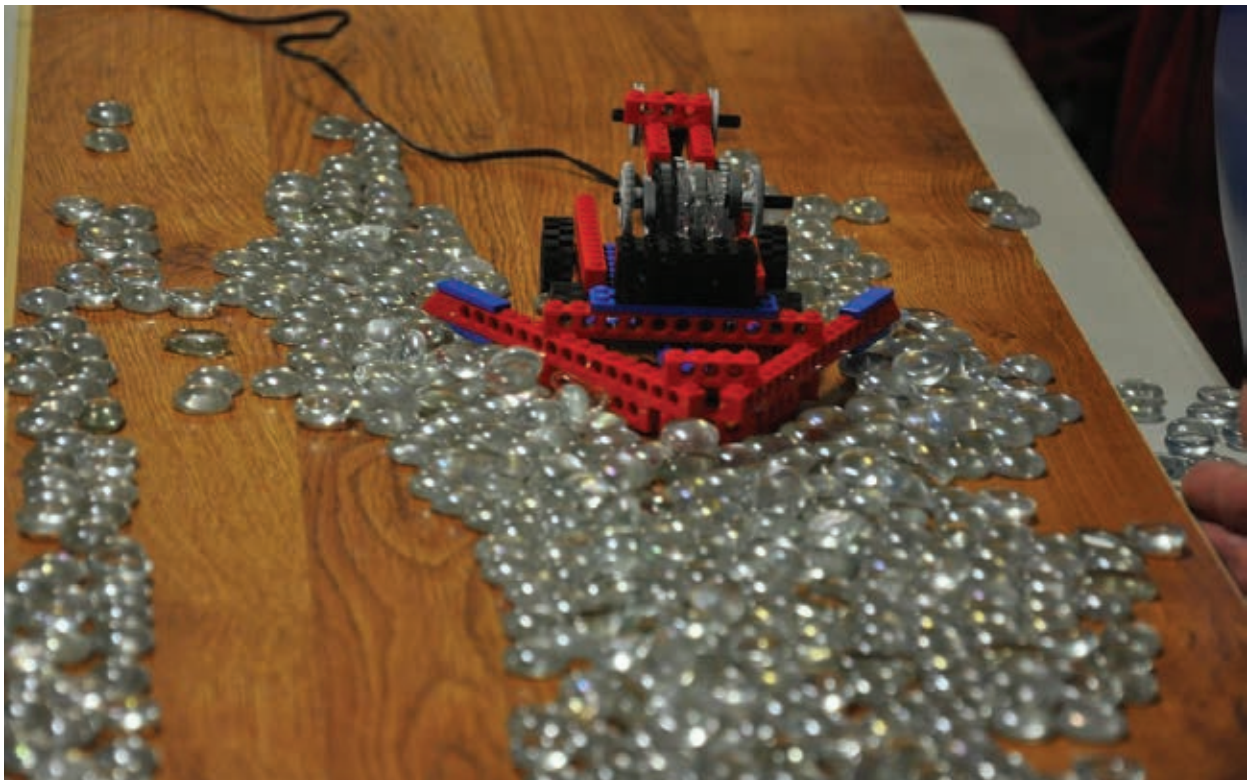




[www.4-hontario.ca](http://www.4-hontario.ca)

## 4-H ONTARIO PROJECT



**Building Blocks  
Engineering Project**

**RECORD BOOK**



## **The 4-H Pledge**

I pledge my Head to clearer thinking,  
my Heart to greater loyalty,  
my Hands to larger service and  
my Health to better living  
for my club, my community and my country.

## **The 4-H Motto**

Learn To Do By Doing

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4-H Ontario grants permission to 4-H Volunteers to photocopy this 4-H project resource for use in their local 4-H program.

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# RECORD BOOK

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## Record Keeping – Why?

Record Books are to document time and money spent, what you have learned, your ideas, memories and what you liked and didn't like. Your Record Book also....

- Helps you set goals for this project
- Has space to record important dates, your elected executive and the names and contact information of your leaders and club members
- Is a great way to get and stay organized

Down the road when you look back on your 4-H projects these books will be able to remind you what you learned so you can use those skills later in life. It will bring back memories of the project, your 4-H friends, your story and thoughts at the time of the project. You will never forget because this book will act as a reminder! It will also be useful at the Achievement Program, when looking at your progress and when reviewing your accomplishments.

## How do I organize my materials?

1. Make your records neat and easy to read. This will make it easier to find information later on, and to share your information with others.
2. Use a three ring binder or duotang to hold your materials and divide your information into sections using dividers. This will keep things from becoming lost and will it easier to find what you need later on. This will also allow you to add extra pages later.

