**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*(Project Title…delete this describer)*

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*(Your Name(s)…. delete this describer)*

**\_\_\_\_\_\_\_’s Class**

*(Name of Teacher…. delete this describer)*

**Midas Creek Elementary**

**\_\_\_\_\_\_\_\_**

*(Change font so it looks yours & not a template.)*

**Engineering Design Process Table of Contents:**

**Need………………………………………………………………………… page \_ \_ \_ \_**

**Research ………………………………………………………………….... page \_ \_ \_ \_**

**Design Requirements ………………………………………………………page \_ \_ \_ \_**

**Design and Methodology …………………………………………………. page \_ \_ \_ \_**

**Constructing and Testing ………………………………………………… page \_ \_ \_ \_**

**Reflection ………………………………………………………………….. page \_ \_ \_ \_**

**Engineering Design Process- Need:**

*(Judging Sheet states: A description of a practical need or problem to be solved is clearly defined. 3 points)*

* *What is the problem you would like to solve?*
* *Describe the intended goal of this innovation; what problem(s) will be minimized/solved?*
* *Begin objective with verbiage, “To design and manufacture...”*

*Example of Need: “To design and manufacture a passive (automatic) device preventing rodents from accessing the dryer exhaust through the outside vent while minimizing energy loss between the home and outdoors.”*

*After you’ve written your “NEED” below delete all of this italicized font so your requirements replace these instructions and are at the top.*

**Engineering Design Process- Research:**

*(Judging Sheet states: Well-written research notes in your own words, comprehensive, contributes to the field of study, and at least three cited references. 4 points)*

* *List three resources used to research topic* 
  + *Sources can be websites, articles read, or people you have talked to.*
  + *Type a paragraph explaining what you learned from each resource.* 
    - *Label each paragraph “Source One,” “Source Two,” etc.*
  + *Below each paragraph correctly cite all sources using the MLA format using citefast.com*
* *Research should answer: 1) what already exists, 2) ideas on how to improve your design (safety, aesthetics/way it looks, cost to make, efficiency, ease of manufacturing, maintenance) 3) problems that exist with current designs, 4) how to test your design so you get data to graph, etc.*

*Abbreviated Example of Source One Paragraph & Citation:*

*“During the cold winter months, after the dryer has finished its cycle, rodents can feel the warm air, and they can often access a home through the louvered exhaust vent’s flaps. Currently there are three basic designs of dryer exhaust vents…the Louvered Exhaust Vent allows rodents to access the home and is not energy efficient... The U.S. Consumer Product Safety commission (2009) estimates in 1998, clothes dryers were associated with 15,600 fires.”*

*“Dryer Safety.” (2009). Orange County Fire Authority. Retrieved on December 20, 2009 from http://www.ocfa.org/\_uploads/pdf/dryersafety.pdf*

*After you’ve written your “RESEARCH” below delete all of this italicized font so your requirements replace these instructions and are at the top.*

**Source One:**

**Source Two:**

**Source Three:**

**Engineering Design Process- Design Requirements:**

*(Judging Sheet states: Explanation of the criteria [what you want it to do] for the proposed solution and an explanation of the constraints [what the limitations are] 3 points)*

*Create the list of things from your experience and research which describes what your prototypes looks like & does in* ***words****. You are not making the prototype yet. Decide:*

* *What does your design* ***look like*** *in order to solve your problem?*
* *What will your design* ***not do*** *(constraints)?*
* *What* ***features*** *does your design have so it solve the problem when it’s done?*
* *Consider: safety, visual appeal, economic feasibility, efficiency, ease of manufacturing, maintenance, and the original problem.*

*• Bullet sentence for each requirement.*

* *Have three to six requirements.*

*Example of Design Requirements:*

* *Design cannot trap lint in the dryer so there are no house fires.*
* *Design must prevent rodents from entering from the outside.*
* *Design must allow moisture to escape from the dryer so clothes dry.*

*After you’ve written your “DESIGN REQUIREMENTS” below delete all of this italicized font so your requirements replace these instructions and are at the top.*

**The design requirements for the prototype are:**



**Engineering Design Process- Design Plan and Methodology:**

*(Judging Sheet states:*

*1)Exploration of alternate designs shown to answer the need; shows beginning and final designs, drawn and labeled to meet the criteria and the constraints.*

*2) Identification of a solution with a final, labeled design for the development of a prototype*

*3) Material list and step-by-step instructions clearly written.*

*Total: 3 points)*

Brainstorm and draw:

* Three to four different designs of possible prototypes **with labeled parts**.
* Designs should meet your design requirements/ criteria from last section.
  + For each design, use a table to compare your criteria with how your design would perform.
* Number these designs to refer to your designs easily.

