

Fuller's Fantastic Geodesic Dome

This lesson was created as a supplement to the *Fuller's Fantastic Geodesic Dome* program at the National Building Museum. It is designed to be used in your classroom independently, or as an activity before or after a school program at the Museum. For more information about and to register for the National Building Museum's school programs, visit <http://www.nbm.org/schools-educators/school-visit/>.

The *Fuller's Fantastic Geodesic Dome* program teaches fifth through ninth grade students about principles of engineering and design. Through studying geodesic domes, students are exposed to an innovative solution to the ongoing challenge of creating structures—how to maximize space while creating a strong, cost-effective, people-friendly structure. By studying the geodesic dome and its construction, students learn about materials, structures, and forces present in all buildings.

National Building Museum

Created by an act of Congress in 1980, the National Building Museum explores, celebrates, and illuminates achievements in architecture, design, engineering, construction, and planning. Since opening its doors in 1985, the Museum has become a vital forum for exchanging ideas and information about such topical issues as managing suburban growth, designing and building sustainable communities, and revitalizing urban centers. A private, nonprofit institution, the Museum creates and presents engaging exhibitions and education programs, including innovative curricula for school children.

Over the past two decades, the Museum has created and refined an extensive array of youth programming. Each year, approximately 50,000 young people and their families participate in hands-on learning experiences at the Museum: 2-hour-long school programs for grades K–9; major daylong festivals; drop-in family workshops; programs helping Cub and Girl Scouts earn activity badges; and three innovative outreach programs, lasting between 30 and 60 hours, for secondary school students. The Museum's youth programming has won the Washington, D.C., Mayor's Arts Award for Outstanding Contributions to Arts Education and garnered recognition from the National Endowment for the Arts.



NATIONAL BUILDING MUSEUM
401 F Street, NW Washington, DC 20001
202.272.2448/www.NBM.org
Red Line Metro, Judiciary Square

Architecture Investigation: Traditional and Geodesic Structures

Now that students understand that different shapes and forms have varying strengths, they can further investigate traditional architectural structures. This lesson also encourages students to investigate their neighborhoods and communities and examine why architects might have chosen certain forms.

OBJECTIVES

Students will:

- understand that buildings today share many of the same structures as buildings built thousands of years ago;
- learn several different types of traditional building structures; and
- identify traditional building structures in their own neighborhood or in Washington, D.C.

NATIONAL STANDARDS OF LEARNING

MathematicsConnections
ScienceF
Social Studies3, 4
Technology4, 5, 19, 20
Visual Arts4

MATERIALS

- Structures Investigation Worksheet, page 40

DURATION

1 class period, 45-60 minutes

LESSON PROCEDURE

1. Discuss different types of structures used in buildings.
2. Investigate the structure of a building in the neighborhood or Washington, D.C.

GEODESIC DOME VOCABULARY

Arch, Dome, Geodesic Dome,
Post and Lintel, Pyramid, Space-
Framing, Structure,
Triangle, Tetrahedron

LESSON PLAN

PART I. Discuss Different Types of Structures Used in Buildings (20 minutes)

- Ask students what shape most buildings commonly form **Answer:** cube or rectangular cube. Why? Explain to students that there are some structures in buildings that have been used for thousands of years, such as post and lintel, arch, and dome while some are a lot more recent like space framing and geodesic domes. Let them know they will be investigating some of these structures used in their school and their neighborhoods.
- Ask students to name examples of arches, post & lintel structures, and domes.
- Ask students from what materials buildings are made. Explain that traditional forms of architecture make use of a variety of natural materials such as stone, brick, and wood. Looking around the neighborhood or Washington, D.C., one can find many examples of buildings and monuments made using these materials.

- Not all triangular-formed structures are geodesic domes. Space-framing uses triangles and tetrahedrons to support roof systems, highway overpasses, and other spans. Their construction is not possible without modern materials that can be identically mass-produced for a given building.
- The Structures Investigation Worksheet, page 40, shows different types of structures and historic buildings where these structures are employed and examples of buildings in the Washington, D.C. area.

PART II. Investigate the Structure of a Building in the Neighborhood or Washington, D.C. (25 minutes in class or assign for homework)




- Using the Structures Investigation Worksheets, pp. 40–43, as a guide, have students consider why structures were built to look the way they do. Have students investigate their school building, a structure in their neighborhood, or a building in Washington, D.C.

