



National Research Council
Canada

Conseil national de recherches
Canada

Saguenay Site
Aluminium Technology
Centre

Site Saguenay
Centre des technologies
de l'aluminium

CNRC · NRC

Annex “A”
Statement of Work (Services)

Development of Non-Standard
Aluminium Trailer Designs for
Phosphate Transport

Reference No.: R799990

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1 OBJECTIVE

The National Research Council of Canada's (NRC) Aluminium Technology Centre (ATC), in Saguenay, is conducting a research project with the Arianne Phosphate Inc. mining company. The project consists in evaluating the potential and benefits of using aluminium in the design of non-standard trailers for phosphate transport. Part of the project involves developing trailer designs that will be assessed by various stakeholders, including the NRC. The development of these designs will be carried out by the NPO Alcoa Innovation, given their expertise in the design of aluminium structures in the field of transportation.

2 DELIVERABLES

2.1. Technical Data Collection (Alcoa Innovation)

- 2.1.1 Obtain a CAD file for the suspension frame to be used on the trailer carrying a 120-tonne load.
- 2.1.2 Obtain the steel grade(s) to be used in manufacturing the frame that will be used.
 - 2.1.2.1 *The objective of obtaining this information is to establish which bearing points the container will be built on, as well as the possible structural contribution of this suspension frame; data essential to the development of any structure.*

Estimated effort: 10 hours

- 2.1.3. If the CAD file is not available:
 - 2.1.3.1. Develop a simplified CAD file for the suspension frame.
 - 2.1.3.2. Determine the steel grade to be considered for manufacturing.
 - 2.1.3.3. Obtain the CAD file for the trailer made by Deloupe Inc., or another manufacturer, that could be used for transportation. *(The probability of obtaining such a file is virtually nil.)*

Estimated effort: 50 hours

2.2. Design Review

- 2.2.1. Design #1: Steel-aluminium substitution
 - 2.2.1.1. Determine the weight of the existing steel liner of a container needed to meet the 120-tonne requirement.
 - 2.2.1.2. Determine the aluminium alloys and thicknesses required in the aluminium wall.
 - 2.2.1.3. Determine the weight of the aluminium liner.
 - 2.2.1.4. Develop an assembly design for the steel structure and aluminium liner.
 - 2.2.1.5. Determine the cost of the aluminium.
 - 2.2.1.6. Obtain quotes for the manufacturing and assembly costs.
 - 2.2.1.7. Compare weights and costs.
 - 2.2.1.8. Present the data.

Estimated effort: 50 hours

2.2.2 Design #2: Container design with a curved section.

- 2.2.2.1. Develop the preliminary design of a curved container that has the volume required to hold 120 tonnes of phosphate.
- 2.2.2.2. Determine the aluminium alloys and thicknesses required in the aluminium walls (chords, reinforcements, container).
- 2.2.2.3. Develop a 3D CAD file of the trailer.
- 2.2.2.4. Forward the 3D CAD file to NRC-ATC for modelling and FEA simulations.
- 2.2.2.5. Identify the suppliers of materials: plates, sheets, extrusions.
- 2.2.2.6. Identify the manufacturers and obtain preliminary estimates for manufacturing.
- 2.2.2.7. Obtain an estimate for the final assembly (assembler not identified).
- 2.2.2.8. Compile the technical data for the container: Weight, preliminary cost of manufacturing.
- 2.2.2.9. Present the data.

Estimated time: 200 hours

2.2.3. Design #3: Container design with a straight line section (plates)

- 2.2.3.1. Develop the preliminary design of a container with a straight line section that has the volume required to hold 120 tonnes of phosphate. The straight line section will be designed to eliminate rolling.
- 2.2.3.2. Determine the aluminum alloys and thicknesses required in the aluminum walls (chords, reinforcements, container).
- 2.2.3.3. Develop a 3D CAD file of the trailer.
- 2.2.3.4. Forward the 3D CAD file to NRC-ATC for modelling and FEA simulations.
- 2.2.3.5. Identify the suppliers of materials: plates, sheets, extrusions.
- 2.2.3.6. Identify the manufacturers and obtain preliminary estimates for manufacturing.
- 2.2.3.7. Obtain an estimate of the final assembly (assembler not identified).
- 2.2.3.8. Compile the technical data of the container: Weight, preliminary cost of manufacturing.
- 2.2.3.9. Present the data.

Estimated effort: 200 hours

3 PROJECT TECHNICAL SPECIFICATIONS

- 70 trailers will be required to transport phosphate.
- 3,000,000 metric tonnes annually
- Distance to be travelled between mine and port: 240 km
- Roads will be Class 1 gravel logging roads.
- Trailers will be required to operate at all times and seasons of the year.

- The minimum payload for each trailer is 120 metric tonnes.

4 CONSTRAINTS

Contract between the NRC and its client stipulating the involvement of a specialized resource with specific expertise in aluminium and transportation.

5 DOCUMENTATION

Progress reports based on the deliverables referred to in sec. 2 as well as a final report.

6 OTHER REQUIREMENTS

N/A

7 DELIVERY

Progress reports based on the deliverables for progressive invoicing are to be sent to:

National Research Council Canada
Saguenay Site
Aluminium Technology Centre
501 University Boulevard East
Saguenay, Chicoutimi borough
G7H 8C3