



DIVISION OF  
BUILDING  
TECHNOLOGY



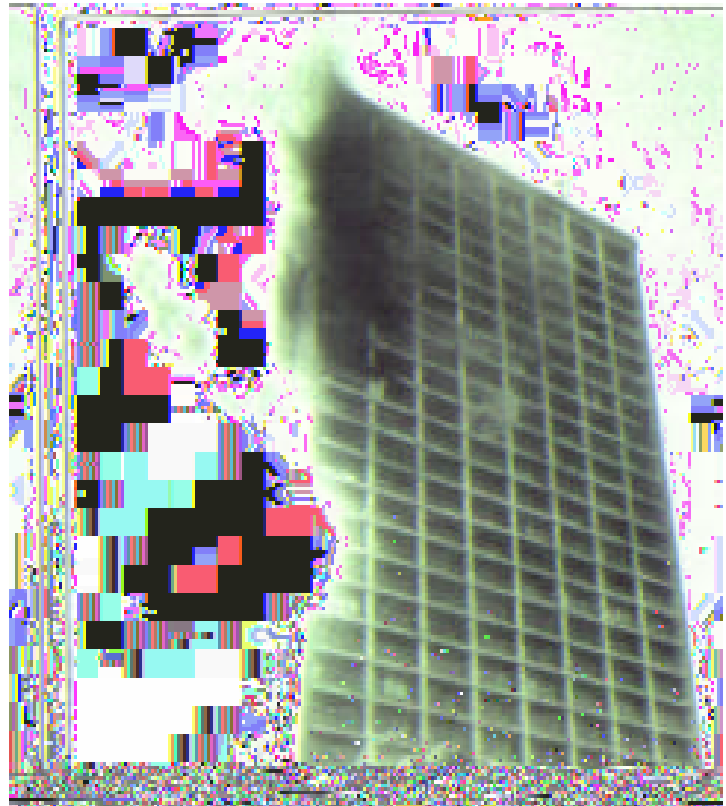
**CSIR**



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# Report on the resistance of a 600mm x 600mm DJ FIRE PILLOW FIRE STOP SYSTEM





## **Building Products & Services Programme**

Report on the resistance of a 600mm x 600mm  
DJ FIRE PILLOW FIRE STOP SYSTEM

Contract No:

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Division of Building Technology, CSIR  
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Republic of South Africa

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# **REPORT ON THE FIRE RESISTANCE OF A 600 mm x 600 mm “D.J. FIRE PILLOW” FIRE STOP SYSTEM**

## **1. SPONSOR**

DJ Mine Services  
7 Pillans Street  
CHAMDOR  
KRUGERSDORP

P O BOX 4040  
LUIPAARDSVLEI  
1743

The fire tests were performed on behalf of the sponsor, care of:

Micon Coatings  
350 Brighton Road  
Bramley View  
Johannesburg

P O Box 307  
Lonehill  
2062

## **2. USE OF THIS REPORT**

The use of this report is subject to the attached *General Contract Conditions*.

## **3. PURPOSE OF THE INVESTIGATION**

The purpose of this test was to evaluate the Fire Resistance Rating performance of a service penetration sealing system, used to prevent smoke, fire and heat from spreading laterally across a separation element, occupancy division or between two separate compartments through service penetrations and ducts.

## **4. SYSTEM DESCRIPTION**

The “**DJ FIRE PILLOW**” Fire Stop seal was installed in a 600 mm x 600 mm vertical opening in the side wall of the furnace (Figure 3).

The seal was installed as per installation procedure, Annexure 1.

The seal consisted of approximately 35 “**DJ Fire Pillows**”, each having a nominal length of 300 mm, width of 200 mm and height of 50 mm, laid in approximately 11 rows from the base of the aperture to the top.

## 5. TEST PROCEDURE

The installation was tested simultaneously with some other types of penetration seals in the CSIR's large scale horizontal furnace. The system was tested in a vertical configuration and was installed into a 600 mm x 600 mm opening in the sidewall of the furnace.

