

Briggs Elementary School, Ashburnham

Wood Pellet Boiler

OVERVIEW

The John R. Briggs Elementary School in Ashburnham is the first public elementary school in Massachusetts to use a wood pellet boiler as its primary method of heating.

With approximately 525 students in preschool through fifth grade, Briggs is one of three elementary schools in the Ashburnham-Westminster Regional School District in north-central Massachusetts. The new 87,000 square foot school opened in the fall of 2013 to replace an overcrowded 1960s building. To reduce the school's operating costs and reliance on fossil fuels, the John R. Briggs School Building Committee selected a wood pellet boiler. The choice was supported by members of the Ashburnham-Westminster Regional School Committee and other local residents who had experience using wood boilers and other forms of renewable energy in their homes.

The boiler is now operating successfully and serving as a model for other projects. While the new building is over one and a half times larger than the one it replaced, the annual cost of fuel to generate heat and hot water has remained consistent, with the help of the wood pellet boiler.



Briggs Elementary School

AT A GLANCE:

- ♦ New 87,000 square foot building opened in 2013
- ♦ Wood pellet boiler provides space heating and domestic hot water, supplemented by a propane boiler
- ♦ Pellets are automatically fed into the boiler from a silo behind the school
- ♦ Fuel costs are consistent with the previous building, while the new school is one and a half times larger

LEARN MORE:

- ♦ Briggs Elementary School: <http://jrb.awrds.org>
- ♦ Renewable heating and cooling in Massachusetts: <http://bit.ly/renewablethermal>



Wood pellet boiler

SYSTEM DESIGN AND OPERATION

One Viessmann Pyrot 540 boiler was installed to heat water for space heating and domestic hot water. The boiler heats the water to approximately 180°F and uses a 1,500 gallon tank for thermal storage. It is fueled by wood pellets, which are made by compressing sawdust and wood shavings under high pressure. The pellets are stored in a 28 foot tall metal silo outside the school and automatically fed into the boiler on demand. An indicator on the silo shows when the level of pellets is low. Sandri, based in Greenfield, delivers pellets to the school every five weeks on average during the heating season. The boiler uses approximately 169 tons of pellets per year.



Student artwork celebrating the new heating system

The wood pellet boiler runs from October through April. During the rest of the year, a propane boiler provides hot water and any heating needed. The propane boiler also serves as backup during maintenance of the wood pellet boiler. There were issues early on with the interaction between the wood pellet and propane boilers, and they were addressed by modifying the programming of the building management system.

Ash that results from the combustion process gets injected by an auger into a bin near the boiler. The ash can serve as a substitute for lime, a supplement used to balance the pH of soil, so about once a month during the heating season, school custodians empty the ash bin and mix it into their loam pile for use in landscaping.

To keep the wood pellet boiler running smoothly, it receives a full cleaning after approximately every 500 hours of operation. During the first year, the installer did the cleanings and trained school custodians, and now the custodians clean the boiler themselves.

Other elements of the new school were also designed to use resources efficiently. The building was designed to take advantage of natural light and includes energy-efficiency measures such as an automated lighting system with dimmers. Many of the building materials, such as the ceiling tiles, were made from recycled materials. Water-efficient plumbing fixtures were used throughout the building.

RESULTS

Ashburnham-Westminster Regional School District superintendent Ralph Hicks reports that the wood pellet boiler ran very smoothly in its second season, after working out some issues during the first year. The boiler has been publicized to the community, and it contributed to the school's national recognition as a Verified Leader through the Collaborative for High Performance Schools, which was celebrated in a community ceremony in June 2015.

In the 2014-2015 heating season, the total annual fuel cost (wood pellets and propane combined) to generate heat and hot water at Briggs was approximately the same as the oil bills of \$60,000 for the last year in the old building, though the new building is 74% larger in square footage.

Following this success at Briggs, the school district is planning to replace the aging oil boiler at their middle school with a wood pellet boiler.

LESSONS LEARNED

To ensure a smooth startup process for new wood pellet boiler installations, school staff and the system installer have several recommendations:

- ♦ Seek an experienced team – Wood pellet boilers are relatively new to the United States, though the industry is well developed in Europe. Because of key differences in operation between wood pellet and fossil fuel systems – such as longer startup and shutdown times and the importance of thermal storage – people with relevant experience should be involved from design through installation. Boiler manufacturers, mostly based in Europe, can be a valuable resource when local expertise is limited.
- ♦ Carefully consider any changes – After construction began at Briggs and piping was laid, the contractor selected a different brand of boiler than had been included in the initial design. It is important to revisit and update the system design and commissioning plan if any changes are made to the equipment.
- ♦ Be patient the first year – It can take some time to optimize operation of a new system and adapt to a new technology. Investing time in training staff and refining system controls will contribute to long term success with a wood pellet boiler.



Pellets are stored in a silo behind the school



A truck delivers pellets about every five weeks



An auger injects pellets into the boiler



Ash is injected into bin and emptied monthly