

## Indian Affairs Architect Designs Crow Creek Gym to Become Part of Replacement School



Gordon Rosby

The new Crow Creek Tribal School gymnasium (right) in Stephan, S.D., was designed by Indian Affairs architect Gordon Rosby, AIA, and marks the first step in the construction of a K-12 replacement school and dormitory to serve students from the Crow Creek Sioux Tribe. The 19,000

square foot gymnasium is located on the site of the proposed replacement campus, which is adjacent to the current middle/high school. The gym will seat over 800.

The master plan for the Crow Creek replacement school site was developed by Indian Affairs during the gymnasium project and calls for a new dormitory serving students in grades 7-12. It will replace a dormitory on the school's



current campus that was demolished following a fire in 2005 (left). Dormitory students have been living in modular buildings since the fire. Also, the replacement school project will include a new elementary school for students who currently attend the Crow Creek Elementary



School 15 miles away in Fort Thompson, S.D. The replacement school will be funded by the American Recovery and Reinvestment Act of 2009.

Crow Creek has not had a gymnasium for over five years, since the demolition of its former gymnasium due to structural problems. Indian Affairs' Great Plains Regional Facilities Office in Aberdeen, S.D., began the gymnasium as an "Emergency Project" in October 2007 with Rosby's design and with the AutoCAD drafting work done by Indian Affairs Engineering Technician Phil Livermont. Rosby also supervised the civil, structural, mechanical, and electrical engineering design. After four months, the building design was completed and construction by Ghost Bear Contracting/RCS joint venture (both South Dakota companies) was completed in April 2009, 18 months from the date the design began. (See Page 3).

Rosby joined Indian Affairs in 2001. Prior to that, he was an architectural and environmental consultant on public school projects in North Dakota and tribal projects in North and South Dakota.

### PUBLIC NOTICE

Official Business  
Penalty for private use \$300

Suite 335 1011 Indian School Road NE Albuquerque, NM 87104

Office of Facilities Management and Construction

Office of Facilities, Environmental and Cultural Resources

Assistant Secretary-Indian Affairs

DEPARTMENT OF THE INTERIOR  
UNITED STATES

OFECR

The Office of Facilities, Environmental and Cultural Resources oversees the Office of Facilities Management and Construction, the Division of Safety and Risk Management, and the Division of Environmental and Cultural Resources Management.

## Office of Facilities, Environmental and Cultural Resources Management Summary

JULY 2009

INDIAN AFFAIRS

### Prototype at Pine Ridge

## OFMC to Construct Justice, Law Enforcement and Detention Facility in One Complex

OFMC will fund the construction of a justice services complex on the Pine Ridge Reservation in South Dakota. The complex will include an Office of Justice Services police headquarters, a justice facility for courts, a short-term detention facility and five employee housing units. The complex will be located next to the existing Oglala Sioux detention center, a longer-term facility. The expanded justice services complex, which will be designed using OFMC's space guidelines and standard design templates for detention centers, will serve as a prototype for future Indian Affairs-funded justice services-detention complexes.

The FY2009 budget allows Indian Affairs to fund the construction of Indian Country justice centers, law enforcement

headquarters and detention facilities. The U.S. Department of Justice (DOJ) had funded the construction of dozens of detention centers across Indian Country, and OFMC is providing Operations & Maintenance for those jails. However, DOJ guidelines limit its construction funding to detention centers.



The justice services prototype will adjoin the 56,500 square foot Oglala Sioux Adult Offenders Facility, which holds 144 adult inmates and opened in 2006.

### Sharing Costs

## OFMC Affirms Policy on O&M Funding for Replacement Schools with Tribal Add-ons

Tribal cost sharing has augmented OFMC's determination of allowable square footage for several recent replacement school construction projects. However, the increased size of a new school does not mean it will receive Operations & Maintenance (O&M) funding for the tribally funded square footage. Instead, O&M funds are provided for a percentage of the gross square footage of the tribally augmented project and are based on allowable square footage as determined by OFMC and the Bureau of Indian Education.

