sections 1-2, MTRS F002S002E – Sections 1-17, 21-24, MTRS F002S003E – Sections 5-8, 18.

"NowCast" means a weighted average of hourly air monitoring data used by the EPA for real-time reporting of the AQI for PM.
"Opacity" means the reduction in transmitted light through a column of smoke as measured by an observer certified in using EPA Reference Method 9 as defined by federal law or EPA approved Alternative Method 82 which is defined as American Society for Testing and Materials (ASTM) D 7520-09.

"Particulate matter" or "PM" means total particulate matter including PM10 and PM2.5 (condensable and noncondensable fraction) and is a complex airborne mixture of extremely small particles and liquid droplets that are made up of a number of components, including acids, organic chemicals, metals, soil, or dust.

"Pellet fuel burning appliance" or "pellet stove" means a closed combustion, vented pellet burning appliance with automatic components creating an active air flow system, sold with the hopper and auger combination as integral parts, and designed, warranted, safety listed, and advertised by the manufacturer specifically to be fueled by pellets of sawdust, wood products and other biomass materials while prohibiting the use of cordwood.

"PM2.5" means particulate matter comprised of particles that have diameters of two and one-half microns or less.

"Proper Wood Storage" means specific and dedicated space to store clean wood in such a manner that the clean wood is not in contact with soil, the top of the clean wood is adequately protected from precipitation, and with airflow available to the clean wood.

"Sale" means the transfer of ownership or control.

"Solid fuel burning appliance" (SFBA) means any appliance designed to produce heat by burning nongaseous and nonliquid fuels. This definition includes, but is not limited to:

1. Wood stoves;
2. Coal stoves;
3. Wood-fired hydronic heaters;
4. Wood-fired furnaces;
5. Coal-fired hydronic heaters;
6. Coal-fired furnaces;
7. Fireplace inserts;
8. Pellet fuel burning appliances;
9. Masonry heaters;
10. Cook stoves; and
11. Fireplaces.

"Waste oil burning appliance" means an appliance that burns used or waste oil.

Section 3. FNSBC 21.28.030 Prohibited acts, shall be amended as follows:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
Within the nonattainment area no person shall install or allow the installation of a solid
fuel burning appliance unless it is listed by the borough as qualifying under this chapter
and the installation complies with all other requirements imposed in this chapter. It is a
separate violation to fail to remove a solid fuel burning appliance installed in violation of
this chapter.
B. No person who has been convicted of or pled no contest to two or more
violations of this chapter involving visible emissions or emissions crossing property lines
shall, in the air quality control zone, operate, use or keep installed a hydronic heater
unless the hydronic heater is:
1. Borough listed or was listed at the time of installation,
2. A closed combustion system with automatic components that feed solid
fuel, including wood pellets, into a firebox where the combustion is enhanced by an
active airflow system, or
3. Connected to a thermal mass system that is certified by the contractor or
installer as sufficient to allow the hydronic heater to burn at maximum capacity
minimizing on/off cycling. The division may require an owner to provide documentation
supporting the certification.
This prohibition shall be effective 90 days after the second conviction or entry of a no
contest plea.
C. Visible Emissions Standard in the Air Quality Control Zone.
1. Standard. No person shall cause, permit, or allow particulate emissions
from a nonmobile source in the air quality control zone to create opacity greater than 20
percent for a period or periods aggregating more than 10 minutes in any hour except
during the first 40 minutes after the initial firing when the opacity limit shall be less than
50 percent.
2. Procedures and Enforcement. When ambient weather and light conditions
permit, methods and procedures specified by the EPA in 40 CFR 60 Appendix A
Reference Method 9 (Visual determination of the Opacity of Emissions From Stationary
Sources), or an alternative technology that replaces Method 9, when the technology is
available and the choice is feasible, upon request of the person being investigated, shall
be used to determine compliance with this section. Smoke visible from a chimney, flue
or exhaust duct in excess of the opacity standard for a period in excess of 30 minutes
shall constitute prima facie evidence of unlawful operation of an applicable solid fuel
burning appliance.
D. PM$_{2.5}$ Emissions Crossing Property Lines. No person shall cause or permit
particulate emissions from a nonmobile source to impact the resident(s) of a
neighboring property through the creation of an emissions plume that:
1. Crosses a property line;

**AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT**
Text to be *added* is underlined
Text to be *deleted* is [BRACKETED, CAPITALIZED]
2. Is observable using EPA Method 22 (40 CFR 60 Appendix A); and
3. Is 25 \( \mu g/m^3 \) greater than the surrounding immediate vicinity background
PM\(_{2.5}\) level using methods defined by the borough division of air quality. For purposes of
this subsection, the surrounding "immediate vicinity" means land within an area
measured 1,200 feet in all directions from the boundaries of the emitting property.

E. Requirements for Installation of Solid Fuel Burning Appliances in New
Construction.

1. For all new construction that commences on or after January 1, 2018 and
is located within the air quality control zone the following will apply:
   a. Installation of a solid fuel burning appliance is prohibited unless a
      permit has been issued by the division. A permit must be obtained for any solid
      fuel burning appliance installed in new construction prior to installation of the
      appliance.
   b. Application. The permit application will require the owner(s) to
certify they will meet the following requirements:
      i. The proposed solid fuel burning appliance meets all federal,
         state, and borough air quality regulations;
      ii. The proposed solid fuel burning appliance meets the
         requirements of this chapter;
      iii. The proposed solid fuel burning appliance is properly sized
         for the structure in the opinion of a Borough listed vendor/installer;
      iv. The proposed solid fuel burning appliance will be installed by
         a Borough listed vendor/installer attesting to proper installation of the
         device based on the manufacturer's installation manual;
      v. Proper wood storage will be available; and
      vi. Training will be provided to the occupants on proper wood
         burning techniques.
   c. Permit. An installation permit will be issued upon receipt of an
      application meeting the requirements of subsection (b) and payment of any
      required fee. Within 24 months of issuance, the owner must verify with
      supporting documentation that the requirements of subsection (b) have been
      completed, upon which an operating permit will be issued. If verification has not
      been submitted or approved within 24 months the permit application will
      automatically expire.
   d. After a public hearing, and prior to installation of the solid fuel
      burning appliance, the air pollution control commission may grant a variance, the
      commission shall consider any alternate proposal that the applicant submits, the
      location of the appliance, impact on surrounding neighborhood of the requested
      variance, emission levels of the appliance, and any other relevant conditions that
      indicate the operation of the appliance at that location or the requirement that is
      being varied will not result in a nuisance or health-hazard.

E. Borough-Wide Installation Requirements for Hydronic Heaters.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
1. Setback. Unless permitted by a variance, or if replacing an existing hydronic heater with a listed appliance, no person shall install or allow the installation of a hydronic heater located less than:
   a. Three hundred thirty feet from the closest property line; or
   b. Six hundred sixty feet from a school, clinic, hospital, or senior housing unit.

2. Any hydronic heater installed in violation of this section shall be immediately remedied or made inoperable and removed as soon as practicable; however, in no case shall the time of removal be longer than 180 days after notice from the division of a violation.

3. Variance. After a public hearing, the commission shall determine whether a person may receive a variance from the installation requirements of this subsection allowing them to install a hydronic heater. In determining whether to grant the variance, the commission shall consider the proposed location of the appliance, impact on surrounding neighborhood, emission levels of the appliance, terrain, meteorological conditions, and other relevant conditions that may render the operation of the appliance at that location a nuisance or a health hazard.

G[F]. Prohibited Fuels. No person shall burn in the borough any fuel, except coal in an appliance designed to use coal, which is not listed in the manufacturer’s owner’s manual as an acceptable fuel for that device or any of the following items in a solid fuel burning appliance:

1. Any wood that does not meet the definition of clean wood or has more than 20 percent moisture content;
2. Garbage;
3. Tires;
4. Materials containing plastic or rubber;
5. Waste petroleum products;
6. Paints and paint thinners;
7. Chemicals;
8. Glossy or colored papers;
9. Construction and demolition debris;
10. Plywood;
11. Particleboard;
12. Saltwater driftwood;
13. Manure;
14. Animal carcasses;
15. Asphalt products;
16. Flooring products.

H[G]. Sales or Leasing of Solid Fuel Burning Appliances.

1. No person shall sell or lease an unlisted solid fuel burning appliance or barrel stove kit in the borough unless the buyer signs an affidavit, on a form prescribed by the borough, attesting that the appliance will not be installed or used in the air quality
control zone. This section does not apply to appliances or stoves that transfer pursuant
to a sale of property;

2. No person shall commercially sell or offer for sale or lease a solid fuel
burning appliance in the borough unless the commercial seller or dealer provides the
prospective buyer or lessee, prior to any sales or lease agreement, with a written notice,
prepared or approved by the division, that includes, but is not limited to, the following:
   a. The fuel restrictions imposed in this chapter;
   b. Proper installation, property location, operation, and maintenance
      of the appliance;
   c. An advisory statement noting that operation of solid fuel burning
      appliances may not be appropriate in some areas due to terrain, meteorological
      conditions, or other relevant conditions that render the operation of the appliance
      a public nuisance or health hazard even though it is otherwise legally installed
      and operated;
3. The written notice required in this section shall be signed and dated by
   the prospective buyer or lessee prior to purchase or lease to indicate receipt of the
   notification requirements of this section;
4. The commercial dealer or seller shall mail or otherwise provide a copy of
   the notice and any required affidavit to the division within 30 days of the sale. All
   commercial dealers or sellers shall also include with the notice documentation showing
   whether the appliance sold or leased meets the borough's emissions standard.

[H]. Nuisance. No person within the Fairbanks North Star Borough shall cause or
allow particulate emissions from a nonmobile source that are injurious to human life or
to property or that unreasonably interfere with the comfortable enjoyment of life or
property. No person within the Fairbanks North Star Borough shall operate a solid fuel
or waste oil burning appliance in a manner so as to create a public or private nuisance.
A violation of a provision of this chapter is hereby declared to be a nuisance.

[J]. Other Laws. Nothing in this section precludes other local jurisdictions from having
more restrictive codes.

[K]. Penalties. Upon first conviction of an offense in this chapter, the
penalty(ies)/fine(s) set forth in FNSBC Title 1 regarding violations of the PM2.5 air
quality control program may be satisfied by completion within 60 days of a borough-
approved class covering PM2.5 health concerns, nonattainment, importance of dry
wood and proper operation of solid fuel burning appliances. The borough may on its
own initiative file notice of satisfaction of attendance requirements with the court, or the
defendant may file a certificate of completion with the court within the applicable time
frame.

Section 4. 21.28.040 Enhanced voluntary removal, replacement and
repair program, shall be amended as follows:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
The Fairbanks North Star Borough shall, to the extent funds are available and appropriated by the assembly, offer an enhanced removal, replacement and repair program to help offset the costs of removing, replacing or repairing a solid fuel burning appliance (SFBA) or fireplace. This program shall be subject to the following eligibility requirements, conditions, and criteria:

A. General Requirements.

1. Application. An application approved by the division and signed by all property owner(s) must be submitted along with any documentation required by the division. Applications for either the removal of a solid fuel burning appliance (SFBA), or replacement of a SFBA with an emergency power system, or an appliance designed to use natural gas, propane, or home heating oil shall include a signed recordable document restricting future installations of SFBAs and requiring appropriate notice to purchasers in the seller’s disclosure statement. Applicants must fully comply with the division’s inspection process which shall verify the existence of a qualifying SFBA.

2. Priority Ranking. Applications may be prioritized and may be limited by the division in its discretion based on geographical location, the overall air quality benefit and the type of SFBA or fireplace being removed, replaced or repaired.

3. Eligibility. The program is limited to properties within the air quality control zone boundary in which a qualifying SFBA or fireplace is installed. If an application is approved for the program, the applicant will be given up to 90 days to meet all of the requirements. Applicants must have no delinquent property tax or penalty or interest owing at the time of application and at completion of the program requirements.

