

# BUILDING CONCEPTS



- 1 Perspective Sketch of the Mule Barn
- 2 Historic Plaque
- 3 Mule Barn

## MULE BARN

### History

The Mule Barn, the Livery Stable and the Blacksmith/Saddle Shop were built in 1906 by the Fred Harvey Company to provide support services to the 1905 El Tovar Hotel. Based on their historic usage these three buildings were referred to as the Fred Harvey Company "Transportation Department." Presumably designed by staff of the Fred Harvey Company, all three buildings are designed in a rustic variation of the Craftsman style. The Mule Barn was originally used to house mules used to carry visitors to the bottom of Grand Canyon. In the 1940s the mules were moved from the Mule Barn to the adjacent Livery Stable to accommodate the growing number of mules. The Mule Barn is presently used as a carpenter shop and storage.

### Building Design Concept

As part of the Grand Canyon Village Interpretive Center the Mule Barn will be converted into a theater, exhibit area and education facility. The Mule Barn is a contributor to the World Heritage, National Register and National Historic

Landmark districts. It was nominated to the National Register along with the El Tovar Hotel, the Livery Stable and the Blacksmith/Saddle Shop in 1974.

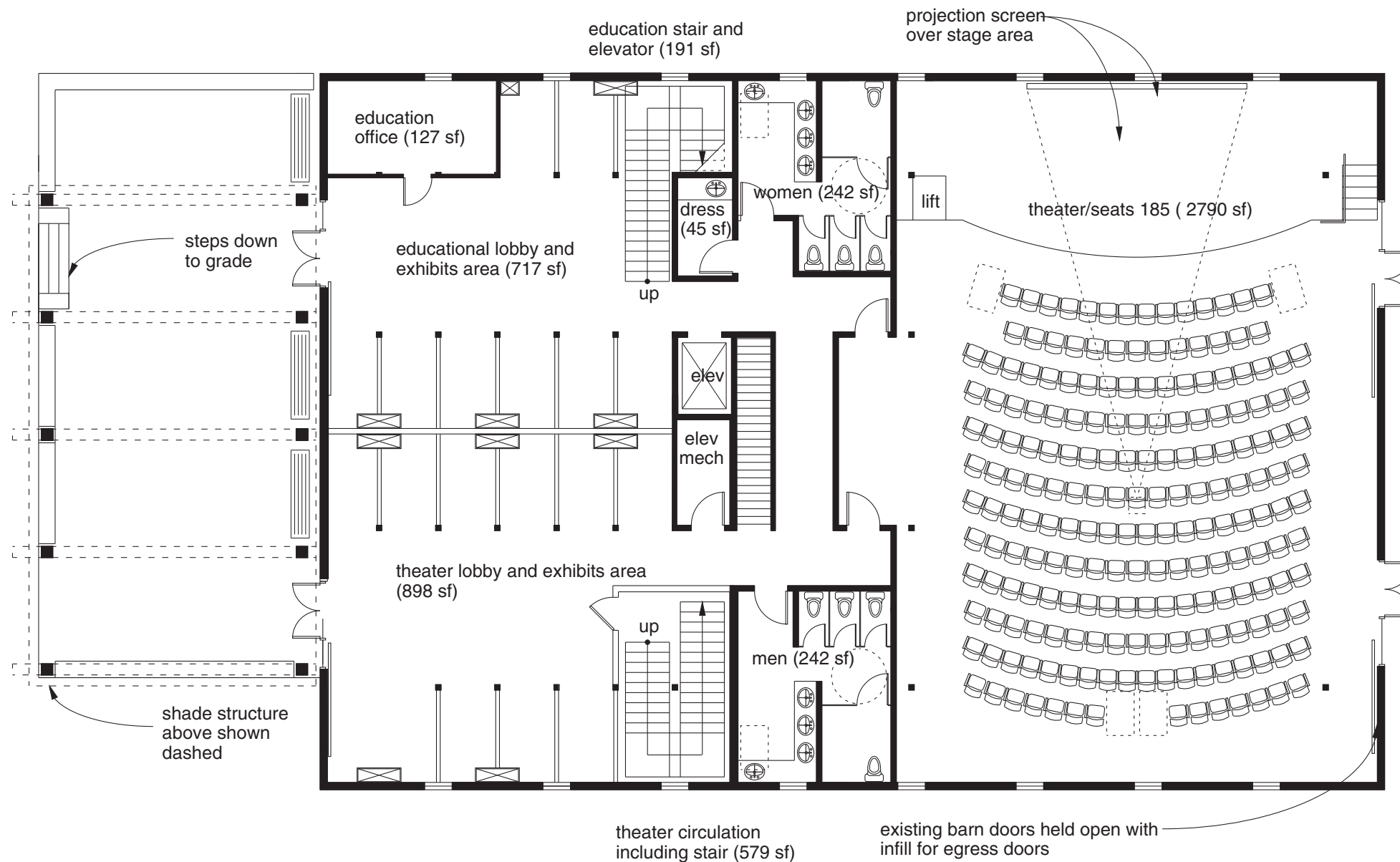
### Exterior Modifications

The only modifications that will be made to the Mule Barn occur primarily at its west end, where it will receive a new entry deck with related steps, and a shade structure. New entry doors will be inserted at both ends of the building within the existing barn door openings that will be retained in an open position. Other modifications will include repair and restoration of all wood siding, and existing window openings. The building may also require a new roof.

### Interior Modifications

The theater is positioned at the east end of the building because there was less historic fabric within this part of the existing structure. Existing columns will need to be removed from this space. Free-span trusses will be created by adding structural elements to existing room members. The wood board flooring from the loft level above the theater will be removed, thus opening up the vertical space to the roof. The theater will have

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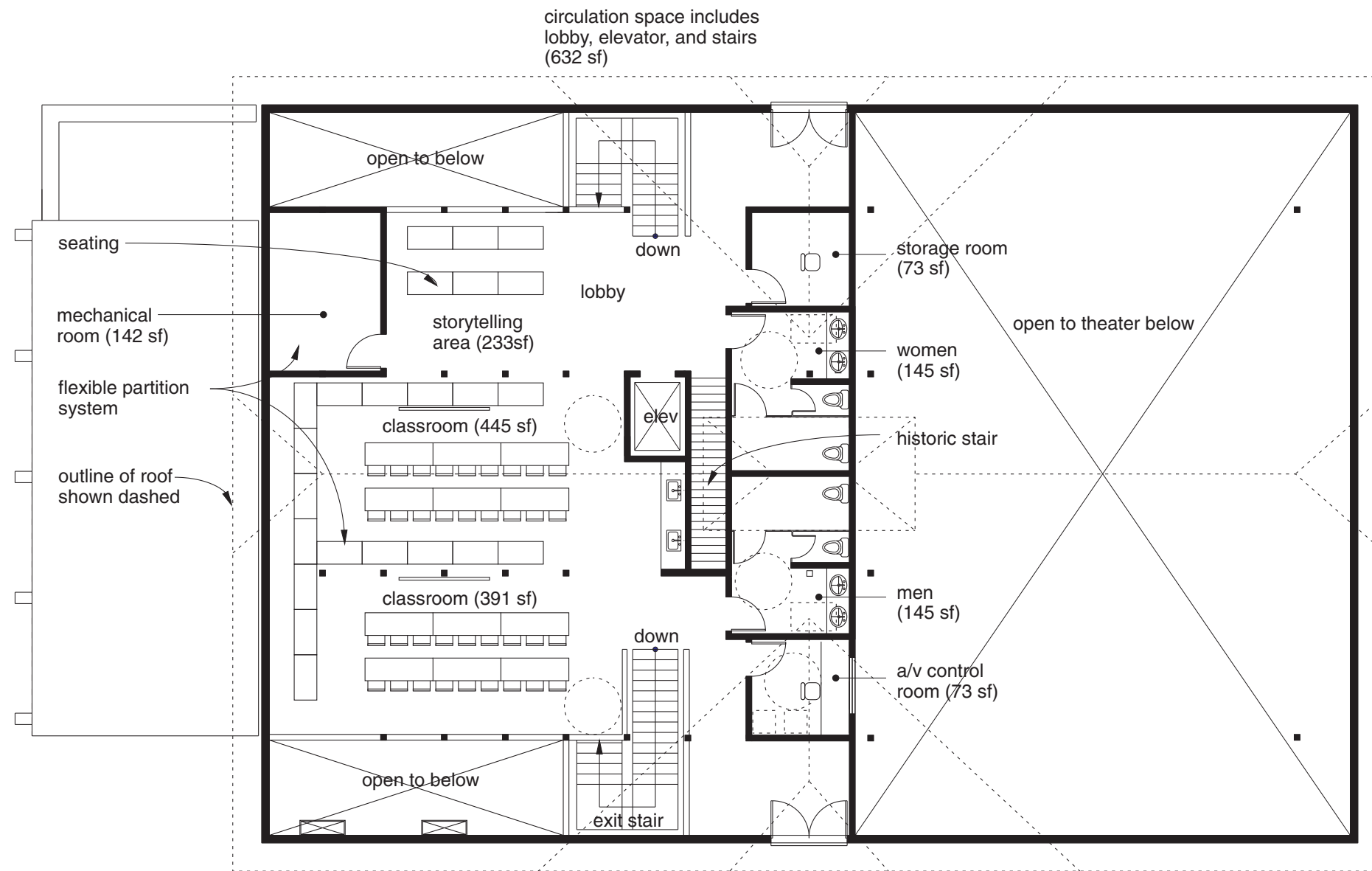
**MULE BARN GROUND FLOOR PLAN**

