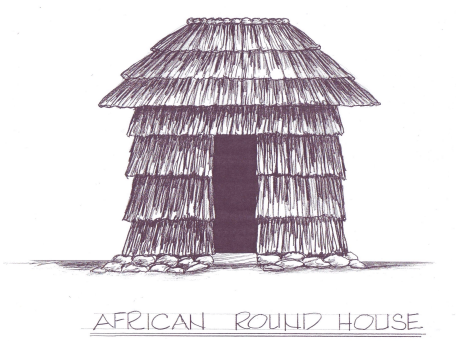
Lesson Plan Six B: Build like the Three Little Pigs – A Straw Roundhouse



Teacher instructions:

This lesson takes a lot of teacher preparation initially, but the rewards are great. Look carefully at instructions located in this lesson and on the working drawings. Try it this way first and change it later if another method suites your style better. Scale model dwellings were constructed before finalizing these lessons to avoid any unanticipated problems students may encounter while building. The building procedures are not always according to actual building standards. Construction was simplified to accommodate young minds just starting to learn about architecture and scale model construction.

Thoroughly explain each part of the scale model dwelling and discuss the importance of each element. Take an equal amount of time in explaining architectural tools and the specifics of each elevation. Although we may know terms do not assume that students have that same knowledge. The success of the end product is directly related to an initial thorough explanation of each phase of the project. The first day there were many questions, but they diminished quickly after the students began the process. This is a construction suitable for a novice builder.

Most of the drawings that correlate with this lesson fit on 8 ½" x 11" paper. Only the roof drawing needs to be enlarged to fit on 11" x 17" paper. Use the attached drawings as a guide to layout cut pieces and check dimensions before assembly. This is a manageable scale for elementary students. Drawn elements are clearly marked, and cutting lists and assembly instructions are a part of this lesson. Give cutting lists and assembly instructions as handouts.

One major goal of this unit is to increase visual acuity and a student's ability to measure accurately. Computer programs are available where students can draw their working drawings on screen, but that eliminates the development of measuring skills that are required in daily life and on standardized tests. My students are weak in this skill. Because of these reasons we are using architectural tools that include a protractor, (2) kinds of triangles, an architectural scale, and a ruled T-square to draw their working drawings. The T-square and architectural scale are in inches because building materials in the United States are cut in feet and inches.

Some students may be overwhelmed at the prospect of accurately drawing elevations required to complete this building process. If this is the case, permit those students to put a piece of wax paper and place it over the drawing enlargements of the accompanying elevations. Cut each piece and lay it on top of the drawn piece. Even if a student does not manually draw the initial working drawings this method also involves precise measurement and eliminates frustration of some students. Students need to feel competent after their initial sally into the project. Use the method that suits students better. Allow advanced students to add to plans.

Using working drawings, each student cuts and labels materials to correspond with specific structural elements on a drawing. Keep a Sharpie handy to mark pieces and sections with their

name or initials to avoid getting misplaced. Wrap loose section pieces together in wax paper to keep all parts together until the next class. Make certain each group of loose pieces is clearly marked. Construction does not begin until all parts of a drawing are cut correctly and laid out over the elevation. The box students construct from a poster board measures 8 1/2"w x 24"l x 2"d and stores all the loose pieces and flat built sections.

Some construction may begin out of order during the construction phase of the project to use time wisely. For example, wrapping raffia to make roof and cladding thatched sections.

Grade and subjects: 5, Architecture, Social Studies, Math

Time required: (4) forty-five minute classes

Objectives:

* **Improve** measuring skills
* Demonstrate that art is a process
* Build a framework accurately
* Clad a building framework
* Investigate the home of an ancient civilization
* Compare these dwellings with contemporary structures
* Acquire information about another culture
* ***Explore*** sustainable building materials in a variety of constructions.
* Compare and contrast the dwellings of the three little pigs with this structure.

