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ABSTRACT

This publication contains brief articles concerned with modular school structures. Some articles offer examples of such structures at actual schools. The articles in this issue are: (1) "Re-Educating Schools" (Chuck Savage); (2) "Tax-Exempt Financing for Public Schools" (John Kennedy); (3) "Help Us Rebuild America" (Michael Roman); (4) "Case Study: Addition Helps School Keep Pace with Growth" (Laurie Robert); (5) "President's Message: Can You Hear Your Facilities Costs Skyrocketing?" (Michael Roman); (6) "Charter School: Up & Running" (Doug Crawford); and (7) "Preventing Mold Growth in Temporary School Structures" (Bruce Stewart). (EV)

Modular Building Institute 2002 Educational Showcase

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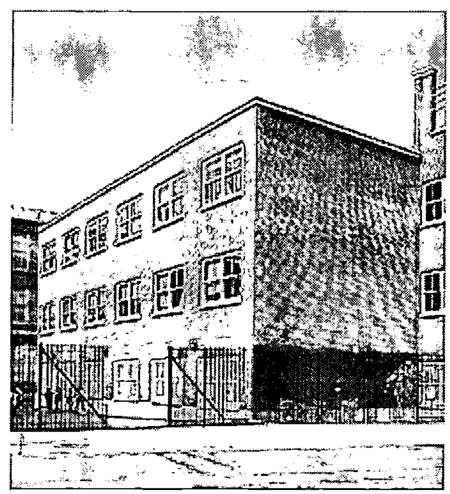
"Re-Educating Schools"
June 2002
by Chuck Savage

How to build with the most misunderstood building method in construction today.

Often, educators, facility planners, and others in the educational buildings market don't explore modular construction for use as permanent free-standing facilities, as well as additions to existing facilities, because of preconceived notions as to what modular construction offers.

Such notions like "limited choice of building materials" and "no flexibility with design" may have been true thirty years ago, when the modular industry had only portable classrooms to offer the educational market. The intended use was to solve temporary overcrowding situations and ended up a permanent fixture at many school sites throughout the United States. These portable classrooms were never designed or constructed to be use for long-term duration, yet with each passing superintendent, principal, and school board, the only thing people saw was a structure never designed for long-term wear and tear. This started some of the preconceived notions or statements such as, "Oh, I've had modular construction, I understand what it's about and that's not what we're looking for our new addition."



In the past twenty years, true modular construction has been growing at a tremendous pace. Professionals in the industry have had to re-educate everyone associated with a school building program to the benefits of modular construction and what the industry has to offer.

Modular construction in the twenty-first century refers to a building that is constructed off-site in a factory that has a controlled environment yet is designed around a steel and concrete building system so that the durability and flexibility of the modular system is better than conventional construction. Steel and concrete modular superstructures has allowed tremendous advancements over the last twenty years, allowing the use of exterior finishes such as 4" brick, interior designs utilizing 6" concrete sub floors, and 8" masonry block walls to be installed at the factory and shipped as an integral part of each modular building.

In addition to structural and aesthetic changes that have taken place, modular contractors employ mechanical professionals which allows alternative heating and air conditioning systems to be offered, making modular construction more compatible with existing mechanical systems, whether gas, electric, oil, hot water baseboard or any combination. In essence, today's modular construction is merely conventional construction being performed in a controlled environment away from the actual project site.

As hard as it has been to re-educate superintendents, deans, facility planners, and school boards, it has even been more difficult bringing the architectural community around to the realization that permanent modular construction is an alternative means of construction that must be seriously evaluated when exploring any educational construction project.

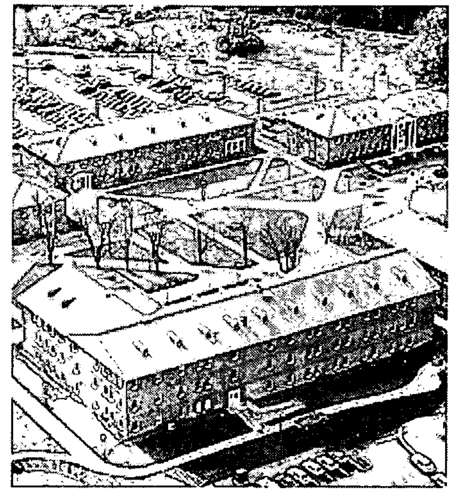
According to Robert M. Iamello of Tomaino, Tomaino, Iamello and Associates, "The manufacturer's assembly plant is an indoor environment for the construction of the outside end product. The fact that the building materials used in modular construction are the same as in conventional construction ensures that the modular units are solid. As the modular building technology continues to advance, planners and designers are wise to examine this technology as an option when reviewing the clients' needs."

Even though the educational architectural community as a whole is just now slowly starting to give some consideration to permanent modular construction, their hesitancy still comes from one of their biggest misconceptions. They feel modular construction is too architecturally restrictive for large sophisticated projects like entire schools or major additions to colleges and universities. However, the architects that have stopped to educate themselves about true modular construction and its advantages are now becoming advocates of this construction method.

Noel Musial, AIA, of the Musial Group, states, "Advantages of modular construction cannot be overlooked when considering construction of a new school or additions to existing schools. The architect must also understand the intricacies of modular construction before he proceeds with the design of the school facility. Almost everything that we as architects can design for on-site construction can be accomplished by modular construction. The only limitations are the considerations that must be given for transporting the modulars over public highways."

Robert Airikka, AIA states, "The biggest problem facing modular construction today isn't a technical issue and it isn't an aesthetic issue, it's perception. From a technical perspective, a modular building can be virtually the same as a conventionally built building, incorporating the same materials, the same systems, and meeting the same building codes. From an aesthetic perspective, a modular building can be every bit as handsome (or ugly) as a conventionally built building. But in the minds of most people, a modular building is somehow less of a building than a conventionally built building. The perception is wrong. A modular building can be as good, in fact can be even better than a conventionally built building."

It is testimony such as with within the architectural community which led the State of Massachusetts to undertake the most challenging and largest modular educational construction project in the United States, the construction of the Middlesex Community College in Bedford, Massachusetts. Their goal was to



build an entire college campus utilizing modular construction, which incorporated in excess of 120,000 square feet, and have an entire facility made ready for occupancy in under 16 months. This project was truly a milestone for the modular construction industry in that it forever eradicated the myths and preconceived stereotypes which have surrounded this construction method since its conception. The campus includes six buildings comprising administrative, education, laboratories, student unions, and student support. The buildings, each two and three stories, are designed to model true New England neo-Georgian architecture with its classical brick exteriors and quoin work on the corners, and a running flemish bond, as well as roof dormers, brick chimneys and cupolas.

