



NAWIC Education Foundation

**CREATE** - **DESIGN** - **Build!**

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# Student Handout

Authors: NAWIC Education Foundation, Jessica Frichtel & Tim Bingham

“Experiential Learning Opportunity”

National Center for Construction Education & Research.

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## Nonresidential Accessory Structures: Zoning Ordinance

1. Nonresidential Accessory Structure Criteria: A nonresidential accessory structure shall not contain a stove, shower or tub. It may contain a refrigerator, toilet or sink but cannot be used as a livable space.
2. Location: Except as provided in this subsection, nonresidential accessory structures shall not occupy a required front or corner side yard or court, or project beyond the front building line of the principal structure on a site. No accessory uses shall be permitted off-site.
3. Maximum Height: The maximum height of a nonresidential accessory structure shall be 12 feet, subject to the provisions of this subsection, provided that pitched roofs shall not exceed a height of 15 feet.
4. Relation to Property Lines:
  - A. A nonresidential accessory structure shall be located a minimum of 4 feet from a rear property line and shall meet the front yard and side yard setback requirements of the zoning district in which it is located.
  - B. Detached nonresidential accessory structures with a projected roof area less than or equal to 120 square feet that are used as tool and storage sheds, playhouses, or similar uses may occupy a required side or rear yard area. Such structures may not exceed 12 feet in height and shall meet the front yard and corner side yard setback requirements of the zoning district in which they are located.
  - C. Patio Covers, Patio Enclosures, Balconies and Gazebos: These structures shall be located a minimum of 10 feet from rear property line and shall meet the front yard, corner side yard and side yard setback requirements of the zoning district in which it is located.
  - D. Uncovered patios and porches, terraces, platforms, decks and other similar structures less than 30 inches in height: These structures may occupy a required front, corner side, side, or rear yard, but must be located a minimum of 3 feet from a side yard for a length of 15 feet parallel to the adjoining property line.
  - E. Garages: Any garage taking access from a corner side yard or the secondary street frontage on a double frontage to the property line shall be setback a minimum of 20 feet, as measured from the front of the garage to the property line, back of sidewalk or back of curb, whatever is most restrictive. Garages taking access off an alley shall meet the general requirements of this ordinance.
5. Measurement of Height: Where a finished grade elevation, different than the existing grade elevation is approved as part of a discretionary application such as Tentative Map, Development Plan, Use Permit, Variance or Coastal Permit, height shall be measured from the approved finished grade elevation at all points on the site. In approving a finished grade elevation of adjacent and surrounding properties shall be considered.

## Create - Design - Build! Overview

You are a design-build contractor. Your company is submitting a bid to your client to design and build a nonresidential accessory project for their back yard. The structure should not exceed 120 – 180 square feet for the site provided. The total cost of the structure must not exceed \$20,000.

### Project Deliverables:

- 1) Floor Plan
- 2) Elevations: North, South, East and West at  $\frac{1}{2}'' = 1'-0''$
- 3) Quantity Take-off
- 4) Project Cost Worksheet
- 5) Site Plan/Layout
- 6) Business Letter and Business Cards establishing your company's name and logo
- 7) Scale Model at  $\frac{1}{2}'' = 1'-0''$

You will form design-build contracting companies of 3 people. You will choose a company name and create business cards. Determine your company philosophy and what type of structure will meet the needs of your client. Then you will write a business letter stating your intent to bid on the job and the service you will provide.

Your company will design the accessory structure based on the needs of the client and the building ordinances for the site provided. You will provide your client with the above deliverables.

## **Meeting the Client's Needs:**

Students must determine what their client will use the accessory structure for. The following questions must be answered by their team. This promotes creativity and makes each project individual.

- 1) What is the planned use for the structure?
- 2) Are there special requirements such as for a conditioned space?
- 3) Are there aesthetic requirements you must meet to please the client?
- 4) Are you able to complete the work within the time constraints?
- 5) Will they need electrical, plumbing, windows, unique flooring, etc.?
- 6) Are you clients concerned about their environmental impact?
- 7) Do they want to use eco-friendly, reclaimed or recycled products?
- 8) Do they want to implement energy and water conservation methods?