4. Additional Requirements. In addition to the general requirements set forth in this section, applicants must also meet the following requirements:

- Fully comply with the inspection process required by the division that shall ensure that the existence of the qualifying appliance to be removed, replaced or repaired is properly documented.
- Removal of appliance.
- Delivery of appliance to an authorized decommission station.
- Certificate of destruction delivered to the division, if applicable.
- Final installation of a qualified appliance visually verified.
- The qualified appliance must be properly installed by a Borough listed vendor/installer attesting to proper installation of the device based on manufacturer’s installation manual, compliance with any building code requirements, and that the device is properly sized for the building in question.
- The applicant will be required to demonstrate proper wood storage.
- The applicant will be required to complete training with the vendor, ensuring that they understand how their particular device operates, including education on proper wood burning techniques.
- All aspects of this section may be performed by borough-approved personnel or a borough-approved vendor.
5. Payments. Applicants will be eligible for reimbursements or, at the option
of the applicant, payment may be made directly to a borough-approved vendor.
Reimbursements and payments shall be available as follows:

a. Replacement of a hydronic heater:
   i. With either an EPA certified wood or pellet stove with an
emission rate less than or equal to two grams of PM2.5 per hour, or an
EPA phase II certified pellet burning hydronic heater with an emission rate
equal to or less than 0.1 pounds per million BTU, or an emergency power
system, up to $10,000 for purchase and installation.
   ii. With an appliance designed to use home heating oil
(excluding waste or used oil) or a masonry heater (including parts, labor
and any costs associated with upgrading the chimney to the extent
required by the manufacturer of the appliance for proper installation), up to
$12,000 for purchase and installation of the appliance.
   iii. With an appliance designed to use natural gas, propane, hot
water district heat, or electricity, up to $14,000 for purchase and
installation of the appliance.

b. Replacement of a non-borough-listed SFBA:
   i. With either an EPA certified wood stove, or fireplace insert
that has an emission rate less than or equal to two grams of PM2.5 per
hour, or in the case of an EPA certified wood stove, PM2.5 emissions
must be reduced by 50 percent and emit two grams of PM2.5 per hour or
less, up to $4,000 for purchase and installation of the appliance.
   ii. With an EPA certified pellet stove that has an emission rate
less than or equal to two grams of PM2.5 per hour, up to $5,000 for
purchase and installation of the appliance.
   iii. With an appliance designed to use home heating oil
(excluding waste oil), hot water district heat, electricity, or a masonry
heater (including parts, labor and any costs associated with upgrading the
chimney to the extent required by the manufacturer of the appliance for
proper installation), or an emergency power system, up to $6,000 for the
purchase and installation.
   iv. With an appliance designed to use natural gas or propane,
up to $10,000 per purchase and installation of the appliance. Multiple non-
borough-listed solid fuel burning appliances or fireplaces, or combinations
thereof, may be replaced with a single heating device that meets the
requirements above, except for those that are fired by solid fuels. Payment
will be based on the number of devices removed, up to a maximum of
three, and may not exceed the replacement cost.

c. Removal of a SFBA (limited to a one-time participation in this
program per property).
   i. Removal of a hydronic heater through a one-time payment of
$5,000.
ii. Removal of other SFBAs through a one-time payment of $2,000.

d. Repair Program.
i. The repair program will pay for the:
   (A) Replacement of a wood stove’s catalytic converter that has exceeded its life span through the one-time payment of up to $750.00.
   (B) Replacement of any emissions-reducing component of an EPA certified wood stove up to the maximum amount of $750.00.

ii. In addition to the general requirements set forth in this section, applicants must fully comply with any inspection process required by the division, which may be performed by a borough-approved vendor.

Section 5. FNSBC 21.28.050, Forecasting exceedances and restrictions in the air quality control zone during an alert, shall be amended as follows:

A. During the winter months of October through March, the borough shall issue a daily PM2.5 forecast by 4:30 p.m. When the PM2.5 concentration reaches the onset level for an alert and is expected to remain at that level for 12 hours or more, an alert will be declared. An alert may apply to the air quality control zone as a whole, or to one or more sub-areas designated by the division. Once an alert is declared, PM2.5 control measures set forth in this section shall be implemented and continued until the alert is cancelled. There are two levels of alerts: Stage 1 and Stage 2. The obligations imposed in this subsection do not require, absent specific funding for that purpose, any actions to be taken outside of the borough’s normal business days and hours of operation. These restrictions shall not apply during a power failure. When an alert is in effect, outdoor burning is prohibited, including nonpermitted incinerators and burn barrels. This outdoor burning prohibition does not include recreational fires such as bonfires, campfires, or ceremonial fires and the use of fire pits.

B. The division will notify local media to ensure the declared alert is broadcast. The division shall also use social media and methods of direct communication such as text messages as feasible. Information within the notification will contain the PM2.5 forecast, stage level for areas, and actions required to reduce sources of PM2.5. The obligations imposed in this subsection do not require, absent specific funding for that purpose, any actions to be taken outside of the borough’s normal business days and hours of operation.

C. Stage 1: Restrictions in the Air Quality Control Zone during an Alert.
   1. A Stage 1 air alert is implemented when concentrations exceed or are forecasted to exceed 25 μg/m³.
   2. No fuel source may be added to the combustion chamber of a firebox of any solid fuel burning appliance or waste oil burning appliance. Residents should rely

**AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT**

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Text to be deleted is [BRACKETED, CAPITALIZED]
instead on their home's alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) until the Stage 1 air alert is cancelled. [BURNING IS PERMITTED IN ALL EPA CERTIFIED SOLID FUEL BURNING APPLIANCES, AND EPA CERTIFIED HYDRONIC HEATERS, MASONRY HEATERS, AND COOK STOVES. NO FUEL SOURCE MAY BE ADDED TO THE COMBUSTION CHAMBER OR FIREBOX OF ANY SOLID FUEL BURNING APPLIANCE OR WASTE OIL BURNING APPLIANCE NOT LISTED ABOVE. RESIDENTS SHOULD Rely INSTEAD ON THEIR HOME'S ALTERNATE, CLEANER SOURCE OF HEAT (SUCH AS A GAS OR FUEL OIL FIRED FURNACE OR BOILER OR ELECTRIC BASEBOARD HEATERS) UNTIL THE STAGE 1 AIR ALERT IS CANCELLED.]

3. If a building owner or other person with a property or managerial interest in the building has an approved "no other adequate source of heat" designation, the building owner is exempted from complying with the Stage 1 air alert restrictions for that building.

4. If a building owner or other person with a property or managerial interest in the building has an approved Stage 1 Waiver the building owner is exempted from complying with the Stage 1 air alert restrictions for that building. A Stage 1 Waiver will be granted if the person with property or managerial interest verifies that the SFBA being operated during a Stage 1 air alert is a Borough listed appliance. A Stage 1 Waiver may be obtained by completing an application on a form developed by the division, that includes the following information:

   a. Documentation of approved appliance must be submitted, including pictures, make and model,

   b. Documentation of the applicant's ability to properly store wood,

   c. Documentation the applicant has taken a class or training in proper wood burning techniques.

D. Stage 2: Required Restrictions in the Air Quality Control Zone during an Alert.

1. A Stage 2 air alert is implemented when concentrations exceed or are forecasted to exceed 35 $\mu g/m^3$.

2. No fuel source may be added to the combustion chamber or firebox of any solid fuel burning appliance or waste oil burning appliance. Residents should rely instead on their home's alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) until the Stage 2 air alert is cancelled.

3. If a building owner or other person with a property or managerial interest in the building has an approved "no other adequate source of heat" designation the building owner is exempted from complying with the Stage 2 air alert restrictions for that building.

Section 6. FNSBC 21.28.060 No other adequate source of heat determination, shall be amended as follows:

**AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT**
Text to be *added* is underlined
Text to be *deleted* is [BRACKETED, CAPITALIZED]
A. A building owner or other person with a property or managerial interest in a building located within the air quality control zone may obtain a "no other adequate source of heat" determination from the division if:

1. The SFBA being used to heat the structure is a Borough listed appliance:[EPA CERTIFIED UNLESS AN APPLICATION HAS BEEN MADE TO THE ENHANCED VOLUNTARY REMOVAL, REPLACEMENT AND REPAIR PROGRAM TO REMOVE OR REPLACE THE NONCERTIFIED SFBA AND HAS BEEN DENIED, A PELLET FUEL BURNING APPLIANCE INSTALLED PRIOR TO APRIL 1, 2017, A MASONRY HEATER, OR A COOK STOVE.]

   a. 

2. The building owner(s) or other person with a property or managerial interest in the building applies with the division on a form developed by the division, including the following:

   a. Documentation of approved appliance must be submitted, including pictures, make, model, and serial number.

   b. Documentation of the applicant's ability to properly store wood.

   c. Documentation the applicant has taken a class or training in proper wood burning techniques;

3. The building owner(s) or other person with a property or managerial interest in the building files an affidavit with the application that the subject structure must be heated and the structure has no adequate heating source without using a solid fuel [OR WASTE OIL] burning appliance or that economic hardships require the applicant's use of a solid fuel [OR WASTE OIL] burning appliance or complying with a restriction would result in damage to property including damage to the appliance itself and its heating system components. If economic hardship is the reason the applicant has no other adequate source of heat, validating documentation is required. Validating documentation may be established by showing approval for assistance from a list of agencies or programs that provide economic assistance (e.g., programs based on HHS poverty guidelines, unemployment insurance, nutrition assistance) to be made available by the division;

4. The building was constructed on or before December 31, 2016.

B. There shall be no fee for applying for or obtaining a determination.

C. It shall be a violation to submit a false affidavit for a "no other adequate source of heat" determination.

D. If the "no other adequate source of heat" appliance does not meet the standards set in this chapter, the division shall provide the applicant with information concerning the borough's voluntary removal, replacement and repair program.

E. Applications denied by the division may be appealed to the air pollution control commission within 30 days of the decision.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
F. An applicant that has been denied a "no alternative source of heat determination" by the division because the appliance does not meet the criteria of this section may apply to the air pollution control commission for a variance within 10 days of this decision. A temporary "no alternative source of heat" determination shall be granted pending the decision of the commission. In determining whether to grant a variance, the commission shall consider the location of the appliance, impact on surrounding neighborhood, emission levels of the appliance, the financial investment and ability of the applicant to replace the appliance and any other relevant conditions that indicate the operation of the appliance at that location is not a nuisance or health hazard. If the commission denies a variance, the "no alternative source of heat" determination shall expire 60 days from the date of denial.

Section 7. FNSBC 1.20.080, Fine Schedule, is hereby amended as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Fine</th>
<th>Repeatable</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.28.030(E)</td>
<td>Failure to obtain, submit and execute a permit for installing a SFBA in new construction.</td>
<td>$1,000</td>
<td>No</td>
</tr>
<tr>
<td>21.28.030(F[E])</td>
<td>Illegal installation of hydronic heaters.</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>21.28.030(F[E])</td>
<td>Failure to remove hydronic heaters.</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>21.28.030(G[F])</td>
<td>Use of prohibited fuels.</td>
<td>$100.00</td>
<td>Yes</td>
</tr>
<tr>
<td>1st offense</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.28.030(G[F])</td>
<td>Use of prohibited fuels.</td>
<td>$500.00</td>
<td>No</td>
</tr>
<tr>
<td>2nd offense</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.28.030(H[G])</td>
<td>Violation of commercial sale requirements.</td>
<td>$500.00</td>
<td>No</td>
</tr>
</tbody>
</table>

Section 8. Subsection G of FNSBC 4.12.110 shall be amended as follows:


*AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT*

Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
Section 9. Appendix E- User Fee Schedule of the FY 2017-18 budget is hereby amended to add the following to the Transportation User Fee Schedule:

Air Quality
Permit application fee for SFBA in new construction $375.00

Section 10. Effective Date. This ordinance shall be effective at 5:00 p.m. of the first Borough business day following its adoption.

PASSED AND APPROVED THIS 19th DAY OF JUNE, 2017.

Kathryn Dodge
Presiding Officer

ATTEST:

Nanci Ashford-Bingham, MMC
Borough Clerk

Yeses: Tacke, Davies, Cooper, Quist, Gray, Lawrence, Dodge
Noes: Roberts, Sattley
FAIRBANKS NORTH STAR BOROUGH

ORDINANCE NO. 2018-04

AN ORDINANCE AMENDING CHAPTER 21.28 FNSBC REGARDING CRITERIA FOR NO OTHER ADEQUATE SOURCE OF HEAT DETERMINATIONS AND AMENDING BOROUGH LISTED APPLIANCES

WHEREAS, A No Other Adequate Source of Heat Determination (NOASH) is only available to applicants with a solid fuel burning appliance that is a borough listed appliance; and

WHEREAS, An appliance that is EPA certified may not qualify for a NOASH because it does not meet the emissions requirements for a borough listed appliance; and

WHEREAS, Applicants who are denied a NOASH but who have EPA certified appliances may also not qualify for the change-out program due to grant restrictions; and

WHEREAS, The NOASH determination should include all eligible EPA certified appliances.

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

Section 1. Classification. This ordinance is of a general and permanent nature and shall be codified.