"The keys to the project were always time, money, and the importance of community involvement so as to guarantee a sensitive design and construction process, while also giving students a state-of-the-art campus. Modular construction seemed to offer the only alternative--the college simply could not wait five years for standard construction," states Jim Mullen, former Dean of Planning, Research and Development at Middlesex Community College. This project was completed with modular construction in just under 1 1/2 year's time. Mullen continues, "The completion of a campus essentially within this timeframe stands as a model for large-scale modular construction projects."

Gordon B. King, former Director of Programming for the Division of Capital Planning and Operations in the State of Massachusetts was also involved with selecting modular construction for this project.

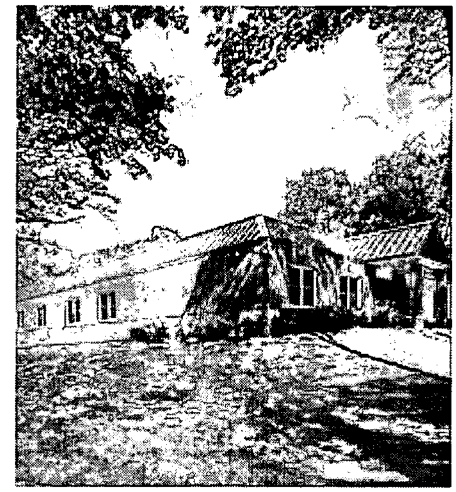
"We investigated the capabilities of the modular building industry relative to a project of this type and size. We believed that the modular construction industry could combine the elements of their success in other areas to provide us with a quality campus that would meet our needs."

The major advantages of permanent modular construction include:

- Rapid Construction - Completion is often within half the time of conventional construction, thus minimizing construction financing cost.
- Fixed-Price Construction - This eliminates normal contractor's change orders.
- Plant-Controlled Construction - Labor and material waste are eliminated, site disruption is kept to a minimum, there are no construction delays due to inclement weather conditions, and craftsmanship quality is consistent.
- Totally-Integrated Construction - Advanced computer technology integrates all phases of the construction process for better information handling.
- Use of Standard Building Materials - Complete client aesthetic flexibility is achieved on exteriors and interiors.
- Financial Flexibility - This includes purchase, lease or lease/purchase options, and minimal capital investment.
- Relocatability - Versatile reuse of the building at a new site; the asset is remarketable in the future.
- Multilevel Construction - Building of up to seven stories can be constructed.
- Factory-Poured Concrete Sub-Floor - This allows for flexible use of finished floor materials as well as occupant's use requirements.
- Steel-Framed Construction - Durable and non-combustible construction meets mandated fire codes.
- Total Contractor Responsibility - This includes architectural development and

engineering (or coordination with client's architect and/or engineer), site development, construction bonding, financing, insurance, building permits and approvals, and project/construction management.

But what does all this technology and innovation bring to the superintendent who needs two, four or maybe even ten additional classrooms to solve overcrowding and what advantages does the modular approach serve?



First and foremost is the fact that modular construction saves time. This is due, in part, because working within a controlled environment for the building portion reduces downtime due to weather conditions. However, it also allows construction of any project to be separated into two simultaneous phases: one being conventional site construction which can be, but is not limited to, foundations, site utilities, etc., and the building itself, which are both performed simultaneously. This reduction of time takes on further merit when employed in the construction of educational facilities.

The most difficult part of construction when it is incorporated into building an educational facility is disrupting the teaching environment due to the interaction of construction concurrently with teaching. It is hard enough for teachers and professors in schools and colleges to keep students interested, but when you combine noise, dust, and worst of all, the liability of an open construction site during the school year, not only does the construction become disruptive, it can become potentially dangerous. By reducing the construction schedule to such a short timeframe (sometimes by as much as 50% compared to conventional construction) it allows a school or college who plans their construction properly to have the project completed during the summer when school is shut down.

Another advantage that modular construction brings to the educational community, whether that be a college, university or the public school market, is its inherent flexibility regarding relocation. Again, relocation does not mean portable but rather since modular construction comes to the project site in sections, it can be disassembled in the same pre-designed sections and move to a new site within the same state. How many times has someone seen an empty school facility because decreasing enrollment or a shift in demographics within the city has occurred?

Modular construction is a viable alternative to lengthy and sometimes even more cost prohibitive conventional construction. It has been shown to be just that for many school districts, universities and colleges throughout the United States and will continue to grow in popularity as such. However, it currently represents less than 2% of all educational construction in the United States due to misconceptions and preconceived notions as to what permanent modular construction really is. The educational community and architectural professionals within this market must be willing to allow themselves to be re-educated so that modular construction can truly be evaluated for its potential.

As Mr. Iamello stated, "We, as professionals, can succeed only if we do not limit our thinking to the basics of a product without visualizing the products potential."

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"Tax-Exempt Financing for Public Schools"
June 2002
by John Kennedy

The use of portable classrooms by public school systems continues to grow at more than 20% every year.

As the modular industry moves towards offering more permanent classrooms, there seems to be a greater desire for public school systems to acquire modular classrooms through financing. This may be the result of better planning by the school systems, realizing at the beginning that ownership is more cost effective than a long-term rental, or lease. It may be that the schools want eventual ownership since the modular industry is building a better product, which is less prone to defects, which can be better used as a "permanent" solution. Or it may be that there is a better understanding of the benefits of this low-interest method of financing that has gained over other methods of financing. Here's a quick overview, incorporating the most often asked questions.

"What is a tax-exempt lease?"

This is a financing transaction also known as a conditional sales contract where the interest earned by the lessor is not subject to federal taxes. The lessor, since they do not pay federal taxes on the interest income can offer a lower interest rate to the lessee. The exclusion from federal taxes is where the "tax-exempt lease" name comes from.

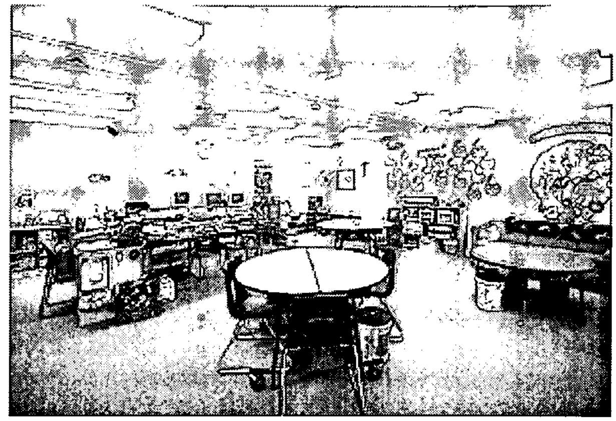
"Who is eligible?"

The lessee must be a state or possession of the US, or a political subdivision thereof. Political subdivisions include cities, towns, counties, as well as other entities, which have sovereign powers that include taxation, eminent domain, and police power. These entities include school districts, water districts, hospitals and others.

"Who isn't eligible?"

