

Northbrook, Illinois • (847) 272-8800
 Melville, New York • (516) 271-6200
 Santa Clara, California • (408) 985-2400
 Research Triangle Park,
 North Carolina • (919) 549-1400
 Camas, Washington • (360) 817-5500



Subjects 555 (555C, 555S)
 (In reply, refer to Subject 555)

333 Pfingsten Road
 Northbrook, IL 60062
 March 29, 1996

TO: Fire Council of Underwriters Laboratories Inc.,
 Subscribers to UL's Standards Service for:
 Fire Dampers;
 Ceiling Dampers;
 Leakage Rated Dampers for use in Smoke Control Systems;
 and
 Others Interested

SUBJECT: Report of the Meeting of the Industry Advisory Conference of UL for Fire Dampers

SUMMARY OF TOPICS

The following topics were discussed at the meeting:

1. Purpose of UL's IAC
2. Heat responsive devices in UL 555
3. Fire damper closure
4. Discussion of UL 555C
5. Update on UL 555, UL 555C, UL 555S and BOCA activities
6. Update on ISO TC92/SC2/WG4 activities
7. Heated air test discussion
8. Leakage rated dampers on air handling units
9. Environmental awareness
10. Miscellaneous
 - A) Use of actuator to close fire dampers
 - B) Update on ANSI canvass for UL 555
 - C) Testing of volume control damper

COMMENTS DUE: April 30, 1996

A meeting of the Industry Advisory Conference of UL for Fire Dampers was held on March 1, 1996 at Tradewinds, St. Petersburg Beach, Florida. The purpose of the meeting was to discuss issues pertinent to the product categories relating to fire dampers, ceiling dampers and leakage rated dampers for use in smoke controlled systems.

A not-for-profit organization
 dedicated to public safety and
 committed to quality service

Attached as Appendix A is a list of those who attended the meeting. Questions regarding interpretation of requirements should be directed to the responsible UL Staff. Please see Appendix B of this bulletin regarding designated responsibility for the subject product categories.

* * * * *

The following report is not intended to be a verbatim transcript of the discussions at the meeting, but is intended to record the significant features of those discussions.

1. PURPOSE OF UL'S IAC

UL outlined the purposes and goals of the IAC as representing an important step in UL's procedure for the development of requirements, test methods, standards and related product evaluation programs. Members of the IAC are appointed by UL on the basis of their technical expertise and involvement in UL's programs. UL establishes technical requirements on the basis of the information from a variety of sources. It is intended that IAC members, functioning in an advisory role, serve as individual representatives of industry. Therefore, UL calls upon the IAC for discussion and review of proposals prior to submission for review by all involved manufacturers, UL's engineering councils, and others expressing interest in the product category. The IAC representatives are also given an opportunity to present new ideas, modifications of existing ideas or requirements, and suggestions as to how UL may better serve its clients.

2. HEAT RESPONSIVE DEVICES, UL 555

Paragraph 5.2 of UL 555 specifies a maximum heat responsive device temperature rating of 286°F (141°C). This maximum temperature limitation is also specified in the National Fire Protection Association's (NFPA) Standard on Installation of Air Conditioning and Ventilating Systems, NFPA 90A.

It has been proposed to revise NFPA 90A to establish a maximum temperature rating of 350°F. The proposal has been recommended for approval by the NFPA Technical Committee on Air Conditioning at its November 16, 1995 meeting. The Technical Committee's action will be reported in NFPA's upcoming Report on Comments. Adoption of the proposal is anticipated to occur at the NFPA Annual Meeting on May 22, 1996.

Upon NFPA adoption, UL will issue a bulletin proposing to revise UL 555 to increase the maximum temperature rating of heat responsive devices to 350°F and also propose a modification to the one minute closure requirement in paragraph 10.1.1.2 of UL 555. The proposal will recommend an immediate effective date after a comment period of approximately 6 weeks.

3. FIRE DAMPER CLOSURE

UL has been developing a new method to evaluate the closure of the fire dampers during the fire endurance test. At the start of the fire endurance test, with the dampers in the open position, there is a significant draft affect within the furnace. This results in a non-uniform heat or flame pattern adjacent to the open damper. UL will now allow manufacturers to conduct fire tests utilizing a cover over the damper at the beginning of the tests. The cover would be removed once the damper is in the closed position. The cover negates the room air from entering the furnace through the open damper. This will allow for more uniform test conditions within the furnace at the start of fire tests.

An industry representative questioned if paragraph 10.1.1.2 of UL 555 would be revised with respect to closing dampers within one minute of the fire test or when the temperature at the heat responsive device is 286°F. UL indicated that they intend to revise this paragraph. It was noted that the temperature of the time-temperature curve used to control the furnace at one minute is 285°F. As such, UL indicated that they also intend to eliminate the one minute requirement and propose a new time limit requirement.

4. DISCUSSION OF UL 555C

A draft of the proposed revisions to the Standard for Ceiling Dampers, UL 555C was issued on March 31, 1995. Some comments were received recommending that UL clarify the terminology of ceiling air devices throughout the Standard. UL has reviewed ARI and ASHRAE publications as sources for industry terminology. An industry representative suggested that the term ceiling air devices be defined in the Standard to encompass the different types of products Classified by UL.

