CRITERION 734

FIRE DAMPERS

SIGNATURES

Julie Wood Criterion Author	8/14/02 Date	FWO-FIRE Group	665-8279 Phone Number
Jim Streit Group Leader	8/14/02 Date	FWO-FIRE Group	667-9045 Phone Number
David McIntosh Maintenance Engineering Team	8-14-02 Date	FWO-SEM Group	667-3616 Phone Number
Kurt Beckman Acting Group Leader, ~~OIC~~	8/14/02 Date	FWO-SEM Group	667-9769 Phone Number
Facility Management Council Committee Chairperson	8/14/02 Date	FMC Group	665-4854 Phone Number

RECORD OF REVISIONS

Revision No.	Date	Description
0	08/27/98	Initial Issue
1	05/31/02	This revision reflects the conversion from a WordPerfect document into a Microsoft Word document and additional clarification on how to develop criteria. This revision includes: • The addition of a Table of Contents, • The use of basis statements in Sections 6, 7, and 9. • Revision to Section 9, "Required Documents," and • Further clarification in the use of references.
	7/29/02	Incorporation of wording changes from FM Council in Section 6.0

TABLE OF CONTENTS

CRITERION 734

FIRE DAMPERS

1.0 PURPOSE

The purpose of this Criterion is to establish the minimum requirements and best practices for operation and maintenance of fire dampers at LANL.

This document addresses the requirements of LIR 230-05-01(Ref 10.1), "Operations and Maintenance Manual."

Implementation of these requirements and recommendations satisfies DOE Order 430.1A (Ref. 10.2), "Life Cycle Asset Management," Attachment 2 "Contractor Requirements Document," Paragraph 2, sections A through C, which in part require UC to "…maintain physical assets in a condition suitable for their intended purpose" and employ "preventive, predictive, and corrective maintenance to ensure physical asset availability for planned use and/or proper disposition." Compliance with DOE Order 430.1A is required by Appendix G of the UC Contract.

2.0 SCOPE

The scope of this Criterion includes the routine inspection, testing, preventive maintenance and predictive maintenance of fire dampers. This Criterion does not address corrective maintenance actions required to repair or replace equipment.

3.0 ACRONYMS AND DEFINITIONS

3.1 Acronyms

CFR	Code of Federal Regulations
DOE	Department of Energy
ITM	Inspection, Testing, and Maintenance
LIR	Laboratory Implementing Requirement
LPR	Laboratory Performance Requirement
O&M	Operations and Maintenance
PP&PE	Personal Property and Programmatic Equipment
RP&IE	Real Property and Installed Equipment

SMACNA	Sheet Metal and Air Conditioning Contractors National Association,
SSC	Structures, Systems, and Components
SSS	Support Services Subcontractor
UC	University of California

3.2 Definitions

Breakaway Connection – A joint connecting a fire damper sleeve and attached duct work which will allow collapse of the ductwork during a fire without disturbing the integrity of the fire damper.

Fire Damper-a ventilation damper located within ventilation system ductwork at the point where the ductwork penetrates a fire rated barrier. It is designed and tested to remain in the open position during normal operation and to automatically close during a fire on one side of the fire barrier. Automatic closure is typically initiated by the melting of a fusible link on the damper. In the closed position, it retards or prevents the passage of heat and flame across the fire barrier, inside the duct, thereby preventing spread of fire from one side of the barrier to the other. A "fire damper" is not credited with preventing the spread of smoke through ductwork.
Note: A "fire and smoke" damper is credited with the fire damper function (above) and with minimizing or preventing spread of smoke through ductwork.

A "Dynamic" fire damper is designed to close under normal air flow, and will always be equipped with closure springs.

A "Static" fire damper is not designed to close under normal air flow. Only horizontal dampers of this type are equipped with closure springs.

Fire Damper Sleeve – A steel enclosure surrounding a fire damper, in an air passage penetration of a fire rated barrier mounted in such a manner that disruption of attached ductwork, if any, will not impair operation of the fire damper. Sleeves may be omitted on certain alternative damper arrangements.

Listed or Approved-All fire protection equipment is required to be listed or approved for its intended use by an independent testing organization such as Underwriters Laboratories (UL) or Factory Mutual (FM).

Management Level Determination (ML1, ML2, ML3, ML4)-A classification system for determining the degree of management control applied to facility work. See LIR 230-01-02 for definitions of each ML level.

4.0 RESPONSIBILITIES

4.1 FWO-Systems, Engineering and Maintenance (FWO-SEM)

4.1.1 FWO-SEM is responsible for the administrative content of this Criterion and monitoring the applicability and the implementation status of this Criteria and either assisting the organizations that are not applying or meeting the implementation expectations contained herein or elevating their concerns to the director(s).

Basis: LIR 301-00-01.11; Issuing and Managing Laboratory Operations Implementation Requirements and Guidance, Section 5.4, OIC Implementation Requirements.

