

# MERRIMACK VALLEY HIGH



This picture shows the shell of the original building being insulated and air sealed. Construction began in 2005 and ended in 2008. The school has already seen significant energy savings.

Summary	
<b>Location:</b>	Penacook, NH
<b>Building Type:</b>	Public High School
<b>Original Building Date:</b>	1967
<b>Project Scope:</b>	Thorough renovation with space additions
<b>Total Project Size:</b>	113,000 ft <sup>2</sup> + additions of 28,000 ft <sup>2</sup> = 141,000 ft <sup>2</sup>
<b>Date Completed:</b>	2008
<b>Students Served:</b>	900 (approx)
<b>Faculty/Staff:</b>	60 (approx)
<b>Certifications:</b>	NE CHPS Verified (Collaborative for High Performance Schools)
<b>Total Project Cost:</b>	\$12.4 M
<b>Cost per square foot:</b>	\$88

**Planning for improvements to the Merrimack Valley High School (MVHS)** began in the mid-1990s. In 1997, the MVHS was slated for the second phase of a 10 year renovation plan. The existing building had served for almost 40 years without significant improvements. Though well maintained, it was outdated for current educational needs and operational realities. Central to the renovation plan was a cost-effective replacement for the old, expensive electric radiant heating system. The building envelope, designed for an era of much cheaper energy supplies, clearly needed improved insulation and air sealing.



**BEFORE**



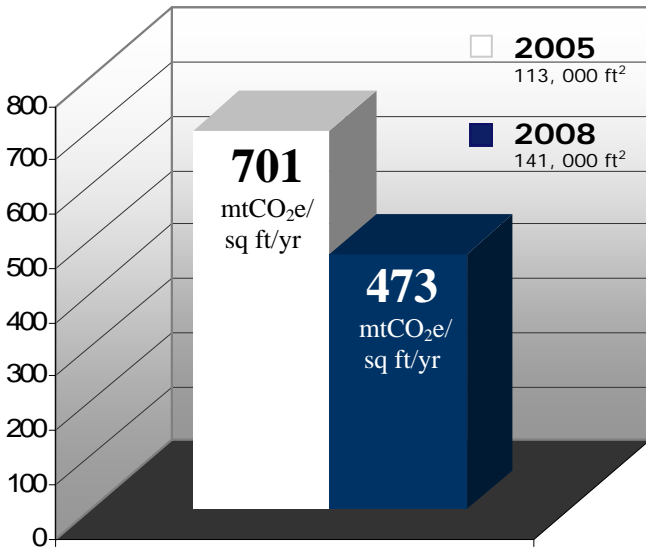
**AFTER**

Overall, the renovation plans included:

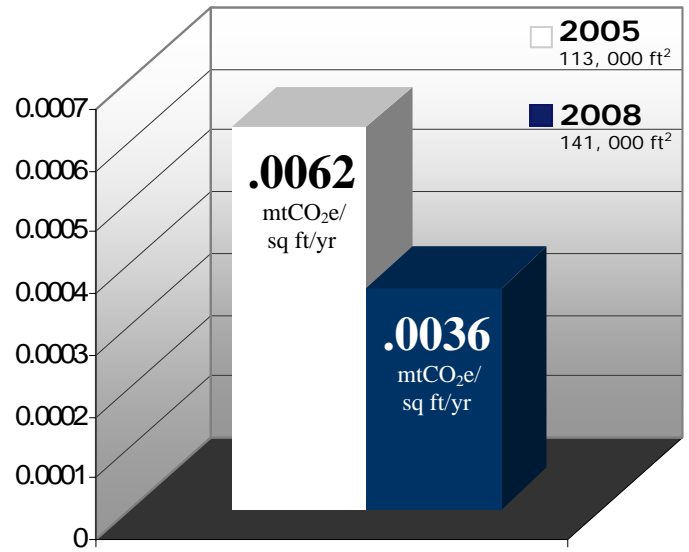
- Wood chip-fired boiler for both the Middle and High Schools
- New hydronic heating distribution system
- New air exchange / ventilation system
- Significant air sealing & insulation additions to the entire envelope, including exterior finish enhancement
- New main entrance, fitness center, exit stair towers
- Upgrade & expansion of library, food service areas, music spaces, science facilities and computer labs
- Electrical improvement (lighting, pumps, motors, controls, remote sensing etc.

