



Metal Technologies, Inc.

July 20, 2009

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Notification of a Potential Safety Hazard, 10CFR Part 21, Report No. 09-01

To Whom It May Concern:

Upon final review of Preferred Metal Technologies, Inc. (PMT) Nonconformance Report No. 565 and conversations with Florida Power and Light (FPL Energy) personnel, PMT is submitting for your review the attached "Report of Potential Safety Hazard".

PMT has completed our final review and have found that due to: (1) the fire dampers in question were never completely installed and released for operation and (2) Preferred Metal Technologies, Inc. had never previously supplied any Safe-Air dampers as part of a Basic Component to any project, it can be concluded that the reported defect did not constitute a safety hazard.

Should you have any questions or comments relating to this report, please contact me at the below listed numbers, or Charles Wojcik (Project Engineer) or Joe Emerson (Quality Assurance Manager) at (630) 887-7700.

Regards,

Tim Stewart
Vice President Nuclear
Preferred Metal Technologies, Inc.

Phone: (630) 887-7700 ext. 755
Direct Line: (630) 320-7755
Cell: (630) 688-9487

cc: John Berzanskis, Jr., President - Preferred Metal Technologies, Inc.
USNRC, Region III, Lisle, IL

*IEIA
NR*



Metal Technologies, Inc.

REPORT OF A POTENTIAL SAFETY HAZARD

Prepared By:	Charles Wojcik	Utility:	FPL Energy (Now NextEra Energy)
Title:	Project Engineer	Location:	Duane Arnold Energy Center
Date:	7/20/2009	Report #:	09-01

Description of Event:	<input checked="" type="checkbox"/> DEFECT	OR	<input type="checkbox"/> DEVIATION
<p>Pursuant to the requirements of 10CFR Part 21, this letter is intended to notify the NRC of the existence of a defect in a 13-1/16" wide x 16-1/16" high, Model # D-300AV, UL Listed Fire Damper as manufactured by Safe-Air of Illinois on May 21, 2008. Preferred Metal Technologies, Inc. (hereafter referred to as PMT) supplied two of these fire dampers as part of a basic component to FPL Energy (now NextEra Energy) Duane Arnold Energy Center (hereafter referred to as DAEC) in October of 2008.</p> <p>After installation into a block wall and during in place testing on December 18, 2008 (prior to final release of the equipment), the fire damper (identified with DAEC Equipment ID # 1V-FD-306) was required to pass two cycle tests. During the second cycle test, the bottom most blade separated from the adjoining blade at the rolled joint (blade knuckle). Cycle testing was subsequently performed on the second identical fire damper with ID # 1V-FD-033 prior to its installation and a blade separation occurred on the third cycle. It should be noted that the 1V-FD-306 fire damper was never released for operation and the 1V-FD-033 fire damper was never installed. DAEC returned the 1V-FD-033 fire damper assembly to PMT for further investigation. PMT generated Nonconformance Report #565 pursuant to PMT Procedure 16.1.G.</p> <p>PMT inspected the equipment and reviewed the circumstances of the failure with plant personnel, and at that time the failure was determined to be a result of the procedure utilized to perform the cycle testing. This was detailed in Revision 0 of the failure analysis generated by PMT (dated 3/16/09). PMT submitted this failure analysis to DAEC for review and approval, and on 4/28/09 submitted Revision 1 that incorporated comments received from DAEC on Revision 0.</p> <p>Subsequent investigation, testing, and attempts to rework the fire damper to its original condition resulted in the method utilized to cycle the fire damper to be immaterial to the cause of the failure, and on 5/28/09 PMT submitted Revision 2 of the failure analysis to DAEC for review and approval. Revision 3, which incorporated DAEC comments on Revision 2, was submitted to and approved by DAEC on 6/30/09. PMT revised a typographical error in the failure analysis and brought it to Revision 4 on 7/1/09.</p> <p>During completion of Revision 2 of the failure analysis, PMT determined that a defect exists within the aforementioned fire dampers. The Safety Function of the fire damper was defined as reliably closing (with or without air flow) in the event of a fire. The damper closing would restrict the passage of flame and maintain the integrity of the fire rated separation. With a separation of the blades, the fire damper could not be considered closed and could not perform its safety function.</p>			



Metal Technologies, Inc.

Page 2

Engineering Evaluation and Recommendations:

During the investigation performed while generating the failure analysis, PMT procured representative samples of commercial grade fire dampers from various manufacturers. PMT performed cycle testing on the fire dampers from other manufacturers, and all were found to be able to withstand 100 cycles without blade separation.