Cultural Reference: African Roundhouse Dwellings

Sustainable dwellings made from straw, stick, brick, stone, mud, and many other natural materials are all found on the continent of Africa in indigenous architecture. The topography is so diverse that all three building materials that the three little pigs used are present on the continent. The roundhouses of Cameroon and Tanzania are made of mud and straw while the vernacular houses in Mali are made strictly from mud. In Dahomey and Benin raised, thatched stick houses are the style of the vernacular architecture. The Zulus of South Africa build beehive–like structures made from bent saplings with grass plaited in between, while the traditional dwelling of the Sudan is a thatched roundhouse with a cone-shaped roof. Zimbabwe has some remnants of stone homes, towers, and walls from ancient societies. All of these homes are built with local natural materials by individuals or members of the village, the very definition of sustainable architecture.

Good Sources for Photographs:

http://travelerfolio.com/travelerfolio/photos/african-straw-hut.jpg
http://www.kepri.com/images/posImpact03.jpg
http://www.shee-eire.com/Arts&Crafts/Celtic/BronzeAge/houses/Cullyhanna1.jpg

Materials:

This is a complete list of all the materials required to complete this lesson. Not all of materials are needed to complete individual sections.

* Sand paper (medium grit)
* (1) small cup of water where the glue rests
* (2) 6" two-part embroidery hoops
* (1) 4" two-part embroidery hoops
* (2) 4" embroidery hoop
* Damp paper towel

* Masking tape
* Foam Core (on which you build project)
* Diagram of each section
* Cutting List for section
* Ruler
* Sharpie
* Wax paper
* ¼" x ¼" x 24" Basswood
* Scissors
* Poster board
* Raffia for roofing
* 1" wire brads
* (3) Small paper plates
* Brass fasteners for roof

Tools:

* (1) each Proedge miter box and razor saw set with handle and saw blade #01390
* (1) each Ruler
* (1) each Scissors
* (1) each ruled T-square

Learning Experience/ Straw Roundhouse Assembly:

Construction of the Hut Structure

1. Separate the inner and outer pieces of the two 6" wooden hoops.
2. Apply glue to the inside surface of the outer hoop.
3. Reassemble the inner and the outer pieces, and align the inner and outer hoops perfectly.
4. Tighten the tension screw on the outer hoop.
5. Allow the glue to dry completely.
6. Remove the tension screws on the outer hoop.
7. Pry the metal pieces off the hoops
8. Place one hoop on top of the plan view of the hut that shows the locations of the wall studs. Transfer the stud locations from the diagram to the hoop by making a mark at each location. Mark both the top and bottom hoops.
9. Apply two patterns for temporary support to poster board using and glue sticks.
10. Cut out two poster board temporary supports and cut a slot half way up the center of each piece.
11. Turn one piece upside down and slide it down onto the center slot of the second piece. The two pieces will intersect at the center forming an 'X'.
12. Place one of the hoops on your work surface and set the temporary support in the center of the hoop. It should fit snuggly into the hoop.
13. Place the second hoop on top of the temporary support. This will hold the two hoops in place while you install the studs.
14. Make sure the temporary support is between the stud locations and will not interfere with the installation of the studs.
15. Align the marks you made on the top hoop with the marks on the bottom hoop.
16. Cut twelve pieces of ¼" x ¼" Basswood 5 ½" long. These are the studs.
17. Apply glue to both ends of one stud and place it between the top and bottom hoop. Glue and install four studs in the locations shown on the diagram with an 'X'.
18. Press glued pieces together and secure each stud with some masking tape.

19. After the glue has dried on the first four studs, continue to glue and install remainder of studs.
20. Allow glue to dry completely.

Roof Construction

1. Glue the roof pattern to a piece of poster board using a glue stick.
2. Cut out the poster board pattern and punch holes in poster board as indicated on the pattern.
3. Remove the paper roof pattern from poster board, and mark overlap lines on poster board.
4. Apply glue to overlap the tab of the poster board.
5. Fold poster board into a cone shape overlapping the ends of the cut out roof pattern.
6. Align the holes and insert brass fasteners through both layers of the poster board and spread the wings of the fastener.
7. Allow glue to dry completely.