## THE FLOOR PLAN – FLOW/SPACE CONSIDERATIONS

**Flow or Circulation is the movement from one room to another.**

Successful circulation means that there are convenient pathways between areas that have the most connecting traffic. It is the designer's responsibility to design the shed with the least amount of traffic as possible. Some items to consider when designing:

- Storage near entry/exit for convenient access
- Proper lighting/ventilation over/near work area as needed
- Proper electrical outlets/receptacles near work area as required
- Benefit of natural lighting/sun
- Storage cubbies for supplies
- Sink convenient to work area as needed
- Outside spigot convenient to access as needed

## QUANTITY TAKE-OFF

The Quantity Take-Off is a listing of all material quantities needed to construct a project. When a contractor looks at a set of plans, the first thing they do is have the estimator or "Take-Off person" go through and calculate the quantities of all materials or types of construction involved. In order to aid in the pricing process, many items are priced according to a unit value, i.e.: square feet (sf or ft<sup>2</sup>), cubic yard (cy or yd<sup>3</sup>), linear feet (lf) and quantity of each. Some different items and their Take-Off units are listed below: (see the Quantity Take-Off Worksheet and Project Cost Worksheet for units in this project).

<b>Square Feet</b>	<b>Linear Feet</b>	<b>Quantity/Each</b>
Concrete Slab	Cabinets	Door
Roofing Material	Shelving	Windows
Exterior Siding		Electrical Outlets
Flooring (square yards)		Light Fixtures
Walls		Plumbing Fixtures

## Quantity Take-Off Worksheet

This worksheet will explain how to do a quantity Take-Off of the work items shown in the Project Cost Worksheet.

### Concrete Footing and Slab on Grade:

The floor of your shed will be a concrete slab with an integrated footing (monolithic slab) placed at or slightly above the grade of the surrounding soil. This item is measured in square feet (sf or ft<sup>2</sup>).

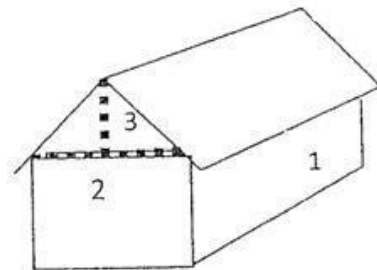
Area of Slab on Grade: (If Structure is rectangular or square)	(Length) x (Width)
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Calculations:

### Exterior Walls and Siding:

The exterior walls are measured in square feet (sf or ft<sup>2</sup>). Divide the exterior walls into sections where the area can be easily calculated. The example to the right was divided into (3) Sections:

- Section 1 = Length of Structure x Height
- Section 2 = Width x Height
- Section 3 =  $(1/2 \times \text{Base} \times \text{Height}) \times 2$   
Area of an isosceles triangle



If your structure is rectangular:	Area = (Section 1 + Section 2 + Section 3) x 2
If your structure is not rectangular:	Find the area of each exterior wall and combine.

Calculations:

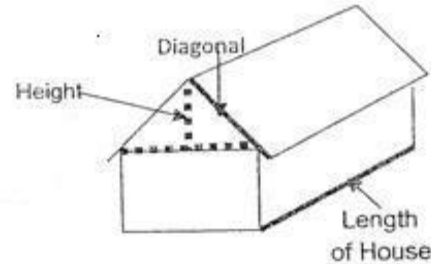
## **Roof Framing and Roofing Material:**

Roof Framing measures the area of the Roof. Because the roof is not flat, the area must be calculated using the Pythagorean Theorem.

### **PYTHAGOREAN THEOREM:**

$$(1/2) \text{ Width squared} + \text{Height squared} = \text{Diagonal squared}$$

$$\text{Diagonal} = \text{square root of } (1/2 \text{ W squared} + \text{H squared})$$



If your structure is rectangular:	Roof area is equal to the diagonals times the length of the structure times two. (Multiply times two, because the roof has two equal sides).
If your structure is not rectangular:	Divide the roof into rectangular sections, follow the steps above for each section and add all the sections together.

Calculations:

## **Interior Walls:**

This item is measured in square feet (sf or ft<sup>2</sup>).