In existing standards for fire dampers, there are no requirements for extended cycle testing. ASME AG-1 requires a minimum of 10 full cycles to verify the free operation of all parts and the correct adjustment and positioning of all blades. This was performed in accordance with a utility approved procedure on both dampers prior to shipment. AMCA-500 does not state any minimum cycle requirements the damper must pass. UL-555 does require the damper to be cycled 250 times, but this standard is for UL qualification of a fire damper model line and is not intended to be performed on production dampers. NFPA-90A requires fire dampers to meet UL-555 and to be exercised at least every four years to verify that they fully close. PMT recommends that if a commercial grade damper is to be dedicated and utilized as a basic component, that the number of cycles the fire damper must withstand should be clearly identified and that a sacrificial fire damper be cycled to at least that number of cycles as part of the dedication process. This test should be considered destructive in nature and should not be performed on the actual fire dampers that will be utilized.

Conclusions:

Since the 1V-FD-306 fire damper was never released for operation and the 1V-FD-033 fire damper was never installed, it has been concluded that the defect did not constitute a substantial safety hazard. These two fire dampers are the only two of that size and model number that have been supplied by PMT as part of a basic component. In addition, PMT has not supplied and is not currently in the process of supplying any other equipment manufactured by Safe-Air of Illinois as a basic component to the nuclear industry.

Attachment(s): PMT 033 and 306 Fire/Smoke Dampers Failure Analysis, Rev 4 dated July 1, 2009.

Disposition (Check One):

- Yes, this constitutes a substantial safety hazard and requires a final report.
- No, this does not constitute a substantial safety hazard and does not require any further reporting.

Generated by:

Signature: Charles Wojcik

Title: PROJECT ENGINEER Date: 7/20/09

Reviewed by PMT Responsible Officer:

Signature: [Signature]

Title: V.P. Date: 7-20-09



Metal Technologies, Inc.

Page 1 of 10

July 1, 2009

Mr. Lal Rijhsinghani
FPL Energy
Duane Arnold Energy Center
3277 DAEC RD
Palo, IA 52324

Subject: 033 and 306 Fire/Smoke Dampers Failure Analysis, Rev 4

Reference: DAEC Purchase Order K126358
PMT Job Number N1605

Dear Mr. Rijhsinghani:

Please find attached PMT failure analysis for the fire damper blade separation.

Please contact me at 630-320-7730 if you have any questions or require additional information.

Sincerely,

A handwritten signature in black ink that reads "Charles Wojcik". The signature is written in a cursive, slightly slanted style.

Charles Wojcik
Project Manager



Metal Technologies, Inc.

Page 2 of 10

Purpose

The purpose of this report is to discuss the blade separation issue that has occurred on fire dampers supplied to DAEC by Preferred Metal Technologies. The 306 damper was installed and during the operational test of the fire damper, the lower blade separated from the adjacent joining blade. The 033 damper separated during troubleshooting efforts while in the DAEC mechanical shop.

History of Installed Fire Damper

For a detailed history, see Attachment 1, Fire Damper history letter from P. Waterloo to L. Rijhsinghani dated 01-05-09.

Fire Damper Troubleshooting at PMT

The 033 damper was received at PMT's Burr Ridge facility and an inspection was performed. This was a parallel effort with inspection of other fire dampers on hand manufactured by the same company, Safe-Air of Illinois.

During inspection of the 033 damper, the lower blade separated from the adjacent blade in the same fashion as the 306 damper did in the field, after its installation.



*033 Damper at PMT facility with bottom blade separated from adjacent blade.
Note starting point for separation at end of blade.*



Metal Technologies, Inc.

