

# Test Report

REPORT NO: 885160



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Page 1 of 9  
INT.: EAVA  
No. of appendices: -

**Requestor:** Contact: Danny Klein  
Company: Acusafe  
Address: 8/46 Smith Street, Southport  
City: AUS-4215 Queensland

**Specimen:** KAG pipe with Acusafe replacement kit

**Sampling:** Sampling has been done by the customer and received at the Danish Technological Institute 2019.11.28

**DTI mark:** 885160

**Tested:** 2019.12.03

**Test procedure:** DS/EN ISO 14122-3:2016 (section 8.2.2) with DNVGL specification.

**Result:** Result:  
See page 6 for complete result overview


**Storage:** Test items will be kept for 6 months from the date stated on the report.

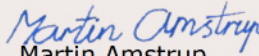
**Comments:** Present during testing was Torben H. Pedersen (ACURAIL) and Troels Amdi (DNV-GL)

**Terms:** The test has been performed according to the general terms and conditions of The Danish Technological Institute. The results from DTI's work in this report, i.e. analyses, assessments and instructions may only be used or reported in their entirety. The customer may not mention or refer to DTI or DTI's employees for advertising or marketing purposes unless the DTI has granted its written consent in each case.

**Location:** Date 13-12-2019, Danish Technological Institute, Aarhus, Materials

**Signature:**

  
Egill Arnar Valsson  
M.Sc.

  
Martin Amstrup  
B.Sc. Mech., IWE

## TEST METHOD

**Test specimen:** Two set of replacement safety rail, one KAG Safety Rail and one steel pipe  $\varnothing 48,2 \times 3,2$  mm with ACUSAFE replacement kit.

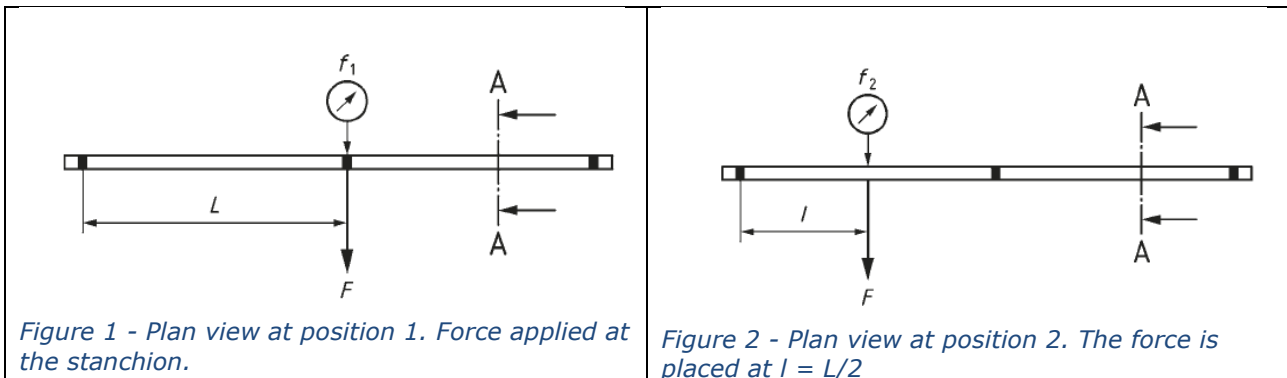
**Test equipment:** Hydraulic cylinder, HBM 5t/U1 load cell (MATP 08-02), ASM position sensor 1000mm (MATP 09-16) and a laptop computer connected with HBM Quantum X Data Acquisition System, sample rate 50Hz.

### Test procedure:

Testing of handrail. Two tests acc. to EN ISO 14122-3 section 8.2.2 and DNVGL specification:  
One test with  $\varnothing 48,2 \times 3,2$  mm steel pipe together with ACUSAFE replacement kit.  
One test with  $\varnothing 48,2 \times 3,2$  mm KAG pipe together with ACUSAFE replacement kit.