## How do I keep good records?

1. Keep track of activities throughout the meetings, as you complete different parts of the project. It's often difficult to remember things that happened in earlier meetings.
2. Make sure the information you write in your Record Book is complete and accurate. If you're not sure about something, ask your leader for help before writing it in your book. You can also consult people in your community or do some research on your own. If you borrow information from someone or someplace else, make sure you write down where you found it.

***Remember that this is YOUR Record Book so make it your own! And, remember to bring your Record Book to every meeting!***



## Who's Who

Club President: \_\_\_\_\_ Ph. #/E-mail: \_\_\_\_\_

Vice President: \_\_\_\_\_ Ph. #/E-mail: \_\_\_\_\_

Secretary: \_\_\_\_\_ Ph. #/E-mail: \_\_\_\_\_

Treasurer: \_\_\_\_\_ Ph. #/E-mail: \_\_\_\_\_

Press Reporter: \_\_\_\_\_ Ph. #/E-mail: \_\_\_\_\_

Meeting Dates:

	<i>Date &amp; Time</i>	<i>Place</i>	<i>Notes:</i> <i>(Things to bring, remember, etc.)</i>
<b>Meeting 1</b>			
<b>Meeting 2</b>			
<b>Meeting 3</b>			
<b>Meeting 4</b>			
<b>Meeting 5</b>			
<b>Meeting 6</b>			
<b>Achievement Program</b>			

<i>Leader Name &amp; Contact Information</i>	<i>Leader Name &amp; Contact Information</i>

## Member Expectations and Goals

Why did you join the Building Blocks Engineering club?

What is one goal that you want to achieve in this project?

Do you have any ideas for fun things to do during the project?

Do you have any ideas for an Achievement Program for the Building Blocks Engineering club? (Keep in mind that an Achievement Program should include the community in some way).

## Member Responsibilities

- Be a current paid member of 4-H Ontario
- Attend at least 2/3 of the meeting time allotted for this project
- Complete the Record Book for this project. Bring it with you to each meeting!
- Put your Record Book in a binder or duotang so you don't lose any of the pages.
- Remember the more you put into your 4-H club the more you will get out of it!

**Roll Calls - In my Opinion.....**

	<i>Roll Call:</i>	<i>My Answer:</i>
<i>Meeting 1</i>		
<i>Meeting 2</i>		
<i>Meeting 3</i>		
<i>Meeting 4</i>		
<i>Meeting 4</i>		
<i>Meeting 4</i>		





## Take Home Activity #1 Meeting #1

Research what different kinds of building block kits are available and the price of each kit. Record your findings below.

Type of Building Block Kit	Price

## Take Home Activity #2 Meeting #1

Research what types of projects can be built/created using various building block kits. What is the ultimate project that you want to be able to create by the end of this project? Record your findings below.

Types of Projects that can be built using Building Block Kits

**My idea of an ultimate Building Blocks Project is:**

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## Take Home Activity #1 Meeting #2

Using the Internet, research what the largest structure ever made out of Building Blocks of any kind is. How tall or long was it? How many blocks were needed to build it? Where was it built? Record your findings below and, if possible, include a picture.


## Building Blocks Journal

Name of the Structure Built: \_\_\_\_\_

Name of the Building Blocks Kit used to build the structure:

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If the structure was built to record distance, speed or any other measure of performance, record the information here:

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What challenges were there in building this structure? Is there something you would do differently next time?

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Picture:

\*\*Note: this page should be photocopied for each structure built during the Building Blocks Engineering Project.

**Take Home Activity #1 Meeting #3**

Take a walk around your home (or in your shop or barn if you have one) and list 5 items that use gears and 5 items that use levers. Record your findings below.

**Gears**

1.	
2.	
3.	
4.	
5.	

**Levers**

1.	
2.	
3.	
4.	
5.	

**Take Home Activity #2 Meeting #3**

Find a small triangular object (or make one out of heavy cardboard, etc.) and build a mini lever using the triangular object and a ruler. Test to see how much weight you can lift. Experiment by moving the ruler so the fulcrum is not centred on your lever. Record what items you were able to lift with your lever and include a picture if possible.

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Picture:

**Activity #5 – Meeting #3****Sturdy Walls**Criteria

1. Appearance – How tall is the wall? How long is it? Or is the wall small and short? Does the wall meet the minimum requirements set out for size? Does it look safe to stand on?
2. Function – Is the wall able to hold the weight of a 4-H Member? Does it crumble under the weight? Did it completely fall apart or did only one or two pieces fall off?

