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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) "An Architect's Perspective: Convincing a Skeptic" (Robert M. Iamello); (2) "66 Portables for San Mateo High" (Steven Williams); (3) "Case Study: Charter Schools" (Robert Airikka); (4) "Studyin' Trailers--Part 3" (Michael I. Roman); (5) "Design-Build" (Linc Moss); (6) "How To Obtain a Modular Facility Identical to a Site-Constructed Facility" (Mike Morton); (7) "Permanent Modular Construction: A Growing Trend" (Steve Sickman); (8) "Studyin' Trailers--Part 2" (Michael I. Roman); (9) "Classroom Accessibility" (Robert Gorleski); (10) "Hall-Dale Elementary" (Steven Williams); (11) "Laying A Foundation" (Jerry Brosius); (12) "Modular 101" (Michael I. Roman); (13) "So, You Want To Buy a Portable Classroom" (Randall D. Holler); (14) "Studyin' Trailers--Part 1" (Michael I. Roman); and (15) "Temporary Classrooms" (Judy Smith). (EV)

Modular Building Institute 2001 Educational Showcase

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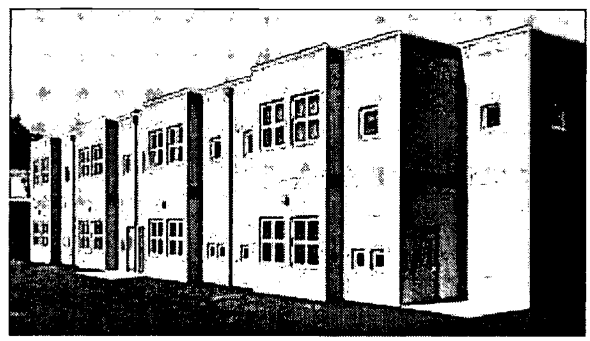
"An Architect's Perspective
Convincing a Skeptic:
My Education in Modular Building Construction"
October 2001
by Robert M. Iamello, AIA, NCARB

I was pleased to learn that the Modular Building Institute gave one of my school building projects one of its Awards of Distinction for 2001. Looking back at the project, I realized that I was initially skeptical about designing a modular unit as a school building addition. I was pleasantly surprised to discover that with teamwork, an open mind, and creativity, a modular unit was the perfect choice and met the client's pressing deadline.

Housing Students Was Paramount



When I was asked by Dr. Edwin DuRoy of the Paterson Public School District to plan a classroom addition, I thought it would be a typical design project. Student population had increased dramatically, and the project was driven more by time than by cost, as the goal of reducing overcrowded classrooms was paramount. Although cost is always a factor in school construction, the issue of housing students took precedence. Thus, modular building construction became the most viable choice to meet the client's needs. I, however, had to quickly learn more about modular building construction in order to turn around a design and get the project underway.

Design Challenges

Although our firm had managed modular building construction for classrooms in the past, the scope of this project was broad and contained some design challenges. Paterson Public School #27 needed 10 more classrooms, a science lab, a large group room, and student restrooms. The site for the addition was located on a steep sloping hill that could not be
filled in.

Therefore the project had to accommodate the steep grade and look like a natural addition to the existing building. An elevator would be included to provide a vertical link connecting the old and new buildings.

For School Officials, No Convincing Needed

The Paterson Public School District needed no convincing when approached with the idea of modular building construction. The district had used modular building construction for two other schools and was pleased with the results. I, on the other hand, had several concerns that needed to be addressed before the design phase was started.

My primary concern was the visibility of the vertical joints between the two buildings. One architectural goal was to reduce the obvious difference between an addition and the existing building. The visibility of the vertical joints in other modular building additions I had seen had a "zipper" look, due to the brick veneer of the modular units being layered into the building façade. I was challenged to create a way to reduce the visibility of these joints.

A visit to the modular building manufacturer proved to be just the educational experience I was looking for to move forward with this project. I was to witness firsthand the various complexities of the modular product and gain an understanding of my own design abilities in working with modular building projects.

The manufacturer's assembly plant is an indoor environment for the construction of the outside end product. Unlike standard construction practices, the fabrication of the product is done in a controlled setting without regard to weather conditions.

Production can also be provided on a 24-hour schedule if necessary to meet client deadline. The fact that the building materials used in modular construction are the same as in conventional construction ensures that the modular units are solid and will not blow over in the occasional New Jersey "nor'easter."

Understanding the Modular Process

Talking with the mechanics in the factory gave me the opportunity to discuss my concerns about the visibility of the vertical joints. Joining a modular building to an existing one had certain design limitations, and my discussions with the mechanics gave me the insight I needed to consider the issue of concealed joints.

I now had a better understanding of the process, and my creative side emerged. Several design options were developed to produce concealed joints between the modular components.

One idea was to design the modular units to step in and out from one another creating a relief in the elevation of the building. The resulting corners concealed the joints on the building's façade. Another option was to design the rainwater downspout system to cover the joints. The modular manufacturer was enthusiastic and willing to examine ways to enhance their technology as we worked together to address the design possibilities.

While the modular units were being constructed, the site was being prepared to receive the finished product. The site was excavated, a foundation poured, and the steel framework erected. To face the challenge of the steep grade of the ground, the design of the modular building allowed for a split-level effect, with the main floor of the existing building equal in elevation to the second floor of the modular unit.

A newly created foyer was located between the first and second floor of the modular unit giving access to the elevator and stairs to the other levels of the existing building. The time savings of preparing both the site and the building simultaneously were valuable to the client in order to meet the deadline.

Factory-Built Buildings: A Combination of Science and Art

I learned about other key factors that affect the feasibility of modular building construction. In addition to the issues of timeline, site topography, and budget, one

must examine the accessibility of the route from the factory to the site. With the units being shipped on standard flatbed 15-foot by 40-foot trucks, the roads have to be able to accommodate the turning radius of the vehicle as well as bear the weight of the load. In creating the design, the 15-foot width becomes an essential element that is the basis of framing the module. Façades such as brick veneer masonry are often completed at the site to reduce the weight of the modular unit during transport.

Placing the modular building on the prepared foundation and steel framework was a combination of science and art. Large cranes lifted the building units off the truck and delicately situated them on their new home of steel and concrete. With the nearly invisible joints completed and all the added systems, such as electrical, fire, security, and HVAC connected, the building was ready for the interior design work to be done.

Ahhhhhhhhh, Success!

We had reached our goal. Paterson Public School #27 had received a seamless addition that matched the existing building, and it was completed in plenty of time for student occupancy.

Dr. DuRoy, superintendent of schools, was heard to say, "This is the best one yet!" As a result of teamwork among the planners, designers, and engineers, the finished product garnered a Modular Building Institute Award of Distinction for 2001.

The client was thrilled with the finished product, and this architect got a valuable education in modular building and its design potential. The array of possibilities in the field of modular construction becomes greater with the team efforts of the planners and designers involved.

As the modular building technology continues to advance, planners and designers are wise to examine this technology as an option when reviewing the client's needs. We can succeed only if we do not limit our thinking to the basics of a product without visualizing the product's potential.

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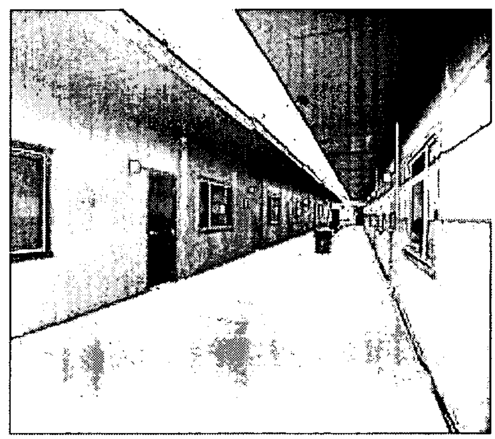
"Case Study
66 Portables for San Mateo High"
by Steven Williams

"The kids are overwhelmingly in support of what has been done. It's a marvelous example--if enough people pull together--of what can be done in 83 days."

--Marcia Cohn-Lyle, trustee for San Mateo Union High School District

After only 83 days of work, high school officials are proud to say they've got a facility at San Mateo High that's ready for students.



The 66 portables line San Mateo High's baseball field, perhaps a surprising welcome for students and staff who thought nothing could break the school's original 80 year-old brick and mortar structure.

But in May, days before the start of final exams, San Mateo Union High School District Superintendent Tom Mohr unexpectedly shut down the school when he learned that nothing was holding up the building exterior in the event of an earthquake.

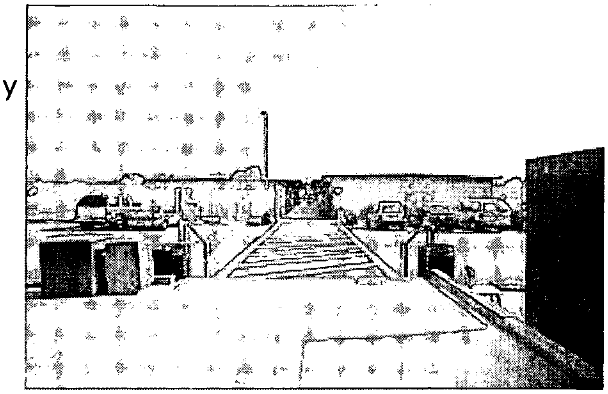
Occupants were immediately moved to another location within the district as the district board battled out what to do with the old buildings, eventually deciding to replace the entire main building and Performing Arts Center with new buildings.

A tour of the portable classrooms in place as interim facilities alleviated any concerns about whether the district would be able to house 1,500 students and provide them with a good education through the next one-year of new building construction.

"Mobile Modular Management Corporation supplied us with the buildings, most of which were specifically built for this project," said Patrick May, manager of purchasing for the district. "Most of the buildings are doublewide classrooms, while our science lab is triplewide. Our administrative building is made up of four modular units."

The portables boast rows of elevated cement walkways lining 95,000 square feet of classroom space fully wired and fitted with computers and lab equipment.

While the facilities are only temporary, officials are talking about possibly using the space for other schools in the district after construction at San Mateo High is complete.



The portable classrooms are larger than the old building, and are air conditioned and fully modernized.