Section 2. Subsection A of FNSBC 21.28.060, No other adequate source of heat determination, is hereby amended as follows:

A. A building owner or other person with a property or managerial interest in a building located within the air quality control zone may obtain a “no other adequate source of heat” determination from the division if:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED & CAPITALIZED]
1. The SFBA being used to heat the structure is:
   a. a borough listed appliance, or
   b. an EPA certified appliance manufactured after 1998, and if the appliance has a catalyst, the catalyst has been replaced by a new catalyst in the accordance with manufacturer recommendation or specifications;
2. The building owner(s) or other person with a property or managerial interest in the building applies with the division on a form developed by the division, including the following:
   a. Documentation of approved appliance must be submitted, including pictures, make, model, and serial number.
   b. Documentation of the applicant’s ability to properly store wood.
   c. Documentation the applicant has taken a class or training in proper wood burning techniques;
3. The building owner(s) or other person with a property or managerial interest in the building files an affidavit with the application that the subject structure must be heated and the structure has no adequate heating source without using a solid fuel burning appliance or that economic hardships require the applicant’s use of a solid fuel burning appliance or complying with a restriction would result in damage to property including damage to the appliance itself and its heating system components. If economic hardship is the reason the applicant has no other adequate source of heat, validating documentation is required. Validating documentation may be established by showing approval for assistance from a list of agencies or programs that provide economic assistance (e.g., programs based on HHS poverty guidelines, unemployment insurance, nutrition assistance) to be made available by the division;
4. The building was constructed on or before December 31, 2016.

Section 3. FNSBC 21.28.020, Borough listed appliances, is hereby amended as follows:
A solid fuel burning appliance shall be listed by the borough if:
A. The solid fuel burning appliance is EPA certified as meeting the federal emissions rate of 2.5 grams of PM2.5 per hour or less, or, for hydronic heaters, is EPA certified and has an emission rating of 0.10 pounds per million BTU or less; or
B. The solid fuel burning appliance is a masonry heater[,] or cook stove[, OR FIREPLACE]; or
C. The solid fuel burning appliance is tested, including by use of a handheld or other portable device, by an accredited independent laboratory, or other qualified person or entity approved by the borough, establishing that it meets the emissions rate of 2.5 grams per hour or less.

Section 4. Effective Date. This ordinance shall be effective at 5:00 p.m. of the first Borough business day following its adoption.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED & CAPITALIZED]
PASSED AND APPROVED THIS 8TH DAY OF FEBRUARY, 2018.

Kathryn Dodge
Presiding Officer

ATTEST:

Nanci Ashford-Bingham
Borough Clerk

Yeses: Quist, Cooper, Tacke, Roberts, Lojewski, Major, Lawrence, Dodge
Noes: None
Other: Gray (Excused)
FAIRBANKS NORTH STAR BOROUGH

ORDINANCE NO. 2018-26

AN ORDINANCE AMENDING CHAPTER 21.28 FNSBC TO ADD DEFINITIONS AND STANDARDS FOR RETROFIT CONTROL DEVICES, INCLUDING ELECTROSTATIC PRECIPITATORS

WHEREAS, Due to the high and varying cost of heating oil, there is considerable interest in identifying technologies capable of reducing PM2.5 emissions from wood and pellet stoves in order to allow them to operate during air quality stage alerts; and

WHEREAS, Retrofit controls devices such as electrostatic precipitators that are used in conjunction with a solid fuel burning appliance (SFBA) may be reduce the SFBA’s emissions to levels equal to or less than levels emitted by residential fuel oil boilers and furnaces; and

WHEREAS, The administration is actively working with the Environmental Protection Agency to establish protocols for testing after-market emission control devices for SFBAs, and this ordinance will help set forth the standards to be implemented as soon as they are developed.

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks North Star Borough:

Section 1. This ordinance is of a general and permanent nature and shall be codified.
Section 2. FNSBC 21.28.010, Definitions, shall be amended to add the following definition [the Clerk shall add the definition in alphabetical order]:

"Electrostatic Precipitator (ESP)" means a device that removes suspended particulate matter from an exhaust stream by applying a high-voltage electrostatic charge and collecting the particles on charged plates.

"Retrofit Control Device (RCD)" means an after-market device used in conjunction with an SFBA and designed to reduce particulate matter emissions. A Retrofit Control Device includes an electrostatic precipitator.

Section 3. FNSBC 21.28.050, Forecasting exceedances and restrictions in the air quality control zone during an alert, is amended as follows:

C. Stage 1: Restrictions in the Air Quality Control Zone during an Alert.

1. A Stage 1 air alert is implemented when concentrations exceed or are forecasted to exceed 25 μg/m³.

2. No fuel source may be added to the combustion chamber of a firebox of any solid fuel burning appliance or waste oil burning appliance. Residents should rely instead on their home's alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) until the Stage 1 air alert is canceled.

3. If a building owner or other person with a property or managerial interest in the building has an approved "no other adequate source of heat" designation, the building owner is exempted from complying with the Stage 1 air alert restrictions for that building.

4. If a building owner or other person with a property or managerial interest in the building has an approved Stage 1 waiver the building owner is exempted from complying with the Stage 1 air alert restrictions for that building. A Stage 1 waiver will be granted if the person with property or managerial interest verifies that the SFBA being operated during a Stage 1 air alert is a borough listed appliance. A Stage 1 waiver may be obtained by completing an application on a form developed by the division, which includes the following information:

   a. Documentation of approved appliance must be submitted, including pictures, make and model.

   b. Documentation of the applicant's ability to properly store wood.

   c. Documentation the applicant has taken a class or training in proper wood burning techniques.

5. If a building owner or other person with a property or managerial interest in the building has an Approved RCD, the solid fuel burning appliance is exempted from Stage 1 air alert restrictions.

D. Stage 2: Required Restrictions in the Air Quality Control Zone during an Alert.

1. A Stage 2 air alert is implemented when concentrations exceed or are forecasted to exceed 35 μg/m³.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZE]
2. No fuel source may be added to the combustion chamber or firebox of any solid fuel burning appliance or waste oil burning appliance. Residents should rely instead on their home's alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) until the Stage 2 air alert is canceled.

3. If a building owner or other person with a property or managerial interest in the building has an approved "no other adequate source of heat" designation the building owner is exempted from complying with the Stage 2 air alert restrictions for that building.

4. If a building owner or other person with a property or managerial interest in the building has an Approved RCD, the solid fuel burning appliance is exempted from Stage 2 air alert restrictions.

E. Stage RCD: Required Restrictions in the Air Quality Control Zone during an Alert

1. A Stage RCD air alert is implemented when concentrations exceed or are forecasted to exceed 55 µg/m³.

2. Stage RCD air alerts apply only to solid fuel burning appliances with an Approved RCD.

3. No fuel source may be added to the combustion chamber or firebox of a solid fuel burning appliance with an Approved RCD. Residents should rely instead on their home's alternate, cleaner source of heat (such as a furnace, boiler or electric baseboard heaters) until the Stage RCD air alert is canceled.

4. If a building owner or other person with a property or managerial interest in the building has an approved "no other adequate source of heat" designation the building owner is exempted from complying with the Stage RCD air alert restrictions for that building.

5. A Stage RCD air alert is not required to be issued unless one or more Approved RCDs are on file with the division.

Section 4. FNSBC 21.28.060, shall be renamed Exemptions, and shall be amended to read as follows:

A. No Other Adequate Source Of Heat

[A]. A building owner or other person with a property or managerial interest in a building located within the air quality control zone may obtain a "no other adequate source of heat" determination from the division if:

[1]a. The SFBA being used to heat the structure is:

[A]. A borough listed appliance, or

[B]ii. An EPA certified appliance manufactured after 1998, and if the appliance has a catalyst, the catalyst has been replaced by a new catalyst in accordance with manufacturer recommendation or specifications;

[2]b. The building owner(s) or other person with a property or managerial interest in the building applies with the division on a form developed by the division, including the following:

**AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT**

Text to be **added** is underlined

Text to be **deleted** is [BRACKETED, CAPITALIZE]
[A]. Documentation of approved appliance must be submitted, including pictures, make, model, and serial number.

[B]. Documentation of the applicant’s ability to properly store wood.

[C]. Documentation the applicant has taken a class or training in proper wood burning techniques;

[D]. The building owner(s) or other person with a property or managerial interest in the building files an affidavit with the application that the subject structure must be heated and the structure has no adequate heating source without using a solid fuel burning appliance or that economic hardships require the applicant’s use of a solid fuel burning appliance or complying with a restriction would result in damage to property including damage to the appliance itself and its heating system components. If economic hardship is the reason the applicant has no other adequate source of heat, validating documentation is required. Validating documentation may be established by showing approval for assistance from a list of agencies or programs that provide economic assistance (e.g., programs based on HHS poverty guidelines, unemployment insurance, nutrition assistance) to be made available by the division;

[E]. The building was constructed on or before December 31, 2016.

[F]. There shall be no fee for applying for or obtaining a determination.

[G]. It shall be a violation to submit a false affidavit for a “no other adequate source of heat” determination.

[H]. If the “no other adequate source of heat” appliance does not meet the standards set in this chapter, the division shall provide the applicant with information concerning the borough’s voluntary removal, replacement and repair program.

[I]. Applications denied by the division may be appealed to the air pollution control commission within 30 days of the decision.

[J]. An applicant that has been denied a “no alternative source of heat determination” by the division because the appliance does not meet the criteria of this section may apply to the air pollution control commission for a variance within 10 days of this decision. A temporary “no alternative source of heat” determination shall be granted pending the decision of the commission. In determining whether to grant a variance, the commission shall consider the location of the appliance, impact on surrounding neighborhood, emission levels of the appliance, the financial investment and ability of the applicant to replace the appliance and any other relevant conditions that indicate the operation of the appliance at that location is not a nuisance or health hazard. Interested persons may testify and submit other admissible evidence for the commission’s consideration. If the commission denies a variance, the “no alternative source of heat” determination shall expire 60 days from the date of denial.

B. Approved RCDs

A building owner or other person with a property or managerial interest in a building located within the air quality control zone may obtain an “Approved RCD” designation from the division for a borough listed appliance that is a pellet fuel stove.

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appliance, a catalytically controlled wood stove appliance, or a non-catalytically
controlled wood stove appliance, if the requirements of this section are met:

1. Performance testing. Performance testing of the appliance with the RCD
has been conducted in accordance with this section and demonstrates post-RCD PM
emissions of less than 0.01 lb/MMbtu.

a. Performance testing for PM emissions on a wood stove, using cord
wood as a fuel source, shall be conducted using EPA Reference Methods 1, 5H, ASTM
Method E3053 and CSA-B415.1-10.

b. Performance testing for PM emissions on pellet fuel burning
appliances shall be conducted using EPA Reference Methods 1, 5H, ASTM E2779(10)
and CSA-B415.1-10.

c. Particulate matter sampling, per EPA Reference Method 5H, shall
be performed simultaneously upstream and downstream of the RCD.

d. A total of six (6) completed tests, each consisting of all applicable
test runs at required burn rates, is required per appliance-RCD combination.

e. Performance testing shall be performed by either (1) a test
laboratory that is EPA approved for wood heater certification testing under 40 CFR
60.535 or (2) an independent third-party test laboratory that is accredited under ISO-
IEC Standard 17025 to perform testing using the test methods specified in 40 CFR
60.534 by an accreditation body that is a full member signatory to the International
laboratory Accreditation Cooperation Mutual Recognition Arrangement and approved by
the EPA for conducting testing under 40 CFR 60 Subpart AAA.

f. Testing protocols shall be submitted to the division for approval 30
days prior to testing. One complete set of performance tests conducted in accordance
with this section is required per appliance category. A written report of the results with
sufficient information to guarantee that the emissions requirements of this section are
met shall be submitted to the division.

2. Application. The building owner(s) or other person with a property or
managerial interest in the building may apply to the division on a form developed by the
division, including the following:

a. Documentation of an approved appliance category-RCD
combination must be submitted, including pictures, make, model, and serial number of
both appliance and RCD.

b. Documentation of the applicant’s ability to properly store wood, if
applicable.

c. Documentation the applicant has taken a class or training in proper
wood burning techniques, if applicable.

d. Documentation that the RCD was installed by a certified installer.

3. Conditions of approval. A person receiving an Approved RCD must certify
that they (a) will ensure that the subject appliance obtains an annual chimney sweep
and submit proof to the division; (b) will provide data to establish maintenance and
monitoring protocols to ensure the RCD performs effectively; (c) will perform any

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
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additional maintenance and monitoring determined necessary to maintain emissions standards as established through field tests; and (d) maintain and operate per the manufacturer’s instructions.

