Colorado Outward Bound Micro Cabins

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Name of project: Colorado Outward Bound Cabins
Type of project: Micro Dormitories

Design-Build Timeline:
(started) January 2015
(finished) June 2015

Location: Leadville, CO

Primary materials used: Steel, dimensional lumber and birch plywood

Size of building:
Each cabin is less than 200 sq. ft.
14 cabins total

Size of site: 3.3 acres

Cost of construction:
$9,500 per cabin, $133,000 total (material cost)
The design build program donated all the labor

Scope of work:
Prefabricated flat pack cabins
Designed and built in 19 weeks
Constructed at 10,000 ft. in a lodgepole pine forest

Additional information:
The cabins replaced tuff sheds and quonset huts that were being used as staff housing.
Located on a steep hillside in a lodgepole pine forest, these cabins were designed as micro dormitories for a community of outdoor educators. The cabins sit lightly on the landscape, directing views from private spaces towards trees, rock outcroppings and distant mountain views of the Mosquito Range. More public “community” views are directed into social spaces that develop from the organization of the cabins in relationship to one another. These community spaces are made up of front porches and the negative spaces between cabins.

To satisfy clients’ lodging and storage requirements, and to facilitate completion in three weeks of on-site construction, the cabins were conceived as two separate elements, a “box” and a “frame”. The “frame” acts as a storage device for the educators’ large gear (bikes, skis, kayaks, etc.) while simultaneously housing the cabin “box” and covered porches. The prefabricated cabin “box” rests in the frame under the protection of a “snow roof” designed to keep the winter snow load off the waterproofed roof below. Hot rolled steel provides a low maintenance rain screen for the box. This steel cladding and the vertical columns blend with the lodgepole forest minimizing the visual impact of the cabins. Structural taped glazing on the windows eliminates mullions and connects the occupants directly with natural views.

The interior of the cabin is skinned in CNC’d birch plywood bringing warmth to the interior and evoking a connection with the trees surrounding the site. The plywood is specifically milled to accommodate desks, beds and storage for each user. The walls and CNC’d plywood were prefabricated in Denver, flat packed onto trucks and shipped to Leadville to shorten the on-site construction timeline.

This project was designed and built by 28 graduate students in 19 weeks. A team of interdisciplinary faculty and professionals helped guide the process. The project showcases architect lead design build and the ingenuity of an integrated project delivery design team.
The semester began with an intensive three-day integrated project delivery design session. The clients, structural engineer, students and architecture faculty worked as a team to understand the history of the Colorado Outward Bound School, diagram existing housing precedents, analyze environmental data and better comprehend the social nature of the school. The outcome of the visit was to establish “core issues” and “joint positions” with the Integrated Project Delivery team.
Core Issues: Existing Housing Stock

EXISTING HOUSING CONDITIONS: TOYOTA TACOMA

STICK FRAME CONSTRUCTION
ASPHALT ROOF
EXPOSED FRAMING
OSB WALLS
NO STORAGE
FAKE WOOD SIDING
REQUIRES CONSTANT MAINTENANCE
POORLY CONSTRUCTED DOORS AND WINDOWS
ALLOW ANIMALS INTO SPACES

EXISTING HOUSING CONDITIONS: TUFF SHED

EXISTING HOUSING:
DOES NOT SUPPORT A
RANGE OF SOCIAL ENGAGEMENT

Joint Position: Increase Social Gradient

JOINT POSITION:
CREATE A VARIETY OF SPACES TO
ADAPT TO SOCIAL CHANGE

BED | CABIN | PORCH | STAFF VILLAGE | BASE CAMP
Core Issues: Gear

Joint Positions and
Diagrammatic Architectural Morphology: "Box" and "Frame"

EXISTING STORAGE NEEDS: TYPICAL OUTWARD BOUND GUIDE

- Storage bins for easy organization and mobility
- Large gear typically stored outside
- Gear for rock and ice climbing, biking, etc.

DESIGN SOLUTION
- Construct a frame to negotiate the landscape and hold the snow
- Insert a prefabricated cabin and all required staff gear

D-DECK "SNOW ROOF"
- Covered porch with dry storage area
- Prefabricated cabin with custom CNC'd birch plywood interior, durable steel clad exterior, EPDM roof and tape glazed windows
- Happy outward bound guide
- Under cabin dry storage
As the semester evolved the students presented concepts to the IPD team and clients. The feedback they received was incorporated into new design proposals and a full-scale mock-up. The students tested their prefabricated assemblies and CNC’d furniture using the mock-up, which was constructed inside the architecture building. The second floor studio, where the project was constructed, proved to be a good test for how building assemblies could negotiate tight spaces.

The outcome of the mock-up was to better understand the timeframe and budget of the project when tested against a real build. The process proved invaluable. At the conclusion of the mock-up build the students changed design details, materials assemblies and products to better fit the remote site and condensed timeline. Without this stage of the design process the project would never have been completed on time.
Engaging the consultants

The mock-up became a tool for learning about new methods of construction. The prefabricated projected windows, glazed with 3M VHB tape, evolved into an area where collaboration between instructors, students and material representatives was required to create a new waterproofing detail.

Students also tested their prefabricated Structurally Non-Insulated Panels or SNIPs. The CNC’d interior and flat stud wall framed SNIPs were designed with the structural engineer and conceived to be a lighter, more integrated way to assemble the cabins and interior furniture. It proved to created unforeseen issues with tolerance that slowed the process and compromised the craft of the cabins. The idea was abandoned for flat packed, advanced frame, prefabricated wall assemblies.

Finally the mock-up proved useful for determining the steel frame details. Various column to girder connections were explored along with tension connections for the cross bracing. Students were able to evaluate the cost of each assembly and weight it against the ease of construction and aesthetic value.
In a mere 29 days on-site the students built 14 cabins constructing everything from the steel frames to the CNC’d interior furniture and storage.
CABIN 1
FLOOR PLAN
1. QUEEN BED
2. STORAGE
3. DESK
4. SLIDING BARN DOOR

CABIN 2
FLOOR PLAN
1. BED (TWIN)
2. BENCH / DESK / UTILITY
3. STORAGE (ABOVE BEDS)
CABIN 4
FLOOR PLAN
1 EAST BED / STORAGE UNDER
2 DESK / STORAGE / OVERFLOW BED
3 WEST BED / STORAGE UNDER
4 DESK / STORAGE / OVERFLOW BED

CABIN 5
FLOOR PLAN
1 LOWER BED - TWIN
2 UPPER BED - DOUBLE
3 STORAGE
4 BENCH / DESK / TWIN BED

CABIN 5 and 4
CABIN 9
FLOOR PLAN
1 UPPER BED / UNDER STORAGE
2 DESK / STORAGE
3 LOWER BED
4 DESK / STORAGE

CABIN 10
FLOOR PLAN
1 BED (4' WIDE)
2 BENCH / DESK / UTILITY
3 STORAGE (ABOVE-BELOW BEDS)
CABIN 9 and 10
CABIN 11
FLOOR PLAN
1 TWIN BED
2 STORAGE WALL
3 DESK (FLIP DOWN DESKS)
Cabin 13
Floor Plan
1 Bed (Full)
2 Bed (Full)
3 Ying Yang Storage and Desk

Cabin 14
Floor Plan
1 Bed (Full)
2 Deep Storage
3 Mud Room
4 Breakfast Counter/ Sleeping Platform
5 Common Area