1. Background

Observations of lifebuoys installed on Norwegian and Swedish vessels have demonstrated water ingress to such extent that certain specimens were found sinking.

In a safety notice issued 13 November 2009, the NMD informed that lifebuoys from the manufacturers Veleria San Giorgio and EVAL were prone to water ingress that could potentially lead to a loss of buoyancy. On this background the NMD contacted the test laboratory Thelma with the purpose to carry out tests and produce a report documenting both the test schemes and the results.

The purpose of the tests was to establish factors that may influence water ingress and absorption, such as:

- Access and absorption of water in the buoy.
- Sealing of the outer shell.
- Sealing properties as a result of external conditions.
- Sealing properties over time

The tests were carried out on two lifebuoys from EVAL. The lifebuoys subjected to the tests had been placed on board a Norwegian vessel for about one year prior to being examined.

2. Floatation test

2.1. Procedure

The floatation test was carried out on one of the two buoys according to specifications contained in the LSA Code 2.1.1.3/ MSC 81(70) 1.6[1]

The lifebuoy was weighted down with 14.5 kilograms, and then put into freshwater for twenty-four (24) hours. The weight of the buoys was registered before and after the floatation test.

Figure 1. (Refer to the Norwegian text version). The buoy is being tested according to standard floatation tests.

2.2. Results:

2.2.1. Weight:

Dry buoy: 2,950 grams.

Buoy after 24 hours exposure in water: 3,300 grams.

Difference: 350 grams.

The test results established an increase in the weight of 10.6% (350 grams). The results conform to the requirements of the testing standard, which only requires that the lifebuoy shall remain floating after 24 hours exposure in water.

[1] Requirement: The life-saving appliance shall remain floating after 24 hours exposure in water.

2.3. Adjusted floatation test.

2.3.1. Adaption of the test-configuration

As the observed weight increase was relatively modest, it was decided, after consulting with the NMD, to subject the buoy to a full immersion test.

2.3.2. Procedure

Weights were attached to the buoy so that the entire lifebuoy was covered with water. The foam-injection hole was in an upright position five (5) centimetres below the water surface.

After twenty-four (24) hours exposure the lifebuoy was recovered. The buoy was weighted before and after the immersion test.

The buoy was split open in two parts, and then one half was cut open longitudinally (refer to figure 2. – contained in the Norwegian text version)

The internal foam filling material and the extent of the filling was investigated.

2.3.3. Results

2.3.3.1. Weight

Dry buoy: 2,950 grams

Buoy after twenty-four (24) hours exposure fully immersed: 3,550 g

Difference: 600 g

The test results conclude that there is an increase in the weight of 16.9% (600 grams). The semi-buoy still had satisfactory flotation capability on the conclusion of the immersion test.

2.3.3.2. Observations internal foam filling material

Refer to figure 2 (in the Norwegian test version) which depicts cross and longitudinal sections of the buoy.

The extent of the foam filling is satisfactory. Some minor air pockets are found along the shell walls as well as partially in the filling material itself.

2.4. Flotation test of the foam material

2.4.1. Procedure

Weights were attached to one quarter of the lifebuoy, and then this section was exposed to water with the upper part of the material submerged ten (10) centimetres below the water surface.

The material was recovered after twenty-four (24) hours. The weight of the foam filling material was measured before and after the test.

Figure 3. (refer to the text of the Norwegian version) Foam filling of the buoy.

2.4.2. Results

2.4.2.1. Weight (g)

Dry foam-filling material (1/4 of the buoy): 200 grams.

Foam-filling material after 24 hours exposure: 246 grams

Difference: 46 grams

The test results conclude that there is an increase in the weight of 18.7% (46 grams). The foam-filling has satisfactory flotation capability on the conclusion of the floatation test.

3. Temperature cycling tests

3.1. Procedure

The temperature cycling tests were carried out according to MSC 81(70) 1.2.1 using a semi-buoy (half-buoy).

Refer to the text of the Norwegian version and its appendix that contains temperatures logged during the cycling test.

3.1.1. Requirements

MSC 81(70) 1.2.2 "The lifebuoys should show no sign of loss of rigidity under high temperatures, and after the tests, should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities."

3.1.2. Results

The test demonstrates that being exposed to repeated temperature variations ranging between +65 and – 30 degrees Centigrade, the foam filling material is capable to maintain the volume with minimal shrinkage. It cannot be proved that the buoy demonstrates any weaknesses in relation to the specifications of the testing standard.

Figure 4 (refer to the text of the Norwegian test report) shows the foam filling material before and after the temperature-cycling test).

4. Conclusion

Floatation test according to requirements contained in the LSA Code 2.1.1.3/ MSC 81(70) 1.6 demonstrates that the EVAL lifebuoy conform to the requirements applicable to lifebuoys.

Floatation tests involving submerging the buoy in water were carried out in order to clarify the possibility as well as the consequences of water ingress in the buoy.

The test results demonstrate that although the reflective tape that seals the injection hole is damaged, thus exposing the hole, only limited quantities of water will be absorbed in the buoy.

Tests carried out on the foam filling material submerged in water demonstrate that the foam filling material applied in subject buoy(s), will absorb a very limited amount of water during a twenty-four (24) hours period.

The test results demonstrate that the lifebuoy being tested conforms to the requirements of the standard, even with the absence of the reflective tape covering the injection hole.

The extent of the foam filling in the buoy(s) is satisfactory and only very minor voids give room for additional water potentially being trapped inside the buoy.

The quality of the foam applied in the buoy(s) absorbs limited quantities of water, which means that the foam material maintains its floatation capabilities.

The temperature-cycling tests give no indication that the foam material deteriorates or alter properties as a consequence of the temperature exposure.

Based on the results from the tests carried out on the buoy, an exposed opening in the outer shell will not alter the properties of the foam material to the extent that this increases the absorption of water in the foam material itself or the buoy as a complete product.

Comparing the information received from the Swedish Maritime Authority, as well as feedback from the industry, with the test results contained in this report, concludes that the buoys stand the tests.

Reasons for the observed variations may be based on one or more of the following conditions:

- Models subjected to tests are not identical;
- Buoys subjected to tests originate from different production series;
- Based on experiences testing other types of products, demonstrate that different production series may give raise to large variation in observed quality, the reason being failures in the production processes as well as sub-standard quality of the materials used in the production process;
- The quality control in the production process is sub-standard, resulting in that some buoys from the same production series do not conform to requirements;
- Previously tested buoys have been exposed to greater external forces or a prolonged period of use;
- Non-conforming buoys may have been subjected to vandalism.