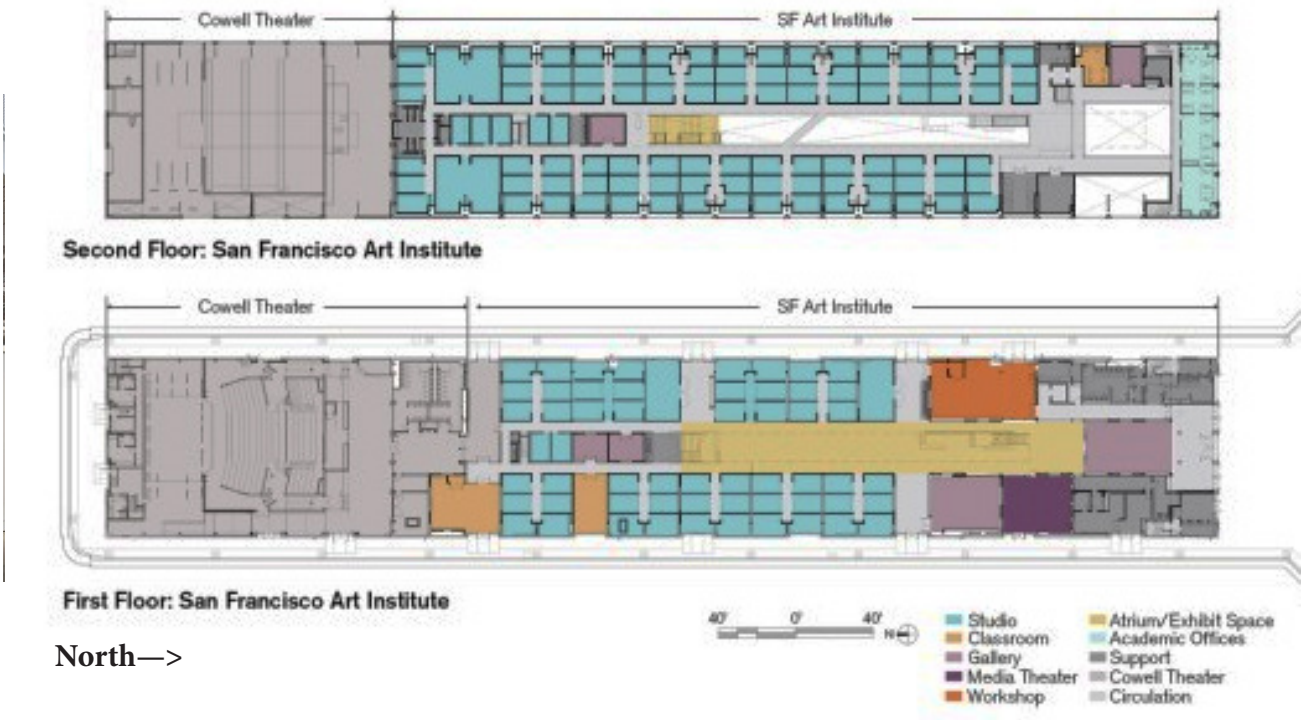
Arch 463
ECS
Fall 2018 **Name**_____

Quiz #4

"Peerless Pier Two"

For this problem you are a teaching assistant. You're trying to understand the new Pier 2 campus of the San Francisco Art Institute so that you can prepare a lecture about it to an ECS class. SFAI is the middle pier in the photo above.