Page 3 of 10



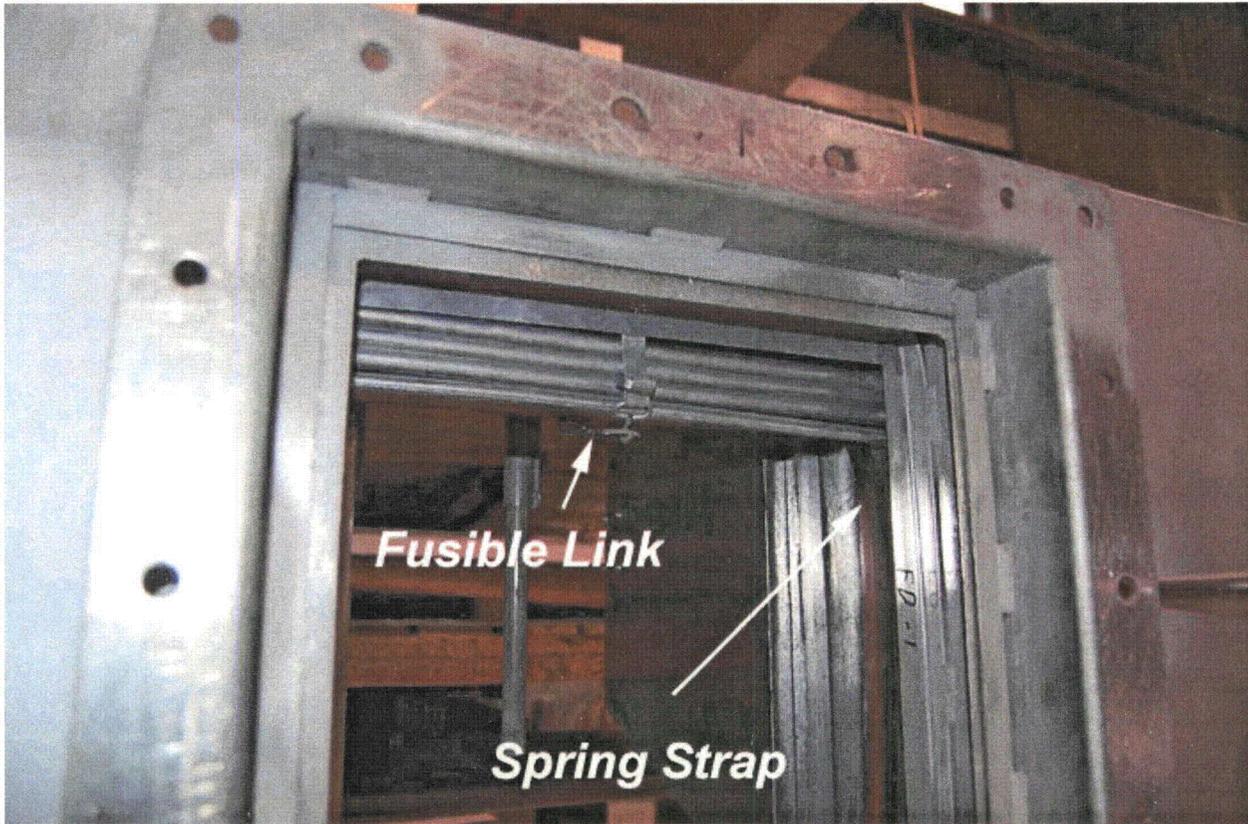
033 Damper at PMT shop with bottom blade re-attached to adjacent blade.

The lowest blade is attached to two spring strap (closure spring) assemblies that are riveted onto the damper. A typical spring strap assembly can be seen riveted to the blade in the image on page two of this document. These closure springs pull the damper closed when the fusible link melts or when the damper is released during testing.



Metal Technologies, Inc.

Page 4 of 10



Spring Strap (closure spring) riveted onto the lowest blade assembly. There are two, one on the left side of the damper and one on the right. The fusible link can be seen in the center of the damper holding it in the open position.

