

# Storm King Art Center Teacher Resource



## Edgy Engineering

How did they do that? Experience the effects of cutting-edge sculpture in outdoor spaces and consider the role that structure and problem-solving play in art making and installation.

Recommended for grades 6-12.

Dear Teachers,

We are delighted to welcome you to Storm King Art Center, a 500-acre outdoor museum located in New York's Hudson Valley, where visitors experience large-scale sculpture and site-specific commissions under open sky.

This resource is designed to help you prepare to explore the theme of "Edgy Engineering" with your students at Storm King. By approaching visits through a thematic lens, we hope to engage learners in focused close looking, activities, and conversation—providing a solid foundation as students construct connections throughout their experience.

Whether you have chosen a guided tour or will be facilitating your own visit, this resource offers pre-visit ideas to prepare for your trip, tips and tools for onsite engagement, and post-visit activity prompts for continued exploration.

During a guided visit, your educator might build the experience around a particular sub-theme related to Engineering (ex: structural support, kinetic sculptures). Please be in touch at least two weeks before your program if you have specific interests.

While you may not see all artworks in this packet during a guided program, we invite you to visit additional artworks after your tour, if time allows. The artworks in this packet are situated within one mile of the School Group arrival area.

If you have additional questions about your upcoming visit, please contact us at:  
[groups@stormkingartcenter.org](mailto:groups@stormkingartcenter.org)

We look forward to welcoming you and your students soon!

Sincerely,  
The Storm King Education Team

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**Cover Image:** Menashe Kadishman (Israeli, 1932–2015), *Suspended*, 1977. Weathering steel, 23 ft. x 33 ft. x 48 in. (701 cm x 10.1 m x 121.9 cm). Gift of Muriel and Philip I. Berman, Allentown, PA. © Menashe Kadishman

# Pre-Visit

## INTRODUCTION TO STORM KING ART CENTER

Storm King Art Center is a 500-acre outdoor museum, where visitors experience large-scale sculpture under open sky. We strongly recommend you download our new, free mobile guide on the Bloomberg Connects app (available on the Apple Store, Google Play, or at <https://www.bloombergconnects.org/>). Here you'll find photos, videos, audio recordings, maps, suggested routes, activities for children and families, and more. You and your students can learn more about Storm King's [environmental stewardship](#), collection, and community connections in this brief [Oral History video](#), featuring Storm King President, John P. Stern.

## INTRODUCTION TO THE THEME “EDGY ENGINEERING”

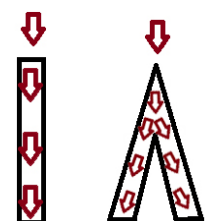
Engineers apply science and math to solve problems and create structures and objects. Invite students to participate in one or more hands-on engineering challenges to help introduce ideas they might explore at Storm King. Here are links to engineering challenges using [toothpicks](#), [straws](#), [clay](#), and [newspaper](#). Some concepts that you might discuss include:

**Structural Engineering:** This branch of Civil Engineering focuses on designing and analyzing structures, such as buildings or bridges. Structural Engineers consider various forces that put stress on different members, or parts, of a structure, and make sure that structure will remain stable. Ask students to list different types of structures they've seen in their neighborhood or while travelling (tunnels, pavilions, sculptures, buildings). What are some things the structures have in common, and what are some differences in their designs?

**Compression:** Compression happens when forces press inward on an object. Students can experience compression in their own bodies by placing both of their palms flat against one another and pushing their arms in. Pressing down hard on a desk with metal legs can demonstrate that many metals remain strong under compression. If students roll up a sheet of paper and compress both ends, it may remain sturdy for a while, but will eventually buckle under too much compression.

**Tension:** Tension occurs when forces pull on an object. Students can experience tension in their bodies by curling the fingers of each hand around one another and pulling their arms apart. A string is an example of something that can withstand much tension, even though it is easily compressed. Pulling on both ends of a rolled-up sheet of paper will demonstrate that it has a stronger tensile strength than compressive strength.

**Load Path:** Engineers design structures that transfer forces and move stress from areas of weakness to an area of strength. A load, or force, moves through a structure's members down to its foundation. The path that it takes is called a load path. If a force, like a weight or gravity, acts on a vertical beam, the load takes a path straight down. If a force acts on a triangular shape, the load is distributed down each member to the foundation.



## **ART & ENGINEERING**

When creating a sculpture, artists often have to think like or work with engineers. They choose materials, design structures, and consider forces that might act on the sculpture. Because Storm King is an outdoor museum, sculptures will be exposed to different forces than they would inside of a gallery.