4.1.2 FWO-SEM shall provide technical assistance to support implementation of this Criterion.

4.2 FWO-Fire Protection (FWO-FIRE)

4.2.1 FWO-FIRE is responsible for the technical content of this Criterion and monitoring its proper implementation across the Laboratory.

4.2.2 FWO-FIRE shall provide technical assistance to support implementation of this Criterion.

4.2.3 FWO-FIRE is responsible for determining what dampers are credited as fire dampers, and for transmitting this information for incorporation into the Master Equipment List (MEL). To this extent, FWO0FIRE is responsible for the list of fire dampers contained in the MEL. Changes to the fire damper information in the MEL must be approved by FWO-FIRE, including modifying existing fire dampers, or adding or removing fire dampers from the MEL.

4.3 Facility Manager

4.3.1 Responsible for operations and maintenance of institutional, or Real Property and Installed Equipment (RP&IE) under their jurisdiction, in accordance with the requirements of this document.

4.3.2 Responsible for operations and maintenance of those Personal Property and Programmatic Equipment (PP&PE) systems and equipment addressed by this document that may be assigned to the FM in accordance with the FMU-specific Facility/Tenant Agreement.

4.4 Group Leader

4.4.1 Responsible for operations and maintenance of those PP&PE systems and equipment addressed by this document which are under their jurisdiction.

4.4.2 Responsible for system performance and subsequent replacement or refurbishment of assigned PP&PE.

4.5 Authority Having Jurisdiction (AHJ) – Fire Marshal

4.5.1 The AHJ is responsible for providing a decision on a specific technical question regarding this Criterion.

4.5.2 The LANL Fire Marshal is the approval authority for any exceptions or variances to this Criterion.

4.5.3 The LANL Fire Marshal is the approval authority for design changes to fire dampers, including removing or abandoning existing fire dampers.

4.6 Support Services Subcontractor

4.6.1 Responsible for providing ITM of the fire protection systems addressed in this Criterion at the request of the responsible Facility Manager.

4.6.2 Responsible for coordinating work with the operating group and Facility Manager to conduct ITM in the affected area.

5.0 PRECAUTIONS AND LIMITATIONS

5.1 Precautions

This section is not intended to identify all applicable precautions necessary for implementation of this Criterion. A compilation of all applicable precautions shall be contained in the implementation procedure(s) or work control authorization documents. The following precautions are intended only to assist the author of a procedure or work control document in the identification of hazards/precautions that may not be immediately obvious.

5.2 Limitations

The intent of this Criterion is to identify the minimum generic requirements and recommendations for SSC operation and maintenance across the Laboratory. Each user is responsible for the identification and implementation of additional facility specific requirements and recommendations based on their authorization basis and

unique equipment and conditions, (e.g., equipment history, manufacturer warranties, operating environment, vendor O&M requirements and guidance, etc.).

Nuclear facilities and moderate to high hazard non-nuclear facilities will typically have additional facility-specific requirements beyond those presented in this Criterion. Nuclear facilities shall implement the requirements of DOE Order 4330.4B (Ref. 10.3) (or 10 CFR 830.340, Maintenance Management, when issued) as the minimum programmatic requirements for a maintenance program. Additional requirements and recommendations for SSC operation and maintenance may be necessary to fully comply with the current DOE Order or CFR identified above.

6.0 REQUIREMENTS

Minimum requirements that Criterion users shall follow are specified in this section. Requested exceptions and variances to these requirements shall be prepared and submitted to FWO-SEM in accordance with LIR 301-00-02 (Ref. 10.4), "Variances and Exceptions to Laboratory Operations Requirements," for review and approval. The Criterion users are responsible for analysis of operational performance and SSC replacement or refurbishment based on this analysis. Laws, codes, contractual requirements, engineering judgement, safety matters, and operations and maintenance experience drive the requirements contained in this section. Variance and exceptions to this Criterion shall be approved by the LANL Fire Marshal.

6.1 Operations Requirements

6.1.1 Operations Checklist

Fire dampers must remain operational at all times. Fire dampers shall be deemed operational when the following conditions are met:

- Fire dampers are properly installed in all required openings (see attached information for guidance).
- Each fire damper is "Listed or Approved" and is in good repair.
- Fire dampers are normally open, and are arranged for automatic closure (with actuation by heat, for example). NOTE: A fire damper in the closed position due to abnormal conditions may be considered operable from a fire protection standpoint, but the closed position of the damper may make the ventilation system inoperable.

  Basis: NFPA 90A, 1999 Standard for the Installation of Air Conditioning and Ventilating Systems, Section 3-4.5 and Appendix A-4-3.3

6.2 Maintenance Requirements

CAUTION: The inside of ductwork is generally considered a confined space. Follow appropriate LANL guidelines and requirements for working in confined spaces.