When asked what she thought about the portable classrooms, one San Mateo High parent said, "I've been impressed with what they're able to do." Not at all concerned about the temporary facilities, "You go to school for the quality of education," said the parent.

Some of the students skateboarding around campus yesterday had mixed feelings about going back to school on Monday with the changes.

"It's kind of cool," said a sophomore student about the interim housing. "I'll miss the old buildings, though. There were a lot of emotions going at the end of the year."

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"case study: Charter Schools"
by Robert Airikka, AIA

The ideal choice for any charter school is to have a new building built to fit its specific educational and philosophical requirements.

The Facilities Hurdle

One of the biggest hurdles in starting a charter school is finding a suitable building. This is a process that can lead to a great deal of anxiety among educators as it is often outside of their realm of expertise.

The options are nearly limitless and at the same time there is usually little from which to choose. That is to say, that a school building, whether a new building or a renovation, can be designed in many different ways but, can the suitable site or building to be renovated be found?

To simplify the matter, finding the right building can be seen as a choice between three possible approaches:

1. Finding an available existing school building that can be occupied by the new charter school.
2. Finding and renovating an existing industrial or commercial building.
3. Finding a suitable site and constructing a new charter school building.

Regardless of the approach chosen these approaches share several common concerns, these concerns are schedule, quality and cost.

Finding An Existing School Building

Finding an existing school building to use is clearly the simplest way to acquire a building. A building that was designed originally as a school may offer many advantages. The building will usually contain classroom-sized spaces and will be designed with adequate exits. There will be toilets and offices and possibly a gym.

But there are a number of questions that will need to be asked.

Is the building the right size?
Is the classroom count what is needed?
How much renovation is required to bring it up to current standards?
What is the condition of the mechanical systems?
What is the condition of the roof?
Does the building contain asbestos?
Is the building in a desirable location?
Does its design lend itself to the educational philosophy of the charter school?

Once these questions are considered it will probably become clear that an existing school building may not always be the best answer for a particular charter school. With an existing school building there will almost always be some degree of compromise.

Renovating An Existing Industrial or Commercial Building

Renovating an existing building often gives greater flexibility in the design of the school. A former department store for instance will have large open areas that can be divided up as needed, providing classrooms and offices of the size and configuration desired.

Again however, some of the same questions will need to be asked. Is the building the right size? How much renovation is required to bring it up to current standards? What is the condition of the mechanical systems? What is the condition of the roof? Does the building contain asbestos? Is the building in a desirable location?

Renovating an existing building may not be the right answer either. There is still the element of compromise.

Building A New Charter School Building

The ideal choice for any charter school is to have a new building built to fit its specific educational and philosophical requirements. This approach provides the greatest flexibility and gives the school a "fresh" building with all new features and systems. The roof will be new; as will the mechanical systems, and both will be under warranty.

A new building requires the least amount of compromise. In addition, a new building is not necessarily the most expensive solution. Renovation projects inherently have many unknowns. There is no telling what will be found in the walls and under the floors until the work has begun. Most of the problems that arise during the renovation of an existing building will not be an issue with a new building.

Balancing The Concerns

Schedule, quality and cost must be balanced. Each is a major concern and the order of their priority will no doubt vary from school to school.

Schedule is probably the least flexible. To keep the school charter, a school building is mandatory.

Being able to move directly into an existing school building, that truly fits the needs of a new charter school, would be ideal. However, finding this ideal existing building will most likely prove impossible. Renovation and repair will need to be done regardless of whether the existing building was previously a school or a warehouse. A minimum of six months should be expected to properly perform the necessary work.

Consider Modular

Surprisingly, a new school building can be designed and built in the same amount of time. Modern steel and concrete modular construction technology can provide a new school in as little as six months.

While the site is being prepared the school itself is built in a controlled factory environment. The school is delivered to the site nearly complete, with brick and windows and tile and chalkboards already installed. All that needs to be done is to complete the joints between the modular sections.

When complete, the concrete and steel modular school is indistinguishable from a conventionally built school. Steel and concrete modular school buildings can be built as high as seven stories and can have any exterior finish desired.

The quality of the school building can vary. Vinyl tile can be used in place of carpet;

painted wallboard can be used in place of ceramic tile. Quality is the same for each approach; existing school buildings, renovated commercial buildings and new construction are all subject to the same question of quality and it often becomes a question of affordability.

Cost is usually the driving factor. It can't be built or renovated without money. Costs can however be reduced by selecting less expensive materials or even by staging construction, or, in other words, building part of the school this year and expanding in later years. Also, the on-going costs of maintenance need to be considered. A new school building will require the least up-keep as all systems and elements will be new.

Conclusion

When all factors are considered, it is clear that a new school building is the best choice for a charter school (or any school for that matter). A new school building is best able to address the educational needs of students and teachers and the budgetary and operational needs of administrators.

And, when considering the various types of new construction technology available, modern steel and concrete modular construction offers the very best combination of speed, value and quality to be found.

Robert Airikka, AIA, serves Kullman Industries, an integrated manufacturer of commercial modular buildings headquartered in Lebanon, New Jersey.
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MBI Net > magazine > designbuild5_01

"Design-Build"
BY LINC MOSS

Over the past couple of years, the phrase "design-build" has been much used in many construction industries. But what exactly is "design-build?"

By the nature of modular construction, either wittingly or unwittingly, the factory-built buildings industry has participated in the design-build process for many years. This was due primarily to owners and architects not being familiar enough with our product to execute complete design packages reflecting modular construction. As design-build has grown in popularity, the bar has been raised for expectation and greater a definition of responsibilities assigned.

The design-build process is one of several processes referred to as a delivery system, or a means of defining roles and executing the project. Design-build means that the owner contracts with a single company that is responsible for the building's design and construction.

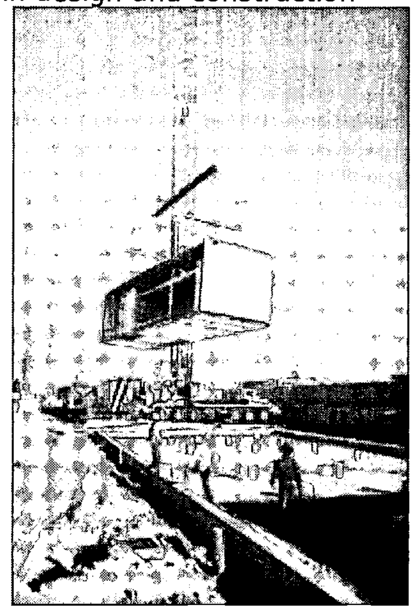
There are several project delivery systems. The most traditional delivery system is design-bid-build. This is where the owner enlists the services of an architectural and engineering firm to execute the design, then takes those designs and goes out for bid. The award for construction is issued to a general contractor or multiple prime contractors typically based upon price and reputation of the contractor(s). In design-bid-build, there are several variants involving construction management. Construction management is the review and inspection of the construction process that assures compliance with the initial design.

Construction management agency and construction management at risk are examples of the variants mentioned. For the sake of simplicity, we will assume that the architect will act in the role of construction manager with no financial risk (construction management agency).

As with construction types, there is no perfect project delivery system. There are some advantages and disadvantages to both of these delivery systems that we will discuss.

The immediate advantage to design-build is the direct line of communication between owner and the designer/builder. Since these are one and the same, there should be little or no interpretation errors associated with the owners requests. Typically design build projects allows for "fast-tracking" of the job. This is where the contractor is released to commence a portion of the actual work while other aspects of the project are still in the design phase. In addition to communication and speed, costs are much easier to control in a design-build environment since the designs are reflective of the construction means and methods of the contractor.

The downside to design-build is an increased workload upon the owner. In this arrangement, typically the owner plays a more active role in design and construction decisions. Another area of concern is publicly funded projects.



Typically public funds are spent with the lowest bidder only. This normally precludes letting design and construction contracts to the same entity. With the concept of design-build becoming more popular as a project delivery system, many existing laws addressing public funded projects are under review and will probably be rescinded in the near future.

Design-bid-build as mentioned above is the oldest most traditional means of building a project. The advantage to design-bid-build is that the owner can greatly reduce their amount of involvement in the project (given a good relationship with the designer). Depending upon the architectural and engineering firm's skill and familiarity with the type of building, this delivery system can also render a lower initial project price.

The downside is increased project duration due to construction not commencing until 100% of the design work is complete and additional layers of communication between owner and builder. Unfortunately if the architectural and engineering firm is not familiar with the building type or current construction cost, project pricing can quickly get out of hand, rendering a higher initial cost that may exceed the owner's budget.

Design-build requires that a company have strong in-house design capabilities and/or strategic partnership with an architectural and engineering firm. For the most part, our industry has long had in-house design capabilities covering code compliant design of our buildings and all related systems. An area we have normally lacked expertise is civil design. This encompasses the improvements to the land that the building is to be sited upon. These improvements typically address drainage, utilities, paving and landscaping.

It may be necessary for your modular builder to form strategic partnerships with civil design firms before acting in the role of a design-build company. Additionally, some states require all commercial construction or buildings over a certain square footage be sealed by an architect. As with the civil work, either in-house professionals or a partnership with an architect will be required.

Finally, the last item for consideration is the increased liability associated with total design and construction responsibility. Your design-build provider should have professional liability insurance or errors and omission insurance, as it is sometimes called, covers problems with the design that does not meet either an express or implied warranty with the owner. It is important to realize that unlike builder's risk, professional liability insurance coverage does not end when the project is completed. Three, five, and even ten year discovery periods are not uncommon.

Design-build is quickly becoming the favorite option for building or expanding in the public and private education sectors. By eliminating the adversarial relationships and inefficiencies inherent in the traditional design-bid-build method, design-build provides schools the opportunity to obtain the best possible value.
From this short introduction, you can see that the design-build process may make sense as a strategic means for your school system.

Whether you require a simple addition or an entire campus, design-build providers have engineers, designers, and architects that can help you with facility layout, student flow, construction codes, and environmental concerns.