At the November 16, 1995 meeting of the NFPA Air Conditioning Committee to discuss comments on the Report on Proposals (ROP) to NFPA 90A, the Committee accepted the proposal to require ceiling dampers to close under airflow. The proposal will be under full Committee vote on May 22, 1996 at the annual meeting. If the proposal is accepted, UL would then propose revisions to UL 555C to require that dampers close under airflow conditions. UL recommended that a minimum airflow be established when testing the ceiling dampers under airflow. Industry members concurred with this recommendation. The suggested airflows were 1200 fpm at 1 in. w.c. for ducted supply systems, 700 – 800 fpm at .2 in. w.c. for unducted supply systems and 500 fpm for return air systems.

The proposed revisions will also include consistent terminology for ceiling air devices. UL is requesting input with regard to terminology and also for the minimum airflow values.

5. UPDATE ON UL 555, UL 555C, UL 555S AND BOCA ACTIVITIES

The fifth edition of UL 555 dated May 31, 1995 is referenced in the 1996 version of BOCA National Building Code. UL 555C and UL 555S are not currently referenced in the BOCA Code. UL is working with BOCA to revise the permissive language in UL 555C and UL 555S. The industry representatives requested they be advised of UL's progress.

UL indicated that Dan Kaiser is involved with revising these standards. However, UL staff functioning as liaison with the various model code organizations were identified as follows:

Dan Marcinek for BOCA, Northbrook Office, (847) 272-8800 extension 42053

Jim Barthman for ICBO, Santa Clara Office, (408) 985-2400 extension 32273

Robert Scott for SBCCI, RTP Office, (919) 549-1400 extension 11854.

6. UPDATE ON ISO TC92/SC2/WG4 ACTIVITIES

It was reported ISO Draft International Standard (DIS) 10294-1, Fire Resistance Test, Fire Dampers for Air Duct Work Systems - Part I: Method of Test, has been published as an ISO Standard. UL will conduct tests in accordance with ISO 10294-1. Classified dampers tested in accordance with ISO 10294-1 will be published in UL's Directory, "Products Evaluated in Accordance with International, Regional and Foreign National Standards".

ISO CD 1-294-2 (Classification, Criteria and Field Evaluation of Test Results) and ISO CD 10294-3 (Commentary) will be published as a DIS.

Working Group 4 is presently working on developing a Standard for Thermal Release Mechanisms. The Standard is proposed to consist of two tests. One test is intended to document the activation temperature of the thermal release mechanism. The method consists of placing the thermal release mechanism in air at 20°C flowing at a rate of one meter per second. The temperature of the air is increased at a rate of 20°C per minute until the thermal release mechanism activates. The proposal requires the thermal release mechanism to activate at a temperature equal to or lower than 100°C. The second test is intended to document the stability of the thermal release mechanisms. For this test, a load equal to two times the normal service load is applied to the thermal release mechanism. The thermal release mechanism is exposed to air at 60°C flowing at a rate of one meter per second. After stabilization, the thermal release mechanism is to remain in the 60°C environment for 1 hour without activating.

The proposed Standard also includes provisions for subjecting the thermal release mechanism to a 20 percent salt spray exposure for 5 days before conducting the activation or stabilization test. The salt spray exposure is proposed to be optional.

Industry supported the use of the salt spray exposure but requested the intensity of the salt spray be representative of a 40 year design life. UL will attempt to determine if a relationship exists between:

- a) design life,
- b) the salt spray concentration, and
- c) the exposure time to the salt spray

UL will then issue the appropriate proposal to the Working Group 4.

7. HEATED AIR TEST DISCUSSION

An industry representative indicated that the Air Movement Controllers Association (AMCA) has completed draft revisions to AMCA 500 to include a test methodology to conduct tests under heated airflow.

UL indicated that proposed revisions to UL 555 and UL 555S with respect to the heated air test are currently being worked on and UL anticipates issuing the proposed revisions mid-year.

UL indicated the need to expand on the guide information pages in the Building Materials Directory to clarify the Classification of dampers as well as establish a new product category for products that are evaluated in accordance with both the Standard for Fire Dampers, UL 555 and the Standard for Leakage Rated Dampers for Smoke Control Systems, UL 555S.

Industry representatives recommended that UL consider the establishment of minimum airflow values for damper testing. A 2000 fpm minimum was suggested. The industry representatives also suggested that UL consider the establishment of a safety factor. UL will consider these items when developing the proposed revisions.

It was reported that ASHRAE has established a standards project to develop a standard for dampers used in smoke control systems. It was suggested that this project be monitored.

8. LEAKAGE RATED DAMPERS ON AIR HANDLING UNITS

An industry representative provided input with respect to the installation of leakage rated dampers to isolate air handling units. The location of the damper would not necessarily be in a defined smoke barrier. It was indicated that this would be an acceptable installation of the dampers and that manufacturers could specify this use in their installation instructions.

9. ENVIRONMENTAL AWARENESS

UL suggested that considerations be given to the environmental impact of conducting the heated air tests under maximum airflow velocities. In an open system, the amount of natural gas consumed would be much greater than compared with a closed loop system.

10. MISCELLANEOUS

Use of actuator to close fire dampers

An industry representative raised a concern of an actuators ability to close fire dampers. The return springs on actuators are generally not as large as a jackshaft spring. Additionally, he raised a concern about electric motors freezing such that the return spring would not operate the dampers.

UL indicated that the Standards are generally developed as performance based Standards rather than prescriptive requirements. UL indicated that these types of dampers have met the performance based tests. A concern was also raised about the use of samples measuring 24 in. by 24 in. to evaluate damper closure. UL will research this requirement.

In regards to the field performance of actuators industry representatives discussed that actuators should be cycled four times per year. Currently, there are no code requirements to cycle the actuator.

An industry representative indicated a booklet on how to maintain the product will be developed and distributed with their product.

