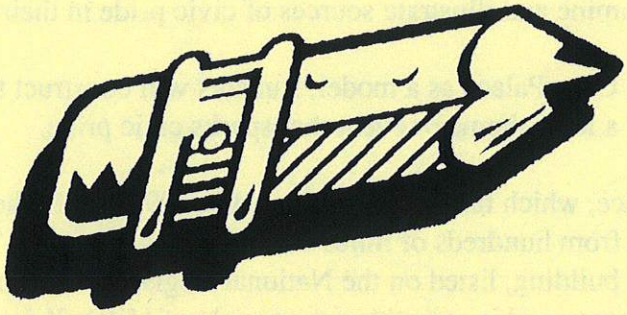
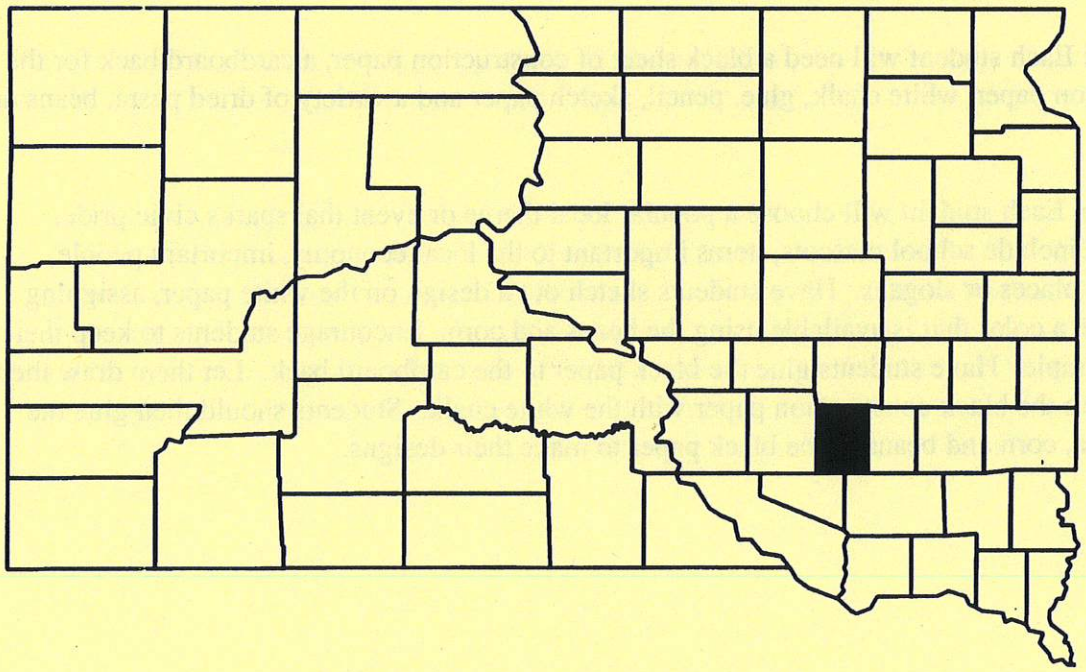


Design & Drawing Activities
Section 2, Lesson 8



Civic Pride

Corn Palace • Mitchell, South Dakota

CIVIC PRIDE-The Corn Palace

Objective: Students will examine and illustrate sources of civic pride in their community.

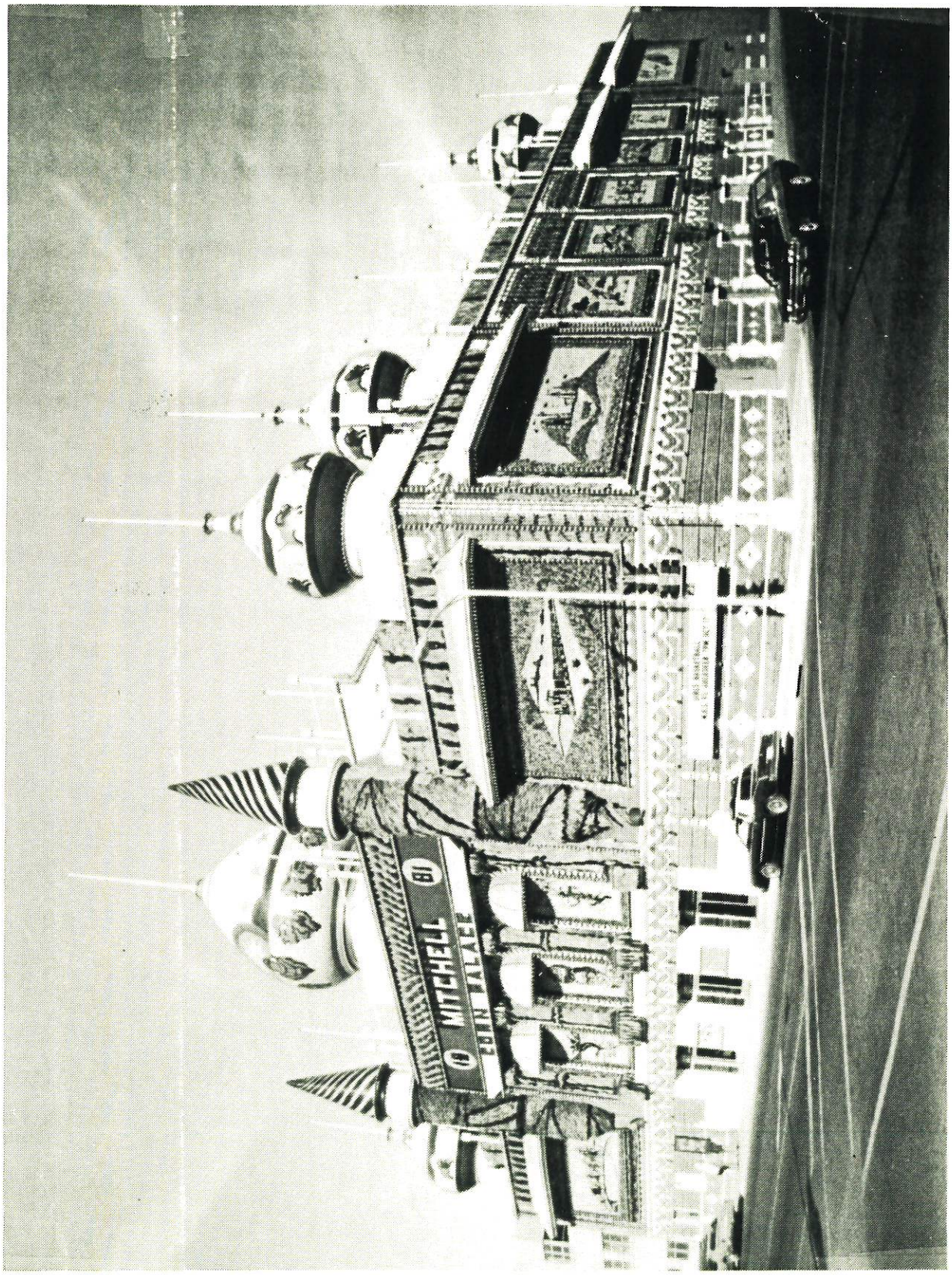
Method: Using the Mitchell Corn Palace as a model, students will construct their own "Corn Palace" mosaics illustrating a local theme or event that sparks civic pride.

Background: The Corn Palace, which turned 100 years old in 1992, is Mitchell's biggest tourist attraction and draws people from hundreds of miles around who want to see "The World's Only Corn Palace". This historic building, listed on the National Register of Historic Places, is very important to Mitchell's economy and is something the people of Mitchell are very proud of. It features unusual exterior mosaics made from different color ears of corn and framed with bundles of grain and grass. The interior serves as a concert hall and community auditorium.The first corn palace was built in 1892, the second in 1905 and the present building and location date from 1920-1921. The onion shape domes and minarets in the Moorish architectural style date from 1937. The exterior picture panels are changed once each year in late September as part of Corn Palace Week.

Artists design the exterior panels on regular size paper and then blow up the designs to actual scale on large sheets of tar paper that are nailed to the outside wall. Each section is color-coded. Workers saw ears of corn in half lengthwise and nail each half ear to the wall with the grain side out. This process continues until the designs are completed, just like a mosaic. All of the plants used in the Corn Palace are grown locally. Artists have yellow, orange, red, blue and mixed corn to choose from when designing the panels.

Materials: Each student will need a black sheet of construction paper, a cardboard back for the construction paper, white chalk, glue, pencil, sketch paper and a variety of dried pasta, beans and corn.

Procedure: Each student will choose a popular local theme or event that sparks civic pride. Examples include school mascots, items important to the local economy, important people, important places or slogans. Have students sketch out a design on the white paper, assigning each space a color that is available using the beans and corn. Encourage students to keep their designs simple. Have students glue the black paper to the cardboard back. Let them draw their design onto the black construction paper with the white chalk. Students should then glue the dried pasta, corn and beans to the black paper to make their designs.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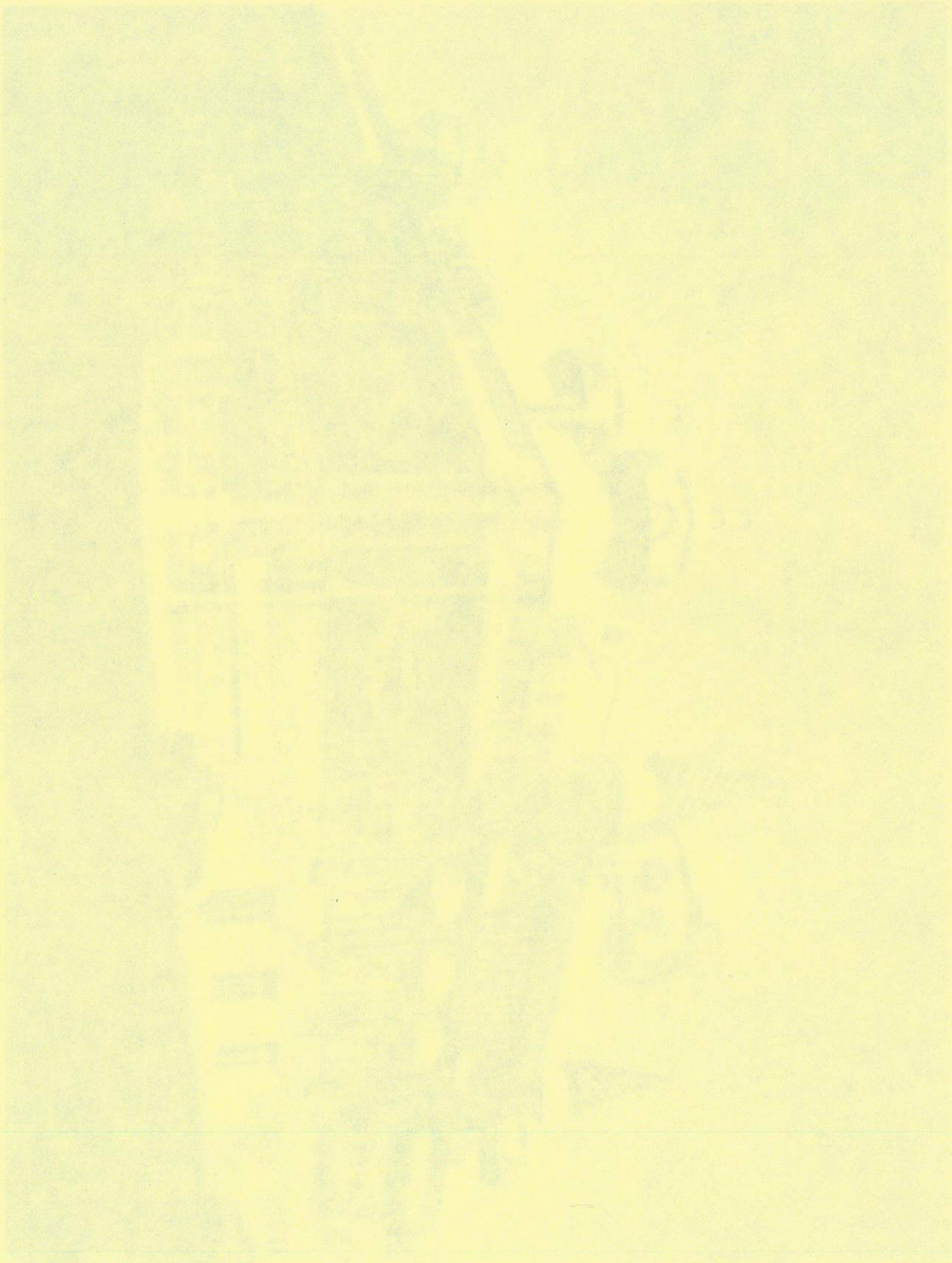
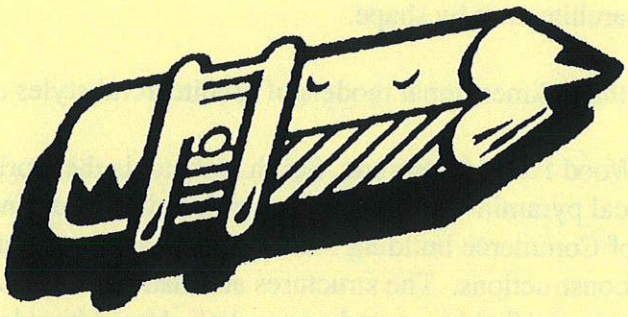
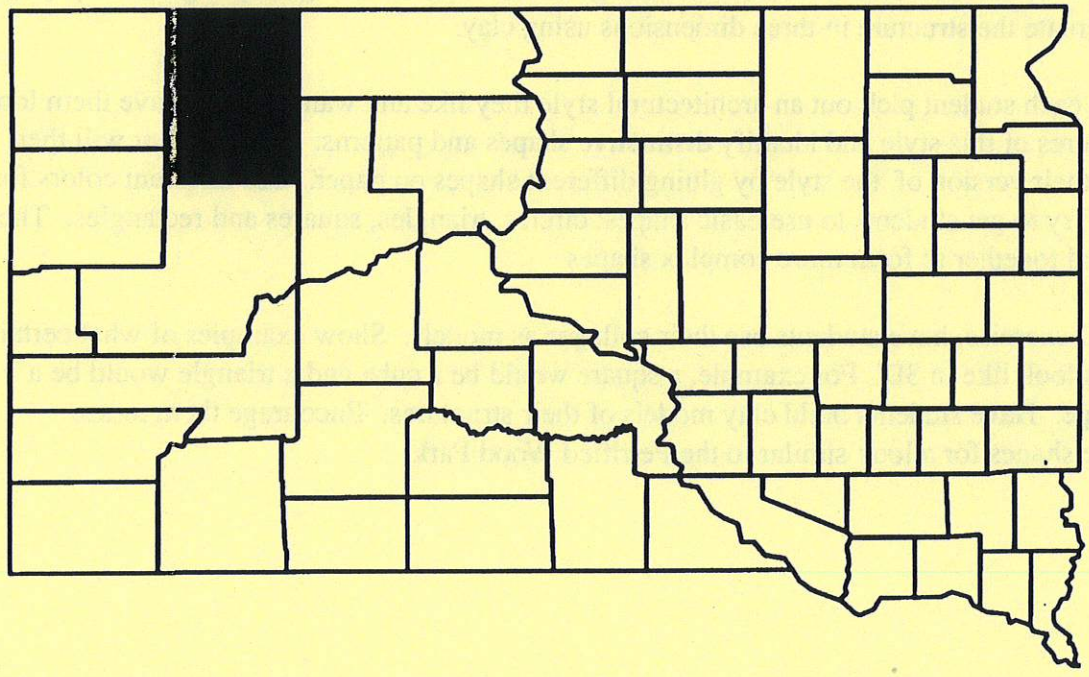




Design & Drawing Activities
Section 2, Lesson 9



Shapes in Architecture

Petrified Wood Park • Lemmon, South Dakota

SHAPES IN ARCHITECTURE-Lemmon Petrified Wood Park

Objective: Visually analyze architecture by shape.