Separation of Blades

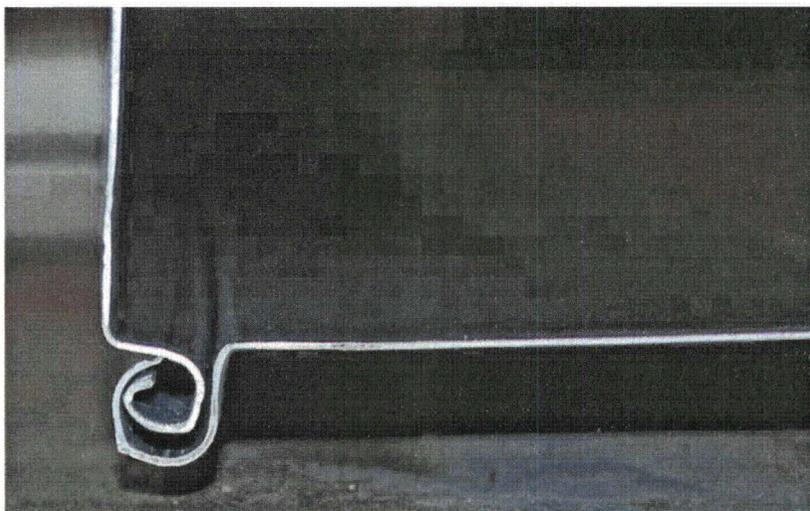
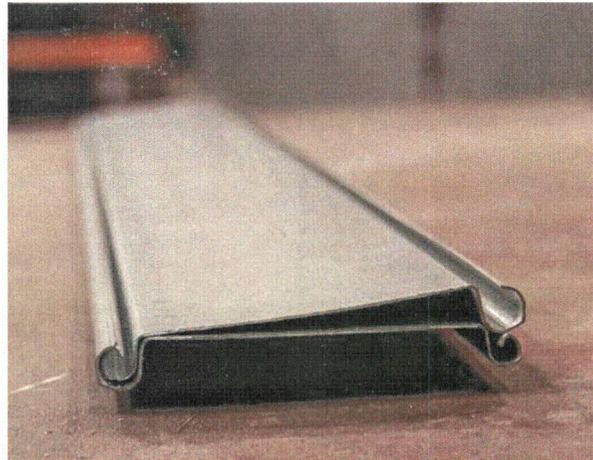
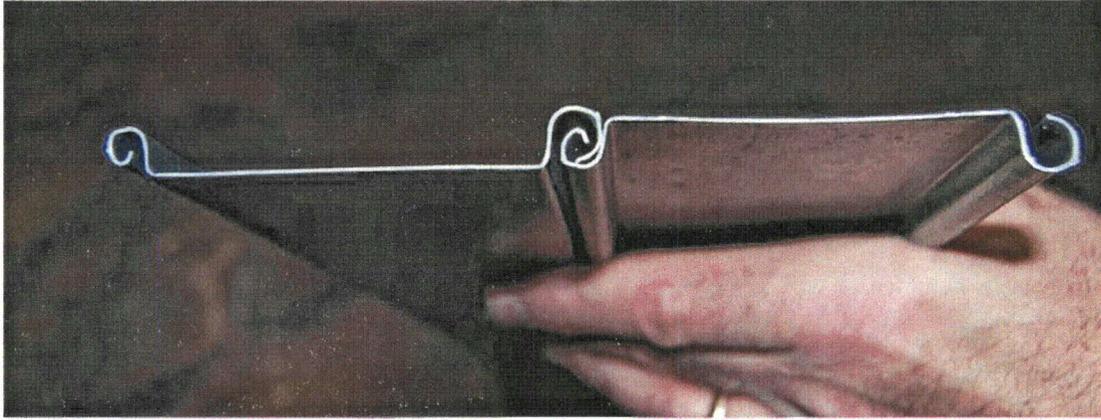
In an attempt to determine how the blades could separate on the dampers, another fire damper manufactured by Safe-Air of Illinois was disassembled to determine blade configuration and to test for separation. PMT also performed cycle testing of fire dampers from various manufacturers to determine how many cycles a typical curtain style fire damper can withstand before failure.

During manufacturing, the blades are made by continuously forming them into long lengths. The blades are then cut to length and turned opposite directions and interlocked within each other by sliding the male end into the female end. This is repeated until the proper height of the curtain is achieved. It is then installed in the fire damper frame. PMT procures the entire fire damper assembly from Safe-Air of Illinois and dedicates the unit for safety related use.



Metal Technologies, Inc.

Page 5 of 10



*Images of fire damper blades in various positions.
These blades could not be separated by pulling with directly opposing forces in any position.*