Most charter schools (excluding Ohio,

Colorado, and some other states), "not-for-profit" entities also known as 501(c) 3, federal agencies, and public "affiliate" (not run by) entities.



Modular building dealers and manufacturers may offer tax-exempt lease/purchase financing to qualified customers even if financing is not part of the bid request. This can streamline the documentation process. Often, municipal customers are already bidding the financing separately. It varies from customer to customer. If you do choose this type of financing, make sure to note that the appropriate documentation will be necessary. A set of sample tax-exempt documents may be included with your bid response, as you would be surprised how many purchasing agents still aren't familiar with this type of financing.

"Is it always a Dollar ($1.00) Purchase Option?"

The IRS Code requires a nominal purchase option at the end of the lease term. This small amount is typically one dollar, but can be slightly higher.

"OK, I'm getting there, just how cumbersome are municipal documents?"

The IRS Code requires a few very basic provisions be included to qualify the lease as tax-exempt. This document has been standardized by the industry and using the document from a financing source will have a favorable effect the interest rate. These documents include but aren't limited to:

<u>Master Lease/Purchase Agreement</u>
This spells out the terms of the financing. This also includes a "non-appropriations clause," which states the lessee can terminate the lease at the end of the current fiscal year, and return the equipment if they are unable to obtain sufficient funds to meet future lease payments.

<u>Legal Opinion</u>
This comes from the lessee's counsel, and states proper procedures were followed in executing the documents.

<u>Essential Use Certificate</u>
The lessee states that the modular equipment is necessary and essential to the on-going operations of the lessee. This is important in light of the "non-appropriations" clause.

<u>Insurance Certificate</u>

<u>8038-G or GC IRS Form</u>
This is an IRS form and requires specific information to be filed. Failure to do so may result in the transactions loss of its tax-exempt treatment.

<u>Payment Schedule</u>
Represents payments due under the lease and also breaks out the interest and principle components of the lease payment, which is required by the IRS code.

<u>Acceptance Certificate</u>
Clearly specifies the lease start date

"Who is responsible for maintenance, property taxes, insurance, and other operating expenses?"

A tax-exempt lease is a "net lease" and the lessee is responsible for all operating expenses. The lessee may contract with a modular dealer/manufacturer to provide such services as maintenance, but these are paid outside the scope of the tax-exempt financing.

"Why would I enter into a tax-exempt lease?"

There are a few obvious benefits to this type of financing which include:

- A lower interest rate than a taxable finance lease resulting in lower lease payments.
- The school district only carries the current operating expense of the lease on its books. In most states a tax-exempt lease subject to annual appropriations is not included in the debt calculations and will not affect the debt ceiling.
- Traditional means of tax-exempt debt, or the issuance of bonds, are not economically feasible for individual projects. Bond issues start to make sense for more than $5,000,000 for small issuers and $10,000,000 for larger issuers.
- Avoidance of a large capital expenditure, where the lessee may not have available funds. Allows the user to pay for the buildings through their use, over time. This is common in a fast growing school district, which may need "emergency" modular classrooms.
- Flexible terms, with equity building in the buildings with each payment
- Simple, quick, inexpensive means of financing for qualified Lessees.

"Should the dealer/manufacturer act as the lessor in the lease? How does this affect the lessee?"

Most financing sources will let the modular dealer/manufacturer act as the lessor in the lease and take a non-recourse assignment of that lease to others. The lessor and lessee both retain any obligations they have in the lease and do provide warrants and representations of such to the financing source.

"Can they finance modular equipment/furniture?"

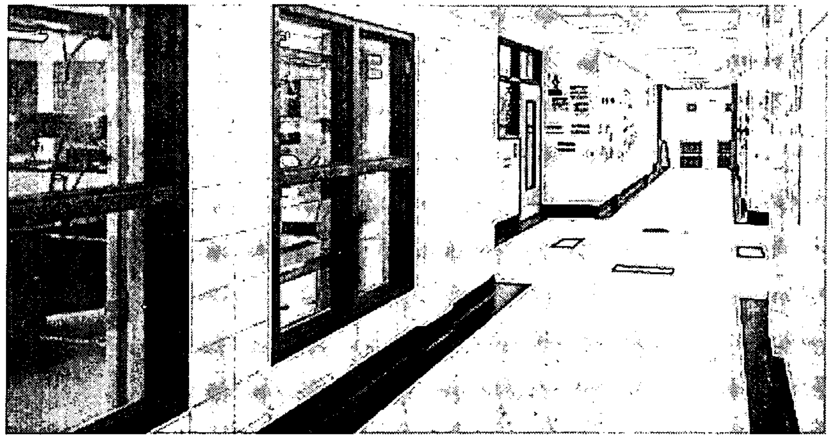
Other equipment can be added to the tax-exempt financing in addition to the modular equipment. This may include furniture and fixtures for new modular classrooms, computers, or HVAC equipment. The list is almost endless. The important thing is that this equipment must be "essential" to the operations of the lessee. A classroom desk and chair is obviously essential to teaching a child in your modular classroom.

"How does credit approval work?"

Most lessors like to see three years of audited financial statements for credit consideration. Obviously, the risk of a school district going away is minimal, but if they are having budget problems the lease needs to be priced accordingly. There are financing sources for all types of credits and circumstances. If the lessor knows the circumstances and has the information, the proper lease can be tailored, with the proper rate.

"Who owns the equipment?"

In most cases the title, or MSO, is passed to the lessee, with the lessor holding a security interest in the equipment.



That's the quick overview. A good quote to a qualified customer should include this type of offering whether tax-exempt lease/purchase financing is requested or not.

The prospective buyer may decide that the quote, with its tax-exempt offering, is more cost effective than other financing options.

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"Help Us Rebuild America"
by Michael I. Roman

The U.S. Department of Energy (DOE) created the Rebuild America program in 1994 to investigate, develop and deploy advanced energy efficiency and renewable energy technologies and practices. Rebuild America works to accomplish these goals by building partnerships among communities, states and the private sector to improve building performance and connect people, resources, ideas and practices for energy solutions to community needs. Through Rebuild America, hundreds of communities and businesses are saving energy dollars and reinvesting in their communities by improving buildings and stimulating the local economy. In addition to renovating existing buildings, public/private partnerships are addressing new construction and are reaching to include land use planning, alternative fuels and vehicles, water and wastewater treatment and the impact of electric utility restructuring. See www.rebuild.org.