Method: Construct two and three dimensional models of architectural styles using basic shapes.

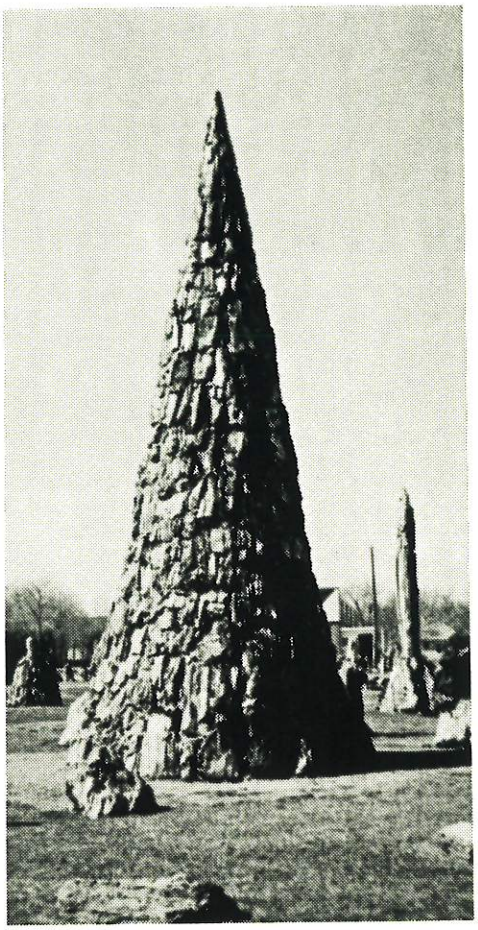
Background: The Petrified Wood Park in Lemmon, South Dakota, is the world's largest petrified wood park. It contains conical pyramids, pillars, a museum building featuring exterior spires of varying height, a Chamber of Commerce building that was a gas station, a miniature castle building and assorted other constructions. The structures are made up of tons and tons of petrified wood, petrified grass, petrified bones and cannonball shaped boulders from the Cannonball River in North Dakota. The stones come in a wide variety of shapes, sizes and colors. Ole Quammen, the park's founder, was a Lemmon pioneer who ran the local lumberyard and was also an amateur geologist. He hired local people to build the park during the early years of the Great Depression using petrified material he had gathered over time. The park is located on two city blocks in downtown Lemmon and has always been a popular tourist attraction since it was completed in 1933.

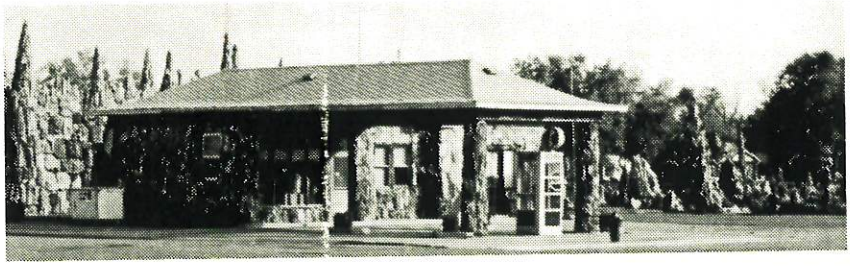
Materials: architectural style books, poster board, different colored paper, scissors, glue, clay

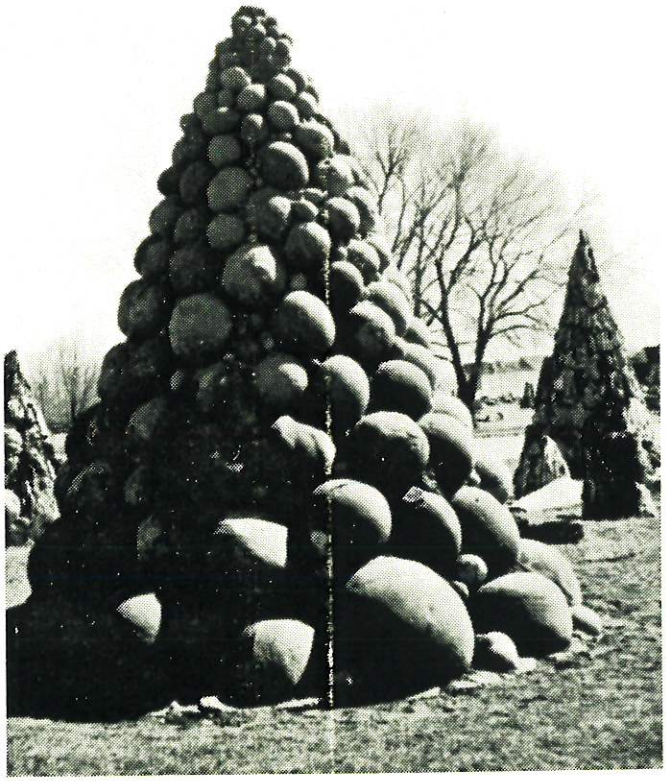
Procedure: Show the students the photos of the Petrified Wood Park. Emphasize the variety of shapes and different ways they are put together to make the structures in the Park. Tell students they are going to construct their own park containing buildings in different architectural styles. First, they will construct a two dimensional image of the structure using shapes glued to paper and then create the structure in three dimensions using clay.

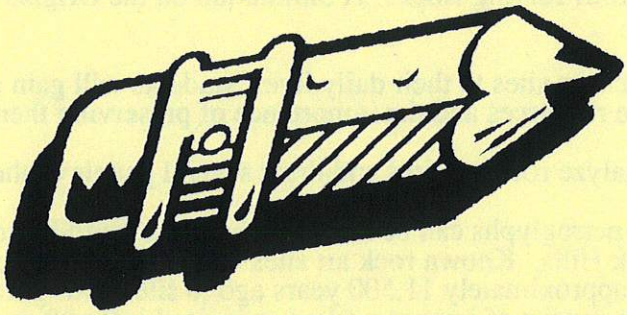
First have each student pick out an architectural style they like and want to use. Have them look at the pictures of this style and identify distinctive shapes and patterns. Each student will then construct their version of the style by gluing different shapes on paper. Use different colors for contrast. Try to get students to use basic shapes: circles, triangles, squares and rectangles. They can be used together to form more complex shapes.

For the 3D exercise, have students use their collages as models. Show examples of what certain 2D shapes look like in 3D. For example, a square would be a cube and a triangle would be a prism shape. Have students build clay models of their structures. Encourage them to use distinctive shapes for a look similar to the Petrified Wood Park.

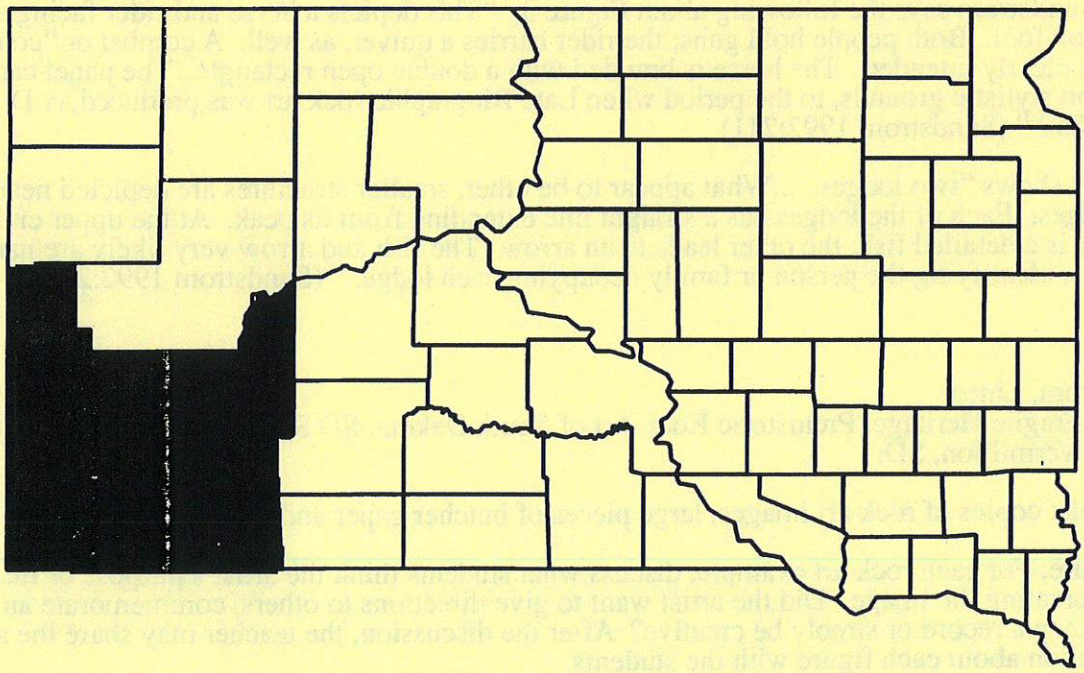








Design & Drawing Activities
Section 2, Lesson 10



Communication Through Images

Rock Art

PLACES WORTH EXPLORING

COMMUNICATION THROUGH IMAGES-Rock Art

This lesson courtesy of Rosemary Moeller, Gifted Teacher, Miller Schools. This lesson is partially based on ideas from Talking Rocks -A Simulation on the Origins of Writing by Robert F. Vernon.

Objective: By relating rock art sites to their daily lives, students will gain a better understanding of the uniqueness of these resources and the importance of preserving them.

Method: Students will analyze rock art sites and draw several panels of their own rock art.

Background: Rock art or petroglyphs can be found throughout South Dakota with the greatest concentration in the Black Hills. Known rock art sites date from the earliest known prehistoric activity in South Dakota approximately 11,500 years ago to sites dating from the nineteenth century. Most of the sites consist of images pecked or incised into soft rock such as sandstone. A number of distinct styles with similar themes and styles have been identified. The message or purpose of some panels has been hypothesized while others remain a mystery. Several examples are shown in the accompanying diagrams.

Figure 1 shows a panel of Pecked Realistic rock art depicting a hunting scene. A group of approximately ten humans are pursuing a herd of deer. Three animals at the base of the scene have been interpreted as dogs. The panel is notable because it shows the figures in action. The art may have marked the spot as a good hunting zone.

Figure 2 shows a Vertical Series style panel. The line of crescents and crosses are probably tallies of days or months. A drying rack symbol appears in the upper left hand corner. Rock art expert Linea Sundstrom writes of this panel, "This panel appears to have been a pictographic message, only a part of which can still be interpreted. Ethnographic sources suggest that this rock art may have been deliberately ambiguous. The Lakota Sioux believed that the meaning of rock art could only be understood by holy persons and then only after a period of fasting and prayer." (Sundstrom 1992:129)

Linea Sundstrom says the following about Figure 3. "This depicts a horse and rider facing a person on foot. Both people hold guns; the rider carries a quiver, as well. A combat or "coup" scene is clearly intended. The horse is branded with a double open rectangle. The panel can be dated, on stylistic grounds, to the period when Late Biographic rock art was produced, A.D. 1830-1850." (Sundstrom 1992:211)

Figure 4 shows "two lodges. ...What appear to be other, smaller structures are depicted near the two lodges. Each of the lodges has a straight line extending from its peak. At the upper end of one line is a detailed fish; the other leads to an arrow. The fish and arrow very likely are name symbols, identifying the person or family occupying each lodge. " (Sundstrom 1992:259)

Sundstrom, Linea
1992 Fragile Heritage: Prehistoric Rock Art of South Dakota. SD State Historical Preservation Center, Vermillion, SD.

Materials: copies of rock art images, large pieces of butcher paper and permanent markers

Procedure: For each rock art example, discuss what students think the artist's purpose or message was in creating the image. Did the artist want to give directions to others, commemorate an event, keep a record or simply be creative? After the discussion, the teacher may share the above information about each figure with the students.

Have each student draw a rock art panel without written words or numbers that represents a typical day for them.

Divide the class into several groups. Give each group one of the following messages. Students must design a way to communicate the message without using letters or numbers. The "rock art" is then passed onto another group. See which group can successfully decode the most messages. After a few tries with the first group of messages or similar ones, students can move onto more abstract messages from the second list.

After the game discuss what images or patterns recurred over time. What made some messages easy and others difficult to decipher?

List 1
1) Tomorrow we will travel east to the flat hill and camp on the west side near the river. We will fish for five days.

2) When winter comes we will go south along the river until two rivers join ours. We will camp between the two new rivers until spring.

3) We will go west for one month to hunt deer. We will travel six days to the lone hill near the mountains and make camp there.

4) We will visit the beaver lodge people to the north and bring them corn and a buffalo hide. It takes half a month to go, visit and return.

5) We will hunt and fish along the river which flows east until winter. Then we will go south across three rivers to the winter camp.

List 2
1) The spirit of lightning protects us and gives us fire and wisdom.

2) The Star Child who fell to earth gave us the bow and taught us how to hunt.

3) We are the People of the Hawk and are enemies of the People of the Turtle.

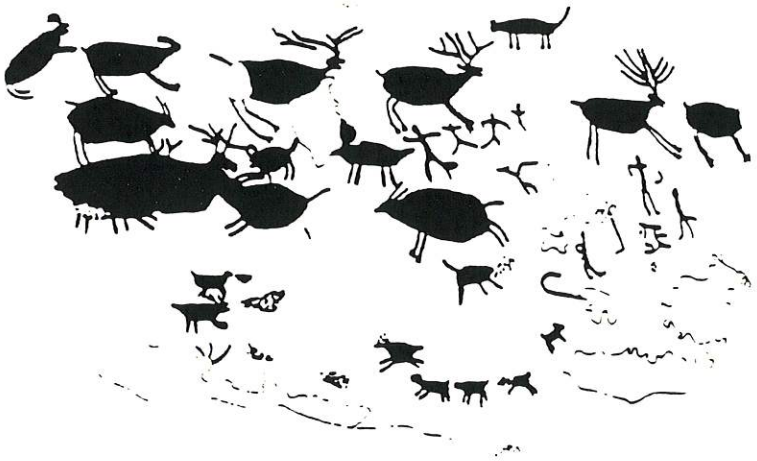
4) We will speak to future generations through the rocks of the sacred earth.

5) We believe that the spirit of the earth is good and gives us what we need.