0 2.5' 5' 10'

light control (with shades) to allow for "black-out" conditions to be accomplished for film media. The inclusion of a simple raised stage in the theater allows use of this space for lectures, music performance during the festival or low-key theatrical productions. Audio/visual facilities are provided with a projection/control room on the loft level overlooking the space. The theater space is to be designed for acoustic performance for all these uses and for this reason is oriented across the building. This allows the high point of the space to be better located to focus sound. Adjacent to the theater a minimal changing room is provided to accommodate theatrical performances or staff needs for other events. Loading for this space can occur using the existing barn doors on the back of the building.

To access the theater one enters from under the shade structure into the south side bay of the historic mule barn. Inside there are interpretive exhibits integrated into the historic mule stalls. This allows people waiting or queuing for the theater to experience this interpretive content. A small theater entry lobby is created at the back of this space to accommodate people moving in and out of the theater, and restrooms are provided adjacent to this space.

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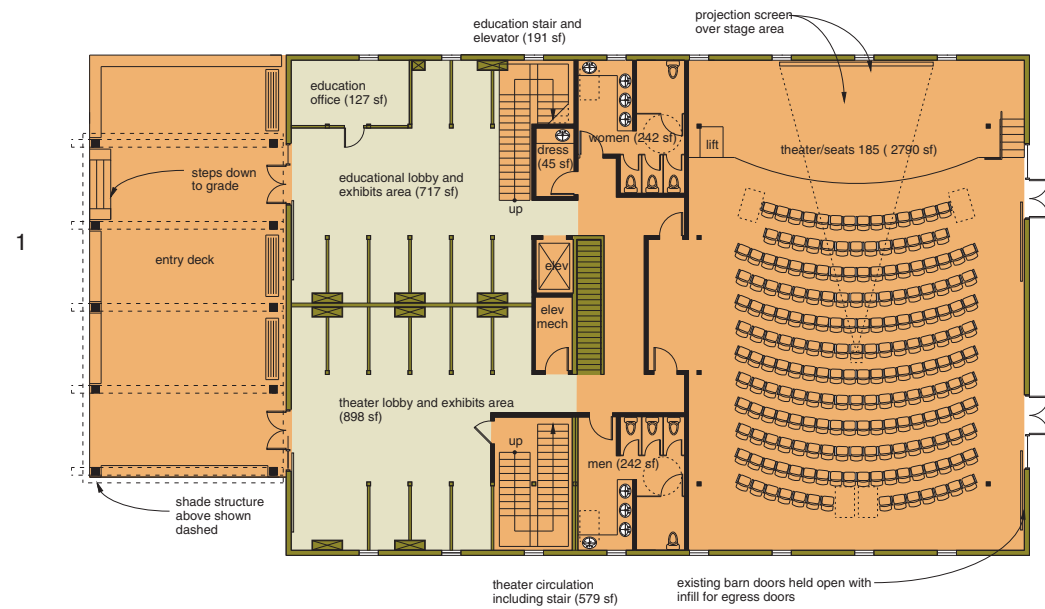
MULE BARN HAY LOFT PLAN



