Public Works DIGEST

Volume XXVIII, No. 1
January/February/March
2016

At U.S. Army Garrison Hawaii, planners are working to convert existing streets into safe and efficient avenues and boulevards to support multi-modal transit, infill development, and stormwater management. (Image courtesy of The Urban Collaborative)

This Issue:
Master Planning, Housing, and Barracks

Public Works DIGEST

Volume XXVIII, No. 1
JANUARY/FEBRUARY/MARCH 2016

U.S. Army Installation
Management Command
2405 Gun Shed Road
Fort Sam Houston, TX 78234-1223

Public Works Digest is an unofficial publication of the U.S. Army Installation Management Command, under AR 360-1, The Army Public Affairs Program. Method of reproduction: photo-offset; press run: 1,600; estimated readership: 5,000. Editorial views and opinions expressed are not necessarily those of the Department of the Army. Mention of specific vendors does not constitute endorsement by the Department of the Army or any element thereof.

Gregg Chislett
Chief, Public Works Division
Installation Management Command
U.S. Army Installation Management Command
2405 Gun Shed Road
Fort Sam Houston, TX 78234-1223
Attn: Editor, *Public Works Digest*

Candy Walters
Managing Editor,
U.S. Army Corps of Engineers
Headquarters, USACE
441 G Street, NW
Washington, DC 20314-1000
202-761-0022 DSN 763
editor.pwdigest@usace.army.mil

Printed on recycled paper.

Narrow wing buildings bring in daylight, increase productivity

by Jerry Zekert and Lyndsey Pruitt

Higher productivity, lower absenteeism, fewer errors or defects in products, positive attitudes, reduced fatigue, and reduced eyestrain; are these the effects of a large cup of coffee? These are the benefits of different wavelengths of light on building occupants as summarized by the National Renewable Energy Laboratory. As architects, engineers, and planners, we are rediscovering daylight as a pure source of light that contains all wavelengths throughout the day.

Before 1940, daylight worked in combination with combustion lighting for all interior lighting needs. In the next 20-year span, electric light dominated the market and quickly became the design precedent. Electric light is less energy-efficient than daylight because electric light loses a large portion of energy in transmission where as daylight is direct-source energy. Further, daylight is generally cooler per lumen than electric light; thus, in a lumen per lumen comparison, electric light requires a larger cooling load offset. With the advent of sustainable building design, architects and engineers are challenged to integrate daylight for energy savings but should be aware of the superior quality of daylight and subsequent physiological and psychological effects.

There are many forms of integrating daylight into buildings. Typically they fall into four categories: skylights, clerestories, windows, and light tubes. Skylights, penetrations in the roof or ceiling to allow light infiltration, were used in Roman Architecture. Conventional skylights have numerous functional issues such as hot spots, glare, and uncontrolled heating. Modern technology has evolved to diffuse the incoming light through prismatic skylights. A clerestory is a raised section of interior above the adjacent rooftops to allow light to penetrate. It is historically part of the nave and transept of churches. Clerestories throw daylight back into spaces and can diffuse the light but do not provide views. Clerestories and skylights generally only work for one floor making them of limited value in multi-story buildings.

Almost every building has windows, the penetrations in a façade that allow daylight and views directly in and ornament the building exterior. Window technology has come a long way with various coatings, gas fillings, and layers to develop composite systems with better insulating properties. Light tubes are recent technology in which daylight is piped through a highly reflective tube and delivered where needed. Light tubes are typically used when mechanical

(See Narrow Buildings, page 11)

(Mixed Use, continued from page 9)

financed construction within a single unit." Combining complementary functions also minimizes the need for multiple Anti-Terrorism Force Protection buffers and extra utility lines. In addition, horizontal mixed-use areas contribute to a vibrant and safe retail core by bringing more "eyes on the street" from residences or offices on upper floors.

Mixed-use planning is also addressed in Unified Facilities Criteria 2-100-01 (Installation Master Planning). Mixed-use planning supports several other master planning strategies including: **sustainable planning** that calls for horizontal and mixed use development for the reasons described above; **natural, historic and cultural resource management** that calls for land preservation and mission compatibility; **healthy community planning** to create healthier environments for service members and their families; and **defensible planning** that calls for appropriate Anti-Terrorism Force Protection setbacks.