In determining the O&M funding for replacement school construction projects which are augmented by tribal cost sharing, OFMC relies on its School Facilities Design Handbook and School Facilities Space Guidelines. The handbook and guidelines, along with the school's enrollment (actual and projected) and curriculum, play a fundamental role during the planning and design of a replacement school to determine OFMC's funding for the proj-

ect. Using similar criteria, the anticipated O&M for the replacement school is established during this planning and design phase.

"We welcome tribal cost sharing because it usually results in expanded capacity and opportunities for the students, but we have to follow our guidelines in determining O&M for a replacement school," said Charles Thomas, Chief of OFMC's Division of Operations and Maintenance. "We have limited O&M funds, and they are committed to those spaces that we determine are necessary to educate BIE students."



The Sac and Fox Tribe and OFMC shared in the cost of constructing the Meskwaki Settlement School. The tribe also will fund part of the O&M for the replacement high school in Tama, Iowa, which will be dedicated this summer. These clerestory windows are part of the school's LEED-inspired design to add daylight.

To provide for tracking O&M in replacement schools in which a tribe has shared in the cost of the project, FMIS is being adjusted to determine O&M funding based on the percentage of allowable square footage within the gross square footage of the completed replacement school. For example, if a boiler needs replacing in such a school, OFMC pays for a percentage of the replacement cost and the tribe pays the remainder.

# Briefs

## Midwest Region Schools Advised on Energy Use

Four Midwest Region schools which have shown high energy usage—Flandreau Indian Boarding School in South Dakota; Nay-Ah-Shing and Fond du Lac Ojibwe schools in Minnesota; and Hannahville Indian School in Michigan—have received retro-commissioning plans to optimize the performance of existing systems or to replace equipment. Generally, the plans show that each school will benefit by refining its use of its energy management control systems, sealing building envelopes and improving outside air controls. Upgrading to energy-saving lighting fixtures and replacing some HVAC equipment was recommended, as well. For three schools, renewable energy sources such as solar panels for heating water and for generating electricity, or wind turbines for generating electricity, were not recommended due to the length of time needed for energy savings to recoup the initial investment.

## Green Laundry Proposal by Haskell in Backlog

Haskell Indian Nations University has added to its FMIS backlog a project to consolidate its dormitory laundries into one new green laundry featuring photovoltaic panels and wind turbines to create electricity, solar water heaters for washing machines, and rooftop drying towers. Grey water impurities would be digested by plants and organisms and the water piped to wetlands. The building would be heated and cooled with the assistance of a closed-loop, ground source heat pump.

## Employee Housing

### Right-sizing Plan to Emerge from Indian Country Surveys

The OFMC Employee Housing Program is completing the second of its two nationwide condition assessment surveys of Indian Affairs employee housing. A Master Housing Plan then will be created for all 131 surveyed locations across Indian Country. It will identify unneeded housing units at each location and those units which need renovation or replacement. To right-size the number of Indian Affairs employee housing units, the Master Plan will spell out a 10-year demolition effort to remove the unneeded housing units from the employee housing inventory. The Master Plan also will be used to request appropriated funds for the demolition.



Employee housing assessment inspector Michael Morrison examines a door frame of a home at Tohono O'odham High School in Arizona while Papago Agency Quarters Manager Lee Ivey looks on.

The first survey, conducted in 2007, assessed the condition of 3,116 housing units at 84 locations that have 10 or more units. The now-concluding second phase focused on 47 locations, each with under 10 units, for a total of 275 employee housing units. Another 29 locations, which have all housing in good condition, were each part of a replacement school construction project during the past decade. The construction of new employee housing units was funded as a part of the total replacement school project.

Rental receipts from employee housing tenants are not sufficient to address the deferred maintenance backlog for each location's necessary employee housing units, especially where there are only a few units. Funds from the American Recovery and Reinvestment Act will be used to renovate some units in those locations. Other funds will still be needed to remediate hazardous materials in many housing units.