Section 5. Subsection C of FNSBC 21.28.030, Prohibited Acts, shall be amended as follows:

C. Visible Emissions Standard in the Air Quality Control Zone.

1. Standard. No person shall cause, permit, or allow particulate emissions from a nonmobile source in the air quality control zone to create opacity greater than 20 percent for a period or periods aggregating more than 10 minutes in any hour except during the first 40 minutes after the initial firing when the opacity limit shall be less than 50 percent.

2. Approved RCD Standard. Other standards set forth in this chapter notwithstanding, no person shall cause, permit, or allow visible emissions with an opacity greater than 0% from an appliance with an Approved RCD other than during the first 40 minutes after the initial firing when the opacity limit shall be less than 50 percent.

[2]3. Procedures and Enforcement. When ambient weather and light conditions permit, methods and procedures specified by the EPA in 40 CFR 60 Appendix A Reference Method 9 (Visual determination of the Opacity of Emissions From Stationary Sources), or an alternative technology that replaces Method 9, when the technology is available and the choice is feasible, upon request of the person being investigated, shall be used to determine compliance with this section. Smoke visible from a chimney, flue or exhaust duct in excess of the opacity standard for a period in excess of 30 minutes shall constitute prima facie evidence of unlawful operation of an applicable solid fuel burning appliance.

Section 6. Effective Date. This ordinance shall be effective thirty days following its adoption.
PASSED AND APPROVED THIS 13TH DAY OF SEPTEMBER, 2018.

Kathryn Dodge
Presiding Officer

ATTEST:

April Trickey, CMC
Borough Clerk

Yeses: Tacke, Roberts, Cooper, Quist, Major, Gray, Lawrence, Dodge
Noes: None
Other: Lojewski (Excused)

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZE]

Fairbanks North Star Borough, Alaska
ORDINANCE NO. 2018-26

Appendix III.D.7.7-5277
FAIRBANKS NORTH STAR BOROUGH

ORDINANCE NO. 2018-45

AN ORDINANCE AMENDING CHAPTER 21.28 FNSBC REGARDING AIR QUALITY
CONTROL PROGRAM, FNSBC 1.20.080 FINE SCHEDULE, AND CHAPTER 4.12 FNSBC
REGARDING AIR POLLUTION CONTROL COMMISSION

WHEREAS, Voters recently adopted an ordinance by initiative, “The Home
Heating Reclamation Act,” which prohibits the Borough from in any way regulating,
prohibiting, curtailing, banning, or issuing fines or fees association with the sale,
distribution, installation, or operation of solid fuel heating appliances or combustible
fuels; and

WHEREAS, Portions of Chapter 21.28 FNSBC are effectively repealed with
the enactment of the initiative ordinance, and amending code will provide clarity for the
public.

NOW, THEREFORE, BE IT ORDAINED by the Assembly of the Fairbanks
North Star Borough:

Section 1. This ordinance is of a general and permanent nature and shall
be codified.

Section 2. Chapter 21.28 FNSBC, PM2.5 Air Quality Control Program, is
hereby amended as follows:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
  Text to be added is underlined
  Text to be deleted is [BRACKETED, CAPITALIZED]

Fairbanks North Star Borough, Alaska

ORDINANCE NO. 2018-45

Page 1 of 23

Appendix III.D.7.7-5278
Chapter 21.28
PM2.5 AIR QUALITY CONTROL PROGRAM

Sections:

21.28.010 Definitions.
21.28.020 Borough listed appliances.
21.28.040 Enhanced voluntary removal, replacement and repair program.
21.28.050 Forecasting [EXCEEDANCES AND RESTRICTIONS] in the air quality control zone [DURING AN ALERT].
21.28.060 [NO OTHER ADEQUATE SOURCE OF HEAT DETERMINATION.] Repealed.
21.28.070 The Home Heating Reclamation Act

21.28.010 Definitions.

In this chapter, the following definitions apply:

“Air quality control zone” means the area of the borough currently contained in the EPA designated nonattainment area, which uses the nonattainment area southern, western and eastern boundaries as modified by their respective intersection with the following northern boundary described as: beginning at the intersection of Isberg Road with Chena Ridge Road on the western boundary of the EPA designated nonattainment area, then following Chena Ridge Road back to Chena Pump Road and continuing north on the Parks Highway to Sheep Creek Road, then Sheep Creek Road to Miller Hill Road, then north on Miller Hill Road, then east on Yankovich, then north from Yankovich Road along the east boundary of the Large Animal Research Station to a point just north of its intersection with Nottingham Drive and follows the ridge crest across Nottingham Estates to approximately the point where Swallow Drive intersects Dalton Trail to north on Dalton Trail to the crest of the Farmer’s Loop Ridge, then follow the geographic crest of Farmer’s Loop Ridge to its intersection with the New Steese Highway, then southeast on Bennett Road, and along Steele Creek Road to the intersection of Chena Hot Springs Road, and Chena Hot Springs Road to the eastern boundary of the EPA designated nonattainment area.

“Air quality index” (AQI) is an index for reporting daily air quality, which indicates how polluted the air currently is or how polluted it is forecast to become. The higher the AQI value, the greater the level of air pollution and the greater the health concern. AQI is divided into six categories with correspondingly higher levels of health concern as outlined in the table below:

<table>
<thead>
<tr>
<th>AQI (Air Quality Index)</th>
<th>AQI Category</th>
<th>Cautionary Statement</th>
<th>Health Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 50</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
<table>
<thead>
<tr>
<th>AQI (Air Quality Index)</th>
<th>AQI Category</th>
<th>Cautionary Statement</th>
<th>Health Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>51 – 100</td>
<td>Moderate</td>
<td>Unusually sensitive people should consider reducing prolonged or heavy exertion.</td>
<td>None</td>
</tr>
<tr>
<td>101 – 150</td>
<td>Unhealthy for Sensitive Groups</td>
<td>People with respiratory or heart disease, the elderly, and children should limit prolonged exertion.</td>
<td>Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly.</td>
</tr>
<tr>
<td>151 – 200</td>
<td>Unhealthy</td>
<td>People with respiratory or heart disease, the elderly, and children should avoid prolonged exertion; everyone else should limit prolonged exertion.</td>
<td>Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.</td>
</tr>
<tr>
<td>201 – 300</td>
<td>Very Unhealthy</td>
<td>People with respiratory or heart disease, the elderly, and children should avoid outdoor activity; everyone else should avoid prolonged exertion.</td>
<td>Significant aggravation of the heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in the general population.</td>
</tr>
<tr>
<td>301 – 500</td>
<td>Hazardous</td>
<td>Everyone should avoid any outdoor exertion; people with respiratory or heart disease, the elderly and children should remain indoors.</td>
<td>Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in the general population.</td>
</tr>
</tbody>
</table>

["ALERT" MEANS A NOTICE ISSUED BY THE DIVISION WHEN THE DIVISION DETERMINES, USING AVAILABLE DATA OR MODELING, THAT PM2.5 CONCENTRATION LEVELS HAVE REACHED OR ARE FORECASTED TO REACH 25 "G/M" OR HIGHER FOR AT LEAST 12 CONSECUTIVE HOURS.]

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
“Appliance” means a device or apparatus that is manufactured and designed to utilize energy and which does not require a stationary source air quality permit from the state of Alaska under 18 AAC 50.

“Clean wood” means natural wood that has not been painted, varnished, or coated with a similar material, has not been treated with preservatives, and does not contain resins or glues as in plywood or other composite wood products.

[“COMMENCE” MEANS (1) BEGIN, OR CAUSE TO BEGIN, ACTUAL ON-SITE Construction OR (2) ENTER INTO BINDING AGREEMENTS OR CONTRACTUAL OBLIGATIONS TO BEGIN CONSTRUCTION, WHICH CANNOT BE CANCELED OR MODIFIED WITHOUT SUBSTANTIAL LOSS TO THE OWNER.

“CONSTRUCTION AND DEMOLITION DEBRIS” MEANS A CONGLOMERATION OF MATERIALS FROM CONSTRUCTION, REPAIR, REMODELING OR DEMOLITION OF BUILDINGS AND STRUCTURES CONTAINING ANY PROHIBITED FUELS.]

“Cook stove” means a wood burning appliance that is designed primarily for cooking food and that has the following characteristics:

1. An oven, with a volume of 0.028 cubic meters (one cubic foot) or greater, and an oven rack;
2. A device for measuring oven temperatures;
3. A flame path that is routed around the oven;
4. A shaker grate;
5. An ash pan;
6. An ash clean-out door below the oven; and
7. The absence of a fan or heat channels to dissipate heat from the device.

“Division” means the Fairbanks North Star Borough air quality division.

[“ELECTROSTATIC PRECIPITATOR (ESP)” MEANS A DEVICE THAT REMOVES SUSPENDED PARTICULATE MATTER FROM AN EXHAUST SYSTEM BY APPLYING A HIGH-VOLTAGE ELECTROSTATIC CHARGE AND COLLECTING THE PARTICLES ON CHARGED PLATES.]

“Emergency power system” is an independent source of electrical power that supports important electrical systems on loss of normal power supply. An emergency power system may include a standby generator, batteries, and other apparatus. Emergency power systems are installed to protect life and property from the consequences of loss of normal electric power supply.

“EPA” means the United States Environmental Protection Agency.

“EPA certified” means that the solid fuel burning appliance meets emission performance standards when tested by an accredited independent laboratory and is labeled according to procedures specified by the EPA in 40 CFR Part 60 Subpart AAA or QQQQ.

“Fireplace” means an assembly consisting of a hearth and open fire chamber of noncombustible factory-built or masonry materials and provided with a chimney, for use with solid fuels, which cannot be operated with an air to fuel ratio of less than 35 to one.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
“Fireplace insert” means a solid fuel burning appliance similar in function and performance to a freestanding wood burning stove, which is made from cast iron or steel designed to be installed in an existing masonry or prefabricated fireplace.

“Forecast” means a description of the current dispersion conditions described as good, fair, or poor and including the expected PM2.5 NowCast AQI categorized as good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, or hazardous.

["HEATING APPLIANCES" MEANS, BUT IS NOT LIMITED TO: WOOD, COAL, OR PELLET FIRED HYDRONIC HEATERS, STOVES, AND FURNACES; OIL OR GAS FIRED BOILERS AND FURNACES; AND MASONRY HEATERS, PELLET STOVES, COOK STOVES, AND FIREPLACES.]

“Hydronic” means having to do with a system moving heat from one location to another by means of the circulation of a heat transfer liquid through piping or tubing.

“Hydronic heater” means a fuel burning appliance designed to (1) burn wood or other solid fuels and (2) heat building space and/or domestic hot water via the distribution, typically through pipes, of a fluid heated in the appliance.

["INTERESTED PERSONS" MEANS THOSE INDIVIDUALS WHO TIMELY APPLY TO PARTICIPATE IN A MATTER AND DEMONSTRATE THAT THEY POSSESS A SPECIFIC PROPERTY INTEREST THAT MAY BE SIGNIFICANTLY AFFECTED BY THE PROPOSED ACTION IN A WAY DIFFERENT THAN THAT OF THE GENERAL PUBLIC.]

“Masonry heater” means a wood burning appliance that complies with the guidelines of ASTM E1602-08, Standard Guide for Construction of Masonry Heaters, and:

1. Is designed and intended for operation only in a closed combustion chamber configuration; and

2. Has enough thermal storage capacity to maintain no less than 50.0 percent of the maximum masonry-mass temperature for at least four hours after the maximum masonry-mass temperature has been reached; and

3. The masonry heater design and installation has been confirmed and documented by a qualified person or entity approved by the borough.

["NEW CONSTRUCTION" MEANS CONSTRUCTION OF ENTIRELY NEW STRUCTURES DESIGNED FOR HEATED OCCUPANCY AND ANY STRUCTURAL ALTERATION THAT ADDS HEATED SQUARE FOOTAGE TO AN EXISTING STRUCTURE WHETHER OR NOT THE STRUCTURE WAS PREVIOUSLY OCCUPIED.]

“Nonattainment area” is the area depicted on the map attached to the ordinance codified in this chapter and is further defined as follows:

Township Range Delineated Boundary for the Fairbanks Nonattainment Area MTRS F001N001 – All Sections, MTRS F001N001E – Sections 2-11, 14-23, 26-34, MTRS F001N002 – Sections 1-5, 8-17, 20-29, 32-36, MTRS F001S001E – Sections 1, 3-30, 32-36, MTRS F001S001W – Sections 1-30, MTRS F001S002E – Sections 6-8, 17-20, 29-36, MTRS F001S002W – Sections 1-5, 8-17, 20-29, 32-33, MTRS F001S003E – Sections 31-32, MTRS F002N001E – Sections 31-35, MTRS F002N001 – Sections 28, 31-36, MTRS F002N002 –
"NowCast" means a weighted average of hourly air monitoring data used by the EPA for real-time reporting of the AQI for PM.

