

# TALL TOWERS

## A LEGOLAND® California Educational Resource Guide Grades K-2



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### Welcome to LEGOLAND California

**Education Programs:** Tall Towers has been developed by the LEGOLAND Education Department in cooperation with LEGO Education. For information on LEGOLAND Education programs, visit [www.LEGOLAND.com/edu](http://www.LEGOLAND.com/edu)

**Extended Learning in the Park:** Lab Notes are provided to guide your experience on recommended rides and attractions, to enhance the Tall Towers-themed educational experience and provide applied learning.

**Arrival and Entry:** Please arrive 30 minutes before your program. Teachers must be present during the staff-facilitated 45-minute program.

**Lunches:** School groups may bring lunches in disposable containers and use self-storage bins. Lunches may be pre-ordered when you book your program, or purchased at LEGOLAND restaurants.

**Safety:** LEGOLAND Parks are built to the highest standards of quality and safety. Height restrictions apply on selected attractions throughout the park.

# Background Information

## Before you Build, Study These Structures!

### What is a structure?

A **structure** is the arrangement all the parts of a whole thing. It is something that is built.

### What is a man-made structure?

A **man-made structure** is built or constructed by people. Houses, cars, towers, cranes, chairs, and bridges are all man-made structures.

### What is a natural structure?

**Natural structures** grow, or are built by other living things. Leaves and snail or turtle shells are natural structures that grow. A spider web, bird nest, bee hive, and beaver dam are examples of structures that are built by other living things.

### What is a shell structure?

A **shell structure** is built to enclose people or objects. Houses, cars, pitchers, and boxes are man-made shell structures. A bee hive or bird nest is a natural shell structure.

### What is a frame structure?

A **frame structure** is built to support a load. Bridges, chairs, and ladders are man-made frame structures. Spider webs and leaves are natural frame structure. Everyone has a natural frame structure in his or her own body—a skeleton.

### Structures can be flexible or rigid.

Some structures are **flexible** or stretchy, like a net, folding doors, or a plastic bag. Some structures are **rigid**, like towers, houses, and tables.



## How to Design a Structure

When you think about building a structure, think about what the structure will need to do and how it will be used. Then choose the right materials and shape for the structure.

- **Materials:** For example, a spider's web needs to be stretchy and elastic so it can blow in the wind without breaking. A house needs to be strong and is often made of bricks.
- **Shape:** For example, a chair needs a flat seat and legs to support the load of a person. A pitcher needs to have a spout for easy pouring.

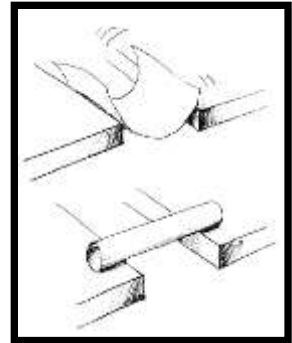
The tallest LEGO tower ever was built in Seoul, South Korea, in 2012. The tower was 102 feet tall!

## Before and After the Visit: Minds-On Activities

### Paper Bridges: Design Makes a Difference Strong and Stable or Weak and Wobbly?

When using identical materials, one design can be weak and another can be strong.

1. Place a sheet of paper between two desktops as shown. Lying flat, the paper will fall; it is not very strong or stable.
2. Now change the design. Roll the paper and tape it to form a tube. Place the paper between the two tables. You have created a stronger and more stable structure by changing the shape!
3. Fold paper into different shapes and lay it across two desktops. Find the strongest and most stable design.



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### Your Skeleton: A Natural Frame Structure

Each person has a natural frame structure inside his or her body—a skeleton! Our skeleton gives us shape and supports the weight of our muscles. The size of our frame, or skeleton, determines how tall we are.

The tallest person who ever lived was Robert Wadlow (1918-1940), of Alton, Illinois. When he was five years old in Kindergarten, he was 5'6" tall. He grew to be 8'11" tall.



### Compare Shapes and Sizes

1. Lie on the floor on butcher paper and ask a partner to trace the shape of your body. Cut out the shape. Trace your partner's shape and cut it out.
2. Now draw a 8'11" tall shape for the tallest man who ever lived.
3. Tape the shapes to the wall, along with a tape measure.
4. Find the difference between the tallest person in the class and the tallest man who ever lived.

# Discovery and Learning at LEGOLAND

## Shell Structure

People or things can go into a shell structure.

Find the shell structures in each picture. Circle them.