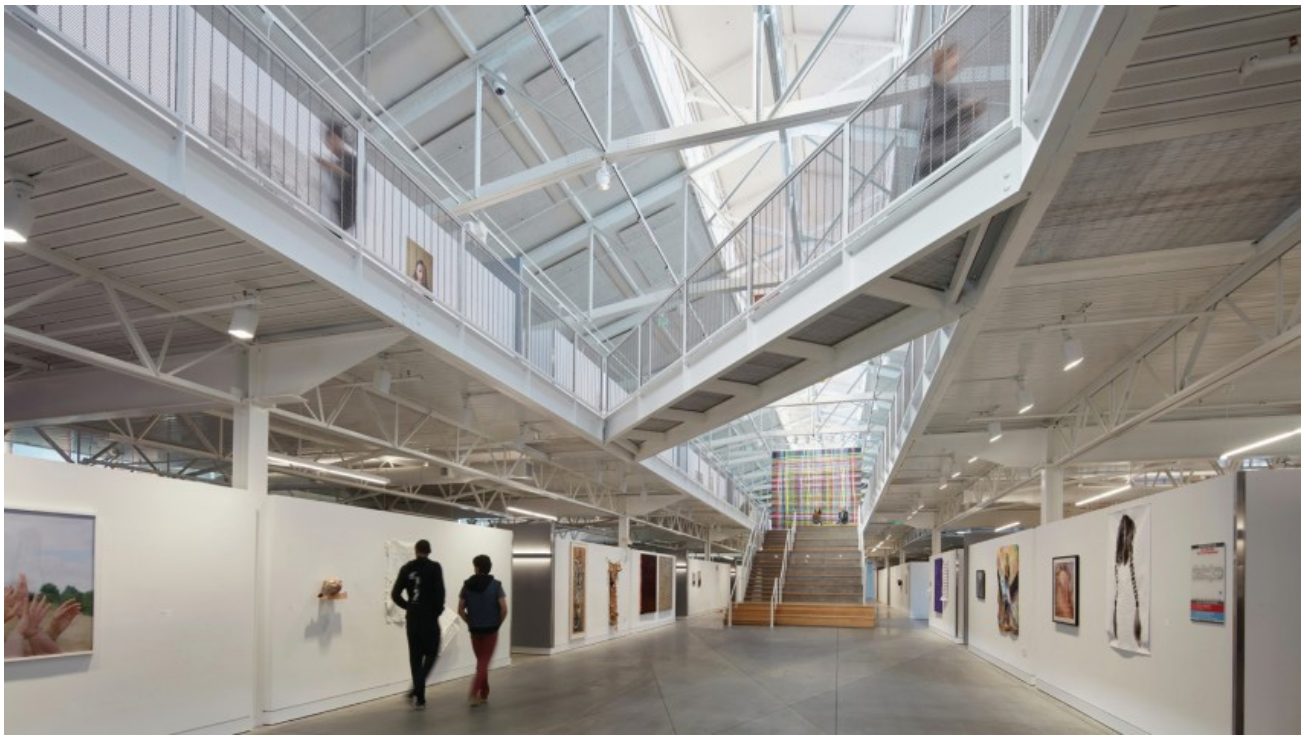
North—>

Photos and drawings: *Architect* Nov. 2018

San Francisco Art Institute

Leddy Maytum Stacy Architects

A crumbling, landmarked former Army warehouse was transformed into a light-filled, energy-efficient art school.



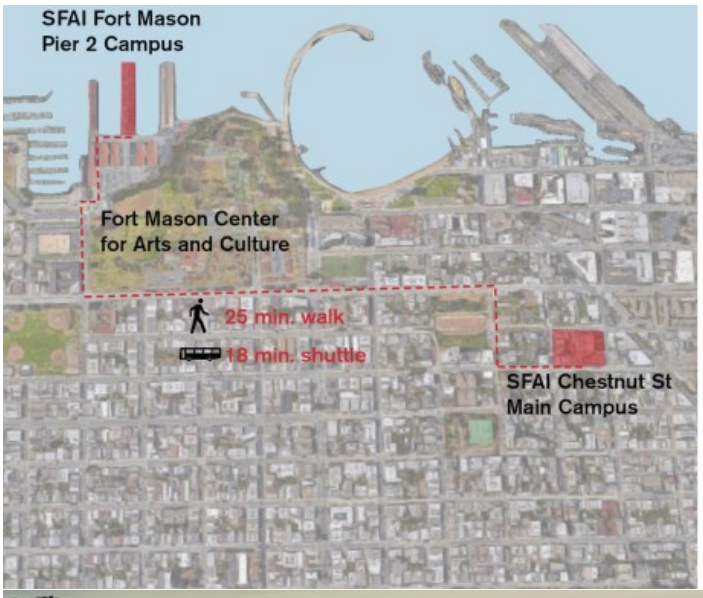
Leddy Maytum Stacy Architects (LMSA) have transformed a historic 1909 concrete-and-steel structure on Pier 2 at the city's Fort Mason Center into a new campus for the San Francisco Art Institute (SFAI). "The most sustainable strategy is reusing and adapting to new use," principal Marsha Maytum, FAIA, says.

