The original Maplewood Police and Court Building, built in 1930, had become functionally obsolete. A new building was needed to provide additional space as well as infrastructure to support more advanced telecommunications technology. The building program called for a 100-seat courtroom/meeting room, a 10-cell detention facility, dispatch/communications center, fitness center, locker/shower rooms, squad room, nine-bay garage, a sally port, staff bunk rooms, training room, conference rooms, four-lane indoor firing range, and offices for the municipal court and for the police department.

To accommodate future requirements, provisions were to be made for horizontal and/or vertical expansion. To accommodate this request, the third floor of the building was designed solely as a future growth space.

Although police and court facilities are often thought of as somewhat insular building types, the municipality wanted the building to provide spaces that could be shared with the Maplewood community. Toward that end, several conference rooms were designed to be used by community groups when not needed for police or court purposes. Since completion, those rooms have accommodated a larger variety of users than anticipated, but the heaviest users continue to be those involved in township business.

The firing range also was designed to be used by others. Police personnel are required to participate in firearms training and testing on a regular basis, and few ranges are in the vicinity. Therefore, the township decided that nearby municipalities would find it convenient and cost-effective to send officers to the Maplewood range. Several outside agencies have trained their personnel here, but the township has found it more difficult than anticipated to compete with other ranges for business.

To be visually recognizable as a municipal structure, the township requested the use of materials and/or forms typical of Maplewood's older municipal facilities, especially its iconic Town Hall. These included decorative red brick in Flemish bond, stone water tables and trim, arched openings, slate roofing, and ornamental metal railings. To be visually compatible with neighboring structures, the building was designed to comply with the architectural guidelines of the Special Improvement District in which the project was located, even though, as a public project, it was exempt from them.

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With the Maplewood Police and Court Building, the Township of Maplewood, N.J., is a town with a plan: reduce its greenhouse gas emissions 20% by 2015. Starting in 2006, it redesigned its recycling program, converted its non-specialty motor vehicle fleet to hybrids, and completed an energy audit of its municipal buildings among other initiatives. The township wanted its new Police and Court Building to reflect its green values, so it decided to pursue LEED certification.
Law enforcement and judicial facilities must accommodate several different occupant groups—the public, the police, the judiciary, and the detained—each with its own security requirements and circulation network. Accommodating these multiple networks can yield low building efficiency (i.e., the ratio of net to gross area), not to mention disorientation on the part of users. With the cost of such facilities being roughly $400 per gross square foot, it is imperative that this ratio be as high as possible. Since the façade is among a building’s costliest components, it is also imperative that floor-to-floor heights be no more than necessary.

To maximize the efficiency of the plans and maintain a simple interior organization, we took advantage of the fact that we were dealing with a multi-story building. In a one-story police building, the cellblock must be visible wherever possible in the finished building, and using modular masonry design to reduce cutting and waste. The building’s locally sourced materials include its red brick veneer and slate roofing. Both require little maintenance, have long useful lives, and reprise the palettes of the township’s other public buildings. Low-emitting paints, coatings, adhesives, sealants, and carpets were used throughout.

The site was just large enough to accommodate the building and staff and official parking. To accommodate weekday visitor parking, the municipality entered into a long-term agreement with the administrators of the church next door, to share its parking lot.

Other strategies that reduced the volume of building materials included using acoustic metal floor and roof decking for sound control instead of separate suspended ceilings, leaving the superstructure exposed to view whenever possible in the finished building, and using modular masonry design to reduce cutting and waste. The building’s locally sourced materials include its red brick veneer and slate roofing. Both require little maintenance, have long useful lives, and reprise the palettes of the township’s other public buildings. Low-emitting paints, coatings, adhesives, sealants, and carpets were used throughout.

To minimize floor-to-floor heights, we coordinated the ductwork with the floor framing, so that ducts never had to pass under girders. This allowed the ceilings to be much closer to the framing above than is normally the case, enabling the building height to be reduced by about 10%, decreasing the cost of construction and the surface area through which to gain or lose heat.