6.2.1 Inspection

Every two years, examine each fire damper using the following criteria:

- Fire damper is properly installed in accordance with SMACNA guidelines for fire damper installation (see Appendix C to this Criterion for selections from SMACNA guidelines).
- Retaining angles are properly installed to cover the required gap between the damper/sleeve and the structural opening, and shall be verified to overlap the structural opening. Angles are not to be attached to the wall or floor, but only to the sleeve.
- Damper is properly attached to sleeve (tack-welded, bolted, screwed, or riveted).
- Damper (including frame/sleeve) is not rusted, bent, or blocked such that the damper closure would be prevented.

  NOTE: If required perimeter gap between damper/sleeve and structural opening has been filled with grout or other seal material, damper frame may be bowed in, preventing damper closure.
- Damper springs are not rusted, bent or (if flat type, as on curtain dampers) twisted.
- For curtain type dampers, retaining straps on which the fusible link is installed should not extend underneath the bottom damper blade (this can impede damper

closure), however this may not be preventable where the fusible link is small. In all cases, the fusible link must be centered on the bottom damper blade.

- Where duct is attached to sleeve or damper, ensure the connection is an approved duct breakaway connection.
- Fusible link and/or actuators are in working order (no obvious deficiencies or flaws such as excessive rust or deformation of components).
- Fusible link is Listed or Approved by an independent testing laboratory, and is not rated less than 160 degrees F. ((Link should be marked with Listing or Approval, and should be labeled with temperature rating. If this information cannot be obtained from visual inspection, replacement of link with one of known manufacture and rating is recommended.)
- Damper is properly labeled. (Fire damper label is typically attached to inside of damper frame or bottom curtain on curtain-type dampers, and indicates Approval or Listing by a recognized independent testing laboratory. If a label cannot be located, contact the LANL Fire Marshal for disposition.)

Basis: NFPA 90A, 1999 Standard for the Installation of Air Conditioning and Ventilating Systems, Appendix B; SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems; and LIR 402-910-01, LANL Fire Protection Program.

6.2.2 Testing

CAUTION: Prior to drop-testing of any fire damper, inspect the fire damper label to determine if the fire damper is a Dynamic fire damper or a Static fire damper. Static fire dampers, and any damper that cannot be verified to be Dynamic, must be drop tested under NO AIR FLOW conditions to avoid damage to damper/ductwork.

CAUTION: Fire dampers can close with considerable force. Flat-type damper springs have sharp edges. Take appropriate safety precautions to prevent injury to hands and fingers.

(a) All new fire dampers shall be drop-tested as part of installation acceptance testing.
(b) All fire dampers shall be drop-tested as part of acceptance testing following fire damper repair work or work on associated ductwork or fire barrier penetration.
(c) Fire dampers shall be drop-tested once every 4 years using the following steps:

1. Remove the fusible link and verify that the damper fully closes and latches (if a latch is installed).
2. Re-open damper and re-install fusible link.
3. Lubricate moving parts and/or clean damper as deemed necessary.

Basis: NFPA 90A, 1999 Standard for the Installation of Air Conditioning and Ventilating Systems, Chapter 5 and Appendix B.

6.2.3 Maintenance

6.2.3.1 Other than as described above in Section 6.2.2-(c)-3, there are no periodic preventive or predictive maintenance activities for fire dampers.

6.2.3.2 Correct deficiencies identified during inspection or testing in accordance with the manufacturer's recommendations and requirements listed in NFPA 90A, 1999 Standard for the Installation of Air Conditioning and Ventilating Systems. Contact FWO-FIRE for additional guidance if required.

Basis: NFPA 90A, 1999 Standard for the Installation of Air Conditioning and Ventilating Systems.

6.3 Impairments and Modifications

6.3.1 If one or more of the operations checklist requirements listed in Section 6.1.1 above are not maintained, follow the actions outlined in Criterion 733, Fire Protection System Impairment Control Program.

6.3.2 Visually inspect fire damper before returning it to service following maintenance or modification.

6.3.3 Conduct a drop test of the fire damper before returning it to service following maintenance or modification.

6.4 Personnel

Alarm verification (if any) will be conducted by SSS personnel, in compliance with LIR 402-910-01, Section 6.0.

Basis: LIR 402-910-01.4, LANL Fire Protection Program, Section 5.1.

7.0 RECOMMENDATIONS AND GOOD PRACTICES

The information provided in this section is recommended based on acceptable industry practices and should be implemented by each user based on his/her unique application and operating history of the subject systems/equipment.

7.1 Operations Recommendations

7.1.1 Operational testing may be conducted by other than SSS personnel. Testing personnel must consider the potential for the ventilation system to be made inoperable during testing and should identify contingency plan prior to testing.

7.2 Maintenance Recommendations

7.2.1 Persons other than SSS Fire Protection Maintenance personnel may conduct visual inspection requirements identified in this document.