Update on ANSI canvass for UL 555

UL provided an update regarding the status of the ANSI canvass of the fifth edition of the Standard for Fire Dampers, UL 555. While the Standard has widespread canvass support, the ballots cast were not unanimously affirmative. The negative comments are currently being resolved.

Testing of volume control damper

UL indicated that leakage rated dampers could also be evaluated to be used as volume control dampers. UL would conduct a 100,000 cycle test on these dampers prior to the performance based airflow tests. UL would verify that the damper would be able to close or open at any intermediate open position of the damper under the maximum rated airflow conditions.

11. NEXT IAC MEETING - SCHEDULE

It was agreed that the annual IAC Meeting would continue to be scheduled to coincide with the AMCA/HVI/UL Policy Meeting. Therefore the next meeting of the IAC of UL for Fire Dampers will be scheduled for March, 1997.

Subjects 555 (555C, 555S)

-6-

March 29, 1996

In conclusion, UL thanked the industry representatives for their time, assistance, and valuable input.

REQUESTS FOR COMMENTS ON PROPOSALS

Please provide your comments concerning the meeting report.

Written comments should be sent to the attention of Mary Jo Borja at UL's Northbrook office, 333 Pfingsten Road, Northbrook, IL 60062-2096. Please reference all correspondence to Subject 555.

All comments should be sent by April 30, 1996.

Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with these proposals.

UNDERWRITERS LABORATORIES INC.

REVIEWED BY:

Mary Jo Borja

MARY JO BORJA (Ext. 42281)
Project Engineer
Standards Department

William S. Metes / rms

WILLIAM S. METES (Ext. 43200)
Managing Engineer
Engineering Services, Department 411

SR:AM

555MTGR.B01

APPENDIX A

ATTENDANCE AT THE MARCH 1, 1996 MEETING OF THE IAC FOR FIRE DAMPERS

Industry Representatives

Michael Beaver*
Lou Bentsen
Patrick Cockrum
Ray Feller
Roger Lichtenwald
Francis McCabe*
Dick Plettner
Robert Van Becelaere
John Young

NCA Mfg.
Honeywell Inc.
Pottorff Company, Inc.
Johnson Controls
Air Balance Inc.
Prefco Products, Inc.
Greenheck Fan Corporation
Ruskin
Nailor Industries Inc.

Invited Guests

Richard McKnight
Richard Niemela
Michael Wolf

Air Balance Inc.
Cesco Products
Greenheck Fan Corporation

UL Staff

William Metes, Chairman
Robert Berhinig
Dan Kaiser
Mary Jo Borja

UL Northbrook
UL Northbrook
UL Northbrook
UL Northbrook

*Not in attendance

APPENDIX B

DESIGNATED RESPONSIBILITY FOR UL

PRODUCT CATEGORIES

EMKU2, DAMPER OPERATORS

EMME, DAMPERS

EMNO, DAMPERS, FIRE DAMPERS

EMOY, DAMPERS, FIRE DAMPER OPERATORS

EMOG, DAMPERS, FIRE DAMPERS, CORRIDOR DAMPERS

EMQI, DAMPERS, LEAKAGE RATED DAMPERS

The individuals shown in the following tables are involved with the investigation of products covered under the subject categories. The Primary Designated Engineer (**shown in UPPERCASE letters**) coordinates the establishment and uniform interpretation of UL requirements applicable to the product categories. The Designated Engineers (**shown in lowercase letters**) work with the Primary Designated Engineer to interpret requirements and maintain standards.

Should you have questions regarding the interpretation of the requirements proposed in this bulletin or any adopted requirements that affect your product, you are encouraged to contact the individual at the office to which you normally submit your products.

The Industry Advisory Conference (IAC) Chairman for the subject categories is William Metes at UL's Northbrook office. The IAC Chairman oversees the significant interpretations made by the Primary Designated Engineer and arbitrates any differences regarding interpretation of UL requirements.

CCN	Office/Subsidiary	Responsible Engineer	Extension
EMME, EMNO, EMOG	Northbrook	D. KAISER	42074
	RTP	M. Cunningham	11669
	Santa Clara	G. Tom	32438

CCN	Office/Subsidiary	Responsible Engineer	Extension
EMKU2	Northbrook	D. KAISER	42074
	RTP	M. Cunningham	11669

CCN	Office/Subsidiary	Responsible Engineer	Extension
EMOY	Northbrook	D. KAISER	42074

CCN	Office/Subsidiary	Responsible Engineer	Extension
EMQI	Northbrook	D. KAISER	42074
	RTP	G. Tom	32438

Northbrook, Illinois • (708) 272-8800
 Melville, New York • (516) 271-6200
 Santa Clara, California • (408) 985-2400
 Research Triangle Park,
 North Carolina • (919) 549-1400



Underwriters Laboratories Inc.®

Subject 555 (555C, 555S)
 (In reply, refer to Subject 555)

333 Pfingsten Road
 Northbrook, IL 60062
 March 31, 1995



TO: Fire Council of Underwriters Laboratories Inc.,
 Subscribers to UL's Standards Services for:
 Fire Dampers;
 Ceiling Dampers;
 Leakage Rated Dampers for Use in Smoke Control Systems;
 and
 Others Interested

SUBJECT: Report of the Meeting of the Industry Advisory Conference of UL for Fire Dampers;
 Request for Comments on Proposed Requirements for the First Edition of the Standard
 for Ceiling Dampers and Ceiling Air Diffusers, UL 555C; PROPOSED EFFECTIVE DATE

SUMMARY OF TOPICS

The following topics were discussed at the meeting:

1. Purpose of UL's IAC
2. Action's Completed Since the February 25, 1994 IAC Meeting
3. Industry Review Program
4. Update on ISO TC92/SC2/WG4 Activities
5. Dampers for Tunnel Corridors
6. Metrication
7. Uniform Building Code (UBC) 15-Second Requirement
8. The Standard for Impedance-Protected Motors, UL 519, Versus the Standard for Temperature-Indicating and -Regulating Equipment, UL 873
9. Discussion of Ceiling Dampers

(Continued)

A not-for-profit organization
 dedicated to public safety and
 committed to quality service

AVA Documents
 Document Sharing Hub

SUMMARY OF TOPICS (Cont'd)**10. Miscellaneous Discussion**

- A. Standards Development
- B. ANSI Approval
- C. Heated Air Test
- D. Reliability of Dampers

11. Next IAC Meeting – Schedule**COMMENTS DUE: May 15, 1995**

A meeting of the Industry Advisory Conference of UL for Fire Dampers was held on March 3, 1995 at Sheraton Sand Key, Clearwater Beach, Florida. The purpose of the meeting was to discuss issues pertinent to the product categories relating to Fire Dampers and Leakage Rated Dampers for use in Smoke Controlled Systems.

Attached as Appendix A are proposed requirements for UL 555C. Attached as Appendix B is UL's Bulletin dated March 16, 1995 containing a list of Recognized Pneumatic Operator Manufacturers. Appendix C contains information for corridor dampers contained in UL's 1995 Fire Resistance Directory. Appendix D contains information for metric dimensions contained in UL's 1995 Fire Resistance Directory. Attached as Appendix E is a list of the attendees at the meeting. Questions regarding interpretation of requirements should be directed to the responsible UL Staff. Please see Appendix F of this bulletin regarding designated responsibility for the subject product categories.

Please note that proposed requirements are of a tentative and early nature and are for review and comment only. Current requirements are to be used to judge a product until these requirements are published in final form.

PROPOSED EFFECTIVE DATE

These proposed requirements will not necessitate a review or additional testing of currently Classified products. Therefore, UL proposes that the new requirements become effective upon publication.

* * * * *

The following report is not intended to be a verbatim transcript of the discussions at the meeting, but is intended to record the significant features of those discussions.

1. PURPOSE OF UL'S IAC

UL outlined the purpose and goals of the IAC as representing an important step in UL's procedure for the development of requirements, test methods, standards and related product evaluation programs. Members of the IAC are appointed by UL on the basis of their technical expertise and involvement in UL's programs. UL establishes technical requirements on the basis of the information from a variety of sources. It is intended that IAC members, functioning in an advisory role, serve as individual representatives of industry. Therefore, UL calls upon the IAC for discussion and review of proposals prior to submission for review by all involved manufacturers, UL's engineering councils, and others

expressing interest in the product category. The IAC representatives are also given an opportunity to present new ideas, modification of existing ideas or requirements, and suggestions as to how UL may better serve its clients.

2. ACTIONS COMPLETED SINCE THE FEBRUARY 25, 1994 IAC MEETING

1. Fire Closure Test Update - UL noted that the Standard for Fire Dampers, UL 555, has a requirement that all fire dampers completely close during the first 60 seconds of the fire endurance test. UL has developed a fire closure test that will negate furnace fluctuations. UL indicated that the preliminary results of the testing conducted suggests that the method lacks sufficient fire intensity and will no longer be pursued. As an alternative, UL is considering conducting fire endurance tests with a cover placed on the damper sleeve to prevent ambient air from flowing across the dampers until they are closed. Once the dampers are in the closed position, the cover would be removed to record observations of the dampers performance.

An industry representative was concerned with the duration of the response time required for the heat response device. UL indicated that the proposed revisions to UL 555 would include an upper end response time for the damper operator.

Another industry representative suggested complete evaluation of the test procedures before a proposal is made. UL indicated that further developmental work would be needed. UL intends to propose revisions to UL 555 to remove the 1 minute close criteria should NFPA 90A adopt revisions to increase the temperature of the heat responsive devices.

2. UL 555 - 286°F (141°C) Heat Response Devices - Paragraph 6.2 of UL 555 specifies a maximum heat responsive device temperature rating of 286°F (141°C). This maximum temperature limitation is also specified in the National Fire Protection Association's Standard of Installation for Air Conditioning and Ventilating Systems, NFPA 90A.

The industry representatives supported increasing the maximum heat responsive device temperature. UL indicated the revision to increase the maximum heat responsive would first need to be adopted in NFPA 90A.

The chairman indicated that 1) UL has reviewed the proposal and considers it appropriate and 2) as long as NFPA accepts the revision of the requirement, UL will propose to revise the Standard to increase the maximum heat responsive device temperature. The NFPA meeting to discuss public proposals will be held on March 30, 1995 in Baltimore. UL would make every effort to coordinate the revision to UL 555 with the revision to NFPA 90A.

3. Status Report on the Recognition of Pneumatic Operators - UL reported the establishment of the Component Damper Operator Product Category (EMKU2) for pneumatic actuators. UL agreed to provide a list of the current manufacturers of these pneumatic devices by means of a bulletin to industry. A copy of the bulletin is attached, see Appendix B.

4. Status Report on the Deletion of the Fire Damper Operator Product Category - At the February 25, 1994 IAC meeting, UL proposed to eliminate the Fire Damper Operator Product Category. Each Listed Fire Damper Operator is currently only suitable for installation on the particular manufacturers' Fire Damper or Leakage Damper. Under the current program, when operators are attached to the damper at the factory, it is required that the manufacturer provide a Fire Damper or Leakage Resistance Classification Mark on the damper and a Fire Damper Operator Listing Mark on the operator. Since the operator is essentially a damper part, the elimination of the Fire Damper Operator Category will eliminate

the need for the additional label on factory installed operators. UL proposed to establish an implementation schedule for this program. An industry representative noted that this program was in their best interests and that an implementation schedule should not be necessary.