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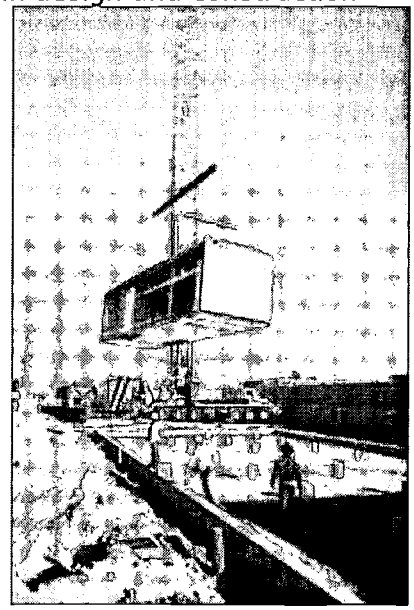

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How to Obtain a Modular Facility
Identical to a Site-Constructed Facility
BY MIKE MORTON

When outlining your specifications and selecting your modular builder, you must look for certain key elements. If done correctly, you can obtain a facility that is identical in every respect to a traditional site constructed facility, for less money and less time.

If you are an end-user, purchaser or owner of a permanent factory-built school facility or campus that didn't possess the same quality and life cycle you anticipated, then it's time to identify the pitfalls that may have gotten you there. In the following few paragraphs, you will learn how to get the results that you wanted in the first place. In other words: don't stop reading now.

When outlining your specifications and selecting your modular builder, you must look for certain key elements. If done correctly, you can obtain a facility that is identical in every respect to a traditional site constructed facility, for less money and less time. But first, you must arm yourself with the necessary knowledge to make the right decision. If you feel you haven't made the best choice in the past, don't worry–you probably didn't know these essentials and that's why you ended up with something that fell short of your expectations.

That's all about to change . . .

CONCRETE FLOORS

Let's face it, a concrete floor is superior to any other kind of floor, so why settle for anything less? If you currently use modular-built facilities, you may have already experienced the inherent problems with other floor types: termites, decay, rotting, squeaking, buckling, hollow sounding noises, high maintenance, and so on.

The plain truth of the matter is that the floor system in your facility is the single most important element in achieving the same quality and life cycle as other methods of construction. Few realize that concrete floors are inexpensive and are readily available anywhere. There are many modular companies that provide concrete floors. If your modular builder doesn't, go see another.

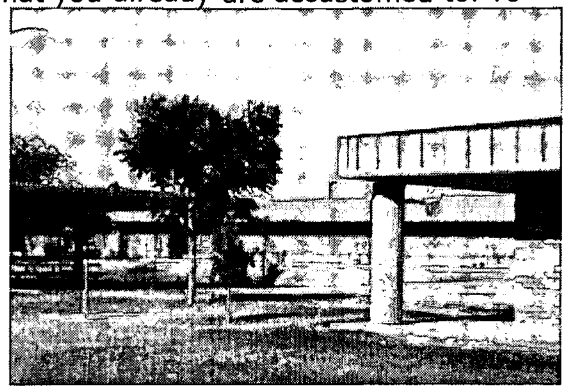
AVOID "INDUSTRY STANDARD"

If you see or hear the words "industry standard," run like hell. This phrase is used to describe materials and construction methods that are only known and available to the modular builder. In most every case, this phrase is used because the materials and construction methods are not equal to site construction.

To achieve an identical site-constructed facility with the same performance, the materials must be the same. These include block or brick exteriors, 10-20 year roof warranties, the highest energy efficient mechanical and electrical systems, grade one heavy-duty fixtures and equipment, and the list goes on.

SAME LOOK & FEEL

Since everyone is familiar with commercial site-constructed facilities (your office, church, school, dentist, doctor, bank, etc.), your new modular facility should have the same look and feel in order to be indistinguishable from what you already are accustomed to. To verify that this requirement can and will be met by the builder you choose, you simply need to visit a similar project completed by your builder. While you're making the inspection, you should ask the building users about maintenance, energy consumption, and overall performance.



From the modular builder's perspective, you have successfully passed this test when your prospective client asks the receptionist where the modular building is and the receptionist responds, "You're standing in it."

STEEL CONSTRUCTION

Although a vast majority of residential and commercial buildings have been wood-constructed, the trend is moving toward steel construction for commercial facilities. The benefits of steel construction over wood construction are most apparent with commercial facilities, even though there are many residential tracts switching to steel. Fire ratings, termite resistance, strength of materials, lesser insurance costs, and increased appraisal value are a few of the many benefits steel construction has to offer.

If you want to be part of the majority that has constructed a modular facility identical to a site-constructed facility, have it steel-constructed. A modular builder that engages in building construction identical to site construction will offer steel construction as a standard; and if not, it will be offered at a modest increase in cost.

AVOID HUGE COST SAVINGS

If a modular builder claims they are going to provide you huge cost savings for an identical site-constructed facility, they're not providing an identical facility. If the materials and general construction are the same, how can there be a huge cost savings? Well, there is a cost savings, but it's not in the cost of the building.

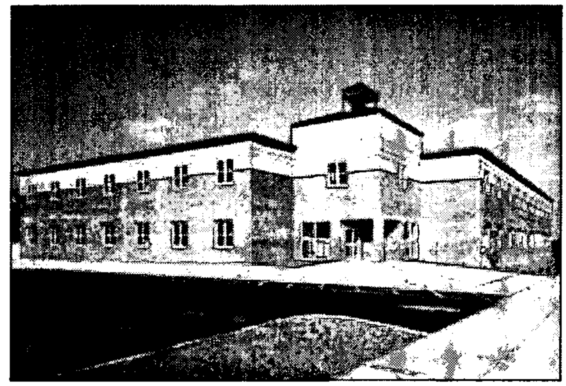
The building should cost about the same, when compared to site construction, and will differ slightly depending on the builder's buying power, efficiency and technical innovation. When one considers the entire project however, the modular builder will provide you savings through an accelerated construction timeline borne of the simultaneous construction activity that occurs off-site and on-site.

Since the overall construction timeframe is shorter than that of site construction (by about half) the costs for interim construction financing, insurance, supervision, security, temporary utilities, equipment and labor allocations, temporary office space, and a host of other costs related to a construction jobsite, including principal and interest on the land, are significantly reduced.

Additionally, the occupancy, or opening date, will usually occur in about half the time–allowing the user to begin a speedy return on the investment. Minimal disruption to the ongoing operation of the user and adjacent businesses also translates into cost savings. These are the user's real savings when a modular method of construction is utilized to achieve the quality of a site-constructed facility. Industries that often capitalize on these cost and time savings are fast food restaurants, banks, convenience stores, gas stations, schools, and any facility located in a remote region where mobilization of material and manpower is needed.

SINGLE RESPONSIBILITY

The two most popular project delivery methods are design-bid-build and design-build. In design-bid-build, the owner commissions an architect to prepare plans and specifications. These are then used in a competitive bid process to select a contractor. In most cases, it is the lowest bidding contractor that will be selected, and not necessarily the best contractor for the job.



The difference between this method of project delivery and design-build is that by utilizing design-build, one entity executes both the architecture and construction. This method is also known as "design-construct" or "single responsibility." Employing a design-build firm accelerates the construction timeline even more by minimizing "middle-man" miscommunication and eliminating costly change orders. This is because in a design-build contract, the design-builder is required to guarantee error free plans. Mistakes are therefore resolved by the design-builder on his nickel and incentive exists to resolve mistakes immediately to lessen the cost.

In contrast to these advantages, the contractor in a design-bid-build scenario looks for mistakes to generate change orders and no incentive exists for timely corrective action. If you have a choice between these two delivery systems, selecting design-build will guarantee the objective of an identical facility to site-construction and will do it on time and on budget.

YOU'VE GOT THE TOOLS

You now have the tools that you need to build a long-lasting modular facility that is identical to a site-constructed building in every way.

When purchasing your next educational building, don't sacrifice quality when opting for a factory-built method of construction. In fact, you should make the most of the amazing time and cost savings available through this dynamic new technology.

For a modular facility that looks like a site-constructed facility, find a turn-key manufacturer near you.

Mike Morton is president of Modular Technology, Inc. in Phoenix, Arizona. He is also a past president of the Modular Building Institute.

The Modular Building Institute makes available free lists of member companies that specialize in design-build technology. For a copy of these members in your area, visit our Member Finder or call MBI at 888-811-3288.

MODULAR BUILDING INSTITUTE

Permanent Modular Construction: A Growing Trend
BY STEVE SICKMAN

If your school district needed 103 permanent kindergarten classrooms with complete site development at 37 separate locations all in less than 15 months, how would you do it?

When the Arlington, Texas Independent School District found themselves in this situation, they turned to the only project delivery system and construction method capable of meeting their needs–design-build permanent modular construction.

Serving 55,000 students in 64 schools spread out over 94 square miles, the Arlington, Texas I.S.D. is the 8th largest school district in Texas and the 66th largest nationally. Arlington I.S.D. is a progressive school district experienced in the benefits of temporary and permanent modular construction, as well as the legal stipulations granting public schools the ability to issue design-build contracts. They understood from the start that a fast-track construction method like modular, together with a design-build construction contract, was the only way to properly execute a project of this scope.

Arlington estimated that using conventional construction and the traditional design-bid-build process would have taken a minimum of three years to complete a project of this complexity. According to Bob Wadsworth, executive director of plant operations for the school, "Our district's decision to expand to full-day kindergarten created a critical need for multiple new facilities in a very short time frame. The modular construction method was the one construction process that could meet our tight deadlines by taking the design criteria from our instructional program facility guidelines and implement it into a fast-track construction schedule."

