NOHH
Newcastle Occupational Health and Hygiene Ltd

COMPANY:	ZANDLEVEN COATINGS B.V.
PAINT NAME:	ACRATON HS-U
REPORT TYPE:	Grain Contamination Test
REPORT NO:	3564/26

PREPARED BY:	Andrew Hall
POSITION:	Senior Qualified Occupational Hygienist
DATE:	9 March 2026

CONTENTS

SECTION ***PAGE***

1. INTRODUCTION

Following a request by Mr. Johan Dijkstra of ZANDLEVEN COATINGS B.V., Newcastle Occupational Health & Hygiene Ltd has carried out an investigation on ACRATON HS-U in order to assess, from a toxicity standpoint, its suitability for use as an interior coating for the holds of ships employed in the transport of grain.

The report describes the investigation, presents the results and comments on the possibility of grain cargo contamination.

2. THE TEST MATERIAL

The paint system under test was applied on 17 December 2025 and consisted of one coat of ACRATON HS-U to a total mean dry film thickness of 150µm (NOHH Ltd measured 178µm).

The most likely sources of cargo contamination are:

- Vaporisation of binder constituents from the dried coating.
- Vaporisation of trapped solvents from the dried coating.

3. INVESTIGATION

The investigation was carried out during January and February 2026.

3.1 Method

The paint was tested in the laboratory under simulated field conditions. A sheet of shot blasted mild steel plate measuring 12" x 12" x $^{1}/_{16}$" was pre-coated with the paint system by ZANDLEVEN COATINGS B.V. A wooden box, with removable sides, each measuring 12" x 12" was constructed so that when the steel plate was fixed in position, coated side facing in, a completely closed container of one cubic foot capacity was formed.

The box was filled with wheat grain free from fungicides or preservatives of any kind. Tubular wire mesh sampling 'thieves' were set into the grain, parallel to the plane of the steel plate, so that grain samples at different fixed distances (1" to 10") from the coated surface could be withdrawn at a later stage. The joints of the filled container were carefully sealed and the box and its contents were kept at a temperature of 20ºC for twenty one days. A control sample of grain of similar bulk was treated in the same manner except that it was not exposed to the paint coating. At the end of the test period, the box was opened and the sampling 'thief' nearest the coated surface was withdrawn. This grain sample was then examined for toxic constituents of the types listed below.

3.2 Solvents

A minute volume of (1µml) of an acetone extract of control grain and exposed grain were placed on a suitable column and analysed by means of a gas chromatograph using a flame ionization detector.

3.3 Binder Constituents

3.3.1 Because of the complex chemical nature of the binders used in the system, a simple but sensitive taste test was carried out on the exposed grain. A panel of ten volunteers were asked to taste the following samples:-

3.3.2 A reference sample of control grain. The subject was informed that this grain was uncontaminated.

3.3.3 A sample of control grain presented ‘blind’.

3.3.4 A sample of exposed grain presented ‘blind’.

Samples two and three were presented to each subject in random order, and a simple ‘yes’ or ‘no’ elicited to the question, “Does this sample taste different from the reference sample?” Between each tasting the subject’s mouth was rinsed with distilled water. After an interval of two hours, the whole series was repeated.

3.4 Results

3.4.1 Solvents

A comparison of the chromatograms of the acetone extracts of control grain and exposed grain showed that no solvent traces were present in the exposed grain lying close to the coated surface.

3.4.2 Taste Test

Of the ten subjects taking part in the test, none were able to detect a difference in taste between the ‘blind’ sample of control grain and the sample of exposed grain. This is evidence that very little of the strongly tasting binder components were present in the exposed grain lying close to the surface coated with the paint system.

4. DISCUSSION OF RESULTS

The results show that toxic components of the system do not contaminate stored grain under laboratory test conditions and are therefore most unlikely to do so during the carriage of grain in ships' holds. Even supposing that under field conditions, traces of the system's components are transferred to the thin layer of grain in direct physical contact with the coating, the dilution factor involved when cargo is transferred is so great as to place cargo contamination far beyond the limits of detection and completely insignificant as compared with, say contamination due to the waste products of vermin infestation or deliberately added fungicide or pesticides.

It should be noted that transporting bulk materials with the potential to cause abrasion of the coating could result in particulate contamination to subsequent cargos. So long as this can be prevented, or the system is compliant to recognised abrasion test standards, there should not be a problem.

5. SUMMARY & RECOMMENDATIONS

The coating system ACRATON HS-U has been tested in order to determine whether toxic constituents are likely to contaminate a cargo when this system is used as an interior surface coating for the storage holds of grain transporters.

The results of the tests indicate that when the system is applied as recommended, there is little likelihood of dry cargo contamination.

Signed: .....

Andrew Hall
Senior Qualified Occupational Hygienist

Date: **9 March 2026**