DNVGL specification:

The principles as stated in ISO 14122-3, Section 8.2 can be used and followed. As acceptance criteria there should be no permanent deformation above 0.3% of the distance L. However, handrail is to be tested with 75kg/m not 300 N/m as indicated in ISO 14122-3.



The distance between the stanchions (center to center) where the replacement kit is mounted is 1575mm (see figure 9). Therefore the test force will be  $75\text{kg/m} \times 1,575\text{m} = 118,1\text{kg}$  or  $\Rightarrow 1160\text{N}$ . The load is held for a minimum one minute each time.

At position 2 the replacement kit with pipe is pulled with hand force in the direction of force to take out free movement (see figure 8). The insert is slightly smaller than the inside of pipe in the handrail.



Figure 3 – guard-rail fastening at position 1



Figure 4 - Guard rail fastening at position 2



*Figure 5 - Guard rail fastening, with an RHS 100x50x4,5mm laid on top of the foot plates.*





Figure 6 – Example of test setup at position 2



Figure 7 - Test setup, position sensor



Figure 8 - Connection of the replacement kit

## RESULTS

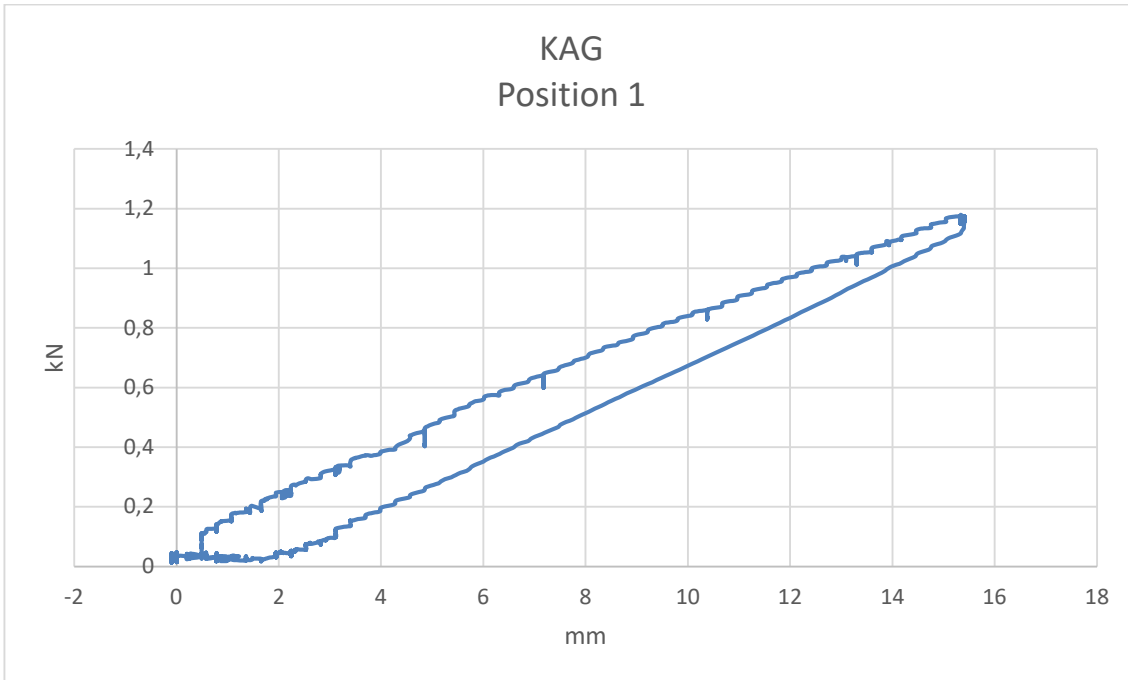
Table 1 - Results from the tests

Type	Position	Test force [kN]	F <sub>max</sub> [kN]	Deflection at max force [mm]	Deflection after load is removed [mm]
KAG	1	1,16	1,17	15,33	0,78
Steel Pipe	1	1,16	1,18	14,54	0,29
Steel Pipe	2	1,16	1,17	16,60	0,58
KAG	2	1,16	1,22	19,51	1,17