Giving Reasons:

I place this class of Sturdy Walls \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

I place Sturdy Wall \_\_\_\_\_ first because.....

I place Sturdy Wall \_\_\_\_\_ over Sturdy Wall \_\_\_\_\_ because.....

I place Sturdy Wall \_\_\_\_\_ over Sturdy Wall \_\_\_\_\_ because.....

I place Sturdy Wall \_\_\_\_\_ over Sturdy Wall \_\_\_\_\_ because.....

I place Sturdy Wall \_\_\_\_\_ 4th because.....

For these reasons, I place this class of Sturdy Walls

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

Official Placing \_\_\_\_\_.

**Take Home Activity #1 Meeting #4**

1. Using the Internet, or by looking around home, research and list 10 items that use a pulley system to either lift, move or power an item or piece of machinery. Record your findings below.

**Items that use a Pulley System**

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	



**Activity #9 – Meeting #5****Sturdy Cars – The Drop Test**Criteria

3. Appearance – Does the car meet all the requirements asked for in the instructions?
4. Function – Was the car able to withstand a drop? Does it fall apart when it hits the floor? Did it completely fall apart or did only one or two pieces fall off?

Giving Reasons:

I place this class of Sturdy Cars \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

I place Sturdy Car \_\_\_\_\_ first because.....

I place Sturdy Car \_\_\_\_\_ over Sturdy Car \_\_\_\_\_ because.....

I place Sturdy Car \_\_\_\_\_ over Sturdy Car \_\_\_\_\_ because.....

I place Sturdy Car \_\_\_\_\_ over Sturdy Car \_\_\_\_\_ because.....

I place Sturdy Car \_\_\_\_\_ 4th because.....

For these reasons, I place this class of Sturdy Car

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

Official Placing \_\_\_\_\_.

## EXTRA ACTIVITIES

### Activity # 12

#### Paper Towers

*Materials Needed:* 3 sheets of standard 8 ½" X 11" plain white paper, 3 regular paper clips

*The Challenge:* Build the tallest free-standing paper tower using only 3 sheets of plain white paper and 3 paper clips. Tearing of the paper is allowed. Scissors cannot be used.

*The Goal:* To have the tallest tower that can stand on its own for a minimum of 5 seconds.

## EXTRA ACTIVITIES

### Activity # 13 – Word Search

## Building Blocks!

V	M	Q	I	S	L	M	L	L	S	Q	S	H	D	P	N	E	T	R	A
X	W	R	A	T	U	P	B	E	A	M	S	H	L	A	O	K	S	I	A
T	C	I	Z	R	I	B	U	N	E	I	W	A	E	Z	I	D	K	Y	V
R	W	R	C	U	U	U	R	L	S	H	T	H	N	A	S	Z	R	G	O
R	M	L	I	C	Y	S	E	E	L	E	W	Z	Y	H	R	B	A	G	K
S	U	B	H	T	X	S	G	Z	S	E	X	E	K	L	O	H	Y	S	A
F	N	A	K	U	R	K	D	N	J	S	Y	R	D	R	T	E	P	F	U
D	I	O	N	R	C	O	E	Y	N	L	T	E	S	E	S	T	B	M	W
J	P	L	I	E	O	O	W	V	U	U	E	I	N	K	P	R	R	S	E
G	N	I	H	S	U	B	N	Q	W	P	O	G	N	E	Q	F	I	G	L
R	E	V	E	L	N	U	G	N	S	B	I	P	H	Y	S	I	C	S	V
O	H	N	X	B	Q	E	A	D	E	N	T	Y	T	L	E	B	K	G	A
K	B	X	L	F	A	U	T	L	E	C	X	B	U	B	M	I	S	G	D
U	T	E	X	R	E	U	R	E	A	J	T	W	Q	V	E	F	R	Q	J
W	D	I	G	R	R	D	R	A	W	Y	S	O	S	Z	A	M	Q	Y	I
A	Q	C	O	S	V	D	A	X	U	L	A	M	R	I	J	X	A	I	R
K	J	B	L	E	C	Y	U	L	P	R	B	H	V	S	C	Q	L	D	G
F	P	G	L	K	A	G	X	E	T	D	Q	V	W	E	L	S	U	C	V
N	S	K	V	S	T	U	L	X	F	L	U	I	W	A	R	B	R	S	J
W	R	N	Q	E	B	Z	W	C	Q	R	V	B	J	T	F	N	K	U	V

