



PHOTO BY MARC CHRISTIAN, CAMSTAFF

# READING AND WRITING ON THE RIVER

## New UPSM High School Rises Near the Detroit Riverfront

BY MARY E. KREMPOSKY  
ASSOCIATE EDITOR

PHOTOS COURTESY OF RESENDES DESIGN GROUP,  
BY PRINCIPAL MARK KWIATKOWSKI, AIA

Watching a freighter ply the waters of the Detroit River is just another school day at the new University Prep Science and Math (UPSM) High School in Detroit. The glittering blue ribbon of the river is clearly visible through the two-story glass walls of the school's remarkable high-rise dining hall. Sitting in this light-filled cafeteria's lime-green chairs and watching a flotilla of clouds drift over the riverfront probably ranks as one of the best lunch hours available in any school. Part of the hoped for revival of the East Riverfront, the cafeteria is part of a vertical addition perched on top of a three-story brick warehouse transformed by Resendes Design Group, Detroit, The Monahan Company,



Eastpointe, and TAKTIX Solutions, LLC, Detroit, into a charter high school, courtesy of the Thompson Educational Foundation.

"The building is really about being on the water," said Francis Resendes, managing principal of Resendes Design Group. "Because of the unique site, the school's architecture responds to the river."

What drew the school to the river was not only the waterway itself, but also a \$1.5 million dollar grant from the Community Foundation of Southeastern Michigan. "The grant helped pay for an increase in the market price, because of its location near the riverfront," said John G. Cleary, vice president of finance and real



estate, Thompson Educational Foundation. Another \$3 million from the New Market tax credit program for urban renewal encouraged the development of this school located in the warehouse district east of GM's world headquarters. Ultimately, The Monahan Company delivered this 89,000-square-foot educational facility for \$11.3 million in construction costs.

#### THE MOUND BUILDERS

The building's capacity for vertical expansion also drew the Thompson Foundation to the former Franklin Furniture warehouse on Chene and Franklin streets. Aerial photography revealed a dot pattern on the roof of the stout old building. The "dots" were the work of the warehouse's original builders who bent the rebar of this reinforced concrete building and capped it with a concrete mound, essentially using an early 20th Century construction technique to mark the building's vertical expansion points.

The roof mounds became a sort of signal in concrete, drawing future generations to expand this modest warehouse. "The builder had reroofed over the top of it all, but it was still obvious from aerial photographs that the structure was originally built for vertical expansion," said Resendes.

This discovery was welcome news, because constructing a vertical addition mitigates the risk of disturbing soils in an area of historically high industrial use, said Cleary. Expanding vertically rather than horizontally also frees the property for parking. "We did not have to buy any additional land, because we were able to use what we had for parking," said Cleary.

"Building up" offers educational and economic benefits, such as vertical stacking of specialty labs and the efficient routing of mechanical systems. "We have an affinity for vertical schools in an urban setting," said Resendes. "With a vertical building, each floor can become a school within a school."

#### THE GLASS SLIPPER

This workhorse of a warehouse, with 10-inch-thick structural floor slabs and heavy No. 10 steel rebar, also had the structural integrity to move into the 21st Century. "The building was conducive to the program with its structural integrity, spans between columns, ceiling heights and square footage," said Cleary. As a former warehouse, the building interior was ideal for an open, contemporary schoolhouse designed without traditional corridors. "The building offered a neutral palette and open areas with only a few interior walls on the third floor," said Resendes.

Given the green light, the project team transformed this basic warehouse of common brick and broken windows into an outpost of new development on the East Riverfront. New brick infill now outlines the exposed concrete frame, adding a touch of schoolhouse red to this contemporary urban educational facility. "The bricks originally used in this type of building were utilitarian in nature," said Resendes. "They used a very soft and chalky common brick that was not a great brick to restore."

The main expanse of this hybrid exterior is a meeting of present and past with the shimmer of new glass offsetting the raw look and structural strength of the exposed concrete frame. The new glass "slipper" fits perfectly on this Cinderella of a building with three additions of glass and corrugated metal panels embellishing the concrete heart of the original warehouse. The expansions include the main two-level vertical addition housing the cafeteria, gymnasium and mechanical penthouse; a glass-wrapped main entrance and staircase on the west; and two stair towers scaling the east face and sheltering a small, raised-bed vegetable garden in the ground between the two towers. As a fourth addition, a modest, single-story expansion projects forward from the main entrance and houses an auditorium. Altogether, this series of additions added 29,000 square feet to the existing 60,000-square-foot building.

