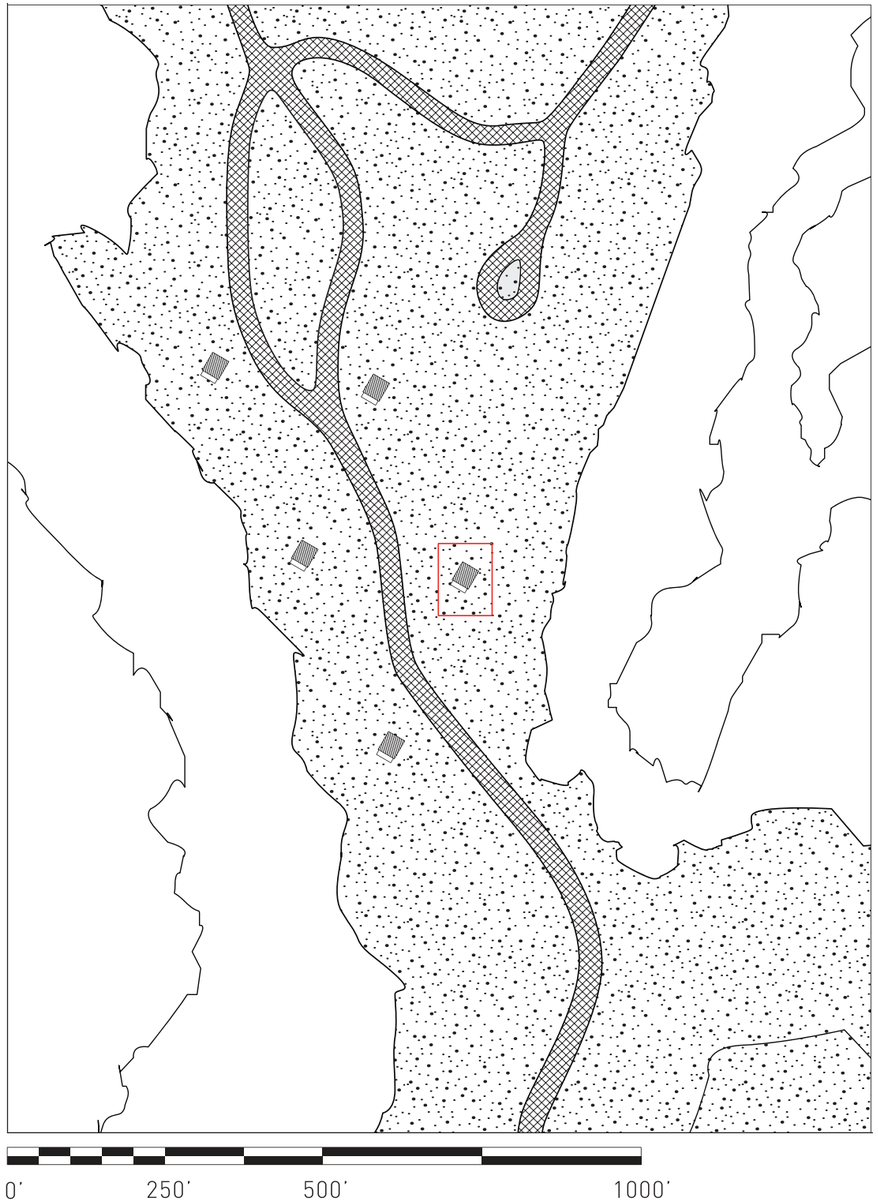
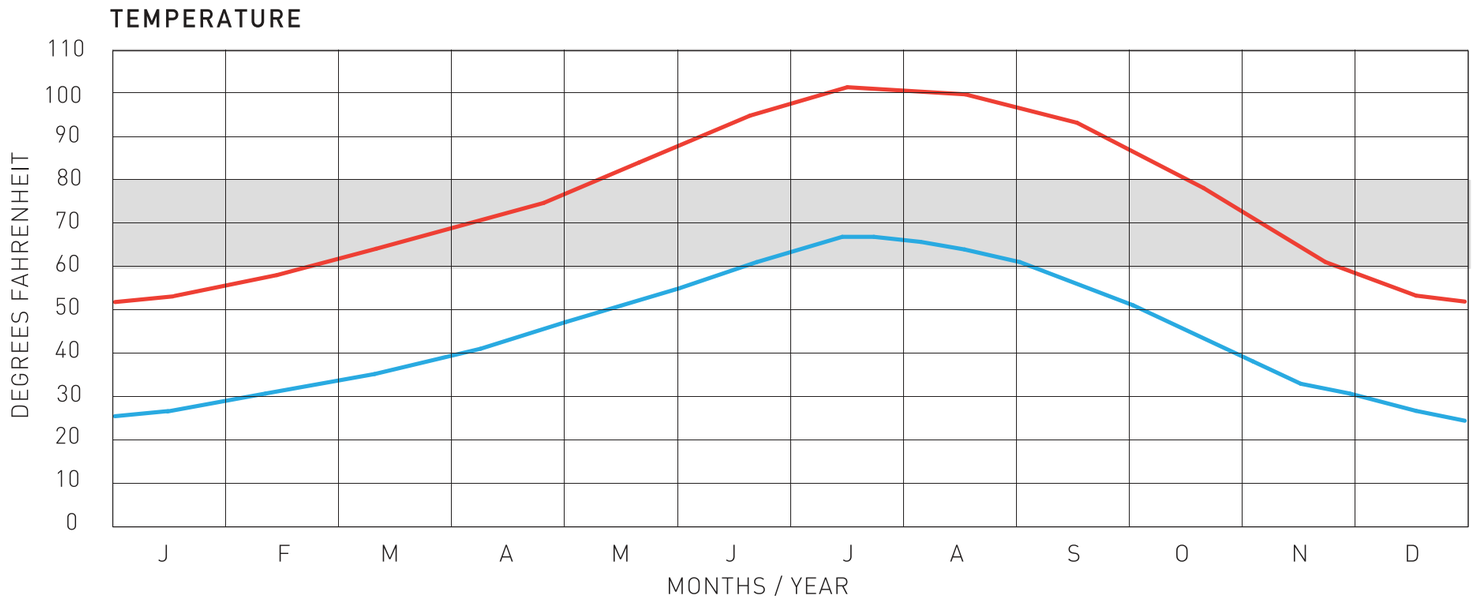
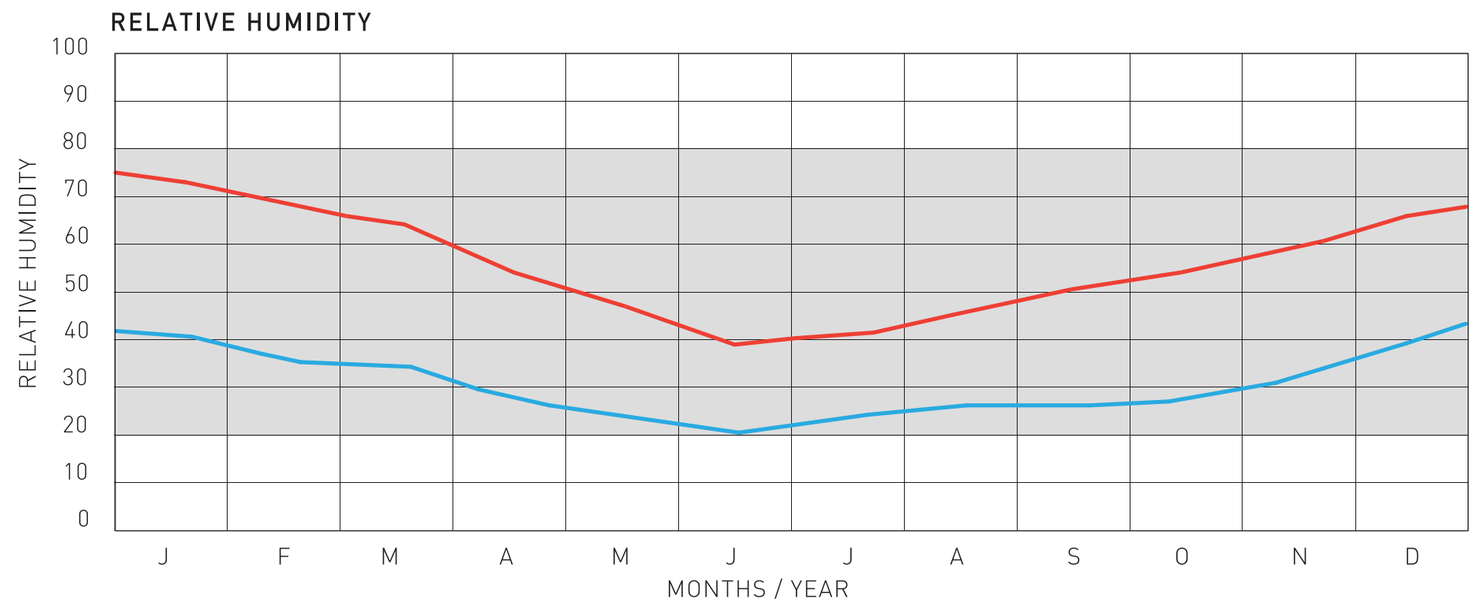
BADLANDS CABIN
SITE PLAN + CLIMATE