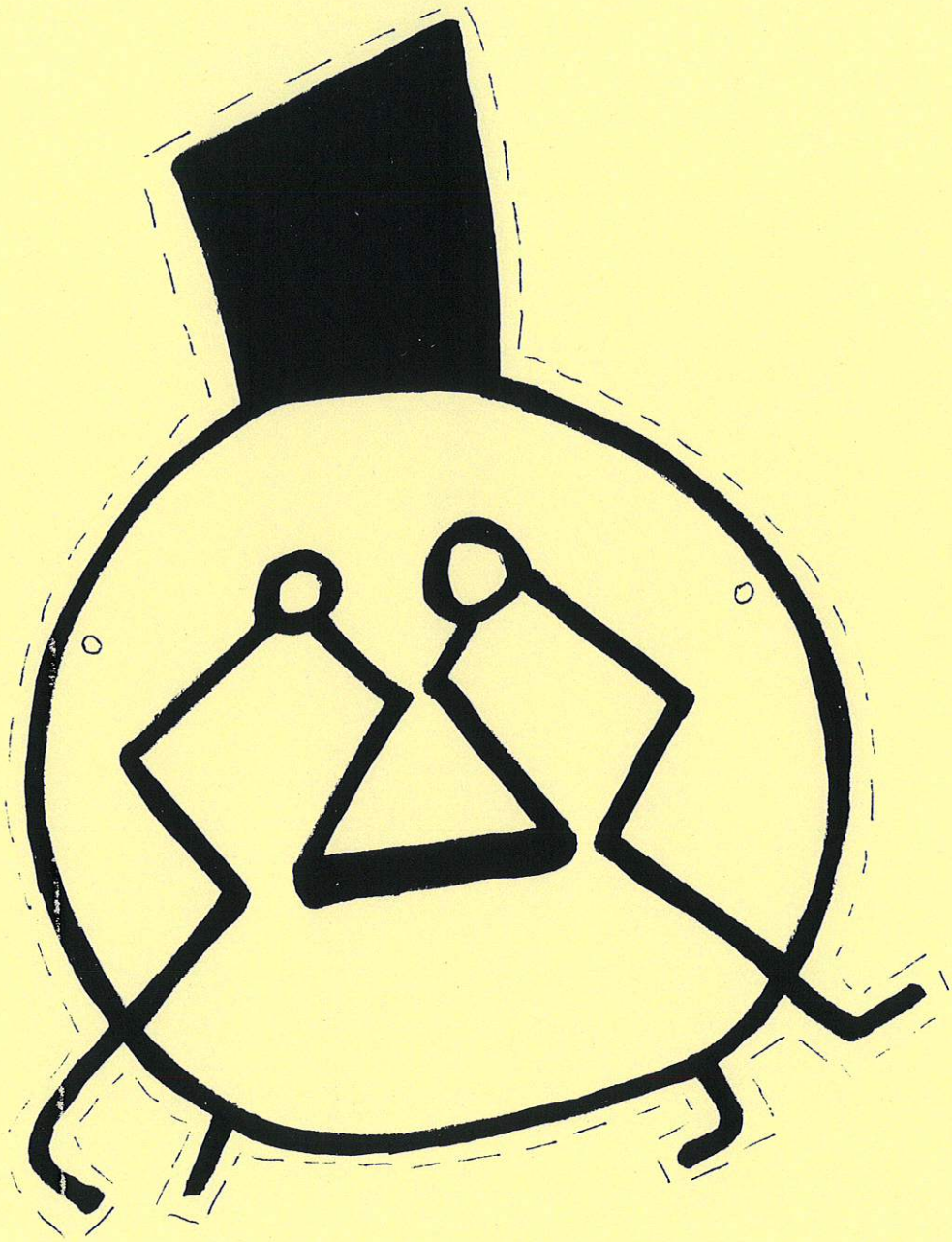
Extension: Students can discuss the difficulties and successes they had and see how we communicate time and direction and abstract ideas in our society. A discussion of a belief in the future of a people as seen in their enduring communications can be compared to the way we leave messages for the future. Students may leave messages in a time capsule for a future generation telling about themselves and their interests in pictographs. Students may want to include their drawings of a their typical day in the time capsule.

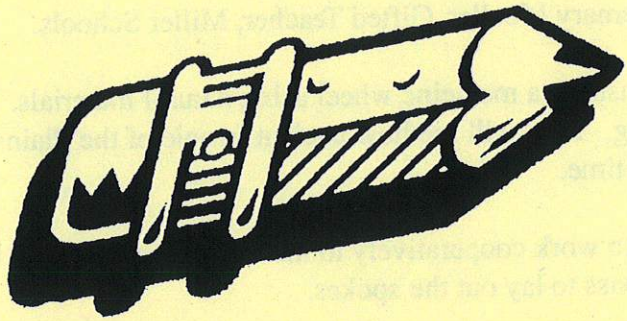
Extension: Review the Wounded Knee lesson plan with the students. Have them design a monument for the site using rock art symbols without any written words or numbers.

Extension: Have students design a rock art mask to wear. Have them answer some basic questions about their rock art character. What is my name? Am I male or female? Do I forage or hunt? What do I make to trade? How old am I? What do I teach the younger ones?

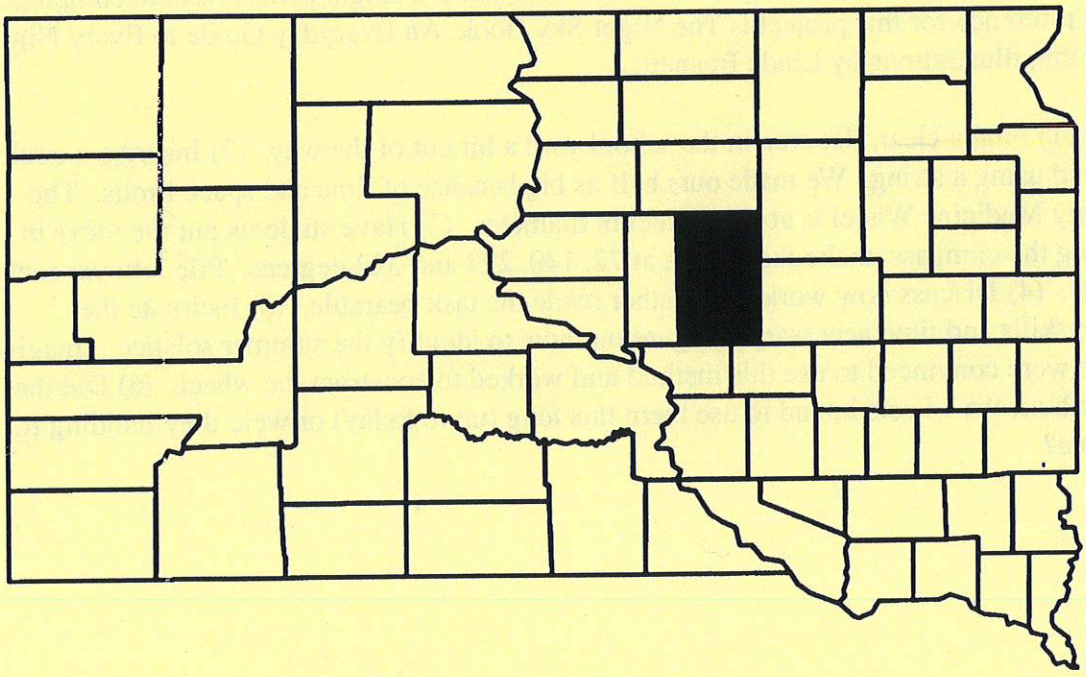


Figures 1-4 appear from top to bottom. All figures from *Fragile Heritage: Prehistoric Rock Art of South Dakota* by Linea Sundstrom.





Design & Drawing Activities
Section 2, Lesson 11



Telling Time

Hand County Medicine Wheel • Hand County, South Dakota

TELLING TIME-Hand County Medicine Wheel

This lesson courtesy of Rosemary Moeller, Gifted Teacher, Miller Schools.

Objective: Students will construct a medicine wheel using natural materials. Their replica will be functional for star sighting. They will see how ancient people of the Plains were able to make a calendar and keep track of time.

Method: Students will have to work cooperatively to move two tons of rocks to form a stone circle. They will use a compass to lay out the spokes.

Background: There are a few stone circles on the Great Plains. One of them is in Hand County, SD (Figure 1). The Lakota have said "the sun built them" or "they were here when we came" and call them medicine wheels. Unlike large circles that may have 28 spokes (like the days in the moon calendar month) this stone wheel has four spokes. Astroarcheologists have theorized that the alignment has to do with the summer solstice and that the spokes point to Sirius, Aldabaran and Rigel, the brightest compass stars at the horizon at that time of year. For the Plains Indians, the solstice was the time when the sun is highest in the sky and the "growing power" of the world is strongest. Medicine wheels were used, it seems, to set the time of summer ceremonies and events.

Materials: 3,000-4,000 pounds of rock, a six foot string and a compass. We brought half a pick-up truck of field rocks over to the school. The students unloaded the rocks and built the wheel in one hour by working together. This process could have taken a single person days to complete. A valuable reference for this project is The Night Sky Book: An Everyday Guide to Every Night by Jamie Jobb, illustrations by Linda Bennett.

Procedure: (1) Find a clear, flat area in the school yard a bit out of the way. (2) Inscribe a circle in the ground using a string. We made ours half as big because of time and space limits. The Hand County Medicine Wheel is about 20 feet in diameter. (3) Have students put the rocks in place. Using the compass, make the spokes at 72, 140, 222 and 322 degrees. Pile leftover rocks in the center. (4) Discuss how working together made the task bearable. (5) Estimate the observation skills and time necessary to figure out how to identify the summer solstice. Imagine how people were convinced to use this method and worked to construct the wheel. (6) Did the people who built the wheels intend to use them this long (up to today) or were they building for future people?

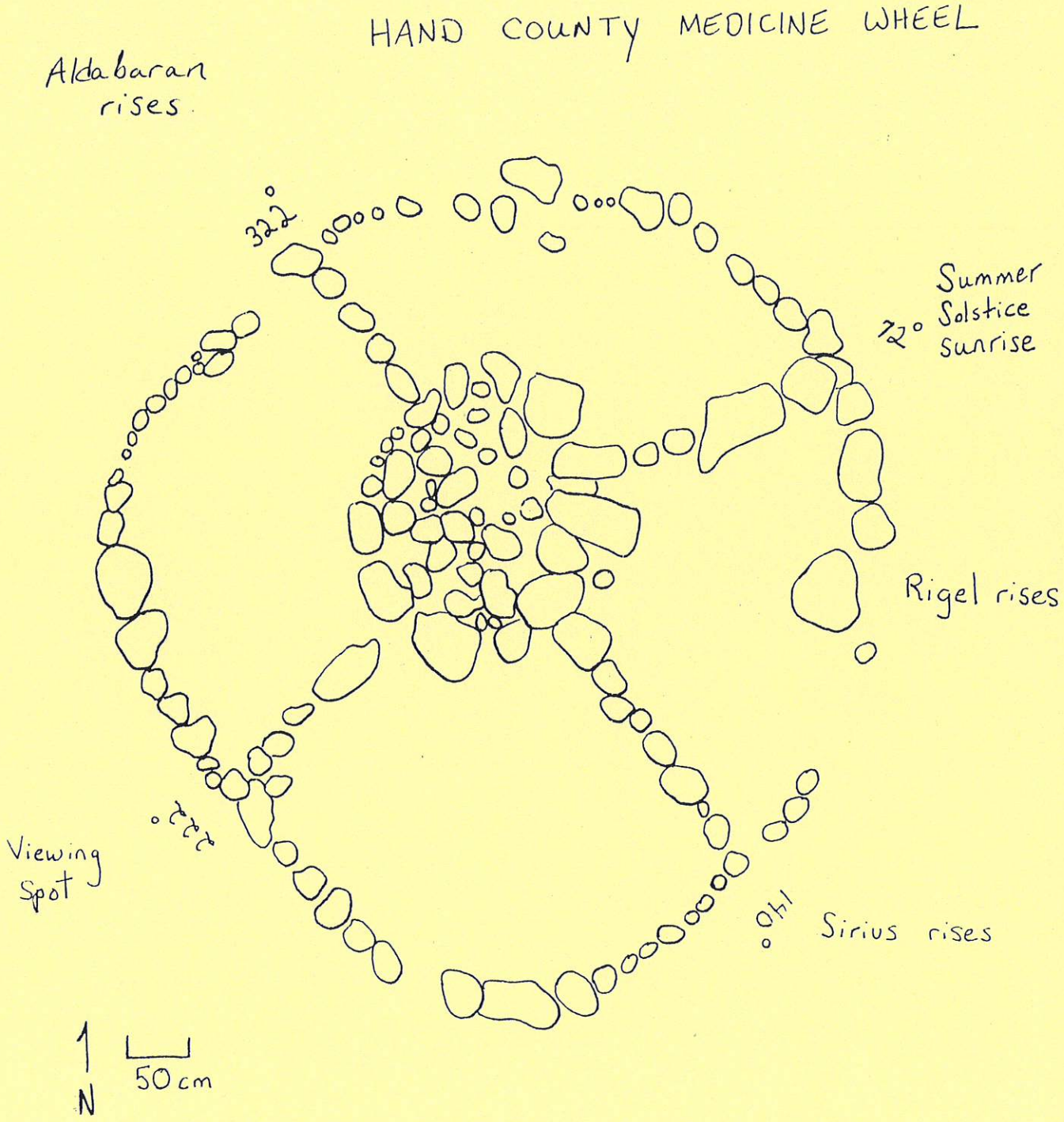
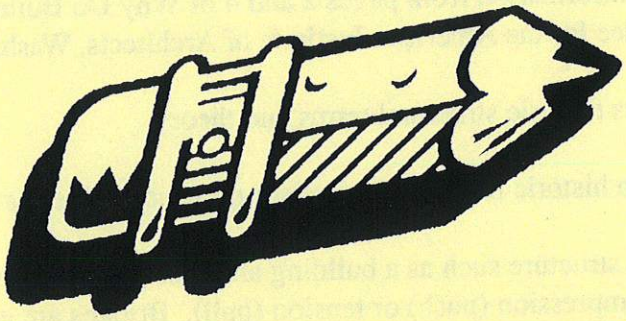
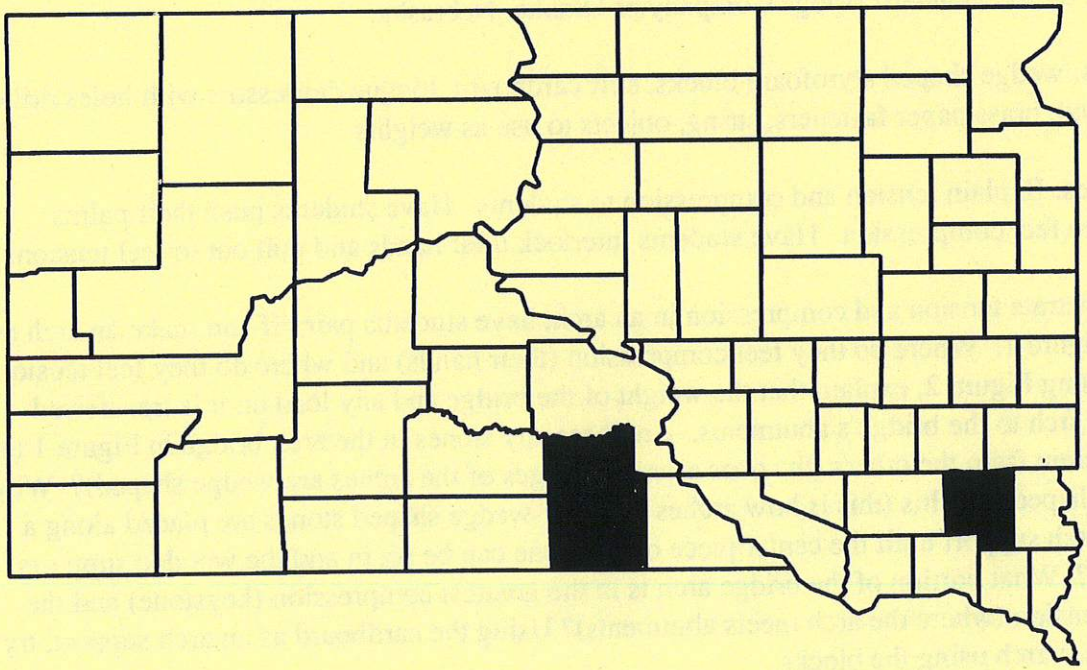


Figure 1-Hand County Medicine Wheel



Design & Drawing Activities
Section 2, Lesson 12



Structural Principles

Bridges

STRUCTURAL PRINCIPLES-Bridges

Lesson partially based on information from pages 2 and 4 of Why Do Buildings Stand Up? by Instructor Education Service for the American Institute of Architects, Washington, D.C., 1988.

Objective: Instruct students in basic structural terms and theory.

Method: Use South Dakota historic bridges in exercises on structural terms and theory.

Background: All parts of a structure such as a building are either being pushed or pulled. These forces are referred to as compression (push) or tension (pull). Bridges are good examples to use to illustrate these forces because their structural skeletons are clearly visible.

Arches and triangular frameworks called trusses are the two basic forms used in many South Dakota bridges. Figures 2 and 3 show two historic South Dakota bridges.

The Turner County bridge in Figure 2 is a double arch structure made out of local quartzite fieldstone. It was built in 1935 using primarily unworked stone. Each arch measures approximately 7 1/2 feet across. The bridge is 26 feet wide by 22 feet long. Approximately 185 similar bridges and culverts were constructed in Turner County during the mid 1930s to early 1940s as part of the Great Depression relief effort.