Projects of this size are still considered large for the modular industry, with challenges that require a modular construction firm that possess true design-build capabilities, a growing trend within the commercial modular industry. Some of the more challenging aspects of the Arlington project scope included:

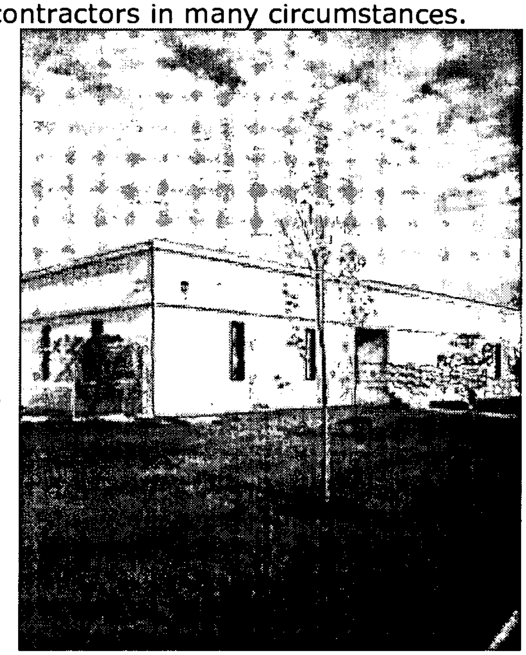
- Developing 37 individual site design packages to conveniently locate the freestanding additions to existing kindergarten suites, utilities, drainage, and traffic flow.
- Identifying the construction type and ratings of the existing buildings to determine the required separations and construction ratings of the proposed additions.
- Verifying the compliance of the handicapped accessibility in the existing facility while making all necessary upgrades along the "accessibility route."
- Conducting soils analysis and designing poured-in-place foundations unique to each site's soil conditions.
- Coordinating the administration of 37 simultaneous permit applications addressing ADA compliance, parking requirements, landscape ordinances, fire department requirements and life safety issues.
- Matching existing architecture and new brick to the existing facilities - some over 40 years old.
- Tying low voltage systems (alarm and communication) into the existing facilities, upgrading several in the process to become code compliant.
- Administering over 20 separate subcontractors with a daily average of 60 plus

tradesman across all 37 sites.

The advantages of modular construction have been well documented by many firms for some time. Issues such as speed to completion, increased opportunity cost, alternative forms of financing such as operating and finance leases, and the potential for relocation and resale are the cornerstones that have driven the modular industry to where it is today.

These advantages and the growth of the industry as a whole have produced an expansion of the number of companies with the technical capabilities to address not only the building structure but the major infrastructure improvements as well.

Several modular construction companies around the country now possess the resources and skills required to complete large complex projects, allowing the modular industry to compete head-to-head against sophisticated site contractors in many circumstances.



The use of permanent modular construction to complete the Arlington project was not the only aspect that enabled the district to achieve their goals in the desired time frame. Incorporating the design-build project delivery method became critical in getting the project on track to meet the districts commitments.

This 'alternative' contracting method is becoming increasingly more common for publicly funded projects, providing entities such as school districts the flexibility in obtaining the best project value instead of just the lowest price. Forty-two states now allow design-build contracts in varying forms for publicly funded projects.

Under a design-build contract, a single entity is contracted to provide both the design and construction. This 'singularity of responsibility' puts the design-builder at-risk for the cost, schedule, quality and management of the project.

According to the Design-Build Institute of America, this integrated services concept recognizes that outstanding quality is attainable only when a single entity controls both the design and construction. The benefits to educational institutions using this method include:

- The elimination of disputes since the school only has to work with one company, eliminating the finger-pointing common with other contract types.
- The owner is considered an integral part of the team and participates in the design process, allowing for input on costs early in the design process which minimizes unexpected civil, architectural, or construction cost surprises.
- Reduced completion times are usually achieved as efficiencies are achieved in each phase, particularly during the design phase.
- Lower design costs when compared to traditional architectural firm fees and a guaranteed maximum price (GMP) that is furnished before a construction contract is finalized.
- Improved control over costs since the designs reflect the means and methods of the contractor.
- The owner is shielded from most design flaws since the design-build contractor is responsible for correcting any design defects.

Through the continued development of the infrastructure required to complete complicated projects like the one for Arlington I.S.D., today's modular companies offer the ability to design and build the educational facilities required for the 21st century. n

Steve Sickman serves as director of marketing at Ramtech Building Systems in Mansfield, Texas..

To view other examples of permanent educational facilities and the latest in modular construction and design, visit the Awards of Distinction section of the website.

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MBI Net > magazine > classaccess

"Classroom Accessibility"

BY ROBERT GORLESKI

Modular, temporary, portable, and relocatable classrooms are all alternatives to conventional stick-built school buildings for elementary, secondary, and post secondary applications when districts are faced with increasing enrollment and budget restraints in areas that have high growth rates.

Temporary classrooms are a good solution for the short term until more permanent school buildings can be erected. In fact, the modular classrooms can be incorporated into industrialized modular units to form permanent elementary, secondary, and post secondary schools with the electrical, mechanical, plumbing and HVAC completely installed in the modular units, constructing a complete school on a permanent foundation.

Industrialized modular and modular classroom construction, however, must meet strict federal, state, and local guidelines. These guidelines include conformance to a national building, electrical, mechanical, and plumbing codes, plus functional requirements for the modular units.

Functional requirements are typically accessibility standards, which are derived from the federal standard, Americans with Disabilities Act (ADA), a civil rights law prohibiting discrimination of persons with disabilities, which provides laws and specifications of building elements for construction of public places, such as schools, so that students with disabilities have facilities that are readily accessible and usable. The ADA is a law only and is not to be used as a model code but a guideline.

For states and local building code enforcement agencies that have adopted model codes, such as the national building code, the ADA guidelines for accessibilities are incorporated into the model code using reference standards, such as the CABO/ANSI A117.1, Accessible and Usable Building Facilities, for attaining accessibility compliance.

Under the CABO/ANSI A117.1 standard, accessible and usable building facilities, such as modular classrooms, classrooms shall be provided with five components.

1. An Accessible Entrance on an Accessible Route

Each accessible entrance on an accessible route shall not have a walking surface slope greater than 1:20. The accessible clear width for 90 degree turns shall be 36" minimum

and when an obstruction is encountered, a minimum clear space of 42" x 48" is required. Ramps on accessible routes shall be a minimum of 36" with a slope not steeper than 1:12 and the ramp run rise shall be 30" maximum. The landing at ramps shall be as wide as the widest ramp leading to it and the landing length of 60" minimum clear. When the ramps change direction at landings, however, a 60" x 60" minimum landing is required. All ramps with a rise of 6" and a run greater than 72" shall have continuous handrails on both sides of the ramp at a 34" minimum and 38" maximum height above the landing surface and 12" minimum extended handrails at the top and bottom of ramp runs.

2. Usable Doors

All doorways shall have a clear width of 32" minimum when the door is opened 90 degrees. The hardware on accessible doors shall have operable parts with a shape that is easy to grasp and usable from both sides of the door. The threshold at the doorways shall be a minimum of 1/2" high, if applicable. Each door shall have a maneuvering clearance of 18" beyond the latch side of the door for a front approach on the pull side of the door and a 60" minimum clearance perpendicular to the door.

3. Accessible Elements Inside the Classroom

Drinking fountains and water coolers shall have accessible spouts 36" above the finish floor and within 3" of the front edge. Clearances under the water cooler shall be provided with knee and toe clearances. Accessible seating spaces and surfaces shall be provided for wheelchair accessibility.

4. Accessible Locations for Electrical Devices & Controls

Electrical switches, receptacles and thermostat devices shall be mounted a maximum of 48" above the floor for a forward unobstructed approach and a low forward reach of 15" above the floor. An unobstructed parallel approach shall be 54" maximum above the floor with a low side reach above the floor of 15" minimum for the devices.

5. Accessible Bathrooms

Doors to accessible bathrooms without stalls shall not swing onto the clear floor space of the fixture, provided a 30" x 48" clear space is provided beyond the arc of the door swing. If a stall is provided, a minimum of 60" wide and 56" deep stall is required for a wall hung water closet and if the door swings into the stall, the required depth shall be increased 36" minimum.

The lavatory accessible fixtures shall be mounted 34" above the floor with 29" clearance minimum from the floor to the bottom of the apron. The fixture shall have the proper knee and toe clearance. The faucet shall be a single handle lever configuration.

Grab bars for accessible toilet stalls shall be located on the wall closet to the water closet and the rear wall with minimum dimensions of 42" and 24", respectively.

Mirror over lavatories shall be a minimum of 38" above the floor to the bottom edge of the mirror

The five components listed above are not a complete list of accessibility, but the minimum requirements for accomplishing accessibility. Additional accessibility requirements are storage, such as closets and lockers, detectable warning signs, directional signs, and kitchens. In addition, state and local jurisdictions, as well as, the educational review board can amend certain requirements of the model codes and accessibility standards as well.

Note: Dimensions and facts derived for the accessible components were taken from the CABO/ANSI A117.1 standards.

Robert Gorleski is field service representative for PFS Corporation in Bloomsburg, Pa.

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"Hall-Dale Elementary"
BY STEVEN WILLIAMS

After an unscheduled closing in June, and a now urgent need for classroom space, school officials in Hallowell, ME discover a modular solution—designed, built, and delivered in only 78 days.

It's not everyday you find AIA architects touring the plants of modular manufacturers. But, then again, president and CEO Nick Ververis would say he runs his plant a little differently.

American Modular Corporation took advantage of some AIA leads MBI posted on its website, sending 75 architects invitations to visit their Connecticut plant. To date, ten design firms have taken Ververis up on the offer, touring American Modular, seeing first-hand factory-built construction, and taking away with them a better understanding of the whole modular process. "They saw the speed and efficiency of our plant," Ververis said. "They saw into our walls, the frames of our floors, and how proud we are of the buildings we produce. We stand behind our products and, quite frankly, our industry, and we wanted the architects to know it." "Creating a better and more diverse awareness of our industry is extremely important for all of us, we look to do whatever we can in that regard" Ververis adds.

Ververis and his partners started American Modular in 1998 when they realized the need for affordable housing was so great. Ververis was in the insurance business when he was approached by one of his customers about the idea of building modular retirement communities. They investigated the idea, purchased a former Arthur Industries factory, hired many of the former managers and employees, and began producing homes, apartments, classrooms, and offices. "We're fulfilling a dream of ours, providing the highest quality of affordable space, both residential and commercial," Ververis said. "And with the Arthur plant being available, well, everything just sort of fell into place."