**Exploration of Alternate Designs to Answer Need:**

**Design #1**

*(This is where you present your first ideas for a design which you could prototype in the next sections. Add more spaces to provide you with room to draw and label your design. Replace chart below with your design requirements* ***and*** *put an X in the box below the requirement IF you think your design fits your criteria. Delete these italicized instruction.)*

**Checking Design #1 Against Established Design Requirements/ Criteria:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Replace with your #1 design requirement* | *Replace with your #2 design requirement* | *Replace with your #3 design requirement* | *Replace with your #4 design requirement (if you have a 4th)* | *Replace with your #5 design requirement(if you have a 5th)* | *Replace with your #6 design requirement (if you have a 6th)* |
| *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* |

**Exploration of Alternate Designs to Answer Need:**

**Design #2**

**Checking Design #2 Against Established Design Requirements/ Criteria:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Replace with your #1 design requirement* | *Replace with your #2 design requirement* | *Replace with your #3 design requirement* | *Replace with your #4 design requirement (if you have a 4th)* | *Replace with your #5 design requirement(if you have a 5th)* | *Replace with your #6 design requirement (if you have a 6th)* |
| *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* |

**Exploration of Alternate Designs to Answer Need:**

**Design #3**

**Checking Design #3 Against Established Design Requirements/ Criteria:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Replace with your #1 design requirement* | *Replace with your #2 design requirement* | *Replace with your #3 design requirement* | *Replace with your #4 design requirement (if you have a 4th)* | *Replace with your #5 design requirement(if you have a 5th)* | *Replace with your #6 design requirement (if you have a 6th)* |
| *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* |

**Exploration of Alternate Designs to Answer Need:**

**Design #4**

**Checking Design #4 Against Established Design Requirements/ Criteria:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Replace with your #1 design requirement* | *Replace with your #2 design requirement* | *Replace with your #3 design requirement* | *Replace with your #4 design requirement (if you have a 4th)* | *Replace with your #5 design requirement(if you have a 5th)* | *Replace with your #6 design requirement (if you have a 6th)* |
| *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* |

**Final Design to the Development of Prototype #1:**

*(This is where you present your final design which you will prototype in the next sections. Add more spaces to provide you with room to draw and label your design. Replace chart below with your design requirements* ***and*** *put an X in the box below the requirement IF you think your design fits your criteria. Delete these italicized instructions.)*

**Checking Final Design (Final #1) Against Established Design Requirements/ Criteria:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Replace with your #1 design requirement* | *Replace with your #2 design requirement* | *Replace with your #3 design requirement* | *Replace with your #4 design requirement (if you have a 4th)* | *Replace with your #5 design requirement(if you have a 5th)* | *Replace with your #6 design requirement (if you have a 6th)* |
| *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* |

**Material List:**

*(Make a list of all the materials and equipment you use for building your prototype and for testing prototype. Any materials that are measured should have the measurements listed. Don’t forget details. Delete these italicized instructions.)*

**Step-by-Step Procedure:**

*(Write a step-by-step plan that you will follow to build your prototype. Write it in the order you want to follow. Be very descriptive in your writing. Delete these italicized instructions.)*

1.

2.

3.

4.

5.

6.

7.

8.

9.

**Constructing & Testing the Prototype:**

*(Judging Sheet states:*

*1) After constructing, the first testing of the prototype shows sufficient data gathering with written analysis.*

*2) Follow up redesigning by testing in multiple conditions and/or trials demonstrates engineering skills and completeness.*

*3) The criteria and constraints of the prototype meet the needs of the desired requirements.*

*Total: 3 points)*

*(Write about the experience of building your prototype. What worked? What problems did you run into? Don’t forget details. Delete these italicized instructions.)*

**Test and Data Recording:**

*(After you have built the prototype, it is time to test and collect reliable data to show how well it works. Write a step-by-step plan that you will follow each time you test which provides numbers which can be graphed and analyzed. You might have to write a graduated scaled description and give it a number value, 0-5, so your testers can provide uniform feedback. Numbers are ideally recorded in metric units [i.e., meters, grams, liters]. Delete these italicized instructions.)*

**Testing Procedure to Ensure Uniform Results:**

1.

2.

3.

4.

5.

**Testing Variables:**

* **Control Variables:**

*(Identify all the controls for testing. The controls (i.e., temperature of the testing environment, time of day tested, etc.) are the components that do not change throughout experimentation.*

*Example of Controls for Testing: “Considered dark basement with a drop-down fixture for test light but noted the temperature was eight degrees cooler than main floor. The research indicated compact fluorescents would not work as well in cool environment.”*

*Delete these italicized instructions.)*

* **Independent Variables:**

*(Identify the variable for testing. There must be one variable control (i.e., temperature, distance something is moved, light intensity, etc.) which changes and can be measured and collected during the testing of the prototype. The variable measurement will allow the results from each designed prototype to be compared to your established Design Requirements/ Criteria to determine if prototype meets Engineering Objective. Delete these italicized instructions.)*

* **Dependent Variables:**

**Prototype #1 Graphed Results:**

*(Insert graph here. Test each prototype at least three times using testing procedure and accurately recording data. Graph data. Give your graph a title. A number scale on a graph goes up by the same amount (i.e., 0.5 cm starting with zero unless you use a broken scale mark and jump right to the numbers needed, but then it goes up the same amount at that point. Label the x-axis and y-axis [i.e., prototypes, testers, time in seconds, weight in gram]. Delete these italicized instructions.)*