Weaving Straw Cladding into the Hut Structure

1. Take four full length strands of raffia and tie them together with a knot at one end.
2. While holding the knot against the inside of the top hoop, wrap the raffia bunch around the hut weaving it in and out between the studs.
3. As you near the end of the first raffia bunch tie four more strands to the end of the first ones and continue weaving in and out between the studs around the hut.
4. Continue weaving the raffia around the hut. Keep each row tight against the previous row.
5. After completing about two inches down from the top. Begin leaving an opening for the doorway. To accomplish this change in weaving wrap the raffia around one of the door studs and begin weaving the strands back in the opposite direction. When you have reached the other door stud, wrap the raffia around the stud and weave back in the opposite direction.
6. Continue weaving back and forth around the hut until you complete the entire structure.
7. Tie the last group of strands to one of the studs near the bottom hoop.

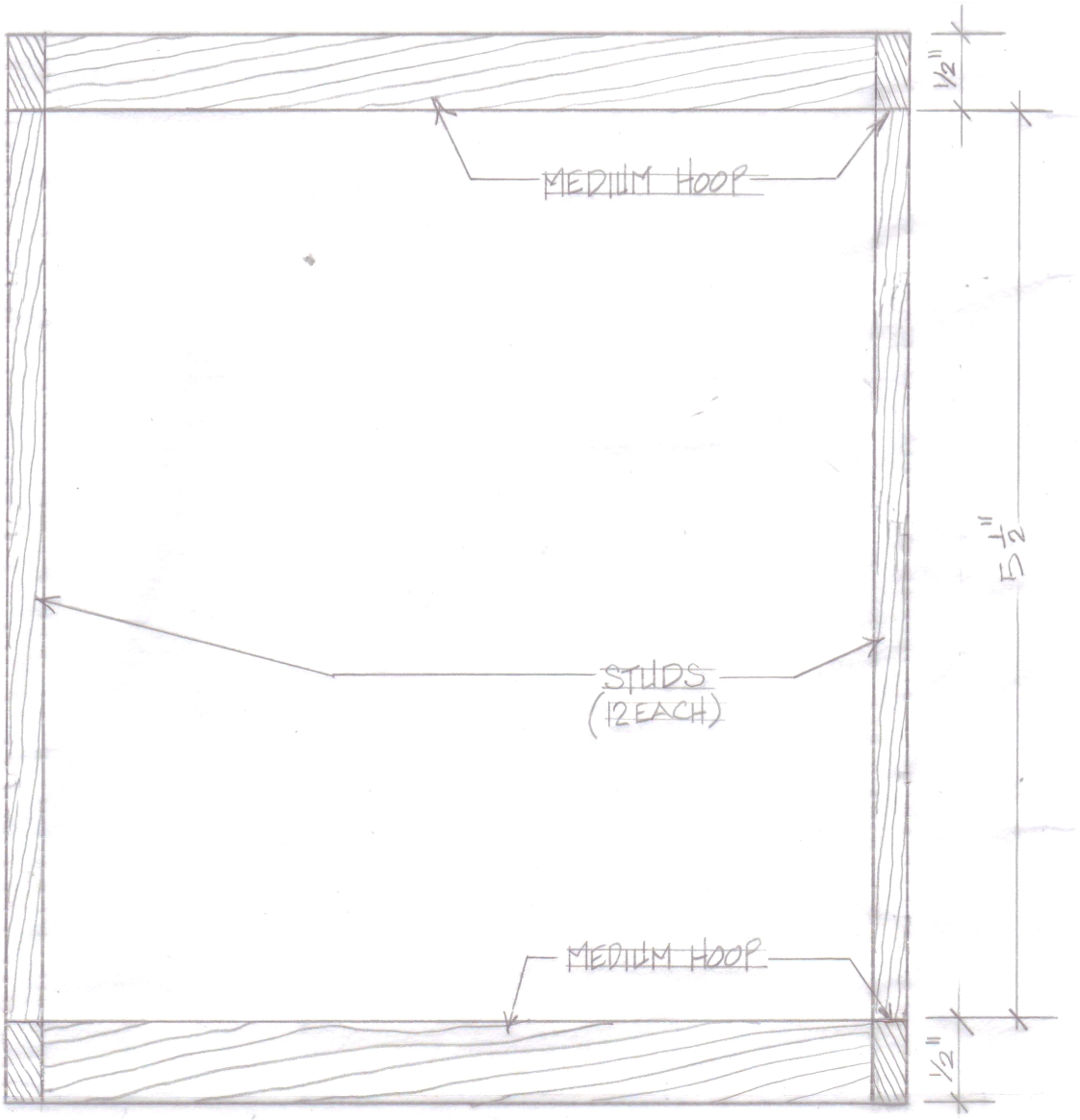
Roof Thatching

1. Take a piece of foam core 3 ½”wide x 12”long and wrap a strip of tan masking tape around it with the sticky side up. Wrap around the 12” length in the center of the foam core.
2. Wrap a single strand of raffia around the 3 ½” width of the foam core piece pressing the raffia into the sticky side of the tape.
3. Continue wrapping until the entire piece of foam core is wrapped.
4. Take another strip of tape and wrap it around the center of the 12” length like you did in Step 2, but this time press the sticky side down.
5. Slip a pair of scissors under both pieces of the masking tape and cut the loop of tape.
6. Begin cutting the loop of tape lengthwise down the center of the tape.
7. After cutting down the center of the entire loop of tape you will have two 12” long strips of thatching with tape on both edges. With your scissors cut down the center of each strip of thatching. Now you have four strips of thatching with tape along one edge of each piece.
8. Cut thatching strips into pieces about 1” wide.
9. Starting at the bottom of the roof cone glue pieces of thatching to the poster board by applying glue to the masking tape and sticking it around the bottom of the roof.
10. Glue another row of thatching overlapping the masking tape of the first row.
11. Continue adding row of thatched pieces until the entire roof is covered.
12. Finish the top row and cover the making tape at the top by taking strands of raffia and twisting them into a rope that you glue around the top edge of the top row.