#### OVERCOMING THE PAST

The project was not a mere insertion of additions. The Monahan Company deserves to go to the head of the class for its intricate structural work at UPSM. For the main vertical addition, grafting a new steel frame to the concrete "bones" of this old warehouse was an exercise in advanced surveying and mathematics. Because the concrete columns of this early 20th Century building were not placed in a perfect grid, and the building as a whole was slightly out of square, the

grid of concrete columns had to be meticulously surveyed and every steel column had to be custom fit to its concrete companion of yesteryear. "One column in the concrete grid might be two inches out of sync and the next might be four inches in the other direction," said W. Daniel Monahan, vice president of The Monahan Company.

Repairing cut openings in the structural floor slab was just as demanding in a building originally constructed in the early days of reinforced concrete structures. The original builders had installed an unpredictable grid of irregularly placed rebar. "Today, we are much more scientific about how we place the steel, and its height, size and location within the concrete," said Resendes. "At that time, there was a great deal of trial and error with how much rod one should place in the slab. More times than not there was a great deal of overkill in the amount of steel rod."

Despite this intricate steel surgery, Monahan delivered the project on an aggressive 10-month schedule in time for the school to welcome its first class of ninth-grade pupils under Principal Gabriela Gui. "It was not an easy project," said Cleary. "Monahan, along with our owner's representative, Larry Marantette of TAKTIX Solutions, did a great job. There also had to be good coordination between Resendes, TAKTIX and Monahan to continually solve the problems that you run into on a rehab project. But the end result is that everybody is elated. As an owner,



**This light-filled cafeteria with riverfront views is part of the vertical addition perched on top of the original three-story brick warehouse.**

the facility is even better than I had anticipated. The parents, the students and the staff are very, very pleased with this building. They are in love with it."

#### THE FURNITURE GRAVEYARD

It was definitely not love at first sight. In its original condition, all three floors of the old Franklin warehouse were stacked to the ceiling with a jumble of office furniture. "There was every decade of office furniture you could imagine," said Resendes. In fact, film makers at work in Michigan

and went up through the second." The large openings meant The Monahan Company literally had its work cut out for them. Repair was essential, because "the two-way reinforced concrete floors are part of the structure," said Monahan. "There are no floor beams."

The project team actually x-rayed the thick concrete slabs to pinpoint the location of the unpredictably placed rebar. The equipment employed resembles a metal detector commonly used to retrieve coins and other valuables on a beach. This lesson in early 20th Century

source of pressure," said Resendes. "Without it, the column would poke through the ceiling."

The astute student of construction will even notice the bell columns become smaller with each ascending floor. Once a type of learning lab for the study of reinforced concrete structures, perhaps the building will inspire a new generation of architects, engineers and construction professionals.

#### TAKING THE HEAT

The project team repaired past cuts in the structural floor slab and took care to minimize the amount and scope of new openings. The two stair towers scale the outside of the building for this very reason. "We tried to disturb the existing frame as little as possible, so it was easier to build next to the building rather than through it," said Resendes. The new main stairway was placed in the same location as the building's original stairway and freight elevator shaft to avoid disturbing the two-way structural floor slabs. "The old staircase and freight elevator were right next to each other, so structurally a large opening was already in place," said Monahan.

The project team did have to cut a vertical tower through the center of the building all the way to the fifth floor mechanical penthouse, but the cut efficiently clustered wash rooms, the elevator and two supply and return mechanical chases in the same core area. Inserting the major mechanical shaft near the central elevator shaft required a relatively small 5 x 20-foot incision. "Rather than installing an octopus-like system horizontally, we did a vertical supply, because it is a much more efficient way of designing a building," said Resendes.

The second-floor ceiling area was the main distribution point. The pipe and conduit went from "the second floor down to the first and then was distributed around the perimeter of the building to avoid cutting openings," said Monahan. "We then went up to the third floor and distributed around the perimeter."

The type of heating units also minimized disturbance of the two-way structural floor slabs. "Most of the heating system goes around the perimeter," continued Monahan. "The perimeter of the building is heated and cooled by under window radiant units fed with hot water and cold water supply and return lines and ducted tempered air."

#### A CUSTOM FIT

Monahan next turned its attention to the intricate work of the vertical addition three stories above grade. The melding of steel columns to an irregular concrete grid took "repetitive surveys and measurements with the crew on the rooftop drilling exploratory holes with air hammers and drills," said Monahan.

