



**A Method to Stimulate the Economy, Achieve
Energy Savings and Sustain the Environment While
Modernizing Public School Facilities in the United States**

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EXECUTIVE SUMMARY

The installation of sustainable retrofit metal roof assemblies over existing school building roofs can save energy for heating and cooling, dramatically extend the roofs' service lives, and enhance the appearance of the buildings.

- This document addresses the modernization of public schools to make them more energy efficient.
- A nationwide program to retrofit public school facilities enhances U.S.-based job opportunities in the construction market, the design community and metal product manufacturing sectors.
- Retrofit metal roof systems discussed in this document are made of sustainable, environmentally friendly materials that can help the school buildings earn credits toward certification in the U.S. Green Building Council's LEED™ (Leadership in Energy and Environmental Design) program.
- Sustainable retrofit metal roof assemblies provide ongoing energy efficiency.
- A retrofit metal roof's lifecycle is more than double that of other roofing methods.
- A program to retrofit public schools delivers ongoing long-term cost savings to public schools, allowing school funding to be spent on education rather than on energy and roof maintenance and replacement.

KEY FACTS

The Energy and Information Administration (EIA)¹ 2003 database shows that public schools consumed 649 trillion BTUs for comfort cooling and heating.

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Savings are estimated in the billions of dollars through extended roof service life, reduced maintenance costs, and savings on energy used for heating and cooling.

When available, Federal funding can for such a program can foster economic growth that will help employ U.S. workers to retrofit existing building roofs with new metal systems on a portion of the 6.6 billion square feet² of current roofs sheltering public school facilities.

KEY CONSIDERATIONS

- The EIA³ estimates that about 25% of public K -12 schools have inadequate roofs protecting their occupied space. Many pre-1980 schools were constructed with flat or low-slope built-up roofs (BUR). More than 87,004 public schools currently have these types of roofs.
- Some 1.65 billion square feet of new retrofit metal systems could be installed on the 25% of the pre-1980 public schools that need repair.
- The Metal Construction Association (MCA) represents small and medium sized metal roof and wall system manufacturers throughout the nation that have the expertise necessary to provide a complete retrofit package through qualified roofing contractors operating at the local level.

¹ Energy Information Administration; Department of Energy. 2003 Building Characteristics Overview of Major Fuel Consumption.

² Economic Policy Institute Briefing Paper #216-dated April 29, 2008 and the National Center for Education Statistics (NCES), 2007 Digest

³ Energy Information Administration; Department of Energy 2007 Building Energy Data Book, DOE/EE-0324, Table 7.5.6 “Percentage of Public K-12 Schools with Inadequate Building Features.”

- Metal roofing offers superior weatherability and long-term performance compared to petroleum-based low-slope roof systems. The use of metal also helps reduce the United States' dependence on oil. The estimated service life of a metal roof is 41.6 years, which is more than double that of the best flat roof system⁴ and therefore provides a substantial return on investment to a school district.
- Metal roofing systems are ideal for the incorporation of solar technology. This can be done through traditional photovoltaic panels, thin film photovoltaic laminates, and/or the collection and use of warm air from a specially designed cavity beneath a metal roof system.

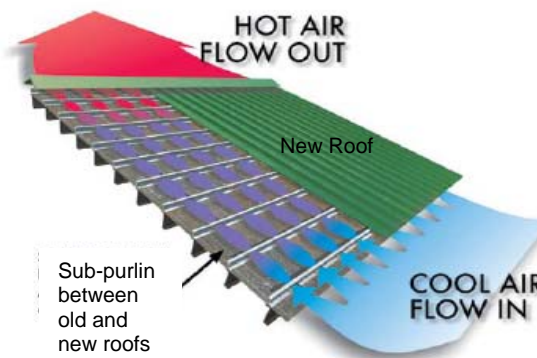
**RETROFIT METAL ROOFING
DEFINED –**

Retrofit metal roofing is a fully engineered system designed for existing buildings with roofs of any slope. These systems utilize light-gauge steel framing to create the slope and to receive new high-performance metal roofing. This essentially creates a new ventilated attic space between the existing roof and the new sloped roof. Insulation is then added at the topside of the existing roof to increase the thermal resistance to meet



Model Energy Code, ASHRAE 90.1 minimum values (R).