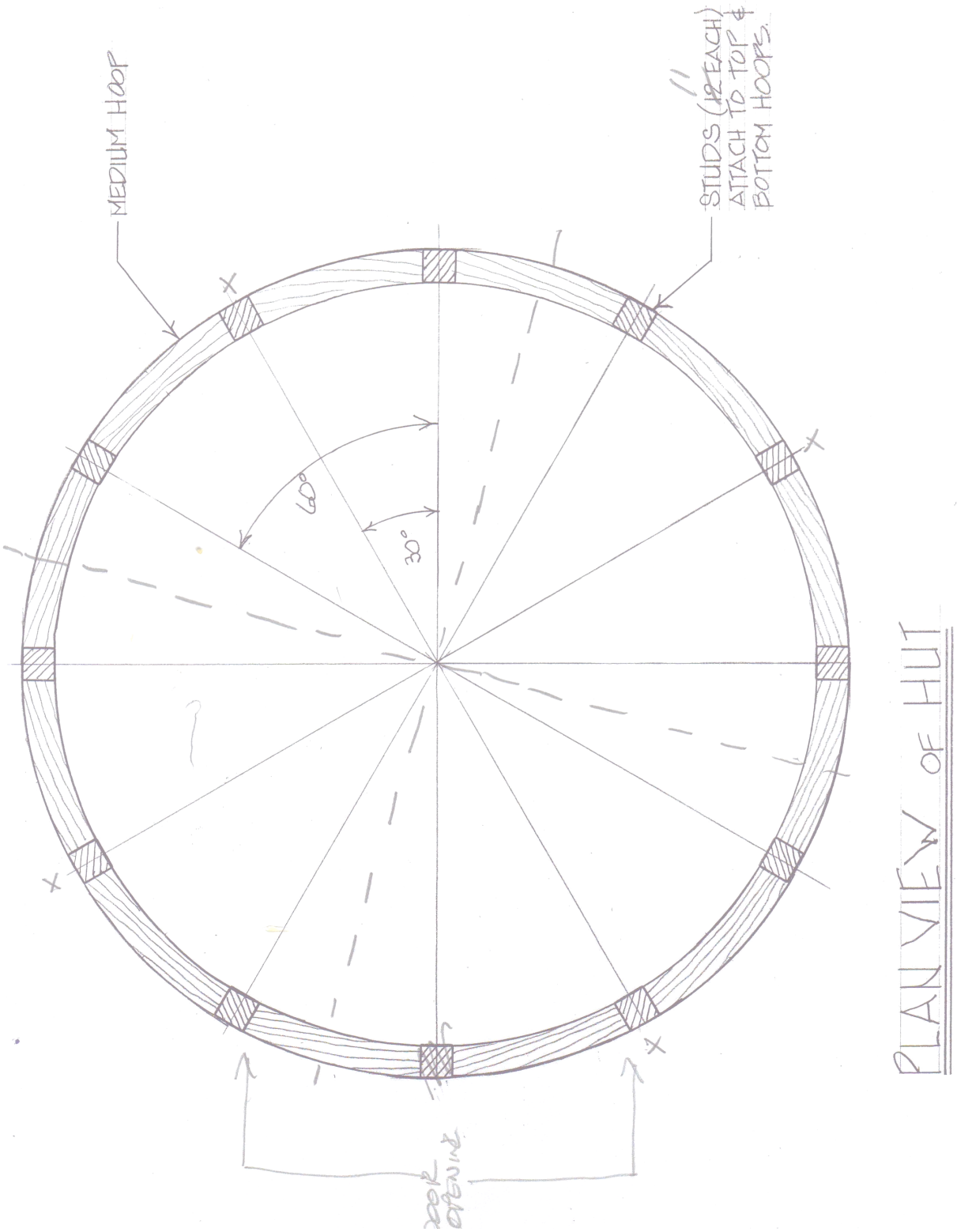
Handouts:

Learning Experience Assembly Instructions
(3) Elevations and/or Plan View Enlargements and (1) Roof Pattern found in Section C