That was also the case with a recent project of theirs, when American Modular teamed up with Schiavi Leasing, a wholly-owned subsidiary of Vanguard Modular Building Systems. Schiavi, a commercial modular dealer in Oxford, Maine, approached American Modular about building classrooms to solve an unexpected public school space need in central Maine. The project turned out to be an entire elementary school building for 200 students, some 16,000 sq. ft. It's a pretty incredible story—a real testament to how the modular industry can quickly meet space needs with a product that rivals or surpasses traditionally built structures.

On April 14th, Lenora Murray, superintendent of Maine's School Administrative District No. 16, called Schiavi to initiate discussions about leasing portable classrooms for Hall-Dale Elementary School in Farmingdale. This small school district just south of the state capitol covers two towns, Hallowell and Farmingdale, with an elementary school in each.

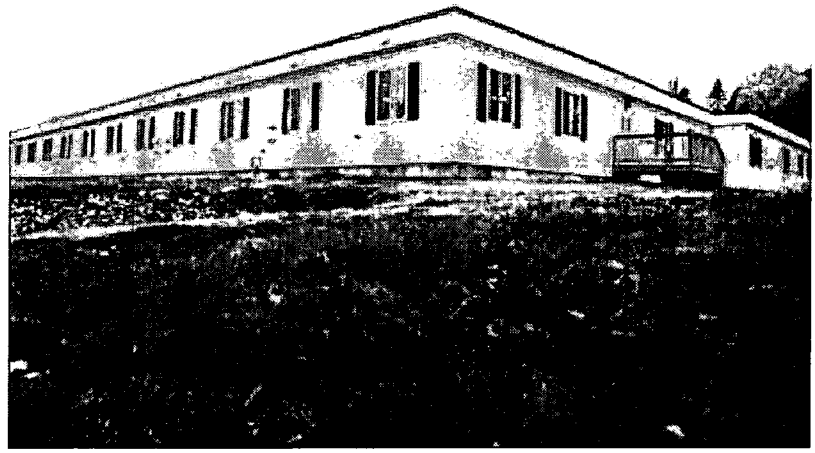
Hall-Dale Elementary was overcrowded and needed about $ 750,000 in repairs to its 50-year-old building. There were HVAC and other mechanical failures, cracked and rotting wood trusses and beams, and mold and asbestos that needed to be removed. Initial discussions pointed toward a solution involving use of some sections of the old school combined with a substantial modular addition. But in late May, results of indoor air quality tests weren't good, and Superintendent Murray and the board decided to close the school immediately and finish the year by distributing the students throughout other schools in the district. With no location for the students in the Fall, Murray now had a crisis on her hands and embarked on four weeks of intense planning with Schiavi and state officials.

On June 20th, Schiavi president Steve Weems submitted a final proposal for an entire new modular school. The District's Board of Directors awarded the contract to Schiavi the very next day. "It was fortuitous American Modular already had seven stock units built for us designed as classroom units," Weens said. "These could be modified to comprise one wing of a new school. They then built another 12 floors in 30 days, consisting of a 10,890 sq. ft. main wing, to complete the project." Floors and units are individual factory-built modules assembled at a final location to make a complete building.

American Modular began construction of the new units on July 31st. "In addition to our already full production schedule through the summer, we accommodated Schiavi by working around the clock, overtime every day and through every weekend in August," Ververis said. On average, the company was putting out about 125 sq. ft. of completed space each hour. "But that's the beauty of working in a controlled environment," said Ververis. "If construction had been onsite, instead of in a factory, there would've been numerous delays." In many cases, conventional stick-built construction stops when there is inclement weather or when there is no longer natural light by which to work.

"In addition," said Weems, "Hall-Dale was completing site-work while American Modular was building the classrooms, saving even more time." Hall-Dale has a facilities manager, Jim Goulet, with a background in construction. So Goulet supervised site preparation, grading, and construction of the foundation. Dealers of modular buildings also take on these responsibilities as requested by customers.

Working in close coordination with American Modular, a trucking company, and the school district, Schiavi's crew started setting the floors by crane on August 30th and finished the initial set work on September 7th. An intense month of on-site building finish work and utility connections ensued. The entire modular building (19 floors) was carpeted and the siding was installed on site. All the floor, wall and roof seams were finished. Electrical, plumbing, fire alarm, intercom, and computer connections were made, and a complete sprinkler system was installed throughout the building. An enclosed connector was built to an adjacent school. At the end of all this Hall-Dale teachers had access to their classrooms on October 4th and students were greeted with new classrooms on October 10th.



Hall-Dale Elementary isn't located in Farmingdale anymore. It's now adjacent to the Hallowell Primary School, six miles away. While the schools share a cafeteria and gymnasium, Hall-Dale Elementary has its own offices for the assistant principal, guidance counselors, and secretaries as well as its own faculty lounge and restroom, multiple boys and girls restrooms, and 17 classrooms.

Engineers at Schiavi and American Modular worked with Superintendent Murray and her staff to design the building. Each module of the wood-framed building is built on a steel I-beam perimeter frame undercarriage with steel I-beam cross-members throughout. It has a 60-lb. live-load roof that is R-38 insulated and EPDM covered. The walls and floors are insulated at R-21, the windows are 4'x5', its ceiling height is 8', and it is sprinkled throughout. Though the classrooms can be disassembled and relocated, they sit on a permanent full frost wall foundation. And on the outside, the new school fits in harmoniously in design, scale and layout with the old.

The new Hall-Dale Elementary is L-shaped and is connected to the existing Hall-Dale Primary School by an enclosed, heated connector. One wing is made up of seven 12'x60' modules, the stock units American Modular had built. The second wing is twelve 13'9"x66' modules and the site-built connector is 10'x24'. It took 111 days total elapsed time from the date of contract award to student use to complete the school. Hall-Dale Elementary now totals 16,170 sq. ft.

American Modular continues to manufacture classrooms for Schiavi; its parent, Vanguard Modular Building Systems; and for many other dealers throughout the region. "We enjoyed working with American Modular," Weems said. "This was my first experience working directly with Nick and his team. They are top-of-the-line professionals and rose to the challenge on this critical project. Working together, we were able to provide a high quality building to solve this crisis, on time and on budget."

Ververis and his partners plan to open a second factory sometime next year, primarily dedicated to residential manufacturing. "Each year, we've experienced 60 to 70 percent growth in sales of mostly commercial buildings," said Ververis. "Although our dealers and the commercial industry will remain our primary focus here at American Modular, we have not lost sight of the driving force behind the genesis of American Modular," he said, emphasizing the word "affordable." The new division will operate under the name Clearvision Housing and will be the affordable housing arm of American Modular Corporation. Until the new production facility is up and running, American Modular will be manufacturing the homes in its Terryville, Connecticut facility.

Last year, Ververis met Fred Ohrn, owner of Fred Ohrn and Associates, a builder of high-end modular homes. Ohrn had also seen a need for affordable housing and, as a result, founded the New Canaan, Connecticut-based Affordable Housing Institute. The two men discussed their similar interests, and agreed on a collaboration. The parties have agreed on five prototype home sizes and styles, and will begin marketing their new product line throughout Connecticut and Massachusetts by the end of the year. The homes range in size from about 1,000 sq. ft. to just under 3,000 sq. ft.

American Modular's current factory employs about 65 people. The company runs three production lines in the 68,000 sq. ft. plant during one shift. Last year, they produced some 225 floors and expect sales to close to triple by the end of 2001.

Steven Williams is the Editor of Commercial Modular Construction and works out of the Modular Building Institute headquarters located in Charlottesville, Va.

You can visit the companies mentioned above online at:
American Modular corporation: http://www.american-modular.com
Vanguard Modular Building Systems: http://www.vanguardmodular.com

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MBI Net > magazine > layfound

"Laying a Foundation for Your Modular Building"
BY JERRY BROSIUS

Proper design and installation of the foundation are critical to the optimal performance of any building. Modular classrooms are no exception.

Footings

Most temporary classrooms are placed on piers constructed from masonry block. The location of the piers is critical. The manufacturer typically provides a suggested blocking points plan that will locate the piers and identify the building loads that each location must support.

On multi-section classrooms, the blocking point locations along the mating lines are extremely critical. An example would be a 60-foot long building comprised of two modules and containing two 30-foot classrooms. To achieve the 30- foot clear spans in each classroom, columns would be placed in the end-walls and the wall separating the classrooms. The loads at the columns are much higher and will require larger footings and piers.

Footings are typically constructed with concrete. The base of the footing must be on undisturbed soil and extend to the frost line or bedrock. The minimum depth for any footing is 12 inches. The final foundation design should be prepared by a registered engineer based on the information supplied with the building and with the local conditions.

Anchorage

Most temporary classrooms use a system with steel straps secured to the frame that transports the structure. These straps are connected to an auger that is embedded into the soil. The manufacturer's blocking point plan will provide suggested tie-down locations, which are based on the capacity of the ground anchors and wind speed design of the building. Proper design and installation of the anchoring system provide safety and durability through the effective transfer of wind loads to the ground. A design based on local conditions would be included with the footing design prepared by the engineer.

Site Work

The manufacturer will provide instructions for completion of the building on-site. On a typical two-section classroom, this would include securing the sections together at the floor and roof line. Other considerations would be the final electrical and plumbing connections.

On a temporary installation, the crawl space must be ventilated in accordance with the local building code. Proper ventilation will prevent the build-up of moisture that could affect the durability of the building as well as the indoor air quality. The area under the building should be elevated enough to prevent the accumulation of standing water in the crawl space area. All site work, including the footing and anchorage installation, is under the jurisdiction of the local building department, who will issue the appropriate permits and perform the installation inspections.

Permanent Installation

The preceding comments focused on temporary installations. When classrooms are intended for a permanent application, the foundation and anchorage system must be prepared by a design professional. These designs generally use a foundation wall around the perimeter of the building and could include a basement. Anchorage would be provided through attachment to the wall. Column supports at the mating lines would still be required per the manufacturer's recommendations. All other code considerations would be addressed by the design.

Jerry Brosius serves NTA, Inc. in Camp Hill, Pa.

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"Modular 101"
BY MICHAEL I. ROMAN

An introduction to the commercial factory-built industry.

Pick up the Yellow Pages anywhere in the country and turn to "Modular Building." Chances are very good you will find no listing at all.