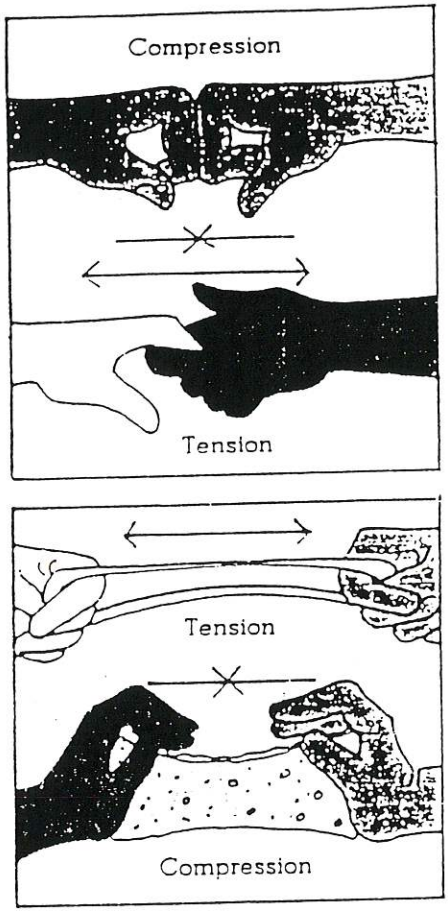
The Tripp County bridge in Figure 3 was built in 1914 and measures 20 feet wide by 60 feet long. This riveted and bolted Pratt pony truss bridge is made of steel with a wooden deck. It was built by the Standard Bridge Company of Omaha, Nebraska.

Materials: wedge shaped styrofoam blocks, stiff cardboard, tongue depressors with holes drilled in each end, brass paper fasteners, string, objects to use as weights

Procedures: Explain tension and compression to students. Have students push their palms together to feel compression. Have students interlock their hands and pull out to feel tension.

To demonstrate tension and compression in an arch, have students pair off and make an arch as seen in Figure 1. Where do they feel compression (their hands) and where do they feel tension (feet)? Using Figure 2, explain that the weight of the bridge and any load on it is transferred down the arch to the bridge's abutments. Are there any stones in the arch bridge in Figure 1 that look different from the others (the ones along the edges of the arches are wedge shaped)? Why are they shaped like this (this is how arches are built-wedge shaped stones are placed along a wooden arch support until the center piece or keystone can be set in and the wooden supports removed)? What portion of the bridge arch is in the greatest compression (keystone) and the greatest tension (where the arch meets abutments)? Using the cardboard as an arch support, try to construct an arch using the blocks.

Show the class the bridge in Figure 3. What is the basic shape used in the structure (triangle)? The triangle is an extremely stiff form. Have students look at the bridge truss chart (Figure 4). They will notice that the structures contain triangular forms pointing both up and down. Using tongue depressors and brass paper fasteners to construct triangles, have students hang weights from the point of the triangle when it is facing up and down. What parts are in tension and compression? (when the point is up, the sloping sides are in compression and the cross bar is in tension; when the point is down the sloping sides are in tension and the cross bar is in compression) Have students experiment with making their own bridges either using the trusses shown on the chart or their own. Try to determine what part of the bridges are in compression and which are in tension. Experiment with placing different weights on the bridges. If a bridge fails, where does the problem start?



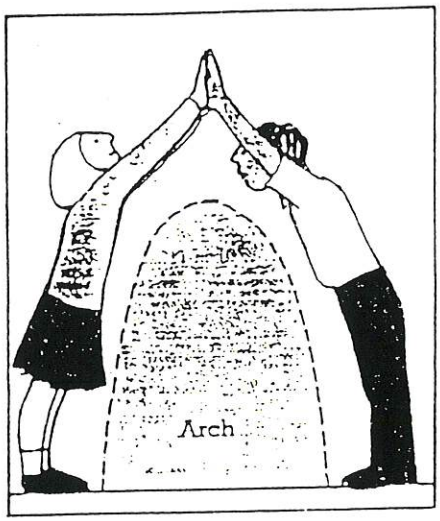


Figure 1-Tension and Compression diagrams from pages 2 and 4 of *Why Do Buildings Stand Up?* by Instructor Education Service for the American Institute of Architects, Washington, D.C., 1988.

Figure 2-Turner County bridge

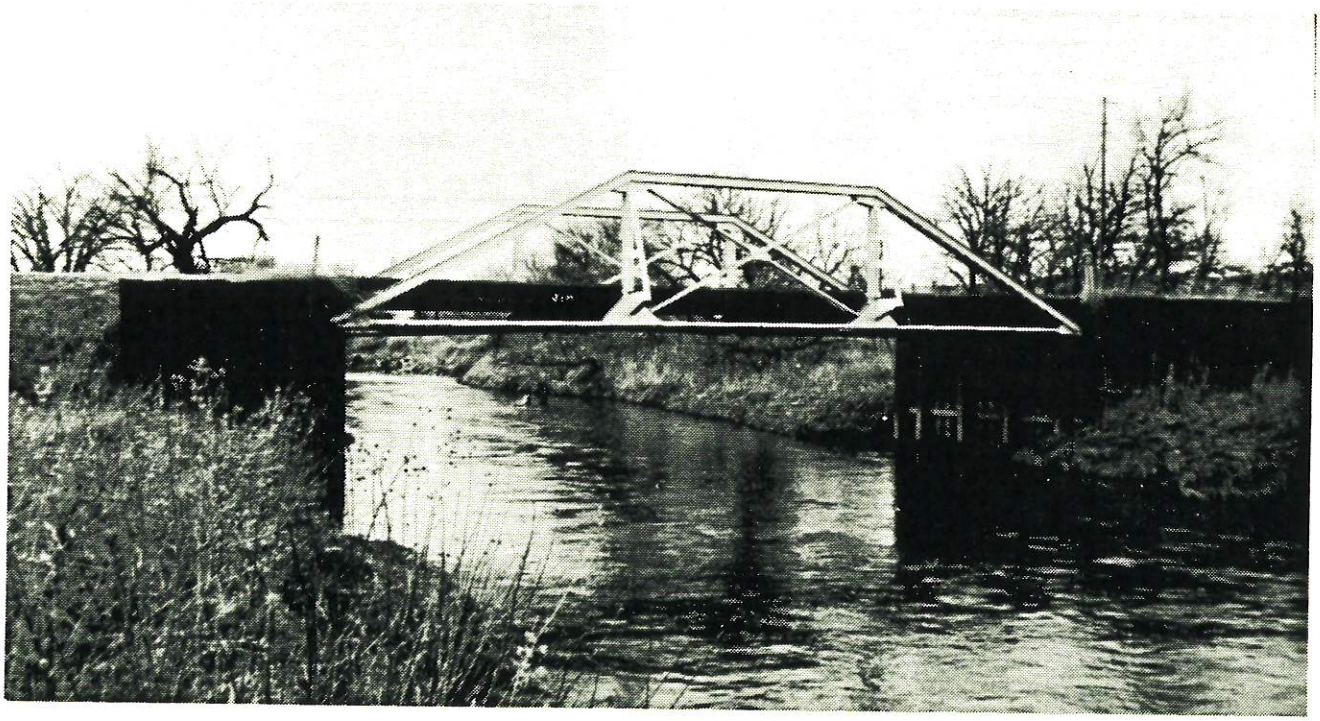


Figure 3-Tripp County bridge

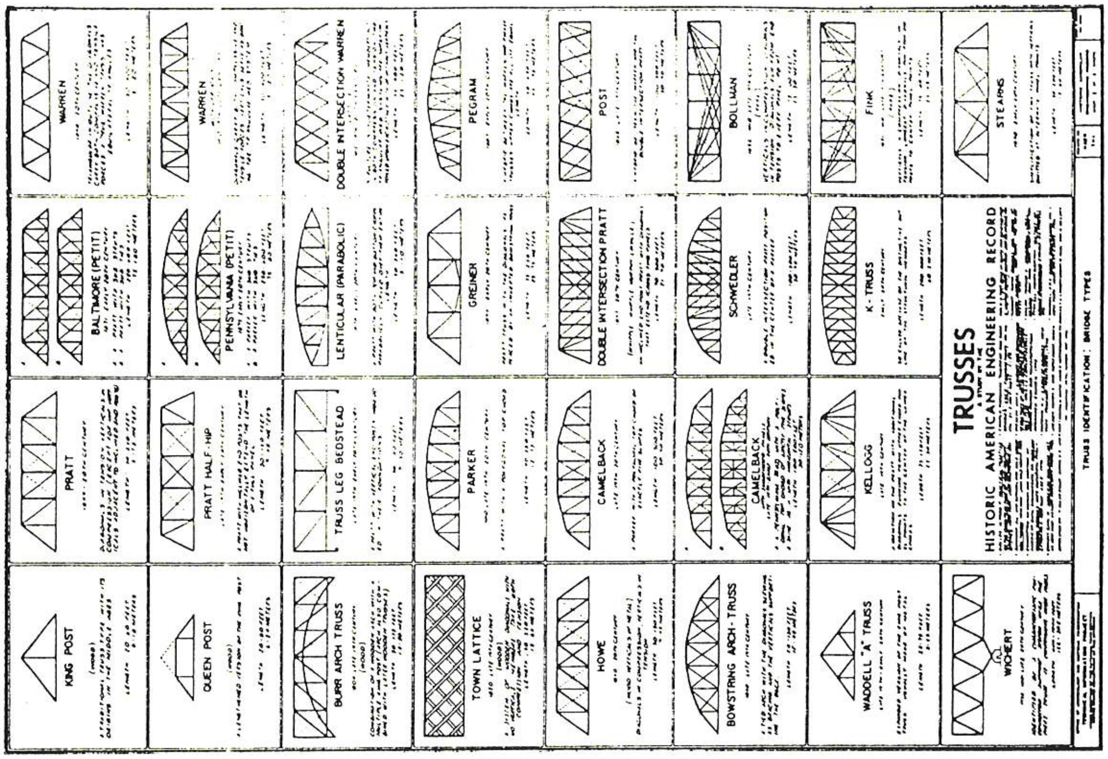


Figure 3. *HAER Bridge Truss Type Poster (1976). Originally produced by HAER in 1976 and still distributed by SIA, over 2,000 prints of this classic poster have been sold. With its companion publication,* Bridge Truss Types: A Guide to Dating and Identifying, *published by the American Association for State and Local History as Technical Leaflet 95, the poster and booklet have guided bridge enthusiasts and scholars to the identity of truss types more than any other reference. The poster is available for $5.50 (checks payable to SIA/Roebling Chapter) from Nanci Batchelor, 203 West Burlington Street, Bordentown, N.J. 08505, and the booklet for $1.00 from the association at 708 Berry Road, Nashville, Tenn. 37204.*

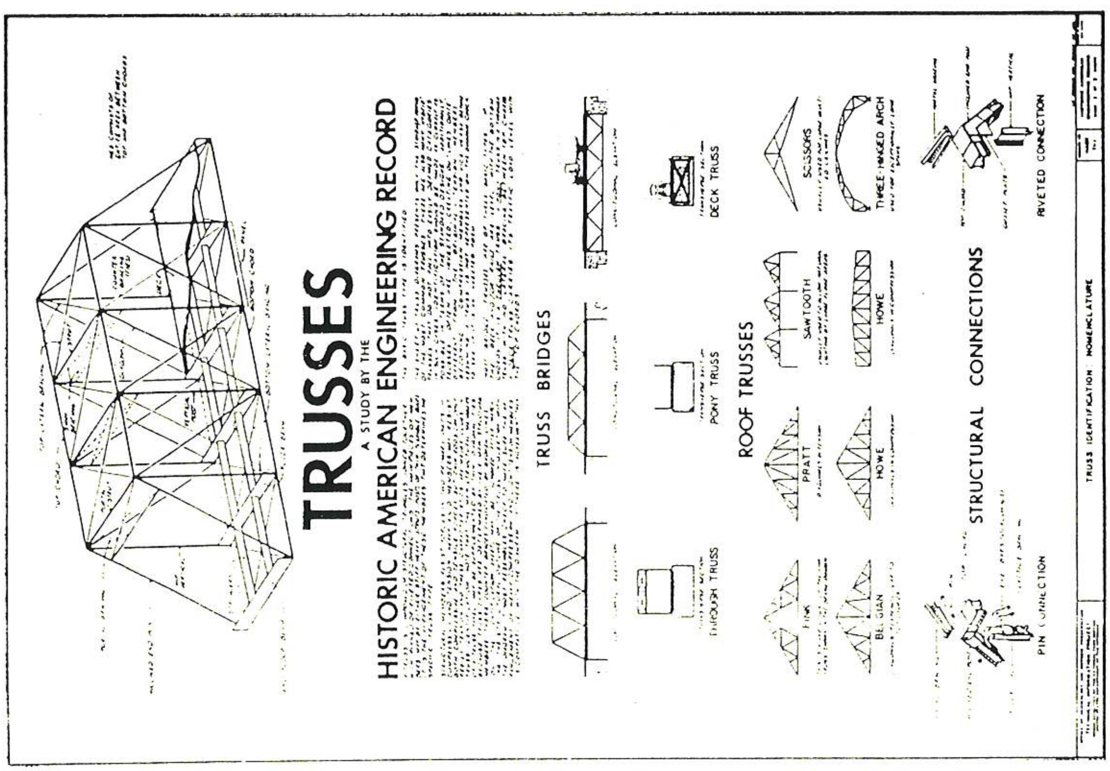
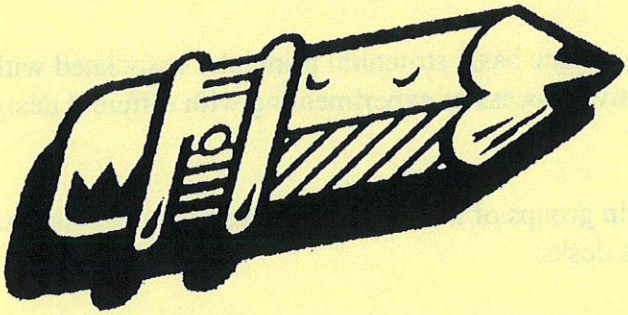
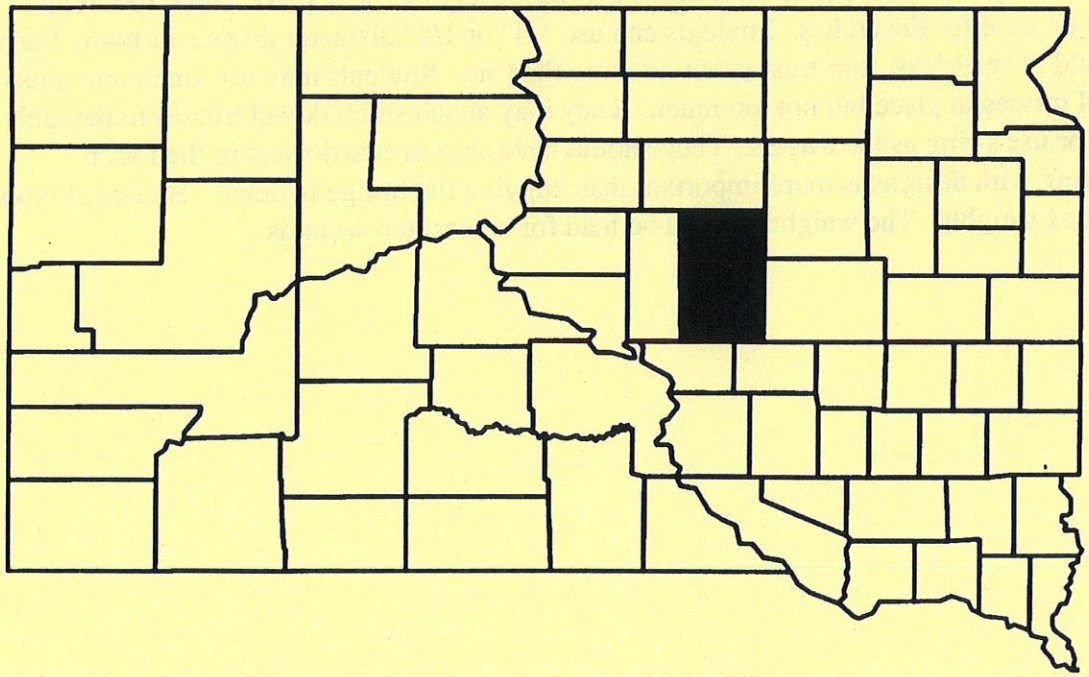


Figure 4-Bridge truss chart from *HAER's Historic Bridge Program* by Eric DeLony in The Journal of the Society for Industrial Archeology, Volume 15, Number 2, 1989



Design & Drawing Activities
Section 2, Lesson 13



Build A Bridge

Miller Rainbow Arch Bridge • Miller, South Dakota

BUILD A BRIDGE-The Miller Rainbow Arch Bridge

This lesson written by Rosemary Moeller, Gifted Teacher, Miller Schools

Objective: Students will learn some basic structural principles associated with bridge building and will experience the creative process of experimenting with different designs to find one that works.