NOTES:

Structures Investigation Worksheet Part I

NAME:


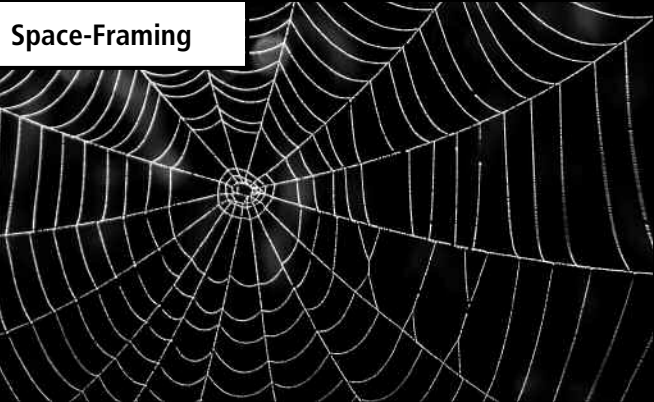

Take a look at these architectural structures. They will help you identify structures in other buildings.

Structure	Historical or Natural Model	Example in Washington, D.C.
<p data-bbox="164 709 399 758">Post & Lintel</p> 	<p data-bbox="833 716 1101 743">Greek Parthenon, Athens</p>	<p data-bbox="1166 716 1403 783">Lincoln & Thomas Jefferson Memorials</p>
<p data-bbox="164 1115 399 1163">Pyramid</p> 	<p data-bbox="833 1121 1029 1148">Egyptian pyramids</p>	<p data-bbox="1166 1121 1365 1188">Top of Washington Monument</p>
<p data-bbox="164 1520 399 1568">Arch</p> 	<p data-bbox="833 1526 1089 1633">Roman Coliseum, Rome Pont de Gard Roman aqueduct, France</p>	<p data-bbox="1166 1526 1398 1791">Francis Scott Key & Arlington Memorial Bridges National Building Museum Washington National Cathedral</p>

Structures Investigation Worksheet Part I

NAME:

Take a look at these architectural structures. They will help you identify structures in other buildings.

Structure	Historical or Natural Model	Example in Washington, D.C.
<p data-bbox="164 709 402 758">Dome</p> 	<p data-bbox="834 716 1073 863">Hagia Sophia, Istanbul Pantheon, Rome St. Paul's Cathedral, London</p>	<p data-bbox="1164 716 1403 821">Library of Congress National Gallery of Art U.S. Capitol</p>
<p data-bbox="164 1115 402 1163">Space-Framing</p> 	<p data-bbox="834 1121 964 1152">Spider webs</p>	<p data-bbox="1164 1121 1451 1268">Pentagon City Mall Thurgood Marshall Federal Judiciary Building (by Union Station)</p>
<p data-bbox="164 1520 402 1568">Geodesic Dome</p> 	<p data-bbox="834 1526 1078 1589">Disney's EPCOT Center Crystals</p>	<p data-bbox="1164 1526 1408 1558">Playground jungle gym</p>

Structures Investigation Worksheet Part II

NAME: _____

Now that you've learned about types of architectural structures

it's time to investigate a building in your neighborhood or Washington, DC. Visit the building or view pictures of it to answer the questions below:

1. Name and address of building: _____

2. Building's use: _____

3. Describe three types of structural systems in use.

	Structure	Location	Purpose
<i>Ex.</i>	<i>post & lintel</i>	<i>entryway</i>	<i>provides a simple short span for doorway opening</i>

a. _____

b. _____

c. _____

4. Document your findings. Draw or paste a picture of your building here:

Structures Investigation Worksheet Part II

NAME:

5. How do you think these structures affect the building? Were they chosen...

- to save money
- to appear grand or stately
- to blend with their surroundings
- to mimic a structure from the past
- to appear modern and innovative
- other _____

6. Do they appear to be...

- inexpensive
- expensive
- beautiful
- functional
- traditional
- modern
- historical
- funky
- utilitarian
- other _____

7. What materials is this building made from? Do you think these materials are a good choice for the building? Why or why not?

8. If you could change this building by adding a different type of structure, which one would it be? Why?