A Case Study in Sustainable Infrastructure: The Auraria Bike Pavilions

RICK SOMMERFELD
University of Colorado Denver

Keywords: Sustainable Infrastructure, Design-Build, Design for Disassembly.

INTRODUCTION

How can we better support non-motorized transportation with sustainable infrastructure in Downtown Denver? From Tokyo to Copenhagen, examples of more bike-friendly roads coupled with sheltered bike parking inundate the urban fabric. In Denver, a proposed 5280 Bike Loop linked to a vast network of biking trails prompted a similar response.

The Auraria Higher Education Center (AHEC), an educational facility in the heart of downtown Denver, houses three different universities and colleges: the University of Colorado Denver, the Metropolitan State University of Denver, and the Community College of Denver. AHEC is home to over 38,000 students and approximately 5,000 faculty and staff. It is also home to the city's highest bike theft rate.

ColoradoBuildingWorkshop operates within a framework of three Core Design Principles: Sustainability, Security, and Utilization to encourage new ridership and protect current bikers. The two bike storage pavilions designed by the 26 Masters of Architecture students house over 50 bicycles per structure. The project focuses on innovative sustainable design solutions and materials promoted by the Auraria Sustainable Campus Program. The project emphasizes building security and unique design features to attract students to utilize the structure as a bike shelter and a communal gathering space.

The building's walls are constructed from composite louvers made of steel and limestone. This innovative structural system leverages the weight of the dry-stacked limestone and the tensile strength of the steel to create tectonic elements that serve as walls, columns, shear walls, and parking spaces for the bikes. Each louver is designed for disassembly allowing the dry-stacked limestone to be reused and the steel to be recycled if the building ever outlives its useful life.

DESIGN FOR RESOURCES

To better assess the impact of the building on the environment, the students chose to assess their earliest designs using Tally software. They focused their research on carbon footprint, landfill diversion, material reduction, and embodied energy.

The Larimer Street location
Reduced the CARBON FOOTPRINT by 61% equaling 60 tons of carbon
Diverted 31 tons of WASTE which was a 45% reduction
Reduced the MATERIAL USAGE by 52% equaling 93 tons
Decreased the EMBODIED ENERGY by 57% or 679,150 megajoules

The Curtis Street location
Reduced the CARBON FOOTPRINT by 62% equaling 96 tons of carbon
Diverted 51.5 tons of WASTE which was a 53% reduction
Reduced the MATERIAL USAGE by 64% equaling 184 tons
Decreased the EMBODIED ENERGY by 66% or 1,379,000 megajoules

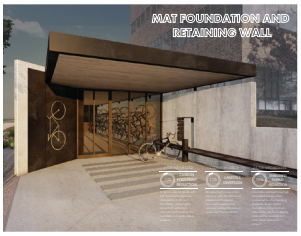
DESIGN FOR DISASSEMBLY

If the building is ultimately determined to be demolished, the design considers disassembly. The dry stacked limestone louvers are connected with stainless steel pins and clipped to the steel using stainless steel clips every four courses. This construction detail creates a monolithic louver but allows the stone to be separated from the steel so the limestone can be reused and the steel can be recycled. The CLT roof was produced in 8' x 14-15' sections. Over 85% of the panels have not been modified and are attached with screws to the steel fascia. The lights are integrated at the panel seams to help with construction tolerance and ensure the CLT panels remain largely undisturbed. These design decisions leave only the EPDM membrane and concrete mat foundation as construction elements that cannot be reused or recycled.

A Case Study in Sustainable Infrastructure:
The Auraria Bike Pavilions

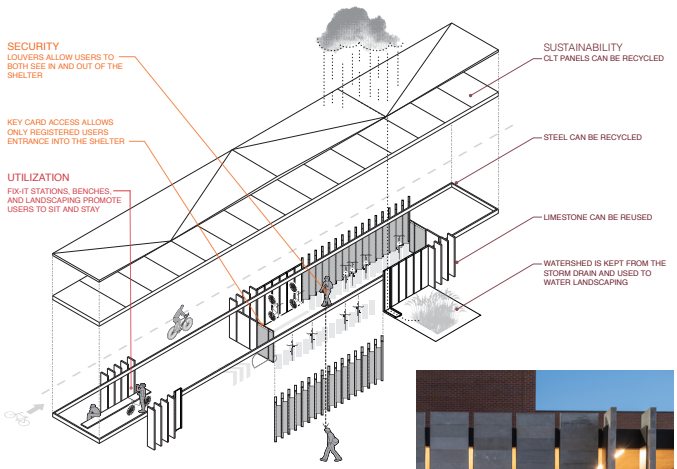
Curtis Street Bike Station

DESIGN FOR RESOURCES

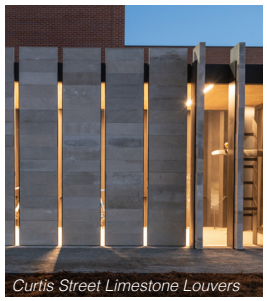


Early student design concepts and Tally software analysis

DESIGN FOR DISASSEMBLY



Detail photo of the limestone disassembly clips



Curtis Street Limestone Louvers

POSTER

Figure 1. *Poster.* Erik Sommerfeld.