The Kelso Dunes campground, Mojave National Preserve, CA. This National Parks Service campground lies at the edge of the Devil's Playground, one of the largest white sand dunefields in California. Because the landscape here is constantly shifting, there are no roads, landmarks, or amenities beyond this point. The Badlands Cabins are National Parks Service rental properties designed to negotiate the harsh conditions of this remote location, incorporating operable ventilation louvres, sunshading devices, and a passive solar hydronic system.





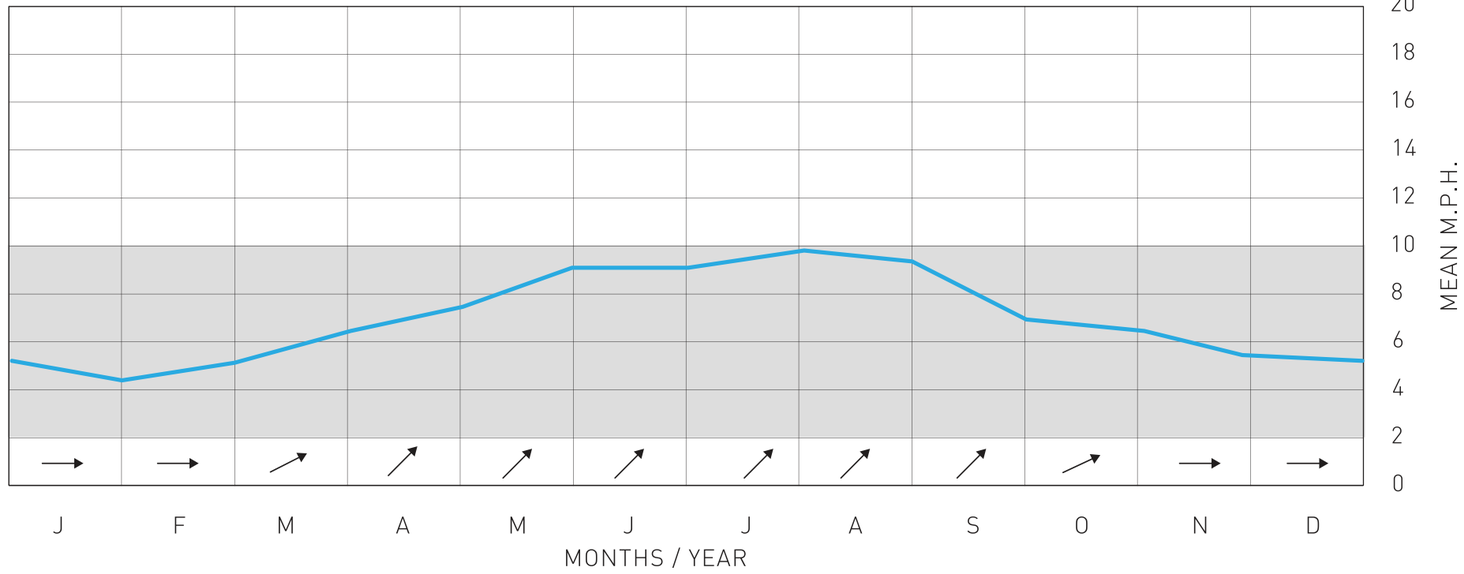


LEFT: Site plan. This campsite is located at the base of the Kelso Dunes. Beyond this point lies the Devil's Playground. **RIGHT:** Climate data.

