



<b>STAGE 5 iSTEM</b>	<b>Murrumbidgee Regional High School Industrial Arts / STEM / TAS Faculty</b>		<b>West Point Bridge Designer Engineering Report</b>	
	<b>Assessment Task No. 1 of 5 iSTEM</b>			
<b>ISSUE DATE:</b>  Term 1, Week 8  <small>Issue dates are approximate. Teacher can vary depending on cohort.</small>	<b>TEACHER/S:</b> <b>Mr. I. Preston</b>	<b>DUE DATE:</b>  Term 2, Week 2  <small>Issue dates are approximate. Teacher can vary depending on cohort.</small>		<b>WEIGHTING:</b>  <b>20%</b>
	<b>HEAD TEACHER:</b> <b>Mr. I. Preston</b>			

### Syllabus Outcomes for Assessment Task 1:

Outcome	Description
5.1.1	Develops ideas and explores solutions to STEM based problems.
5.1.2	Demonstrates initiative, entrepreneurship, resilience and cognitive flexibility through the completion of practical STEM based activities.
5.2.1	Describes how scientific and mechanical concepts relate to technological and engineering practice.
5.3.1	Applies a knowledge and understanding of STEM principles and processes.
5.4.1	Plans and manages projects using an iterative and collaborative design process.
5.4.2	Develops skills in using mathematical, scientific and graphical methods whilst working as a team.
5.5.1	Applies a range of communication techniques in the presentation of research and design solutions.
5.6.2	Will work individually or in teams to solve problems in STEM contexts.
5.8.1	Understands the importance of working collaboratively, cooperatively and respectfully in the completion of STEM activities.

### Criteria for Assessment Task 1:

**Task:** You are a civil engineer responsible for designing a bridge to carry a two-lane highway across a river valley. You are to submit a bridge design to the selection committee. The bridge design can be a Cable Stayed, Suspension, Beam, Truss or Arch Bridge. The deck elevation for the bridge is totally up to you as are all other design considerations. You must propose a design the selection committee should accept.

Explicit details are provided to you in a separate Design Specifications document (attached).

You have two main objectives;

1. To ensure the bridge is structurally sound (i.e: must pass load test)
2. To keep the cost of the project as low as possible

You will need to use West Point Bridge Designer 2014 software to design your bridge. The software will be supplied to you free of charge. This program includes a drawing board that automatically sets up your bridge to the correct span length, height and supports. The software also automatically calculates the loads and the resulting member forces. It allows you to run a 'load test' where it performs structural safety checks and determines whether or not your bridge is stable. The software also calculates the cost of your bridge automatically. You can manipulate the bridge configuration any way the software allows you too as long as you meet the overall design specifications. The full print out of design specifications will be given to you in a separate handout when you receive this task notification.

**Note: your design must be unique. You cannot use any of the sample bridge files for your submission.**

Once you have finalised your bridge design you need to present your design in the form of an engineering report. The engineering report will need to include the following sections:

1. Title Page
2. Abstract
3. Introduction
4. Analysis
5. Results Summary
6. Conclusion / Recommendation
7. Acknowledgements
8. Bibliography
9. Appendices

In addition to the engineering report you will also be required to email your bridge design file in .bdc format so they can be tested and verified by your teacher. Ensure you include your surname in the file name e.g.SMITH1.bdc.

The Engineering Report must be submitted electronically via email in either Microsoft Word or Adobe .pdf format to my email address at [ian.preston@det.nsw.edu.au](mailto:ian.preston@det.nsw.edu.au).

The engineering report and the bridge design files must be submitted no later than 9:00am on the due date. Note: emails are automatically time stamped when they are received.

You will be awarded marks according to the Marking Criteria that is included in this document. The Marking Criteria provides a detailed breakdown of how marks are to be awarded for this task. You are encouraged to regularly consult the criteria in consultation with your teacher to gauge your progress in this task.

## **Specific Instructions / Requirements:**

**Title Page:** the title page gives the title of the report, identifies the writer or writers, their company or organisation and the publication date.

