Sustainability and Its Relationship to IACP's Facility Planning Model: A Case Study

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Synopsis:

Police facilities often make outstanding candidates for sustainable design and construction. Determining the sustainability potential of a specific facility requires a basic understanding of several related principles of green design. Because of the importance of these principles, a strategy is presented for integrating them into IACP's Facility Planning Model. The new Maplewood (NJ) Police & Court Building is then presented, to demonstrate how sustainable principles can be incorporated into a state-of-the-art municipal law enforcement facility.

The importance of sustainability

Buildings consume enormous amounts of natural resources in their construction and operation. Huge amounts of energy are used in the extraction, manufacturing, and transportation of their materials. When resources were cheap, the issue of sustainability was rarely mentioned. However, in the context of global warming, rapidly rising costs for fuel and commodities, and heightened environmental awareness, it is only natural to consider alternative design and construction scenarios to reduce the environmental impact of buildings.

The impact a building has on the environment is a function not only of the materials of which it is constructed, but also of the way it is used. A school, for example, may only be occupied half the days of the year, and only one-third the hours of those days, for the equivalent of only one-sixth of the hours of the year. An office building would normally be occupied forty to fifty hours a week, or less than one-third of the hours of the year. By contrast, the typical law enforcement building is in use twenty-four hours, every day of the year.

All else being equal, the more hours a building is occupied, the more energy will be consumed in its operation. This creates both a problem and an opportunity. The problem is obvious: higher operating costs. The opportunity may not be so obvious, but is extremely important: Any investment in energy conservation will pay for itself in less time. Thus, it will take far less time to pay back the cost of energy-efficient windows, for example, in a police facility than in a school. In fact, the difference in payback periods may be so great that certain investments could only be justified in buildings running round the clock.

Historically, public buildings have been designed to last a long time. To achieve that objective, their designers specified materials and systems which were durable and required little maintenance, even if their initial costs were higher. Such an approach was seen as a responsible use of public funds. Investing in materials and technologies which reduce the consumption of natural resources during the construction and operation of buildings is a natural extension of that same attitude.

A holistic approach to energy conservation

If you ask people what strategies they employ to reduce their consumption of gasoline, their answers likely include: drive less, buy a car that gets better mileage, use mass transit, or, perhaps, ride a bicycle. To reduce their driving, they more carefully plan their trips, eliminate non-essential trips, or carpool with others. This sort of thoughtful, holistic approach to reducing one's use of gasoline is analogous to the approach we take in thinking about reducing the use of energy in our buildings.

Although the most basic goal of a building is to shelter its occupants from the elements, a building is not a passive container. Energy flows constantly through its roofs, walls, and floors. Depending on a building's orientation and geographic location, the time of year and time of day, and the weather, light and heat may be flowing in or out.

While the ultimate objective is, of course, to eliminate energy use, this is virtually impossible to achieve in practice, especially in a police facility. Nevertheless, by using a combination of strategies, it is possible to achieve a significant reduction. Here are 10 strategies which, collectively can make a big difference:

1. Shape, orient, and organize the building to optimize daylighting,
2. Minimize the surface area of the building,
3. Heavily insulate the building skin to minimize heat transfer through it,
4. Use high-performance glazing, to minimize heat transfer through the windows,
5. Use efficient HVAC equipment and lamps to get the most out of the energy you use,
6. Use sensors to shut off lights when spaces are unoccupied or sufficiently illuminated by daylight,
7. Condition spaces only when they are occupied,
8. Recover as much energy as possible,

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9. Consider photovoltaics to generate your own power,
10. Use green power, to minimize the environmental impact from the generation of the energy you use.

Notwithstanding the above, some of the more common approaches to saving energy are particularly difficult to achieve in police facilities. For example, while low-output parking lot lights may be acceptable at a shopping mall, they may not provide the light levels needed for nighttime operations in police parking facilities. Similarly, although porous pavements have the environmental benefit of reducing stormwater runoff, they require more maintenance and offer less durability than appropriate for a public facility.

Each building has a unique amount of surface area exposed to the atmosphere. If one goal is to maximize daylighting, then it follows that rooms which could benefit from windows be located on the building's perimeter. In buildings with relatively simple programs, this is relatively easy to achieve. However, given the complexities of law enforcement facilities, it is often difficult simultaneously to satisfy adjacency requirements and daylighting imperatives. Under such circumstances, it sometimes becomes necessary to use interior windows or translucent floors to illuminate interior spaces with daylight "borrowed" from perimeter spaces.