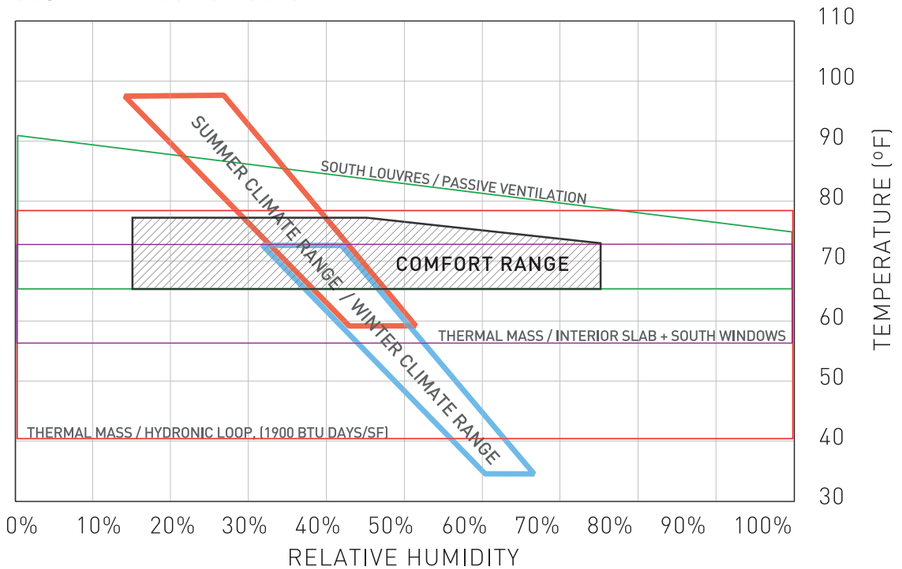
BADLANDS CABIN
SITE ANALYSIS

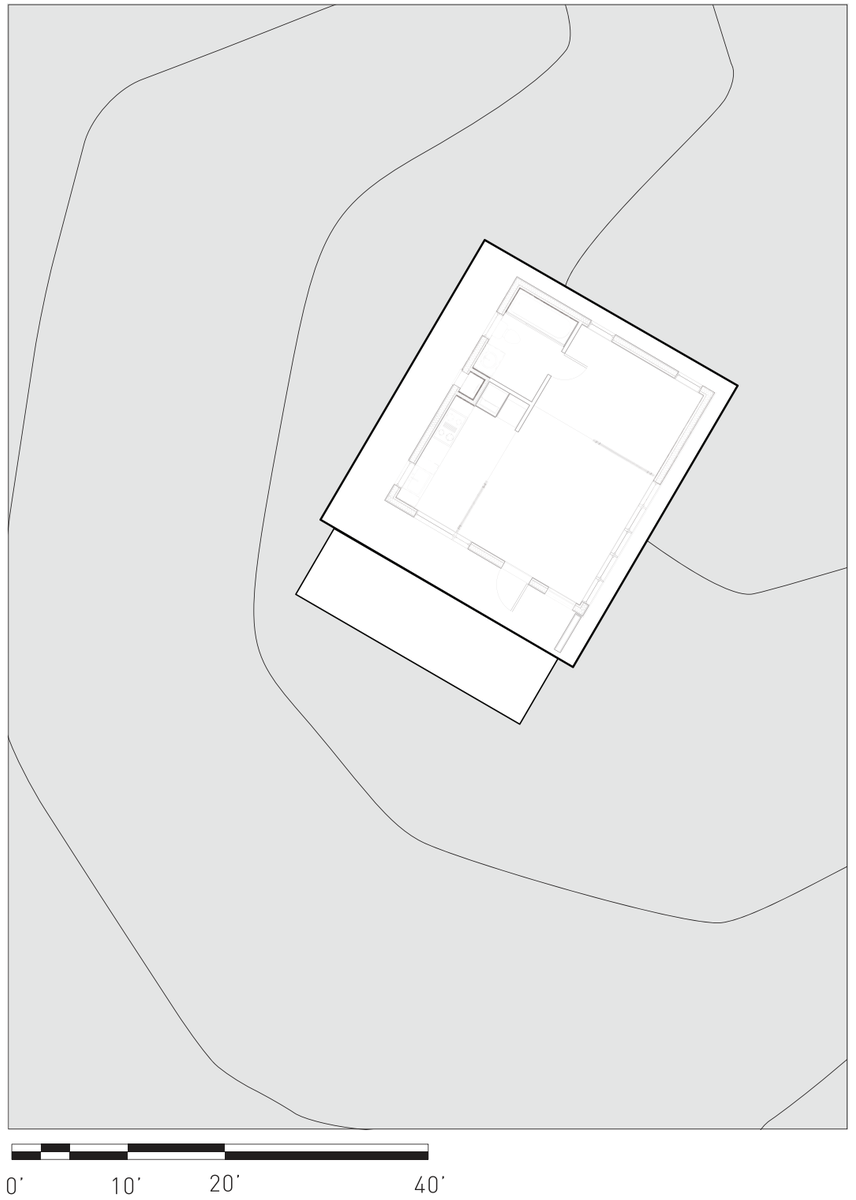
Shown here are the the analyses of several aspects of the local climate. The standard comfort ranges for each variable are shown in grey. The humidity is mild, and fluctuates inversely to shifts in temperature, providing a comfortable “dry heat” throughout the Summer. Although yearly highs of over 100ºF are common, the Winter months are far more threatening, with low temperatures well below the freezing point. The Climatic Response Chart (bottom right) shows how the harsh climatic conditions of this site are buffered using passive energy strategies.

WIND SPEED



CLIMATE RESPONSE CHART

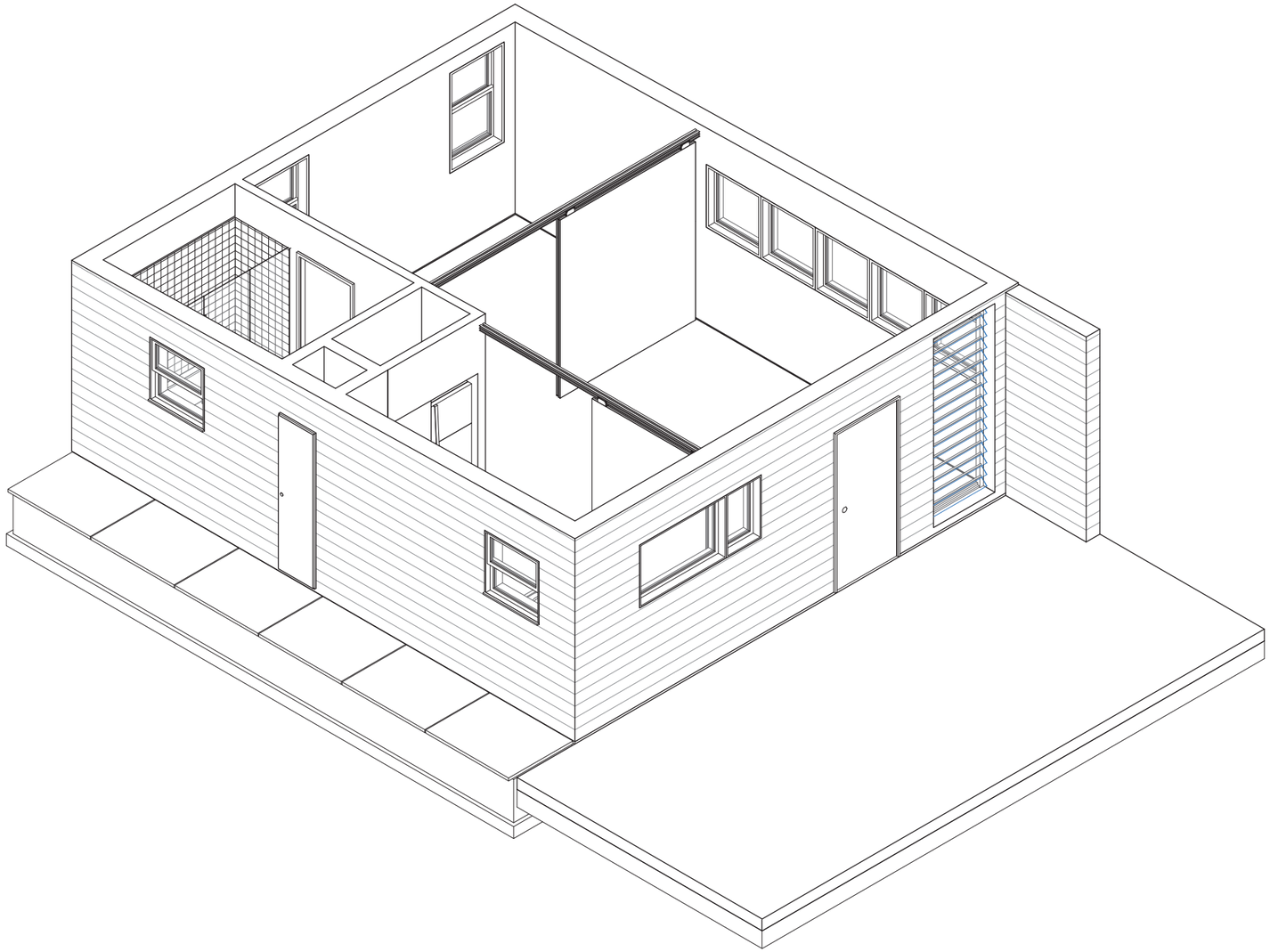




LEFT: Climate data. **RIGHT:** Detail of site plan, showing one of the five rental units.

BADLANDS CABIN
UNIT PLAN

The cabin is compact at only 450 square feet. The open plan provides a relaxed, spacious atmosphere while the opearble partition walls allow for several different configutations of public and private space. The narrow exterior deck along the Western facade conceals a shallow utility trench, which houses the hydronic mechanical system and all major plumbing connections. Adjacent utility room (located here to allow general maintainance while preserving user privacy) contains a tankless water heater, electrical breaker panel and all additional mechanical equipment.



RIGHT: Axonometric perspective.