**Abstract:** this is a concise summary of the content and purpose of the main report; its purpose is to provide enough information for readers to decide if the report is relevant for their needs.

**Introduction:** this section provides an overview the subject as well as the purpose and scope of the engineering report. It may also contain theoretical or historical background material based on research of technical literature and other appropriate areas. It also outlines the sections of the engineering report including why the investigation was undertaken, what research occurred, how data was collected and what analysis was conducted.

**Analysis:** this is the body of the engineering report and should show evidence of research and experimentation. Information about materials and the mechanics of products should be collected or calculated for all engineering reports. This section must contain information required to satisfy the aim and purpose of the report. Tables and graphs used to summarise detailed data in a concise form, are common features of an engineering report.

**Results Summary:** here the results are presented concisely and note any limitations on the investigation. The results inform and support the conclusions and recommendations.

**Conclusions / Recommendations:** this section summarises the major points or issues in earlier sections of the engineering report. This section requires the author to draw conclusions or make recommendations based on data collected. If the purpose of the engineering report was to 'select the best.....' then the selection should be stated and the reason for the choice explained.

**Acknowledgements:** the acknowledgement section provides the opportunity to credit other people's work that has contributed to the report.

**Bibliography:** the bibliography is your opportunity to demonstrate that the report is well researched. All references, such as books, journals, websites, and other references, need to be included. Bibliographic entries should follow established guidelines.

**Appendices:** the appendix is where all calculations and drawings are located for readers who wish to see technical details related to the study or report. The information in this section is not essential but enhances the other data.

## **ISTEM ENGINEERING REPORT MARKING GUIDELINES**

*Assessment Rubric written by:  
Mr. Ian Preston*



**MURRUMBIDGEE**  
Regional High School

- 5.1.1 Develops ideas and explores solutions to STEM problems.
- 5.1.2 Designs initiative, entrepreneurship, resilience and cognitive flexibility through the completion of practical STEM based activities.
- 5.2.1 Describes how scientific and mechanical concepts relate to technological and engineering practice.
- 5.3.1 Applies a knowledge and understanding of STEM principles and processes.
- 5.4.1 Plans and manages projects using an iterative and collaborative design process.
- 5.4.2 Develops skills in using mathematical, scientific and graphical methods whilst working in a team.
- 5.5.1 Applies a range of communication techniques in the presentation of research and design solutions.
- 5.6.2 Will work individually or in teams to solve problems in STEM contexts.
- 5.8.1 Understands the importance of working collaboratively, cooperatively and respectfully in the completion of STEM activities.

<b>Final Cost of Bridge</b>	<b>20</b>	<b>19-16</b>	<b>15-11</b>	<b>10- 6</b>	<b>5-1</b>	<b>0</b>
<p>(Cost of cheapest bridge to meet requirements x 20)</p> <hr style="width: 50%; margin: auto;"/> <p>Cost of submitted bridge</p> <p>(5.1.1, 5.1.2, 5.3.1, 5.4.1, 5.4.2, 5.6.2)</p>	The bridge that costs the least amount and meets the design specifications will be awarded the top mark of 20.	Marks in this range are determined by applying the formula shown. Bridges in this range have performed well in comparison to the cheapest bridge to meet the specifications.	Marks in this range are determined by applying the formula shown. Bridges in this range have performed satisfactorily in comparison to the cheapest bridge to meet the specifications.	Marks in this range are determined by applying the formula shown. Bridges in this range have performed well below the cheapest bridge to meet the specifications.	Marks in this range are determined by applying the formula shown. Bridges in this range have performed poorly in comparison to the cheapest bridge to meet the specifications.	Not submitted or bridge does not meet the design specifications.
<b>Teacher Observations</b>	<b>10</b>	<b>9-7</b>	<b>6-5</b>	<b>4-3</b>	<b>2-1</b>	<b>0</b>
<p>Understands the importance of working collaboratively, cooperatively and respectfully in the completion of STEM activities (5.8.1)</p>	Student always works collaboratively, cooperatively and respectfully in the classroom.	Student usually works collaboratively, cooperatively and respectfully in the classroom.	Student sometimes works collaboratively, cooperatively and respectfully in the classroom.	Student rarely works collaboratively, cooperatively and respectfully in the classroom.	Student very rarely works collaboratively, cooperatively and respectfully in the classroom.	Student not present in class to assess.