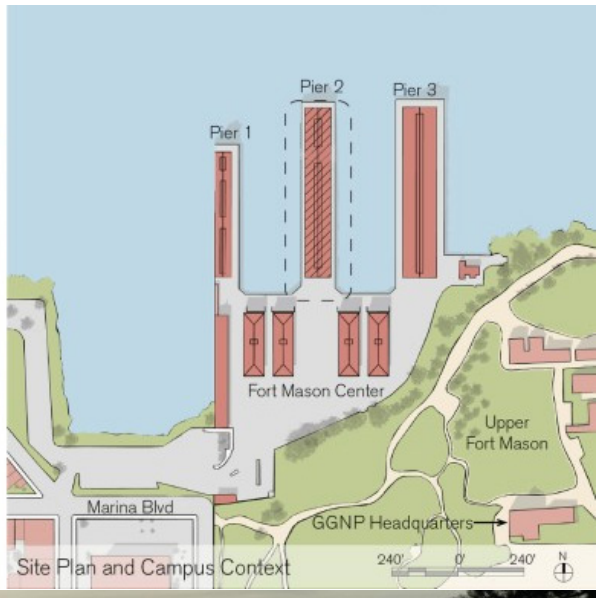
Fort Mason served as a United States Army facility for more than a century and was the principal supply port for the Pacific theater during World War II. Following its decommissioning in the 1970s, Pier 2 was renovated as part of the overall complex's transformation into a cultural, educational, and recreational facility. The current project reimagined the original single-story, open-space structure as a two-story, 69,422-square-foot art school.

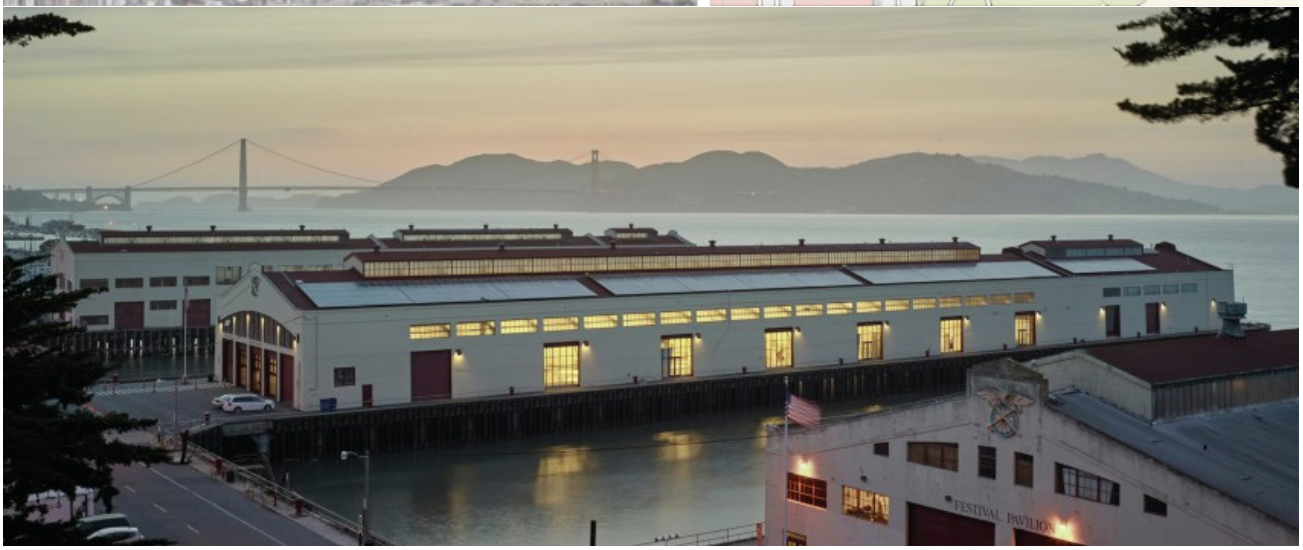
Fort Mason is located on the edge of San Francisco Bay within the Marina District, with a decent walk score of 72. Public access was critical, and the design not only extends an open invitation to enter and experience the 500-foot-long shed structure, but allows access to the outside pier edge. Programmed elements include student studios, public exhibition galleries, flexible teaching spaces, a black-box theater, and a workshop/maker space.