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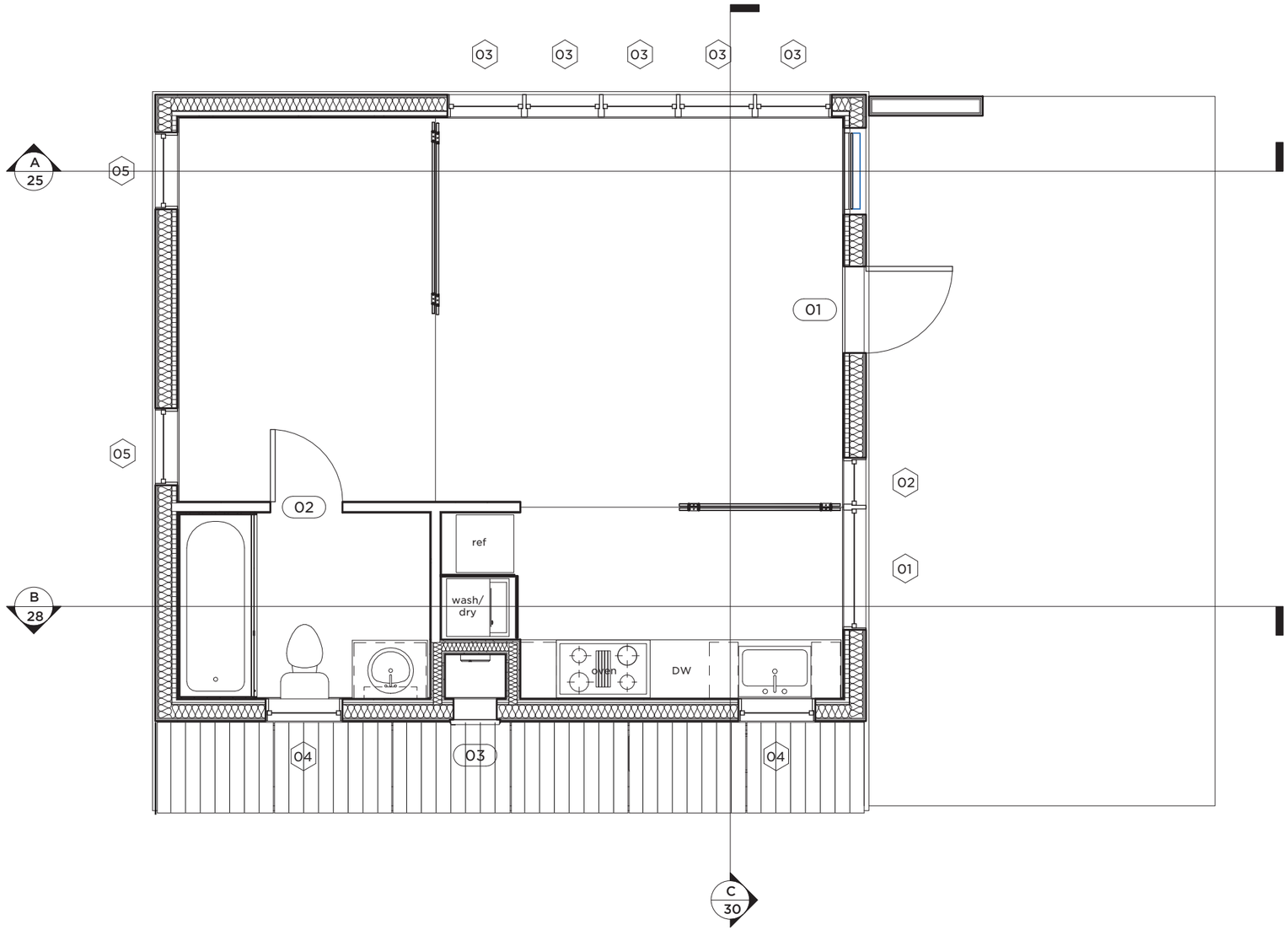
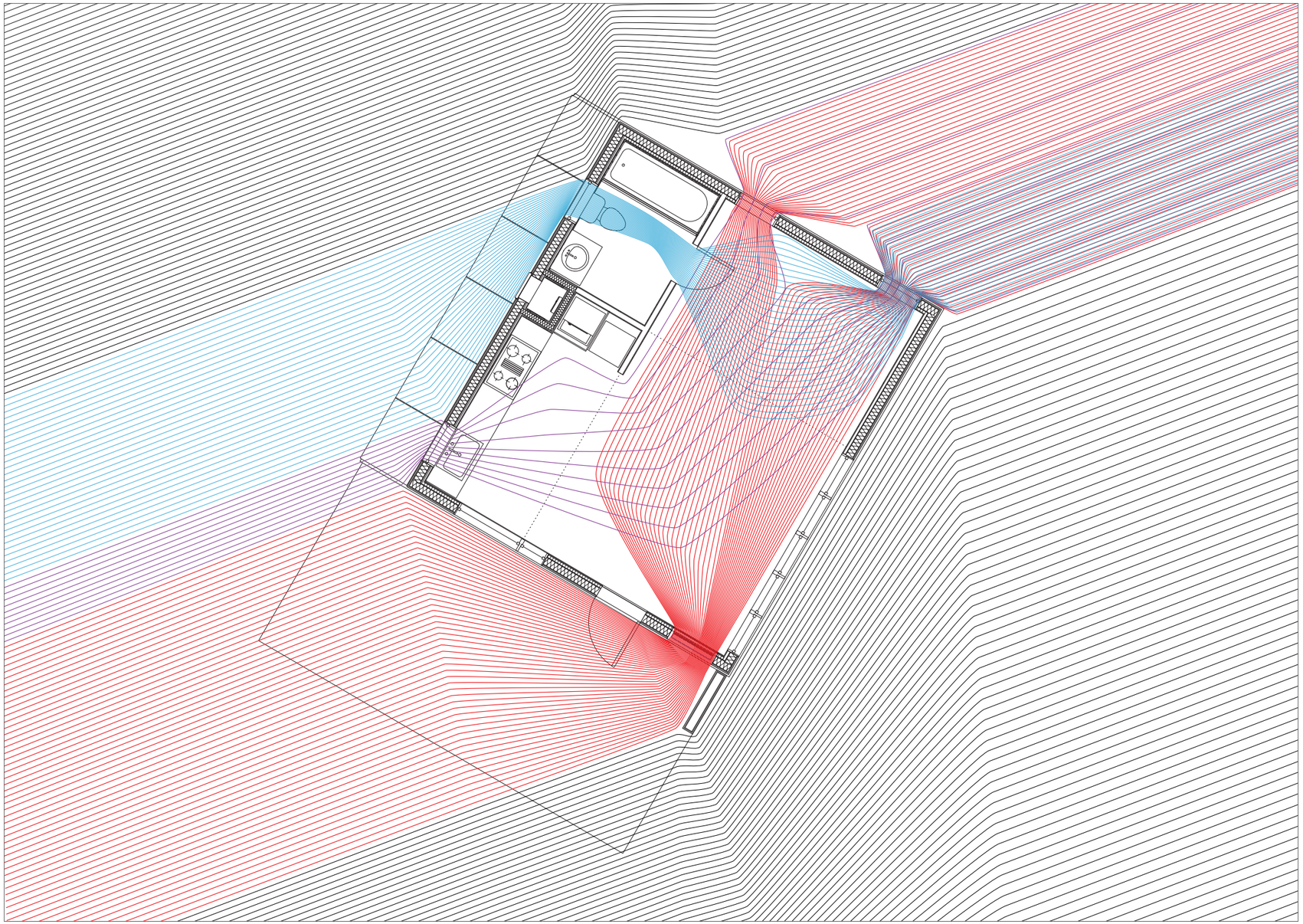
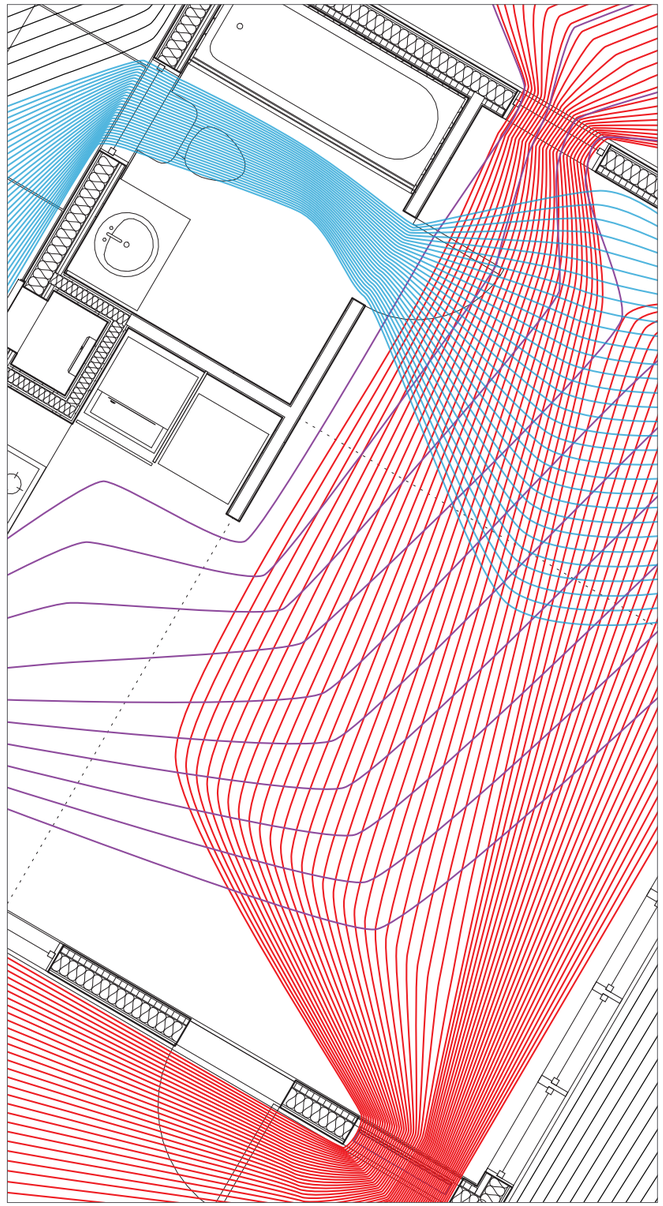