UL agreed to not establish a schedule and requested damper manufacturers to advise UL of their intentions in this regard. To simplify the work involved, upon request UL will incorporate the Follow-Up Service Procedure for Fire Damper Operators within the Leakage Rated Damper or Fire Damper files.

UL indicated this topic will be on next year's meeting agenda and, if necessary, an implementation schedule would be established at that time.

3. INDUSTRY REVIEW PROGRAM

UL noted the effective dates for revised or added requirements involving a review of currently Classified products for UL 555 is May 29, 1995 and the effective date is May 30, 1995 for UL 555S.

An industry representative was concerned with UL's workload and asked if a product is submitted on time but the testing is not completed on time, will the manufacturer lose their rating? UL indicated the work will be completed on time if appropriate information was provided within the time frame specified.

An industry representative was concerned if a product fails a test, will there be insufficient time to retest before the effective dates. UL expressed the importance of the significant dates of an Industry Review Program to prevent this from happening.

There was discussion relative to the placement of minimum and maximum pressure ratings on pneumatic actuators. UL suggested that the markings should be placed on the pneumatic device to avoid confusion in the field.

4. UPDATE ON ISO TC92/SC2/WG4 ACTIVITIES

UL reported that the Standard for Heat Responsive Links for Fire Protection Service, UL/ANSI 33, prepared in ISO format was submitted at the October 1994 meeting in San Antonio. The document will be discussed further at the March 1995 ISO Working Group meeting.

5. DAMPERS FOR TUNNEL CORRIDORS

UL distributed a handout on Corridor Dampers, see Appendix C, contained in UL's 1995 Fire Resistance Directory. UL completed its work on developing a test method. A protocol has been established and Classification is now available.

An industry representative was concerned if other requirements have been established for tunnel corridors. UL mentioned they were not aware of additional requirements.

An industry representative was concerned with the ceiling construction because the setup appears to be a test of the ceiling assembly and not the damper. UL explained the test sample evaluates the performance of the ceiling damper and its installation in a ceiling assembly.

An industry representative was concerned about how a damper manufacturer chooses the best ceiling assembly. UL mentioned the ceiling assemblies are described in the City of L.A. Building Code.

6. METRICATION

UL distributed a handout on Metric Dimensions, see Appendix D, contained in UL's 1995 Fire Resistance Directory and indicated that it applies to all designs. UL indicated that the classification information, will be revised to identify products intended for installation in metric dimensional assemblies.

7. UNIFORM BUILDING CODE (UBC) 15-SECOND REQUIREMENT

Chapter 57 of the UBC, added for smoke control requirements, specifies a maximum 15-second closing time and a maximum 15-second reopening time for smoke control dampers. UL 555S requires a maximum of 75 seconds for each operation, which was adopted from the Recommended Practice for Smoke Control Systems, NFPA 92A. An industry representative was concerned if UL was considering revising the 75 second requirement to the 15 second requirement. UL responded that the 75 second requirement is not being amended at this time.

An industry representative asked if UL monitors the code proposals. UL responded that it does and it has a coordinator to monitor ICBO, BOCA and SBCCI code revisions. The coordinators receive the proposed revisions to the codes and distributes them to the appropriate UL staff to provide comments.

8. THE STANDARD FOR IMPEDANCE-PROTECTED MOTORS, UL 519, VERSUS THE STANDARD FOR TEMPERATURE-INDICATING AND -REGULATING EQUIPMENT, UL 873

Temperature Test Requirements - An industry representative expressed a concern over why UL 873 was selected versus UL 519 with regard to the requirements for electric damper operators. UL indicated that UL 873 was selected because it contains requirements for electric motors that are stalled as a part of normal operation. Many Leakage Rated Dampers are designed for the motor to stall in the open position. This would be considered a normal function. The Standard for Impedance-Protection Motors, UL 519 considers stalled motors to be an abnormal condition, and therefore allows for higher temperature limitations during the temperature test than UL 873. This item was a clarification of the requirement to become effective on May 30, 1995 for UL 555S.

9. DISCUSSION OF CEILING DAMPERS

Discussion on the Proposed Revisions to the Standard for Ceiling Dampers, UL 555C, See Appendix A - The industry representatives indicated that additional comments will be provided after the meeting report is issued. However, the following comments were made:

1. The combination of ceiling dampers and ceiling air diffusers is a good concept. However the terms ceiling damper and ceiling air diffuser should be defined. The term "ceiling air diffuser" has a somewhat different meaning to the HVAC Industry than what is apparent in the standard. A ceiling air diffuser is usually understood to be an air supply device that has certain specific capabilities to diffuse refrigerated supply air, mixing it with room air, to prevent drafts within the room. As used in the UL Classification, the term "ceiling air diffuser" would appear to apply to all manners of manufactured air inlet and air outlet devices, which in the normal HVAC vocabulary are referred to as "grills, registers, and diffusers". Substituting the term "ceiling air diffuser" for "ceiling air devices" would eliminate this potential for misunderstanding.
2. The Standard should include air terminal units. UL indicated the scope of UL 555C can be expanded to include air terminal units.