["OPACITY" MEANS THE REDUCTION IN TRANSMITTED LIGHT THROUGH A COLUMN OF SMOKE AS MEASURED BY AN OBSERVER CERTIFIED IN USING EPA REFERENCE METHOD 9 AS DEFINED BY FEDERAL LAW OR EPA APPROVED ALTERNATIVE METHOD 82 WHICH IS DEFINED AS AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) D 7520-09.]

"Particulate matter" or "PM" means total particulate matter including PM10 and PM2.5 (condensable and noncondensable fraction) and is a complex airborne mixture of extremely small particles and liquid droplets that are made up of a number of components, including acids, organic chemicals, metals, soil, or dust.

"Pellet fuel burning appliance" or "pellet stove" means a closed combustion, vented pellet burning appliance with automatic components creating an active air flow system, sold with the hopper and auger combination as integral parts, and designed, warranted, safety listed, and advertised by the manufacturer specifically to be fueled by pellets of sawdust, wood products and other biomass materials while prohibiting the use of cordwood.

"PM_{2.5}\) means particulate matter comprised of particles that have diameters of two and one-half microns or less.

"Proper wood storage" means specific and dedicated space to store clean wood in such a manner that the clean wood is not in contact with soil, the top of the clean wood is adequately protected from precipitation, and with airflow available to the clean wood.

["RETROFIT CONTROL DEVICE (RCD)" MEANS AN AFTER-MARKET DEVICE USED IN CONJUNCTION WITH AN SFBA AND DESIGNED TO REDUCE PARTICULATE MATTER EMISSIONS. A RETROFIT CONTROL DEVICE INCLUDES AN ELECTROSTATIC PRECIPITATOR.]

"SALE" MEANS THE TRANSFER OF OWNERSHIP OR CONTROL.]

"Solid fuel burning appliance" (SFBA) means any appliance designed to produce heat by burning nongaseous and nonliquid fuels. This definition includes, but is not limited to:

1. Wood stoves;
2. Coal stoves;
3. Wood-fired hydronic heaters;
4. Wood-fired furnaces;
5. Coal-fired hydronic heaters;
6. Coal-fired furnaces;
7. Fireplace inserts;
8. Pellet fuel burning appliances;
9. Masonry heaters;
10. Cook stoves; and
11. Fireplaces.

“Waste oil burning appliance” means an appliance that burns used or waste oil.

21.28.020 Borough listed appliances.

A solid fuel burning appliance shall be listed by the borough if:

A. The solid fuel burning appliance is EPA certified as meeting the federal emissions rate of 2.5 grams of PM2.5 per hour or less, or, for hydronic heaters, is EPA certified and has an emission rating of 0.10 pounds per million BTU or less; or

B. The solid fuel burning appliance is a masonry heater or cook stove; or

C. The solid fuel burning appliance is tested, including by use of a handheld or other portable device, by an accredited independent laboratory, or other qualified person or entity approved by the borough, establishing that it meets the emissions rate of 2.5 grams per hour or less.

21.28.030 PROHIBITED ACTS.

A. INSTALLATION OF CERTAIN SOLID FUEL BURNING APPLIANCES IN THE NONATTAINMENT AREA. WITHIN THE NONATTAINMENT AREA NO PERSON SHALL INSTALL OR ALLOW THE INSTALLATION OF A SOLID FUEL BURNING APPLIANCE UNLESS IT IS LISTED BY THE BOROUGH AS QUALIFYING UNDER THIS CHAPTER AND THE INSTALLATION COMPLIES WITH ALL OTHER REQUIREMENTS IMPOSED IN THIS CHAPTER. IT IS A SEPARATE VIOLATION TO FAIL TO REMOVE A SOLID FUEL BURNING APPLIANCE INSTALLED IN VIOLATION OF THIS CHAPTER.

B. NO PERSON WHO HAS BEEN CONVICTED OF OR PLED NO CONTEST TO TWO OR MORE VIOLATIONS OF THIS CHAPTER INVOLVING VISIBLE EMISSIONS OR EMISSIONS CROSSING PROPERTY LINES SHALL, IN THE AIR QUALITY CONTROL ZONE, OPERATE, USE OR KEEP INSTALLED A HYDRONIC HEATER UNLESS THE HYDRONIC HEATER IS:

1. BOROUGH LISTED OR WAS LISTED AT THE TIME OF INSTALLATION,

2. A CLOSED COMBUSTION SYSTEM WITH AUTOMATIC COMPONENTS THAT FEED SOLID FUEL, INCLUDING WOOD PELLETS, INTO A FIREBOX WHERE THE COMBUSTION IS ENHANCED BY AN ACTIVE AIRFLOW SYSTEM, OR

3. CONNECTED TO A THERMAL MASS SYSTEM THAT IS CERTIFIED BY THE CONTRACTOR OR INSTALLER AS SUFICIENT TO ALLOW THE HYDRONIC HEATER TO BURN AT MAXIMUM CAPACITY MINIMIZING ON/OFF CYCLING. THE DIVISION MAY REQUIRE AN OWNER TO PROVIDE DOCUMENTATION SUPPORTING THE CERTIFICATION.

THIS PROHIBITION SHALL BE EFFECTIVE 90 DAYS AFTER THE SECOND CONVICTION OR ENTRY OF A NO CONTEST PLEA.

C. VISIBLE EMISSIONS STANDARD IN THE AIR QUALITY CONTROL ZONE.

1. STANDARD. NO PERSON SHALL CAUSE, PERMIT, OR ALLOW PARTICULATE EMISSIONS FROM A NONMOBILE SOURCE IN THE AIR QUALITY

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
CONTROL ZONE TO CREATE OPACITY GREATER THAN 20 PERCENT FOR A PERIOD OR
PERIODS AGgregATING MORE THAN 10 MINUTES IN ANY HOUR EXCEPT DURING
THE FIRST 40 MINUTES AFTER THE INITIAL FIRING WHEN THE OPACITY LIMIT SHALL
BE LESS THAN 50 PERCENT.

2. APPROVED RCD STANDARD. OTHER STANDARDS SET FORTH IN THIS
CHAPTER NOTWITHSTANDING, NO PERSON SHALL CAUSE, PERMIT, OR ALLOW
VISIBLE EMISSIONS WITH AN OPACITY GREAT THAN 0% FROM AN APPLIANCE WITH
AN APPROVED RCD OTHER THAN DURING THE FIRST 40 MINUTES AFTER THE
INITIAL FIRING WHEN THE OPACITY LIMIT SHALL BE LESS THAN 50 PERCENT.

3. PROCEDURES AND ENFORCEMENT. WHEN AMBIENT WEATHER AND
LIGHT CONDITIONS PERMIT, METHODS AND PROCEDURES SPECIFIED BY THE EPA IN
40 CFR 60 APPENDIX A REFERENCE METHOD 9 (VISUAL DETERMINATION OF THE
OPACITY OF EMISSIONS FROM STATIONARY SOURCES), OR AN ALTERNATIVE
TECHNOLOGY THAT REPLACES METHOD 9, WHEN THE TECHNOLOGY IS AVAILABLE
AND THE CHOICE IS FEASIBLE, UPON REQUEST OF THE PERSON BEING
INVESTIGATED, SHALL BE USED TO DETERMINE COMPLIANCE WITH THIS SECTION.
SMOKE VISIBLE FROM A CHIMNEY, FLUE OR EXHAUST DUCT IN EXCESS OF THE
OPACITY STANDARD FOR A PERIOD IN EXCESS OF 30 MINUTES SHALL CONSTITUTE
PRIMA FACIE EVIDENCE OF UNLAWFUL OPERATION OF AN APPLICABLE SOLID FUEL
BURNING APPLIANCE.

D. PM$_{2.5}$ EMISSIONS CROSSING PROPERTY LINES. NO PERSON SHALL CAUSE OR
PERMIT PARTICULATE EMISSIONS FROM A NONMOBILE SOURCE TO IMPACT THE
RESIDENT(S) OF A NEIGHBORING PROPERTY THROUGH THE CREATION OF AN
EMISSIONS PLUME THAT:

1. CROSSES A PROPERTY LINE;
2. IS OBSERVABLE USING EPA METHOD 22 (40 CFR 60 APPENDIX A); AND
3. IS 25 G/M$^3$ GREATER THAN THE SURROUNDING IMMEDIATE VICINITY
BACKGROUND PM$_{2.5}$ LEVEL USING METHODS DEFINED BY THE BOROUGH DIVISION
OF AIR QUALITY. FOR PURPOSES OF THIS SUBSECTION, THE SURROUNDING
"IMMEDIATE VICINITY" MEANS LAND WITHIN AN AREA MEASURED 1,200 FEET IN ALL
DIRECTIONS FROM THE BOUNDARIES OF THE EMITTING PROPERTY.

E. REQUIREMENTS FOR INSTALLATION OF SOLID FUEL BURNING APPLIANCES IN
NEW CONSTRUCTION.

1. FOR ALL NEW CONSTRUCTION THAT COMMENCES ON OR AFTER
JANUARY 1, 2018, AND IS LOCATED WITHIN THE AIR QUALITY CONTROL ZONE THE
FOLLOWING WILL APPLY:

A. INSTALLATION OF A SOLID FUEL BURNING APPLIANCE IS
PROHIBITED UNLESS A PERMIT HAS BEEN ISSUED BY THE DIVISION. A PERMIT
MUST BE OBTAINED FOR ANY SOLID FUEL BURNING APPLIANCE INSTALLED IN NEW
CONSTRUCTION PRIOR TO INSTALLATION OF THE APPLIANCE.

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
B. APPLICATION. THE PERMIT APPLICATION WILL REQUIRE THE
OWNER(S) TO CERTIFY THEY WILL MEET THE FOLLOWING REQUIREMENTS:

I. THE PROPOSED SOLID FUEL BURNING APPLIANCE MEETS
ALL FEDERAL, STATE, AND BOROUGH AIR QUALITY REGULATIONS;

II. THE PROPOSED SOLID FUEL BURNING APPLIANCE MEETS
THE REQUIREMENTS OF THIS CHAPTER;

III. THE PROPOSED SOLID FUEL BURNING APPLIANCE IS
PROPERLY SIZED FOR THE STRUCTURE IN THE OPINION OF A BOROUGH LISTED
VENDOR/INSTALLER;

IV. THE PROPOSED SOLID FUEL BURNING APPLIANCE WILL BE
INSTALLED BY A BOROUGH LISTED VENDOR/INSTALLER ATTESTING TO PROPER
INSTALLATION OF THE DEVICE BASED ON THE MANUFACTURER’S INSTALLATION
MANUAL;

V. PROPER WOOD STORAGE WILL BE AVAILABLE; AND

VI. TRAINING WILL BE PROVIDED TO THE OCCUPANTS ON
PROPER WOOD BURNING TECHNIQUES.

C. PERMIT. AN INSTALLATION PERMIT WILL BE ISSUED UPON
RECEIPT OF AN APPLICATION MEETING THE REQUIREMENTS OF SUBSECTION
(E)(1)(B) OF THIS SECTION AND PAYMENT OF ANY REQUIRED FEE. WITHIN 24
MONTHS OF ISSUANCE, THE OWNER MUST VERIFY WITH SUPPORTING
DOCUMENTATION THAT THE REQUIREMENTS OF SUBSECTION (E)(1)(B) OF THIS
SECTION HAVE BEEN COMPLETED, UPON WHICH AN OPERATING PERMIT WILL BE
ISSUED. IF VERIFICATION HAS NOT BEEN SUBMITTED OR APPROVED WITHIN 24
MONTHS THE PERMIT APPLICATION WILL AUTOMATICALLY EXPIRE.

D. AFTER A PUBLIC HEARING, AND PRIOR TO INSTALLATION OF THE
SOLID FUEL BURNING APPLIANCE, THE AIR POLLUTION CONTROL COMMISSION MAY
GRANT A VARIANCE TO ANY REQUIREMENT OF THIS SUBSECTION. IN DETERMINING
WHETHER TO GRANT A VARIANCE THE COMMISSION SHALL CONSIDER ANY
ALTERNATE PROPOSAL THAT THE APPLICANT SUBMITS, THE LOCATION OF THE
APPLIANCE, IMPACT ON SURROUNDING NEIGHBORHOOD OF THE REQUESTED
VARIANCE, EMISSION LEVELS OF THE APPLIANCE, AND ANY OTHER RELEVANT
CONDITIONS THAT INDICATE THE OPERATION OF THE APPLIANCE AT THAT
LOCATION OR THE REQUIREMENT THAT IS BEING VARIED WILL NOT RESULT IN A
NUISANCE OR HEALTH HAZARD. INTERESTED PERSONS MAY TESTIFY AND SUBMIT
OTHER ADMISSIBLE EVIDENCE FOR THE COMMISSION’S CONSIDERATION.