TOP: Unit plan. Window types 04 and 05 are operable, others are fixed. Door “03” accesses exterior utility room.

BADLANDS CABIN
AIRFLOW DIAGRAM

The average wind speed at the Kelso Dunes fluctuates between 5mph (Winter) and 10 mph (Summer). The wind direction is equally consistent, blowing Easterly during the Winter months and Northeasterly during the Summer. The cabin was designed to capitalize on the airflow opportunities offered here. An operable louvre system at the Southeast corner provides high volume air exchange. Shown here is just one of several ventilation options this system provides.

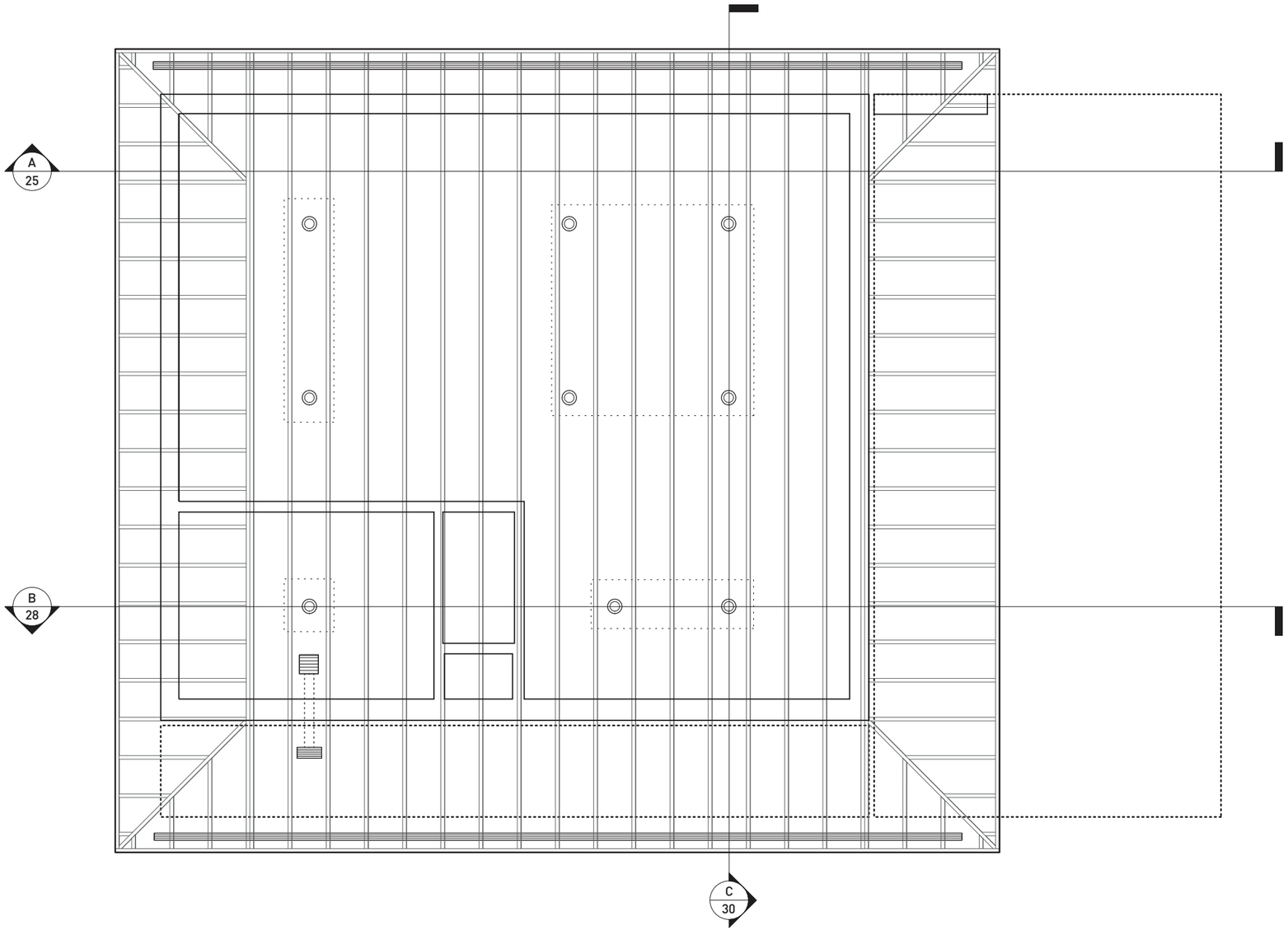




TOP: Airflow diagram. Line density indicates air pressure. The building orientation creates a buildup of air pressure along the South and West facades.