### Replacement Campus Ready at Dilcon Community School



The replacement campus for Dilcon Community School (above) in Arizona is nearing completion. It will serve 307 students in grades K-8. The 61,319 square foot school and 18,357 square foot dormitory, which will house 80 students, is utilizing natural lighting as part of its anticipated U.S. Green

Building Council Silver Leadership in Energy and Environmental Design (LEED) Rating. The former school's gymnasium (upper left), and former dormitory and kitchen will be demolished when the new project is completed. The OFMC Project Manager is Phil Asmus.



Phase Two of Wingate Project: High School and Dormitory Underway Near Gallup, N.M.

The massive, two-phased Wingate replacement school project is heading into the homestretch with construction of the new 143,000 square foot high school (above right) and its 137,900 square foot dormitory (above left), adjacent to the completed 287,000 square foot elementary school and dormitories in Ft. Wingate, N.M., near Gallup. The high school is being constructed by the U.S. Army Corps of Engineers for 800 students, including 512 in the dormitories. The elementary school was built by the Corps in 2005 for 850 students, including 550 in its dormitories. The OFMC Project Manager is Barbara Borgeson, a member of the Comanche Nation of Oklahoma.

### Red Water Elementary Has Ground Source Heat Pumps

The Red Water Elementary School in Carthage, Miss., (right) will be ready for its 119 students in grades K-8 this fall. The school includes ground source heat pump technology for heating and cooling. The OFMC Project Manager is Eastern Region Facility Manager Johnny Parham.



### Pueblo Pintado Replacement School and Dormitory Rises

A new campus for the 387 students at Pueblo Pintado Community School in New Mexico will feature a 71,000 square foot replacement school and a 21,000 square foot dormitory. Construction is



Pueblo Pintado Community School Principal Notah Benally visits the school's new dormitory, while workers prepare the school gymnasium entrance (inset).

set to begin on a second dormitory funded by the American Recovery and Reinvestment Act of 2009. The new K-8 school has a ground source heat pump, closed loop heating and cooling system. It includes a honeycomb-shaped, roof-top heat recovery unit which captures heat from air leaving the building and uses that heat to warm incoming air. The OFMC Project Manager is Renee Allen, a member of the Hopi Tribe.

Continued from Page 6.

goal of the TERO is to ensure "positive business and employment practices on the reservation," St. Clair said.

He said all organizations seeking to do business on the Eastern Shoshone and Northern Arapahoe reservation must register with the TERO, pay a 2 percent TERO fee, and comply with the tribes' employment requirement. Approximately 40% of the fee revenue is used for TERO administration and 60% is used for employment and safety training, community programs, and regulatory compliance.

OFMC's standard construction contract language calls for construction contractors and subcontractors to employ American Indian workers "to the extent feasible" and to provide on-the-job, classroom or apprenticeship training.

Franklin Cook, Senior Superintendent for Hall-Irwin Construction, the construction contractor for the St. Stephens Indian School project, said he has found the local TERO to be "efficient." While most of the American Indian workers presented by TERO have limited construction skills, Cook said one TERO worker has been able to serve in an apprenticeship training capacity to gain journeyman status.

OFMC Deputy Director Emerson Eskeets has found TEROs to be crucial to ensuring American Indians gain employment opportunities at projects funded by OFMC: "They focus on hiring practices, and that's beneficial for American Indians."

The OFMC Project Manager for the St. Stephens Indian School is Rocky Mountain Regional Facility Manager Bruce Ward.

# FOCUS

## OFMC Funding Assists Indian Employment at St. Stephens Indian School

The nation's top Tribal Employment Rights Office (TERO) is working with St. Stephens Indian School construction contractors to provide employment opportunities for local tribal members and other American Indians.

The Shoshone and Arapahoe TERO, which received the 2008 National TERO of the Year Award from the Council for Tribal Employment Rights, has been ensuring that a minimum of 50% of the workforce at the OFMC replacement high school project in St. Stephens, Wyo., are American Indians, as required by an Eastern Shoshone and Northern Arapahoe tribal ordinance.

