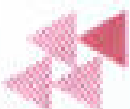




DIVISION OF  
BUILDING  
TECHNOLOGY

**CSIR**



Building  
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# EVALUATION OF THE TOXICITY OF THE COMBUSTION GASES PRODUCED BY “INTUSAYF” INTUMESCENT PAINT





**Building Products & Services Programme**

**EVALUATION OF THE TOXICITY OF THE  
COMBUSTION GASES PRODUCED BY “INTUSAYF”  
INTUMESCENT PAINT**

Contract No:

BF 203/020(a) 5600 5664

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## EVALUATION OF THE TOXICITY OF THE COMBUSTION GASES PRODUCED BY “INTUSAYF” INTUMESCENT PAINT

Please note that the following report is subject to the attached *General Contract Conditions*.

### 1. SAMPLE DESCRIPTION

The intumescent material tested was identified as “Intusayf”, a white water-based intumescent material. The sample submitted for evaluation was in its dried state with some of the red base coat paint and light green topcoat also forming part of the specimen.

### 2. TEST METHODS AND RESULTS

The material was tested in accordance with the Naval Engineering Standard (NES) 713 test protocol. One gram of the submitted specimen was burned in a chamber with a volume of 1 m<sup>3</sup>. The concentrations of certain specified gases were determined by means of colorimetric (Dräger) tubes. These concentrations were then used to calculate the quantities of gases given off by burning 100 g of material in a cubic metre of air. The toxicity index is calculated from the summation of the ratios of these concentrations to the concentrations causing fatality to man after a 30 minute exposure time. Gases to be determined and their fatality limits are:

Gas	Conc. (ppm)	Gas	Conc. (ppm)
Carbon Dioxide	100000	Nitrous Oxides	250
Carbon Monoxide	4000	Hydrogen Cyanide	150
Formaldehyde	500	Acrylonitrile	400
Hydrogen Fluoride	100	Ammonia	750
Hydrogen Chloride	500	Sulphur Dioxide	400
Hydrogen Bromide	150	Hydrogen Sulphide	750
Phenol	250	Phosgene	25

The following results were obtained:

Gas detected	Conc. Of gas per 100g of material consumed (ppm)	Toxicity Index
Carbon Dioxide	90 000	0.9
Carbon Monoxide	4 000	1.0
Nitrous Oxides	500	2.0

Hydrogen Chloride	250	0.5
Ammonia	Traces	-

Total Toxicity Index: 4.4

### 3. DISCUSSION OF RESULTS

The intumescent material did not ignite as such, but upon exposure to heat some gases are liberated during the expansion process. The gases detected during this test should therefore not be seen as combustion products but rather as decomposition gases.

The toxicity index of the decomposition gases liberated by this material is not as low as the toxicity index for the combustion gases of wood or polyolefins. It is, however, not unacceptably high and would comply with the commonly accepted standard of 5.0 for mining applications.

It should also be considered that intumescent paints such as “Intusayf” would normally not react when exposed to temperatures below approximately 200 °C, therefore no toxic gases would be liberated by the material unless under direct influence of an external ignition source.

When this material is applied to electrical cables, one should consider that the polyvinyl chloride (PVC), which is often used as electrical insulation, would liberate a substantial amount of hydrogen chloride when decomposing thermally. The contribution to the toxicity from the intumescent paint would therefore be of less significance.

### 4. CONCLUSION

The “Intusayf” intumescent material as tested would therefore not present a significant hazard when considering the toxicity of its thermal decomposition gases.

I trust the foregoing will be of assistance to you, but should you require any further information, please do not hesitate to approach the undersigned



K van Dyk  
**FIRE ENGINEERING SCIENCES**  
 CSIR, Division of Building and Construction Technology



## GENERAL CONTRACT CONDITIONS

1. **PURPOSE**

The purpose of the investigation must be fully disclosed to the CSIR. The client will use the results of the investigation only for the purpose disclosed to the CSIR, unless otherwise agreed.
2. **RISK RELATING TO MATERIALS, APPARTUS, OR EQUIPMENT**

Materials, apparatus or equipment delivered by or on behalf of the client to the CSIR pursuant to the contract, shall be accepted, retained and used at the owner's risk.
3. **PUBLICATION OF REPORTS**
  - (a) The contents of any interim reports issued are confidential and may not be published by the CSIR or the client, and the results of any discussions with CSIR personnel relating to this investigation may not be communicated to the press or technical journals or be given publicity in any other manner until the final report has been issued.
  - (b) The final report will be the property of the client and may be published by him provided that:
    - (i) the CSIR be acknowledged in the publication;
    - (ii) it is published in full, or where only extracts or a summary of an abridgment are published, the CSIR's written approval of the extracts, summary or abridged report be obtained prior to publication; and
    - (iii) the CSIR be indemnified against any claim for damages which may result from publication.
4. **CONFIDENTIALITY**