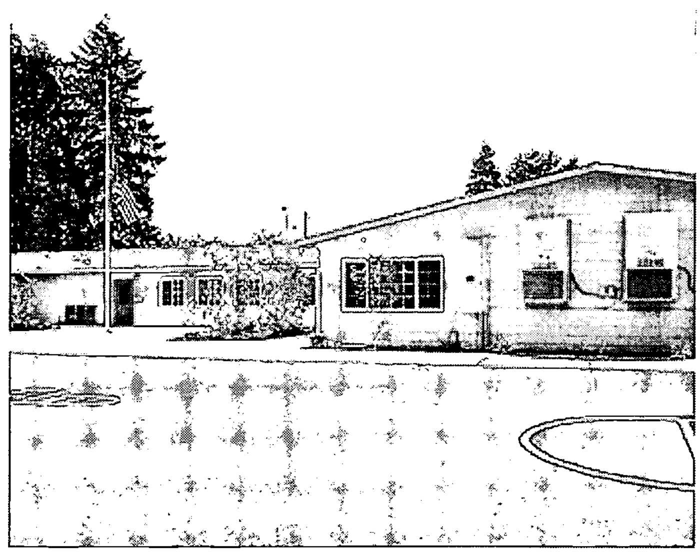
To date, Rebuild America has been an unqualified success. As of September 30, 2000, DOE's $36 million investment in Rebuild America initiatives has: generated $94 million in annual energy savings, $428 million in capital investment and cumulative cost savings of $188 million; renovated over 300 million square feet of floor space; an additional 450 million square feet of projects are committed or underway which will result in $600 million of new capital investment and $140 million in additional energy savings; developed constituencies in 335 community partnerships in 51 states and territories; and influenced more than 1,000 schools. Through September 30, 2000, every DOE dollar has produced $14.35 in annual energy savings and stimulated $11.80 in private investment.

Rebuild America's highest priority market is schools that educate from kindergarten through twelfth grade (K-12). There are approximately 86,000 public schools and 26,000 private schools in the U.S. that together have more than 300,000 buildings. More than 73% of these buildings were built before 1970. The average age of our K-12 educational facilities is 42 years. See www.eren.doe.gov/energysmartschools. Given the age of our educational buildings, it is not surprising more and more money is being spent on school facilities. $20.3 billion worth of construction was put in place in 2001 with $10.4 billion spent on new buildings, $5.4 billion for additions and $4.5 billion spent on upgrades including ADA compliance, new heating and ventilating systems, roofs and windows. 2001 marks the second year in a row that school construction has passed $20 billion and 2002 is forecast to continue the trend. The increase in construction spending on educational facilities has been quite dramatic. In 1983 school construction in the U.S. was $4.7 billion; by 1990 it had reached $10 billion; by 1996 $12 billion. Construction of schools reached $15 billion in 1998, $18 billion in 1999 and $21.2 billion in 2000.

During most of the eighties and nineties, the majority of school construction dollars were spent on upgrading and adding to existing buildings. Since 1997, that trend has reversed with new construction representing approximately half the construction dollars. This change is due in large part to a shift in priorities. School construction, once strictly a concern of school boards, administrators and local parents, is now a major player on the national political and economic stage. A renewed emphasis at the federal and state level for improving educational facilities has been supported by strong financial commitments. Many states including Ohio, New York, Florida and California have made substantial amounts of money available for school construction projects. See http://www.peterli.com/spm/special/constrpt/2000/2000rpt.cfm and http://www.peterli.com/spm/special/constrpt/2002/2002rpt.cfm

Despite the record amounts of construction spending on educational facilities, the backlog of deferred maintenance continues to grow. It is estimated that deferred school maintenance in the U.S. is in excess of $80 billion. This backlog represents, in part, many projects disregarded in prior years due to resource allocation choices. School districts, especially those facing rapid growth, face numerous pressures for spending construction dollars. Which is more important, to build a new elementary school to relieve overcrowding, to remodel an existing junior high school so that a middle school program can be installed or to add to the high school to meet the crush of larger incoming classes? Should existing facilities be upgraded and is the money spent truly cost effective? Should technology be added across the board or only in some buildings? Can we afford to do everything at once? Choices are often made based on general economic conditions, borrowing capacity, budgetary constraints and to appease the most vocal constituents. Shifting demographics, smaller class sizes, increasing pre-school demand, proliferating adult education programs and general overcrowding guarantee the budget choices are not only here to stay, but will become more difficult in the future.

One prominent choice of many school systems to ease overcrowding is the use of portable classrooms. These buildings offer speed of delivery, the ability to be relocated and fit neatly within constrained budgets. The Modular Building Institute (MBI) estimates that more than 385,000 portable classrooms are currently in use throughout the U.S.



Portable classrooms are available in two distinct categories. These are the older wood based buildings and the new generation of steel and concrete. The vast majority of portable classroom users and potential users associate "portable" with mobile homes or office trailers. These buildings generate a decidedly negative image when viewed as permanent solutions to our educational facility requirements. These wood constructed buildings offer inexpensive, temporary relief for overcrowding, but are not intended to be permanent fixtures. Despite the best of intentions, however, many school systems have become "trailer junkies". In the earlier years of a wood constructed portable classroom's life, it is easy to justify the additional space for the price. Over time, however, the price of the temporary space increases as maintenance expenses rise. Despite limitations of the early models, many public school systems have recognized that portable classrooms are a viable space option and have sought to upgrade building specifications to extend the useful life. They are searching for the balance between the additional cost of the upgrades and the desire to stretch the facilities dollars as far as possible. The analysis often boils down to the anticipated period of use.

For many public and private school systems, the use of temporary classrooms routinely extends beyond twenty years. Even with proper maintenance and care, twenty years of continuous heavy use in an educational environment for a wood constructed portable classroom is pushing the limit. Yet the need for relocatable space that can be moved quickly and inexpensively is more entrenched then ever.

The standard doublewide is undergoing a metamorphosis as school administrators, parents and teachers are demanding a longer lived, more aesthetically pleasing portable classroom. The new generation of portable classrooms are built of steel and concrete and boast a fifty-year useful life. The basic structure includes floors with fiberglass reinforced concrete over steel, walls with steel frames and studs and a metal roof covered with a rubber based material. Interior walls are half inch vinyl covered gypsum over one half inch unfinished gypsum while the exterior is .019 high rib aluminum siding. The floors are covered in 28-ounce carpet over decking and the doors are solid core pressed steel.

Just as the portable end of the modular building market is experiencing a push to quality, the benefits of greater modular space under a contiguous roof are being explored. This phenomenon is being driven by the realization that the construction of classrooms in a factory is simply an alternative construction method. Today, more and more schools are being built with a combination of factory built classrooms and site constructed common areas. These larger modular projects use the same building materials as site built builders, but perform much of the work off site in a controlled environment. This allows for building classrooms at the same time the site and foundations are being readied. Concurrent operations speed up the overall construction period.

The MBI has joined forces with Rebuild America to investigate potential energy efficiency measures that could be incorporated in newly manufactured portable classrooms. The goal is not only to improve energy efficiency, but also to create an improved learning environment in our K-12 buildings. The base building being studied is the new generation steel and concrete portable which will over the next decade become the standard throughout the U.S. Acceptance of this more costly replacement for the wood based portable is relatively slow because schools often find it difficult to abandon the low cost alternative. Progress is being made largely driven by legislative initiatives.