140 E. Tower Drive - Burr Ridge, Illinois - 60527 - Phone: 630.887.7700 - Fax: 630.887.0770

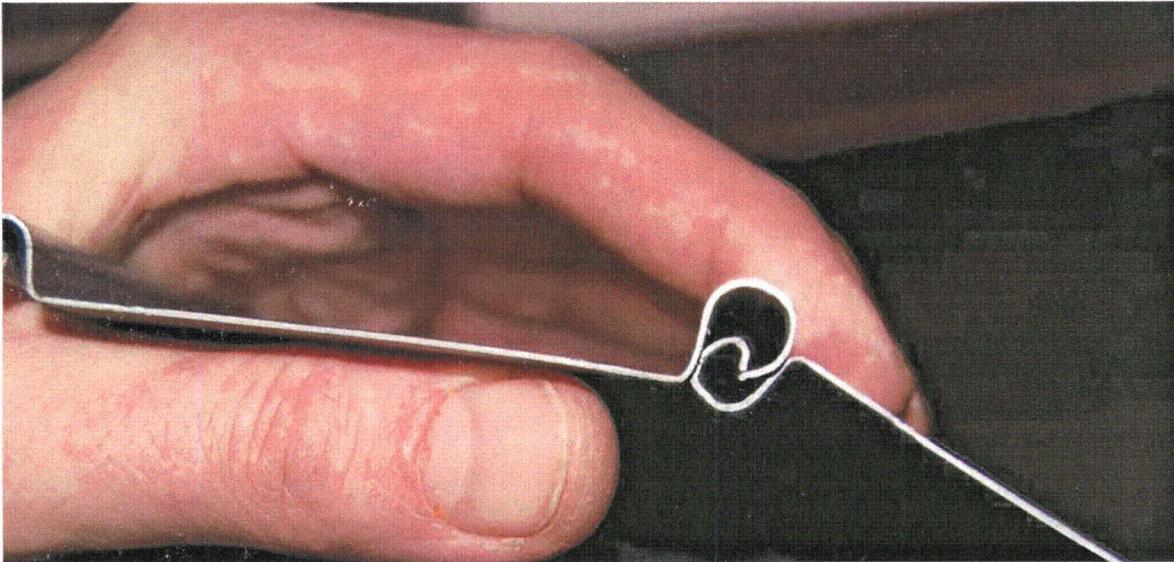


Metal Technologies, Inc.

Page 6 of 10

The spare fire damper was manipulated by hand to determine if the blades could be separated. It could not be separated with hand forces placed in opposite directions (directly opposing forces). After repeated attempts to separate it with directly opposing forces, additional side forces were placed on the damper with the blades in all positions and it could not be separated.

The damper female side dimension was then opened slightly.



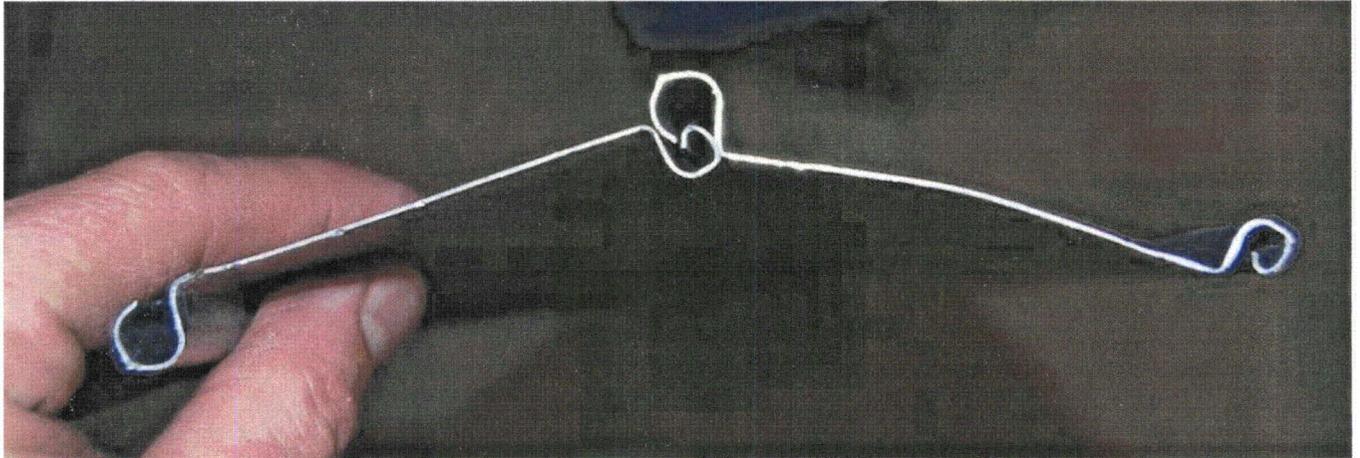
Attempt to separate damper blades after dimensional opening of female side.

After the female side of the blade was physically opened up, the blades could not be separated by applying opposing forces. Side forces were then placed on the blades and the damper blades separated. This could only be accomplished with the blades at an approximate 150 degree angle relative to each other. Any other position would not allow separation.