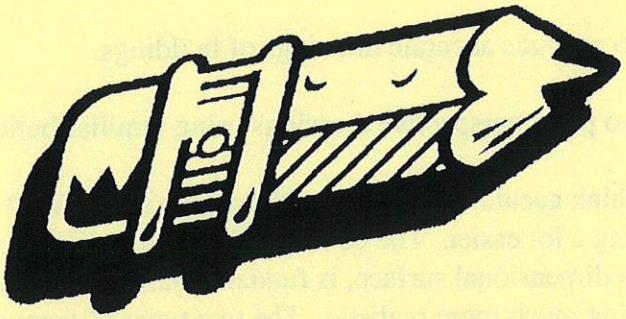
Method: Students can work in groups of three or four to design an arch that supports a cardboard road over a gap between two desks.

Background: The Miller Ree Creek Bridge in Miller, South Dakota, is the oldest and best preserved example of only three Marsh rainbow arch bridges in the state. James Marsh patented his bridge design in 1912. In 1914, Hand County contracted with the Iowa Bridge Company of Des Moines, Iowa, to build the 42 foot long and 22 foot wide structure. It consists of two parallel arches made up of steel beams covered with concrete. The floor of the bridge is suspended from the arches by reinforced concrete hangers riveted to the arches and the floor "stringers" that are positioned across the short dimension of the bridge deck. The arches are attached to the front of concrete abutments below the floor level.

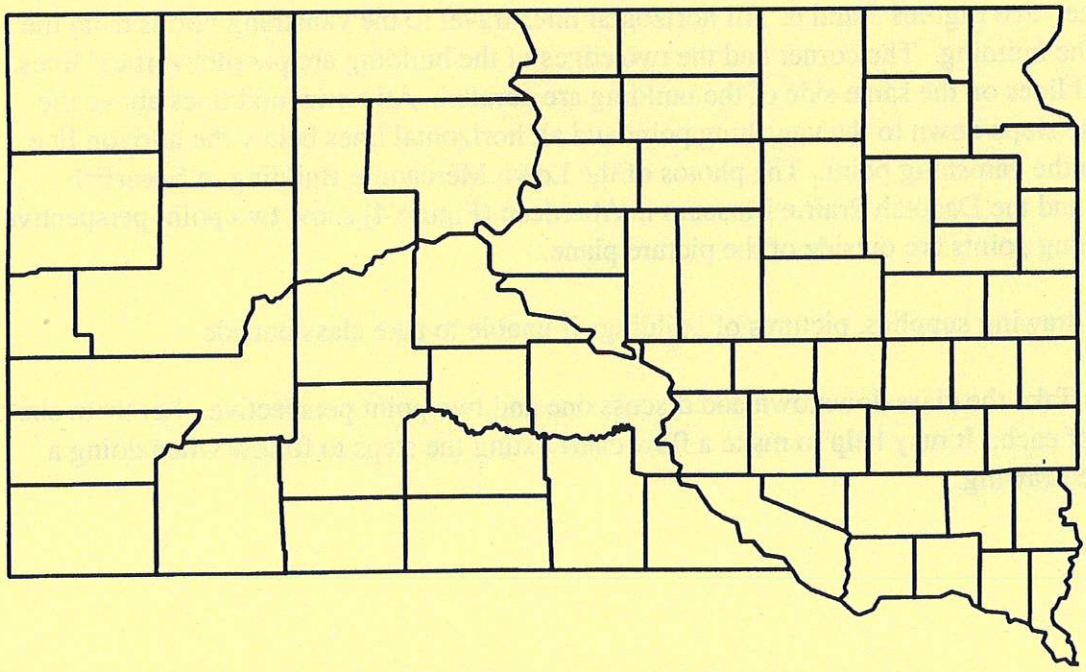
Materials: For each group-a strip of cardboard wide enough and long enough for the deck, scissors, string, tape, at least two 3 foot long 1/4" or 1/8" diameter dowels, dowels of assorted shorter lengths and blocks of wood for weights.

Procedure: Each group should place two desks approximately two feet apart. Three foot long dowels can be used for the arches. Students can use 1/4" or 1/8" diameter dowels or both. Each bridge should have at least four trusses but no more than six. Students may use small amounts of tape to hold trusses in place but not too much. They may attach small dowel trusses to the arch with string or use string as the trusses. They should have at least two dowels in their arch. Experimenting with designs is more important than copying the bridge in detail. Blocks of wood can be used as weights. The weights should be held for at least ten seconds.

Miller Rainbow Arch Bridge



Design & Drawing Activities
Section 2, Lesson 14



One & Two Point Perspective

ONE AND TWO POINT PERSPECTIVE

Objective: Enable students to produce accurate drawings of buildings.

Method: Perform one and two point perspective drawings using familiar buildings.

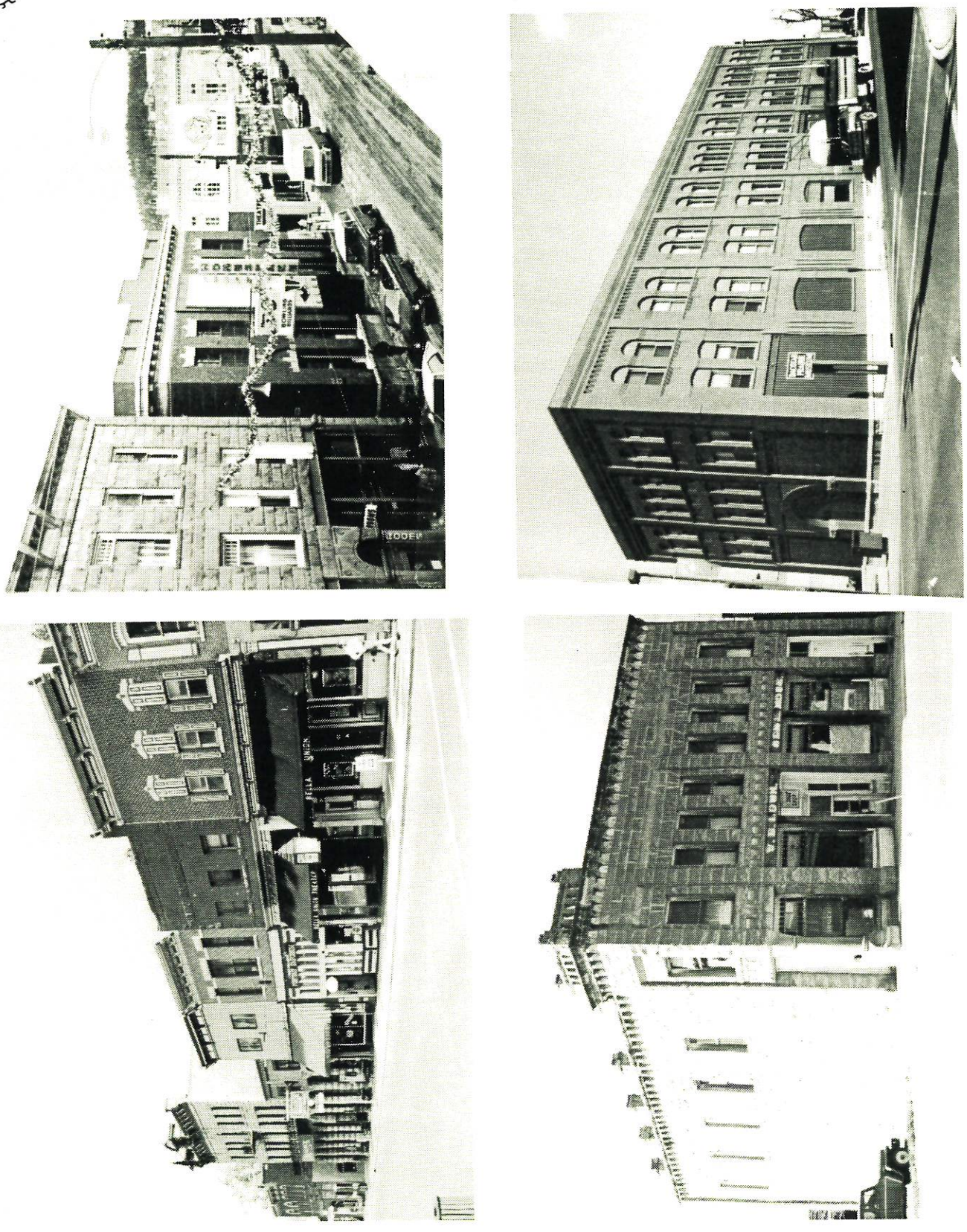
Background: Students may think accurate architectural drawings are difficult to do, but a few simple hints can make drawing a lot easier. The concept of perspective, representing three dimensional objects on a two dimensional surface, is fundamental to any architectural drawing. Perspective makes any drawing much more realistic. The two types of perspective used in a standard architectural drawing are one point and two point.

One of the best represetations of one point perspective is a set of railroad tracks. If you stood on the tracks and looked as far as you could see, the tracks seem to meet at one point. This one point is called the vanishing point. The vanishing point is located on an imaginary horizontal line called the horizon line. See Figures 1 and 2. The pictures of historic downtown Deadwood and Lead show one point perspective. Follow the top and bottom lines of the buildings from one side of the photos to the other. Notice how they get closer and closer to each other. The vanishing point is somewhere past the borders of the photos. One point perspective only involves one plane, the front, of the buildings shown in the photo.

Two point perspective makes it possible to represent two planes or sides of a building on a single sheet of paper. Two point perspective involves two vanishing points that are located on the same horizon line. See Figures 5 and 6. All horizontal lines travel to the vanishing points from the corner of the building. The corner and the two edges of the building are parallel vertical lines. All vertical lines on the same side of the building are parallel. All horizontal lines above the horizon line slope down to the vanishing point and all horizontal lines below the horizon line slope up to the vanishing point. The photos of the Lown Mercantile Building in Spearfish (Figure 3) and the Dacotah Prairie Museum in Aberdeen (Figure 4) show two point perspective. The vanishing points are outside of the picture plane.

Materials: drawing supplies, pictures of buildings if unable to take class outside

Procedure: Take the class downtown and discuss one and two point perspective. Let them sketch examples of each. It may help to make a flow chart listing the steps to follow when doing a perspective drawing.



Figures 1-4: Viewed from the side, Downtown Deadwood-upper left, Downtown Lead-upper right, Lown Mercantile-Spearfish-lower left, Dacotah Prairie Museum-Aberdeen-lower right