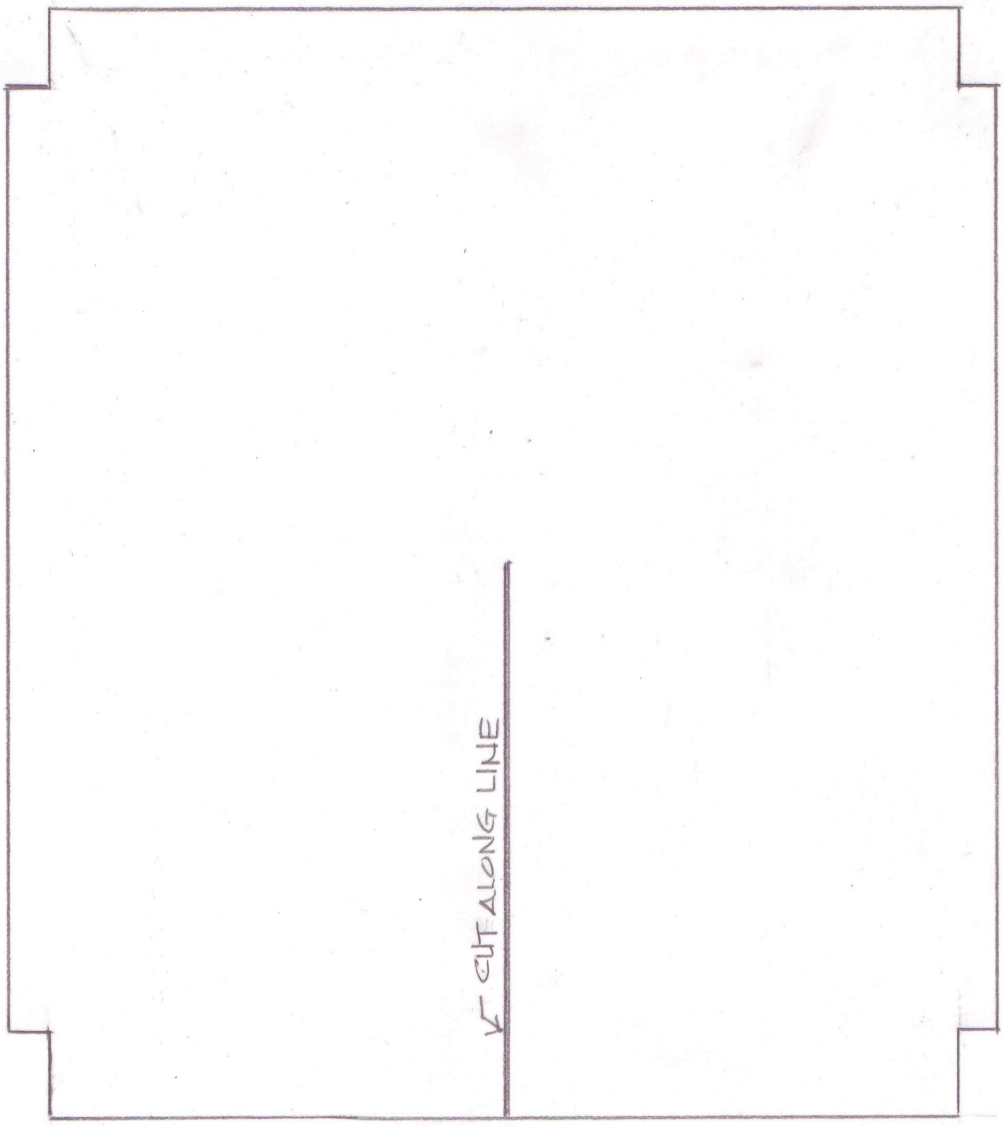
***Elevations: Section B* - Straw Roundhouse-Section through Walls** Page -1- of -4-