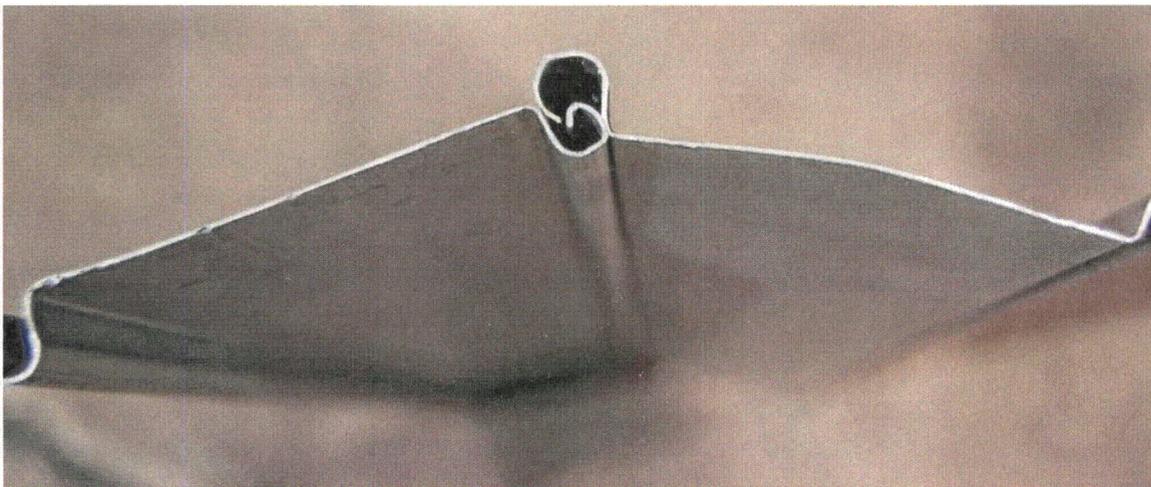
Metal Technologies, Inc.

Page 7 of 10



Placement of side loads on damper blades after dimensionally opening up female blade allowed the blades to separate. The blades must separate from left to right or right to left. The separation cannot occur in the middle and work its way out.

It was noticed that after the blades separated, the female dimension of the "hook" had dimensionally opened up even further (larger inside dimension). The blades in both the DAEC dampers and test unit could be put back together, but the female "hook" now had too large of a dimension and the blades could be easily separated after the initial separation evolution had occurred.



Blade separation of male and female sides. This must occur with side load forces to occur. Once the blade separates the first time, the female "hook" dimension opens up allowing for repeated separations.



While the blades could be separated by hand with a side load, PMT continued to look at additional causes for the blade separation.

As a result of the continued investigation into the fire damper failure, PMT set out to determine the amount of cycles a typical fire damper (from any manufacturer) can withstand without failing. While the fire dampers provided to DAEC have a 3 hour rating, most manufacturers only stock 1.5 hour rated fire dampers, and have 3 hour rated fire dampers made to order. PMT procured typical in stock fire dampers from four manufacturers to perform cycle testing on, and three of the four fire dampers tested did have a 1.5 hour rating. The different fire rating is not critical to the results of this testing, as the roll forming machine utilized by fire damper manufacturers to make their blades is the same no matter if the blade is for a 1.5 hour or 3 hour curtain style fire damper. In addition, the mounting configuration of the blade is also the same. As a side note, typically the only differences in 1.5 hour and 3 hour fire dampers are the requirements for installation and maximum allowable sizes. The manufacturing details are typically the same. The details of the four fire dampers tested are as follows:

Manufacturer	Fire Rating	Width	Height
Greenheck	1.5 Hours	16"	16"
NCA	1.5 Hours	13-1/16"	16-1/16"
Ruskin	1.5 Hours	16"	12"
Safe Air	3 Hours	13-1/16"	16-1/16"

A Safe Air fire damper identical to the one provided to Duane Arnold under this contract was procured for this baseline testing. The target number of cycles to be performed by PMT during the testing was established to be 100 cycles. This was based off of an estimate of PMT cycling the damper 20 times prior to shipment and the damper being cycled two times per year for the next 40 years (80 field cycles) for a total of 100 cycles.

The general conclusion from the testing is that a typical fire damper should be able to withstand 100 cycles without blade separation. This was the result on three of the procured dampers. PMT determined that the Safe Air fire damper that was tested failed after only 27 cycles. Based on the known failure after an estimated 20 to 30 cycles on the two production units supplied to DAEC, this seems to be a consistent failure for the Safe Air fire dampers. The exact cause of the failure is indeterminate. However, the failure can generally be said to exist on the finished Safe Air product for use in an application where it will be cycled multiple times.



Metal Technologies, Inc.

Page 9 of 10

Recommendations to Prevent Recurrence

Generally speaking, the curtain assembly must maintain parallelism to the top/bottom of the fire damper frame during testing. This will prevent side loading of the damper blades, allowing it to operate correctly and to simulate actual conditions when a fusible link melts. PMT recommends that this be followed for cycle testing on any manufacturer's fire damper, as this is how our baseline testing was performed.

The procedure for field testing of the damper should be revised to:

- Place two fire curtain jacks under the fire curtain, one on the left and one on the right side of the fusible link to support the damper in place.
- Remove the fusible link from clover hooks.
- Replace the fusible link with an ETL or tie wrap attached to each end of the clover hooks.
- Remove jacks from fire damper.
- Energize the ETL or cut the tie wrap with wire cutters to drop the curtain assembly.

