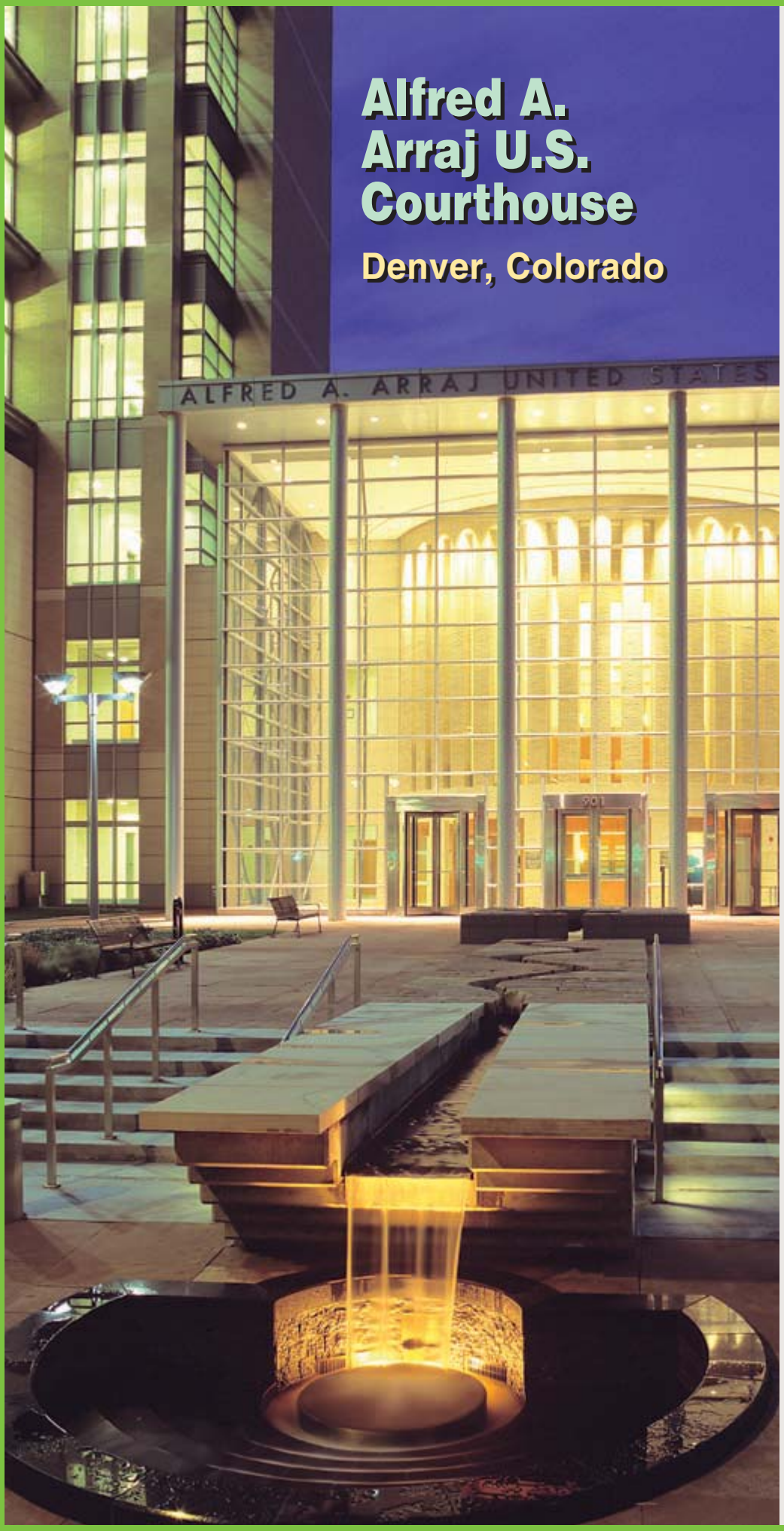


Alfred A. Arraj U.S. Courthouse

Denver, Colorado

A Model of Sustainability

On the northwest edge of downtown Denver a new Federal courthouse is the latest addition to a four-block district that exemplifies the Federal Government's presence in the Mile High City for the past 100 years. With each building in the district symbolizing the dignity and permanence of the government, each also reflects the unique time period in which it was designed. Completed in 2002, the Alfred A. Arraj U.S. Courthouse is a model of sustainability symbolizing a renewed environmental awareness that is becoming increasingly more important in the 21st century.

