



e² design season three — The Art and Science of Renzo Piano

Episode Summary

Since its establishment in 1853, the California Academy of Sciences in San Francisco has had a mission to explore, explain and protect the natural world. But as Chris Andrews, the current Director of the Steinhart Aquarium, explains, a modern museum must also serve as an attraction in order to achieve its mission. If the public doesn't walk through the doors, the Academy of Sciences will not have an audience that can be encouraged to explore, explain or protect the natural environment.

In 1998, when the time came to design a new building to unify all twelve of the Academy's buildings under one roof, while also creating a model of sustainable design, the vastness of the project was clear. The Academy invited forty architecture firms to participate in an international design competition and chose six finalists to meet with the board for an interview. Renzo Piano, a Pritzker Prize-winning architect from the Genoa-based Renzo Piano Building Workshop (RPBW), was one of those finalists. At the interview, rather than presenting his vision to the board members, he asked them to share their goals for the new building with him. The Academy realized that he was a true collaborator and voted unanimously to offer the project to RPBW.

At the core of Renzo Piano's architecture is the concept of storytelling. He believes that each building has its own story to tell. Just as an auditorium should tell a story about music, a natural science museum should tell a story about energy, exploration, discovery, and wonder. It is with this sensibility that he approached the design for the Academy of Sciences. Not only does the Academy offer a planetarium, an aquarium and a natural history museum, it also conducts a significant amount of scientific research and houses 20 million specimens. Renzo Piano found a way to highlight the attractions, display the science and also take on the enormous challenge of creating one of the greenest museums in the world.

Perhaps the most impressive feature of the building is the living roof. Not only is the entire roof an exhibit that displays 1.7 million species of native California plants without the need for irrigation, but the roof is also an experiment. While the experts have conducted research to choose the species, even they are not sure how the plants will respond. The roof is expected to capture almost 3 million gallons of storm water each year and prevent it from being sent to water treatment plants in San Francisco. The carefully designed circular skylights will provide essential light for the aquarium and rainforest exhibits below. The roof has insulating properties so that the temperature below the roof is ten degrees cooler than the temperature on the roof, reducing the need for air conditioning inside. The sustainable design features are impressive, but the fact that the roof will actually provide up



to 10% of the museum's energy needs is what sets it apart from other green roofs. While it may look like decoration, the band of 60,000 photovoltaic cells at the edge of the glass canopy surrounding the roof will generate approximately 213,000 kilowatt-hours of energy per year and prevent the release of 405,000 pounds of greenhouse gas emissions into the air.

Renzo Piano's design has incorporated the individual goals of the board members, sustainable design features that they were eager to model and a sense of fun and exploration that will make the new Academy the attraction that they had hoped for.

To find out more about the California Academy of Sciences' new building, visit www.calacademy.org/academy/building/index.php

To find out more about the Renzo Piano Building Workshop, visit www.rpbw.r.ui-pro.com



e² design season three — The Art and Science of Renzo Piano

PRE-VIEWING QUESTIONS

1. What is the purpose of a science museum? Have you ever been to a science museum? If so, list some of your favorite exhibits and describe why you liked them.
 2. Have you ever heard of sustainable architecture? What are some ways that architects can design buildings to be sustainable? What natural elements are taken into account in sustainable architecture?
 3. What do you know about scientific inquiry? What is the purpose of scientific experiments? List some of the steps of the scientific method. How might this process be applied to designing and constructing a building?
-

POST-VIEWING QUESTIONS

1. List at least three of the unique characteristics of the roof of the new Academy of Sciences building. How do these features affect the exhibits inside the museum? How do they affect the natural environment outside the museum?
2. In what ways does Renzo Piano apply transparency to his architecture? Use specific examples from the episode to support your answer.
3. In the episode, Dr. Pat Kociolek, the former Executive Director of the California Academy of Sciences, said that the Academy wanted to make a statement with the new building. What statement is the Academy of Sciences making by building using sustainable architecture?
4. According to Renzo Piano what is the relationship between nature and architecture? How does his design for the Academy of Sciences integrate the building with the surrounding environment of the park? Use specific examples from the episode to support your answer.
5. Describe how the design of the museum encourages scientific inquiry? Use specific examples from the episode to support your answer.
6. In the planning of the building, the scientists and the architect encountered problems. Describe how they used a scientific approach to solving those problems.



NATIONAL STANDARDS FROM MCREL STANDARD

Engineering Education

Standard 5.6 - Knows renewable and non-renewable sources of energy (e.g., fossil, wind, nuclear, solar).

Standard 5.8 - Understands how the use of domestic and commercial power and energy affects the environment.

Standard 9.4: Understands the steps involved in designing construction projects (e.g., planning, generating layouts, developing drawings with measurements and details of construction considering constraints, selecting materials).

Standard 11.3 - Understands how the construction industry may be affected by future technology.

Standard 11.4 - Understands how society and the environment have been affected by the construction industry.

Standard 14.4: Understands how societal interests, economics, ergonomics, and environmental considerations influence a solution.

Science

Standard 12.1 - Understands the use of hypotheses in science (e.g., selecting and narrowing the focus of data, determining additional data to be gathered; guiding the interpretation of data).

Standard 12.6 - Knows that scientists conduct investigations for a variety of reasons (e.g., to discover new aspects of the natural world, to explain recently observed phenomena, to test the conclusions of prior investigations, to test the predictions of current theories).

Standard 13.6 - Knows that creativity, imagination, and a good knowledge base are all required in the work of science and engineering.



Technology

Standard 4.5 - Knows that since there is no such thing as a perfect design, trade-offs of one criterion for another must occur to find an optimized solution.

Standard 4.6 - Knows that a design involves different design factors (e.g., ergonomics, maintenance and repair, environmental concerns) and design principles (e.g., flexibility, proportion, function).

Standard 6.7 - Knows that construction design is influenced by factors such as building laws and codes, style, convenience, cost, climate, and function.

Standard 6.8 - Knows different requirements for structural design (e.g., strength, maintenance, appearance) and that these structures require maintenance.