7.2.2 Installation of a brass tag at the fire damper may be done to indicate date of last inspection. Installation of such a tag must not interfere with proper operation of the damper.

7.2.3 As a core function, the SSS provides inspection, testing, and maintenance services for complex fire protection systems and shall remove systems from service for testing, drills, modifications and related activities.

Basis: LIR 402-910-01.4, LANL Fire Protection Program, Section 5.2.

8.0 GUIDANCE

8.1 Operations Guidance

8.1.1 No operations guidance available.

8.2 Maintenance Guidance

8.2.1 No maintenance guidance available.

9.0 REQUIRED DOCUMENTATION

Maintenance history shall be maintained by the Facility Manager for fire dampers to include, as a minimum, the parameters listed in the Table 9-1 below:

Table 9-1 Documentation Parameters

MAINTENANCE HISTORY DOCUMENTATION PARAMETERS				
PARAMETER	ML 1	ML 2	ML 3	ML 4
Fire Damper Maintenance Activities				
Repair / Adjustments	X	X	X	X
PM Activities	X	X	X	X
Fire Damper Equipment Problems				
Failure Dates	X	X	X	X
Failure Root Cause	X	X	X	X
Fire Damper Inspection Results (per this Criterion)				
Inspection Date	X	X	X	X
SSC Condition	X	X	X	X

Basis: Documentation of the parameters listed in Table 9-1 above satisfies the requirements of LPR 230-07-00, Criteria 2, (Ref. 10.5) which states; "Maintenance activities, equipment problems, and inspection and test results are documented."

10.0 REFERENCES

The following references, and associated revisions, were used in the development of this document.

10.1 DOE O 430.1A, Attachment 2 "Contractor Requirements Document" (Paragraph 2, Sections A through C), a requirement of Appendix G of the UC Contract.

10.2 DOE Order 4330.4B, Maintenance Management Program, Section 3.4.9.

10.3 LIR 230-05-01.0, Operations and Maintenance Manual.

10.4 LIR 230-01-02.2, Graded Approach for Facility Work

10.5 LIR 301-00-02.0, Variances and Exceptions to Laboratory Operation Requirements.

10.6 LIR 402-910-01.4, LANL Fire Protection Program.

10.7 LPR 230-07-00, Maintenance History, Performance Criteria [2].

10.8 NFPA 90A, 1999 Standard for the Installation of Air Conditioning and Ventilating Systems.

10.9 SMACNA, Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems.

11.0 APPENDICES

Appendix A: Two Year Fire Damper Inspection Checklist

Appendix B: Fire Damper Testing Steps

Appendix C: Selections from SMACNA "Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems", Fourth Edition, 1992.

Appendix A
Two Year Fire Damper Inspection Checklist

Examine each damper using the following criteria:

- Fire damper is properly installed in accordance with SMACNA guidelines for fire damper installation (see Appendix C to this Criterion for selections from SMACNA guideline).
- Retaining angles are properly installed to cover the required gap between the damper/sleeve and the structural opening, and shall be verified to overlap the structural opening. Angles are not to be attached to the wall or floor, but only to the sleeve.
- Damper is properly attached to sleeve (tack-welded, bolted, screwed, or riveted).
- Damper (including frame/sleeve) is not rusted, bent, or blocked such that the damper closure would be prevented.

  NOTE: If required perimeter gap between damper/sleeve and structural opening has been filled with grout or other seal material, damper frame may be bowed in, preventing damper closure.
- Damper springs are not rusted, bent or (if flat type, as on curtain dampers) twisted.
- For curtain type dampers, retaining straps on which the fusible link is installed should not extend underneath the bottom damper blade (this can impede damper closure), however this may not be preventable where the fusible link is small. In all cases, the fusible link must be centered on the bottom damper blade.
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- Fusible link and/or actuators are in working order (no obvious deficiencies or flaws such as excessive rust or deformation of components).
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- Damper is properly labeled. (Fire damper label typically is attached to inside of damper frame or bottom curtain on curtain-type dampers, and indicates Approval or Listing by a recognized independent testing laboratory. If a label cannot be located, contact the LANL Fire Marshal for disposition.)

Basis: NFPA 90A, 1999 Standard for the Installation of Air Conditioning and Ventilating Systems, Appendix B; SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems; and LIR 402-910-01, LANL Fire Protection Program.

Appendix B

Fire Damper Testing Steps

CAUTION: Prior to drop-testing of any fire damper, inspect the fire damper label to determine if the fire damper is a Dynamic fire damper or a Static fire damper. Static fire dampers, and any damper that cannot be verified to be Dynamic, must be drop tested under NO AIR FLOW conditions to avoid damage to damper/ductwork.

CAUTION: Fire dampers can close with considerable force. Flat-type damper springs have sharp edges. Take appropriate safety precautions to prevent injury to hands and fingers.

(a) All new fire dampers shall be drop-tested as part of installation acceptance testing.