F. BOROUGH-WIDE INSTALLATION REQUIREMENTS FOR HYDRONIC HEATERS.

1. SETBACK. UNLESS PERMITTED BY A VARIANCE, OR IF REPLACING AN
EXISTING HYDRONIC HEATER WITH A LISTED APPLIANCE, NO PERSON SHALL
INSTALL OR ALLOW THE INSTALLATION OF A HYDRONIC HEATER LOCATED LESS
THAN:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
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A. THREE HUNDRED THIRTY FEET FROM THE CLOSEST PROPERTY LINE; OR

B. SIX HUNDRED SIXTY FEET FROM A SCHOOL, CLINIC, HOSPITAL, OR SENIOR HOUSING UNIT.

2. ANY HYDRONIC HEATER INSTALLED IN VIOLATION OF THIS SECTION SHALL BE IMMEDIATELY REMEDIED OR MADE INOPERABLE AND REMOVED AS SOON AS PRACTICABLE; HOWEVER, IN NO CASE SHALL THE TIME OF REMOVAL BE LONGER THAN 180 DAYS AFTER NOTICE FROM THE DIVISION OF A VIOLATION.


G. PROHIBITED FUELS. NO PERSON SHALL BURN IN THE BOROUGH ANY FUEL, EXCEPT COAL IN AN APPLIANCE DESIGNED TO USE COAL, WHICH IS NOT LISTED IN THE MANUFACTURER'S OWNER'S MANUAL AS AN ACCEPTABLE FUEL FOR THAT DEVICE OR ANY OF THE FOLLOWING ITEMS IN A SOLID FUEL BURNING APPLIANCE:

1. ANY WOOD THAT DOES NOT MEET THE DEFINITION OF CLEAN WOOD OR HAS MORE THAN 20 PERCENT MOISTURE CONTENT;

2. GARBAGE;

3. TIRES;

4. MATERIALS CONTAINING PLASTIC OR RUBBER;

5. WASTE PETROLEUM PRODUCTS;

6. PAINTS AND PAINT THINNERS;

7. CHEMICALS;

8. GLOSSY OR COLORED PAPERS;

9. CONSTRUCTION AND DEMOLITION DEBRIS;

10. PLYWOOD;

11. PARTICLEBOARD;

12. SALTWATER DRIFTWOOD;

13. MANURE;

14. ANIMAL CARCASSES;

15. ASPHALT PRODUCTS;

16. FLOORING PRODUCTS.

H. SALES OR LEASING OF SOLID FUEL BURNING APPLIANCES.
1. NO PERSON SHALL SELL OR LEASE AN UNLISTED SOLID FUEL BURNING APPLIANCE OR BARREL STOVE KIT IN THE BOROUGH UNLESS THE BUYER SIGNS AN AFFIDAVIT, ON A FORM PRESCRIBED BY THE BOROUGH, ATTESTING THAT THE APPLIANCE WILL NOT BE INSTALLED OR USED IN THE AIR QUALITY CONTROL ZONE. THIS SECTION DOES NOT APPLY TO APPLIANCES OR STOVES THAT TRANSFER PURSUANT TO A SALE OF PROPERTY;

2. NO PERSON SHALL COMMERCIALY SELL OR OFFER FOR SALE OR LEASE A SOLID FUEL BURNING APPLIANCE IN THE BOROUGH UNLESS THE COMMERCIAL SELLER OR DEALER PROVIDES THE PROSPECTIVE BUYER OR LESSEE, PRIOR TO ANY SALES OR LEASE AGREEMENT, WITH A WRITTEN NOTICE, PREPARED OR APPROVED BY THE DIVISION, THAT INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:
   A. THE FUEL RESTRICTIONS IMPOSED IN THIS CHAPTER;
   B. PROPER INSTALLATION, PROPERTY LOCATION, OPERATION, AND MAINTENANCE OF THE APPLIANCE;
   C. AN ADVISORY STATEMENT NOTING THAT OPERATION OF SOLID FUEL BURNING APPLIANCES MAY NOT BE APPROPRIATE IN SOME AREAS DUE TO TERRAIN, METEOROLOGICAL CONDITIONS, OR OTHER RELEVANT CONDITIONS THAT RENDER THE OPERATION OF THE APPLIANCE A PUBLIC NUISANCE OR HEALTH HAZARD EVEN THOUGH IT IS OTHERWISE LEGALLY INSTALLED AND OPERATED;

3. THE WRITTEN NOTICE REQUIRED IN THIS SECTION SHALL BE SIGNED AND DATED BY THE PROSPECTIVE BUYER OR LESSEE PRIOR TO PURCHASE OR LEASE TO INDICATE RECEIPT OF THE NOTIFICATION REQUIREMENTS OF THIS SECTION;

4. THE COMMERCIAL DEALER OR SELLER SHALL MAIL OR OTHERWISE PROVIDE A COPY OF THE NOTICE AND ANY REQUIRED AFFIDAVIT TO THE DIVISION WITHIN 30 DAYS OF THE SALE. ALL COMMERCIAL DEALERS OR SELLERS SHALL ALSO INCLUDE WITH THE NOTICE DOCUMENTATION SHOWING WHETHER THE APPLIANCE SOLD OR LEASED MEETS THE BOROUGH'S EMISSIONS STANDARD.

I. NUISANCE. NO PERSON WITHIN THE FAIRBANKS NORTH STAR BOROUGH SHALL CAUSE OR ALLOW PARTICULATE EMISSIONS FROM A NONMOBILE SOURCE THAT ARE INJURIOUS TO HUMAN LIFE OR TO PROPERTY OR THAT UNREASONABLY INTERFERE WITH THE COMFORTABLE ENJOYMENT OF LIFE OR PROPERTY. NO PERSON WITHIN THE FAIRBANKS NORTH STAR BOROUGH SHALL OPERATE A SOLID FUEL OR WASTE OIL BURNING APPLIANCE IN A MANNER SO AS TO CREATE A PUBLIC OR PRIVATE NUISANCE. A VIOLATION OF A PROVISION OF THIS CHAPTER IS HEREBY DECLARED TO BE A NUISANCE.

J. OTHER LAWS. NOTHING IN THIS SECTION PRECLUDES OTHER LOCAL JURISDICTIONS FROM HAVING MORE RESTRICTIVE CODES.

K. PENALTIES. UPON FIRST CONVICTION OF AN OFFENSE IN THIS CHAPTER, THE PENALTY(IES)/FINE(S) SET FORTH IN FNSBC TITLE 1 REGARDING VIOLATIONS OF THE PM$_{2.5}$ AIR QUALITY CONTROL PROGRAM MAY BE SATISFIED BY COMPLETION WITHIN 60 DAYS OF A BOROUGH-APPROVED CLASS COVERING PM$_{2.5}$ HEALTH

**AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT**

Text to be *added* is underlined.
Text to be *deleted* is [BRACKETED, CAPITALIZED]
CONCERNS, NONATTAINMENT, IMPORTANCE OF DRY WOOD AND PROPER OPERATION OF SOLID FUEL BURNING APPLIANCES. THE BOROUGH MAY ON ITS OWN INITIATIVE FILE NOTICE OF SATISFACTION OF ATTENDANCE REQUIREMENTS WITH THE COURT, OR THE DEFENDANT MAY FILE A CERTIFICATE OF COMPLETION WITH THE COURT WITHIN THE APPLICABLE TIME FRAME.]

21.28.040 Enhanced voluntary removal, replacement and repair program.
The Fairbanks North Star Borough shall, to the extent funds are available and appropriated by the assembly, offer an enhanced removal, replacement and repair program to help offset the costs of removing, replacing or repairing a solid fuel burning appliance (SFBA) or fireplace. This program shall be subject to the following eligibility requirements, conditions, and criteria:

A. General Requirements.

1. Application. An application approved by the division and signed by all property owner(s) must be submitted along with any documentation required by the division. Applications for either the removal of a solid fuel burning appliance (SFBA), or replacement of a SFBA with an emergency power system, or an appliance designed to use natural gas, propane, or home heating oil shall include a signed recordable document restricting future installations of SFBAs and requiring appropriate notice to purchasers in the seller’s disclosure statement if required by the terms and conditions of the funding source. Applicants must fully comply with the division’s inspection process which shall verify the existence of a qualifying SFBA.

2. Priority Ranking. Applications may be prioritized and may be limited by the division in its discretion based on geographical location, the overall air quality benefit and the type of SFBA or fireplace being removed, replaced or repaired.

3. Eligibility. The program is limited to properties within the air quality control zone boundary in which a qualifying SFBA or fireplace is installed. If an application is approved for the program, the applicant will be given up to 90 days to meet all of the requirements. Applicants must have no delinquent property tax or penalty or interest owing at the time of application and at completion of the program requirements.

4. Additional Requirements. In addition to the general requirements set forth in this section, applicants must also meet the following requirements:

a. Fully comply with the inspection process required by the division that shall ensure that the existence of the qualifying appliance to be removed, replaced or repaired is properly documented.

b. Removal of appliance.

c. Delivery of appliance to an authorized decommission station.

d. Certificate of destruction delivered to the division, if applicable.

e. Final installation of a qualified appliance visually verified.

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Text to be deleted is [BRACKETED, CAPITALIZED]
f. The qualified appliance must be properly installed by a borough listed vendor/installer attesting to proper installation of the device based on manufacturer’s installation manual, compliance with any building code requirements, and that the device is properly sized for the building in question.

g. The applicant will be required to demonstrate proper wood storage.

h. The applicant will be required to complete training with the vendor, ensuring that they understand how their particular device operates, including education on proper wood burning techniques.

i. All aspects of this section may be performed by borough-approved personnel or a borough-approved vendor.

5. Payments. Applicants will be eligible for reimbursements or, at the option of the applicant, payment may be made directly to a borough-approved vendor. Reimbursements and payments shall be available as follows:

a. Replacement of a hydronic heater:
   i. With either an EPA certified wood or pellet stove with an emission rate less than or equal to two grams of PM2.5 per hour, or an EPA phase II certified pellet burning hydronic heater with an emission rate equal to or less than 0.1 pounds per million BTU, or an emergency power system, up to $10,000 for purchase and installation.

   ii. With an appliance designed to use home heating oil (excluding waste or used oil) or a masonry heater (including parts, labor and any costs associated with upgrading the chimney to the extent required by the manufacturer of the appliance for proper installation), up to $12,000 for purchase and installation of the appliance.

   iii. With an appliance designed to use natural gas, propane, hot water district heat, or electricity, up to $14,000 for purchase and installation of the appliance.

b. Replacement of a non-borough-listed SFBA:
   i. With either an EPA certified wood stove, or fireplace insert that has an emission rate less than or equal to two grams of PM2.5 per hour, or in the case of an EPA certified wood stove, PM2.5 emissions must be reduced by 50 percent and emit two grams of PM2.5 per hour or less, up to $4,000 for purchase and installation of the appliance.

   ii. With an EPA certified pellet stove that has an emission rate less than or equal to two grams of PM2.5 per hour, up to $5,000 for purchase and installation of the appliance.

   iii. With an appliance designed to use home heating oil (excluding waste oil), hot water district heat, electricity, or a masonry heater (including parts, labor and any costs associated with upgrading the chimney to the extent required by the manufacturer of the appliance for proper installation), or an emergency power system, up to $6,000 for the purchase and installation.
iv. With an appliance designed to use natural gas or propane, up to $10,000 per purchase and installation of the appliance. Multiple non-borough-listed solid fuel burning appliances or fireplaces, or combinations thereof, may be replaced with a single heating device that meets the requirements above, except for those that are fired by solid fuels. Payment will be based on the number of devices removed, up to a maximum of three, and may not exceed the replacement cost.

c. Removal of a SFBA (limited to a one-time participation in this program per property).
   i. Removal of a hydronic heater through a one-time payment of $5,000.
   ii. Removal of other SFBAs through a one-time payment of $2,000.

d. Repair Program.
   i. The repair program will pay for the:
      (A) Replacement of a wood stove’s catalytic converter that has exceeded its life span through the one-time payment of up to $750.00.
      (B) Replacement of any emissions-reducing component of an EPA certified wood stove up to the maximum amount of $750.00.
   ii. In addition to the general requirements set forth in this section, applicants must fully comply with any inspection process required by the division, which may be performed by a borough-approved vendor.