Ask students what forces they think might affect an outdoor sculpture. Sculptures have to support their own mass as it is acted on by gravity. Outdoor sculptures are also subjected to forces like wind, snow and ice, and even geological events like earthquakes or erosion. Some sculptures remain static and some have dynamic, or moving, members. In addition to considering the shapes and ideas they want to express, artists must be sure their sculptures remain stable.

## **OBSERVE AND DISCUSS**

Project or print images of Mark DiSuvero's sculptures [Mother Peace](#) and [She](#) (pages 5 & 6). Ask students what they notice about each sculpture, and then ask them to compare and contrast the structures. Why do they think the artist might have incorporated triangular shapes? Where else have they seen triangular shapes supporting structures? Which members, or parts, of di Suvero's sculptures seem to be under compression? Which members seem to be in suspension? Which seem static and which seem dynamic?

Share Mark di Suvero's [Oral History video](#). Ask students to discuss with a partner: What are some ideas the artist talked about in the video? One concept that he mentioned was "center of gravity," which students can explore through [this hands-on activity](#). How do students think that concept might relate to di Suvero's process?

In addition to considering engineering choices, ask students what ideas the sculptures make them think about. In *Mother Peace*, di Suvero cut a peace symbol into one of the steel beams. What other parts of the sculpture resemble a peace symbol? *She* includes a swaying platform that people can stand or sit on. Why do students think an artist might choose to create sculpture people can interact with?

At Storm King, students will explore sculptures that interact with forces, landscapes, and ideas. During their visit, they can continue to notice and discuss relationships between art and engineering.

# Artwork Images and Information



Mark di Suvero (American, born China, 1933), *Mother Peace*, 1969–70. Painted steel, 41 ft. 8 in. x 49 ft. 5 in. x 44 ft. 3 in. (12.7 x 15.1 x 13.5 m). Gift of the Ralph E. Ogden Foundation. © Mark di Suvero, courtesy of the artist and Spacetime C.C.

## [Mother Peace \(1969-70\) by Mark di Suvero](#)

*Mother Peace*, one of Mark di Suvero's most overtly political works, includes a torch-cut peace sign in its lower horizontal beam; the entire sculpture also takes the form of a three-dimensional peace sign. It is the last major work that di Suvero completed before leaving the United States for a four-year stay in Europe in 1971, in protest of US involvement in the Vietnam War. Di Suvero created *Mother Peace* without the aid of assistants in a parking lot in Pasadena, California, over the course of nine months; he arranged its large I-beams with a crane. The sculpture weighs approximately six tons, but seems to defy its own great mass: its upper elements are suspended by thick cables and sway in response to gusts of wind.

**Media:** Mark di Suvero's [Oral History Video](#); Audio recordings and photos available on our digital guide on Bloomberg Connects.





Mark di Suvero (American, born China, 1933), *She*, 1977–78. Steel with wooden swinging bed, 17 x 52 x 28 ft. (518.2 cm x 15.8 m x 853.4 cm). Private collection. © Mark di Suvero, courtesy of the artist and Spacetime C.C.

### [She \(1977-78\) by Mark di Suvero](#)

Peace, freedom, and the civic responsibility of the artist have long been concerns for di Suvero, who was imprisoned while protesting the Vietnam War. In sculptures like *She*, the design of which incorporates a hanging wooden bed, di Suvero has worked to transform a viewer's relationship with art, inviting participation and fostering a sense of inclusiveness.

*She* also proposes new and intimate uses for the world's discarded industrial products: a crane hook and the rusty steel barrel of a steamroller are incorporated into its design.

**Media:** Mark di Suvero's [Oral History Video](#); Audio recordings and photos available on our digital guide on Bloomberg Connects.



Menashe Kadishman (Israeli, 1932–2015), *Suspended*, 1977. Weathering steel, 23 ft. x 33 ft. x 48 in. (701 cm x 10.1 m x 121.9 cm). Gift of Muriel and Philip I. Berman, Allentown, PA. © Menashe Kadishman

### [Suspended \(1977\) by Menashe Kadishman](#)

The two simple forms of Menashe Kadishman's *Suspended* engage in a gravity-defying balance that belies expectation. Seen from a distance, atop one of two adjacent hilltops, the sculpture's balancing act is surprising. Viewed up close, the massive scale of the steel work becomes apparent and its structural viability even more difficult to comprehend. With no visible evidence of the engineering holding the sculpture up, *Suspended* prompts contemplation of the relationship between its two conjoined, towering masses, coupled with questions about what lies below ground. Rich and rusted, the patina of the weathered steel wraps the stark geometric shapes in a skin-like sheath.