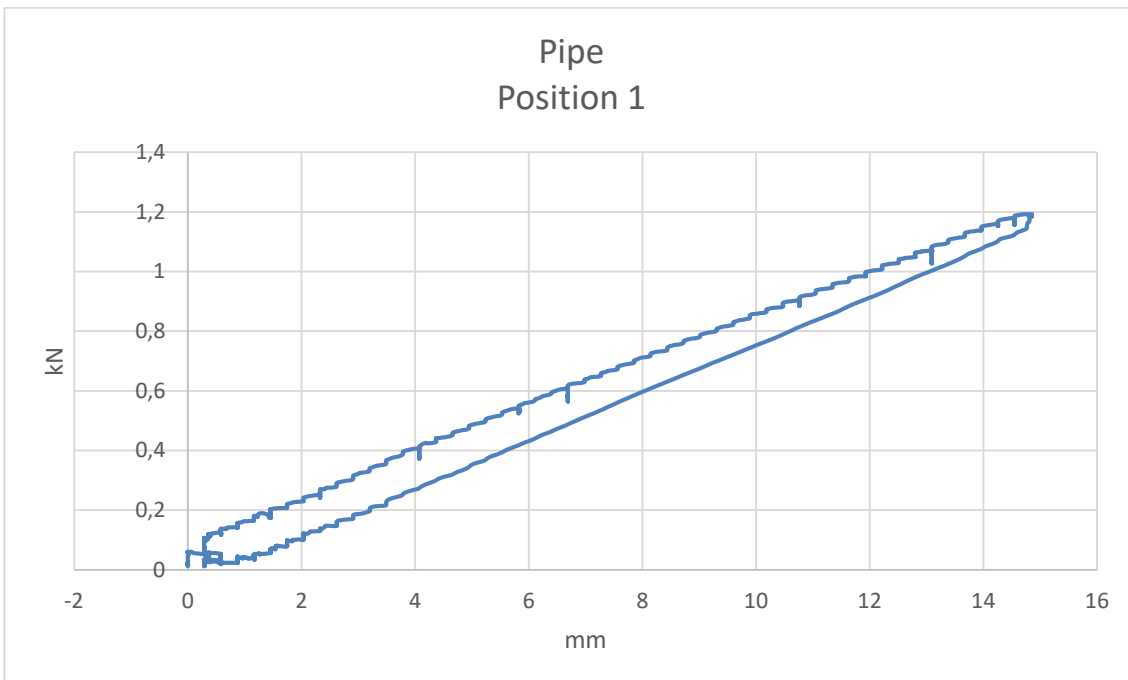
## CONCLUSION

The tested guard rail is in compliance with the requirements in DS/EN ISO 14122-3:2016 and DNVGL specification. As can be seen in table 1 the deflection at max force is less than 30mm and deflection after the load is removed is also less than 0,3% of the height H (height of the guard rail 1005mm) which is 3mm.