<b>Engineering Report</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
Title Page  (5.5.1, 5.6.2)				Title page gives title of the engineering report, identifies the author and gives the date when the report was completed.	Title page provides one or two of the required details ie: title, author, date completed.	Not submitted or not appropriate.
Abstract  (5.5.1, 5.6.2)			Concise statement of maximum three paragraphs, shorter if possible. Abstract clearly covers the scope of the report (what the report is about) and the approaches used to complete the analysis (how the information was assembled).	Abstract briefly covers the scope of the report (what the report is about) and the approaches used to complete the analysis (how the information was assembled).	Abstract briefly covers the scope of the report (what the report is about) OR The approaches used to complete the analysis (how the information was assembled).	Not submitted or not appropriate.
Introduction  (5.5.1, 5.6.2)			Introduction clearly provides an overview of the subject, purpose and scope of the report. May also contain background information regarding the topic.	Introduction provides brief overview of the subject, purpose and scope of the report. Briefly outlines at least two sections of the engineering report.	Introduction provides brief overview of the subject OR Introduction briefly outlines at least one section of the engineering report.	Not submitted or not appropriate.
	<b>7</b>	<b>6-5</b>	<b>4-3</b>	<b>2</b>	<b>1</b>	<b>0</b>
Analysis  (5.2.1, 5.3.1, 5.4.1, 5.4.2, 5.6.2)	Analysis will clearly show evidence of research and/or experimentation. The engineering report will provide extensive data on materials available, members that could be used and variables that can be modified. Tables and/or graphs will be used.	Analysis will show evidence of research and/or experimentation. The engineering report will provide data on types of materials that could be used and/or variables that can be modified. Tables and/or graphs may be used.	Analysis will show evidence of research and/or experimentation. Some appropriate data on variables that can be modified is included. Tables and/or graphs may be used.	Analysis will show basic evidence of research and/or experimentation.	Analysis will show very little evidence of appropriate research and/or experimentation.	Not submitted or not appropriate.
	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>
Results Summary  (5.2.1, 5.2.2, 5.3.1, 5.4.1, 5.4.2, 5.6.2)	Thorough summary of the results. Limitations of the investigation are noted. The results support and inform and support the conclusions and recommendations.	Concise presentation of results, preferably in table format.	Clear presentation of results, preferably in table format.	Basic presentation of results.	Poor presentation of results.	Not submitted or not appropriate.
Conclusion / Recommendations  (5.5.2)		Thorough summary of major points with an appropriate set of recommendations.	Concise summary of major points with an appropriate set of recommendations.	Satisfactory summary of major points with an appropriate set of recommendations.	Basic summary of major points and/or an appropriate recommendation.	Not submitted or not appropriate.

	5	4	3	2	1	0
Acknowledgements (5.6.2)				Author clearly indicates other people's work that has contributed to the report. Clear evidence that extensive contacts have been made.	Author indicates other people's work that has contributed to the report and/or some evidence that contacts have been made.	Not submitted or not appropriate.
Bibliography (5.5.1, 5.6.1)				Bibliographic entries follow established guidelines. Clear evidence that the report has been well researched.	Bibliographic entries mostly follow established guidelines. Evidence that the report has been researched.	Not submitted or not appropriate.
Appendices (5.5.1, 5.6.1)				Appendices contain at least two pieces of data that enhances the engineering report.	Appendices contain at least one piece of data that enhances the engineering report.	Not submitted or not appropriate.
<b>TEACHER COMMENT:</b>					<b>TOTAL MARK:</b>	
					<b>CLASS RANK:</b>	