Turn back a page and you might find a few entries under "Mobile Offices & Commercial Units." Look up "Portable Buildings" and you probably will be referred to "Buildings - Portable." Companies listed there provide storage barns, gazebos, carports and utility sheds. Look up "Classrooms," "Commercial Buildings" and "Relocatable Classrooms" and you'll not find any listing. The bulk of the modular building industry participants are listed under "Trailer Renting & Leasing" along with U-Haul and Thermo King, alongside road trailers, storage trailers, and shipping containers.

More than 60 years ago, large highway and real estate construction firms placed a commercial version of a mobile home at project sites as a field office. Alternatively referred to as a mobile office, field office or construction trailer, these buildings are manufactured in a factory with axles and tires attached for ease of relocation. With roots in the mobile home industry and as small buildings with their own axles and tires, it is no wonder most people refer to our products as trailers.

During those same 60 years, factory-built buildings for commercial applications have benefited from both better construction materials and better construction techniques. Not long after the adaptation of mobile homes to commercial applications, building materials were upgraded to enhance useful life. Unlike mobile homes, which are generally built to be moved once and permanently sited, mobile offices are constructed with relocation in mind. Not only must mobile offices be dry, clean working environments, they must be capable of repeated travel at 70 miles per hour.

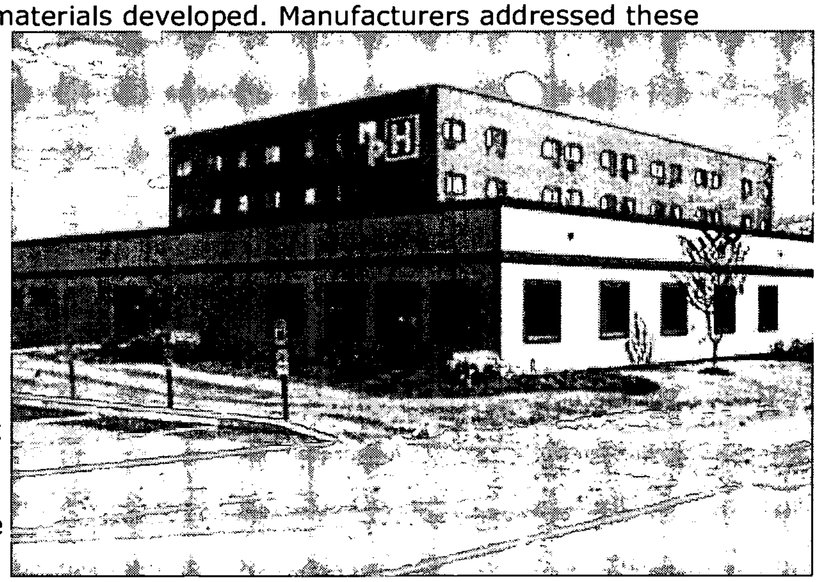
Thirty-five years ago, someone decided a single mobile office did not provide adequate working space under a common roof. Two buildings were constructed, each missing a sidewall, so they could be joined into doublewide. Together, the two units provided far more space, and foreshadowed the inclusion of a greater number of units under a common roof.

The advent of multi-unit buildings introduced the problem of interior supports. It is awkward and often times unacceptable to have interior space visually cluttered with mid-floor support posts running up to the roof. In order to eliminate the internal support posts, the weight of the roof had to be transferred to the perimeter. The solution was the truss. The truss looks like a series of connected "W's" running just below the roof, which operate to diffuse weight to the load-bearing exterior walls. While there are limits, the use of trusses permits the creation of large, unobstructed interiors.

Just as the industry was experimenting with multi-unit buildings and weight transferring trusses, the demand for temporary space was fueled by the defense industry.

TRW, Martin Marietta, Lockheed and a host of other defense contractors discovered these buildings provided an optimum solution for project-specific space requirements. Not only could the buildings be easily installed and de-installed in a timely manner, the users could specify interior layouts and could lease them only for the period of their contract. Better yet, the lease payments could be passed through the federal government on a cost plus basis. Heightened demand from the defense sector increased industry capacity and provided the impetus in development of the multi-unit factory built office building. Use of these multi-unit buildings quickly spread to state and local governments and commercial users outside the defense sector.

As more and more users experienced factory-built construction, requests for higher-quality construction materials developed. Manufacturers addressed these requests through rigorous research and development programs. Today, multi-story, multi-unit buildings can be constructed in a factory from steel and concrete. The units, shipped to the site either on a flatbed trailer or on their own axles and tires, are craned into place and joined on site. Once completed, these high-end, factory-built building are indistinguishable from site-built construction. There generally are no visual or structural differences whatsoever. Unless you witnessed the construction project, you would never know the building was manufactured in a factory. Thus, at the high end, the method of construction is not readily evident.



At the same time, multi-unit buildings have been gaining wider customer acceptance. Demand for the single and doublewide buildings has grown rapidly in numerous markets. In addition to construction site field offices, single units are used in a wide variety of applications such as office/storage units, sales offices, classrooms, banks, telecommunication shelters, decontamination units, showers and restrooms. Doublewides are used predominately as supplemental office space and classrooms. The hallmarks of single-unit and double-unit buildings are speed of installation, ease of relocation, a long useful life and economically attractive purchase and lease/rental options.

The singles and doublewides are easily identifiable and disproportionately shape the image of our industry. While singles and doubles are easily identified as trailers, higher-end, custom multi-unit buildings are indistinguishable from site-built buildings.

The term "modular buildings" stems from the lack of precise industry terminology and the fact multi-unit buildings are comprised of numerous modules. While the difference between a mobile office (the "trailer") and a modular building has not been delineated by rule, most practitioners refer to any factory-built structure with three or more individual modules as a modular building. Thus, this multibillion dollar industry manufactures, sells and leases single mobile offices, doublewides and modular buildings.

MODULAR BUILDING INSTITUTE

"So, You Want to Buy a Portable Classroom"
BY RANDY HOLLER

So, You Want to Buy a Portable Classroom!

If you do, then you have just joined literally thousands of others nationwide. Whether you call them portable, relocatable, modular, or even trailers, the industry is filling an important need and has grown tremendously in recent years. The modular solution can be a very practical and successful one.

Some schools need space fast. Certain areas are experiencing population shifts in a mobile society and portability is attractive. Still other districts have budget crunches and growth problems that can only be taken care of by leasing portable classrooms.

A 1990 industry survey conducted by the Mobile Modular Office Association (now the Modular Building Institute) indicated that the value of the industry's entire lease fleet was $ 1.5 billion. Compare that with gross revenue ten years later of over $ 4 billion. Industry estimates have recently pegged classrooms as about 30 percent of total revenue, or in excess of $ 1.2 billion in 1999 alone.

Our company (Manufactured Structures Corporation) manufactures roughly 10 percent of modular structures made in the North-Central region (Indiana, Ohio, Michigan, Illinois, Wisconsin, Kentucky) and is also only one percent of national production. Some 165 firms are currently manufacturing modular buildings. That indicates that the industry is competitive and portable classrooms are no exception.

Yet we have also seen tremendous growth. In the five years beginning in 1995 our total revenues from production grew almost 250 per cent. At the same time economies of scale enabled classroom prices to decline about 12 percent.

Based upon our output, modular classroom production in the North-Central region last year was around $ 45 million. Indications are that this trend will continue.

There are a couple of simple steps you can take to make sure your modular building buying experience is good. First, make sure the structure is built to meet specified building, mechanical, plumbing and electrical codes. Second, check references on your dealer, their manufacturer, and the site contractor (set-up crew). Third, insist on a complete scope-of-work so that you know what work is not included. Finally, visit a portable provided by your dealer prior to signing on the dotted line.

Randy Holler is president and CEO of Manufactured Structures Corporation in Middlebury, In.

"Studyin' Trailers"
BY MICHAEL I. ROMAN

The negative perceptions of trailers as classrooms stem from a variety of issues.

The trailers are often placed in remote areas taking up valuable parking or athletic fields and require an uncovered walk through inclement weather just to use the cafeteria, gym, library or restrooms. The trailers are an eyesore with exteriors reminiscent of mobile home parks. Trailers are the visual reminder of less than optimal planning and are perceived to offer a substandard, unsafe, inferior learning environment.

Many of the criticisms about portable classrooms are justified. Yet despite very vocal opposition, the use of portable classrooms by public school systems continues to grow at more than twenty percent (20%) every year. This growth is fueled by ever increasing enrollments, intra-district shifts, the push for earlier education for children and continuing adult education, the drive for lower student-teacher ratios, an aged facilities infrastructure and seemingly ever tightening access to adequate funding. Moreover, the demand for portable classrooms is increasing as private schools and the new wave of charter schools seek quick, lower cost construction.

The criticisms leveled at portable classrooms are a by-product of the procurement process. The current procurement process generally looks no further than one year and attempts to get as much space as possible for the least amount of money. Unless and until portable classrooms are incorporated as part of a long-term facilities strategy, the criticisms will be fully justified. It is often not economically feasible to eliminate portable classrooms. It may be far easier to alter the procurement process.

With few exceptions, a public school system solicits bids from qualified vendors to provide portable classrooms. A school system can acquire the use of portable classrooms in one of three ways: a) by purchasing the classrooms with funds from a capital budget; b) by purchasing the classrooms over time with a finance lease with funds from a capital budget; or c) by leasing the classrooms generally on a year-to-year basis with funds from an operating budget.

The decision to purchase (either outright or over time with a finance lease) or lease a classroom is both political and economic. The availability of capital monies often depends on voter approval and voter approval depends on numerous factors including current economic conditions, the economic outlook and average population age. Allocation of available capital monies depends on a variety of issues at the local level including the age and overcrowding of existing facilities and has been profoundly impacted by the increasing requirements of technology.

