

INVESTMECH (Pty) Ltd



Reg. No. 9507367/07 • VAT Reg. No. 4490105409
Postnet Code # 251, Private Bag #1315, Lynton, 6140 • www.investmech.com
Tel: +27 (0) 354 7804 • Fax: +27 (0) 354 4192

***Report on safety testing of a tractor
canopy for surface usage according to
Ingwe specification***

11116 AIM (Tractor canopy ROPS)

Prepared for

AIM Off Road Equipment

Investmech
Musa P. Eng. Ph.D. (Managing)
CI Registered Engineering Technologist



Document No: IM-TR395



Revision: 0.0

Date: 18 Augustus 2006

Document information

| | |
|-------------------|---|
| Project Name: | 11118 AIM (Tractor canopy ROPS) |
| Title: | Report on safety testing of a tractor canopy for surface usage according to Ingwe specification |
| Author: | Ciska Roos |
| Project Engineer: | Riaan Bergh |
| Document Number: | IM-TR395 |
| Filename: | IM-TR395 11118 AIM (Canopy ROPS) TR R0.0 |
| Creation Date: | 18 Augustus 2006 |
| Revision: | 0.0 |
| Revision Date: | 18 Augustus 2006 |

Approval

| Responsibility | Name | Designation | Signature | Date |
|----------------|------------------------------|-------------------|---|------------|
| Checked by: | Comd' Swanepoel | Director |  | 2006-08-19 |
| Approved by: | Dr. Michiel Heyns Pr.Eng. | Managing Director |  | 2006-08-19 |

Distribution list

| Name | Company / Division | Copies |
|-------------|------------------------|----------|
| Hans Fourie | AIM Off Road Equipment | 1 |
| DCC | Investmech (Pty) Ltd | Original |

Summary

This report describes the requirements, methods used and results of safety testing performed on a tractor canopy for surface usage according to Ingwe specification

Table of Contents

| | |
|---------------------------------------|---|
| 1. INTRODUCTION | 4 |
| 2. TESTING REQUIREMENTS | 4 |
| 2.1 Test Philosophy | 4 |
| 3. LABORATORY TESTING | 4 |
| 3.1 Test method | 4 |
| 3.2 Vertical loading | 4 |
| 3.3 Longitudinal loading | 5 |
| 3.4 Lateral loading | 5 |
| 4. TEST RESULTS | 5 |
| 4.1 Vertical loading (25kN) | 5 |
| 4.2 Longitudinal loading (25kN) | 5 |
| 4.3 Lateral loading (25kN) | 6 |
| 5. CONCLUSION | 6 |
| 6. REFERENCES | 6 |

1. INTRODUCTION

AIM Engineering approached Investmech to re-certify a canopy that was tested for KIM Engineering, now known as AIM Off Road Equipment, by Investmech, previously known as LCI Structural Mechanics and Dynamics. The project entailed safety tests on one tractor canopy design and configuration. The re-certification is possible because no changes were made to the design of the canopy subjected to the previous ROPS testing, for which the results are presented in the remainder of this report.

A test rig was constructed which was able to perform the tests. The canopy supports were rigidly mounted onto the test floor in the laboratory. The testing procedures comprise of a minimum vertical load of 25kN, a lateral load of 25kN and a longitudinal load of 25kN, all applied onto the canopy roof structure. During testing it is required to apply these loads independently and to demonstrate that the permanent deflection of the roof is never more than 10% of the maximum deflection measured under load. The canopy was subjected to each of the individual tests.

This report describes the testing requirements, methods used and results obtained during the test.

2. TESTING REQUIREMENTS

2.1. Test Philosophy

The test procedures were performed according to the requirements stipulated in an earlier report by LCI Structural Mechanics and Dynamics, dealing with the safety testing of continuous miner canopies. The requirements pertaining to each performed individual test method are briefly described in Sections 3.2 – 3.4.

3. LABORATORY TESTING

3.1. Test method

The canopy was rigidly mounted onto the test floor in the laboratory. Hereafter the canopy was loaded vertically, laterally and longitudinally as described in the following paragraphs.

3.2. Vertical loading

The load acted downwards onto a third of the length of the beam of the roof. A laser displacement transducer was used to measure the displacement of the structure. The displacement transducer was placed directly in line with the load. A hydraulic actuator was used to perform the tests.

A settling load of 15kN was applied and removed. A 25kN load was subsequently applied and the maximum displacement recorded. The load was removed and the permanent residual displacement was recorded (the residual displacement must not exceed 10% of the maximum displacement).

3.3. Longitudinal loading

The longitudinal force was applied in line with the vertical loading point. The load acted inwards onto a third of the length of the edge of the roof. A laser displacement transducer was used to measure the displacement of the roof.

A settling load of 13.4kN was applied and removed. A 25kN load was subsequently applied and the maximum displacement was recorded. The load was removed and the permanent residual displacement was recorded (the residual displacement must not exceed 10% of the maximum displacement).

3.4. Lateral loading

The lateral force was applied in line with the vertical loading point. The load acted inwards onto a third of the length of the outer edge of the roof. A laser displacement meter was used to measure the displacement of the roof.

A settling load of 13.4kN was applied and removed. A 25kN load was subsequently applied and the maximum displacement was recorded. The load was removed and the permanent residual displacement was recorded (the residual displacement must not exceed 10% of the maximum displacement).

4. TEST RESULTS

The residual displacement as a percentage of the maximum displacement is defined as the test result. The test results for each type of loading for the canopy are listed in the sections below.

4.1. Vertical loading (25kN)

Table 1. Vertical loading test results.

| Canopy identification number | Permanent residual displacement |
|---------------------------------|---------------------------------|
| FORD 5640, SL, 5610, 5610, 7610 | 1.3% |

4.2. Longitudinal loading (25kN)

Table 2. Longitudinal loading test results.

| Canopy identification number | Permanent residual displacement |
|---------------------------------|---------------------------------|
| FORD 5640, SL, 5610, 6510, 7610 | 3.5% |

4.3. Lateral loading (25kN)

Table 3. Lateral loading test results.

| Canopy identification number | Permanent residual displacement |
|---------------------------------|---------------------------------|
| FORD 5540, SL 5610, 65e10, 7610 | 1.93% |

5. CONCLUSION

The canopy listed in Tables 1-3 was successfully tested and comply to the worst case requirements set by a combination of international standards with an additional safety factor of two.

6. REFERENCES





AGCO DO BRASIL COM. E IND. LTDA
BRAZIL

ROLL - OVER PROTECTIVE

RANGE **5000** SERIAL Nº **300**

THIS ROPS MODEL HAS BEEN TESTED IN ACCORDANCE WITH NBR 10.001 STANDARDS AND COMPLIES WITH NBR 10.000 STANDARDS, WHEN INSTALLED, ACCORDING TO AGCO DO BRASIL COM. E IND. LTDA ASSEMBLY INSTRUCTIONS FOR USE ON TRACTORS WITH MASS NOT TO EXCEED **5000 Kg**

PROTECTION AFFORDED BY THIS ROPS WILL BE IMPAIRED IF IT HAS BEEN SUBJECTED TO ALTERATION, STRUCTURAL DAMAGE OR OVERTURN ACCIDENT. IN THESE CASES, THE ENTIRE STRUCTURE MUST BE REPLACED. REMOUNTING MUST COMPLY WITH AGCO DO BRASIL COM. E IND. LTDA REQUIREMENTS.

053 340-P1