Rebuild America engaged the Florida Solar Energy Center ("FSEC"), a research institute of the University of Central Florida, to investigate potential energy improvements for portable classrooms, among other things. FSEC has teamed up with Resun Leasing, a national portable classroom dealer and several wholesale manufacturers to conduct an in-depth pay back study on certain energy improvements. The idea is to modify a standard portable classroom and erect a control classroom and a modified classroom side by side to measure energy consumption over an extended period of time. Cost savings are documented and compared to the cost of the modifications. As an example, if more energy efficient windows replaced standard windows at an incremental cost of $120 and the energy savings of the modified classroom was $10 per month over the standard classroom, then the cost of the better windows is recovered every 12 months. If a school expected to need the modified portable classroom for a period in excess of 12 months, then the upgraded windows would save money.

This is a time consuming process as each test requires adjacent portable classrooms identical in all respects except for a specific energy efficiency item. East test is conducted over a year or so and requires constant monitoring to document energy consumption. Testing needs to occur in many different climates and over a wide array of energy efficiency options. In the State of Florida, FSEC will be investigating cost savings associated with the following:

a) increased insulation in the ceiling, walls and floor;
b) use of skylights to increase natural light;
c) use of a white EPDM covering on the roof;
d) high energy efficiency windows;
e) use of special carpet tiles with an anti-microbial impervious vinyl composition backing instead of regular carpet;
f) alternative lighting;
g) an alternative heating, ventilation and air-conditioning (HVAC) system; and
h) energy efficient thermostats.

Test sites are currently being identified in Florida, Georgia, North Carolina, Maryland, New York, Texas, New Mexico, Arizona and California. A control portable classroom will be installed next to a modified portable classroom and energy consumption will be monitored. The collective results will detail pay back periods for a variety of energy efficiency options over a wide array of climates.

Control specifications and specifications for the modified classrooms to be used in the Florida study are below as Appendix A and Appendix B respectively. The MBI and its member companies are dedicated to improving K-12 learning environments in the U.S. Rebuild America and our partnership with FSEC has afforded our industry a perfect opportunity to take an active role in developing an energy efficient new generation portable classroom. Our partnership with FSEC is incomplete without additional school systems willing to participate in the study. If you are willing to assist in the study you can help by sitting adjacent portable classrooms and permitting energy consumption to be monitored. You can contact the FSEC at www.fsec.ucf.edu or sthomas@fsec.ucf.edu. Become part of the solution and help us Rebuild America.

APPENDIX A

Control Specifications (FL)

Architecture/Planning
* Modular in two sections to create plan 24' x 36'. Operable Windows, Interior HVAC Recess

Structure & Framing
* Wall - Steel moment frame w/ 3 5/8" metal studs @ 16" OC (18ga.)
* Roof - structure 14ga. Steel purlins @ 24" OC
* Floor - 20ga. "B" decking under Viroc (lightweight concrete w/ fiberglass reinforcement) with (3) foundation vents: R 14 unfaced.

Building Envelope
* Wall - 1/2" VCG (vinyl covered gypsum) over 1/2" gypsum unfinished. R-11 faced batt insulation. 5/8" Dens Glas (R 0.73); .019 high rib aluminum siding
* Windows - Anodized aluminum frame. 1/8", non-tempered, single glaze bronze tint,

Type 1, slider windows U=1.03 (summer). SHGC =0.84, Vt=0.77; 46" x 53" (vertical slide)
* Roof - 0.45mm black EPDM (Mulenhyde) roof over 5/8" Dens Glas substrate over 22ga. B-deck 22ga.; 4" overhang; faced R-19 batt insulation netted to underside of deck
* External doors 6'-8" HM pressed steel SECO (solid core)

Interior Finishes
* Wall - 1/2" VCG wall, Class A
* Wall - 3/32" FRP over 1/2" gypsum in bathroom
* Floor - base - 4" vinyl base, topset
* Floor - roll vinyl in bathroom, 6" self cove base
* Floor - 28oz. Carpet Georgia Mills direct glue down on decking (or compliance with Group 1, Type A or B, Class 2. Density 4600, direct glue down); R-14 unfaced batt insulation
* Interior doors - 3'-0" x 6'-8" hollow metal doors
* Ceiling - T-grid 2x4 @ 8'-0" a.f.f. - Armstrong 1729 high humidity

HVAC System
* 3.5 ton Bard with WERV: WA 422D-A10RX4XX
* Supply ducts; insulated ducts shall have vapor barrier on warm side of duct; ceiling flex duct
* 6 supply grilles, 2' x 2'; 12" damper
* 30" x 16" filter grille

Lighting
* Two rows, 4 lamp (14) 2'-4' fluorescent troffer T12 (2 level)
* Manual controlled (one switch controls the 2 perimeter lamps, other switch controls 2 interior lamps)
* Single lamps fluorescent white board lighting

Plumbing
* No water heating
* Handicap accessible water closet
* Fan/light combo (80cfm)
* Supply piping CPVC
* Waste piping PVC (stubbed through floor only)

APPENDIX B

Modified Specifications (FL)

Architecture/Planning
* *Modular in two sections to create plan 24' x 36'. Monitored. Daylighting. Operable Windows. Wall mounted Seer12 HVAC Recess, Type IV

Structure & Framing
* Wall - Steel moment frame w/ 3 5/8" metal studs @ 16" OC (18ga.)
* Roof - structure 14ga. Steel purlins @ 24" OC
* Floor - 20ga. "B" decking under Viroc (lightweight concrete w/ fiberglass reinforcement) with (3) foundation vents: R 14 unfaced batt insulation.

Building Envelope
* *Wall - 1/2" VCG (vinyl covered gypsum) over 1/2" gypsum unfinished; metal stud infill with R-11 faced batt insulation; 5/8" Dens Glas (R 0.73); 3/4" isocyuranate insulation; .019 high rib aluminum siding
* *Windows - Vinyl frame. Vertical slide. Low e (pane 2). Type 1, slider windows

U=0.59 (summer). SHGC =0.38, 46" x 53" (DH). Ellison with Solarban 60 PPG glass.
* *Roof - 0.45mm white EPDM roof over 3/4" isocyuranate insulation, over 5/8" Dens Glas over 22ga. B-deck; 4" overhang; R-19 faced batt insulation netted to underside of deck
* *Skylight - (5) 2' x 4' roof integrated skylights on min. 6" curb and flashed; flared well to 4' x 6' at ceiling tile with 3/4" insulation and gypsum board finish
* *External doors 6'-8" HM pressed steel KD (knock down) SECO (honey comb fill or polystyrene core) min. R=3.8