Although no pressure difference was measured across the slab, it can be assumed that the furnace was operated under neutral pressure, the flue gasses being taken out from the bottom of the furnace.

Four steel-sleeved K-type thermocouples were used to measure the temperature within the furnace environment. Their readings were used to ensure that the temperature inside the furnace was adjusted to follow the Standard Temperature Time (ISO) Curve. The compliance with this temperature criterion is a requirement of the SABS 0177 Part 2 (1991) test procedure as well as the BS 476 Part 20 (1987) test protocol. This particular furnace configuration used four air-aspirated diesel burners as heat sources.

Two K-type thermocouples were fitted to the **DJ Fire Pillow** fire barrier installation. The first was introduced into the centre of the seal system between two bags. The second was located on the non heat exposed surface of the sealing system, located over the joint formed between two bags, just off centre of the entire seal. The thermocouple point was covered by insulative tape to minimise thermal loss from the air exposed side. This thermocouple measures the temperature on the unexposed side of the fire stop and is used to determine whether the seal fulfils the insulation requirements.

## 6. TEST CRITERIA

As with any fire resistance evaluation, there are three criteria that would need to be met. These are:

- No burn through to the unexposed side is allowed during the test period (integrity criterion)
- There should be no structural failure of the seal, which is not allowed to fall out of position within the test period (stability criterion)
- The temperature on the outer surface is not allowed to exceed 140 °C (plus ambient) during the exposure time (insulation criterion). Ambient temperature on the day of the test was taken at 26 °C.

The installation was tested to determine whether it would not fulfil the requirements of a 2 hour Fire Resistance Rating (FRR).

## 7. RESULTS

The temperatures recorded inside the furnace are shown in Figure 1. It can be seen that the furnace temperature followed the ISO curve within acceptable limits.


The temperatures recorded on the seal system are shown in Figure 2.

The seal installation remained stable throughout the 2 hour test period. No burn-through to the unexposed side occurred. The effects of the exposure to the interior or fire exposed surface of the bags was inspected post test and is recorded in Figure 6 and in a close up, Figure 7. There was minimal spillage of the contents of the bags when the exposed surfaces of the bags deteriorated under heating.

## 8. DISCUSSION AND CONCLUSION

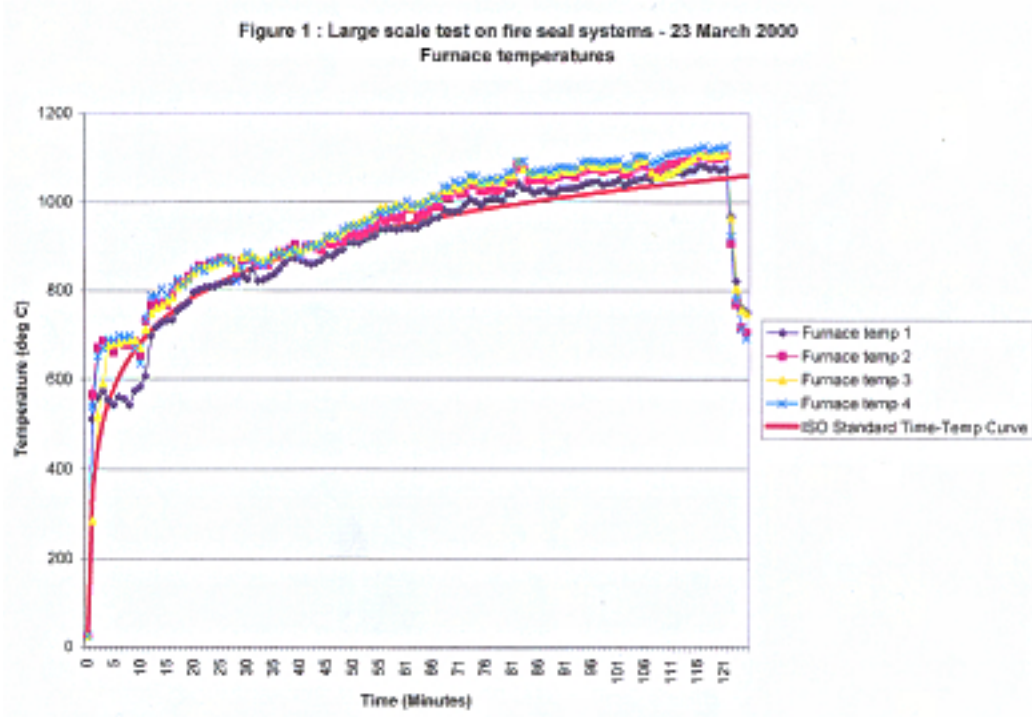
There was no sign of burning through of the service penetration seal therefore the integrity criterion was met. The **DJ Fire Pillow** was both still in position after the test period, having neither collapsed or disintegrated, the bags still firmly dry packed against the walls of the aperture. The stability criterion has been met. The temperature on the unexposed surface was found to be well below the required values after 120 minutes, therefore displaying very good insulative properties. Due to the marginal increase in the exterior temperature across the seal, the nominal width of 200 mm is in excess of what is required to ensure the required rating on insulation, however contributes to the overall stability of the system.