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Living
Daylighting is an integral part of the design. In general, the offices are concentrated on the second floor. Their windows are glazed with vision glass to 8 ft above the floor, and daylight glass above that. Lightshelves are mounted between these upper and lower lites, shading the vision glass and redirecting that daylight through the clerestory, deep into the interior. Sensors turn on the lights only when spaces are occupied and insufficient daylight is available to serve them.

The main lobby, located on the south side of the building, faces the street. Its south wall is heavily glazed, allowing daylight to flood the space. Interior windows in its north wall and glass block in its floor allow this daylight to be shared with the adjacent courtroom and with the fitness center below.

Daylight from the lobby above filters through its glass block floor into the fitness center below. Windows into the surrounding corridors help distribute daylight even further.

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Building Systems and Energy Use
The building uses a highly efficient (0.66 kW/ton) water-cooled condensing chilled water system. As demand for cooling decreases, the flow of water to the chiller decreases (via variable speed pumping) to the minimum flow established by its manufacturer. Upon reaching minimum flow, the water temperature increases. The cooling tower is located in the building’s parking lot, and is piped underground to the mechanical room in the building’s basement. As most buildings of this size are conditioned with DX-type rooftop units, LEED considers that approach the baseline for this project’s (less than 150 tons) energy modeling.

Other equipment contributing to the building’s performance include sealed combustion modulating gas boilers, and variable speed drives on chilled water and hot water pumps. Rooms and spaces on similar operating schedules are zoned together. The building is conditioned with variable volume air-handlers and chillers capable of stepped operation, so that the supply of conditioned area is matched to demand.

For security reasons, none of the windows are operable. A revolving entrance door helps control air exchange.

The building’s air-handlers are located in a well on the roof (see building section). Clerestories around the perimeter of the well bring daylight into the third floor. This floor was left unfinished initially, but is ultimately expected to be subdivided for future offices. A grid-connected 20 kW photovoltaic array is mounted above the air-handlers, at the sill level of the clerestory. Sufficient room was left around the perimeter of the array to satisfy the air-supply requirements of the rooftop units.
To ensure that sufficient capacity is always available for cooling this around-the-clock operation, the chiller has twice the capacity needed to satisfy the design load. The BMS is programmed to equalize the runtimes of the building’s four chiller barrels.

Interior lighting is controlled with occupancy sensors and continuously dimmable ballasts.

To ensure air quality inside and outside the building, the indoor firing range is exhausted through HEPA filters and supplied with 100% outside air. The range is served by two air-handling units, each outfitted with a heat-pipe recovery coil. The exhaust unit is located just above the bullet trap, while the makeup air unit is located just behind the firing line. The two coils are connected with refrigerant piping. Seventy percent of the heat from the exhaust airstream is recovered and used to temper the makeup air. Sufficient cooling is provided by the high velocity laminar flow of the range’s airstream so that mechanical cooling was deemed unnecessary.

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The coffering of the lobby ceiling recalls that of the ceiling of Maplewood’s iconic town hall. Here, the coffers were prefabricated to be consistent with design predictions. The building, here, the coffers were prefabricated to be consistent with design predictions.

**LESSONS LEARNED**

The tighter the building envelope, the more sensitive building performance is to ventilation air volume. Although the building is occupied round-the-clock, the number of occupants ranges from as few as three at night and over weekends, to as many as 150 or more during court sessions, with an average of around 25. As with many high-performance buildings, the building was designed with multiple backups to maintain air infiltration. A network of carbon dioxide sensors provide real-time indications of air quality from which ventilation air requirements are calculated. The design was based on 20 cfm/person, and assumed simultaneous and full occupancy of each space. The BMS responds to the building’s wide-ranging occupant loads by continuously sensing and calculating the volume of fresh air actually required. After occupancy, we learned that the amount of air delivered was extremely sensitive to the response of the BMS to changing occupant loads. Although the specified schedules of outdoor air make-up requirements indicated that the volumes of air being delivered (and conditioned) was substantially higher than necessary for the given number of occupants.