Once the concrete grid was firmly established, Monahan drilled and set nearly 200 anchor bolts into the existing reinforced concrete columns. Specifically, each steel column is held to its concrete counterpart by about six bolts drilled 16 inches into the existing concrete. "We had to core out the concrete and then epoxy in the bolt," said



PHOTO BY MARCI CHRISTIAN, CAM STAFF

**As a former warehouse, the building interior was ideal for an open, contemporary schoolhouse designed without traditional corridors. The warehouse's original bell columns add a unique touch to the interior.**

rented the period furniture stashed within the interior, added Cleary.

Removal of massive amounts of debris and old furniture – some on the third floor coated with pigeon droppings – was the first order of business in transforming this building from a basic brick warehouse to a stunning contemporary schoolhouse. The second was infilling a 7-foot-deep partial basement with sand and concrete slurry. "It wasn't a needed space, and it would have certainly been more costly to bring it up to any kind of code or serviceability," said Monahan.

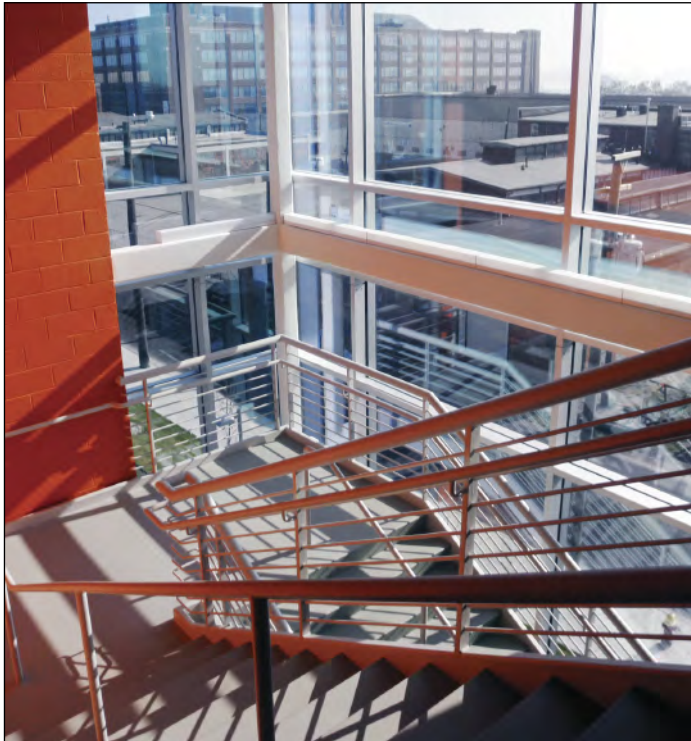
Monahan speculates the building can be dated to about 1917 or 1918 based on the dates of old newspapers discovered in the walls during demolition of the building down to its bare concrete frame. Demolition also exposed two sizeable openings in the structural floor slab. "Various industrial users had occupied and modified the building over the years, including cutting two large 20 x 40-foot holes in the second floor," said Monahan. "We believe the openings were cut for old tanks that went in at the first floor

construction continued after the team discovered that the steel rod in the building actually ran on a diagonal between the structural columns, said Resendes.

The Monahan Company marked the location of the steel rod in chalk lines before drilling 35 inches into the existing concrete slab to make way for the new rebar. In placing the new concrete, the project team even reproduced the board finish ceilings common to buildings of the era. (The board finish shows the wood grain of the original formwork.) "V & O Contracting, Clinton Township, did a nice job in the infill areas in simulating the planks," said Monahan. "You would really have to look hard to tell the difference between the original and the infill."

The board finish ceilings and exposed bell columns – columns shaped like a type of long-stemmed champagne glass in concrete – give this contemporary interior a historical flavor and an industrial edge. The bell columns are an early method of combating punch-through shear. "The bell distributes the load to eliminate a pinpoint





**A series of stair towers draw natural light into this new schoolhouse near the Detroit River.**

Monahan. "Sometimes the bolts were slightly off because of obstructions."

The obstructions were the spider web of thick, heavy No. 10 steel rod laced throughout the old building's concrete slabs and columns. "We drilled down and would hit a big piece of steel," said Monahan. With the bolts set in a slightly irregular pattern to avoid obstructions, the base plate of each steel column had to be custom fit to the specific bolt pattern drilled into the concrete. Again, precise measurements were vital in this marriage of two buildings shaped by the construction technologies of two different centuries.