3. The first sentence in paragraph 1.2 should be revised since neither sheet metal nor ducts are always used.
4. Paragraph 6.1.2 - needs clarification to explain the rationale for referencing the smallest duct outlet size.
5. Table 5.1 - eliminate dust loading.
6. Paragraph 6.1.5 - why is UL no longer recording joist temperature. UL indicated they have not included joists in test samples for several years.
7. Paragraph 6.1.4 - Can surface mounted ceiling dampers be installed in gypsum board ceilings with or without ducts? UL indicated results from UL 555C are applicable to wallboard ceilings with air outlets. However, fire endurance ratings have not been established for assemblies with wallboard ceilings with air outlets.
8. Paragraph 6.5.2 - a reference to ceiling dampers and ceiling air diffusers needs to be added.
9. Paragraph 11A.1 - needs to be clarified on why and when the formula is used. UL indicated that if a limiting condition was experienced a correction factor could be used instead of retesting. This wording is used in all fire endurance test standards.
10. Paragraph 12.2 - Industry representatives suggested to retain paragraph 12.2 items 2, 3, and 4, with a revision to item 4 to replace "duct drop" with "finish ceiling".

UL indicated they will review the wording of this Standard to assure it complies with BOCA requirements.

Discussion of Ductless Ceiling Dampers and Ceiling Air Diffusers, as Defined in the Fire Resistance Directory - An industry representative was concerned about the addition of dynamic closure for ceiling dampers. UL responded that testing the dynamic closure of ceiling dampers should also include an evaluation of the effect the air flow would have on the hourly rating of the fire resistive assembly in which the ceiling damper is installed.

The industry representatives and UL believed the subject of testing the dynamic closure of ceiling dampers will be discussed at the March 30, 1995, NFPA 90A Technical Committee meeting.

10. MISCELLANEOUS DISCUSSION

A. Standards Development - UL provided an overview of the UL process for the development and/or revision of a standard in comparison with other organizations such as NFPA, ICBO, BOCA, SBCCI, ASHRAE, and AMCA. It was noted that

NFPA is a not-for-profit standards writing organization that establishes installation standards. The NFPA published documents include Codes, Standards, and Recommended Practices. UL typically follows the guidance of NFPA's principles and practices with respect to the development of UL Standards.

ASHRAE membership has expertise in HVAC related equipment and write engineering practices in standards formats or hand books. There is an overlap of expertise in the fire and smoke control practices for HVAC equipment.

AMCA is a Trade Association that writes Standards and works with UL on the Heated Air Test Standard.

Model Codes - ICBO, BOCA, and SBCCI are independent code writing organizations. These organizations have historically used NFPA Standards to assist with their code writing but are under no obligation to use them in their entirety.

UL indicated that UL writes independent standards with input from manufacturers, outside standards organizations such as NFPA and ASTM, Model Building Codes and many other organizations such as ASHRAE and AMCA.

It should be understood that UL does not write consensus standards, since all final decisions with respect to the standard's requirements are made by UL. NFPA has historically used the consensus method to develop the methods and philosophies of fire protection practices. UL's requirements typically mirror those of NFPA with respect to installation practices.

It was mentioned that UL's due process of standard development is outlined in a pamphlet entitled Method of Development, Revision and Implementation of UL Standards for Safety and if anyone is interested in obtaining a copy to contact UL. The IAC was developed as a source of information from manufacturers who are knowledgeable with the use of their products. UL uses the expertise of the IAC members to assist with the development of Standards. It was noted that the purpose of the IAC is not to develop proposals nor to vote on issues. UL also has a Fire Council that meets every 2 years, with a membership consisting of individuals from the academic community, authorities having jurisdiction, the insurance industry, government agencies, and other interested parties.

Although a voting system is not used by UL in the development of its standards, by policy each and every comment received must be replied to in writing. Also, UL indicated that the meeting report of the IAC is not only provided to the IAC members but also to all subscribers to the product category, the Fire Council and other interested parties who also have the opportunity to comment on the proposed requirements.

An industry representative mentioned that some ASHRAE staff members are under the misunderstanding that they do not always have an opportunity to comment on proposed requirements. Also, UL's due process is not understood by everyone nor is it realized that before a revision or a new standard is published outside parties do have a chance to comment. UL suggested that a paper or an article on UL's due process could be published, perhaps in an NFPA or ASHRAE publication. The industry representatives supported this idea.

B. ANSI Approval - After a standard has been developed, UL will proceed with obtaining ANSI Approval typically using the canvass method. This process is outlined in the method of Development, Revision and Implementation of UL Standards for Safety. If a negative vote is received, UL attempts to resolve the disagreement. If the comment remains unresolved, the comment explaining the disagreement with the standard is distributed to all of the participants in the canvass. If the disagreement is resolved then UL will submit the standard for ANSI approval. If the disagreement is not resolved UL does have the option of submitting the Standard for ANSI approval to the ANSI Board of Standards Review (BSR) under certain conditions. ANSI approval can also be obtained using the ANSI Accreditation Method also outlined in the Method of Development, Revision and Implementation of UL Standards for Safety. In this process, the initial draft of the proposed Standard is reviewed by the UL Technical Advisory Group (UL-TAG) and the UL Product Safety Standards Committee (UL-PSSC) for comment and revisions. The revised draft is then ANSI canvassed and the final draft of the proposed standard is submitted to the UL Standards Review Committee (UL-SRC) for review before the ANSI-BSR.

C. Heated Air Test - UL reported that a UL representative participated in five meetings of the AMCA task group developing heated air test requirements. An industry member stated that they anticipated developing a draft of the heated air test requirements by the end of June, 1995 to coincide with ASHRAE's summer meeting in San Diego, CA. UL was asked to provide comment to the draft. UL agreed to have a representative contact the chairman of the task group with UL's comments. UL reiterated its position to continue to work with AMCA to develop heated air test requirements.