(b) All fire dampers shall be drop-tested as part of acceptance testing following fire damper repair work or work on associated ductwork or fire barrier penetration.

(c) Fire dampers shall be drop-tested once every 4 years using the following steps:

1. Remove the fusible link and verify that the damper fully closes and latches (if a latch is installed).

2. Re-open damper and re-install fusible link.

3. Lubricate moving parts and/or clean damper as deemed necessary.

Basis: NFPA 90A, 1999 Standard for the Installation of Air Conditioning and Ventilating Systems, Chapter 5 and Appendix B

Appendix C

Selections from SMACNA's

"Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems"

Fourth Edition
1992

- SMACNA document Cover Sheet
- UL Accepted Duct-Sleeve Connections (Breakaway Connections) (SMACNA Fig. 2-2)
- Vertical Fire Damper Installations (SMACNA Fig. 2-3)
- Horizontal Fire Damper Installations (SMACNA Fig. 2-5)
- Fire Damper Opening Protection (SMACNA Fig. 3-1)
- Diagonal Penetration (Fire Dampers) (SMACNA Fig. 3-3)
- Curtain Fire Dampers (SMACNA Fig. 4-1)
- Single Blade Fire Damper (SMACNA Fig. 4-3)
- Multiblade Fire Damper (SMACNA Fig. 4-4)
- Duct Liner Interruption (SMACNA Fig. 5-2)
- NFPA Standard 90A Application (SMACNA Appendix A)

Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems

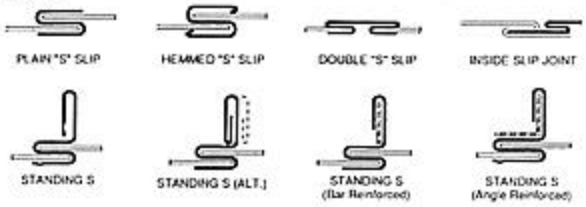
Fourth Edition, 1992

4201 Lafayette Center Drive
Chantilly, Virginia 22021-1209

Figure 2-2

UL Accepted Duct-Sleeve Connections (Breakaway Connections)

1. Duct-sleeve connections listed in UL 555, Fourth Edition, "Standard For Fire Dampers".



2. Additional duct-sleeve connections which were tested by SMACNA and witnessed by UL in 1991. The connections performed within the requirements of the UL test criteria. See note 1.

   (a) Joints using connections shown in 1. above with a maximum of two #10 sheet metal screws on each side and on the bottom located in the center of the slip pocket and penetrating both sides of the slip pocket. Note: UL tested duct sealant may be used.

   (b) Joints using connectors of the types shown in 1. above on the top and the bottom and using flat drive slips not exceeding 20" duct height on the sides (see sketch below). Note: Duct sealant may be used.

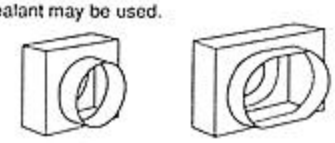
   (c) Joints where round or oval spiral ducts attach to round or oval collars which are part of the damper sleeve as shown below. #10 sheet metal screws are spaced equally around the circumference of the duct per the following:

   - Duct diameters 22" and smaller — 3 screws.
   - Duct diameters over 22" to and including 36" — 5 screws.

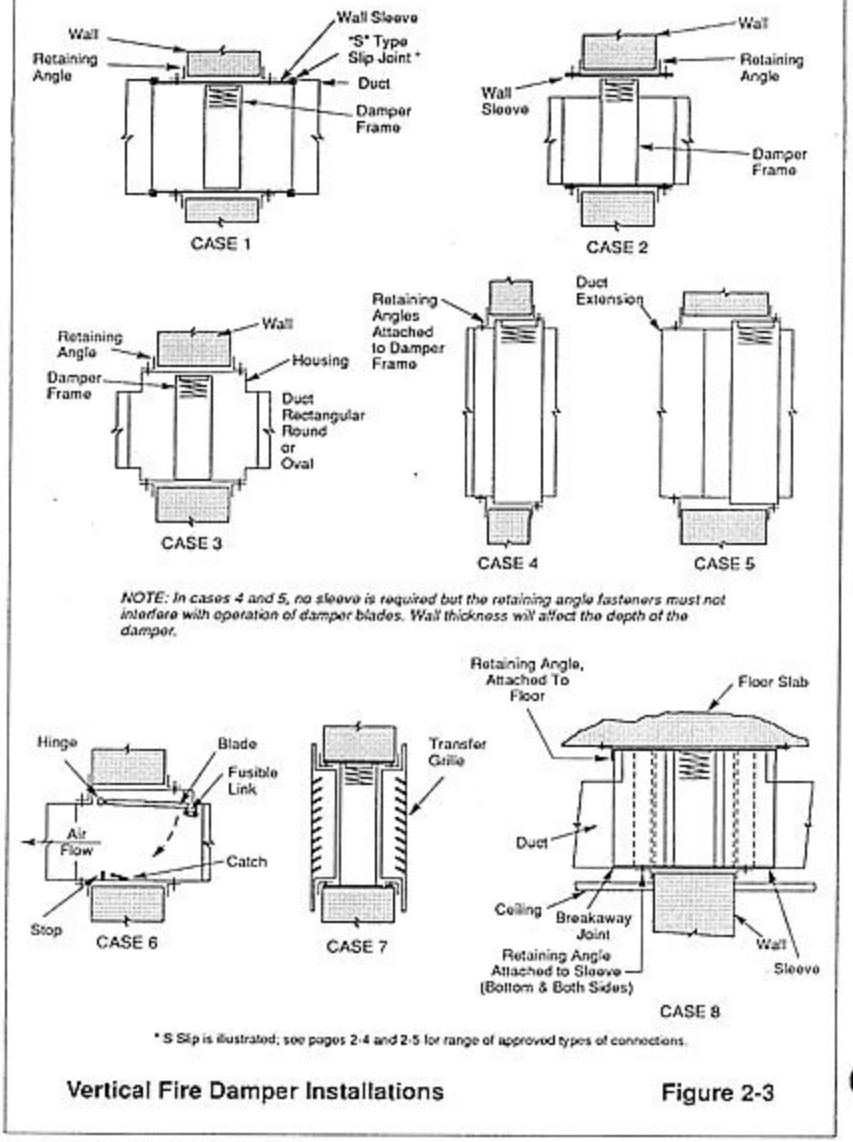
   Notes:

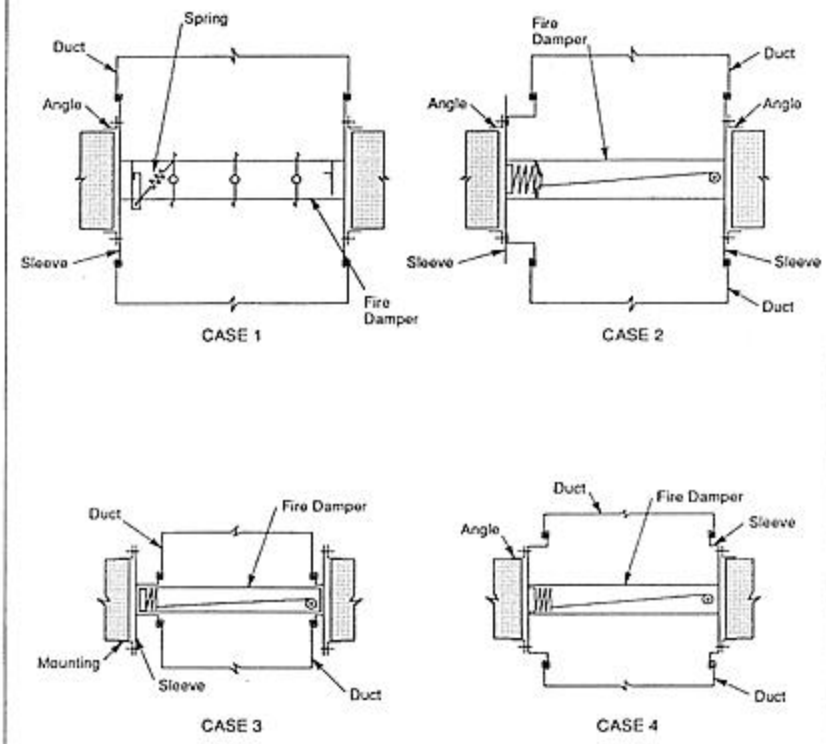
   (1) For flat oval ducts, the diameter shall be considered the largest (major) dimension of the duct.

   (2) Duct sealant may be used.



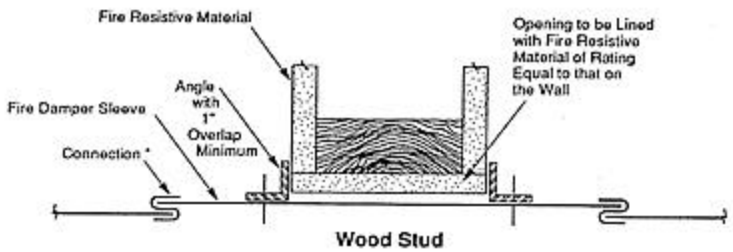
DAMPER/SLEEVE ASSEMBLIES WITH COLLARS FOR ROUND AND FLAT OVAL DUCTS



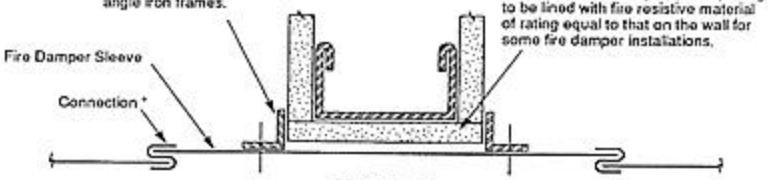


* S Slip connections are illustrated, other types of breakaway connections can be used