The long-term costs of operating a building, especially a police building, tend to dwarf its initial construction costs. While the above strategies will contribute to energy savings, the initial sizing of the building often is the largest determinant of its overall energy performance. All else being equal, planning the facility to get as much use as possible out of each space will yield a smaller building, with lower construction costs and lower operating costs. In fact, rather than providing two separate dedicated spaces, it is often more economical to provide a single shared space that is somewhat larger or more comprehensively outfitted. By "pooling resources" in this way, each of the user groups ends up with a more functional environment.

Green Design and its impact on the IACP Facility Planning Model

Like many planning documents more than five years old, IACP's Police Facility Planning Guidelines does not address the issue of sustainability. While sustainability is a worthy objective and should certainly be an integral part of the design of every law enforcement facility, it should never be achieved at the expense of critical functional relationships.

In 2002, the IACP released the first edition of its Police Facility Planning Guidelines, to "assist Police Administrators in planning, designing, and building facilities to meet their present and future needs." The Guidelines were designed around the IACP's Facility Planning Model. The Planning Model consists of four phases, subdivided into a total of 18 steps, intended to help insure "that the facility constructed reflects the mission of the department, meets all programmatic needs, fulfills all functional requirements, and has sufficient space to meet departmental needs for at least the next twenty years."

As should be clear from the preceding portions of this article, sustainability is not something that can be added to a project after it is completed. On the contrary, to realize its full potential, it must be planned for from the start, and permeate each of the phases of project development. Currently, the Planning Model is silent on environmental aspects. Therefore, to make the Model helpful as a framework for green police facility design, all four of its phases and nearly all of its 18 steps must be modified. While an exhaustive discussion of the impact of sustainability issues on the eighteen individual planning Steps is beyond the scope of this article, it is helpful to consider the general principles which would affect the four planning Phases.

Phase 1: Project Initiation: In terms of sustainability, most existing police facilities are seriously deficient. That deficiency increases the justification for change and may become the source of a disproportionate amount of political and community support for the project. When the cost of energy retrofits is combined with the costs of addressing other deficiencies common in old (and not too old) police facilities — including violations of the Americans with Disabilities Act, inadequate provisions for female officers, and inadequate seismic resistance — it is often more economical to replace existing facilities than to rehabilitate them.

Phase 2: Project Planning/Pre-Design: If sustainability is thought of as a fundamental requirement of the project, then it needs to be considered in the analysis of the facility's needs, in the evaluation of facility options, and in the selection of a site. The importance assigned to sustainability will affect its impact on those issues. Because many green features — including natural light and photovoltaics — rely on access to daylight, consideration must be given not only to a site's current surroundings, but also to its ultimate surroundings. For example, does the zoning permit surrounding buildings to be of a height or bulk which could cast shadows on the police building, thereby affecting the efficacy of these measures?

Phase 3: Budgeting and Funding: Although one can certainly justify sustainability from a variety of non-economic perspectives, many governing bodies need economic justifications for expending public funds. One of the few benefits of higher fuel prices is that they shorten the pay-back period for investments in energy conservation. This is one of the rationales for a larger construction budget. Incentive programs established by various utilities can help fund these measures, but many of these programs are being phased out. In their place, a business has emerged to implement energy upgrades at no cost, with the savings shared between the provider of the upgrades and the owner of the building. Some public agencies have utilized this approach to fund lighting retrofits or rooftop photovoltaic systems.

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Phase 4: Project Design and Delivery: This is the Phase in which the idea of building a sustainable police facility becomes a reality. It is therefore essential that the architect selected for the project have the required expertise and that he understand how to leverage the unique aspects of law enforcement buildings to maximize the benefits of sustainability. Quality control measures must be in place to help assure that the completed facility achieves the specified levels of performance. Various third-party agencies, such as the US Green Building Council, have set up systems to rate and certify the relative sustainable performance of buildings. In general, when establishing criteria for green performance, these programs are good places to start, but a knowledgeable architect will be able to suggest additional criteria of significant value for your specific circumstances.

Maplewood Police & Court Building: A Case Study

The new Police & Court Building in Maplewood, New Jersey, a suburb of New York City, is the first green public building and the first green law enforcement facility in New Jersey. The evolution of the design of this building provides useful lessons for others considering the construction of sustainable police facilities.

Phase 1: Project Initiation: In early 2004, when we began designing this project, interest in green building was a fraction of what it is today. Nevertheless, the Mayor of Maplewood at the time felt that the Police & Court Building, the township's largest public project in decades, represented a unique opportunity to show the community's commitment to sustainability. Over time, he convinced the other members of the township's governing body that this was the right thing to do, and that certification of the results by an appropriate third-party agency would give the township the credibility it needed to compel local developers to follow its lead.