Some metal roof systems enable new metal roofing to be installed directly over existing shingles and other product types. Based upon either the individual product design or the installation of continuous sub-purlin members on the existing roof plane, an airspace is created to achieve ventilation or provide an airgap between the roof deck and the high performance metal roof.



In the past few years, retrofit metal roofs have increased in popularity, which is largely due to recognition of their value based on tests conducted at the DOE's Oak Ridge National Laboratories. These retrofit systems, which create what is referred to as above sheathing ventilation (ASV), have proven to reduce the heat transmission through the new metal and existing roofs and into the building by as much as 45%. The ventilated

⁴ Per the 2007 Ducker Worldwide Case Study and Report, the best flat roof system (Single-ply) has a service life of 20.5 years compared to 41.6 years for metal roofing.

assembly essentially uses the space between the existing and new roofs as a barrier to heat flow.

ENVIRONMENTAL BENEFITS

Many environmental benefits accompany the retrofit metal roofing concept. They include:

- Retrofit metal roofing systems are sustainable in that they provide a return on the investment even after the initial cost has been retired.
- The systems are principally manufactured from steel or aluminum that originates from recycled metal. Depending on the components used in individual systems, anywhere from 28% to 95% of the materials are derived from recycled metal. At the end of the building's useful life, the metal roof is 100% recyclable, meeting some requirements of the LEED building rating standards.
- In the majority of cases, the existing roof surface and substrate (membrane and insulation) remain on the roof and the new retrofit metal roof system is constructed over them. This keeps existing roofing materials out of local landfills, which is typical not the case in a conventional roof replacement.
- Since metal roofing is the component used as the roof's finished weathering membrane, it also helps reduce the heat island effect so common in metropolitan areas. Even more so, the metal roof can be a cool or reflective roof that mitigates the heat island effect and contributes to LEED certification.
- -Most of today's colored metal roofs are coated with a long-lasting polyvinylidene fluoride paint system utilizing reflective pigment technology, which provides exceptional energy efficient qualities. This type of coating has been tested⁵ and implemented with results providing a reduction in heat transmission (absorbed energy through the roof) of as much as 80% less. This means up to 80% of the sun's heat energy is emitted (reflected) from the surface of the metal roof and not transmitted through the roof to the unconditioned attic space.
- -Retrofit metal roof systems are eco-friendly, do not out-gas the way that petroleum-based roofing materials do, and reduce the impact on the environment thus qualifying them for several national green initiatives, including the U.S. EPA and DOE's ENERGY STAR rating program, and the USGBC's LEED building rating system.

⁵ Testing and research conducted by Oak Ridge National Laboratories from 2000 to 2008

IMPACT ON THE U.S. ECONOMY

Several studies on retrofit metal roof system are currently being conducted by industry associations, independent metal system manufacturers and Oak Ridge National Laboratories.

Using 25% of the K-12 public school's square footage or 1.65 billion square feet, the following example illustrates potential annual savings from installing metal retrofit roof systems.

Maintenance Savings.....	\$ 247,500,000
Budget Relief from roof replacements ⁶	\$1,347,743,605
<u>Energy Consumption Savings.....</u>	<u>\$ 710,420,000</u>
 Total Annual Savings.....	 \$2,305,663,605

SUMMARY

Retrofit metal roof systems have been utilized for decades to resolve issues related to the use of petroleum-based low slope roof membranes such as high levels of maintenance and continual roof replacements over the service life of a building.

Thousands of buildings have already been retrofitted including schools, federal/military installations, state and municipal facilities, and commercial structures. Each of these buildings has been reaping the benefits and cost savings of this efficient reroofing concept. The use of energy efficient and sustainable retrofit metal roof assemblies can help ensure that dollars intended for education are spent on educating children rather than operating or maintenance costs.

⁶ Budget relief from roof replacements is explained as not having to budget for future built-up roof replacements because of the 41.6 year service life expectancy of the new metal roof