Interior Finishes
* Wall - 1/2" VCG wall, Class A
* Wall - 3/32" FRP over 1/2" gypsum in bathroom
* Floor - base - 4" vinyl base, topset
* Floor - roll vinyl in bathroom, 6" self cove base
* *Floor - Anti-microbial, impervious vinyl composition backing "Sabi" carpet tiles by Interface. No VOC's carpet adhesive (Group 1, Type A or B, Class 2. Density 4600, direct glue down)
* Interior doors - 3'-0" x 6'-8" hollow metal doors
* Ceiling - T-grid 2x4 @ 8'-0" a.f.f. - Armstrong 1729 high humidity

HVAC System
* *3.5 ton Bard Heat Pump with WERV: WA 362A10RRF4FXX (SEER 12, HSPF 7)
* Supply ducts; rigid with 1" insulation on main with ceiling flex duct branches
* 6 supply grilles, 2' x 2'; 12" damper
* *leak free ducts (FSEC to test and seal; manufacturer to contact FESC for scheduling)
* *twist timer to control HVAC system

Lighting
* *Two rows, 3 lamp (9) 2'-4' fluorescent troffer T8 (3 step)
* *Sun Optics LCM 1000 Light & Louver Controller with twist timer to control electric lighting system
* Single lamps fluorescent white board lighting
* *Lithonia LED LES - Model # 1 R 120/277 ELN SD emergency lighting
* *15 W CFL porch light

Plumbing
* No water heating
* Handicap accessible water closet
* Fan/light combo (80cfm)
* Supply piping CPVC
* Waste piping PVC (stubbed through floor only)

Michael Roman is chief executive officer of Resun Leasing, Inc. headquartered in Dulles, Virginia. He also president of the Modular Building Institute. Email: mroman@resunleasing.com

"Case Study: Addition Helps School Keep Pace with Growth"
June 2002
by Laurie Robert

"It was a simple enough approach. You need a portable classroom when your enrollment rises, and if enrollment keeps rising, you add more space."
- Mordechai Herskovits, Community Hebrew Academy administrative consultant

While it is true that modular buildings have long been associated with temporary facilities, school boards are recognizing the full, significantly advanced reach of modular construction methods and applications available today.

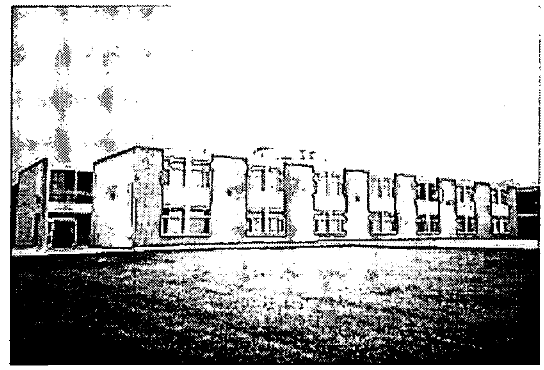
This case study explores the progression of modular construction over a five year period - from the single wood framed relocatable classroom through to the multi-story steel and concrete building addition - all on one school site!

In 1995, a private school in Toronto, Ontario determined it needed more space to accommodate increasing enrolment. To satisfy these immediate needs, they followed the course of many schools and turned to the temporary classroom solution for relief. In the fall of 1996 as enrolment spiked once again, the school approved the lease of two more relocatable classrooms to house the students.

But by 1997 as they continued to outgrow their facilities, it was determined that to add more classroom space would require a more self-contained complex of rooms because of the limited property available. The three single units were returned and a customized 5000sqft complex was ordered to take their place.

Feeling the pinch not a year later, 1998 saw another 7000sqft of classroom space with a cafeteria added to the complex already in use. In each instance, the School was able to make their changes and additions during the summer months without disruption to the students or faculty.

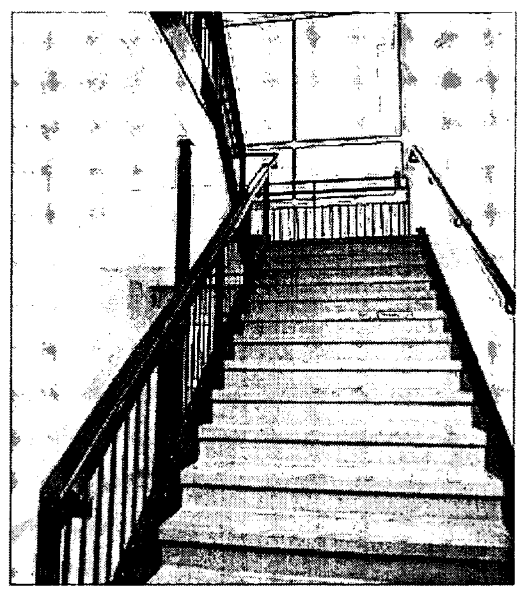
"It was a simple enough approach" commented Mordechai Herskovits, Administrative Consultant and former Executive Director to the Community Hebrew Academy. "You need a portable classroom when your enrollment rises, and if enrollment keeps rising, you add more space."



But school properties do not have infinite boundaries. "There can come a point when adding too much single story temporary space becomes unworkable" Mr. Herskovits said. "We had site limitations, and the amenities and services were not all available there for a permanent enrolment."

So, in 1999 after expanding their interim facilities to the limit - with their enrolment having increased 100% over five years, the school made the decision to build a two story 30,000sqft addition to their existing school. The relocatable classrooms and complexes had served them well but they now needed a more permanent solution to their problem - something more conducive to their property size and longer-term use.

They looked to the convenience of modular construction once again. When asked why the school chose modular over conventional construction methods, Mr. Herskovits replied "That's easy. The student body would not have had anywhere to attend class for the year it would have taken to build our addition. We needed to remove the complex that was already there in order to site build the addition".



He added "The only way to solve the problem was to build off site. By going with modular construction for the addition, we kept the existing complex in place until school closed, and we had the permanent addition installed over the summer months".

The school retained their own series of consultants to do a complete design analysis of the existing facilities, and come up with a performance specification for the addition. Working with NRB Inc., the modular builder who had been with them for five years, they took a team approach, creating a facility that would match the existing school in both appearance and performance.

The modular construction company designed the non-combustible, 64-module structure using a post and beam construction method, with pre-poured concrete floors. The new school wing was designed to blend with the existing school and all features except the face brick and stair cases were installed at the plant.

Roof mounted glycol boilers and remote compressor were used for the heating, ventilation and air conditioning system. In keeping with the modular process, the builder fabricated a non-combustible equipment enclosure, pre-installing the boilers in the enclosure at the plant so it could be craned onto the roof complete.

Modular building methods provide an expedited construction process that cannot be matched by traditional means, and from 1995 to 1999, the Community Hebrew Academy of Toronto experienced virtually every aspect of its flexibility.