D. Reliability of Dampers - UL indicated that it continues to receive negative comments from users of dampers as to their ability to perform when installed or as to their longevity. UL noted that these comments have been verbal comments and not in the form of field complaints.

Industry representatives maintained that the single largest problem with damper operation in the field is due to misinstallation. UL suggested that construction or test requirements could be included in the test standard that could decrease the likelihood of misinstallation.

UL and the industry representatives suggested the following items could be introduced into the UL Standard to improve the reliability of dampers or addressed by some other appropriate means:

1. Structural Requirements.
2. The use of a safety factor applied for all air flow tests.
3. UL requiring only factory attached actuators.
4. UL Certification program for installers.
5. Industry Certification Program for installers.
6. The development of guide manuals for installers.
7. The establishment of air flow classes for dampers. (For example, 2000 fpm @ 4 in. w.c., 4000 fpm @ 6 in.)

UL is seeking input relative to the action UL should take to improve damper reliability.

11. NEXT IAC MEETING - SCHEDULE

It was agreed that the annual IAC Meetings would continue to be scheduled to coincide with the AMCA/HVI/UL Policy Meeting. Therefore, the next meeting of the IAC of UL for Fire Dampers will be scheduled for February, 1996. The IAC members decided that business casual attire will be appropriate for next year's meeting.

In conclusion, UL thanked the industry representative for their time, assistance, and valuable input.

REQUESTS FOR COMMENTS ON PROPOSALS

Please provide the following:

1. Your comments concerning the meeting report and the proposed requirements; and
2. Your comments concerning the proposed effective dates, should the proposals be adopted.

Written comments should be sent to the attention of Mary Jo Borja at UL's Northbrook office, 333 Pfingsten Road, Northbrook, IL 60062-2096. Please reference all correspondence to Subject 555.

All comments should be sent by May 15, 1995.

Subjects 555 (555C, 555S)

-9-

March 31, 1995

Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with these proposals.

UNDERWRITERS LABORATORIES INC.

REVIEWED BY:

Mary Jo Borja

MARY JO BORJA (Ext. 42281)
Associate Project Engineer
Standards Department

William S. Metes

WILLIAM S. METES (Ext. 43200)
Managing Engineer
Engineering Services, Dept. 411

SR:AM

555MTG.B01

PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX A

PROPOSED REQUIREMENTS AND PROPOSED EFFECTIVE DATE FOR THE FIRST EDITION OF THE STANDARD FOR CEILING DAMPERS AND CEILING AIR DIFFUSERS, UL 555C

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~. Proposed new requirements are identified by (NEW). In the case of extensively revised paragraphs, the original text is identified by (CURRENT) and is ~~lined-out~~, followed by the proposed text identified by (PROPOSED). A paragraph that is proposed to be deleted is identified by (DELETED) and is shown ~~lined-out~~.

Numbered items correspond to the numbered items in the meeting report.

RATIONALE

UL proposes to revise the title of UL 555C, Ceiling Dampers, to include ceiling air diffusers to clarify the content of the standard.

Also, UL proposes to revise UL 555C to cover ceiling air diffusers. These revisions will reflect the current practice of evaluating ceiling air diffusers.

IMPACT

The proposals, if adopted, will not require a review or retest of the currently Listed products.

CONTENTS

INTRODUCTION

1 Scope	4
2 General	5

CONSTRUCTION

3 Components	5
4 Corrosion Protection	5

PERFORMANCE

5 General	6
6 Fire-Endurance Test	7
7 Closing Reliability Test	16
8 Dust-Loading Test	16
9 Salt-Spray Exposure Test	16
10 Spring Closing Force Test	17
11 Metallic Coating Thickness Test	17

MANUFACTURER'S INSTRUCTIONS

12 Installation Instructions	20
------------------------------------	----

MARKING

13 General	20
------------------	----

INTRODUCTION

1 Scope

1.1 These requirements and methods of tests apply to ceiling dampers and ceiling diffusers intended for installation in hourly rated fire resistive floor-ceiling and roof-ceiling assemblies ~~constructions~~. Fire resistive assemblies are investigated in accordance with the Standard for Fire Tests of Building Construction and Materials, ANSI/UL 263.

1.2 Ceiling dampers are intended for use in sheet metal air ~~air handling~~ duct outlets which penetrate the ~~membrane~~ ceilings of hourly-rated fire resistive assemblies. Ceiling air diffusers are intended for use with Class 0 and Class 1 air duct connectors, or for ductless installation in the ceilings ~~membrane of hourly rated fire resistive such assemblies which utilize the plenum space for return air.~~ Ceiling dampers and ceiling air diffusers They are designed for use as alternates to previously tested hinged-door sheet metal type dampers installed at the bottom of sheet metal air ducts over each duct outlet. Ceiling dampers and ceiling air diffusers intended for installation in other types of fire resistive assemblies are investigated in accordance with the Standard for Fire Tests of Building Construction and Materials, ANSI/UL 263, and are not covered in this standard.