21.28.050 Forecasting [EXCEEDANCES AND RESTRICTIONS] in the air quality control zone [DURING AN ALERT].

A. During the winter months of October through March, the borough [SHALL] may issue a daily PM2.5 forecast [BY 4:30 P.M.] and, when the division determines that the AQI category is forecasted to be moderate or higher, issue an advisory. [WHEN THE PM2.5 CONCENTRATION REACHES THE ONSET LEVEL FOR AN ALERT AND IS EXPECTED TO REMAIN AT THAT LEVEL FOR 12 HOURS OR MORE, AN ALERT WILL BE DECLARED. AN ALERT MAY APPLY TO THE AIR QUALITY CONTROL ZONE AS A WHOLE, OR TO ONE OR MORE SUB-AREAS DESIGNATED BY THE DIVISION. ONCE AN ALERT IS DECLARED, PM2.5 CONTROL MEASURES SET FORTH IN THIS SECTION SHALL BE IMPLEMENTED AND CONTINUED UNTIL THE ALERT IS CANCELED. THERE ARE TWO LEVELS OF ALERTS: STAGE 1 AND STAGE 2. THE OBLIGATIONS IMPOSED IN THIS SUBSECTION DO NOT REQUIRE, ABSENT SPECIFIC FUNDING FOR THAT PURPOSE, ANY ACTIONS TO BE TAKEN OUTSIDE OF THE BOROUGH’S NORMAL BUSINESS DAYS AND HOURS OF OPERATION. THESE RESTRICTIONS SHALL NOT APPLY DURING A POWER FAILURE. WHEN AN ALERT IS IN EFFECT, OUTDOOR BURNING IS PROHIBITED, INCLUDING NONPERMITTED INCINERATORS AND BURN BARRELS. THIS OUTDOOR BURNING PROHIBITION DOES NOT INCLUDE

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
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Fairbanks North Star Borough, Alaska

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Appendix III.D.7.7-5291
RECREATIONAL FIRES SUCH AS BONFIRES, CAMPFIRES, OR CEREMONIAL FIRES AND 
THE USE OF FIRE PITS.]
B. The division [WILL] may notify local media to ensure the [DECLARED ALERT]
advisory is broadcast. The division [SHALL] may also use social media and methods of 
direct communication such as text messages as feasible. [INFORMATION WITHIN THE 
NOTIFICATION WILL CONTAIN THE PM2.5 FORECAST, STAGE LEVEL FOR AREAS, AND 
ACTIONS REQUIRED TO REDUCE SOURCES OF PM$_{2.5}$. THE OBLIGATIONS IMPOSED IN 
THIS SUBSECTION DO NOT REQUIRE, ABSENT SPECIFIC FUNDING FOR THAT 
PURPOSE, ANY ACTIONS TO BE TAKEN OUTSIDE OF THE BOROUGH’S NORMAL 
BUSINESS DAYS AND HOURS OF OPERATION.
C. STAGE 1: RESTRICTIONS IN THE AIR QUALITY CONTROL ZONE DURING AN 
ALERT.
1. A STAGE 1 AIR ALERT IS IMPLEMENTED WHEN CONCENTRATIONS 
EXCEED OR ARE FORECASTED TO EXCEED 25 G/M$^3$.
2. NO FUEL SOURCE BE ADDED TO THE COMBUSTION CHAMBER OF A 
FIREBOX OF ANY SOLID FUEL BURNING APPLIANCE OR WASTE OIL BURNING 
APPLIANCE. RESIDENTS SHOULD Rely INSTEAD ON THEIR HOME’S ALTERNATE, 
CLEANER SOURCE OF HEAT (SUCH AS A FURNACE, BOILER OR ELECTRIC BASEBOARD 
HEATERS) UNTIL THE STAGE 1 AIR ALERT IS CANCELED.
3. IF A BUILDING OWNER OR OTHER PERSON WITH A PROPERTY OR 
MANAGERIAL INTEREST IN THE BUILDING HAS AN APPROVED “NO OTHER ADEQUATE 
SOURCE OF HEAT” DESIGNATION, THE BUILDING OWNER IS EXEMPTED FROM 
COMPLYING WITH THE STAGE 1 AIR ALERT RESTRICTIONS FOR THAT BUILDING.
4. IF A BUILDING OWNER OR OTHER PERSON WITH A PROPERTY OR 
MANAGERIAL INTEREST IN THE BUILDING HAS AN APPROVED STAGE 1 WAIVER THE 
BUILDING OWNER IS EXEMPTED FROM COMPLYING WITH THE STAGE 1 AIR ALERT 
RESTRICTIONS FOR THAT BUILDING. A STAGE 1 WAIVER WILL BE GRANTED IF THE 
PERSON WITH PROPERTY OR MANAGERIAL INTEREST VERIFIES THAT THE SFBA 
BEING OPERATED DURING A STAGE 1 AIR ALERT IS A BOROUGH LISTED APPLIANCE. 
A STAGE 1 WAIVER MAY BE OBTAINED BY COMPLETING AN APPLICATION ON A FORM 
developed by the division, that includes the following information:
   A. DOCUMENTATION OF APPROVED APPLIANCE MUST BE 
   SUBMITTED, INCLUDING PICTURES, MAKE AND MODEL.
   B. DOCUMENTATION OF THE APPLICANT’S ABILITY TO PROPERLY 
   STORE WOOD.
   C. DOCUMENTATION THE APPLICANT HAS TAKEN A CLASS OR 
   TRAINING IN PROPER WOOD BURNING TECHNIQUES.
5. IF A BUILDING OWNER OR OTHER PERSON WITH A PROPERTY OR 
MANAGERIAL INTEREST IN THE BUILDING HAS AN APPROVED RCD, THE SOLID FUEL 
BURNING APPLIANCE IS EXEMPTED FROM STAGE 1 AIR ALERT RESTRICTIONS.
D. STAGE 2: REQUIRED RESTRICTIONS IN THE AIR QUALITY CONTROL ZONE DURING AN ALERT.

1. A STAGE 2 AIR ALERT IS IMPLEMENTED WHEN CONCENTRATIONS EXCEED OR ARE FORECASTED TO EXCEED 35 G/M³.

2. NO FUEL SOURCE MAY BE ADDED TO THE COMBUSTION CHAMBER OR FIREBOX OF ANY SOLID FUEL BURNING APPLIANCE OR WASTE OIL BURNING APPLIANCE. RESIDENTS SHOULD RELY INSTEAD ON THEIR HOME’S ALTERNATE, CLEANER SOURCE OF HEAT (SUCH AS A FURNACE, BOILER OR ELECTRIC BASEBOARD HEATERS) UNTIL THE STAGE 2 AIR ALERT IS CANCELED.

3. IF A BUILDING OWNER OR OTHER PERSON WITH A PROPERTY OR MANAGERIAL INTEREST IN THE BUILDING HAS AN APPROVED "NO OTHER ADEQUATE SOURCE OF HEAT" DESIGNATION THE BUILDING OWNER IS EXEMPTED FROM COMPLYING WITH THE STAGE 2 AIR ALERT RESTRICTIONS FOR THAT BUILDING.

4. IF A BUILDING OWNER OR OTHER PERSON WITH A PROPERTY OR MANAGERIAL INTEREST IN THE BUILDING HAS AN APPROVED RCD, THE SOLID FUEL BURNING APPLIANCE IS EXEMPTED FROM STAGE 2 AIR ALERT RESTRICTIONS.

E. STAGE RCD: REQUIRED RESTRICTIONS IN THE AIR QUALITY CONTROL ZONE DURING AN ALERT.

1. A STAGE RCD AIR ALERT IS IMPLEMENTED WHEN CONCENTRATIONS EXCEED OR ARE FORECASTED TO EXCEED 55 µG/M³.

2. STAGE RCD AIR ALERTS APPLY ONLY TO SOLID FUEL BURNING APPLIANCES WITH AN APPROVED RCD.

3. NO FUEL SOURCE MAY BE ADDED TO THE COMBUSTION CHAMBER OR FIREBOX OF A SOLID FUEL BURNING APPLIANCE WITH AN APPROVED RCD. RESIDENTS SHOULD RELY INSTEAD ON THEIR HOME’S ALTERNATE, CLEANER SOURCE OF HEAT (SUCH AS A FURNACE, BOILER OR ELECTRIC BASEBOARD HEATERS) UNTIL THE STAGE RCD AIR ALERT IS CANCELED.

4. IF A BUILDING OWNER OR OTHER PERSON WITH A PROPERTY OR MANAGERIAL INTEREST IN THE BUILDING HAS AN APPROVED "NO OTHER ADEQUATE SOURCE OF HEAT" DESIGNATION THE BUILDING OWNER IS EXEMPTED FROM COMPLYING WITH THE STAGE RCD AIR ALERT RESTRICTIONS FOR THAT BUILDING.

5. A STAGE RCD AIR ALERT IS NOT REQUIRED TO BE ISSUED UNLESS ONE OR MORE APPROVED RCDS ARE ON FILE WITH THE DIVISION.]

[21.28.060 EXEMPTIONS.

A. NO OTHER ADEQUATE SOURCE OF HEAT

1. A BUILDING OWNER OR OTHER PERSON WITH A PROPERTY OR MANAGERIAL INTEREST IN A BUILDING LOCATED WITHIN THE AIR QUALITY CONTROL ZONE MAY OBTAIN A "NO OTHER ADEQUATE SOURCE OF HEAT" DETERMINATION FROM THE DIVISION IF:

A. THE SFBA BEING USED TO HEAT THE STRUCTURE IS:

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
I. A BOROUGH LISTED APPLIANCE, OR
II. AN EPA CERTIFIED APPLIANCE MANUFACTURED AFTER
BY A NEW CATALYST IN THE ACCORDANCE WITH MANUFACTURER
RECOMMENDATION OR SPECIFICATIONS;
B. THE BUILDING OWNER(S) OR OTHER PERSON WITH A PROPERTY
OR MANAGERIAL INTEREST IN THE BUILDING APPLIES WITH THE DIVISION ON A
FORM DEVELOPED BY THE DIVISION, INCLUDING THE FOLLOWING:
I. DOCUMENTATION OF APPROVED APPLIANCE MUST BE
SUBMITTED, INCLUDING PICTURES, MAKE, MODEL, AND SERIAL NUMBER.
II. DOCUMENTATION OF THE APPLICANT’S ABILITY TO
PROPERLY STORE WOOD.
III. DOCUMENTATION THE APPLICANT HAS TAKEN A CLASS OR
TRAINING IN PROPER WOOD BURNING TECHNIQUES;
C. THE BUILDING OWNER(S) OR OTHER PERSON WITH A PROPERTY
OR MANAGERIAL INTEREST IN THE BUILDING FILES AN AFFIDAVIT WITH THE
APPLICATION THAT THE SUBJECT STRUCTURE MUST BE HEATED AND THE
STRUCTURE HAS NO ADEQUATE HEATING SOURCE WITHOUT USING A SOLID FUEL
BURNING APPLIANCE OR THAT ECONOMIC HARDSHIPS REQUIRE THE APPLICANT’S
USE OF A SOLID FUEL BURNING APPLIANCE OR COMPLYING WITH A RESTRICTION
WOULD RESULT IN DAMAGE TO PROPERTY INCLUDING DAMAGE TO THE APPLIANCE
ITSELF AND ITS HEATING SYSTEM COMPONENTS. IF ECONOMIC HARDSHIP IS THE
REASON THE APPLICANT HAS NO OTHER ADEQUATE SOURCE OF HEAT, VALIDATING
DOCUMENTATION IS REQUIRED. VALIDATING DOCUMENTATION MAY BE
ESTABLISHED BY SHOWING APPROVAL FOR ASSISTANCE FROM A LIST OF AGENCIES
OR PROGRAMS THAT PROVIDE ECONOMIC ASSISTANCE (E.G., PROGRAMS BASED ON
HHS POVERTY GUIDELINES, UNEMPLOYMENT INSURANCE, NUTRITION ASSISTANCE)
TO BE MADE AVAILABLE BY THE DIVISION;
D. THE BUILDING WAS CONSTRUCTED ON OR BEFORE DECEMBER
31, 2016.
2. THERE SHALL BE NO FEE FOR APPLYING FOR OR OBTAINING A
DETERMINATION.
3. IT SHALL BE A VIOLATION TO SUBMIT A FALSE AFFIDAVIT FOR A "NO
OTHER ADEQUATE SOURCE OF HEAT" DETERMINATION.
4. IF THE "NO OTHER ADEQUATE SOURCE OF HEAT" APPLIANCE DOES NOT
MEET THE STANDARDS SET IN THIS CHAPTER, THE DIVISION SHALL PROVIDE THE
APPLICANT WITH INFORMATION CONCERNING THE BOROUGH’S VOLUNTARY
REMOVAL, REPLACEMENT AND REPAIR PROGRAM.
5. APPLICATIONS DENIED BY THE DIVISION MAY BE APPEALED TO THE
AIR POLLUTION CONTROL COMMISSION WITHIN 30 DAYS OF THE DECISION.
6. An applicant that has been denied a "No Alternative Source of Heat Determination" by the Division because the appliance does not meet the criteria of this section may apply to the Air Pollution Control Commission for a variance within 10 days of this decision. A temporary "No Alternative Source of Heat Determination shall be granted pending the decision of the Commission. In determining whether to grant a variance, the Commission shall consider the location of the appliance, impact on surrounding neighborhood, emission levels of the appliance, the financial investment and ability of the applicant to replace the appliance and any other relevant conditions that indicate the operation of the appliance at that location is not a nuisance or health hazard. Interested persons may testify and submit other admissible evidence for the Commission's consideration. If the Commission denies a variance, the "No Alternative Source of Heat" Determination shall expire 60 days from the date of denial.

