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OPPOSITE The building rests atop unstable landfill left over from construction of the FDR Drive.

OFFICE OF THE CHIEF MEDICAL EXAMINER

DNA FORENSICS BIOLOGY LABORATORY

Structural Steel Steadies a Building on Unstable Ground

As any fan of CSI can attest, investigating the dead in today's crime world can hardly be considered dirty work: The job is all lab coats, rubber gloves, and DNA tests. It is amazing, then, that while forensic science has made radical advances over the last several decades, the DNA Lab for the Office of the Chief Medical Examiner for New York (OCME) continued to operate out of a cramped 6,300-square-foot space in a building on the Bellevue campus. That is, until recently, when the OCME moved to its modern new facility built on an East Side Manhattan site, where steel was the solution to an unexpected series of challenges.

The challenges began during preliminary design work with architect Perkins Eastman and structural engineer Severud Associates unearthing the specter of Robert Moses, so to speak, when they discovered that the building—which would be 50 times larger than its predecessor—was to rise on unstable fill placed back in the 1930s to create the FDR Drive. "You're on the east side of First Avenue," explains John Baranello, partner-in-charge for Severud Associates, "which used to be the original shoreline of Manhattan. On this site, the bedrock at first is close to the surface, but then it dives quickly. In certain spots, you're building on layers of silt and sand before you get to bedrock." At 15 stories and 355,000 square feet, the new building had to be as light as possible so as not to unsettle its foundation, a construction challenge for which structural steel minimized complications.

But the challenges did not end there. Laboratory equipment requires a stable environment to prevent inaccuracy in the data, especially with a sensitive device like the OCME's prized scanning electron microscope. Normally, designers would employ a concrete structure to minimize building sway, but the designers working on OCME had already settled on structural steel because of its ideal weight, flexibility for future adaptation, and cost effectiveness.

To minimize sway and floor vibration the engineers specified unusually deep girders for the laboratory floors. "The beam sizes were 50 percent deeper than on a standard office building," notes Baranello. The need for deeper beams influenced Perkins Eastman's design. Given its role in the forensic and criminal justice systems, the OCME needed office space as well as laboratories. By placing the seven stories of office and mechanical floors on top of the laboratories, the heaviest steel could be situated near the bottom of the tower instead of throughout, a decision that lowered the overall weight and cost of the building. In the end, says Baranello, the structure for each of the four lab floors was about 75 percent heavier than for the office floors above. On the exterior, the two programmatic volumes are individually expressed: An all-glass curtain wall sheathes the seven upper stories and contrasts with the monumental granite-faced laboratories below.

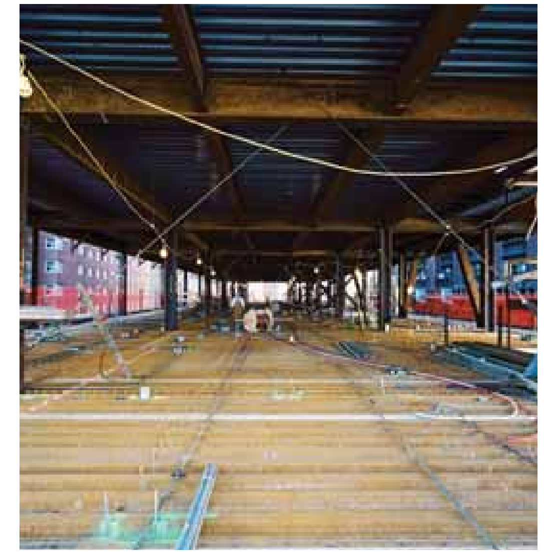
TOP LEFT The architects placed offices on the top seven stories and the laboratories below and expressed this program on the exterior.

BOTTOM LEFT A tower crane placed alongside the building erected the majority of the structural steel.

TOP RIGHT A small crane erected the beginning of the steel structure, before the tower crane was set up.

MIDDLE RIGHT Large girders on the lower floors help stabilize the laboratories.

BOTTOM RIGHT The tower crane lifts the facade bracing frame into place.



TOP Before pouring the floor, the steel deck was reinforced and outfitted with electrical conduit.

BOTTOM The tower crane rises above an upper floor in preparation for the next lift of steel columns.

Notwithstanding the architects' arrangement of the program elements, the structural framing system is configured to contend with vibrations. According to Baranello, instead of the standard W16 and W21 beams that would usually support office floors, the engineers designated W18 and W24 shapes for greater rigidity on the lab floors. The same was true for the girders, which were W24s on the office floors and W27s on the lab floors. The wide flanges were typically ASTM A572, Grade 50 steel, while the plate girders were ASTM A572, Grade 42. ASTM A500 or 501 hollow structural sections were placed in key locations. The engineers also beefed up the lateral system to achieve the desired rigidity. Bolted and field welded moment frames stabilize the building in the east-west direction and a dual system of moment frames and concentric bracing handles the loads in the north-south direction. All of the bolts used in the project were high strength ASTM A325 or A490. In all, the project incorporated 5,000 tons of structural steel.

Thickening the slab also helped stiffen the building. The engineers called for using 3 inches of normal weight concrete atop 18-gage galvanized composite metal decking. All this rigidity turned out to be a boon not only to the stability of the labs but also to the overall design of the facility. In order to increase the facility's square footage, the architects cantilevered the north face of the building 10 feet out from its tight footprint. Thanks to the strength of the extra-large steel members used to stabilize the laboratory floors, no additional bracing was needed to support the overhang.

The OCME also plays an important instructional role, fulfilled here by a 3,800-square-foot, 320-seat, double-height auditorium. To create the 45-foot clear span required for this space, the engineers designed two welded steel plate girders to transfer the load of two columns at the fourth floor away from the auditorium. "The long span of this space could not have been accomplished as efficiently with anything but steel," says Michael Lew, project manager at Perkins Eastman.

Steel proved critical to the construction and stability of the OCME, but the future is where its greatest strength lies. John Patey, who helped OCME design its lab spaces as Perkins Eastman's project manager for tenant build out, explained that only the flexibility and adaptability of steel could accommodate the versatile floor plans necessitated by ever-evolving lab technology. "If you look at the timeline on this," Patey says, "you'll see we started in August 2000 and will open in February or March of 2007. This whole time we've been designing against the lab equipment, most of which has gone through three or four iterations since we began. Punching holes in concrete to make way for evolved equipment wouldn't have been impossible, but it certainly would have caused some unnecessary headaches. No, it had to be steel." ■

OFFICE OF THE CHIEF MEDICAL EXAMINER, DNA FORENSICS BIOLOGY LABORATORY

Owner **NYC Office of the Chief Medical Examiner** *New York, NY*
Architect **Perkins Eastman Architects** *New York, NY*
Structural Engineer **Severud Associates Consulting Engineers** *New York, NY*
Curtain Wall Consultant **Gilsanz Murray Steficek** *New York, NY*
Construction Manager **Gilbane/TDX J.V.** *New York, NY*
General Contractor **T.A. Ahern Contractors Corp.** *Woodside, NY*
Structural Steel Fabricator **Kline Iron and Steel Corp.** *Columbia, SC*
Structural Steel Erector **A.J. McNulty & Co. Inc.** *Maspeth, NY*
Curtain Wall Fabricator **Sota Glazing, Inc.** *Brampton, Ontario, Canada*
Curtain Wall Erector **W&W Glass Systems, Inc.** *Nanuet, NY*
Precast Erector **A.J. McNulty & Co., Inc.** *Maspeth, NY*
Metal Deck Erector **Solera Construction, Inc.** *New York, NY*