The courthouse was built by the U.S. General Services Administration's (GSA) Public Buildings Service, which has a tradition of promoting technical innovation and plays a leadership role in providing environmentally sensitive building design, construction, and management practices. Federal buildings must reflect the image and values of the United States and respond to the obligation of all citizens to be stewards of the environment.

The Arraj Courthouse, designed by HOK and Anderson Mason Dale Architects, houses the U.S. District Court for the District of Colorado and the U.S. Marshals Service. The 320,000 square foot facility includes a 10-story tower with 14 courtrooms and a 2-story pavilion housing the Special Proceedings Courtroom. The Arraj Courthouse is an example of GSA's continuing commitment to Design Excellence, a program to attract the best design talent available for creating outstanding facilities to serve the American public.

Site Selection and Orientation

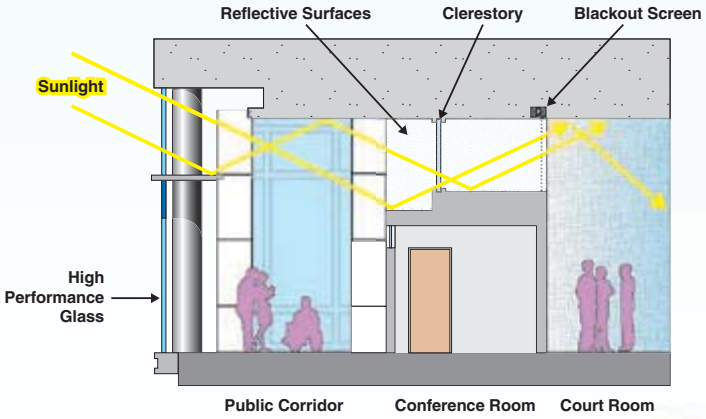
The building completes a four-block Federal district delineated by 18th and 20th Streets and Curtis and California Streets. It is adjacent to Denver's rapid transit system and multiple bus stops to enable public transportation access. A collaborative effort between GSA, Denver and public groups made this building compatible with development objectives for the central business district. The building meets the Judiciary's current space requirements allowing for future expansion needs and is designed for a 100-year life expectancy.

Landscape Features

The 2-story pavilion with the public entrance and Special Proceedings Courtroom is positioned on a southeast-oriented landscaped plaza and recalls a historic courthouse-in-the-square. The plaza paving of local stone is set in sand beds rather than concrete to absorb water and help control runoff. The plaza contains a xeriscape of hardy regional plants that are low maintenance and drought tolerant. A water feature runs from the sidewalk to the building entrance symbolizing nearby streams of the high desert.

Materials

Carefully selected building materials maximize the benefits of durability, local production, recycled-content and certified wood. Interior floors of Spanish limestone are light in color and durable. Local materials include exterior stone paving and pre-cast concrete elements. All paints and adhesives are low in volatile organic compounds and water-based. Steel and other recycled content products comply with the Comprehensive Procurement Guidelines for Federal agencies. Maple wood paneling from sustainably managed forests in Pennsylvania is used throughout the courtrooms and lobby. The courtroom flooring is cork, which is a renewable natural resource traditionally used in courtrooms in the 1920's and 30's.



Daylighting

The public corridors of the building are oriented to the southeast to maximize solar exposure. Oversized windows provide visitors with a connection to the outdoors and magnificent views of downtown Denver. Internal light shelves bounce daylight onto light-colored surfaces so that it reaches deep into the interior. Fluted glass panels bring diffused daylight into the interior courtrooms and other spaces. Automated shades can provide 50% or 100% opacity when needed. Overall, natural light is available throughout 75% of the building.