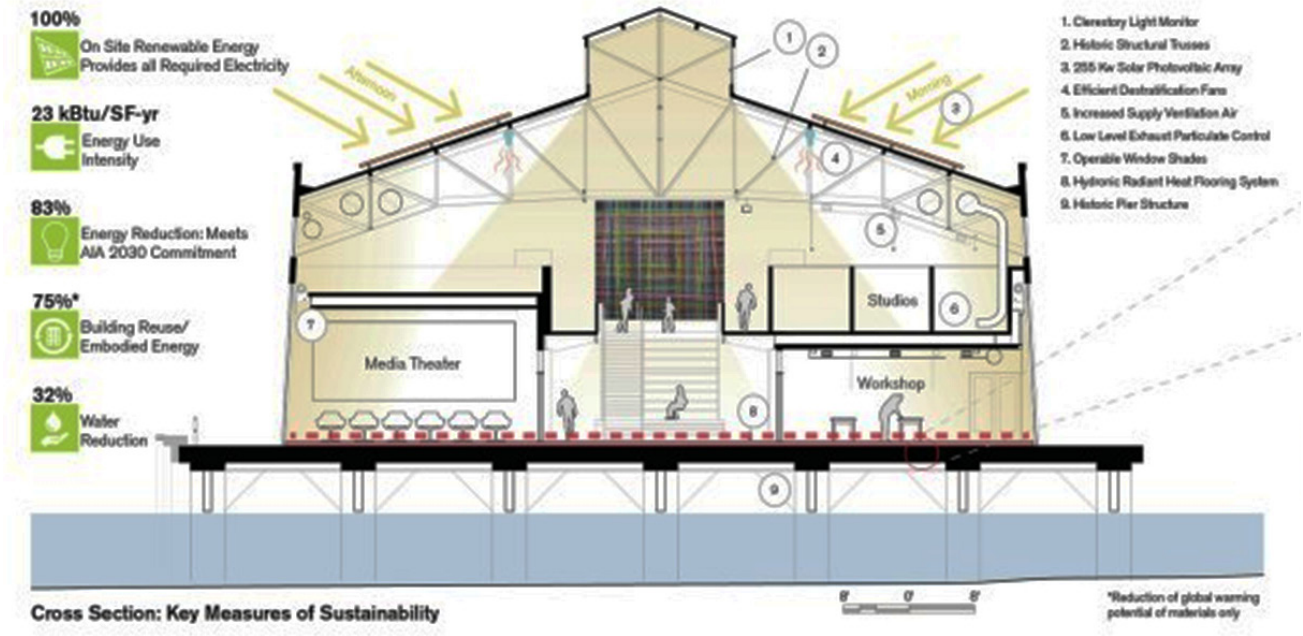
The program of 160 individual studios spaces necessitated the addition of a new mezzanine level, which was strategically kept a few inches away from the historic envelope, according to associate principal Ryan Jang, AIA. Drawing on the character of the original trusses that span the space, the new steel frame insertions were kept as light as possible. The architects used a perforated deck with acoustic material, plus concrete topping slab to minimize sound transmission between spaces.

—Edward Keegan, *Architect* Nov. 2018









Cross Section: Key Measures of Sustainability

3 pts

1. "The existing concrete wall worked well as a thermal mass, but the architects couldn't replace the windows with better insulated units, as their industrial character was a protected element. The single most effective addition from an energy standpoint was the installation of a new, high-efficiency insulated radiant concrete slab over the bay. Using THERM—a free software developed by the Lawrence Berkeley National Laboratory—for 2D thermal imaging, the firm's designers could evaluate the efficacy of adding rigid insulation and a new radiantly heated slab over the existing concrete deck of the pier."

1. What's the key factor in making the existing concrete wall effective thermal mass? **Explain and illustrate**.

2. How could the thermal performance single-pane windows with steel mullions be improved without affecting their industrial character? **Explain and illustrate**.