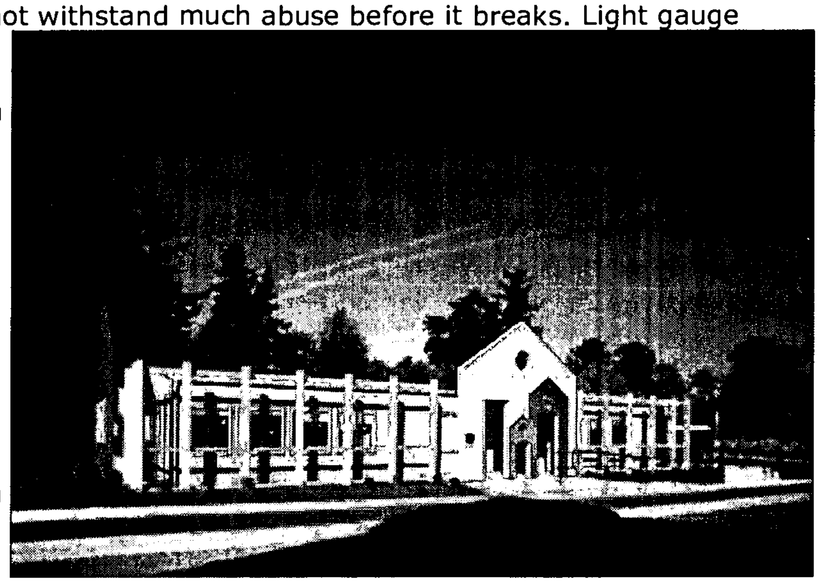
Not only does it seem every school needs more computers, but each must be re-wired to accommodate the intranet age. Re-wiring existing facilities can be an extremely costly proposition in light of building code changes over the years. Generally, the older the facility the more costly the re-wiring. This raises the issue of facilities replacement and places overall facilities planning directly in the limelight.

The requirement to systematically replace aged schools and to address the pressing need for enhanced technology capabilities can stretch the capital budget to the breaking point. While overcrowding is an important issue, priorities can relegate the perceived need for temporary space to the operating side of the budget.

Operating monies are expenditures for short-term benefits, that is, you can lease a portable classroom, but the monthly payment does not build any equity. Thus, the object of the solicitation process for portable classrooms is to get as much as you can, this year, for every dollar spent.

If your goal is to provide space for as many students as possible for the least amount of money, then the specifications which accompany the solicitation package request the bare minimum. Your request demands the cheapest doors, the cheapest interior and exterior wall finishes, the cheapest light fixtures, windows, heating and air conditioning units, the cheapest floor coverings and the cheapest roof and wood supports. While all components meet appropriate federal and state building codes, the useful life of the individual components is limited.

The life of the most austere portable classroom built to code is a direct function of the maintenance policy and the number of times the classroom is relocated. A hollow metal door on a simple frame cannot withstand much abuse before it breaks. Light gauge aluminum on the exterior of a classroom can only withstand the elements for a few years before painting or replacement is required. Air conditioning units with disregarded filters will foul the air. Aggressive floor mopping with excess water left to find its own way out of the class room will rot floors and walls over time. Minor roof leaks that are either ignored or undetected can ruin walls and floors in a few short years. While a good maintenance policy should be in effect for all types of facilities, substandard maintenance will be far more visible, far earlier, in facilities of cheaper components.



Everyone wants a quality learning environment for our children. This simple goal will never be attained if the need for short-term space is always filled with the cheapest portable classrooms money can buy. The problem is not that minimum specification trailers deteriorate rapidly with poor maintenance; the problem is that a perceived short-term requirement turns out to be long term.

The State of Florida found the average age of a temporary portable classroom was nineteen years. The same is undoubtedly true in many other jurisdictions. In fact, Florida found many portable classrooms built to bare minimum standards in use for more than forty years. Even if the classroom had never been relocated, think of the repairs required over the years to maintain a substandard learning environment.

This fiscal blunder is even worse if the classroom is leased rather than owned. Over forty years a school system would have made aggregate rent payments to the lessor of six to eight times the original cost of the classroom and would have spent funds for maintenance of between two to four times the original cost of the classroom, all because capital funds were not allocated at the outset. Capital funds were not made available because the need for additional space was deemed temporary and thus of a lower priority.

Portable classrooms can be built today with long-lived components that are aesthetically pleasing. The new specification for Florida portable classrooms has eliminated wood and replaced this basic material with concrete and steel. The non-combustible classroom has upgraded interior finishes, solid steel doors and frames with solid locksets, a rubber roof to eliminate leaks, an upgraded heating and air conditioning system to improve air circulation and air quality and a vastly superior exterior which is both visually appealing and has a fifty year life.

Portable classrooms can be built with exactly the same materials used in a site-constructed school. The question is whether the additional cost is justified given the perceived temporary space requirement. An upgraded non-combustible portable classroom costs from 150% to 175% of the cost of the cheapest alternative and will have a useful life of at least three times the basic unit. In addition, maintenance costs are far lower and operating costs (such as electric consumption) are lower. If relocatable space is required to handle increasing enrollments, shifting intra-district students, the requirement to lower student-teacher ratios and to offer more pre-K and adult education classes, and the need exceeds five years, it is fiscally irresponsible to propose specifications for the cheapest factory built classroom available.

Portable classrooms allow planners to factor in intra-district relocations, thus extending the useful life of a particular classroom beyond the initial site. Portable classrooms should be an integral part of every master plan for a new permanent school. Utilities should be run to the anticipated locations so that the eventual installation is as economical as possible. Many portables today are installed without restrooms because the cost of bringing water and sewer lines out to the buildings is prohibitive. The cost of running these utilities during construction of the permanent school is far less. In addition, portables should be master planned to incorporate a covered walkway system so the children are not exposed to the elements when they go to the gym or the library.

Finally, portable classrooms should be constructed of the most durable products available consistent with the anticipated use period. The new non-combustible classrooms offer a bona fide alternative to conventional construction in terms of aesthetics and quality of the learning environment. The non-combustible classrooms offer speed of delivery, ease of relocation, and the ability to lease a classroom for a period of intended use with no penalty on discontinuing the use. Even owned portable classrooms can be sold when they are no longer needed.

The seemingly endless complaints about inferior classroom trailers will continue as long as the portables are an afterthought brought in to offer a short-term solution. Unless portable classrooms are viewed as part of the permanent facilities plan, public school districts will continue to overpay for substandard classrooms.

Part II of Studyin' Trailers will focus on individual building component costs and the alternatives available. In addition, we will look at installation, operating and maintenance expenditures over the product life cycle for a low end and a higher end portable classroom.

Michael Roman is executive vice president of Resun Leasing, Inc. located in Dulles, Va.

MODULAR BUILDING INSTITUTE

"Studyin' Trailers part 2"
by Michael I. Roman

My wife gets a permanent and it lasts four days, yet the local elementary school gets temporary classroom trailers and they seem to stay forever.

A few years back the State of Florida surveyed all sixty-seven public school districts in Florida and found the average age of a temporary classroom then in use was nearly nineteen years. Not surprisingly, the State of Florida also found that both maintenance costs and operating costs rose over time. The increase in costs was not due to a rise in the price of electricity, but was the direct result of asking a wood base trailer built with a discrete useful life to do the job of a concrete and steel structure.

Recognizing the important role played by temporary trailers, the Florida legislature acted on the public school study and mandated a change in factory built classroom specifications. The Florida legislative action is a precursor to better product specifications for temporary classrooms which will be adopted state by state over the next decade. Individual states would fare far better if they followed Florida's lead earlier than later.

The peculiar product attributes of relocatability and speed of installation/deinstallation have finally been recognized as an essential planning element for forward thinking school districts. Shifting demographics, temporary needs, smaller class sizes and an ever-expanding breadth of educational alternatives all justify the use of relocatable classrooms. Even more compelling, the wave of elementary age students will eventually diminish and schools are loath to repeat the overbuilding dilemma of the sixties.

If the merits of relocatable classrooms are recognized, the best longer-term economic alternative is to procure classrooms with more substantial specifications. Relocatable classrooms are no longer required to have the look and feel of a mobile home or a construction site trailer. While it is true many relocatable classrooms have been built and continue in use with an aluminum roof, a thin trailer aluminum exterior, small windows, a residential grade door, doorframe and lockset, wood underlayment, studs and walls, and minimum lighting and ventilation, this wood based classroom is no longer the only choice.

Non-combustible classrooms are now mandated in Florida. These doublewide classrooms consist of two 12' x 40' modules built to join lengthwise to form one 24' x 40' rectangle. Built on a rigid steel frame, the classroom complies with large missile impact requirements indicating an ability to successfully withstand the hurricane force winds found in many parts of Florida. The floor is poured lightweight concrete with fiberglass reinforcement offering the feel of site built construction. Gone are the bouncing and hollow sounds often associated with the trailer classroom.

Steel studs extend from the floor to the roof and support a substantial roof structure finished with a long wear, low maintenance black rubber covering material. Similar to bicycle tire inner tubes I repaired as a kid, the rubber roof can be seamed and patched to minimize leaks. The rubber roof has a long useful life and is vastly superior in terms of both energy conservation and appearance to the aluminum found on the standard trailer classroom.

Interior walls are vinyl covered gypsum board attached to drywall. Four large windows with energy efficient glass offer substantial natural light. The exterior walls of light gauge aluminum sheets found on many classroom trailers have been replaced with a Hardi-panel fiber cement siding. This concrete material boasts a fifty-year warranty and offers a variety of finishes including a stucco appearance. Thus, instead of the look of a mobile home, the new non-combustible classroom is essentially a permanent, relocatable structure indistinguishable from its site built counterpart.

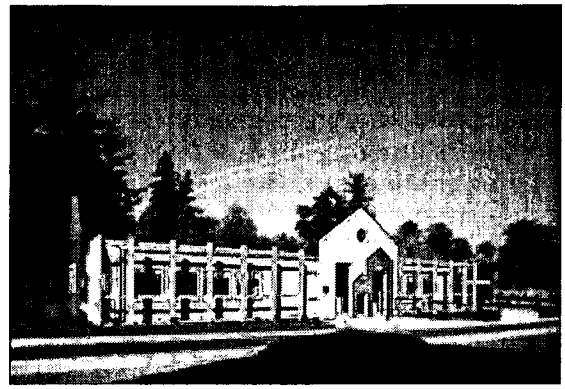
The interior floor covering of the new generation relocatable classroom sports a thick high density, high traffic carpet. Gone are the sprayed ceilings with cheap lights. The new classrooms offer T-grid 2' x 4' tiles with recessed lighting. Interior light levels have been improved with better fixtures and larger windows in response to the request for more light. The cheaper aluminum doors have been replaced with heavy metal, a steel doorframe and a commercial grade lockset. From a maintenance standpoint, the two problem areas with the older trailer classrooms have been roof leaks and faulty doors. Both have been substantially upgraded in the new non-combustible classroom.