**Challenge:** Find other shell structures at LEGOLAND! List your finds on the back of the page.



## Frame Structure

A frame structure can support weight, or a "load." Also, if it spans a gap and you can cross over it, it is a frame structure. Find the frame structures in each picture. Circle them.

**Challenge:** Find other frame structures at LEGOLAND. List your finds on the back of this page.





# Hands-On Activities

## Discover Structures

Look around at the man-made structures in LEGOLAND. Name some man-made structures.

Natural structures grow or are built by other living things. Look at the natural structures. Name some natural structures that animals build.

Shell structures are built so that people or things can go into them. Name some shell structures.

Frame structures are built to support a load, or carry weight, or to span a gap so you can cross over. Name some frame structures. Name the frame structure that is inside your body.



## Tips for Building Stable Structures

When we build structures, we want them to be stable, or strong. Here are two hints from LEGOLAND Master Model Builders to help build

stable structures:

1. Overlap the bricks as you build the levels taller. This is called interlocking.
2. Build a wide base, and do not make the top too skinny.

## Build a Tall Tower!

With a partner, use the DUPLO bricks to build the tallest tower you can! Remember the Model Builder's tips, and build a stable tower.

## Earthquake Table Testing

Take turns and bring the tower to the Earthquake Table. When the table is turned on, it will shake like a real earthquake! Look at each tower as it is placed on the table. Are the bricks overlapping? Is the base wide? Will the tower stand up to the shaking—or will it crash?!

LEGO, the LEGO, the brick and knob configurations, the Minifigure and LEGOLAND are trademarks of the LEGO group. ©2014 The LEGO Group. LEGOLAND and SEA LIFE are a part of the MERLIN ENTERTAINMENTS GROUP.

# About Tall Towers

## Learning Outcomes

- Learn about man-made and natural structures.
- Classify structures as frame or shell structures.
- Learn to build stable structures.
- Relate Hands-On activities to the experience of LEGOLAND attractions.



## California Next Generation Science Standards

### **K Motion and Stability: Forces and Interactions**

**K-PS2-1.** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

### **K-2 Engineering Design**

**K-2-ETS1-1.** ...Define a simple problem that can be solved through development of a new or improved object or tool.

**K-2-ETS1-2.** Develop a simple...physical model to illustrate how the shape ...helps it function to solve a given problem.

**K-2-ETS1-3.** (T)est two objects designed to solve the same problem to compare strengths and weaknesses of each....

### **GRADE 2 Matter and Its Interactions**

**2-PS1-3.** Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. [Clarification Statement: Examples of pieces could include...building bricks...]

The performance expectations above were developed using NRC Framework for K-12 Science Education:

## Science and Engineering Practices

### **Planning and Carrying Out Investigations**

- With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)

### **Constructing Explanations and Designing Solutions**

- Use tools and materials provided to design and build a device that solves a specific problem. (K-PS2-2)

### **Asking Questions and Defining Problems**

- Ask Q's based on observations to find...info about the natural and/or designed world. (K-2-ETS1-1)
- Define a simple problem that can be solved thru development of a new/improved object...(K-2-ETS1-1)

**Developing and Using Models...** based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

**Analyzing and Interpret Data** from tests of an object...to determine if it works as intended. (K-2-ETS1-3)

## Disciplinary Core Ideas

### **ETS1.A: Defining Engineering Problems**

- A situation people want to change or create can be approached as a problem to be solved through engineering.(K-2-ETS1-1)
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

### **ETS1.B: Develop Possible Solutions**

- Designs can be conveyed through...models (and) are useful in communicating...solutions. (K-2-ETS1-2)

### **ETS1.C: Optimizing the Design Solution**

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)

## Crosscutting Concepts

### **Cause and Effect**

Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1),(K-PS2-2)

### **Structure and Function**

Shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

## Common Core State Standards Connections K-2 5

### **ELA/Literacy –**

**W.2.8** Recall information from experiences...to answer a question. (K-2-ETS1-1),(K-2-ETS1-3)

**SL.2.5** Create...visual displays to...recounts of experiences...to clarify ideas.... (K-2-ETS1-2)

**SL.K.3** Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)

### **Mathematics –**

**MP.2** Reason abstractly and quantitatively. (K-2-ETS1-1),(K-2-ETS1-3)

**MP.5** Use appropriate tools strategically. (K-2-ETS1-1),(K-2-ETS1-3)