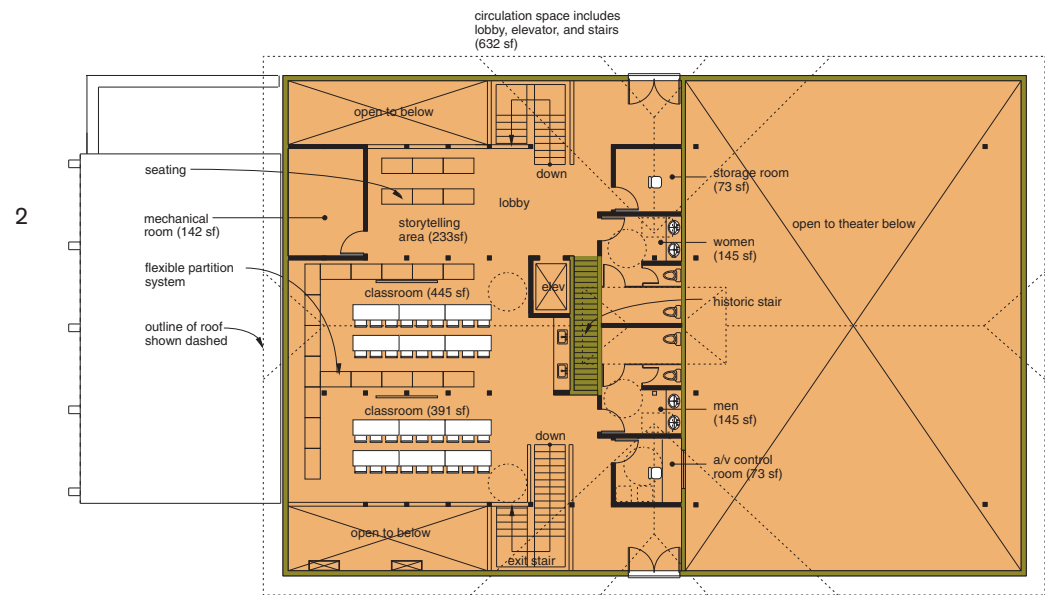
An Education Center is located on the second floor in the former hay loft with an entry lobby on the ground floor, in the northern bay of the mule stalls area. This space provides an orientation and co-ordination point for all the interpretive education programs in the village. The development of the loft space preserves the open character of the existing hay loft as much as possible and proposes to use a flexible partition system. The floor plan is configured to allow natural light from the existing hay loading doors. These doors will be secured open with new windows installed inside them. A sink adjacent to the flexible use classroom area is provided for use by the art programs and bathrooms are also provided on this level.

The entry to the Education Center is provided on the main level with an open dedicated stair leading up to the loft. The historic (but not code compliant) stair is also preserved and usable by visitors. Reception/orientation space as well as individual learning environments are integrated into the Mule stalls in this area. An elevator is added to make the loft area ADA accessible and another stair is added opposite the other stair for fire exiting. This stair exits into the theater entry area, but is enclosed so that theater visitors will not wander up into the education center.

# BUILDING CONCEPTS



**MULE BARN GROUND FLOOR HISTORIC PRESERVATION DIAGRAM**



**MULE BARN HAY LOFT HISTORIC PRESERVATION DIAGRAM**

## Historic Rehabilitation & Effects

### Exterior:

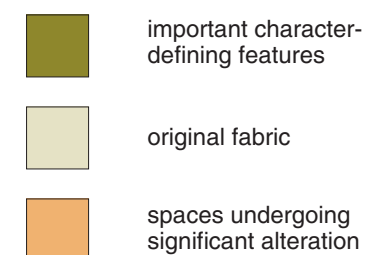
The proposed scheme will rehabilitate the Mule Barn for use as an exhibit area and theater. Exterior changes to the building are to be minimal, consisting for the most part of a new deck and shade structure on the west facade and the creation of new pedestrian entries in the existing sliding barn door openings on both the east and west facades. While the deck will be secured to the Mule Barn, the shade structure will be freestanding and will not physically impact the building. The sliding barn doors will be retained and preserved and kept in an open position. The new pedestrian entries will be constructed of glass and will be as transparent as possible in order to allow the barn doors to be perceived when they are closed.