The “D.J. FIRE PILLOW” fire-stop seal, with the FIRE PILLOWS having nominal dimension of 300 x 200 x 50mm, therefore meets the requirements for a 2 hour FRR when installed in any aperture 600mm high.



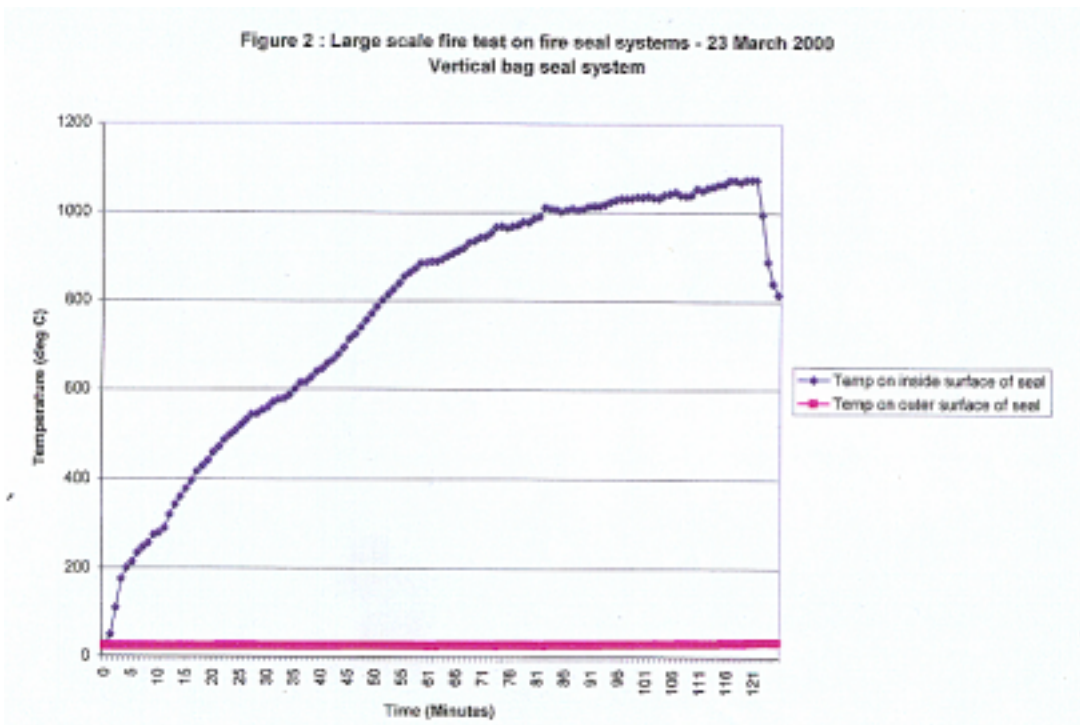
AJH Young

**FIRE ENGINEERING SCIENCES**  
CSIR, Building and Construction Technology



**FIGURE 1 :**

Time / temperature curve of temperatures recorded in furnace during the test.