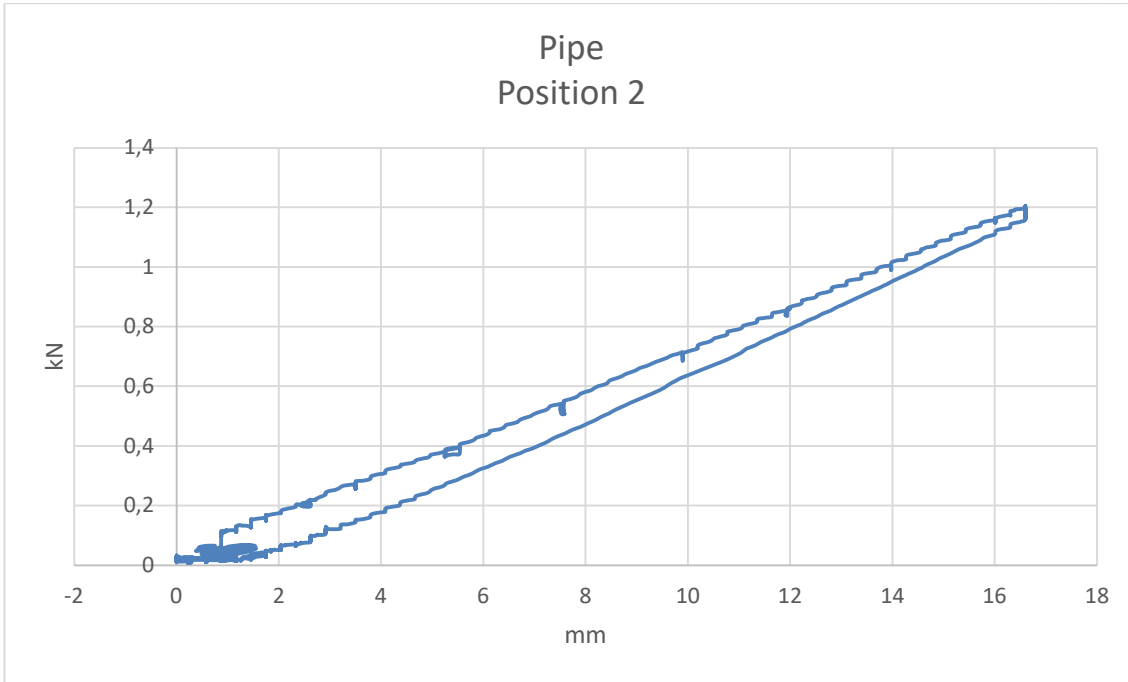
## GRAPHS



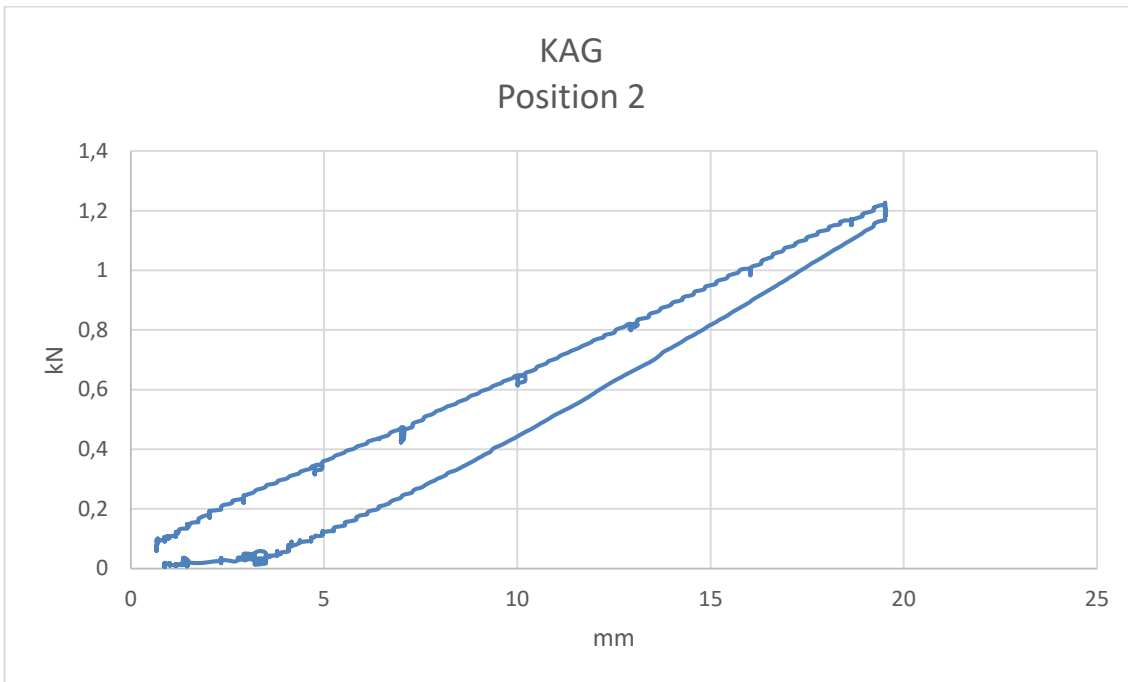
Graph 1 – KAG pipe at position 1



Graph 2 – Steel pipe at position 1



Graph 3 – Steel pipe at position 2