After working with sculptors in his native Israel, Kadishman went to London in 1959, where he came under the influence of Anthony Caro at Saint Martin's School of Art. By the mid-1960s, he had established an international reputation for suspended sculptures that were gestural and full of dynamic tension. In some of his best-known works from this period, Kadishman attached glass or plastic sheets to wood or metal forms so that the mass seemed to float freely in space. *Suspended* represents his interest in such perceptual ambiguities.

**Media:** Audio recording and photos available on our digital guide on Bloomberg Connects.





Kenneth Snelson (American, 1927–2016), *Free Ride Home*, 1974. Aluminum and stainless steel, 30 ft. x 60 ft. x 60 ft. (914.4 cm x 18.3 m x 18.3 m). Gift of the Ralph E. Ogden Foundation. © The Estate of Kenneth Snelson, courtesy Marlborough Gallery, New York

### [Free Ride Home \(1974\) by Kenneth Snelson](#)

When conceiving of *Free Ride Home*, Kenneth Snelson first created a small maquette of metal tubes and knotted strings, envisioning what it would be like to walk under and through its silvery linear forms. “I began by thinking of a sculpture that would soar overhead,” Snelson noted. “I started with a central core and then developed it in three directions with three arches. One of the arches began to take on a descending fast plunge. It reminded me of the shape of a bucking horse. So, *Free Ride Home*, the name of a racehorse, became the name of the sculpture.”

Touching the ground at just three points, the creatively engineered sculpture is fashioned from a network of stainless-steel cables knotted to aluminum tubes. Installing at Storm King in the spring of 1975, a crew of just four raised the entire structure in under an hour. *Free Ride Home* is a prime example of Snelson’s play with organic forms constrained by internal structural tension, a push-pull system he invented in 1948. In this system, inspired by anatomy, cables function like muscles and the aluminum tubes like bones.

**Media:** Audio recording and photos available on our digital guide on Bloomberg Connects. [Archival Images](#) of the installation of Kenneth Snelson’s *Free Ride Home*.



George Rickey (American, 1907–2002), *Five Open Squares Gyratory Gyratory*, 1981. Stainless steel, 9 ft. 4 in. x 72 in. x 42 in. (284.5 x 182.9 x 106.7 cm). Gift of the artist and of Joan O. Stern by exchange. Art © Estate of George Rickey/ Licensed by VAGA, New York, NY

### **[Five Open Squares Gyratory Gyratory \(1981\) by George Rickey](#)**

Other kinds of movement, including gyratory, or a full rotation around a work's central stem, emerged in Rickey's work in the early 1970s, along with a frame-like, elongated, open rectangle. The open square elements of *Five Open Squares Gyratory Gyratory* are sensitively calibrated so that they move with the slightest breeze, continually transforming the piece's configuration. While the squares rotate independently, they remain connected, creating an ongoing dialogue between unpredictable motion and prescribed order. Looking through the open squares, viewers will sense that the landscape itself is constantly shifting.

**Media:** Audio recording and photos available on our digital guide on Bloomberg Connects; Storm King Art Center's [Facebook video](#) of *Five Open Squares Gyratory Gyratory* in motion

# During Your Visit at Storm King

## **GENERAL INFORMATION**

**PLEASE FULLY READ YOUR GROUP CONFIRMATION LETTER** for complete details about arrival, lunch, chaperones, trams, tours, and weather. Additional information about Group Visits can be found at <https://stormking.org/groups/> or by contacting [groups@stormkingartcenter.org](mailto:groups@stormkingartcenter.org)

**PREPARE TO BE OUTDOORS:** Storm King is a 500-acre outdoor sculpture museum. We're open rain or shine. Please be sure your group comes prepared to spend the day outdoors, wears comfortable walking shoes, and brings sunscreen, bug spray, and weather-appropriate attire.

**HELP US PROTECT THE SCULPTURES:** Touching, walking on, or climbing on most of the works of art at Storm King is prohibited. The sunscreen, hand lotion, bug spray, and even natural oils on your hands damage the surface of the sculptures. You might not think one touch matters but remember, about 200,000 people visit Storm King every year. Thousands of touches add up to lots of damage.

**INTERACTIVE ARTWORKS:** Artworks which visitors may touch and with which you may physically interact are designated on the map and on the grounds with a hand icon.