# Comparing PRE and POST Renovation: 2005 and 2008

## Green House Gas Emmissions • • •

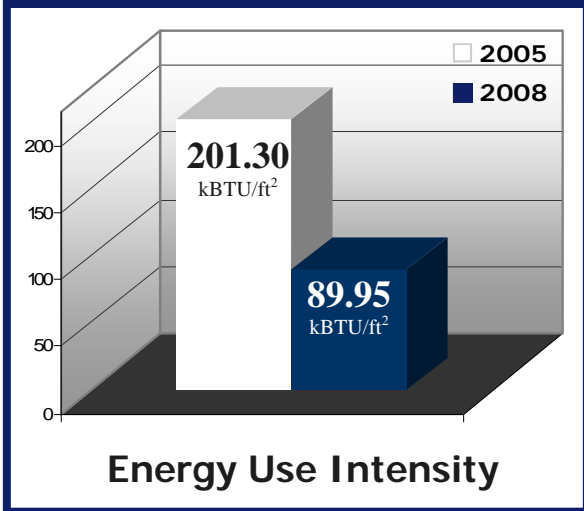


**Total Green House Gas Emissions**  
Per Year in Metric Tons CO<sub>2</sub> Equivalents  
**33% Reduction in Total GHG's**



**Green House Gas Emissions**  
Metric Tons GHG per Square Foot per Year  
**42% Reduction in Total GHG's**

## • • • Total Energy Use, Before & After Renovation



**Energy Use Intensity**

**57%**  
Energy Savings



The Merrimack Valley High School is now in full operation, serving its students, setting an energy example for its communities, and creating significant savings for its taxpayers.

**Energy Use Intensity (EUI):** A building's total energy use is written as an annual EUI. EUI is the sum of all energy usage displayed in British Thermal Units (BTUs) per square foot (BTU/sq ft). Usually a building's energy performance will be converted into 1000BTU/sq ft or kBTU/sq ft, annually. It is an industry-wide recognized value.



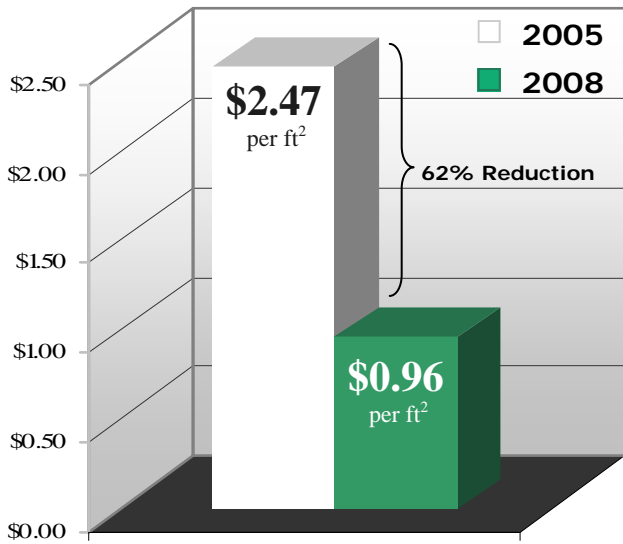
Wood Chip Heating Plant



BEFORE... ..DURING... ..AFTER

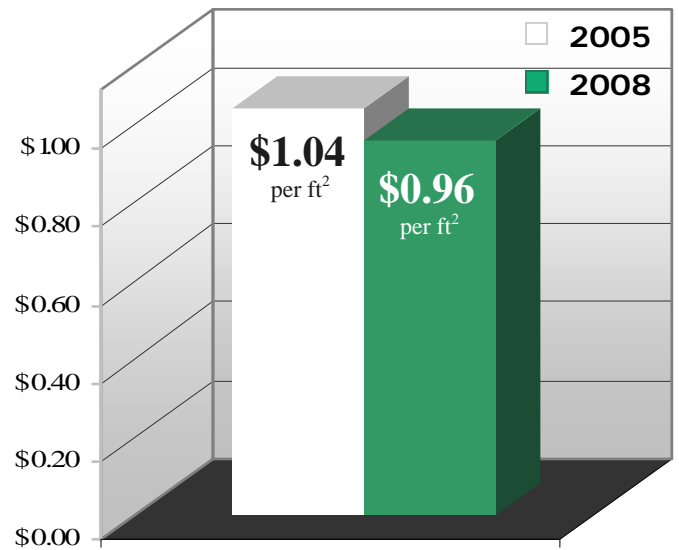
# Comparing PRE and POST Renovation: 2005 and 2008