Graph 4 – KAG pipe at position 2



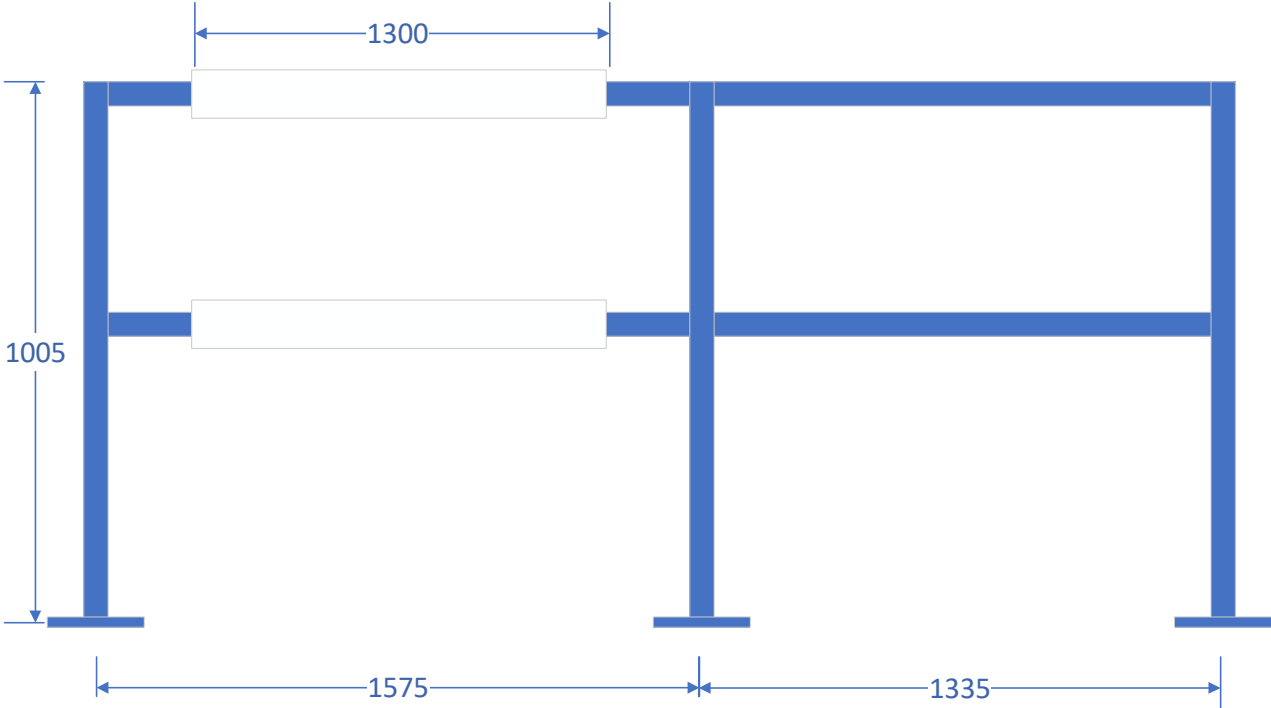


Figure 9 – Sketch with dimension of the handrail. 1300mm opening in the rail for the replacement kit