Adding a further level of complexity, all of this intricate measurement and custom work was performed in the frigid months of December and January. Winter work also included bonding the new and existing roof slabs together in a tight grip. "We had to ensure a strong bond between the old and new slab to combat what is called horizontal shear – the tendency for horizontal displacement from the added weight of the new vertical addition," said Resendes.

A process called scarifying bonded together the slabs with the Monahan crew using air hammers to texture the top of the existing concrete roof deck to a depth of ¼ inch. The next step was coating the old roof deck with a special epoxy bonding material before placing the new steel reinforced slab. "Now the two slabs grip and work together as a system," said Resendes. As an additional aid, "the new slab is not just a hard floor, it actually adds to the structural integrity of the roof structure, and even has a little extra steel in it," said Monahan.

The vertical addition was the core project challenge, but the glass enclosure came in a close second. "We couldn't measure and order the glass until the structure was done," said Monahan. "We had to maintain a huge, visqueen temporary enclosure to keep the weather out and the heat in."

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just eat lunch and enjoy the view from the school's glass-enclosed cafeteria three floors above Franklin Street. The project team even ensured a comfortable temperature range within this unique eatery. This dining hall is wrapped in two stories of pure glass, yet even on a bright day the students are not "cooking" in a greenhouse. It all boils down to – or rather doesn't boil down to – the use of shading devices on the exterior glass and the installation of fritted glass on the upper level. "The shading devices are brows or aluminum fins that extend around the perimeter windows of the cafeteria and even the classrooms," said Resendes. "The fritted glass is a ceramic coating that diffuses the light."

Using this approach, the dining hall has no need for shades, and coupled with vision glass on the lower level, maintains its wonderful vistas. Adding to this pleasant perch, an outdoor patio wraps around the dining hall, offering riverfront as well as panoramic views of the downtown Detroit skyline and Ford Field.

Resendes has a passion for drawing daylight into building interiors. "One of our goals is to create naturally lit schools that require very few lights at all," said Resendes. This mission is seen throughout the building. Clerestory windows ring the gymnasium, drawing in a diffused natural light through translucent Kalwall panels. "Being completely day lit, the gymnasium does not have to have a single light on even on a cloudy day," said Resendes.

Resendes brought the art of natural illumination to the building's main educational spaces, composed of classrooms on the building perimeter with open studios in lieu of hallways in the center. At the border between classroom and studio, the walls never touch the ceiling, allowing natural light to spill into the open studios through clerestory windows. "The light moves right through the whole building," said Resendes.

Within the classrooms, drywall gives way to glass panels near the exterior wall, giving every classroom a sightline along the entire line of educational spaces. "The classrooms float within the building, and people can see from one end all the way to the other," said Resendes.

Resendes is also a strong believer in the use of indirect and diffused light. "We have very few locations in the school where we actually have direct down lighting," said Resendes. "Our lighting throughout the building is virtually all indirect. This creates a calm atmosphere for the students."

Only slender light "pencil" fixtures in the studios produce a small degree of down-lighting. Resendes' ultimate goal is "to design a naturally lit building without a single light fixture." His passion is paying off at UPSM, both in the creation of open spaces filled with natural and indirect light and in lower operational costs for the school. "Indirect lighting is definitely a cost savings," said Cleary. "We have relatively inexpensive fixtures, and we only have perhaps a handful of bulbs in the entire facility." Added Resendes, "We are down to using .5 watts per-square-foot versus the typical 1.5 watts. We are using a third less electricity than most buildings."

#### A NEXT-GENERATION SCHOOL

Beyond lighting, the entire interior is part of next-generation school design. "We challenge what a typical school looks like," said Resendes. At UPSM, every teacher has his or her own office directly attached to the classroom. Traditional hallways and corridors have been eliminated in favor of open studios and what is called intervening spaces.

These open spaces are dotted with seating clusters and custom mobile lockers with locker units on one side and a teaching wall on the other. The teaching wall is a type of white tack board that can be used for impromptu study or teaching sessions. Such features turn what could have been a hallway into useful working spaces.

Some areas of this flexible common space even shift in configuration with folding partitions extending from a classroom across a studio section to create a new classroom enclave. "This allows the teaching staff to create classrooms or make classrooms go away in some areas," said Resendes. "Typically, one sees a folding partition between classrooms, but we have partitions between the classroom and the open or public space."