BADLANDS CABIN
RCP + FRAMING

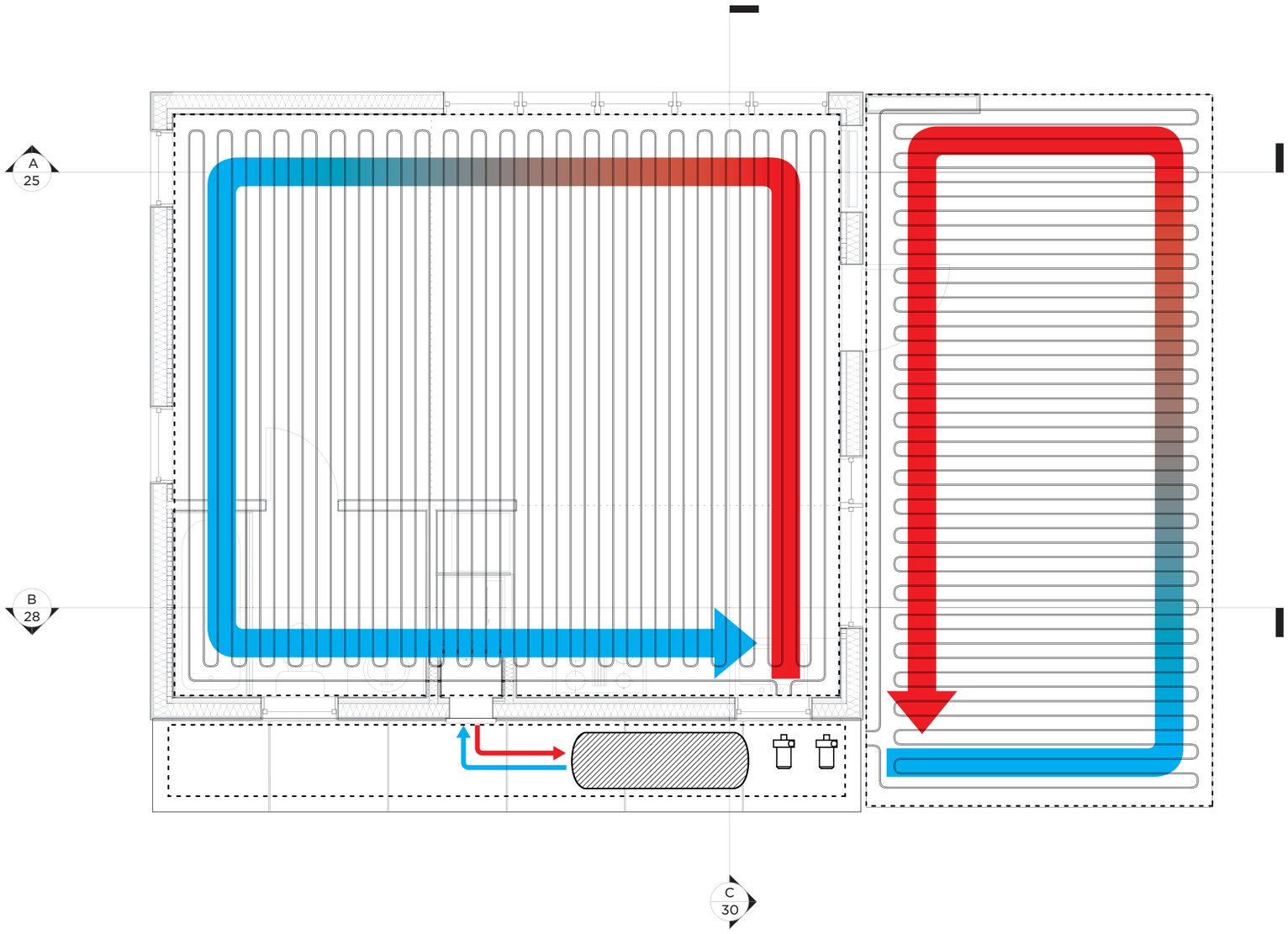
The roof follows a 2-degree slope and is supported only by the exterior walls. The broad cantilevers at the South and West edges provide shading during the Summer months. The structural framing of the roof, shown here, is infilled with fiberglass batt and is capped with a layer of purlins beneath the exterior sheathing for increased ventilation. The overhead fixtures shown here are grouped into circuits as indicated.



TOP: Reflected Ceiling Plan, including roof framing plan. Also indicated are the roof vents (located along the East and West facades) and bath exhaust.

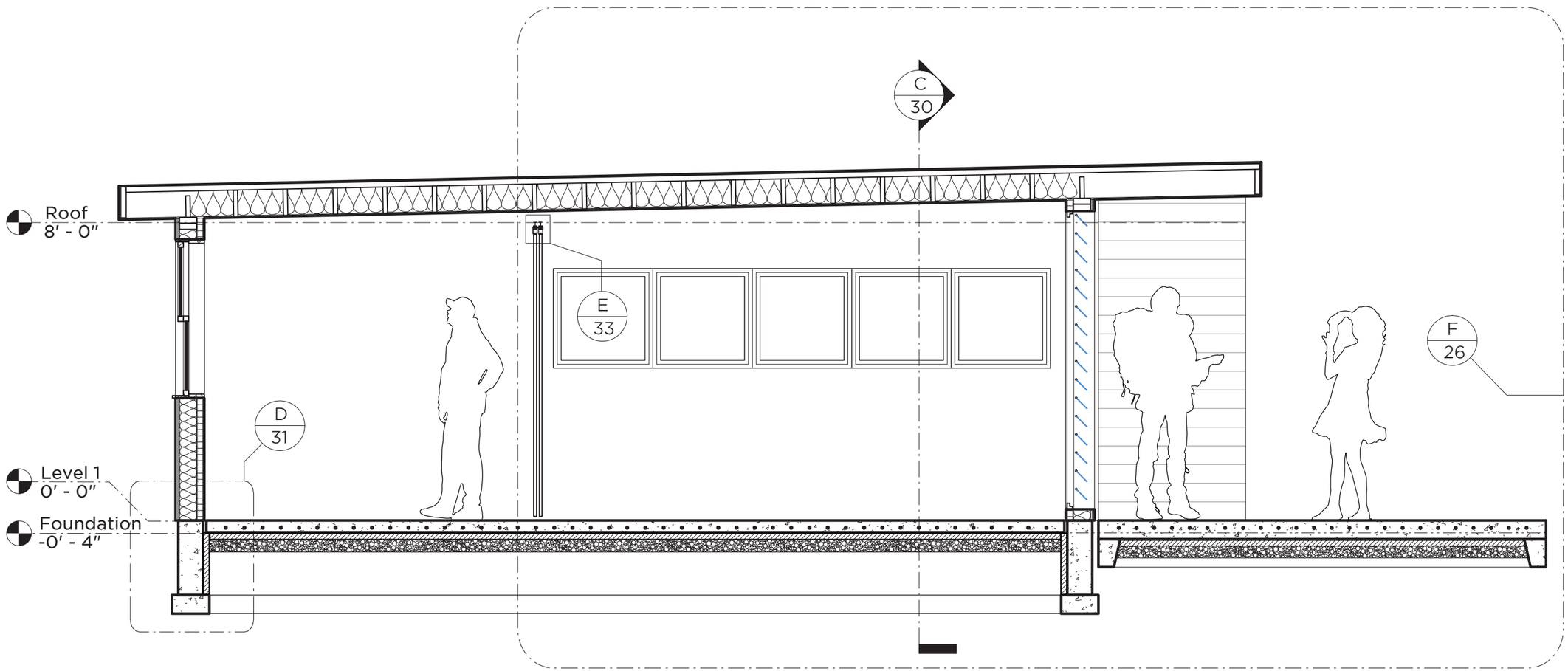
BADLANDS CABIN
HYDRONIC SYSTEM

The South-facing exterior deck captures heat during the daylight hours. This energy is transferred hydronically and stored in an insulated cistera (located in the utility trench), then cycled through the interior slab as needed. To maximize the efficiency of this subfloor radiant heating system, the interior slab is isolated to eliminate thermal bridging. In the event of poor solar conditions, the tankless water heater provides supplemental energy.