3. Why is radiant slab a better choice than a raised floor with displacement ventilation for this particular building? **Explain and illustrate**.

2 pts

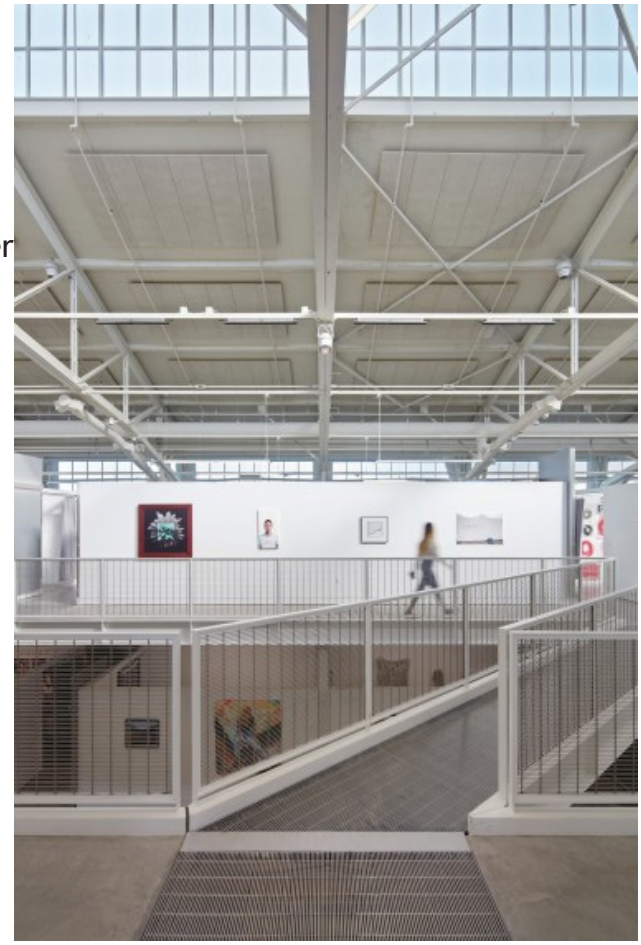
2. "Adding a large photovoltaic system (it's the largest ever installed on a national landmark) to the shallow sloped roofs of the historic structure provides 100 percent of the building's electricity needs. The building already exceeds 2030 Challenge targets: The actual measured EUI is less than half of what was predicted, and net measured EUI shows an 83 percent reduction from average for the building type. The designers believe the renovations will extend the life of the historic building by another century—resulting in a 74.9 percent reduction in greenhouse gas impact versus constructing a standard new building."

1. The PVs are mounted on east- and west-sloping roofs. **Explain** why this strategy though not optimum is the best for this project.

2. The measured EUI is 23 kbtuh/sqft/yr (17% of the average university building) and reuse of the building was a low carbon option. **Discuss the significance** of each of these results.

3 pts

3. "The open layout with a central atrium under the historic clerestories facilitates daylighting throughout the building. Eight-foot-tall partition walls around each studio help distribute daylight while creating spatial transparency and maintaining the integrity of the building's historic volume. Perforated riser stairs at each end of the atrium keep these necessary circulation and egress elements from blocking light, contributing to the sense of openness. Daylighting is available to all instructional and public spaces, as well as 71 percent of all regularly occupied spaces."



1. Almost all of the windows and clerestories face east or west and have single-pane clear glazing. **Criticize this scheme.**

2. How effective is the strategy of 8' high partition walls in daylighting and spatial integrity? **Explain and illustrate**.

3. What is the true effect of the perforated risers and expanded mesh bridges on daylighting of the atrium?

2 pts

4. "Supporting the programmed art studios requires a high rate of ventilation, due to the use of paints and other artist materials. How to mitigate the noxious fumes and odors while keeping the atrium space as open as possible “was one the great design puzzles,” Maytum says. Studio pods and brush-washing stations keep the most noxious activities concentrated within contained areas where low-level exhaust systems can capture fumes and other particulates. The architects located the ducts towards the perimeter of the structure and added destratification fans into each structural bay between the historic trusses."

San Francisco has an ideal climate for year-round natural ventilation. **Sketch a cross section** of this building and **show how natural ventilation could work**, if it were allowed for this building.