**GROUND:** The Art Center's grounds comprise varied terrain including rolling meadows, hills, wooded areas, paved paths, and gravel paths. During guided tours, please be prepared to cover up to one mile on grass. If you have a limited amount of time, we suggest making your way to Museum Hill to see the sculptures, vistas, and Visitor Center.

**ACCESSIBILITY:** There are gravel paths throughout the Art Center that can be utilized by strollers and/or wheelchairs. For guided tours, more accessible routes may be planned with advanced notice. You can also find accessible routes on Storm King's digital guide on the Bloomberg Connects app. Groups with limited mobility are always welcome to use the public tram on a first come, first served basis. Seating is limited and cannot be guaranteed. If you have questions about the use of the public tram, please contact us at [groups@stormkingartcenter.org](mailto:groups@stormkingartcenter.org) to discuss your group's needs.

**TIME:** We recommend planning at least 3 hours for your visit. Guided tours are usually 45-60 minutes. If your visit is self-guided, or you have time before or after your tour, you may have lunch at a designated picnic area, and explore the grounds on your own. Suggestions for student engagement are available on pages 11 & 13 of this resource packet.

**MATERIALS:** You may choose to bring pencils and sketchbooks or notebooks for students to draw and write during the self-guided portion of your visit. Suggestions for student engagement are available on pages 11 & 13 of this resource packet.

**MAP:** Access an up-to-date map of Storm King under the heading "Grounds and Accessibility" on our ["Visit" webpage](#), or pick up a map when you arrive at Storm King.



## **EDGY ENGINEERING**

Continue exploring the theme of engineering. If you are on a self-guided visit, or have time before or after your tour, walk the grounds. What do students notice about structures, balance, and support in each sculpture?

**Visit some or all of the artworks featured in this resource packet:**



**Artworks:** *Mother Peace* (1969-70) and *She* (1977-78) by Mark di Suvero

**Location:** South Fields; see map on page 12

**Engagement:** View from multiple angles. Ask students what they notice about these artworks in person, which they did not notice when viewing photos of them in class. Invite a few students at a time to stand and sway on the platform of *She*. How do they think the structure is supporting them? Compare the structure of these sculptures to some other surrounding sculptures by Mark di Suvero.



**Artwork:** *Suspended* (1977) by Menashe Kadishman

**Location:** North Woods; see map on page 12

**Engagement:** Ask students to list questions that this sculpture inspires. What forces might be acting on this sculpture? What kinds of underground materials and structures do they think might support this sculpture? Invite them to draw ideas about what it might look like underground.



**Artwork:** *Free Ride Home* (1974) by Kenneth Snelson

**Location:** Museum Hill; see map on page 12

**Engagement:** Where do students notice tension in this piece? The artist named this sculpture after a racehorse. How do they think the sculpture might relate to a moving horse?



**Artwork:** *Five Open Squares Gyrotory Gyrotory* (1981) by George Rickey

**Location:** North Woods; see map on page 12

**Engagement:** Ask students to identify which parts of this sculpture are static, or still, and which parts are dynamic, or movable? Invite students to take three photos of the sculpture from the same spot and compare the composition in each photo. Explore Rickey's other moving sculptures nearby. Do students have a favorite? Why?

## "EDGY ENGINEERING" ARTWORK LOCATIONS

#113 Menashe Kadishman,  
*Suspended*

#230: Kenneth Snelson,  
*Free Ride Home*



#120: George Rickey,  
*Five Open Squares*  
*Gyratory Gyratory*

#407: Mark di Suvero,  
*Mother Peace*

#411: Mark di Suvero, *She*



## **TIPS AND TECHNIQUES FOR STUDENT ENGAGEMENT AT STORM KING**

**EXPLORE PERSPECTIVE.** View sculptures and vistas from afar, close up, above, and below. Move around and through artworks to experience them from different angles. Invite students to create a rectangle with their hands to use as a viewfinder, “zooming in” on details and “cropping” views. Try photographing the same artwork or area from multiple perspectives. Ask students to imagine or draw what something might look like from a bird’s-eye view or a worm’s-eye view.

**ENGAGE YOUR SENSES.** Take the time to slow down and breathe deeply. What scents do you notice? What sounds do you hear? Invite students to create a six word poem or story inspired by their sensory experiences. In addition to feeling the tickle of breezes and grass blades, we invite visitors to interact with sculptures marked on the map with a green hand icon.

**EMBRACE THE LANDSCAPE.** Enjoy cloud gazing, downhill rolling, and creature and critter watching. Please engage with the land safely and respectfully.