"St. Stephens is doing well, especially in safety," said Director of the Shoshone and Arapahoe TERO Darwin St. Clair, Jr. He said TERO Compliance Officer Julius Lajeunesse visits the construction site two or three times a week to assist with labor pool issues. While the TERO can supply a list of some 800 people looking for jobs on the reservation, many of the subcontractors on the St. Stephens project have already hired American Indian workers.

The local TERO defines American Indian workers in six priority levels beginning with enrolled Eastern Shoshone and Northern Arapahoe tribal members, or their spouses, and continuing through members of other tribes. The

*Continued on Page 7.*

## Seeing is Believing

### Circle of Nation's Facility Manager Rob Peck Writes: Ground Source Heat Pump Savings Prompt Conservation



Rob Peck

The Circle of Nations – Wahpeton Indian Boarding School's ground source heat pump utility cost savings for the 2007-2008 school year is \$85,261 compared to utility costs for the previous school year. In addition to the savings, students and staff here in North Dakota now enjoy air conditioning in all campus buildings. Before the ground source heat pump project, there was no air conditioning in our buildings.

Our savings come largely from the decline in our natural gas bills for the year, yet it includes our utility cost for an additional 130 outdoor high pressure sodium lights installed throughout the campus as part of the Facility Improvement & Repair (FI&R) project which funded the ground source heat pump system in 2006.

After I attended a building automation controls training (for ground source heat pump, closed loop system for heating and cooling) in Sioux Falls, S.D., last week (April), I believe the knowledge from this training, when applied to our control system, will cut another 10-15% off of our utility billings for next year. To date, we have not used some features of the building controls, the most efficient one being the scheduler. This feature will allow us to reduce the use of the heat pumps in the classrooms at night or during the day when students are not in the dorms. Also, the new outdoor lights are capable of being controlled through our building automation controls, allowing us to shut off lights when students are not on campus.

We have set up a training area at the school for staff to keep updated on technology we acquired with the ground source heat pump. In the training area is a working heat pump, controls, piping, and pumps, which makes it convenient to train several of our staffmembers at one time. I have gained considerable knowledge of the system through my last couple year's experience, and I have been training the Circle of Nations staff on the entire system. Staying up to date on the technology allows us to more effectively control the usage of our HVAC system.

Finally, we have been doing considerable research into wind energy. We recently visited a school in Iowa that uses geothermal heating and cooling and has two large wind turbines on its grounds. Hopefully, our school will be doing more about conservation of our natural resources in the near future. — Rob Peck



The closed loop system (top) at Circle of Nations sends a water/glycol mixture through polyethylene piping (now covered over). The earth-warmed/cooled mixture is circulated by pumps (middle) to a classroom heat pump (below) where it assists in heating or cooling.

## American Recovery and Reinvestment Act of 2009

### Indian Affairs' Major Projects Come Into Focus Throughout Indian Country

#### Replacement School Construction

**Rough Rock Community School, Arizona:** Build a K-12 school (on two campuses) for 417 students, including 188 residential students. One campus will be an elementary school and two dormitories with a kitchen and dining facility— a K-8 dormitory will house 86 students and a high school dormitory housing 102 students in grades 9-12. The other campus will consist of a renovated high school. A bus garage/maintenance shop and transportation office will be constructed. In total, 113,382 new square feet will be added, while about 144,000 square feet of old buildings will be demolished.

**Crow Creek Tribal School, South Dakota:** Construct one K-12 school for students who are now attending school on two campuses

#### Facilities Improvement & Repair

**Standing Rock Community School, North Dakota:** Replace plumbing and electrical throughout the academic buildings. Remodel restrooms; improve building accessibility and safety.

**Flandreau Indian School, South Dakota:** Renovate 19 buildings, including dormitories. Improve building accessibility and safety. Demolish an old dormitory building.