***Elevations: Section B* - Straw Roundhouse-Plan view of the Hut Page** -2- of -4-

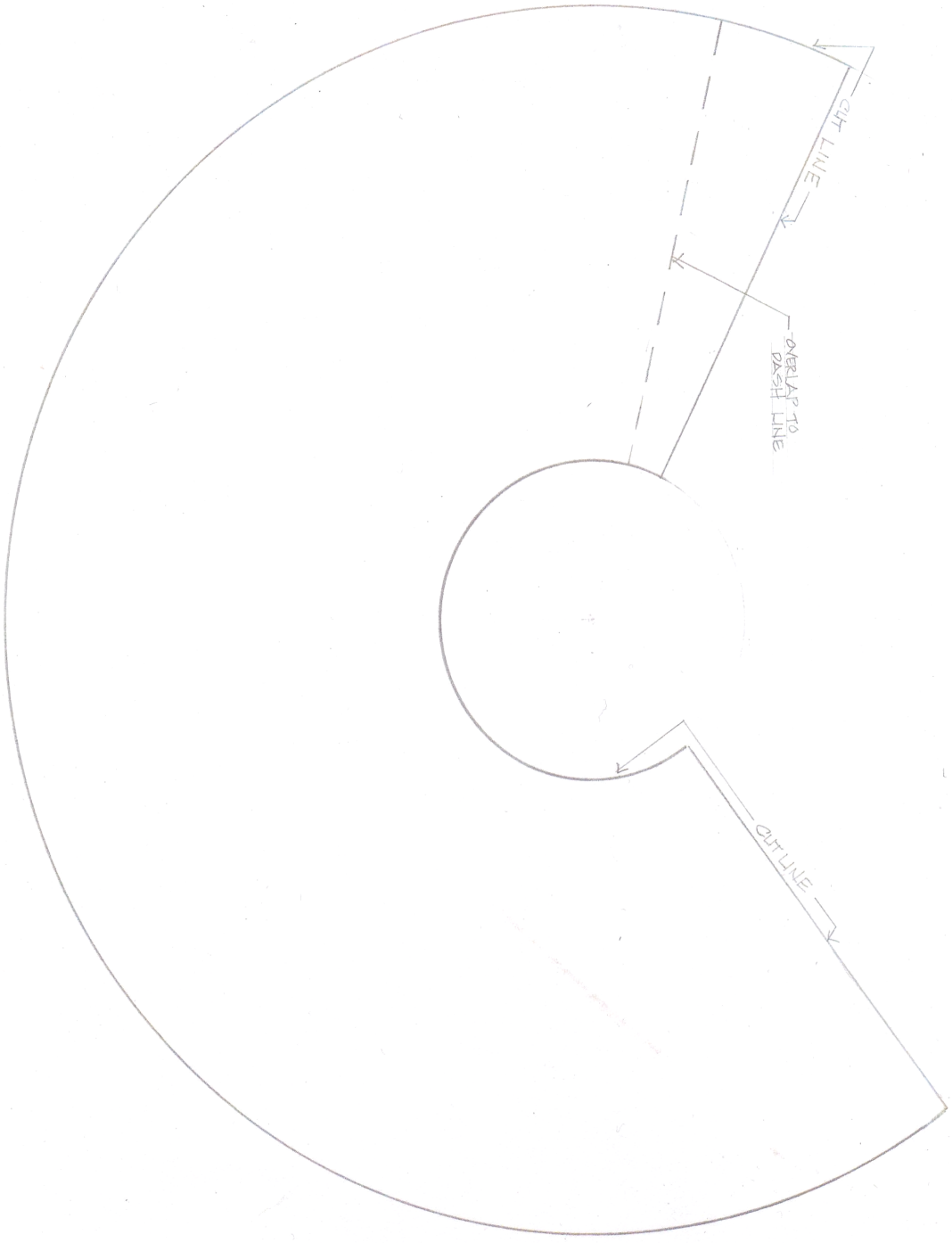


***Elevations: Section B* - Straw Roundhouse -Temporary Support Pattern (2) each**
Page -3- of -4-



PATTERN FOR TEMPORARY SUPPORT

CUT 2 EACH OUT OF POSTER BOARD



ROOF PATTERN

ANNOTATED BIBLIOGRAPHY

Works Cited

American Institute of Architects. "Going Green Sustainability 2030." 2009. <http://info.aia.org/toolkit2030/advocacy/architects-green-building.cfm>.
This article explains our current environmental situation and explores ways citizens and architects specifically can implement positive change.

"Architecture 2030." *Wikipedia*. July 2007. <http://en.wikipedia.org/wiki/Architecture_2030>.
Summary of the organization founded by Edward Mazria.

Auburn University. "Rural Studio Mockbee." 2009. <http://www.cadc.auburn.edu/soa/rural-studio/mockbeeshowall.htm>.
This article discusses Samuel Mockbee's philosophy on life and architecture and the mission of the Rural Studio Program.

Gordon, Mordechai. *Hannah Arendt and Education*. Boulder, Colorado: Westview Press, 2001.
This is a germane quote originally stated by Hannah Arendt in *Teaching as Leading*. Guilford, Connecticut: Oryx Press, Inc., 2001.

Harris, Cyril M. *Dictionary of Architecture and Construction: Third Edition.* New York: McGraw-Hill, Inc., 2000. All the architecture and construction definitions came from this dictionary.

Heinze, Noelle. "Portfolio: 2008 TASA/TASB Awards." *Texas Architect* (January-February 2009): 71-74.
This article outlined all the LEED design components that were used in the construction of my elementary school.

Macaulay, David. *Building Big Activity Guide.* Boston, Mass.: WGBH Educational Foundation Educational Print and Outreach, 1995.
This book gives practical activities to demonstrate the scientific principles that an architect must consider in building a structure.

Middletown Thrall Library. "Going Green Web Guide." 2009. <http://www.thrall.org/special/goinggreen.html>.
This website gave a good background for sustainable alternatives and available eco-friendly initiatives and sources.