## • • • Cost Savings Based on Usage



### Cost Use Intensity

Holding electric rates constant at \$0.142/kwh before and after renovation



### Cost Use Intensity

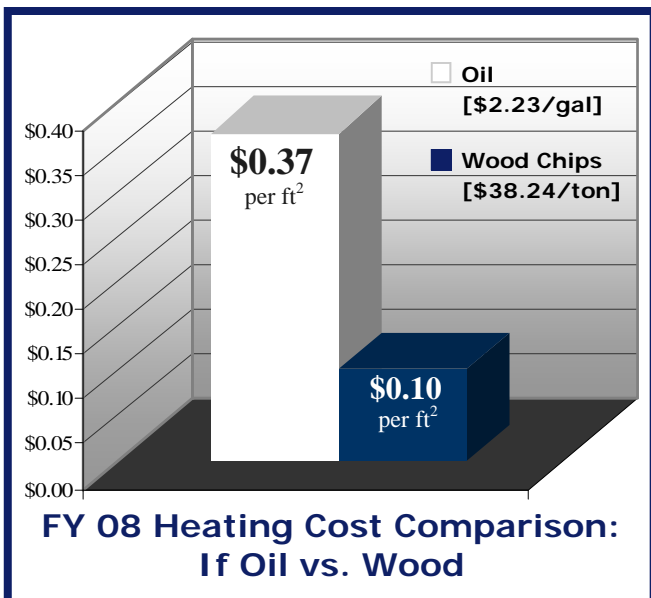
Using historic electric rate for 2005 (\$0.06/kwh) and actual electric rate for 2008 (\$.142/kwh)

**61%** Cost Savings  
Even with an increase in overall square footage

**BEFORE:** Primary Heating from **electricity** with no mechanical ventilation, smaller square footage. **AFTER:** Primary Heating from **wood chips** with mechanical ventilations, higher plug loads, more square footage.

**Cost Use Intensity (CUI):** This is the sum of all annual energy costs per square foot (\$\$/sq ft). This is also an industry-wide recognized value.

## Heating Cost Comparison • • •



Renovation of existing building, exterior wall demolished to be replaced with new high performance exterior envelope.

# CHPS—Collaborative for High Performance Schools

The Merrimack Valley High School is the first school building in NH to be verified by the State Department of Education as a high performance facility. That means it has met the high performance standards adopted by the Department, using the NE-CHPS guidelines (see below), and it means that the taxpayers will receive an extra 3% bonus in School Building Aid from the State to further off-set local costs for the project.

The mission of the Collaborative for High Performance Schools (CHPS) is to facilitate the design, construction and operation of high performance schools: environments that are not only energy and resource efficient, but also healthy, comfortable, well lit, and containing the amenities for a quality education. CHPS helps facilitate and inspire change in our educational system.

The goals of CHPS are to:

- Increase student performance with better-designed and healthier facilities,
- Raise awareness of the impact and advantages of high performance schools,
- Provide professionals with better tools to facilitate effective design, construction and maintenance of high performance schools,
- Increase school energy and resource efficiency, and
- Reduce peak electric loads

## Project Timeline



### DESIGN TEAM

#### Architect

*Banwell Architects, Lebanon, NH*

#### General Contractor

*Hutter Construction, Concord, NH*

#### Civil Engineer

*Nobis Engineering; Concord, NH*

#### Electrical Engineer

*Allied Engineering; Westbrook, ME*

#### Mechanical Engineer

*GWR Engineering; Shelburne, VT*

#### Structural Engineer

*Steffensen Engineering; Auburn, NH*

### MANAGEMENT TEAM

#### Superintendent

*Dr. Michael Martin*

#### Business Administrator

*Robin Heins*

#### Facilities Director / Project Administrator

*Fred Reagan*

#### Plant Manager

*Neil Barry*

#### Consultant / Advisor

*Bernie Davis*

The Jordan Institute would like to thank both the Management Team and the Design Team for their enthusiastic cooperation and support in compiling the data needed to produce this fact sheet. We are pleased to present their excellent example for other school districts to study and emulate.

The Jordan Institute  
11 Stickney Avenue  
2nd Floor  
Concord, NH 03301

Phone: 603.226.1009  
Fax: 603.226.0042

Email:  
[info@thejordaninstitute.org](mailto:info@thejordaninstitute.org)