High-Performance Glazing

The original building design explored the possibility of a double glass curtainwall for the south-facing public corridors. After extensive analysis high-efficiency triple-glazed windows were selected. The initial cost was higher but the resulting reduction in heating and cooling load makes them an economical choice. Clear glazing is used above the light shelves and tinted glass is used below. Fritting is also applied in key areas to filter the sunlight entering the space.

Advanced Building Controls

The lighting system takes maximum advantage of the daylighting by incorporating electronic dimming ballasts, occupancy sensors, and low-level ambient lighting. The building automation and performance assurance system is state-of-the-art to optimize building systems within the top 20% of performance. The custom-designed energy management system monitors outside temperatures to optimize heating and cooling loads and neutralize the impact of weather extremes, weekend building closures, and other conditions that can compromise interior comfort.

Energy

The design was modeled with DOE 2.1 software to perform 46% better than a building designed to the Code of Federal Regulations energy baseline. Photovoltaic panels on the edge of the roof are projected to provide 2 to 3% of the building's electrical load, primarily reducing peak load demand. Evaporative cooling reduces the need for an electric powered chiller and is the major source for seasonal air conditioning. Variable speed fans and pumps also reduce energy usage during partial load conditions.

Underfloor Air Distribution

The courtrooms use displacement ventilation from an underfloor air system to provide thermal stratification throughout the 16-foot high space. Only the occupied area is required to be within standard temperature ranges. Air is delivered to the space at a low velocity, passing the breathing zone and exhausting near the ceiling of the space. This system is extremely quiet and provides high-quality air. A full-scale mockup and heat load test was performed to demonstrate the adequacy and proper balancing of the low velocity system before continuing with the remainder of the building. Underfloor air distribution is also used in the first three floors of offices allowing individual user control and flexibility for spatial reconfiguration.

GSA's Public Buildings Service

The mission of GSA's Public Buildings Service (PBS) is to provide a superior workplace for the Federal worker and superior value to the American taxpayer. The vision is to be the best real estate organization in the world.

PBS is the landlord of the civilian Federal Government, with a total inventory of over 339 million square feet of workspace for one million Federal employees in 2,000 American communities. This includes over 1,600 government-owned buildings, or approximately 55 percent of GSA's total inventory. The remaining 45 percent is in privately owned leased facilities.

GSA is committed to incorporating principles of sustainable design and energy efficiency into all of its building projects. As a means of evaluating and measuring its green building achievements, GSA requires all new construction projects and substantial renovations to be certified through the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) rating system. Projects are encouraged to exceed basic certification and achieve the LEED® Silver Level.

A Showcase Green Courthouse

In November of 1996 a 20-member interdisciplinary panel of leading architects, engineers, environmentalists, planners and research scientists met to recommend green building technologies for GSA's multi-billion dollar courthouse construction program. The result was guidance for incorporating green building design objectives in a Denver courthouse expansion project, later to be known as the Alfred A. Arraj U.S. Courthouse. The project team then determined which sustainable design concepts were appropriate for the project, drawing upon a study that assessed the potential costs of incorporating each strategy. First costs and life-cycle costs were considered as well as intangible benefits such as improved workplace environment, productivity, flexibility, maintainability, and occupant health and safety. Throughout the project the sustainable design measures were continuously evaluated for appropriateness and viability. After an initial budget increase of nearly 7%, most sustainable features were retained through construction cost increases, value engineering and programmatic changes. GSA is proud to showcase its first green courthouse, a model of sustainability.

Project Goals:

- Reduce electrical demand by 50%
- Provide daylighting to all building occupants
- Maximize reusable products
- Maximize flexibility to accommodate change
- Minimize construction waste
- Provide a healthy and productive work environment

Contacts

U.S. General Services Administration
Public Buildings Service
Office of Applied Science
1800 F Street, NW
Washington, DC 20405
www.gsa.gov/sustainabledesign
www.highperformancebuildings.gov

U.S. General Services Administration
Rocky Mountain Region
W. 6th Avenue and Kipling Street
Lakewood, CO 80225

Photo Credits
© Frank Oms Photographer

Produced for the U.S. General Services Administration by the National Renewable Energy Laboratory, a DOE national laboratory

September 2005

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 20% postconsumer waste