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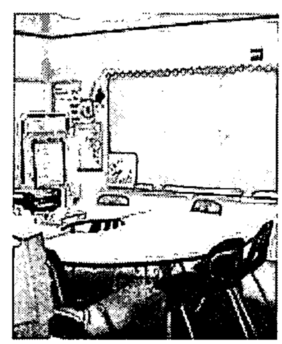
MODULAR BUILDING INSTITUTE

"Can You Hear Your Facilities Costs Skyrocketing?"
by Michael I. Roman

If you are not familiar with a new set of proposed construction standards for classrooms, you should be. In 1998 the parent of a hearing impaired child requested that the ADA Accessibility Guidelines be amended to include new provisions for acoustical accessibility in schools for children who are hard of hearing. The Architectural and Transportation Barriers Compliance Board (the "Access Board") solicited comments and input from interested parties and directed the development of a standard on classroom acoustical design by the American National Standards Institute ("ANSI"). The ANSI is the national coordinator of voluntary standards development. Armed with studies and information from the Acoustical Society of America, ANSI is looking to put some teeth into its suggested standards by introducing the findings to the International Code Council ("ICC"). The ICC is responsible for the International Building Code and is working on bringing uniformity to building codes. If adopted by the ICC, the classroom acoustical requirements would become mandatory as part of the building codes in those states and jurisdictions that use the international building code or its member codes.



The proposed acoustical standards require a reverberation time of not more than 0.6 seconds at the mid-speech frequencies of 250,500 and 1,000 Hertz in a typical classroom and limit background noise in an unoccupied classroom to no more than 35 decibels. These standards are not limited to classrooms for the hard of hearing, but would apply to all classrooms.

In order to satisfy the acoustic criteria of the proposed standard, the walls, roof, floor, doors, lighting, windows and ventilating systems must be modified. For portable classrooms, the proposed changes would increase the cost by at least one-third excluding changes required in the heating, ventilating and air conditioning ("HVAC") systems. At this time, HVAC systems for portable classrooms operate in excess of the 35-decibel standard. New HVAC units would have to be designed and produced. Thus, the potential cost increase of the HVAC system in portable classrooms is unknown.

While the proposed standards have not yet been codified, implementation will certainly assure for more costly facilities - both portable and permanent. If you are concerned about your construction budget and stretching your available dollars, it is imperative you learn more about the proposed acoustical standards.

For additional information, please see www.access.board.gov; www.acoustic.org; www.ansi.org; www.edfacilities.org

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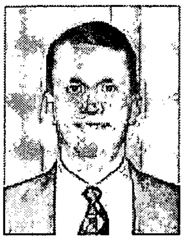
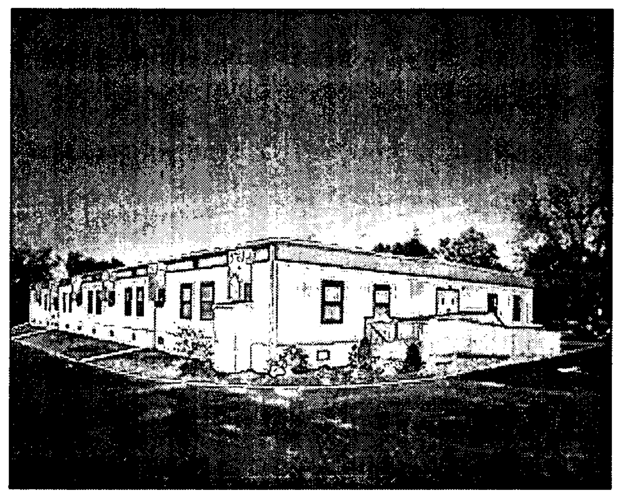


"Charter School: Up & Running"
March 2002
by Doug Crawford

Modular construction enables one school to meet it's charter deadlines

Newark, one of Delaware's largest cities, was in need of an educational alternative for middle school students. There was no public middle school within a 10-mile radius of the Greater Newark area.



In July 1999, a number of parents in the community came together and decided to start a local charter school that would offer their children an education combining scholarship, good citizenship, and creativity. To get doors open by fall 2001, parents turned to a provider of modular and mobile space solutions for a facility that would meet their immediate needs.

"They built and placed the modules, assembled the buildings, and handled interior work," said Duke Pierson, one of the school founders. "Modular construction gave us the opportunity to get the school up and running when no other options were available."

Today, two modular buildings, situated on almost seven acres, serve as the Newark Charter School.

Besides housing 435 students between the fifth and seventh grades, the school offers a meeting space for community organizations. The facility also gives the school's board of directors time to plan for and construct a larger, permanent building.

From Charter to Construction

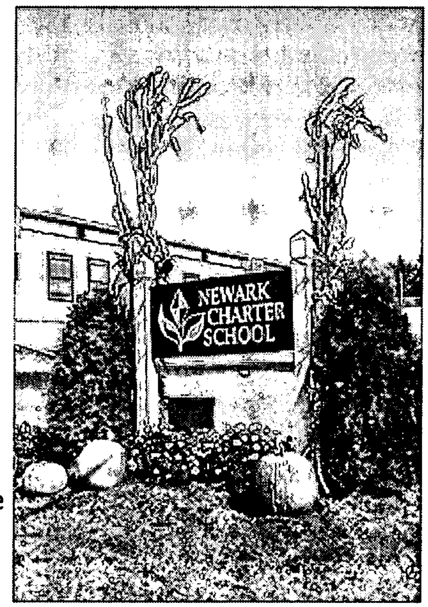
Charter schools are independently operated public schools that are free from most regulations and constraints imposed at the state and local levels. Without these restrictions, charter schools tend to operate more efficiently and innovative, having a greater ability to quickly respond to students' needs. In exchange for this increased freedom and flexibility, charter schools are held accountable for achieving educational results.

In April 2000, the Newark parents obtained a charter to start a community school.

Although they lacked a corporate or school management company sponsor, they were eligible for a federal grant to help with construction costs. Because the charter required the school be running by August 2001, they needed to find a location and building quickly or risk losing the school.

"We tried to use a permanent facility, but it was difficult to fund and get support for conversion of an existing building due to zoning issues, affordability and potential credit risk," said Pierson. "Modular construction didn't require as much an outlay of work or modification. And it enabled us to quickly open a school to meet the charter's deadlines."
After reviewing several bids from modular leasing companies, the parents chose a modular building supplier to construct the school buildings.

"We looked at several modular school buildings," said Pierson, "including . . . installations in Baltimore and Wilmington.



The $ 1.2 million project consisted of two factory-built buildings. Each building was approximately 68ft x 142ft allowing for nine to ten classrooms, two offices, a teachers' lounge, a reception area and restrooms. Together, the buildings offered 19,584 square feet. In only 60 days, the brand-new structures were complete. They were installed on the school's temporary site in time for the charter's August deadline.