Add the lengths of all interior walls and multiply times the height of the walls. Typically, walls are 8' high; be sure to use height that is applicable to your specific project.

Calculations:

**Storage Base and Wall Cabinets:**

These items are measured in linear feet (lf).

Measure the length of the wall where the cabinets will be located.

Calculations:

**Flooring:**

These items are measured in square feet (sf) or square yards (sy).

Calculate the area of each different type of flooring. This is done by multiplying the length of the room by the width of the room.

To convert to square yards, divide the square footage by 9.

$$1 \text{ sy} = 9 \text{ sf}$$

Calculations:

**TOTAL SQUARE FOOTAGE OF STRUCTURE**

<u>Room</u>	<u>Length</u>	<u>X</u>	<u>Width</u>	<u>TOTAL (SF)</u>
Work Area				
Storage				
Other:				
			<b>TOTAL:</b>	



## PROJECT COST WORKSHEET

**Group Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

	DESCRIPTION	COST		QUANTITY	TOTAL
<b>Footings and Slab</b>					
	Concrete Flooring and Slab on Grade	\$ 7.00	/	ft <sup>2</sup>	\$
<b>Exterior Walls</b>					
	2" x 4" wood studs, 4" faced insulation	\$ 5.00	/	ft <sup>2</sup>	\$
	1/2" OSB exterior sheathing				
	2" x 4" wood studs, no insulation	\$ 4.50	/	ft <sup>2</sup>	\$
	1/2" OSB exterior sheathing				
	1/2" drywall on exterior walls	\$ 2.25	/	ft <sup>2</sup>	\$
<b>Siding</b>					
	Vinyl	\$ 4.00	/	ft <sup>2</sup>	\$
	Hardi-Plank	\$ 6.00	/	ft <sup>2</sup>	\$
	Cedar	\$ 8.00	/	ft <sup>2</sup>	\$
	Stucco	\$ 10.00	/	ft <sup>2</sup>	\$
	Brick	\$ 15.00	/	ft <sup>2</sup>	\$
	Field Stone	\$ 22.00	/	ft <sup>2</sup>	\$
<b>Roofing</b>					
	Roof Framing	\$ 6.50	/	ft <sup>2</sup>	\$
	Shingles, 25-yr. – Three Tab	\$ 3.00	/	ft <sup>2</sup>	\$
	Shingles, 40-yr. - Architectural	\$ 3.75	/	ft <sup>2</sup>	\$
	Shingles, Premium Architectural	\$ 4.50	/	ft <sup>2</sup>	\$
	Gutters	\$ 4.00	/	lf	\$
	Gutters with Leaf Guard	\$ 8.50	/	lf	\$
<b>Interior Walls</b>					
	2"x4" wood studs, 1/2" drywall each side	\$ 6.25	/	ft <sup>2</sup>	\$
	4" Insulation in interior walls	\$ 0.75	/	ft <sup>2</sup>	\$
<b>Doors</b>					
	Interior 2'6" x 6'8-0"	\$ 285.00	/	ea	\$
	Interior 3'-0"x 6'8-0"	\$ 295.00	/	ea	\$
	Exterior 3'-0"x6'8-0"	\$ 375.00	/	ea	\$
	Exterior Barn Door 6'-0"x6'-8"	\$ 750.00	/	ea	\$
<b>Windows</b>					
	Double Hung, 2'-4"x4'-6"	\$ 320.00	/	Ea	\$
	Double Hung, 2'-0"x3'-0"	\$ 265.00	/	Ea	\$
<b>Storage</b>					
	12" Wall Cabinets	\$ 65.00	/	lf	\$
	24" Base Cabinets	\$ 90.00	/	lf	\$
	24" Counter Top	\$ 20.00	/	lf	\$
	12" Wall Shelving	\$ 10.00	/	lf	\$
	Hooks	\$ 10.00	/	ea	\$

## PROJECT COST WORKSHEET

**Group Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

	DESCRIPTION	COST		UNIT	QUANTITY	TOTAL
	Peg Board (for tool storage)	\$ 1.50	/	ft <sup>2</sup>		\$

