



Facilitator's Guide

Arches Part 2: Why the Shape Works: Understanding Forces

Developed and curated by the Ansys Academic Program

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This resource uses Ansys Discovery™ 3D product simulation software.

This guide supports the integration of a set of slides, titled “Arches Part 2: Why the Shape Works: Understanding Forces”, into the classroom.

Arches are common features in many historic buildings. They look grand and impressive — but how can they stay standing when they’re made of individual blocks that seem to just lean on one another?

These slides help students explore that mystery step-by-step. The sequence begins with the basics of forces and gradually builds toward understanding how forces act within an arch to make it so stable. Along the way, students encounter thought-provoking questions and simple hands-on activities designed to spark curiosity and encourage active participation.

This is part 2 of our set of resources on the topic of arches. Part 1 is also available online and focuses more on the historical evolution of arches, including topics such as material availability, material properties, manufacturing options, means of transport, and other historical connections.

Part 1 and 2 do, however, not depend on each other and can be used individually.

Zip File Contents:

1. Read Me Facilitator’s Guide (this document)
2. Power Point slides

Age Range: 9-99

This resource is designed to tell a story, give food for thought and inspire knowledgeable discussions. It is worth noting, that we intentionally use simplified language avoiding specific jargon, to make the topic understandable and relatable for children (**age 9+**) and anyone trained outside of this subject area.

The focus is on getting the participants (whether young or old) to talk about STEM topics as a group, no matter at which depth, and think outside the box and be inspired.

Learning Objectives:

After completing this activity, learners will gain a basic understanding of:

- What are forces?
- How are forces classified?
- What does “equilibrium” mean?
- How do forces act within an arch to make it so stable?
- The benefits of simulation in structural design

Format Suggestion:

We expect it to take between 45 to 90 minutes to go through this exercise, depending on the depth at which the included questions and activities are incorporated.

Prior/Supplemental Knowledge Required:

No prior knowledge is required for this exercise.

Fundamental concepts covered:

This resource highlights the significance of balanced forces to make a structure stable, as well as the benefits simulation.

Hands-on Activities:

Download the [Arch Part 1](#) resource and open the “ReadMe” document to see several options for building your own arch in class or at home.

Additional Resources:

Other Ansys pre-university resources:

- [“Arches Part 1: How History Shaped a Powerful Design”](#)
- [“Materials Intelligence: the Card Game”](#)
- [“Selecting Materials for Musical Instruments: a Case Example with a Xylophone”](#)
- [“Our impact on the planet: let’s make it a good one!”](#)
- [“Life’s Engineering Tales: Grandma’s Hip Replacement”](#)
- [“Life’s Engineering Tales, featuring: An element’s journey”](#)
- [“Life’s Engineering Tales: featuring whale-inspired wind turbines”](#)
- [“Life’s Engineering Tales: What kind of engineer could you be?”](#)
- [“How Walkie Talkies Work: an Exploration for Children using Ansys HFSS Software”](#)
- [“Exploring Material Properties via Experiments and Property Charts: the Game”](#)

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Document Information

This case study is part of a set of teaching resources to help introduce students to topics related to fluids.

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