TOP: The interior (left) and exterior (right) slabs each contain a hydronic loop. The utility trench houses all related mechanical equipment.

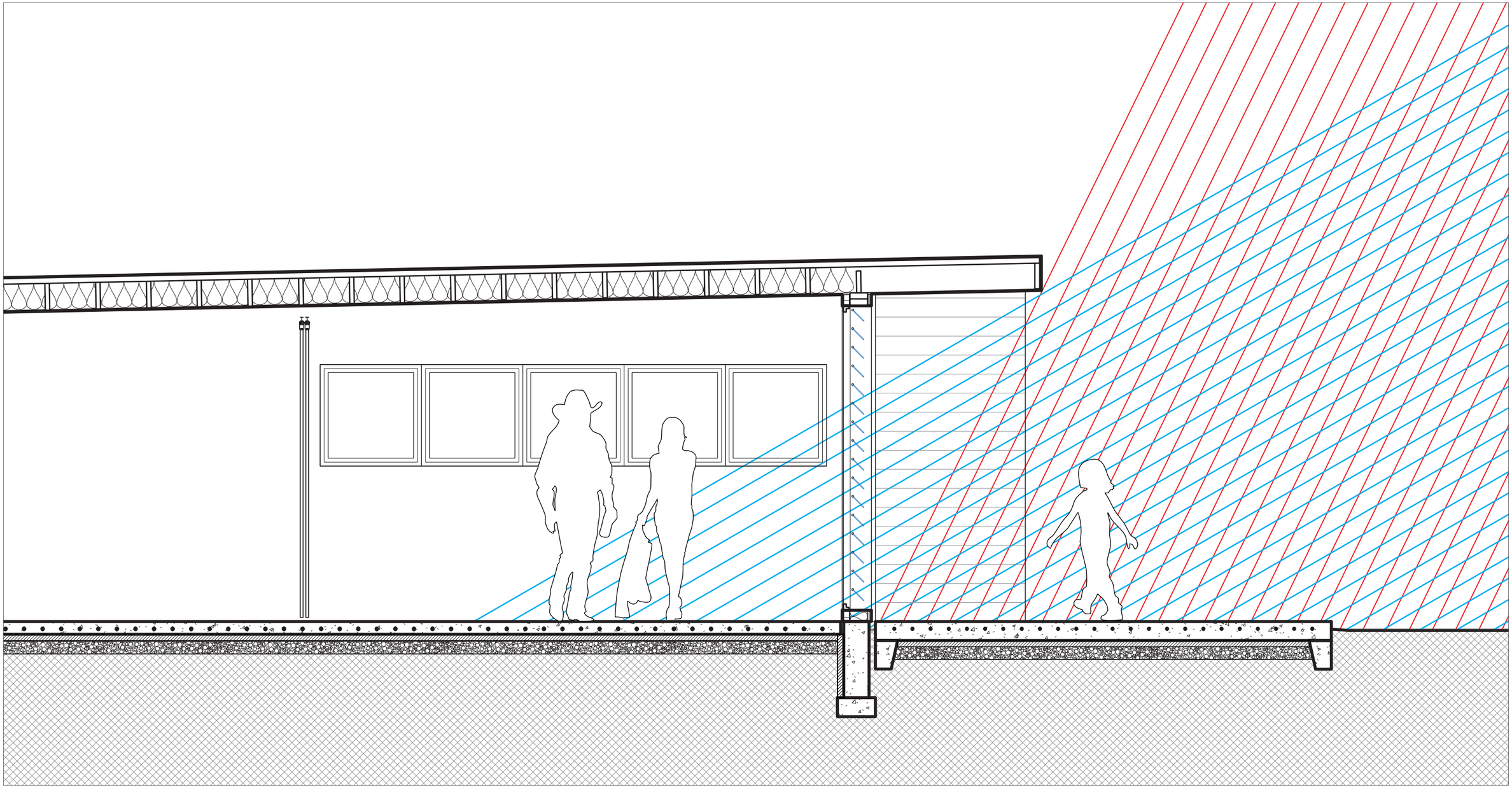
BADLANDS CABIN
SECTION A/25



TOP: East-facing long section.

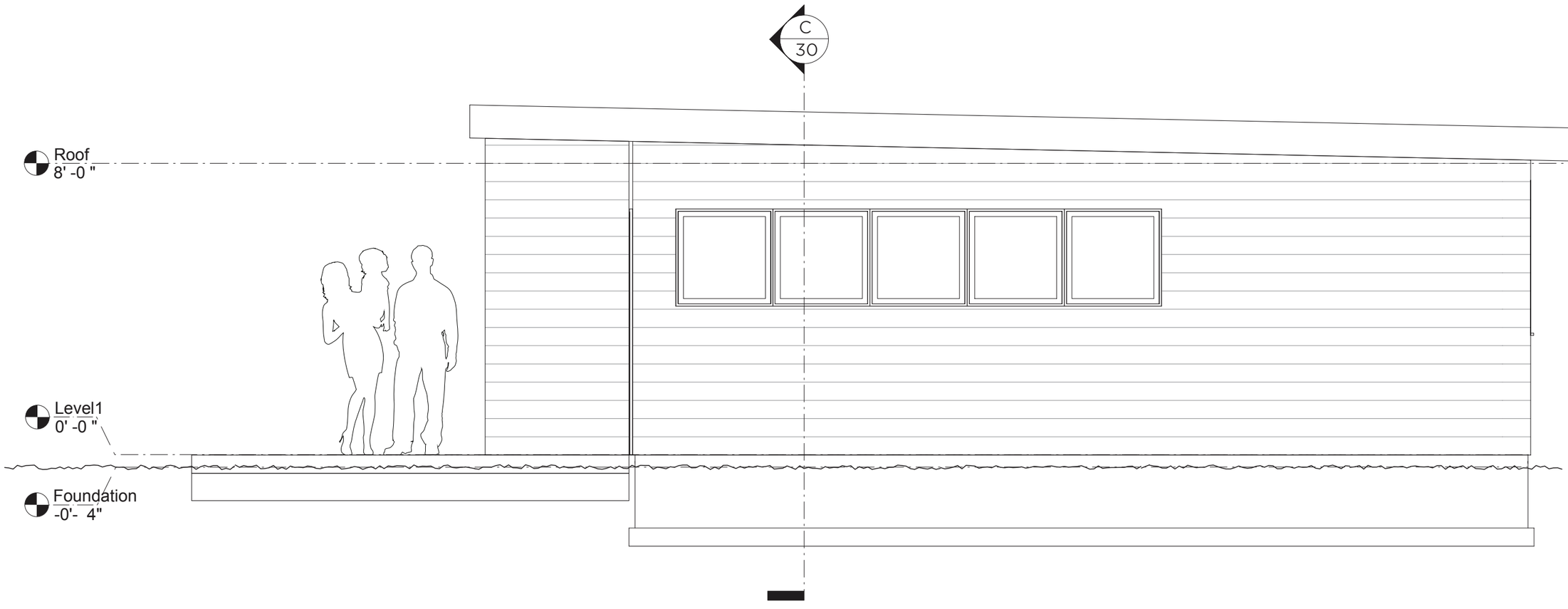
BADLANDS CABIN
DETAIL F/26

Detail of section A/25, illustrating the shading system. The cantilevered roof plane is an effective shading element, eliminating direct thermal gain from light infiltration during the Summer months. Conversely, this shading device is unobtrusive during Winter, and the tall glass louvres in the South wall maximize infiltration and direct thermal gain.