**Painting**

	Walls	\$ .75	/	ft <sup>2</sup>		\$
	Doors	\$ 40.00	/	ea		\$
	Windows	\$ 40.00	/	ea		\$

**Flooring**

	Vinyl Composition Tile (VCT) 12" x 12"	\$ 2.50	/	ft <sup>2</sup>		\$
	Concrete Sealer	\$ .75	/	ft <sup>2</sup>		\$
	Sheet Vinyl	\$ 3.00	/	ft <sup>2</sup>		\$
	Epoxy	\$ 5.00	/	ft <sup>2</sup>		\$

**Plumbing**

	Water from House to Structure	\$ 1,000.00	/	ea		\$
	Sink	\$ 700.00	/	ea		\$
	Outside Spigot	\$ 300.00	/	ea		\$

**Electrical**

	Power to Structure	\$ 500.00	/	ea		\$
	Receptacles	\$ 50.00	/	ea		\$
	GFCI Receptacles	\$ 60.00	/	ea		\$
	Light Fixtures - Interior	\$ 200.00	/	ea		\$
	Light Fixtures - Exterior	\$ 150.00	/	ea		\$
	Exterior Light Motion Sensor	\$ 75.00	/	ea		\$

**Building Permit**

	<b>Building Permit</b>	\$ 75.00	/	ea		\$
<b>SUB-TOTAL:</b>						
Overhead and Profit, 15%						
<b>TOTAL:</b>						

## PROJECT COST

Use the number of items found with the Quantity Take-Off to determine the estimated project cost: (use the Project Cost Worksheet enclosed). If the cost of the project is less than the allowed amount, you can maximize money usage by altering material selections or adding items to the Structure:

- Add features: shelving, tool rack, bike rack, etc.
- Use more expensive items: brick, rather than vinyl siding
- Add additional square footage: This method could possibly exceed the time line for project completion. However, if you think you can enlarge the structure and re-do the Floor Plans, Elevations, Quantity Take-Off and Project Cost Worksheet, then go for it!

If the cost of the project exceeds the allowed amount, then do the opposite of the suggestions above.

## THE SITE

The Structure must proportionately fit on the site. Some items for your Client to consider:

- Are there any utility easements? Are there minimum setbacks required by the locality or by the subdivision in which you are building? The structure cannot sit within any of those areas.
- Are there any elements on the lot you wish to maintain? For example: trees, special shrubs and/or plants, existing buildings?
- Which direction do you want your Structure to face? Toward the road, toward a creek or river, or toward the East to get sun in the morning? Placement in relation to the sun can have a big impact on the light coming through windows.
- Where are your entry doors going to be located?
- Do you plan to add on to the Structure or any other buildings on your property in the future?
- Do you plan to build additional out buildings?

SAMPLE



## ABLE DESIGN & CONSTRUCTION, INC.

1530 55<sup>TH</sup> St., Suite 119  
San Diego, CA 92101  
Ph: (123) 555-4481  
Fax (123) 555-7210  
[www.ABLE.construction.com](http://www.ABLE.construction.com)

October 11, 2010

Mr. & Mrs. Green  
1530 Palm Rd.  
San Diego, CA 80303

Dear Clients:

ABLE is a General Contracting firm located in San Diego, California, and was established in 1987. We have earned a well-deserved reputation for satisfying our clients. We personally work closely with each one to define every project's scope, schedule, and budget in order to deliver superior service and quality products. Providing a safe and stable work environment requires the utmost attention to detail. Adhering to standards of conduct from OSHA Safety Regulations to Building Code requirements is not a matter of requirement but of pride. In a business where cutting corners can lead to a smaller bottom line, ABLE's are squarely formed.

We understand per our meeting that you would like to build a nonresidential accessory structure in your backyard. You need a space that would serve as a dance studio and a work-out room for your family. After getting to know you, we understand that you would like to use recycled and eco-friendly materials as much as possible. We will prepare a bid proposal as well as a site plan, floor plan and scale model to demonstrate the service we can provide by \_\_\_\_\_ (due date).

Sincerely,

Jessica Frichtel  
Construction Superintendent  
ABLE Design and Construction, Inc.