Phase 2: Project Planning/Pre-Design: Early on, we were asked to compare and contrast nearly a dozen different sites, including the site of the original Police Building. Although renovating and expanding that building would have had the advantage of utilizing an existing resource, persistent flooding problems on that site ultimately precluded that option. One of the major attractions of the site ultimately selected was its unobstructed southern exposure. The buildings on that site were deemed unsuitable for reuse as police facilities, so the Committee decided to demolish them and build an entirely new building.

Phase 3: Budgeting & Funding: To help the Township Committee understand the costs and benefits of sustainability, we compiled a spreadsheet showing which of the 69 potential Credits available under the US Green Building Council's LEED program for new construction we and our consultants believed would be achievable on this project, the design and construction costs which would be incurred in order to implement them, and the potential annual savings they would yield. The Committee took the highly enlightened position that they would approve any upgrade beyond the standards given in the applicable building codes, as long as the associated savings were likely to be equal to or greater than the cost of financing the upgrade. Using that measure, they approved a rooftop photovoltaic array — largely because the State was willing to pay for a significant portion of its cost — but rejected a geothermal system. (Of course, the recent unprecedented increase in fuel prices has increased the relative competitiveness of numerous alternative energy technologies.)

Phase 4: Design & Delivery:

Distribution of Spaces: When it was concluded that the selected site was too small to accommodate the required parking, the Mayor negotiated an arrangement with an adjacent church to allow use of its parking lot for weekday visitors to the Police & Court Building. The relatively small size of the site necessitated a small building footprint, with police facilities distributed over several floors. Only those requiring public access — the Lobby, Police Desk, and Records and Violations Bureaus — and those requiring vehicular access — the Sally Porte and Garages — were placed on the First Floor. Offices and conference rooms were located on the Second Floor. The firing range, detention area, storage rooms, fitness room, and locker rooms were placed in the Basement.

Lighting: From our analysis of the needs of the Police Department and Municipal Court, it was clear that bringing adequate daylight into the majority of the occupied spaces would require a relatively large percentage of windows in the exterior walls, all with high-performance glazing. A glass block floor in the Lobby allows daylight to reach the fitness room below. Lighting fixtures, even if they use energy-efficient lamps, generate heat. Therefore, keeping the lights off reduces the demand for power for both lighting and air-conditioning. In this building, sensors were provided in the ceilings of rooms with windows. They switch the lights off whenever the room is unoccupied or bright enough from daylighting. Exterior sunshades reduce glare at workstations located adjacent to the windows, while reflecting daylight deep into the interior to achieve a more uniform distribution.

Air Quality in the Firing Range: The most effective way of maintaining high levels of air quality in an indoor firing range is to exhaust it without recirculation. Unfortunately, such an approach means that whatever heat is added to the air to bring it to room temperature is thrown away after one use. To maintain air quality and achieve sustainability, our Mechanical Engineer designed a heat recovery system to strip the heat out of the outgoing air stream and inject it into

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the incoming one. Seventy percent of the heat is reused, as a result.

Conclusion:

The process by which the Maplewood Police & Court Building was realized illustrates how sustainability can become an integral part of the IACP's Facility Planning Model, enhancing the quality of police facilities for the benefit of the environment.

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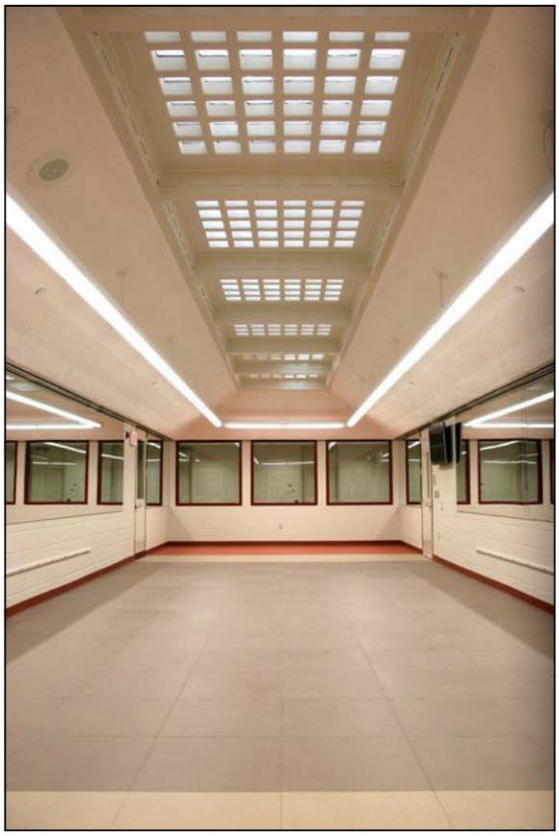
Maplewood Police & Court Building

Maplewood Police & Court Building Lower Lobby



Maplewood Police & Court Building Fitness Center

Maplewood Police & Court Building Entrance