Schools with more traditional designs must maintain a strict division between hall and classroom due to fire codes. At UPSM, the number of stairways – two stair tower additions and the main stairway – places each student within 75 feet of an egress rather than the code requirement of 200 feet. Because of the closeness of egress, the architect had more flexibility in creating this unconventional school interior.

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**These before and after photographs clearly show the dramatic transformation of the former Franklin furniture warehouse into a vibrant urban school.**

This unconventional school even has non-traditional interior finishes with drywall and carpeting replacing extensive use of masonry block, vinyl floor tile and other traditional school “supplies.” The gymnasium even uses fiber bond walls rather than conventional block. “It takes away from the block feel of most schools,” said Resendes.

All of these materials converge to create a calm, neutral interior with bold color walls in select spaces. “We use relatively simple and utilitarian materials,” said Resendes. “There is nothing ostentatious about the materiality of the space. There is a simple use of materials and a love of color, but the idea is creating a volume that is open, airy and soothing.”

**ECONOMICALLY FRIENDLY**

The building is also designed with economy and an economy of space in mind. From a two-way fume hood accessible from two different science classes to the stacking of all science labs on the east side of the building, the facility is designed to be “economically friendly,” said Resendes.

An economy of space is clearly visible in the gymnasium. The bottom of the fifth-level mechanical penthouse is deftly inserted between cafeteria and gymnasium. In fact, the lower end of the penthouse projects into the gym and practically serves as the back board of the basketball hoop. Likewise, the auditorium is a flexible, multi-purpose space with all the furniture on wheels. The floor tiers widen as the auditorium descends, creating different platforms for a variety of uses, ranging from a double row of chairs for community presentations to a desk-and-seat arrangement for classroom lectures.

At UPSM, vestiges of old Detroit combine with contemporary, flexible design to create a schoolhouse of character and efficiency. Academically, the inclusion of high-tech teaching tools in a completely wireless environment provides an educational backbone as strong as the concrete structure. One of UPSM’s labs even has a Z printer, a 3D printer able to produce sand prototypes of an object or tool based on input from a student’s AutoCAD drawing. “The 3D printer allows students to do their own impromptu fabrication,” said Cleary.

In lieu of a conventional teacher’s desk, the classrooms and lecture hall/auditorium have mobile carts stocked with other high-tech teaching aids, such as document cameras with the capacity for three-dimensional projection of objects. With 3D capability, an instructor can more easily teach about the double helix structure of DNA or other scientific concepts.

**WELCOME CLASS OF 2014**

The concrete “bones” of this old warehouse are now the core of a contemporary, completely wireless, light-filled school. At night, the “lanterns” of the two stair towers add a glow to the surrounding area, as the light within illuminates the streets beyond.

This tremendous undertaking has transformed a dilapidated warehouse into a school that would be the envy of any high school student, and has even turned an adjacent weed-infested, gravel parking lot into a manicured expanse of green lawn, complete with a few raised beds for a vegetable garden. In addition, streets once resembling alley ways have been repaved and improved near the school grounds.

The Thompson Foundation is planning to open two new elementary schools in the fall of 2012, said Cleary. Having designed nine Thompson charter schools, Resendes is working on the design of these two elementary schools, one being the former Sydney D. Miller School on Chene slated to become the UPSM elementary school, the other being the former Doty School in the Boston-Edison Historic District slated to become the elementary school for the Henry Ford Academy. Both are historic buildings purchased from the Detroit Public Schools, said Resendes.

“Resendes Design Group has done multiple projects for us with great success,” said Cleary. “Monahan is on our prequalified list of general contractors. We hard bid all of our school projects.” Monahan also was the general contractor on the University Preparatory Academy’s Elementary School, namely the Mark Murray campus in Tech Town.

The school is chartered by Grand Valley State University to the Public School Academies of Detroit, said Cleary. New Urban Learning operates the University Prep Science and Math schools via a contract with Public School Academies of Detroit.

Part of the University Prep Science and Math District, this recently opened riverfront high school currently serves 115 ninth-grade students, but will soon take in pupils from the UPSM middle school, which is attached to the Detroit Science Center. Ultimately, the new high school will serve 500 students as successive waves of UPSM middle-school graduates, as well as enrollees from throughout metropolitan Detroit, enter this renovated and expanded facility. Thanks to the vision, talents and skills of the Thompson Educational Foundation, Resendes Design Group, TAKTIX Solutions and The Monahan Company, the formative years of these fortunate students will be well spent in this almost miraculously transformed schoolhouse near the riverfront. ❖