**Prototype #1 Written Analysis:**

*(Did the results of your test match your design requirements? Does it meet your design requirements/ criteria [fill in the table below with X’s using actual data]? Do you need to make changes? If so, what changes do you need to make for your second prototype?* ***(If changes need to be made, make sure you keep detailed notes about any changes, sketch and label the next design, build and retest your next prototype, and record what happens when you re-test. This is very important.*** *Delete these italicized instructions.)*

**Checking Prototype #1 Against Established Design Requirements/ Criteria:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Replace with your #1 design requirement* | *Replace with your #2 design requirement* | *Replace with your #3 design requirement* | *Replace with your #4 design requirement (if you have a 4th)* | *Replace with your #5 design requirement(if you have a 5th)* | *Replace with your #6 design requirement (if you have a 6th)* |
| *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* |

**Prototype #2 Sketch:**

*(Label this sketch. Add an additional materials used or step-by-step procedures to your previous areas under the heading of Prototype #2. Delete these italicized instructions.)*

**Prototype #2 Graphed Results:**

*(Insert graph here. Retest new prototype at least three times using testing procedure and accurately recording data. Graph data. Give your graph a title. A number scale on a graph goes up by the same amount (i.e., 0.5 cm starting with zero unless you use a broken scale mark and jump right to the numbers needed, but then it goes up the same amount at that point. Label the x-axis and y-axis [i.e., prototypes, testers, time in seconds, weight in gram]. Delete these italicized instructions.)*

**Prototype #2 Written Analysis:**

*(Did the results of your test match your design requirements? Does it meet your design requirements/ criteria [fill in the table below with X’s using actual data]? Do you need to make changes? If so, what changes do you need to make for your third prototype?* ***(If changes need to be made, make sure you keep detailed notes about any changes, sketch and label the next design, build and retest your next prototype, and record what happens when you re-test. This is very important.*** *Delete these italicized instructions.)*

**Checking Prototype #2 Against Established Design Requirements/ Criteria:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Replace with your #1 design requirement* | *Replace with your #2 design requirement* | *Replace with your #3 design requirement* | *Replace with your #4 design requirement (if you have a 4th)* | *Replace with your #5 design requirement(if you have a 5th)* | *Replace with your #6 design requirement (if you have a 6th)* |
| *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* |

**Prototype #3 Sketch:**

*(Delete this additional area if you don’t need a third prototype or copy this section and change the prototype numbers if you need a fourth prototype.*

*Label this sketch. Add an additional materials used or step-by-step procedures to your previous areas under the heading of Prototype #2. Delete these italicized instructions.)*

**Prototype #3 Graphed Results:**

*(Insert graph here. Retest new prototype at least three times using testing procedure and accurately recording data. Graph data. Give your graph a title. A number scale on a graph goes up by the same amount (i.e., 0.5 cm starting with zero unless you use a broken scale mark and jump right to the numbers needed, but then it goes up the same amount at that point. Label the x-axis and y-axis [i.e., prototypes, testers, time in seconds, weight in gram]. Delete these italicized instructions.)*

**Prototype #3 Written Analysis:**

*(Did the results of your test match your design requirements? Does it meet your design requirements/ criteria [fill in the table below with X’s using actual data]? Do you need to make changes? If so, what changes do you need to make?* ***(If changes need to be made, make sure you keep detailed notes about any changes, sketch and label the next design, build and retest your next prototype, and record what happens when you re-test. This is very important.*** *Delete these italicized instructions.)*

**Checking Prototype #3 Against Established Design Requirements/ Criteria:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Replace with your #1 design requirement* | *Replace with your #2 design requirement* | *Replace with your #3 design requirement* | *Replace with your #4 design requirement (if you have a 4th)* | *Replace with your #5 design requirement(if you have a 5th)* | *Replace with your #6 design requirement (if you have a 6th)* |
| *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* | *Mark an X here if you think your design will meet your requirement* |

**Reflection:**

*(Judging Sheet states:*

*1) Student writing describes a detailed amount of the process in creating the prototype and shows strong evidence of learning.*

*2) Shows strong conclusions and applications to real world ties.*

*Total: 3 points; Delete these italicized instructions.)*

In conclusion, I was/or was not able to design and prototype a \_\_\_\_\_\_, which met the established design requirements.

*(Address the following in your reflection:*

* *Did your project meet your purpose?*
* *Why or why not?*
* *Where there any possible errors, human or equipment during testing?*
* *What could you do to improve your prototype?*
* *What did you learn from building the prototype?*
* *How does this prototype help people to understand the world better/ or makes the world a better place?*

*At the end of your reflection close with:* ***“My engineering project is important in the real world because \_\_\_\_\_\_\_\_\_\_.”*** *Delete these italicized instructions.)*

***(Credits for this Engineering Journal Template are given to educator Tawyna Bator, high school engineering international winner Amber Barron, and educator Janae Barron.*** *Delete these italicized credits.)*