**SKETCH.** Ask students to try capturing sculptures and vistas with single-line contour drawings. Challenge them to create quick sketches without lifting their pencil from the page. Try drawing the same artwork or area from multiple angles. Zoom in on details. Experiment with mark making to capture different textures and create compositions featuring both sculpture and landscape.

**GET MOVING!** Encourage students to explore ideas with their bodies. They might physically recreate shapes they observe, or respond to art and nature through dance and movement.

**ASK OPEN-ENDED QUESTIONS.** Engage students in conversation by asking open-ended questions, such as: What do you notice? What does this make you think of? What do you wonder? What artworks or areas do you like the most? Why?

**CONSIDER TITLES.** While the digital guide and Storm King [website](#) can provide additional information about each artwork, many works have nearby placards listing the artist and title. You might add an additional layer to group conversations by considering how a title might relate to an artwork.

**TUNE INTO THE AUDIO GUIDE.** Accessible on Storm King’s new digital guide on the free Bloomberg Connects App. Make the most of your visit with audio and video commentary by artists and Storm King staff. Artwork lookup numbers can be found on the map and on the label next to each artwork.

**PICK UP AN INTERACTIVE GUIDE.** You can pick up our [Field Guide for Young Explorers](#) at the Visitor Center on Museum Hill, or from staff members when you arrive. Explore art and landscape with guided prompts for drawing, writing, and conversation.

# Post-Visit

## REFLECT

Ask students to individually journal, or talk with a partner, about their visit to Storm King. What are some sculptures and ideas they explored? What engineering concepts did they notice in the artwork?

## PROBLEM SOLVING

Print or project images of Kenneth Snelson's [Free Ride Home](#) (page 8) and George Rickey's [Five Open Squares Gyratory Gyratory](#) (page 9). You can also share Storm King Art Center's [Facebook video](#) of George Rickey's sculpture in motion.

In partners or groups, ask students to discuss some problems they think each artist had to solve in order to create those sculptures. You might want to share relevant information about each sculpture (pages 8 & 9) to support students' conversations.

## ART & ENGINEERING CHALLENGE

**Prompt for students:** How will you create a stable, small-scale sculpture that has both static and dynamic parts? This means your sculpture should stand on its own and have at least one still part and at least one part that is moveable.

**Some questions students might consider:**

- What materials will you choose to build with? Why?
- How will you create a stable form that can stand on its own?
- What parts will move? What forces will make them move (wind, a push, etc)?
- Will the shapes/forms in your sculpture relate to any ideas? For example, Mark di Suvero's *Mother Peace* was inspired by the lines of a peace sign, and Kenneth Snelson's *Free Ride Home* is abstract, but he related it to the movement of a race horse.
- Would you like to sketch some ideas before building?

**Materials could include:** paper, clay, wire, aluminum foil, string, toothpicks, rubber bands, paper clips, tape (you might choose to make a rule that tape cannot be used to hold sculptures to a desk, to increase the challenge of creating structural stability)

**Preparation:** First, lead students in an inquiry with the materials. What are different ways that they can shape each material (ex: roll, bend, etc.)? Are some materials stronger when compressed? Are some stronger in tension? How might they effectively join materials, or make certain materials balance and stand on their own?

**Process:** As students work on their sculptures, check in with them, and encourage them to talk with partners to problem solve.

**Reflection:** Invite students to share their completed creations with the class, or do a "gallery walk" around the room to explore each other's sculptures. Ask students to share a problem or challenge they encountered during their sculpture design or construction, and their process for solving it.

# Resources

Storm King Art Center Collection

<https://collections.stormking.org/index.php/About/collection>

John P. Stern Oral History

<https://collections.stormking.org/Detail/oralhistory/4867>

Mark di Suvero Oral History

<https://collections.stormking.org/Detail/oralhistory/4858>

Storm King Art Center Groups

<https://stormking.org/groups/>

Exploratorium Science Explorer: Geodesic Gumdrops

[https://www.exploratorium.edu/science\\_explorer/geo\\_gumdrops.html](https://www.exploratorium.edu/science_explorer/geo_gumdrops.html)

Exploratorium Guide to Scale and Structure: Straws and Pins--Building Out

<https://www.exploratorium.edu/structures/strawspins.html>

Exploratorium Guide to Scale and Structure: Clay Bridges

<https://www.exploratorium.edu/structures/claybridges.html>

Exploratorium Guide to Scale and Structure: Newspaper Bridges

<https://www.exploratorium.edu/structures/newspaper.html>

Exploratorium Teacher Institute: Center of Gravity

<https://www.exploratorium.edu/snacks/center-gravity>