B. Approved RCDs

A building owner or other person with a property or managerial interest in a building located within the air quality control zone may obtain an "Approved RCD" designation from the Division for a borough listed appliance that is a pellet fuel appliance, a catalytically controlled wood stove appliance, or a non-catalytically controlled wood stove appliance, if the requirements of this section are met:

1. Performance Testing. Performance testing of the appliance with the RCD has been conducted in accordance with this section and demonstrates post-RCD PM emissions of less than 0.01 lb/MMBTU.

   A. Performance testing for PM emissions on a wood stove, using cord wood as a fuel source, shall be conducted using EPA reference methods 1, 5H, ASTM Method E3053 and CSA-B415.1-10.

   B. Performance testing for PM emissions on pellet fuel burning appliances shall be conducted using EPA reference methods 1, 5H, ASTM E2779(10) and CSA-B415.1-10.

   C. Particulate matter sampling, per EPA reference method 5H, shall be performed simultaneously upstream and downstream of the RCD.

   D. A total of six (6) completed tests, each consisting of all applicable test runs at required burn rates, is required per appliance-RCD combination.

   E. Performance testing shall be performed by either (1) a test laboratory that is EPA approved for wood heater certification testing under 40 CFR 60.535 or (2) an independent third-party test laboratory that is accredited under ISO IEC Standard 17025 to perform

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
TESTING USING THE TEST METHODS SPECIFIED IN 40 CFR 60.534 BY AN 
ACCREDITATION BODY THAT IS A FULL MEMBER SIGNATORY TO THE 
INTERNATIONAL LABORATORY ACCREDITATION COOPERATION MUTUAL 
RECOGNITION ARRANGEMENT AND APPROVED BY THE EPA FOR CONDUCTING 
TESTING UNDER 40 CFR 60 SUBPART A AA.

F. TESTING PROTOCOLS SHALL BE SUBMITTED TO THE DIVISION 
FOR APPROVAL 30 DAYS PRIOR TO TESTING. ONE COMPLETE SET OF PERFORMANCE 
TESTS CONDUCTED IN ACCORDANCE WITH THIS SECTION IS REQUIRED PER 
APPLIANCE CATEGORY. A WRITTEN REPORT OF THE RESULTS WITH SUFFICIENT 
INFORMATION TO GUARANTEE THAT THE EMISSIONS REQUIREMENTS OF THIS 
SECTION ARE MET SHALL BE SUBMITTED TO THE DIVISION.

2. APPLICATION. THE BUILDING OWNER(S) OR OTHER PERSON WITH A 
PROPERTY OR MANAGERIAL INTEREST IN THE BUILDING MAY APPLY TO THE 
DIVISION ON A FORM DEVELOPED BY THE DIVISION, INCLUDING THE FOLLOWING:

A. DOCUMENTATION OF AN APPROVED APPLIANCE CATEGORY-RCD 
COMBINATION MUST BE SUBMITTED, INCLUDING PICTURES, MAKE, MODEL, AND 
SERIAL NUMBER OF BOTH APPLIANCE AND RCD.

B. DOCUMENTATION OF THE APPLICANT'S ABILITY TO PROPERLY 
STORE WOOD, IF APPLICABLE.

C. DOCUMENTATION THE APPLICANT HAS TAKEN A CLASS OR 
TRAINING IN PROPER WOOD BURNING TECHNIQUES, IF APPLICABLE.

D. DOCUMENTATION THAT THE RCD WAS INSTALLED BY A 
CERTIFIED INSTALLER.

3. CONDITIONS OF APPROVAL. A PERSON RECEIVING AN APPROVED RCD MUST 
CERTIFY THAT THEY (A) WILL ENSURE THAT THE SUBJECT APPLIANCE OBTAINS AN 
ANNUAL CHIMNEY SWEEP AND SUBMIT PROOF TO THE DIVISION; (B) WILL PROVIDE 
DATA TO ESTABLISH MAINTENANCE AND MONITORING PROTOCOLS TO ENSURE THE 
RCD PERFORMS EFFECTIVELY; AND (C) WILL PERFORM ANY ADDITIONAL 
MAINTENANCE AND MONITORING DETERMINED NECESSARY TO MAINTAIN 
EMISSIONS STANDARDS AS ESTABLISHED THROUGH FIELD TESTS.]

21.28.070 The Home Heating Reclamation Act

A. Definitions

In this section, unless the context requires otherwise, the following definitions shall 
apply:

1. "Coal stove" means a heater or stove that is fueled by coal.

2. "Cook stove" means a wood burning appliance that is designed primarily 
for cooking food and that has the following characteristics:

   a. An oven, with a volume of one cubic foot or greater, and an oven 
      rack;

   b. A device for measuring oven temperatures;

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
c. A flame path that is routed around the oven;
d. A shaker grate;
e. An ash pan;
f. An ash clean-out door below the oven; and
g. The absence of a fan or heat channels that dissipate the heat from the device.

3. “Fireplace” means an assembly consisting of a hearth and open fire chamber of noncombustible factory-built or masonry materials and provided with a chimney, for use with solid fuels.

4. “Fireplace insert” means a solid fuel burning appliance similar in function and performance to a freestanding wood burning stove, which is made from cast iron or steel, designed to be installed in an existing masonry or prefabricated fireplace.

5. “Furnace” means an appliance fired by gas, oil, pellets, coal or wood in which air or water is heated to be circulated throughout a building in a heating system.

6. “Hydronic heater” means a fuel burning appliance designed to (1) burn wood or other solid fuels and (2) heat building space and/or domestic hot water via the distribution, typically through pipes, of a fluid heated in the appliance.

7. “Masonry heater” means a device for warming an interior space through radiant heating, by capturing the heat from the periodic burning of fuel (usually wood), and then radiating the heat at a fairly constant temperature for a long period.

8. “Pellet fuel burning devices” means a closed combustion, vented pellet burning appliance with automatic components creating an active air flow system, sold with the hopper and auger combination as integral parts, and designed, warranted, safety listed, and advertised by the manufacturer specifically to be fueled by pellets of sawdust, wood products, and other biomass materials while prohibiting the use of cordwood.

9. “Solid fuel heating appliance” means any appliance designed to produce heat by burning non-gaseous and non-liquid fuels. This definition includes but is not limited to:

a. Wood stoves;
b. Coal stoves;
c. Wood-fired hydronic heaters;
d. Wood-fired furnaces;
e. Coal-fired hydronic heaters;
f. Coal-fired furnaces;
g. Fireplace inserts;
h. Pellet fuel burning devices;
i. Masonry heaters;
j. Cook stoves; and
k. Fireplaces.

10. “Wood stove” means a heater or stove that is fueled by wood.
B. The Fairbanks North Star Borough, excluding the natural gas utility, shall not in any way regulate, prohibit, curtail, ban, nor issue fines or fees associated with the sale, distribution, installation or operation of solid fuel heating appliances or any type of combustible fuels.

Section 3. FNSBC 1.20.080, Fine Schedule, is hereby amended as follows:

<table>
<thead>
<tr>
<th>Code Section</th>
<th>Offense</th>
<th>Penalty/Fine</th>
<th>Mandatory Warning Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>[21.28.030(A)</td>
<td>FAILURE TO REMOVE AN UNLISTED APPLIANCE.</td>
<td>$500.00</td>
<td>YES</td>
</tr>
<tr>
<td>21.28.030(B)</td>
<td>FAILURE TO REMOVE, USING OR OPERATING A PROHIBITED HYDRONIC HEATER.</td>
<td>$500.00</td>
<td>YES, WITH REMOVAL AS SOON AS PRACTICABLE</td>
</tr>
<tr>
<td>21.28.030(B)</td>
<td>FAILURE TO REMOVE, USING OR OPERATING A PROHIBITED HYDRONIC HEATER.</td>
<td>$1,000</td>
<td>NO</td>
</tr>
<tr>
<td>21.28.030(C)</td>
<td>VIOLATION OF VISIBLE EMISSIONS STANDARD. 1ST OFFENSE</td>
<td>$100.00</td>
<td>YES</td>
</tr>
<tr>
<td>21.28.030(C)</td>
<td>VIOLATION OF VISIBLE EMISSIONS STANDARD. 2ND OFFENSE</td>
<td>$500.00</td>
<td>NO</td>
</tr>
<tr>
<td>21.28.030(D)</td>
<td>EMISSIONS CROSSING PROPERTY LINES. 1ST OFFENSE</td>
<td>$500.00</td>
<td>YES</td>
</tr>
<tr>
<td>21.28.030(D)</td>
<td>EMISSIONS CROSSING PROPERTY LINES. 2ND OFFENSE</td>
<td>$1,000</td>
<td>NO</td>
</tr>
<tr>
<td>21.28.030(E)</td>
<td>FAILURE TO OBTAIN, SUBMIT AND EXECUTE A PERMIT FOR INSTALLING A SFBA IN NEW CONSTRUCTION.</td>
<td>$1,000</td>
<td>NO</td>
</tr>
<tr>
<td>21.28.030(F)</td>
<td>ILLEGAL INSTALLATION OF HYDRONIC HEATERS.</td>
<td>$500.00</td>
<td>NO</td>
</tr>
</tbody>
</table>

AMENDMENTS ARE SHOWN IN LEGISLATIVE FORMAT
Text to be added is underlined
Text to be deleted is [BRACKETED, CAPITALIZED]
Section 4. FNSBC 4.12.110, powers and duties of the Air Pollution Control Commission, is hereby amended as follows:


[A. THE COMMISSION SHALL BE NOTIFIED AND MAY MAKE RECOMMENDATIONS FOR AIR POLLUTION PROVISIONS IN ANY PROPOSED ORDINANCE RELATING TO BUILDING CONSTRUCTION AND/OR RELATING TO PERMITS FOR BUILDING CONSTRUCTION.]

[B.]A. The commission may propose ordinances or amendments to ordinances for consideration by the assembly that would serve to protect and enhance the quality of the air within the borough. Prior to the submission of proposed ordinances to the assembly, the commission shall hold public hearings for the purpose of receiving the testimony.

[C.]B. The commission shall review proposed revisions of regulations or other criteria related to the air quality program and make recommendations to the administration. The commission shall hold public hearings for the purpose of receiving testimony.

[D. ON REQUEST OF THE BOROUGH MAYOR, THE COMMISSION MAY FULLY INVESTIGATE NUISANCES, HEALTH HAZARDS AND OTHER HARMFUL EFFECTS RELATED TO OR CAUSED BY AIR POLLUTION.]

[E.]C. The commission may develop or review comprehensive plans for the prevention, abatement, and control of air pollution in the borough. Such plans may include recommendations on subjects including, but not limited to, transportation control measures, zoning, taxation, research, and public relations.
Section 5. **Effective Date.** This ordinance shall be effective at 5:00 p.m. of the first Borough business day following its adoption.

PASSED AND APPROVED THIS 13TH DAY OF DECEMBER, 2018.

Matt Cooper
Presiding Officer

ATTEST:

April Trickey, CMC
Borough Clerk

Ayes: Gray, Tacke, William, Sanford, Lojewski, Major, Cooper
Noes: Lyke
Other: Quist (Excused)