This pattern has been well-tested on military installations. In the 1950s, many of the old "rolling-pin" barracks had dining halls attached to barracks as well as company operations facilities. At Joint Base Lewis McChord, Washington, new housing is at the core of the installation creating a walkable, horizontal mixed use district. And some of the buildings use vertical mixed-use with ground floor commercial uses and housing above. Fort Belvoir, Virginia, provides another excellent model for mixed-use. The master plan emphasizes walkability and connectivity. Enhanced livability measures are well supported there, proving how both horizontal and vertical mixed-use development can make a military installation function better for those working or living there, even as the population increased drastically during the intervening years.

Master Planners' "planning tool-boxes" should include mixed-use solutions that will:

- Integrate compatible uses within districts such as recreation facilities and dining options in residential areas;
- Collocate places to live, work, shop, dine, worship, and play into vertical mixed-use buildings whenever possible;
- Locate public uses on active ground floors and follow a vertical public-private gradient; and
- Site mixed-use buildings around community centers and campus quads.

POC is Jerry Zekert, 202-761-7525, jerry.c.zekert@usace.army.mil

Zekert is chief, Master Planning Team, Headquarters, U.S. Army Corps of Engineers. Gillem, PhD, FAIA, AICP, is the Principal, The Urban Collaborative, LLC, and professor of Architecture and Landscape Architecture, the University of Oregon. Cross is a Leadership in Energy and Environmental Design Green Associate and assistant planner with The Urban Collaborative, LLC.

(Narrow Buildings, continued from page 10)

or structure equipment prevents direct access to daylight.

Even with the most aggressive treatment, daylight quality and quantity greatly reduces after 30 feet. Thus, a building floor depth of no more than 60 feet from south to north façade is the most viable option for a fully day lit interior. Narrow buildings are defined as 60 feet or less in width and considered daylight-optimized. It is crucial that planners consider daylighting and narrow building footprints when developing capacity plans so buildings are optimized from the initial phase.

To complete a daylighting system, couple the strategy with a day-responsive lighting control system. This system automatically adjusts the interior electrical lights to account for daylight when determining the lighting level for each space. When coordinated from planning through architecture and engineering to operation, a well-designed daylighting system can reduce the cooling energy use due to electric lighting systems 10 to 20 percent, according to the Department of Energy's Federal Energy Management Plan.

Taken together, the use of narrow wings can have substantial energy benefits. For example, the National Renewable Energy Labs new lab facility in Golden, Colorado, has wings of 60 feet and a resulting energy use that is 50 percent less than today's norm for similar buildings. Likewise the new building for the U.S. Army Corps of Engineers Seattle District uses about half the energy of a typical office building in part due to the tremendous access to natural light. In the building, the wings are created by the use of a large atrium that effectively splits the building in half and allows light to penetrate deep into the multi-story buildings.

Narrow wing buildings are not new, however. Many historic buildings on military installations are based on the narrow wing model and are as narrow as 40 or 50 feet. These buildings were built before the days of air conditioning and unlimited energy, and had to be efficient. And now they are some of the most loved buildings at many installations because of their access to natural light and even natural ventilation.

Rushmore Center is a consolidated administrative building at Ellsworth Air Force Base, South Dakota, with 50 foot-wide wings that allow most occupants to access great views and natural light. The Omaha District of the U.S. Army Corps of Engineers served as the design agent for this award-winning project. (Image courtesy of Mark L. Gillem)

In addition to reduction in energy, narrow buildings allow more uniform access of occupants to daylight, which has many beneficial physiological and psychological effects. Why is it that the boss always gets the corner office or the one with windows? It is largely because status is associated with access to natural light. However, everyone deserves an office with access to natural light.

In recognition of the value of narrow wing buildings, Unified Facilities Criteria 2-100-01 (Installation Master Planning) states that "buildings of any configuration with footprint elements of approximately 50 feet or less (wings, central courtyards, etc.) can allow natural light deep into the building, which, when combined with energy-efficient glazing, reduces energy consumption. Narrow buildings with operable windows also allow natural ventilation to effectively flow through the interiors, which can reduce energy costs associated with air conditioning. Narrow buildings can be used to define outdoor spaces and can be used to infill development sites across an installation."

The relevance to planners is straightforward. The criteria says that "In terms of planning, when laying out building footprints on Illustrative Plans, planners should generally use building footprints no wider than 50 feet." This is a good prescription for more energy-efficient buildings that are simply better places to live and work.

POC is Jerry Zekert, 202-761-7525, jerry.c.zekert@usace.army.mil

Zekert is chief, master planning team, Headquarters, U.S. Army Corps of Engineers, and Pruitt is an architect and planner with The Urban Collaborative, LLC. Gillem, PhD, FAIA, AICP, the Principal with The Urban Collaborative, LLC.