### Interior:

In the proposed scheme the interior of the Mule Barn will be extensively altered although these changes will be largely confined to the eastern half of the building which has already lost a significant level of integrity. In the proposed scheme the non-contributing partition walls in the eastern half of the building will be removed and replaced with a 185-200-seat theater with ADA-compliant

accessible stage. Some interior supports will be removed and the floor of the hay loft above will also be removed. New toilet rooms will be constructed and the theater space itself will be finished with acoustical materials. The former feed room to the east of the stair will either be converted into a dressing room or storage.

The western part of the Mule Barn currently retains a much higher degree of integrity than the eastern part and the schematic design reflects this by leaving it nearly unchanged on the lower level. Original stable partitions, feed chutes and an original tack room will be retained and preserved and used for housing exhibits. The hayloft will be altered to a higher degree, with some new openings punched in the floor to provide space for a fire stair and to allow natural light to penetrate to the first floor. Partial-height partition walls, possibly made of hay bales or some other alternative sustainable material, will be used to demarcate offices on the hay loft level. Care should be taken to leave the feed chutes on the upper level intact and visible.



# BUILDING CONCEPTS



- 1 Hay Loft Floor Framing
- 2 Stalls
- 3 Exterior Siding
- 4 Hay Chute and Framing Detail

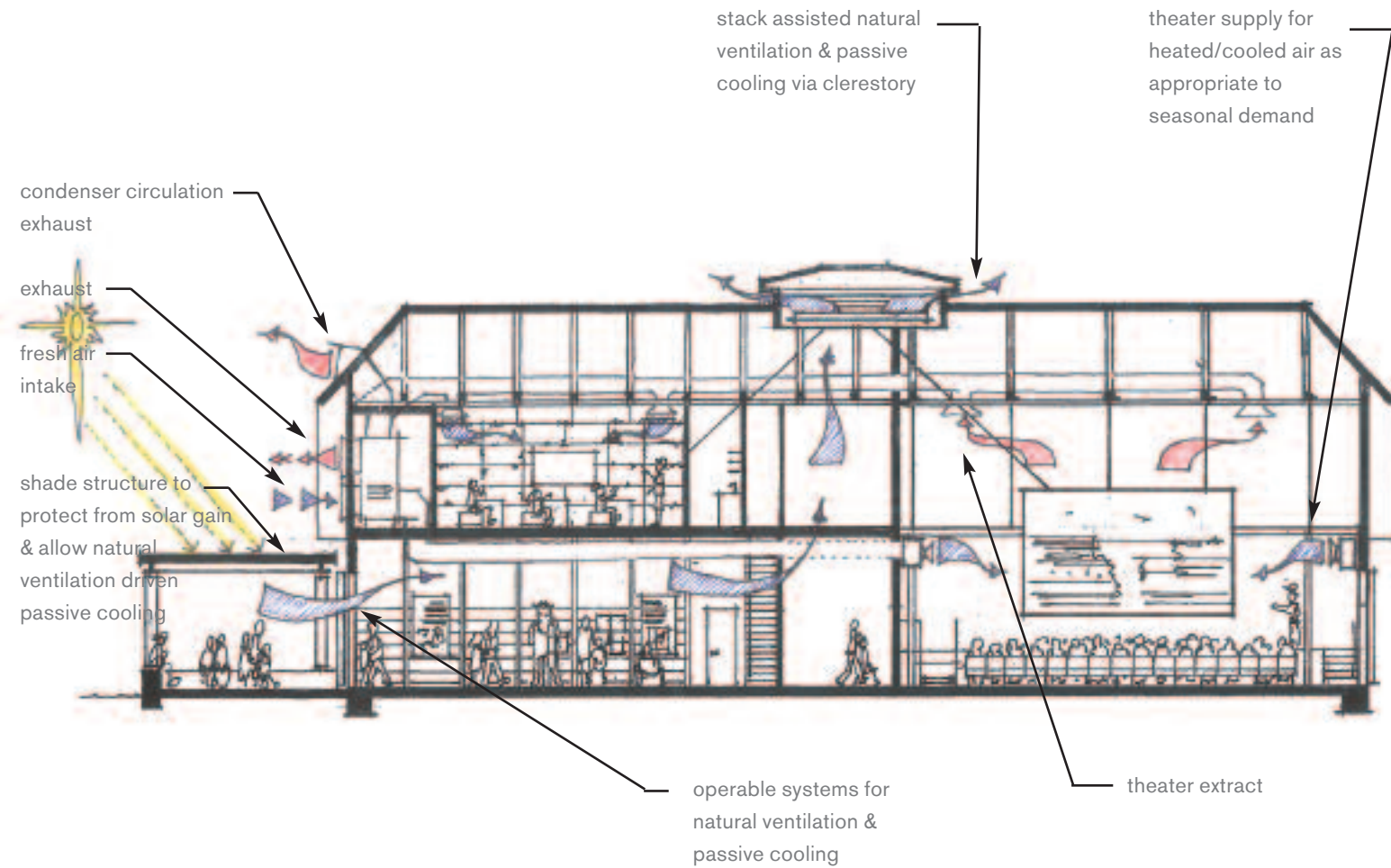
## Structural Assessment

The Old Mule Barn is a one-story structure, with attic loft, of wood frame construction. The roof consists of wood trusses spanning to perimeter wood stud bearing walls and interior post and beam frames. Both the roof and walls are sheathed with 1x straight sheathing. The foundation appears to be concrete spread footings at the perimeter and isolated spread footings at interior posts. The lateral force resisting system is classified as wood shear wall. In our site visit we were unable to verify the connection between the wood shear wall system and supporting spread footing foundation due to straight sheathing applied to the inside face of studs.