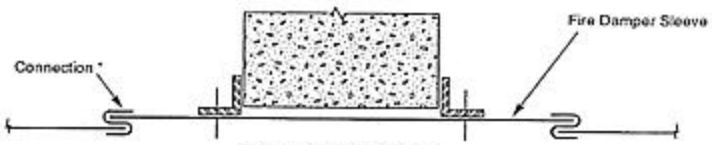
Horizontal Fire Damper Installations **Figure 2-5**



Wood Stud



Metal Stud

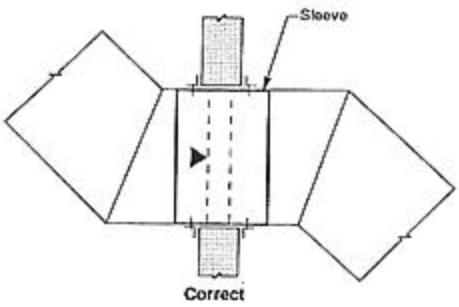


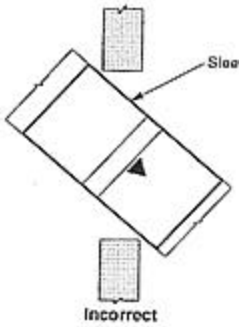
Concrete or Masonry

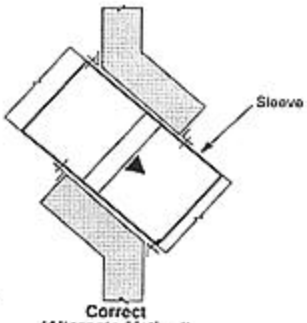
* S Slip illustrated, see pages 2-4 and 2-5 for range of approved types of connection.

NOTE: Thickness and type of fire resistive material may vary with the jurisdiction. Specific framing requirements of openings should be provided in the architectural and structural drawings that are submitted for building permits.

Fire Damper Opening Protection **Figure 3-1**

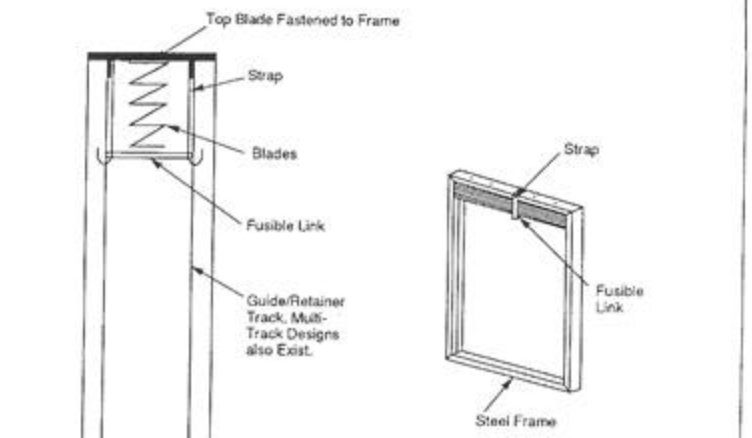




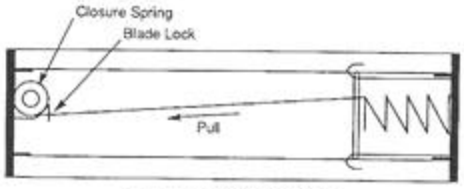


NOTE: Access for service must be maintained.

Diagonal Penetration (Fire Dampers) **Figure 3-3**

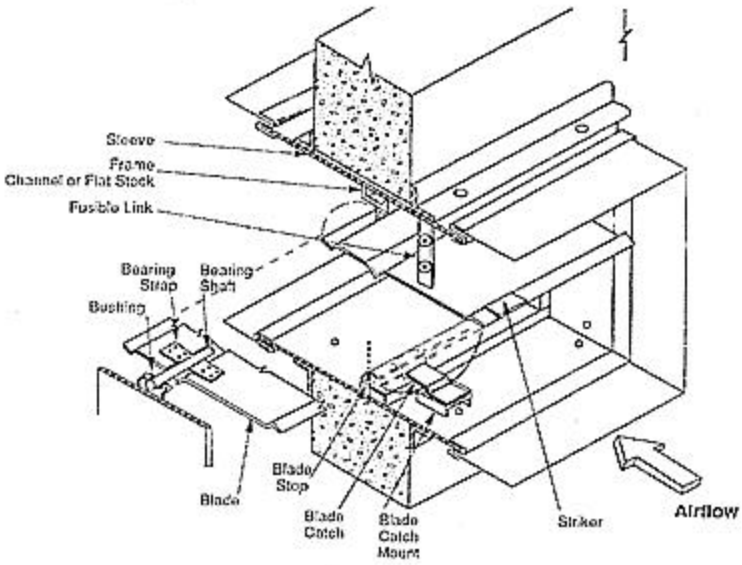


Vertical (Wall) Type
Has Gravity or Spring Closure

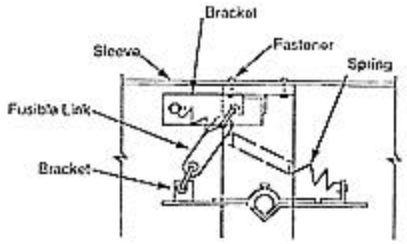


Horizontal (Floor) Style
(Has Springloading)