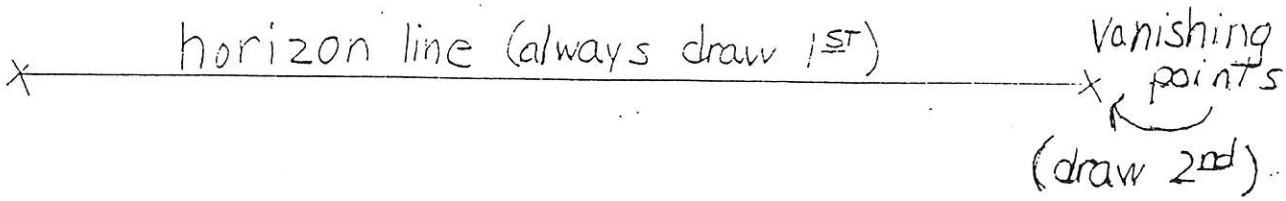
horizontal

vertical

parallel

diagonal

perpendicular



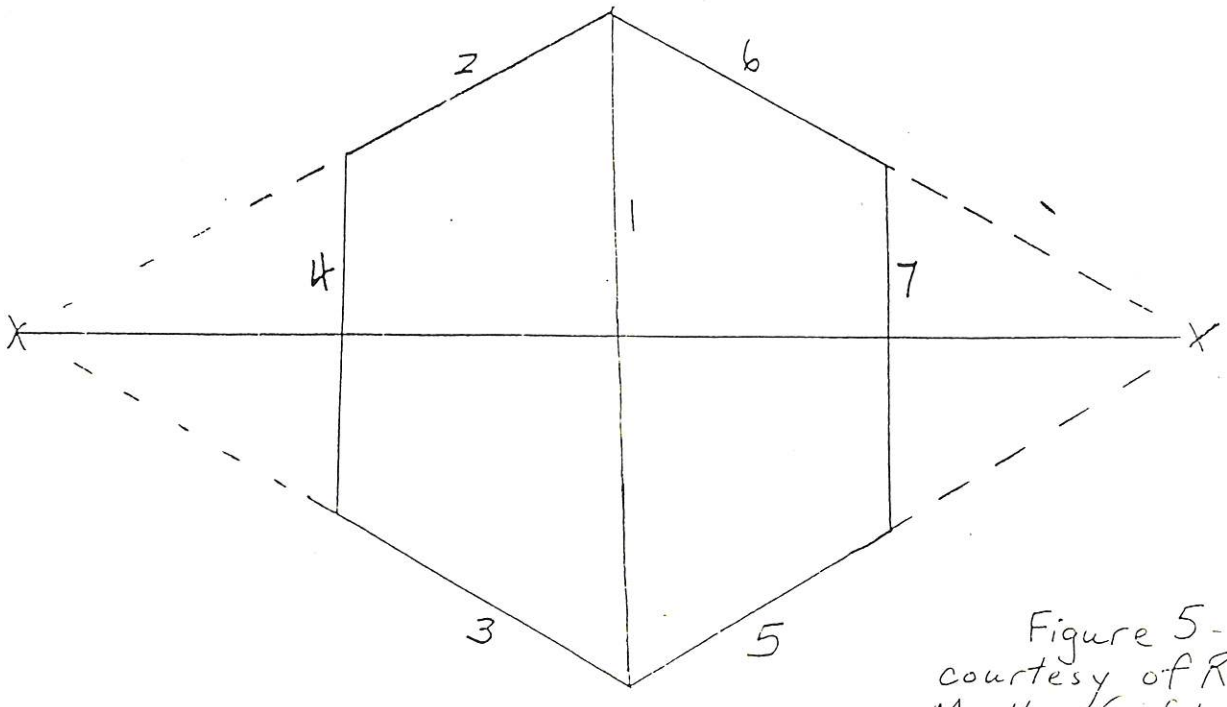


Figure 5 - courtesy of Rosemary Moeller, Gifted Teacher Miller Schools

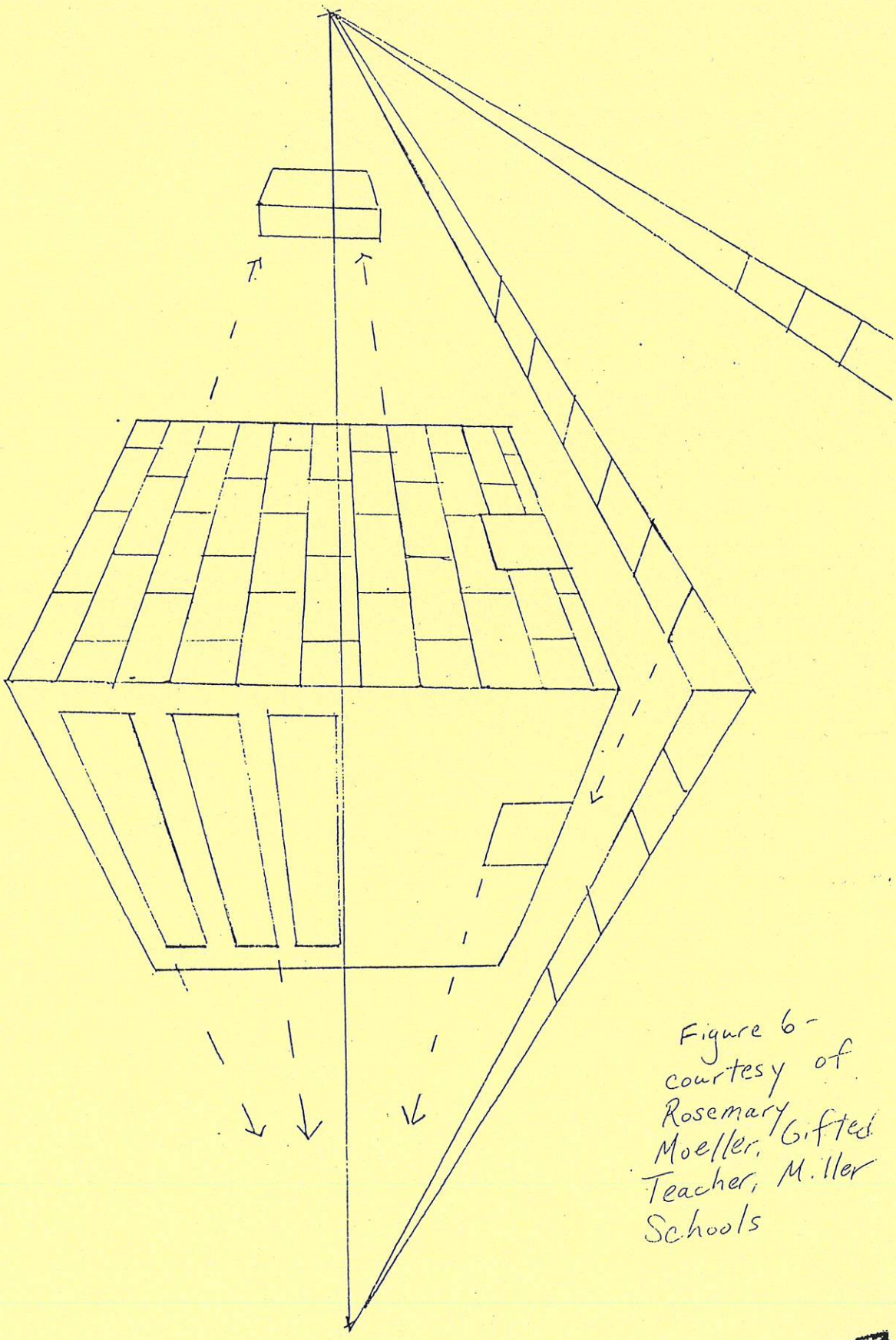
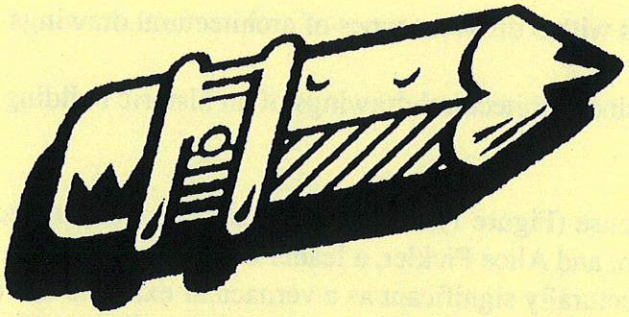
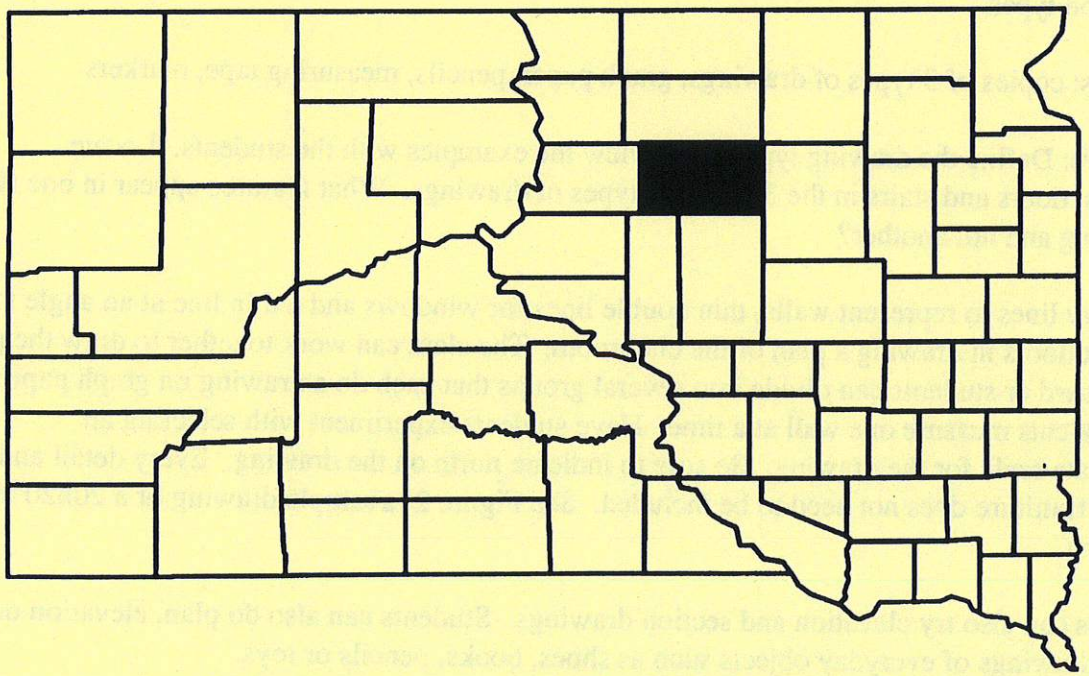


Figure 6 - courtesy of Rosemary Moeller, Gifted Teacher, Miller Schools



Design & Drawing Activities
Section 2, Lesson 15



Architectural Drawings

Pickler House • Faulkton, South Dakota

ARCHITECTURAL DRAWINGS-Pickler House

Objective: Acquaint students with 3 different types of architectural drawings

Method: Students will examine architectural drawings of an historic building and make a drawing of their classroom.

Background: The Pickler House (Figure 1) is historically significant as the home of Major John Pickler, a U.S. Congressman, and Alice Pickler, a leader of the South Dakota women's suffrage movement. It is also architecturally significant as a vernacular example of the Queen Anne architectural style. The house began as a claim shanty in 1882 and was added to until its completion in 1894. Extensive architectural drawings were made as part of an on-going major rehabilitation effort started in the 1970s.

There are 3 types of architectural drawings: plans, elevations and sections. These are drawn to scale so the lines are proportionally equal to the actual structure. Architects use these drawings when designing a building and when undertaking preservation work on an existing building.

A plan is a birdseye view of the building with the roof removed (Figures 2 and 3). It is sometimes called a footprint drawing. An elevation is a view of an entire exterior wall (Figures 4,5 and 6). A rectangular building has four possible elevations. Sections are vertical cross section views of a building usually drawn on a north/south or east/west axis (Figure 7). All three types show features such as windows, doors and stairs. The features look different in the 3 illustration types.

Materials: copies of 3 types of drawings, graph paper, pencils, measuring tape, markers

Procedure: Define the drawing types and review the examples with the students. Locate windows, doors and stairs in the 3 different types of drawings. What features appear in one type of drawing and not another?

Use heavy lines to represent walls, thin double lines for windows and a thin line at an angle to represent doors in drawing a plan of the classroom. The class can work together to draw the plan on the board or students can divide into several groups that each do a drawing on graph paper. Have students measure one wall at a time. Have students experiment with selecting an appropriate scale for the drawing. Be sure to indicate north on the drawing. Every detail and piece of furniture does not need to be included. See Figure 2. a sample drawing of a 20x20 foot classroom.

The class can also try elevation and section drawings. Students can also do plan, elevation or section drawings of everyday objects such as shoes, books, pencils or toys.

Figure 1-Pickler House, Faulkton

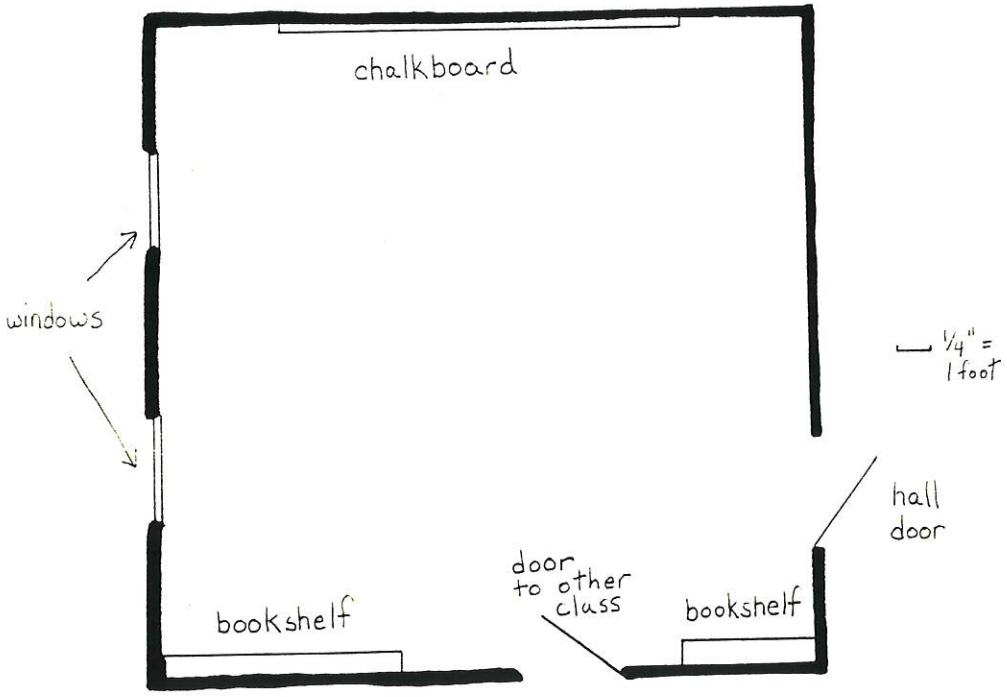
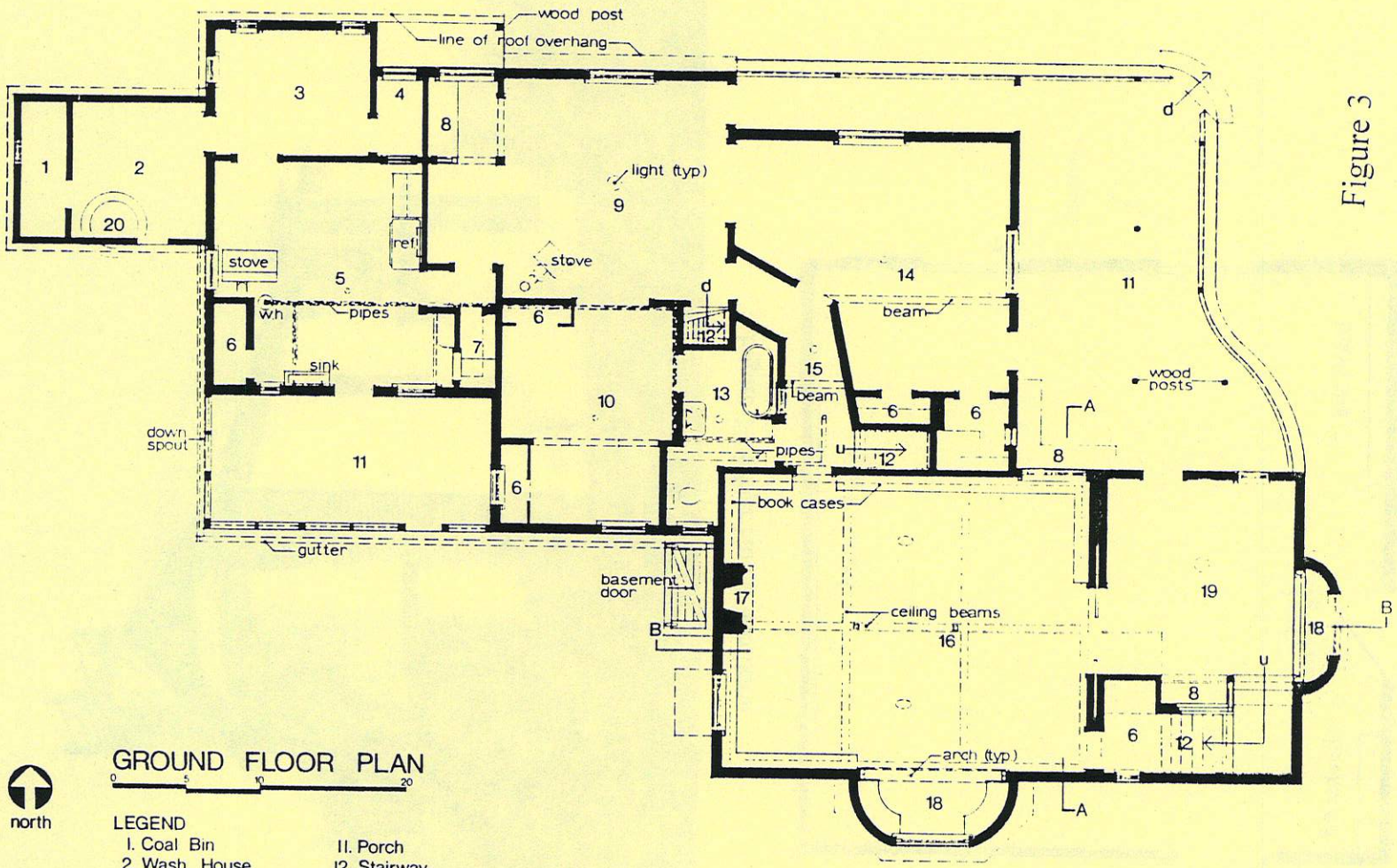


Figure 2-Plan of a 20' x 20' classroom

Figure 3



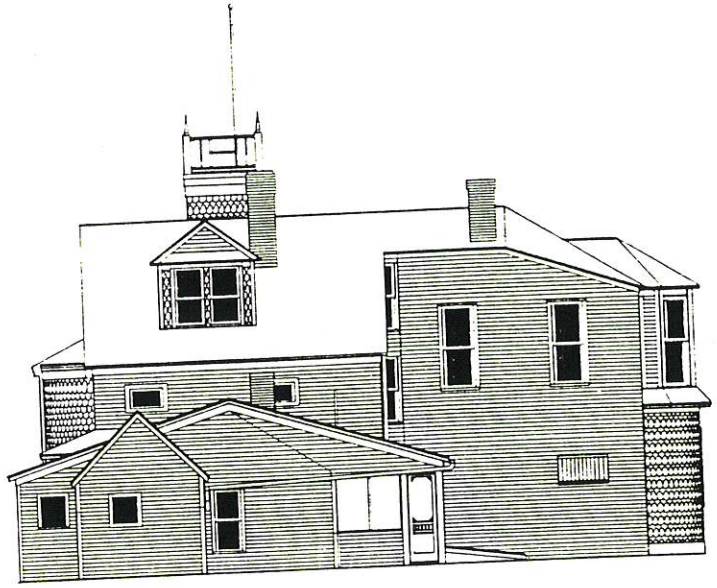
GROUND FLOOR PLAN

0 5 10 20

north

LEGEND

1. Coal Bin
2. Wash House
3. Shop
4. Wood Bin
5. Kitchen
6. Closet
7. Pantry
8. Bench
9. Dining Room
10. Bedroom
11. Porch
12. Stairway
13. Bathroom
14. Parlor
15. Hallway
16. Library
17. Fire Place
18. Bay Window with Seats
19. Music Room
20. Cistern