The new classroom includes a heat pump and a superior ventilation and cooling system. Gone are the large HVAC units hanging off the back of the classroom. Air circulation has been increased and an air monitoring system has been introduced to monitor and control the learning environment.

Finally, the older trailer classrooms were pulled to the site by a truck, set on concrete blocks and aluminum skirting was added to hide the tires and axles and offer a finished appearance. Often several feet in the air, steps, decks and ramps were added at a substantial cost relative to the price of the classroom. The new non-combustible sits on the ground and eliminates the need for the costly steps, decks and ramps. This not only minimizes installation costs, but also eliminates a potential mold problem. The dank crawl space no longer exists.

The new look relocatable classrooms offer vastly superior aesthetics, significantly upgraded building components and an improved learning environment. The buildings by themselves are indistinguishable from site built schools. The remaining difference is the new relocatable classrooms do not share the same roof with the main school. Students must exit the relocatable and walk outside to reach the cafeteria, gym or restroom. This potential exposure has been addressed with a roof overhang at the front of the classroom. If two classrooms are aligned face-to-face, a ten foot covered walkway is formed. The rubber roof of each is joined to the other to form a continuous cover. A number of face-to-face classrooms set alongside each other offer a covered walk to the main school building.

The new non-combustible classroom costs more than the predecessor trailer. While everyone certainly favors a better learning environment, the real question is at what



cost. This is where it can get tricky. Cost must include not only the classroom, delivery and installation, but also maintenance and operating costs over an anticipated period of use. The new classrooms are no more costly to operate and maintain than the core school–and in fact, may be far more efficient given the age of the core structure. The new generation non-combustible classrooms are far cheaper to operate due to numerous energy efficiencies. The new classrooms also require far less maintenance. The analysis boils down to the anticipated period of need.

At nearly twice the cost of the older wood based traditional trailer classroom, the new non-combustible does not make economic sense for a school system if the need is truly temporary (12 to 18 months while construction or renovation of an existing facility is underway). If the requirement is permanent, there is no question the pricier non-combustible is the way to go. It is the mid-year requirement that needs to be analyzed... and analyzed with relocatability and the cost of relocation(s) factored into the equation.

The third part of the series Studyin' Trailers will focus on actual costs including operating and maintenance savings over various periods. In addition, breakeven analyses will be offered under a variety of scenarios.

Michael Roman is Chief Executive Officer of Resun Leasing, Inc. a nationwide dealer of classrooms and other factory-built stuctures. He also serves as a board member of the Modular Building Institute.

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"Studyin' Trailers part 3"
by Michael I. Roman

For decades, wood-based classroom trailers have been used as a low cost method to provide temporary space. More often than not, the temporary requirement lasted for longer than anyone ever imagined

In late 1993, the Florida Center for Community Design and Research, a research arm of the University of South Florida Master of Architecture Program, released a report on The Use of Relocatable Classrooms in the Public School Districts of Florida. Prepared at the behest of the Florida Department of Education, the report provides an in-depth analysis of the use, perceptions and future of relocatable classrooms. The findings and recommendations of the report had a profound influence on the role of relocatable classrooms in Florida. Last year the Florida legislature passed a law partially derived from the report recommendations.

The new Florida legislation recognizes the favorable attributes of relocatable classrooms and is rooted in the belief that the portables are a viable space solution. Essentially, the Florida legislation mandates the use of non-combustible relocatable classrooms. The new generation of relocatable classrooms in Florida are constructed of concrete and steel and sit on the ground just as any building. Gone is the trailer appearance highlighted by a thin aluminum box mounted on visible tires and axels.

The new classroom has a long life rubber roof, suspended T-grid ceiling with recessed lighting, interior walls of vinyl covered gypsum over drywall, large energy efficient windows, steel doors, steel doorframes and a heat pump with superior ventilation and cooling systems. The new relocatable classrooms have concrete panel exterior walls that come in a wide variety of finishes and boast a fifty-year warranty. The relocatable classrooms are built of the same materials as any site built building, meet all the same federal, state and local building codes and are indistinguishable from a site built counterpart.

For several decades, wood based classroom trailers have been used as a low cost method to provide temporary space. More often than not, the temporary requirement lasted for longer than anyone imagined. The light grade trailers were often pressed into extended service and either fell into a state of disrepair or commanded an ever-increasing share of the maintenance and operating budgets. Abuse occasioned by excessive wear and tear was manifest in damaged exteriors, well-worn interior components and poor air circulation.

The 1993 Florida study focused, in part, on the cost of relocatable classrooms as compared to permanent construction. Costs were subdivided into four distinct categories: the initial capital outlay; operating costs; maintenance costs and replacement costs. Remember that survey data for the Florida study was gathered eight years ago in 1993. Permanent school additions in 1993 in Florida cost on average about per square foot. The purchase price per square foot for relocatables, delivered and installed on site, was found to average between and per square foot. The wide variation for relocatables must be due in part to different freight and installation costs as well as different quality in the buildings. The mid point of the 1993 relocatable price range is just over 61% of the cost of permanent school construction in 1993.

Operating costs (direct energy consumption) for a permanent common classroom in 1993 averaged per square foot per year while relocatables ranged from to .20 for low-end relocatables to to .10 for high-end relocatables.

Maintenance costs including normal preventative and replacement maintenance were approximately .30 per square foot per year for permanent construction. High-end relocatables averaged .50 per square foot in 1993 and low-end relocatables averaged .75 per square foot.

Normal refurbishment and replacement costs for items such as HVAC units, roofing, exterior finishes and carpets were approximately 36% higher for relocatables than for permanent structures with total costs over a 30 year period estimated at ,275 for a relocatable classroom and ,167 for a permanent structure.

Life cycle cost analyses were performed on the comparative costs over a 30-year period for permanent and relocatable classrooms. Each analysis looked at estimated life expectancy, required operating and maintenance costs as well as periodic refurbishment outlays. It was assumed the relocatable stayed in place for the entire period of the analysis. Relocatables are essentially permanent structures until such time as they need to be relocated. According to the Florida study, relocatable classrooms were found to be a good investment over the 30 year anticipated life cycle if they were purchased at or below a calculated break-even price. A low end relocatable in 1993 was found to have a break-even price of per square foot while a high end relocatable was found to have a breakeven price of per square foot. This means that in 1993, if you had a 30 year requirement for a classroom, all other things being equal, from a financial standpoint, relocatables performed the same as permanent construction if they could be purchased for or less per square foot for a low end relocatable or or less per square foot for a high end relocatable.

The same analysis needs to be performed for the new generation relocatable classroom. Today permanent construction averages approximately 0 - 0 per square foot. The non-combustible relocatable classroom costs about - per square foot plus delivery and installation. If delivery and installation are included, relocatables cost on average 60% of the cost of permanent construction. This is about the same ratio found in 1993 for the wood based relocatable, yet the new relocatable is concrete and steel.

Higher quality building components in today's relocatable means the differential in operating, maintenance and refurbishment costs found in 1993 between permanent and relocatable have been narrowed considerably. If wood based relocatables were a good investment in 1993, concrete and steel relocatables are a great investment in 2001 when compared to permanent construction.

The Florida study concluded "due to the continuation of high rates of growth in public school enrollment levels... and expected weakness in these district's fiscal position, the use of relocatable classrooms will certainly continue to expand during upcoming years. The information in this report has shown that these structures can be just as educationally effective and cost efficient in the long run as permanent classroom additions... This study has found that the primary advantages of the relocatable classroom are its ability to provide flexible, suitable short-term accommodation for Florida's growing student population and its ability to provide that accommodation incrementally, in a timely and cost efficient fashion... The growing reliance on portable classrooms as a means to meet enrollment expansion needs is in effect shifting some portion of the financial burden for the housing of new students from the capital outlay to the operating end of the budget. This may or may not be a desirable consequence depending upon the relative ease with which the burden can be accommodated."

Florida is a leader in the use of relocatable classrooms in the US. Just as they have assured their position by mandating a new generation of relocatable classroom, it is a certainty the lessons of Florida will spread north. The new relocatables offer compelling product attributes with economics superior to permanent construction alternatives.

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MBI Net > magazine > tempclass

"Temporary Classrooms"
BY JUDY SMITH

The use of factory built buildings has become an important success factor and strategic resource in educational facilities planning, since modular methods can cut traditional construction time by as much as 50%.

It's all very simple: temporary modular buildings offer school districts flexible, cost-effective solutions to changing demographics and increasing enrollments. And with such a large selection of designs available, from single classrooms to entire campuses, there are modular buildings guaranteed to meet your district's financial requirements.

Primarily, four stages make up factory-built construction. First, design approval by school officials and any regulating authorities; second, assembly of module components in a controlled environment (the factory); third, transportation of modules to a final destination; and fourth, erection of modular units to form a finished school building.

Often, third-party agencies are involved in quality-control programs and offer random inspections, testing, and certification services.

Unique to modular construction, while modules are being assembled in a factory, site work is occurring at the same time. This permits earlier building occupancy and contributes to a much shorter overall construction period, reducing both financing and supervision costs. Saving even more time and money, nearly all design and engineering disciplines are part of the manufacturing process.

Quiet, attractive, secure modular classrooms are used for public and private educational applications all around the world, from daycare centers to entire universities.

The insight and knowledge industry manufacturers and dealers have gained from designing, engineering, and building thousands of school facilities means satisfied educational professionals everywhere.

This issue of *Commercial Modular Construction* focuses on temporary school buildings and the variety of benefits they offer.

Let us know how we can meet your learning space needs, whether its a temporary portable classroom, a custom-built science lab, even larger open areas like cafeterias. Chances are we have a member company in your area that can meet your requests in matter of days or weeks.

Judy Smith is executive director of the Modular Building Institute headquartered in Charlottesville, Va.

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