**Marty Indian School, South Dakota:** Renovate seven academic and dormitory buildings.

**Kin Dah Lichi'i Olta, Arizona:** Renovate five academic buildings. Renovate domestic sewer and natural gas mains and service lines.

**Pine Hill Schools, New Mexico:** Renovate 21 academic buildings, including repairing or replacing roofs. Renovate domestic sewer mains and service lines.

**Pine Ridge School, South Dakota:** Replace HVAC systems in the elementary school and the high school. Upgrade the fire alarm system throughout the campus, Demolish a dormitory building.

**Hopi Junior/Senior High School, Arizona:** Repair or replace HVAC system components. Renovate school building, including kitchen.

#### Detention Center Renovation

**Rosebud Detention Center, South Dakota:** Replace roof, power and lighting systems throughout the building. Make HVAC repairs to ensure energy-efficient operation.

**Turtle Mountain Detention Center, North Dakota:** Upgrade electrical and security systems. Upgrade lighting to improve security and to reduce energy use.

separated by 15 miles. LEED Silver Certification is anticipated for the new construction, which will adjoin the new gymnasium (see Page 8). About 18 old buildings will be removed from the Indian Affairs facility inventory.

**Pueblo Pintado Community School Dormitory, New Mexico:** Complete the replacement school project (see Page 6) by constructing an additional 15,000 square foot dormitory for 70 students.

**Ojibwa Indian School, North Dakota:** Construct a 5,000 square foot bus garage to complete the project.

**Kaibeto Boarding School, Arizona:** Begin the K-8 replacement school project with a new dormitory for residential students and a cafeteria.

**T'iis Nazbas Community School, Arizona:** Renovate six academic and dormitory buildings.

**Yakama Tribal School, Washington:** Renovate four academic buildings, including new roofing. Install a fire detection/alarm system and a fire sprinkler system.

**Sherman Indian High School, California:** Renovate 15 academic and dormitory buildings, including new roofing, electrical and plumbing. Demolish an old dormitory building.

**Cibecue Community School, Arizona:** Renovate academic building and add four new portable classroom buildings while demolishing four old portable classrooms.

**Ch'ooshgai Community School, New Mexico:** Renovate four academic buildings. Install sidewalks and upgrade sewer lagoon.

**Nenahnezad Boarding School, New Mexico:** Renovate seven academic and dormitory buildings. Install new central fire alarm system, including a lightning protection system because the site is prone to lightning strikes.

**Hunters Point Boarding School, Arizona:** Construct a 8,000 square foot, pre-engineered classroom/library. Demolish the old building. Upgrade the campus sanitary sewer system.

**Hopi Detention Center, Arizona:** Upgrade HVAC, electrical and security systems. A photovoltaic system will provide additional energy.

**Cheyenne River Detention Center, South Dakota:** Address accessibility and life safety code requirements.

**Fort Belknap Detention Center, Montana:** Upgrade HVAC, security and electrical systems. Upgrade handicap accessibility and replace carpeting.

# Nazlini Net Zero



This preschool building (left) at Nazlini Community School in Arizona will be demolished to make way for the new fire station (right), set in the existing background by WHPacific Senior Architectural Designer Louie Martinez.



The Department of the Interior's first net zero energy building will be an OFMC Structural Fire Protection Program fire station at Nazlini Community School.

The Department of the Interior's first net zero energy building—an Indian Affairs fire station at Nazlini Community School in Arizona—will begin construction this year. To create the design concept for the net zero energy building, OFMC's Structural Fire Protection Program (SFPP) is partnering with the National Renewable Energy Laboratory (NREL), the Navajo Tribal Utility Authority (NTUA) and WHPacific architects and engineers.

Tsosie Tsinhnahjinnie, a member of the Navajo Nation, is the OFMC Project Manager on the project.

A net zero energy building is one that, on an annual basis, uses no more energy from the utility grid than is provided by on-site renewable energy sources. In general, a net zero energy building produces as much energy as it uses over the course of a year. Net zero energy buildings use 50-70% less energy than comparable traditional buildings. The majority of energy used comes from renewable sources, like solar panels or wind turbines, incorporated into the facility.

