



SMART DESIGN STRATEGIES FOR GREEN SCHOOLS

The future of education is shaped by sustainable design, with net zero energy schools leading the way in efficiency and environmental responsibility. These schools use significantly less energy than conventional buildings, relying on renewable sources like solar to meet remaining energy needs. As school systems pursue climate goals and long-term cost savings, educational facilities must evolve to meet higher performance standards. RTM supports net zero capable design through smart HVAC systems, geothermal heating and cooling, daylight harvesting, and advanced building controls, delivering energy-efficient, resilient schools that enhance student wellbeing and align with the sustainability goals of school districts and education agencies.

BUILDING ENVELOPE AND PASSIVE DESIGN

Net zero schools begin with a highly efficient building envelope that drastically reduces energy demands. Super insulated walls and roofs, triple glazed windows, and airtight construction help minimize heat loss and gain. Architectural teams often enhance energy savings by maximizing natural daylight through window placement, reflective surfaces, and passive solar design strategies. These envelope features reduce energy loads and support RTM's high-performance MEP systems, resulting in well-lit, comfortable learning environments that promote student focus and wellbeing.

Successful projects will begin at the earliest stages of design to work with the architect and analyze passive strategies through energy modeling that includes solar orientation, thermal mass, SRI rating of materials and shading of glazing units.

HIGH-EFFICIENCY SYSTEMS AND RENEWABLE ENERGY

Advanced mechanical and electrical systems are essential to achieving net zero performance. Schools incorporate energy efficient HVAC, appliances, and LED lighting with occupancy-based lighting controls, along with demand-controlled ventilation that supplies fresh air only when needed. Smart energy dashboards provide real time monitoring and allow adjustments to optimize energy use.

Strategies to reduce energy use include reusing waste energy through heat recovery, selecting high-efficiency equipment, and designing systems that deliver energy only where and when it's needed.



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In addition, locating domestic water heaters near electric equipment rooms can capture and reuse the continuous source of waste heat for hot water generation.

Renewable energy systems such as rooftop solar photovoltaic panels are integral, delivering clean onsite power that offsets remaining demand. Depending on location, these may be paired with geothermal heating and cooling or solar thermal systems, reducing carbon footprints and lowering long-term operating costs. Photovoltaic systems bolster these high-efficiency measures by delivering clean, onsite power that directly offsets grid purchases by providing PV panels on building roof, canopies, carports, or ground-mounted to accommodate where space is available. Excess generation during weekends or school breaks can be exported under net metering or stored in batteries for backup.

CARBON NEUTRAL & NET ZERO ENERGY (NZE)

Carbon neutrality can be accomplished when a building's carbon dioxide emissions are balanced by an equivalent amount of reductions or removals elsewhere. Typically, schools pursuing carbon neutrality first cut onsite emissions through efficiency measures such as heat pumps, high-performance glazing, and advanced controls. Remaining emissions are then offset by renewable energy systems or purchasing carbon credits.

Net zero energy takes the concept of carbon neutrality further by requiring that a building produce as much energy onsite over a year as it consumes. Net zero energy schools use passive measures and high-efficiency systems to minimize the building's Energy Use Intensity (EUI), then provide renewable energy systems sized to match the reduced load. All-electric buildings use air or water source heat pumps to draw energy from the atmosphere or ground and support heat recovery applications.





MANAGING EXPECTATIONS

Achieving and sustaining either carbon neutrality or NZE requires an ongoing commitment to monitoring, occupant engagement, and adaptive operations. Submetering of critical loads, user-friendly dashboards, and regular training sessions help facility managers and school staff understand how behavior affects energy performance.

FRUITLAND PRIMARY SCHOOL | FRUITLAND, MD

RTM provided the design for a NZE primary school which maximized passive design of the building envelope, heat recovery strategies, utilized variable flow hydronic and air distribution systems based on building load, included demand-controlled ventilation (DCV) strategies and used a geothermal system for heating and cooling. Plumbing systems included high efficiency heat pump domestic water generation and low flow fixtures. Electrical systems included all LED lighting fixtures, vacancy sensors, and 670,000 watts of solar photovoltaics. Electric vehicle chargers will be installed to encourage the use of carbon-zero transportation to the campus.

By combining smart design, efficient systems, and renewable technologies, RTM supports project teams in delivering high-performance schools that meet today's energy standards and tomorrow's challenges.

Let RTM help turn sustainability goals into smart, lasting solutions for net zero education facilities.



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