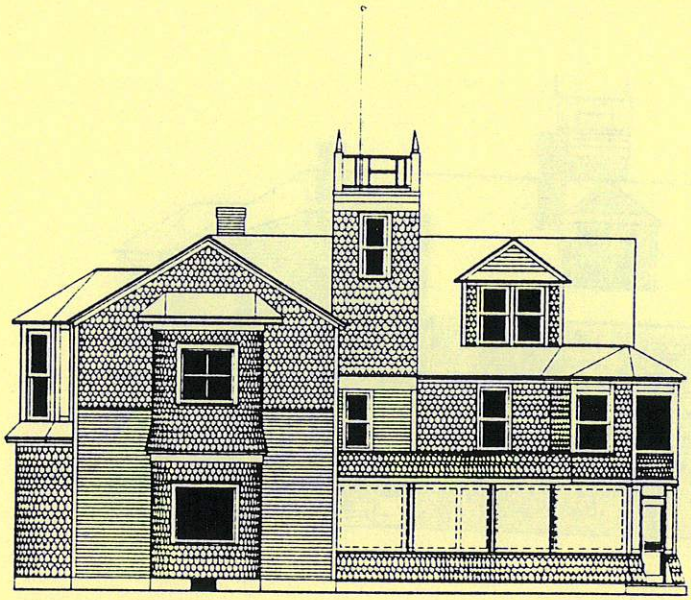


WEST ELEVATION
0 5 10 20

Figure 4

SOUTH ELEVATION
0 5 10 20

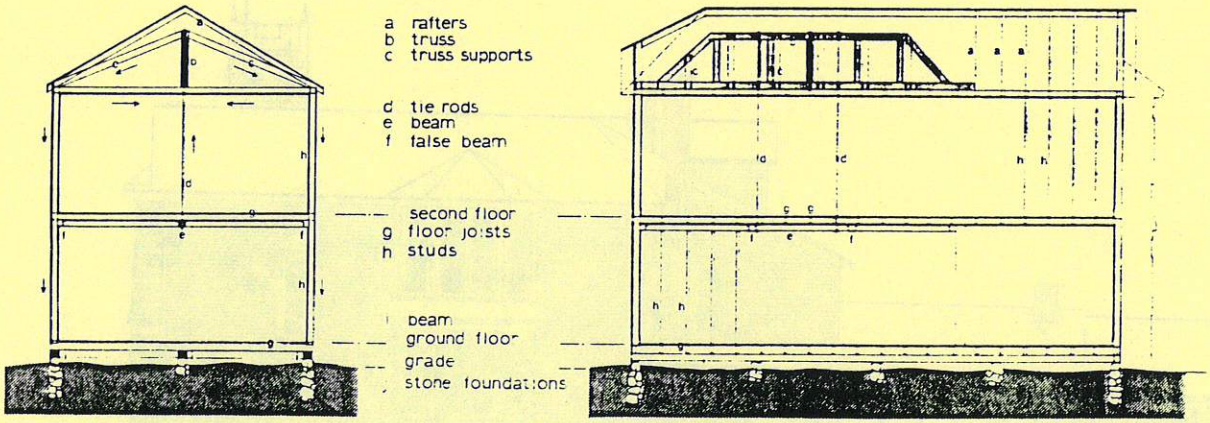
Figure 5



EAST ELEVATION

0 5 10 20

Figure 6



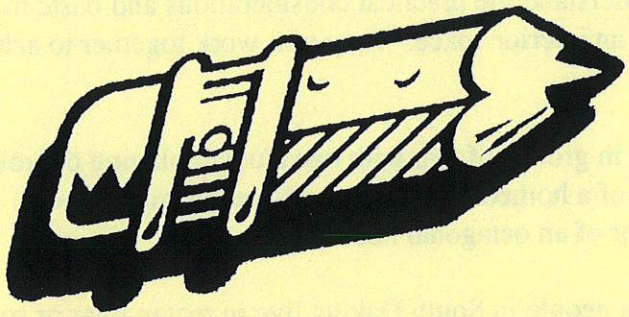
SECTION A-A

0 5 10 20

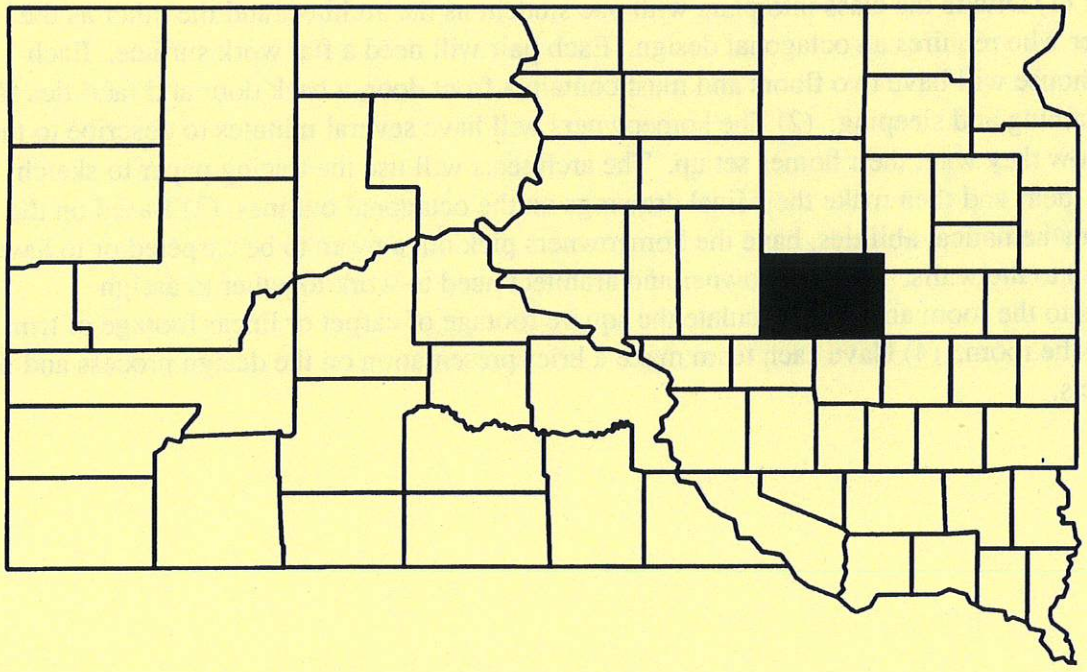
→ force lines

SECTION B-B

Figure 7



Design & Drawing Activities
Section 2, Lesson 16



Floor Plans

Drake Octagon House • Huron, South Dakota

FLOOR PLANS-Drake Octagon House

Objective: Students will understand the practical considerations and basic mathematical processes used in designing an interior space. They will work together to achieve a common goal.

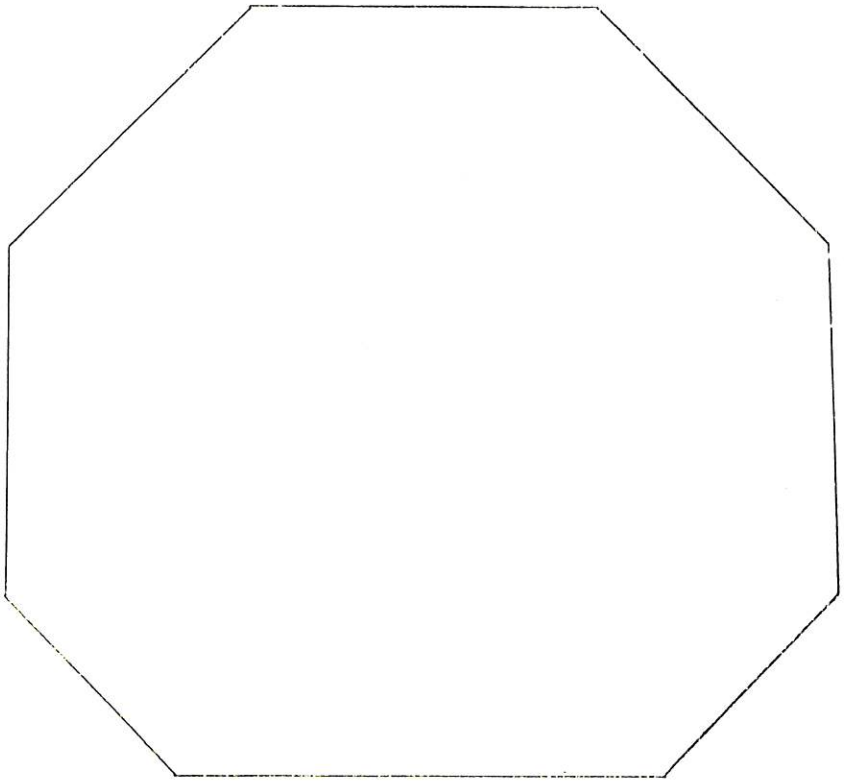
Method: Students will work in groups of two with one student playing the role of architect and one student playing the role of a homeowner who wants an octagonal house. The pairs will work together to design the interior of an octagonal house.

Background: Although most people in South Dakota live in rectangular or square homes, a few live in unusual octagonal houses built in the late 19th century. One of the best preserved examples still used as a residence is the Drake Octagon House in Huron, built in approximately 1893 by Hattie and Henry Drake. Octagonal homes were a fad in the second half of the 19th century. Orson Squire Fowler, a theologian, phrenologist, lecturer and publisher from New York, actively promoted the concept beginning in 1848 with the publication of his work, A Home for All; or The Gravel Wall and Octagon Mode of Building. Fowler believed the octagonal form encouraged harmonious living and helped create a happy home. Fowler built a grand, four story octagonal home for himself. Although the concept never gained widespread acceptance, the octagonal house is a recognized style of American architecture.

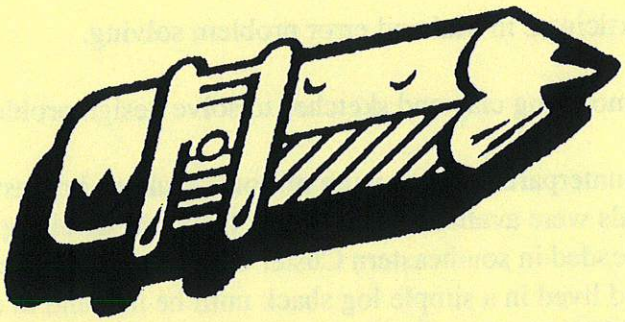
Materials: Copies of the octagonal house outline, tracing paper, tape, pencils, markers for final drawings.

Procedure: (1) Divide the class into pairs with one student as the architect and the other as the homeowner who requires an octagonal design. Each pair will need a flat work surface. Each octagonal house will have two floors and must contain a front door, a back door and facilities for cooking, bathing and sleeping. (2) The homeowners will have several minutes to describe to the architect how they want their homes set up. The architects will use the tracing paper to sketch out design ideas and then make their final drawings on the octagonal outlines. (3) Based on the students' mathematical abilities, have the homeowners pick out a room to be carpeted or to have trim applied to the walls. The homeowner and architect need to work together to assign dimensions to the room and then calculate the square footage of carpet or linear footage of trim needed for the room. (4) Have each team make a brief presentation on the design process and the end products.

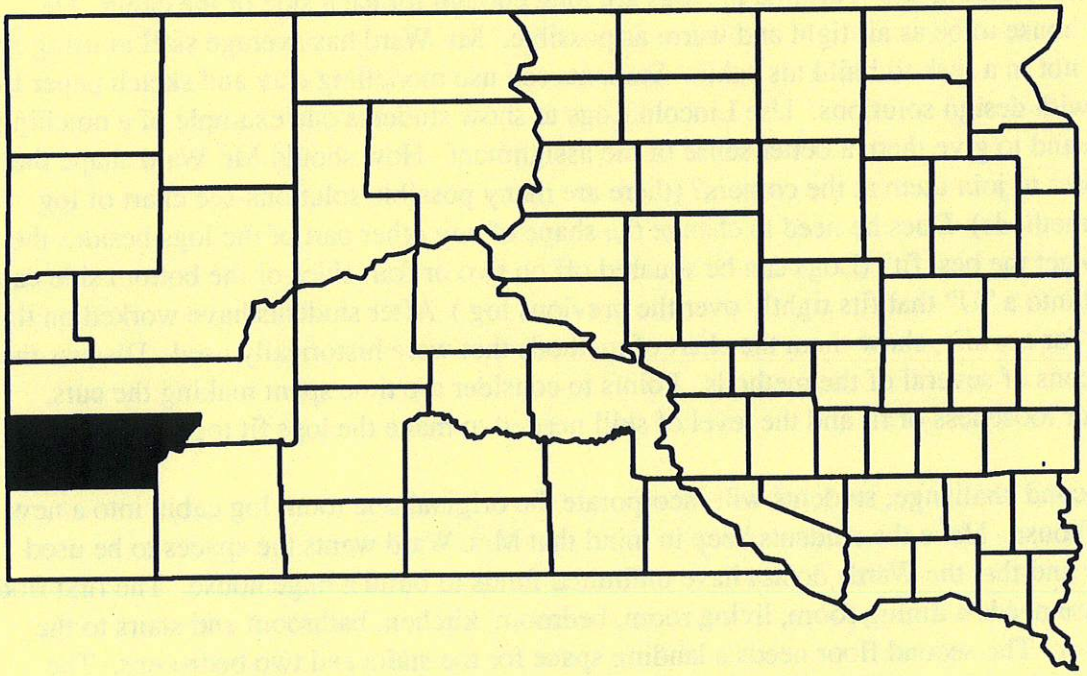
Drake Octagon House, Huron



Floor Plan



Design & Drawing Activities
Section 2, Lesson 17



Log Construction

Ward Ranch in Custer County

LOG CONSTRUCTION-Ward Ranch in Custer County

Objective: Students will participate in trial and error problem solving.

Method: Students will use modeling clay and sketches to solve design problems.

Background: Like their counterparts in other parts of South Dakota, homesteaders in the Black Hills used whatever materials were available to construct their first dwellings. For people such as Elbert Ward who homesteaded in southeastern Custer County in 1916, the most abundant material was logs. Mr. Ward lived in a simple log shack until he met and married his wife Harriet sometime between 1932-34. Mrs. Ward refused to live in the log shack so Mr. Ward built a wood frame building that incorporated the old log building. This tradition of incorporating the original homestead into the second generation home was fairly common on South Dakota farms and ranches.

Materials: modeling clay, plain paper for sketching, pencils, Lincoln Logs and copies of log notching methods sheet

Procedure: Divide students into groups of three or four. Each group will solve two design challenges. First, they need to help Mr. Ward design the best corner notching method for his log cabin. Second, they need to help Mr. Ward expand his log cabin into a large house.

For the first challenge, inform students that Mr. Ward has an unlimited supply of logs just up the hill from the building site. Assume the logs are long enough for each side of the cabin. He wants his house to be as air tight and warm as possible. Mr. Ward has average skill in using an ax. He is not in a rush to build his cabin. Students can use modelling clay and sketch paper to come up with design solutions. Use Lincoln Logs to show students one example of a notching technique and to give them a better sense of the assignment. How should Mr. Ward shape the logs in order to join them at the corners? (there are many possible solutions-see chart of log notching methods) Does he need to change the shape of any other part of the logs besides the corners to get the best fit? (Logs can be squared off on two or four sides or the bottom side can be shaped into a "U" that fits tightly over the previous log.) After students have worked on this challenge for a while, show them the chart of methods that were historically used. Discuss the pros and cons of several of the methods. Points to consider are time spent making the cuts, tightness or looseness of fit and the level of skill needed to make the logs fit together.