Curtain Fire Dampers Figure 4-1

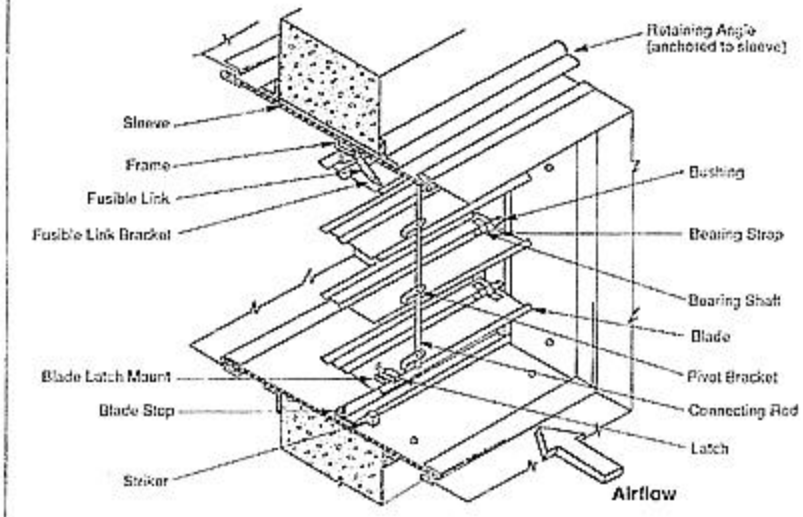


* Slip sleeve connection is illustrated; see pages 2-4 and 2-5 for range of approved types of connections.

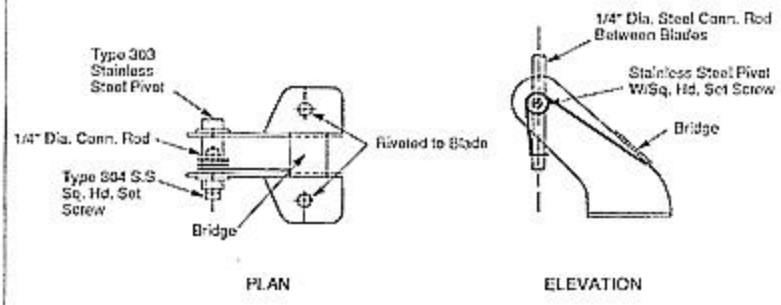


Springload Detail for Horizontal Single Blade Damper

Single Blade Fire Damper **Figure 4-3**



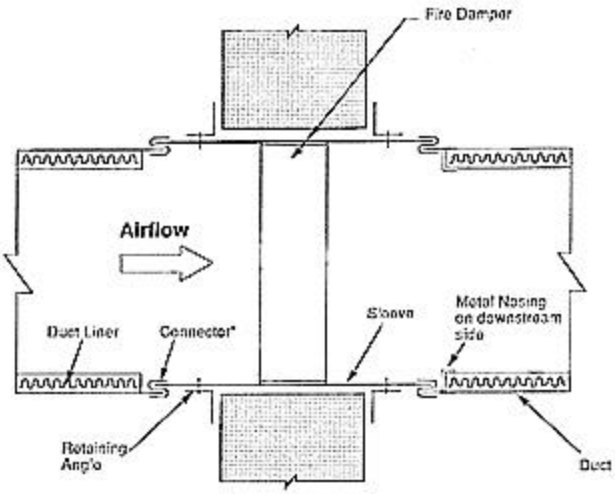
* S Slip sleeve connection is illustrated; see pages 2-4 and 2-5 for range of approved types of connections.



Pivot Bracket

Pivot Bracket is spring loaded when damper is in horizontal position

Multiblade Fire Damper **Figure 4-4**



Interruption of duct liner at the fire damper is required by NFPA Standard 90A. Where 90A is applicable installation should be made as shown and should otherwise conform to the SMACNA HVAC Duct Construction Standards-Metal and Flexible.

The designer should specify external insulation as shown to prevent condensation occurring on unlined metal at penetrations. Where the provisions of NFPA 90A are applicable, neither insulation nor liner can extend through the walls or floors.

* S Slip is illustrated; see pages 2-4 and 2-5 for range of approved types of connections.

Duct Liner Interruption **Figure 5-2**