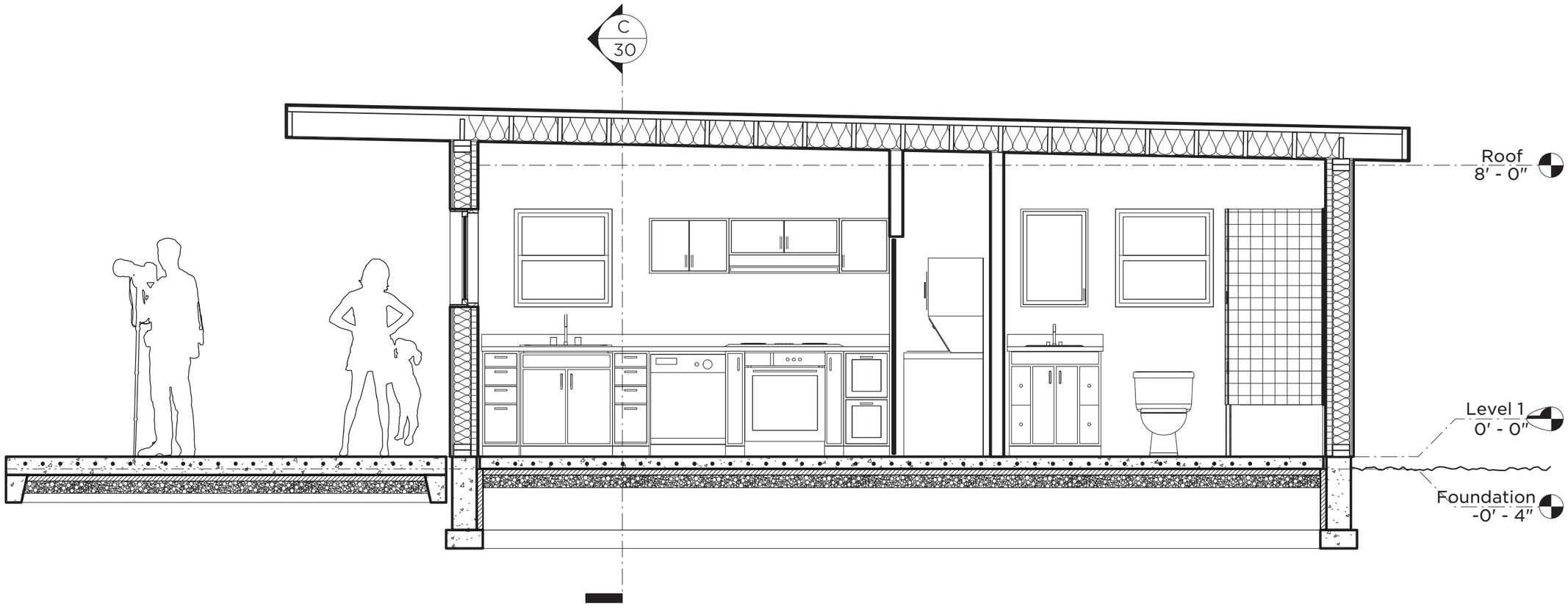
TOP: The roof plane is cantilevered over the exterior deck, providing Summer shade.

BADLANDS CABIN
EAST ELEVATION



TOP: East elevation exterior.

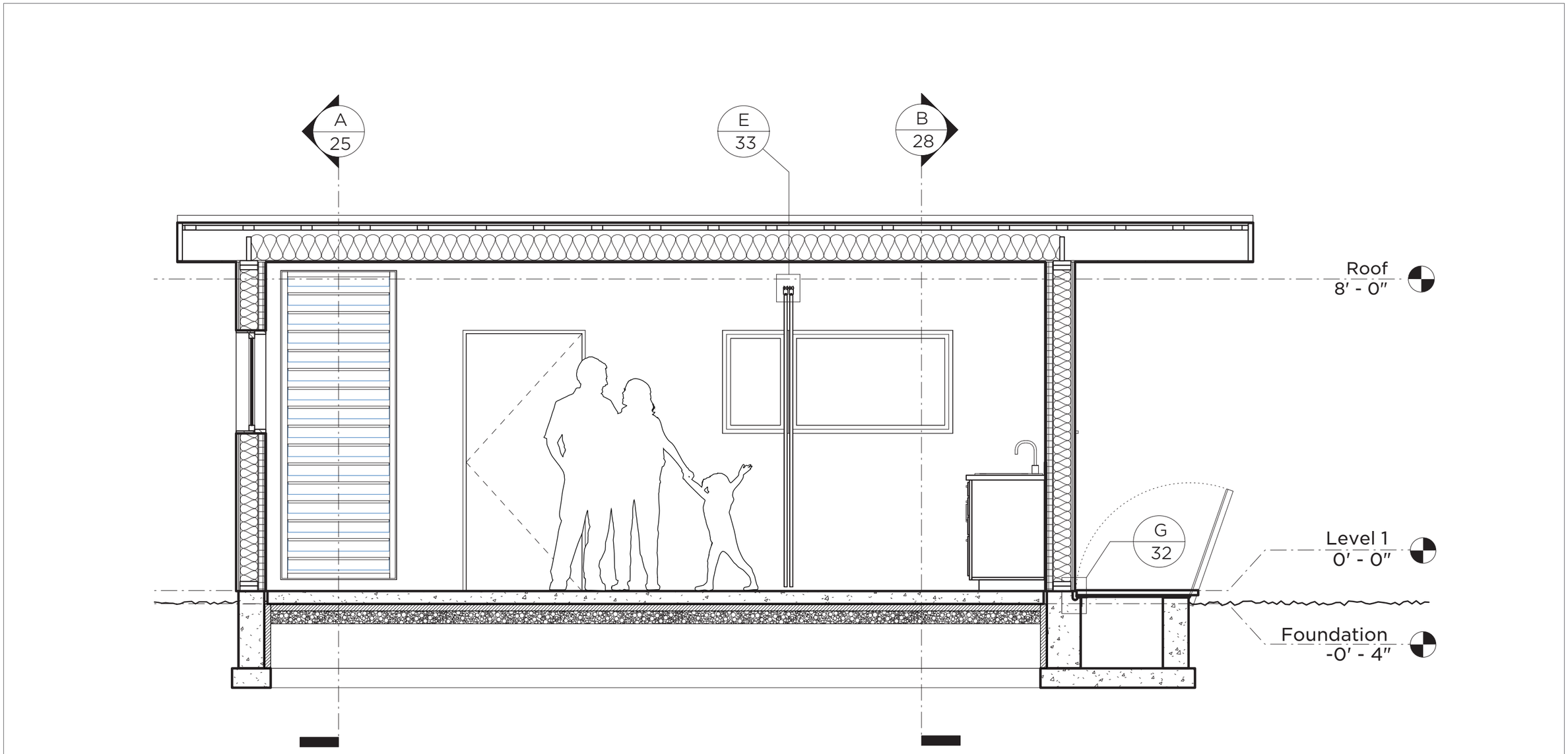
BADLANDS CABIN
SECTION B/28



TOP: West-facing long section. The West facade is the cabin's only plumbing wall.

BADLANDS CABIN
SECTION C/30

This section shows the utility trench at the West edge of the building. The narrow wood deck along this facade is composed of a series of hinged access panels. This utility trench houses the hydronic mechanical systems and plumbing cleanouts.



TOP: South-facing short section illustrating the utility trench along the West facade.