For the second challenge, students will incorporate the original one room log cabin into a new, two story house. Have the students keep in mind that Mrs. Ward wants the spaces to be used efficiently and that the Wards do not have unlimited funds to build a huge house. The first floor of the house needs a dining room, living room, bedroom, kitchen, bathroom and stairs to the second floor. The second floor needs a landing space for the stairs and two bedrooms. The second floor does not have to extend over all of the first floor. Have students draw the first floor plan (footprint) and the second floor plan of the house. Indicate what portion is the original log cabin. What will the roofline of the house look like from the front and the side?

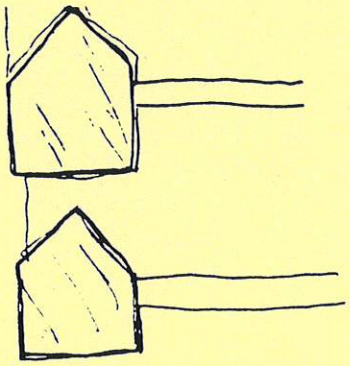


FIG. 4-2 V-Notch, Log Construction.

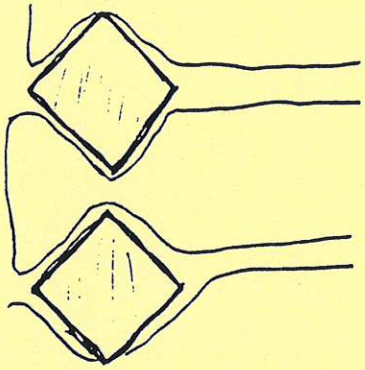


FIG. 4-2 Diamond Notch.

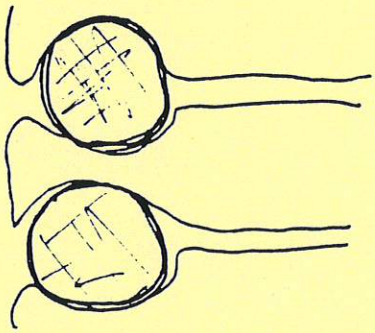
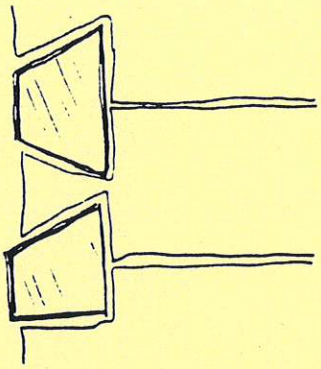


FIG. 4-2 Saddle Notch.



FIG, 4-2 Full and Half Dovetail Notch.

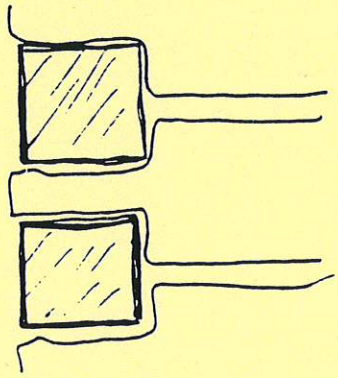
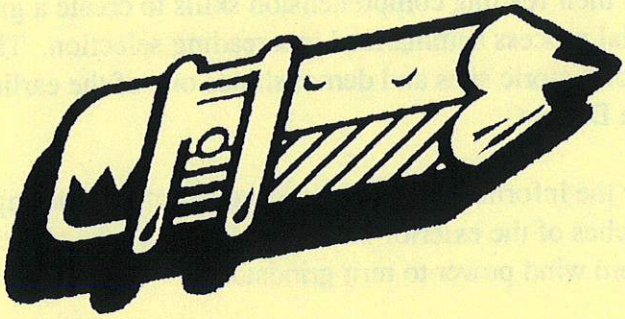
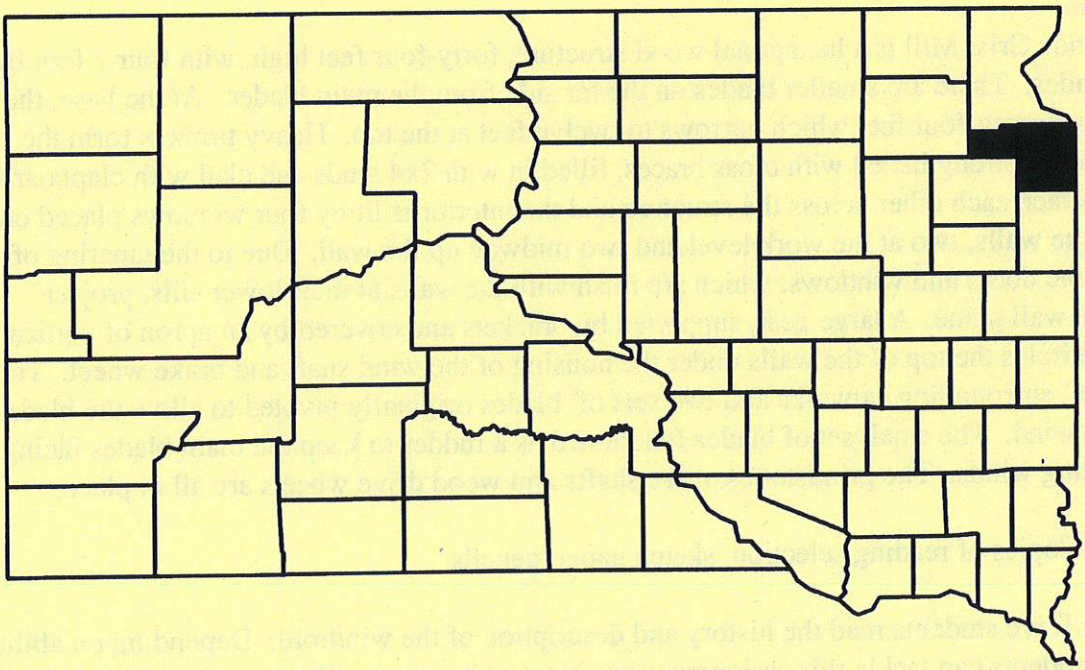


FIG. 4-2 Square Notch.

Log Notching Methods-Illustration from *Architecture and Community History: A Course for South Dakota Junior High and High School Students* by Carolyn Torma, published in 1989 by the South Dakota State Historical Preservation Center, Vermillion, South Dakota.



Design & Drawing Activities
Section 2, Lesson 18



Architectural Descriptions & Wind Power

Hollands Grist Mill • Milbank, South Dakota

PLACES WORTH EXPLORING

ARCHITECTURAL DESCRIPTIONS AND WIND POWER-Hollands Grist Mill

Objective: Students will use their reading comprehension skills to create a graphic representation of a building and an industrial process summarized in a reading selection. This example also emphasizes the uniqueness of historic sites and demonstrates one of the earliest local historic preservation efforts in South Dakota.

Method: Students will study the information in this reading selection, participate in a class discussion and develop sketches of the exterior of the windmill and the process of how the windmill uses the energy from wind power to turn grindstones.

Background: The following information is taken directly from the National Register nomination.

History

The Hollands Grist Mill is significant in the areas of engineering, settlement and industry. Built in 1884, it is one of the oldest structures associated with industry in the Dakotas from the settlement period. The mill is of English design and was built by Henry Hollands who was born in England in 1841 and immigrated in 1870. An original estimation for the windpower generated was twenty horsepower, and this enabled a capacity of 40-50 bushels of wheat to be ground in an hour. Corn and wheat were ground, and the power was also harnessed for sawing wood. Tradition maintains that by 1910 the wind velocity was diminished by the rapid growth of shelter belts on nearby farms and the mill was abandoned. In 1912 local civic groups joined efforts to purchase the mill and it was given to the city.

Description

The Hollands Grist Mill is a hexagonal wood structure, forty-four feet high, with four 7 foot by 30 foot blades. There are smaller blades on the far side from the main blades. At the base, the diameter is twenty-four feet which narrows to twelve feet at the top. Heavy timbers form the frame which is strengthened with cross braces, filled in with 2x4 studs and clad with clapboards. Two doors face each other across the structure and the interior is lit by four windows placed on two opposite walls, two at the work level and two midway up the wall. Due to the tapering of the walls, the doors and windows, which are flush with the walls at their lower sills, project beyond the wall plane. A large gear, supported by brackets and covered by an apron of vertical boards, encircles the top of the walls under the housing of the wind shaft and brake wheel. The domed roof, surrounding catwalks and two sets of blades originally pivoted to allow the blades to face the wind. The small set of blades functioned as a rudder to keep the main blades facing the prevailing winds. The grindstones, drive shafts and wood drive wheels are all in place.

Materials: Copies of reading selection, sketch paper, pencils

Procedure: Have students read the history and description of the windmill. Depending on ability level, the students can tackle this assignment as a class or in groups. Try to make a sketch of the exterior of the windmill using an appropriate scale. Try to make it as detailed as possible using the information given. Show students the photo of the windmill after the sketch is completed. Compare the sketches and photo. How can the description be improved to make it easier for the reader to construct a mental picture of the structure?

Have students try to imagine and sketch how the beginning source of energy, the wind, was transformed to enable the grindstones to grind corn and wheat. The description will provide some clues. The teacher may have to review or introduce how gears and drive shafts work to transfer energy and motion. Ask students to write a short, concise explanation of the process. As a follow-up, teachers may discuss other ways people have harnessed the forces of nature, such
as water, to do work (also see lesson plan on Kruger Dam and water power). Are these methods still used today? (yes, hydroelectric plants)

Extension: Teachers may want to have students construct a fan using the diagram below and compare these devices with windmills. How can the design be modified to create a windmill? (Extension idea and fan diagram courtesy of Rosemary Moeller, Gifted Teacher, Miller Schools)

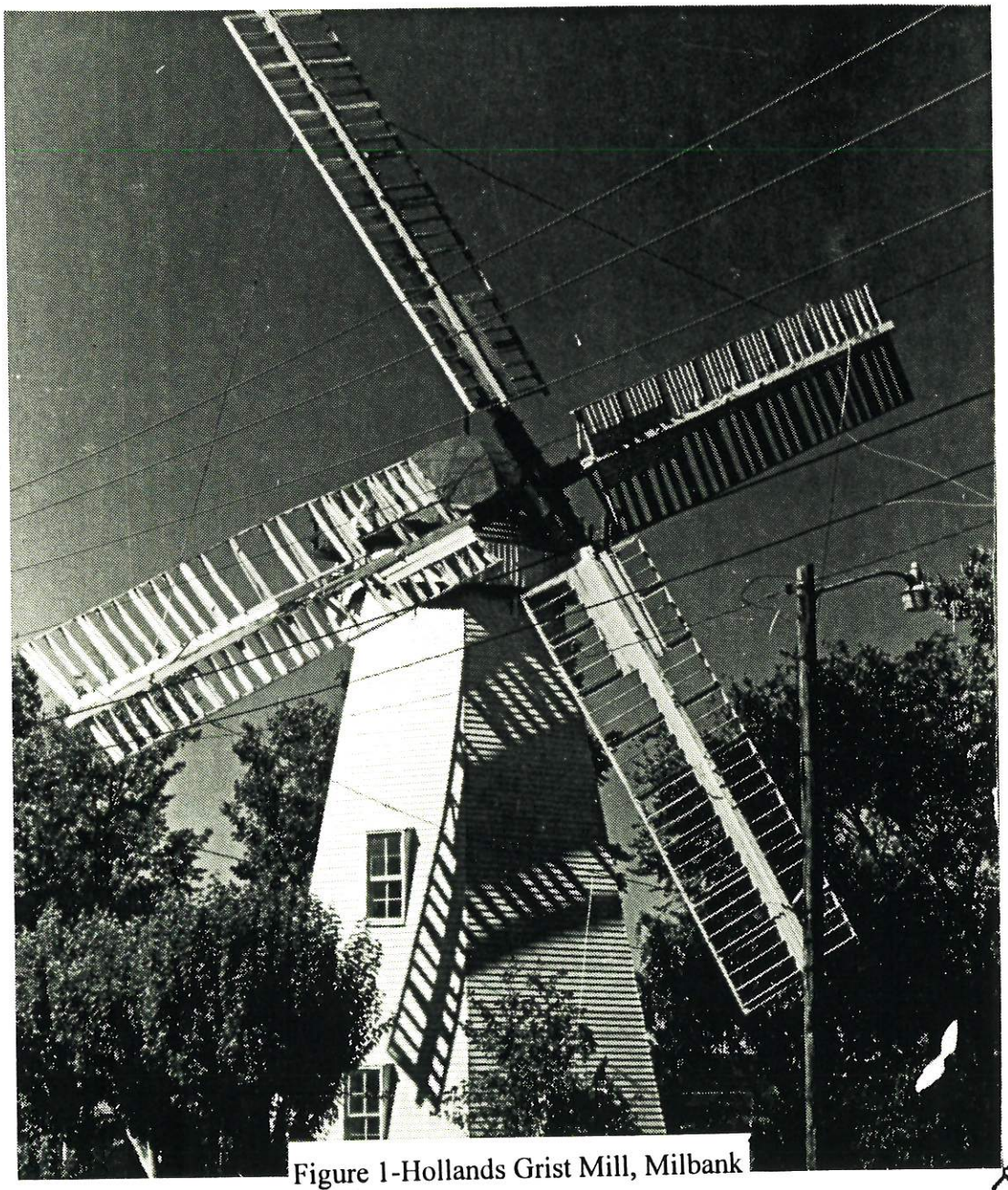
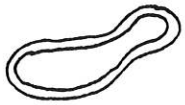


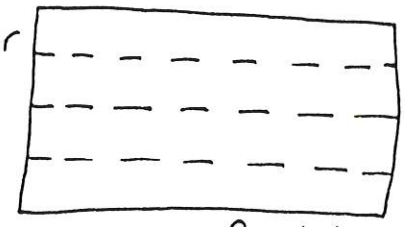
Figure 1-Hollands Grist Mill, Milbank

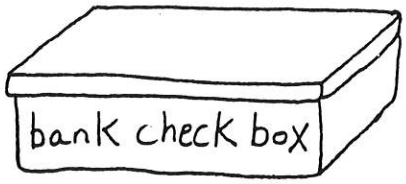
Construct a fan

You will need:

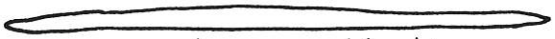

a rubber band


3 straight corks

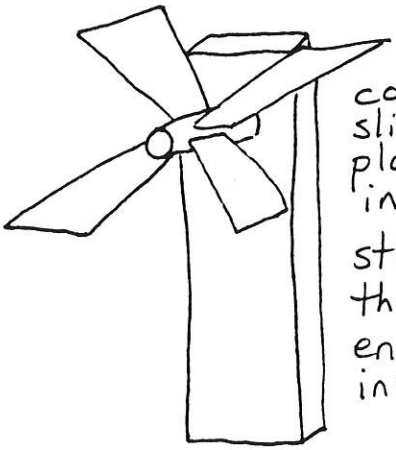

a piece of stiff plastic cut in 4 long pieces




2 paper fasteners

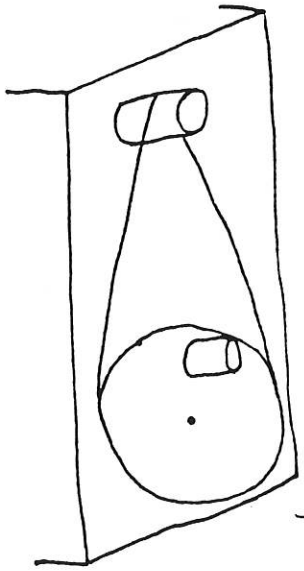

one long stick


mayonnaise jar lid


cork is slit and plastic is inserted

stick pushed through box, ends inserted into corks

front side of box


cork on end of stick

rubber band

one fastener through lid into cork

one fastener through lid center into box

back side of box