We would expect the building to perform well in a moderate earthquake, providing a life-safety level of performance with only a minor amount of upgrade. The roof diaphragm has an aspect ratio of almost one to one and there is a generous amount of shear wall in each principle direction. A connection between the roof and the walls does not appear to exist and the addition of new wood blocking tied into the roof diaphragm and wall double top plates is recommended. In addition, the connection between the walls and foundation should be verified, however, we would expect that additional anchor bolts will be required.

The future reuse plan for the building includes a theater in the back half of the building requiring the removal of the interior posts. New trusses installed under the existing beams will be required with new posts embedded in the exterior stud walls to support the ends of the transfer beams. New footings will be required below the new posts.

## BUILDING CONCEPTS



**MULE BARN SECTION HEATING & COOLING DIAGRAM**

### Heating & Cooling

In contrast to minimal intervention of the envelope, the ventilation and conditioning required of an Orientation Theater will require significant 'tightening' and increased efficiency of the existing building envelope. The design team feels that the creation of a new 'theater box' within the existing building shell could be designed to provide the required infiltration and insulation performance, compromising only the interior character of the existing building, leaving the exterior heritage character intact.

The ventilation, heating and cooling required of this theater space would then be provided by a high-efficiency, stand-alone air-handling unit located in a mechanical room on the hay loft level. 'Waste' heat/cooling from this unit (available through required fresh-air makeup for the theater) is proposed to be utilized as a supplemental heating/cooling source for adjacent spaces as appropriate.

In the Mule Barn-Education Center, in order to respect the historic character of the hay loft space, only minimum modification of the envelope of this portion of the structure is currently proposed. Passive cooling will be provided via

natural ventilation through a combination of operable windows and stack effect using the proposed roof clerestory. Passive heating is proposed to be provided using solar hot water heating panels located on the roof coupled with a hot water storage tank and wall mounted radiator panels where appropriate and/or cost effective.

Supplemental heating/cooling will be provided via the 'waste' heat/cooling from the Orientation Theater mechanical system.