The typical SFPP fire station design incorporates a prefab metal fire station (38'x50') designed for two fire trucks (apparatus room), an office, staff lounge, men's and women's restrooms and parking area along with handicapped parking. The standard design includes an outdoor air handler using refrigerated air and typically either natural gas or propane for heating, a vehicle exhaust removal system, emergency eye wash, dusk- to-dawn security lighting, energy-efficient lighting fixtures, and water-saving plumbing fixtures.

The Nazlini fire station is redesigned from the SFPP prototype using the net zero energy building concept.

In addition, the new fire station project involves analyzing and selecting a proposed building envelope, HVAC and electrical system that will provide the maximum energy performance savings at a life-cycle cost no greater than the baseline building minimum energy design prescribed by ASHRAE 90.1-2004 (the American Society of Heating, Refrigerating, and Air Conditioning Engineers). The United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Green Building Rating System for New Construction is being used as a design guide for improving the building's energy performance.

## Photovoltaics

The Nazlini building will produce at least 75% of its required energy through the use of on-site renewable energy. Photovoltaic (PV) panels have been identified as the renewable energy source suitable for this site.

The PV system is a Grid-Tie system with electric utility Net Metering and without battery backup. This renewable energy source reduces the building operating costs to near a net zero energy level. The system is sized and configured for net zero electricity usage.

The system consists of roof-mounted PV modules, a roof mounting system, a cabling system, cabling from the PV strings to a string control and to a DC-to-AC Grid-Tie Inverter, PV system power meter, surge suppression, grounding, and required DC and AC-fused disconnect switches. The electric utility will provide a utility meter capable of Net Metering. The DC-to-AC inverter converts the DC voltage generated by the PV modules during daylight hours to 240V AC power required to power the building loads. The PV system will need to generate approximately 9.9 Kilowatts to provide sufficient general use electricity for the building during normal occupied daytime use, and to meet the requirements for net zero electricity usage.

Net Metering allows the building to operate primarily from the PV modules and only use utility power when building electrical loads exceed the capacity of the PV system, such as when an overhead door and vehicle exhaust fan is operated or after sunset. The excess electricity generated by the PV system can be credited towards the electric bill. The overall electrical utility power usage should be close to zero for each monthly billing cycle throughout the year. This type of PV system meets the requirements for zero energy usage, is the more economical solution, requires fewer PV modules, and eliminates costly batteries and the associated maintenance. It also eliminates the building space taken up by the batteries and the special containment and ventilation they require.

PV modules in the 19% efficiency range will be provided. They have more power from a given unit area, require fewer panels and allow a lower roof weight load and lower installation cost. Warranty duration and coverage and long-term durability and efficiency also are important considerations. PV modules will be orientated toward true south and be tilted to maximize the system efficiency. Derating factors will be applied when determining the number of PV modules required to produce the 9.9 Kilowatts needed for the building. These derating factors account for production tolerances, ambient temperature variation, dirt and dust accumulation between cleaning cycles, wiring losses, and DC-to-AC conversion losses. Maintenance



The project will lower federal fossil-fuel energy consumption and demand, save taxpayer dollars, and reduce environmental impact.



requirements for this system are minor. To maximize the system efficiency, PV modules will need to be cleaned four times a year.

OFMC, NREL, and WHPacific are in the process of developing a formal Net Metering policy with NTUA, along with the electrical tariffs for a Grid-Tie system. The design team is working with NTUA on a PV system design standard and approval process for the PV system.

## Natural Gas

The fire station is considered a near zero energy building because it will use natural gas available at the site—for heating the large apparatus bay (garage area) and for the furnace portion of the split air conditioner system (this helps minimize the size of the PV system so all panels can be located on the roof of the fire station and improves the payback period). A radiant heating system will be used for heating in the apparatus room. Clerestory windows mounted high in the space will provide additional passive heating for the large fire truck parking area. A gas-fired radiant (infra-red) heating system will emulate the efficiency of the sun by generating radiant energy that will be converted into heat when absorbed by objects in its path. Once the

infra-red energy is absorbed by the floors, machinery, stock, and people, it will then be re-radiated to warm the surrounding air. This method of heating, as opposed to filling a room with warm air (such as by using a forced air unit) will allow the source of heat to begin at the floor level and not the ceiling, making it the most efficient and effective method in which to heat under the diverse conditions present in garage areas, warehouses, storerooms, etc.