"Newark Charter School mirrors the floor plan of a typical school building with classrooms off a long hallway," said Vince Alcarese, sales manager, major projects, GE Capital Modular Space. "Because of its speed and flexibility, modular construction is ideal for charter schools, especially since it is pre-designed to meet state and local zoning requirements. It also can be less expensive and time-consuming than conventional construction methods." GE Capital Modular Space provided Newark Charter School with 24 modular units, manufactured by Whitley Manufacturing.

The Modular Route

Modular building suppliers use the same materials for their buildings as conventional construction companies do. The building process is the only difference between the two methods--modular structures are built off-site in a controlled manufacturing environment. Off-site modular fabrication and assembly can reduce the cost of construction and accelerate the project schedule via simultaneous site preparation. In addition, modular construction is versatile and can be easily expanded, reduced or relocated to accommodate changing needs. Traditional construction methods require that the structure be built on the site it will eventually inhabit.

"Modular construction is the logical option for charter schools since most have tight budgets and have to raise their own funds," said Greg Meece, director, Newark Charter School. "The modules are working very well for us. They more than met our expectations."

Each classroom is approximately 23ft x 30ft. The teachers' lounge serves as a versatile workroom and staff meeting area and is equipped with a lavatory. Newark Charter School has space for a staff of 19 full-time teachers, a school director/principal, two guidance counselors, a nurse, and three administrative assistants.

The buildings were shipped complete with attractive flooring, lighting, and HVAC. White walls and tiles add to the brightness of the new buildings, making it easy for teachers and students to decorate classrooms. The staff also appreciates the nine-foot ceilings, which allow for large windows and natural light. Several rooms, including the nurse's office, are carpeted.

"The teachers are happy with the space we have," said Meece. "Hanging student papers is easier with the gypsum wallboard, so that's a big plus."

Newark Charter School also is fulfilling the community's needs by providing a place for after-school activities such as music lessons and recitals, as well as evening meetings of community groups such as the Boy Scouts.

"Everyone was excited about the school opening," said Pierson. "We've already started the enrollment process for next year and plan to add a grade."

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"Preventing Mold Growth in Temporary School Structures"
March 2002
by Bruce Stewart, CIH, ROH

Mold growth in general purpose buildings, including but not limited to schools, has emerged in the past few years as one of the most important issues confronting property managers.

Standards recently published by the New York City Department of Health and the US Environmental Protection Agency confirm that exposure to mold growth in such buildings is a risk factor for at least some occupants. Allergic responses such as asthma, hay fever, and rash may be triggered in those who have developed sensitivities to molds. A very limited number of molds may cause infections in occupants with compromised immune systems. In addition, it appears that exposures to some species of mold, capable of producing powerful chemicals known as mycotoxins, may cause a wide variety of symptoms including headache, stomachache, nosebleeds, and eye, nose and throat irritation.

One particular mold, Stachybotrys, a mold known to produce a number of powerful mycotoxins, has received a great deal of public attention. While there is considerable debate among environmental researchers as to the relative importance of the toxic versus allergic affects of this and other molds, it is clear enough that the growth of some or all molds in buildings can be harmful to at least some occupants.

The growth of mold in buildings requires the presence of organic building materials or debris that can be a nutrient base for the mold, and extended periods of high moisture. Many common building materials will support mold growth. Cellulose-containing building materials such as gypsum wallboard, ceiling tiles, jute-backed carpets, and pipe insulation are among the most commonly found supporting mould growth. However, soil and debris present in synthetic carpets, or present in crawlspaces beneath school facilities, if damp, may also be a breeding ground for mold growth.

Any source of moisture that will provide a minimum of 70% relative humidity at the surface of the material will allow germination of the spores. This mold growth can occur rapidly. The moist conditions only need remain in effect for a few days for some molds to produce spores. Witness the EPA standard that gives a grace period of only 24-48 hours in which to dry materials, after which time mold growth should be suspected.

Any school building, permanent or temporary can support mold growth, given the right materials being wetted for long enough. In fact, the diligence of maintenance may be a greater factor predicting mold growth rather than the type of building. However, for a number of reasons, some types of temporary buildings, including portable classrooms seem to have had a higher experience of mold growth. Certainly the recent Canadian experience has been that older portable designs were more prone to develop mold growth. Several local health departments have required Canadian school boards to actively inspect their portables for mold growth.

School boards in Canada and the US are responsible under federal and local regulations to provide safe environments for their staff and students. Where can building managers turn for direction on this issue? The most current advice is found in the New York City and EPA guidelines, referenced below.

Several Canadian provinces have posted either Hazard Alerts or detailed standards for employers regarding mold in workplace buildings. Particularly relevant advice is given in the 1999 Ontario Ministry of Health publication, "Boards of Health Working with School Boards and the Community to Address Concerns About Indoor Air Quality (with special reference to indoor mold contamination)." Not only does this guideline give advice on inspection, testing, and remediation of classrooms, but it also presents a number of suggestions to prevent future mold growth.

What can a school board official do to prevent mold growth in buildings?

To begin with, new temporary school facilities should be designed and built to resist water damage to the greatest extent possible. The prevention of mold growth really is a good investment for a property manager, especially in today's litigious environment.

Today, suppliers of temporary buildings have several improvements to offer school officials:

- Cement board and non-cellulose based wall panels can be used to minimize the impact of water damage.
- Roofs can be provided with overhangs and properly sloped eaves-troughs and downspouts to effectively manage water off the roof.
- The siting and skirting of temporary structures is also important. The portable classroom should be placed over a well-drained surface and surface run-off should be directed away from the structure.
- The space under the structure should be well-ventilated to prevent rot from ground moisture.
- Diligent maintenance practices will also help prevent mold growth. Excessive use of water in cleaning of floors should be avoided.
- Mats and trays should be provided for wet boots.
- Maintenance personnel should carefully check caulking and flashing details around windows and service posts, especially after movement of a temporary structure.
- Finally, classrooms should be provided with ventilation to meet current ASHRAE requirements. Although proper ventilation of a classroom will not necessarily prevent mold growth, it should reduce the frequency of general air quality complaints that are often taken as signs of mold exposure. Taken together, these precautions can go a long way to help school officials provide safe, comfortable learning environments, now and in the future.

References:

New York City Department of Health,
"Guidelines on the Assessment and Remediation of Fungi in Indoor Environments", 2000;
www.ci.nyc.ny.us/html/doh/html/epi/moldrpt1.html

US Environmental Protection Agency,
"Mold Remediation in Schools and Commercial Buildings", 2001;
www.epa.gov/iaq/molds/graphics/moldremediation.pdf

Ontario Ministry of Health,
"Boards of Health Working with School Boards and the Community to Address Concerns About Indoor Air Quality (with special reference to indoor mould contamination)", 1999

US Environmental Protection Agency,

"Tools for Schools",
www.epa.gov/iaq/schools/

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