The CSIR will not publish any results without the client's consent. The CSIR is, however, entitled to use technical information obtained from the investigation, but undertakes in doing so not to identify the sponsor or the subject of this investigation.
5. **ADVERTISING**

No reference may be made to CSIR or any of its strategic units or employees in advertisements or for sale or publicity purposes without the CSIR's prior written consent.
6. **OWNERSHIP OF INTELLECTUAL PROPERTY**

In terms of Act No. 46 of 1988 all intellectual property developed by CSIR during the course of the investigation vests in the CSIR unless otherwise agreed in writing.
7. **DOMICILIUM CITANDI ET EXECUTANDI**

The parties hereto respectively choose as their *domiciliuim citandi et exectutandi* for all purposes of, and in connection with, this contract, the addresses stated in the letter of proposal.
8. **WAIVER**

Failure of either party hereto at any time to demand performance of any provision of the contract shall not affect that party's rights to require full performance thereof at any time thereafter and a waiver by either party of a breach by the other of any such provision shall not be taken to a waiver of any subsequent or similar breach, or as nullifying by the effectiveness of such provision.
9. **NOTICES**

Any notice to be given hereunder shall be given in writing and may be given either personally or may be sent by post or telex or telefax and addressed to the relevant party at its *domicilium* or to such other address as shall be notified in writing by any of the parties to the other. Any notice given by post shall be deemed to have been served on the expiry of 7 (seven) working days after the same is posted by registered post by (land or airmail). Any notice delivered personally or sent by telex or telefax shall be deemed to have been served at the time of delivery or sending.

Any notice to be given shall be given to the client at his principal place of business and to the CSIR, Scientia (BOUTEK) at Meiring Naude Road, Pretoria.
10. **AMENDMENTS**

No amendment to this contract or the proposal shall be of any force or effect unless reduced to writing and signed by both parties.
11. **VALUE ADDED TAX**

It is hereby expressly recorded that any Value Added Tax (VAR) payable in respect of the services rendered in terms of this contract shall be for the account of the client and shall be included in the final payment payable in terms of this contract.

**12. LIMITATION OF LIABILITY**

While every care is taken to ensure the accuracy of any work performed by the CSIR under this contract, the CSIR does not warrant the merchantability or commercial viability of the research results. Neither the CSIR nor its employees shall be liable in any way whatsoever to the client or to any other person whatsoever for any negligence, error or omission in carrying out the work or for any erroneous statement, whether in fact or opinion, contained in any report issued pursuant to the work performed.

**13. GOVERNING LAW AND JURISDICTION**

13.1 The contract between the parties shall be governed by and interpreted in all respects in accordance with the laws of the Republic of South Africa. The parties hereby consent to the jurisdiction of any competent Magistrate's Court for the adjudication of any claim based on this contract.

13.2 Notwithstanding the provision of 13.1, in the event of the parties failing to reach agreement in regard to the interpretation of, or the carrying into effect of, or any of the parties' rights and obligation arising from, or the termination of or arising from the termination of, or the rectification of, this agreement within 14 (fourteen) days of the dispute arising, then either party may, by notice in writing to the party, refer the dispute for determination by arbitration in South Africa under the provision of the Arbitration Act, Act No. 42 of 1965, as amended.

The arbitrator shall be, if the matter in dispute is principally

- a legal matter, a practising attorney of not less than 15 (fifteen) years standing or a practising advocate of not less than 10 (ten) year standing;
- an accounting matter, a practising chartered accountant of not less than 10 (ten) year standing;
- any other matter, any independent person agreed to between parties.

Should the parties fail to agree on an arbitrator within 14 (fourteen) days after the arbitration has been demanded then the arbitrator shall be nominated by the (current) serving President of the Law Society of the Transvaal.

**14. PAYMENT OF ACCOUNT**

All amounts due in terms of this contact shall be payable on the due date indicated in the proposal or within 30 (thirty) days of the date of issue of an invoice where that is required. Any amount not paid on the due date shall bear interest at a rate of 2% (two per cent) above the prime overdraft rate charged by Volkskas Bank Limited to its preferred corporate clients, calculated and compounded daily as from the due date until date of payment.

**15. VALIDITY**

All proposals are valid for 30 (thirty) days from date of issue, unless otherwise indicated, and unless accepted within that period, will lapse automatically.

**16. TERMINATION**

This contract may be terminated forthwith by either party in the event of the other being liquidated or being placed under judicial management.

In the event of any party to this contract being in breach of any of the terms of the contract, the other may by written notice require the party which is in breach to remedy the breach, and if it has not been done so within 7 (seven) days of receipt of such notice, or if the breach is incapable of being remedied, the other party may, in writing, terminate the contract without prejudice to its right to claim damages.