To ensure smooth and uninterrupted operation, program the BMS to respond gradually to changes. Another feature of many high-performance buildings is that chilled water temperature varies in response to load. However, for both free-up and short-cycling of the chiller, the BMS must be programmed to modulate chilled water temperature gradually in response to changing demand, just as the cruise-control system in a car responds gradually to changing grades. While troubleshooting the cooling system after start-up, our engineers found that the setpoints and equations with which the BMS had been programmed required fine-tuning to dampen its response.

Don’t underestimate the risk of glare from large windows, even when outfitted with high-light shelves. In spite of using vision glass with a low visible light transmittance and shading it with lighthearts, some occupants with desks near windows complained of glare. This was addressed through the addition of roller shades in appropriate locations.

Avoid large pressure differences. In the firing range, failure to turn on the exhaust and makeup fans simultaneously produces such a large pressure differential that it is impossible for the door to enter or leave the area. To correct this, the exhaust and makeup fans had to be interlocked.

Design to accommodate growth and change. To reduce the cost of providing public services, Maplewood explored, during design, the feasibility of sharing its court operations with those of neighboring South Orange (which shares a church with which it already shares its school system). South Orange showed no interest at that time. However, after the building was completed, the former was able to accommodate this change even though it was not designed for this purpose.

To respond to budgetary constraints, the municipality suggested that the species of wood woofer used in the courtroom millwork and paneling be changed. It was not confirmed until much later that the new species was not available from certified forests. Had this been known at the time, the change probably would not have been approved.

Consider not only the performance of the building envelope, but also its form. The gains and losses of energy through the building envelope are a function of its resistance to heat flow and of its total area. Building codes and LEED address the thermal resistance of the building envelope, but they do not address the building’s surface area or its ratio of surface area to volume. As a result, a building with an inefficient form but a high-performance envelope is looked upon more favorably than a compact building (envisag- ing the same interior area) having a slightly lower floor-to-volume ratio. Even though the latter may have much lower aggregate skin losses than the former. If the goal is to save energy, the codes and rating systems need to address the form factor, or ratio of surface area to volume. With its simple form, efficient internal layout, and low floor-to-height ratios, the Maplewood Police and Court Building has a low ratio of surface area to volume.

A building’s sustainability improvements are not limited to those that fit on its site. As explained earlier, coordinating the site plan with the project with the site plan of the neighboring church resulted in benefits to both projects. Sharing the church’s parking facilities with the site plan of the neighboring church resulted in benefits to both projects. Sharing the church’s parking facilities with those of neighboring South Orange (the municipality with which it already shares its school system), South Orange showed no interest at that time. However, after the building was completed, the former was able to accommodate this change even though it was not designed for this purpose.

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element in the positive economic performance, according to Rutgers.

Conclusion
The holistic approach used in the design of the Maplewood Police and Court Building resulted in a building that maintains architectural continuity with Maplewood’s existing municipal buildings; leverages limited public funds to invest in systems that pay for themselves within a fraction of the building’s service life; incorporates facilities that can be shared with the public and with other municipalities; and reduces environmental impact by sharing parking with its neighbor. This holistic approach to sustainability can serve as a model for other municipalities.

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Eli Goldstein, AIA, LEED AP is managing partner at The Goldstein Partnership, Architects in Maplewood, N.J.

Above left: Raising the entrance 3 ft above the street not only emphasizes its importance, but also protects it from vehicular attack less conspicuously than bollards.

Above The four-port indoor firing range is located in the basement, under the garage. Air is supplied above its firing line and exhausted above its bullet trap, through gaps in its baffled ceiling.

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