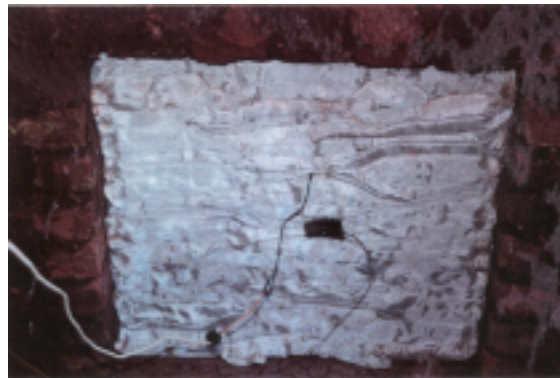


**FIGURE 2 :**

Time / temperature curve of temperatures recorded on the “DJ Fire Pillow” seal during the test.



**Figure 3 :**  
**Photograph of the DJ Fire Pillow at commencement of the test**



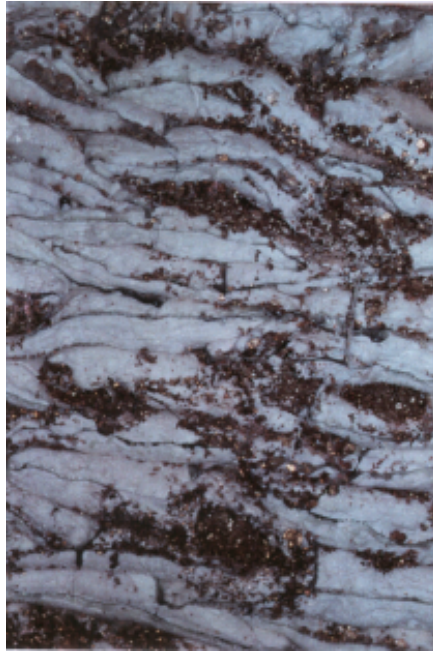
**Figure 4 :**  
**Photograph of the DJ Fire Pillow System at 1 hour during the test**



**Figure 5 :**  
**Photograph of the DJ Fire Pillow System at end of test**



**Figure 6 :**  
**Photograph of the interior of the DJ Fire Pillow Fire Stop System showing the effects of two hours exposure at 1150 degrees celcius**



**Figure 7 :**  
**Close – up of the condition of the DJ Fire Pillow System after two hours of fire exposure**

## **INSTALLATION PROCEDURE**

Install a row of 200 mm x 300 mm DJ Fire Pillow lengthwise into the vertical opening starting from one side and overlapping each pillow. Ensure a tight fit against the walls.

Install the next row of pillows starting from the opposite side ensuring the overlaps do not correspond with the bottom row. Compact the pillows before proceeding with the next row. This procedure is repeated until the opening is completely sealed and airtight.

Manufacturer : DJ Mine Services

Installer : Micon Coatings cc

JJ du Plessis  
HEAD: FIRE ENGINEERING DIVISION  
for PRESIDENT

This report relates only to the samples tested and is issued subject to the conditions printed on the back of Page 1. It does not imply approval by the South African Bureau of Standards of the quality and/or performance of the commodity that has been tested. It does not authorize the use of the Standardization Mark.

Hierdie verslag is van toepassing slegs op die getoetste monsters en word uitgereik behoudens die voorwaardes op die keersy van bladsy 1 gedruk. Dit beteken nie dat die Suid-Afrikaanse Buro vir Standaarde die kwaliteit en/of werkvorming van die getoetste artikel goedkeur nie. Dit verleen ook nie die reg om die Standaardmerk te gebruik nie.



## 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, APPARATUS, 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 contract 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.