PMT will include the testing recommendations in a revision to the installation manual.



Clover hook (2) with fusible link. After the fusible link is removed, an ETL or tie wrap should be used in place of the fusible link for testing. The clover hook/tie wrap assembly will provide support in the center of the damper maintain equal forces on the curtain assembly from the closure springs. To test the damper, the ETL is energized or tie wrap is cut with a pair of wire cutters.

This procedure will allow for minimal side loading of the damper blades which will prevent separation. This is a very similar procedure to how DAEC tests the existing design 033 and 306 damper assemblies. The fusible link is removed, an ETL put in its place and an electrical source is used to allow the ETL to melt causing the fire damper to drop.



Metal Technologies, Inc.

Page 10 of 10

Field and Shop Repair of the 033 and 306 Fire Damper Assemblies

PMT will procure new fire dampers from a different manufacturer for installation into each assembly. Details of the installation will be shown on a PMT drawing that will be submitted to DAEC. PMT will procure a third identical unit (in size and fire rating) to the two production units and cycle it 100 times in order to verify that it cycles without failure prior to installing the new fire dampers.

The acceptability of the installation will be verified in the shop at PMT's Burr Ridge facility after the repair is complete. The new fire damper installed in the 033 assembly will be verified operable prior to shipment back to DAEC.

The installation of the new fire damper in the 306 assembly in the field will require access from both sides of the damper. This will require for the smoke damper to be removed in the battery room for access on the battery room side.

Attachments

1. Fire Damper history letter from P. Waterloo to L. Rijhsinghani dated 01-05-09.
2. Safe-Air Dowco Dynamic Curtain Fire Damper – Model D-300A Specification Sheet.



Metal Technologies, Inc.

January 05, 2009

Mr. Lal Rijhsinghani
FPL Energy
Duane Arnold Energy Center
3277 DAEC RD
Palo, IA 52324

Reference: 033 and 306 Fire/Smoke Dampers

Dear Mr. Rijhsinghani:

The following is a history on the fire/smoke damper during my visit the week of 12/15/08.

Please contact me at 708-771-0719 (cell 312-961-2523) if you have any questions or require additional information.

Sincerely,

A handwritten signature in black ink, appearing to read "Paul Waterloo", written in a cursive style.

Paul Waterloo



Metal Technologies, Inc.

The following is an outline of Paul Waterloo's field service at DAEC for the period of Monday, 12/15/08 through Friday, 12/19/08 as it applies to the fire dampers which the blades became separated.

After discussion with DAEC, the smoke/fire damper assemblies were received and released to mechanical maintenance for installation in the plant. Mechanical maintenance personnel directly involved in the job were:

Day shift: Tim Marshall and Kris Aarhus

Night shift: Jeff Dullare and Tim Reily

Paul Waterloo worked with both teams at different times during the week. Damper 306 was installed between day and night shift on Wednesday, December 17th. Paul Waterloo left at 2200 hours after the fire/smoke damper was shimmed and secured in the block wall. The transition duct work was made up by Jeff Dullare and Tim Reily.

After the duct work was connected, civil provided grouting services and grouted the damper into the wall using dry pack grout until approximately 7 A.M. DAEC let the grout dry a minimum of 12 hours prior to performing the drop test of the fire damper before declaring the damper operable. After a pre-job brief was performed, Jeff Dullare, Tim Reily and Paul Waterloo set out to perform the drop testing of the damper. Once that was completed satisfactorily, work was to start on the 033 damper assembly.

Mr. Jeff Dullare was positioned in the switchgear room on the cable tray to perform the drop test. This was completed by placing two jacks under the fire damper, removing the "S" hook connected to the fusible link (the "S" hook was slightly opened to allow removal), the jacks removed and the fire damper dropped. By DAEC procedure, this needs to be completed twice. The first test was successful. Mr. Dullare then re-positioned the fire damper a second time to the top of the opening and dropped it. At this point the damper dropped, but the bottom most blade separated from the adjoining blade at the rolled connection.

Paul Waterloo was called to the top of the cable tray and inspected it with Mr. Dullare. It was not evident why the two blades had separated. After some manipulation, the damper blades were able to be reconnected, however, they were most likely not completely reconnected as they would be from the factory. The damper was then dropped and the blade could be repeatably disconnected during the drop test.