The Oriental Institute Museum in Chicago, Illinois. Powered by Cuesta Technologies, LLC, 2009. <http://www.oi.uchicago.edu/OI/MUS/ED/TRC/trc_home.html>.
This website discusses Asian cultures and their importance in history. It is a wonderful site that explains archaeological findings from the Middle East that describes the culture and their lifestyle. It is written in easy-to-understand language. A link from this website is listed below:

<http://mesopotamia.mrdonn.org/homes.html>. Powered by Cuesta Technologies, LLC, 2009.
Go to this website to get a great rendering of a Mesopotamian dwelling and a keen understanding of their lifestyle.

Shajasa Travel and Tours Sdn Bhd. Powered by C-Flex <http://www.shajasa.com.my/travel/images/sarawak_iban_longhouse.jpg>.
This is the source for a great Malaysian longhouse.

Shee-Eire.com. <http://www.shee-eire.com/Arts&Crafts/Celtic/BronzeAge/houses/Cullyhanna1.jpg>.
This site describes the life of Bronze Age humans in their thatched, woven, wattle-and-daub homes as formulated in archeological finds.

TravelBlog.org. <http://img6.travelblog.org/Photos/24856/256172/t/2088769-Traditional-Iban-Longhouse-Sarawak-Region-Malaysian-Borneo-2.jpg>.
A great photo of a Malaysian longhouse.

Travelfolio.com. < http://travelerfolio.com/travelerfolio/photos/african-straw-hut.jpg >.
A wonderful photo of raised, woven round huts.

Supplemental Sources

Crouch, Dora P. and June G. Johnson. *Traditions in Architecture/Africa, America, Asia, and Oceania.* New York: Oxford Press, 2001.
This book discusses the reasons for vernacular architecture around the world, and the part culture, climate and ecology play on construction choices.

Dexinger Networks. "AIA Study: Top Cause of Greenhouse Gas Emission." 2005 -2009. Levent Ozler, Editor-in-Chief. 2005-2009. New York. <http://www.dexinger.com>.
This site provides useful information regarding contributors to greenhouse gas emissions, and ways the general public can contribute to a solution.

Kahn, Lloyd. *Home Work: Handbuilt Shelters.* Bolinas, California: Shelter Publications, Inc., 2004.
This is a resource to view many styles of dwellings built from natural materials that span historical and cultural boundaries. There are many drawings of the buildings in different stages of construction.

Kennedy, Joseph F., Michael G. Smith and Catherine Wanek, eds. *The Art of Natural Building.* Gabriola Island, British Columbia, Canada: New Society Publishers, December 2006.
This book discusses designs, constructions and resources required to build natural environments.

Kingore, Bertie. *Engaging Creative Thinking.* Austin, Texas: Professional Associates Publishers, 1998.
This book outlines problem solving techniques that develop creative lessons.

Merrill, Yvonne Y. *Hands-On Africa/ Art Activities for All Ages.* Salt Lake City, Utah: Kits Publishing. September 2005.
This book has easy building ideas for African Architecture.

--. *Hands-On Asia/ Art Activities for All Ages.* Salt Lake City, Utah: Kits Publishing. September 2005.
This book has easy building ideas for Asian Architecture.

--. *Hands-On Latin America/ Art Activities for All Ages.* Salt Lake City, Utah: Kits Publishing. February 2005.
This book has easy building ideas for Latin American Architecture.

Oliver, Paul. *Built to Meet Needs/Cultural Issues in Vernacular Architecture*. Burlington, MA.: Architectural Press. 2006.
This book investigates vernacular architecture from around the globe.

Stevenson, Peter. *The Three Little Pigs.* New York: Scholastic, Inc. September, 1999.
This book was the basis of this unit. It portrays the building efforts and antics of all three pigs.

Taylor, Barbara. *Arty Facts: Structures, Materials and Art Activities.* New York: Crabtree Publishing Co., 2002. This book gives an elementary level approach to building and discusses several varied types of structures.