AXLE

ENGINEER

PULLEY

WEDGE

BEAMS

FULCRUM

SHEAR

WHEEL

BELT

GEAR

SPEED

BRICKS

LEVER

STRUCTURE

BUSHING

PHYSICS

TENSION

CONNECTORS

PLATES

TORSION

## EXTRA ACTIVITIES

### Activity # 15

#### Peak Performance

*The Challenge: to build a car that uses gears to travel quickly across a flat surface but is also able to climb a steep hill.*

*Discuss gearing down and what the result of gearing down is (slower motion of the follower gear). 4-H Members will build a car that can travel quickly on a flat surface as well as be able to handle a steep incline. Members may use gears, friction or any other strategies they think of to design their cars. Have Members work in pairs or as individuals for this project.*

*Evaluation: Who had the car that could both travel quickly on the flat surface and up the steep incline (hill)?*

Once all the teams have their cars finished, have them test their cars one by one. Make sure that results are recorded in the Building Blocks Journal found in the Record Book.

## EXTRA ACTIVITIES

### Activity # 16

#### Human Knot

Have everyone stand in a circle. Then have everyone put their hands in the centre of the circle and hold hands with someone across from them. Then tell them to un-mix themselves without letting go of anyone's hands. Time it.

Do it again but the second time enlist the help of a Dr. Mix Up. Ask for someone to volunteer to be Dr. Mix Up and remove them from the group. Have everyone else repeat the Human Knot again but this time, have Dr. Mix Up help to untangle the group. Time it.

Was it faster to have a leader? Was it easier to have a leader? Why?

## EXTRA ACTIVITIES

### Activity # 17

#### Earthquake in the Room!

Materials Needed: 30 mini marshmallows, 30 toothpicks, one 8 inch square pan filled with Jello (made the night before so it's set) (depending on the size of the group, you may want to have two or three sets of these materials so group sizes aren't too big)

*The Challenge: to build a structure that will withstand the shaking motion of an earthquake*

Engineers face the challenge of designing buildings to withstand earthquakes. Earthquake-proof buildings will bend and sway with the motion of an earthquake, instead of cracking and breaking under the pressure. What does a really tall skyscraper look like? Does it appear fragile and unstable? It might, but it is most probably quite sturdy and can withstand wind, rain and other natural elements and phenomenon. Earthquake-proof buildings will typically have cross bracing that forms triangles in its design geometry (like a bridge). Such buildings also normally include a large "footprint," or base, and a tapered shape, decreasing in size as the building gets taller. Short buildings are more earthquake proof than tall ones. Have you ever climbed up a tree or been on top of a playground jungle gym in the wind? Do you sway more when you are at the top rather than when you are on the ground? All buildings shake at the same frequency as the shaking of the earth, but the movement is magnified as the building gets taller. Sometimes, as can be the case during an earthquake, a building will sway too much, crack, crumble and fall.

*The Task: 4-H Members will make models of buildings and conduct an experiment to test how well their structures stand up under the stress of an earthquake. Illustrate how to make cubes and triangles using toothpicks and marshmallows. Show them how to break a toothpick approximately in half. Explain that cubes and triangles may be stacked to make towers. The towers can have small or large "footprints" (or bases).*

Distribute 30 toothpicks and 30 marshmallows. 4-H Members should make structures of toothpicks and marshmallows using only the materials they have been given. They may make large or small cubes or triangles by using whole or broken toothpicks and may use cross bracing to reinforce their structures. Place the structures on the pans of Jello.

*Evaluation: Shake the square pan back and forth in a shearing motion to simulate an earthquake. After 4-H Members have tested their structures, they should redesign and rebuild them and test them again. What can they do to make it stronger? Did it topple? Should they make the base bigger? Make the structure taller or shorter?*

## EXTRA ACTIVITIES

### Activity # 18

#### Recycled Towers

Materials needed: piece of cardboard, tennis ball, 4 aluminum cans, 12 sheets of newspaper, four 750-mL plastic bottles (such as soda bottles), 6 plastic yogurt cups, 1.5m string, masking tape, 1 pair of scissors (numbers of items can be adjusted depending on availability)

*The Challenge: to build the tallest structure that will withstand wind from a fan, using only recycled materials. The structure must be at least 1 metre tall and be able to hold a tennis ball on the top.*

Some engineers have started building homes and other buildings by reusing things other people would consider garbage. These engineers are continually working to find better ways to build homes and other buildings using recycled materials. Some new designs use old shipping containers for walls, collections of glass bottles for windows, and old pieces of tires as roofing material.

4-H Members can use some or all of the materials given to them to create their tower.

*Evaluation: Will the tower withstand the wind from a fan on high for a least 30 seconds? How long did the tower stand before blowing down? Did the tennis ball stay on the top?*