At this point design engineering was called in and it was determined that the damper should be put back in the normal position ("S" hooks installed with the damper held open) so air flow to the control room could be restored. The smoke damper was verified pinned open and a one hour fire watch was established. No other work was performed on the 306 damper that week.

140 E. Tower Drive - Burr Ridge, Illinois - 60527 - Phone: 630.887.7700 - Fax: 630.887.0770



Metal Technologies, Inc.

The following morning Paul Waterloo worked with design engineering in an effort to determine what the problem could be with the damper. This was completed by looking at the 033 damper which was in the fabrication shop at this time. PMT engineering was also engaged in this discussion through phone conversation.

The 033 fire damper was dropped by removing the "S" hook to the fusible link and inspections performed. The damper was dropped approximately 3 times. Mr. Kris Aarhus was putting the damper back in the normal position (up, and secured with "S" hooks) and during this attempt, one of the blades disconnected from the adjacent blade in a similar fashion to the 306 damper in the field. PMT engineering was informed of this.

At this point it was determined that the 306 damper should be packaged and sent back to PMT for repair and failure analysis.

It should be noted that after discussion with DAEC personnel, the 033 fire damper was not cycled until installed in the block wall. The 306 fire damper was not cycled until troubleshooting began in the fabrication shop on Friday morning, 12/19/08.

Dynamic Curtain Fire Damper - MODEL D-300A

Features – U. L. Rated for 3-hour fire damper, for use in a 4-hour fire partition. • Meets NFPA 90A & UL555 Meets California State Fire Marshal Requirements.

STANDARD CONSTRUCTION

FRAME

4-7/8" deep, 22 gauge galvanized steel

BLADES

3-3/8" wide, 22 gauge galvanized steel

UNDERSIZED

1/4" under ordered size unless specified otherwise

FUSIBLE LINK

165° Standard (others available)

SPRING

Stainless Steel – 301 Negator type

MINIMUM SIZE

4"w x 4"h

MAXIMUM SIZE

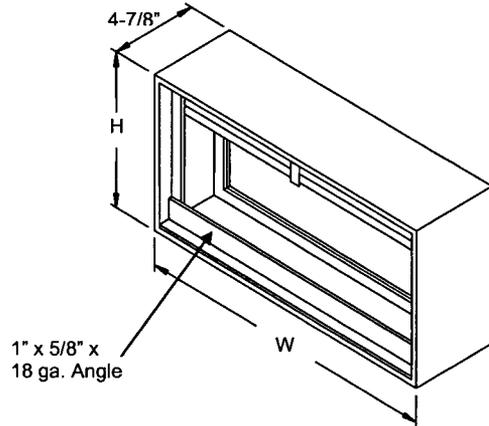
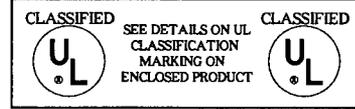
24"w x 24"h

MAXIMUM STATIC PRESSURE (damper closed)

4" WG @ 2000 FPM



03225-0751-001.



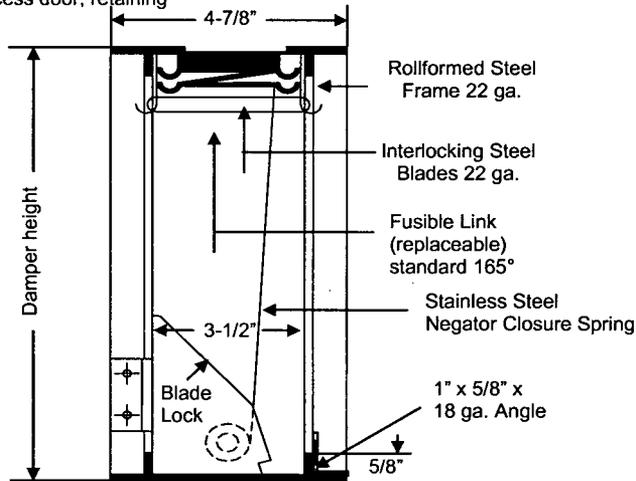
OPTIONAL CONSTRUCTION

FRAME – Available in Stainless Steel

BLADE – Available in Stainless Steel

FUSIBLE LINK – Electrically triggered link (ETL)

SLEEVE & DUCT CONNECTION – 10 ga. to 20 ga. galvanized steel to 30" in length. – transitions available in; round, oval, rectangular, or custom. Factory can install access door, retaining angles, flange connections or security bars.



Vertical Section

(Not available in horizontal)

DATE		ARCHITECT		CUSTOMER	
PROJECT					
ITEM	QTY	W	H	DESCRIPTION	