The office area will be served by a high efficiency split system with indoor air handler with refrigerant coil, gas-fired furnace and outdoor condenser using R-410a refrigerant with a seasonal energy efficiency rating (SEER) of 18. The indoor air handler will provide the heating, ventilation and air conditioning (HVAC) for the office area. The split system SEER will exceed current energy standards design prescribed by ASHRAE 90.1-2004. This refrigerant is environmentally sound and is designed not to harm the earth's ozone layer. Federal law requires that all manufacturers phase out ozone depleting refrigerants in the next few years. R410a refrigerant is approved by the U.S. Environmental Protection Agency (EPA) as a replacement for Freon 22. The heating portion of the air conditioner will be 96.6% efficient, exceeding the energy standard prescribed by ASHRAE 90.1-2004.

## Insulation

The building will be a 1,900 square foot single story pre-engineered metal building consisting of concrete footings and concrete slab on-grade with rigid board perimeter insulation with an insulation value of R=10. The building envelope and roofing system in a standing seam profile will consist of an insulated steel metal panel system with a insulation value of R=35.7. The insulated steel metal panels will have 31% total recycled contents and low-emitting VOC (volatile organic compounds) sealants supplied with the metal panel system in line with LEED. The building envelope will use a cold storage design concept in which the building will be sealed from the inside and from the outside, holding energy losses to a minimum. The windows will be triple pane glazing insulated units, "Super Peak Performance" low E2 with an insulating value of R=10. The exterior doors will be 1¾" thick, metal and insulated with an injected polyurethane core for a value of R=14.3. The interior materials will consist of steel stud framing with gypsum wall board and acoustical insulation. Finishes will be ceramic tile, VCT flooring, exposed concrete floors, acoustical lay-

in ceiling and a gypsum board suspended ceiling.

## Lighting

For natural day lighting, the translucent roof skylight panels were deleted in the high bay area from the original design, and the roof now will be used for the PV system. Instead, triple-pane glass with two heat mirror films and aluminum frame clerestory windows will be provided for day lighting in the high bay (apparatus room) with a insulating value of R=8.03. In the winter, solar heat gain will be generated from the windows for added heat, in addition to the day lighting. Four windows will be provided in the high bay area with an overhang sized to shade windows in the summer and allow the sun to passively heat the space in the winter. Since the windows serving the office and lounge were studied and were found to provide adequate day lighting, no skylights will be provided for the office or lounge.

Energy-efficient lighting with the newer T5 lamp and electronic ballast technology will be used. The lighting throughout the facility will use occupancy sensors for energy savings. A time clock will be used for outdoor lighting so that it may be turned off after normal hours of required lighting (sunset to 11:00 p.m.).

## Water

The building hot water heating system will use a 30-gallon natural gas sealed combustion water heater with direct venting with 96% air-to-fuel utilization efficiency (AFUE). The plumbing fixtures will be low flow type and energy efficient. The high efficiency toilets (HETs) will consume a minimum of 20 percent less water than the 1.6 gallon per flush (gpf) models mandated by EPA. The toilets' water usage will be 1.28 gpf.

## Commissioning

Commissioning will include the building envelope (using blower door testing and infrared technology), electrical power, lighting, PV and HVAC systems. After construction, a weather station will monitor the ambient conditions, provide verification and monitoring of the building operation. Data to be collected includes incidence solar radiation, wind and rainfall. The PV system meter will be used for monitoring the energy generated by this system and usable electrical energy output. Data on natural gas usage also will be collected by the natural gas meter for monitoring purposes.