1.3 The investigation of ceiling dampers and ceiling air diffusers involves a comparison of the fire resistance performance of the a manufactured ceiling damper or ceiling air diffuser with that of a hinged-door sheet metal damper, ~~installed in identical suspended ceiling constructions,~~ to determine that the substitution of the ceiling damper or ceiling air diffuser would not reduce the hourly fire endurance ~~resistance~~ rating of an ~~the~~ assembly previously rated with the hinged-door type damper. Ceiling dampers and ceiling air diffusers are not assigned hourly ratings, but rather are assembly components designated for use in specific hourly rated fire resistive assemblies incorporating air duct outlets penetrating protective ~~membrane~~ ceilings. ~~The fire resistance performance of the maximum size ceiling damper submitted for test is compared with the performance of the hinged door type damper protecting the smallest size duct outlet specified in a rated assembly and having the maximum hourly rating for which fire resistance of a specified duration is required.~~

(DELETED)

~~1.4 Tests conducted in accordance with these requirements are intended to demonstrate the performance of ceiling dampers during the period of fire test exposure, and are not intended to determine acceptability for use after exposure to fire.~~

1.5 Tests ~~It is the intent that tests~~ conducted in accordance with the test methods described herein are intended to will develop data to enable regulatory authorities to determine the acceptability of ceiling dampers and ceiling air diffusers for use in floor-ceiling and roof-ceiling assemblies having hourly fire endurance ratings of the specified or shorter duration.

1.6 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard ~~in use when the Standard was developed,~~ and that involves a risk of fire, electric shock, or injury to persons, shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the acceptable level of safety for the user of the product as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific provisions of this standard cannot be judged to comply with this standard. Where considered appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

2 General

(Deleted)

~~2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component.~~

(Deleted)

~~2.2 The component need not comply with a specific requirement that:~~

- ~~a) Involves a feature or characteristic not needed in the application of the component in the product covered by this standard, or~~
- ~~b) Is superseded by a requirement in this standard.~~

2.3 A component of a product covered by these requirements shall comply with the requirements for that component and shall be used in accordance with its recognized rating established for the intended conditions.

2.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions for which they have been recognized.

2.5 If a value of measurement as given in these requirements is followed by an equivalent value in other units, the second value may be only approximate. The first stated value is the requirement. SI units as employed are in accordance with the American National Standard for Metric Practice, ANSI/ASTM E380.

(Deleted)

~~2.6 As used in this standard, the term "damper assembly" applies to ceiling dampers.~~

2.7 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

CONSTRUCTION

3 Components

3.1 The load on a heat responsive fusible link used in a ceiling damper or ceiling air diffuser assembly shall be within the design load limits of the heat responsive fusible link.

3.2 Component springs used in a ceiling damper or ceiling air diffuser assembly shall be of a material having spring properties equivalent to stainless steel conforming to the Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Spring Wire, ASTM A313-87.

4 Corrosion Protection

4.1 Ferrous metal Steel parts used in the ceiling damper or ceiling air diffuser assembly shall be one of the 300 Series of stainless steel or shall be provided with one of the following corrosion-protection systems:

- a) Employing one of the 300 Series of stainless steel;

b) A ~~coating of~~ hot-dipped mill galvanized ~~coating sheet steel~~ conforming with the coating Designation G60 or A60 in Table I of the Specification for General Requirements Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, ASTM A525-90, with not less than 40 percent of the zinc on any side, based on the minimum single spot test requirement in this ASTM Designation. The weight of zinc coating shall be established in accordance with the ~~test method in the~~ Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles, ASTM A90-81 or by any equivalent method. An A60 (alloyed) coating shall also comply with the requirements in 4.4;

c) A zinc coating, other than that provided on hot-dipped mill galvanized sheet steel, uniformly applied to an average thickness of not less than 0.41 mils ~~0.00041 inch~~ (10.41 microns ~~0.01041 mm~~) on each surface with a minimum thickness of 0.34 mils ~~0.00034 inch~~ (8.64 microns ~~0.00864 mm~~). The thickness of the coating shall be established by the Metallic Coating Thickness Test, Section 11. An annealed coating shall also comply with the requirements in 4.4;

d) A cadmium coating not less than 0.5 mils ~~0.0005 inch~~ (12.7 microns ~~0.0127 mm~~) thick on both surfaces. The thickness of coating shall be established in accordance with the Metallic Coating Thickness Test, Section 11; or

e) Two coats of an organic finish of the epoxy or alkyd-resin type or other outdoor paint on each such surface. The acceptability of the paint shall ~~may~~ be determined by its composition or by corrosion tests if necessary.

4.2 Coated or uncoated metals used in the assembly of ceiling dampers or ceiling air diffusers shall be galvanically compatible.

4.3 Component springs and bearings used in the assembly of ceiling dampers or ceiling air diffusers shall be of a material having resistance to atmospheric corrosion equivalent to brass or bronze.

4.4 A hot-dipped mill galvanized A60 (alloyed) coating or an annealed zinc coating which is bent or similarly formed after annealing and which is not otherwise required to be painted shall be painted in the bent or formed area if the bending or forming process damages the zinc coating.

4.5 If flaking or cracking of the zinc coating at the outside radius of the bent or formed section is visible at 25 power magnification, the zinc coating is considered to be damaged. Simple sheared or cut edges and punched holes are not considered to be formed, but extruded and rolled edges and holes shall conform with the requirements in 4.4.

PERFORMANCE

5 General

5.1 Representative samples of each size, style, and arrangement of ceiling damper or ceiling diffuser shall be subjected to the tests specified in Table 5.1. The representative samples sizes shall be determined on the basis of maximum ceiling damper size and most critical closing force condition.

Table 5.1
Tests for ceiling dampers

Test	Sections	Gravity-operated	Spring-operated
1. Fire Endurance Test	6	X	X
2. Closing Reliability	7	X	X
3. Dust Loading	8	X	X
4. Salt-Spray Exposure	9	X	X
5. Spring Closing Force	10	—	X
X Test applicable			
— Test not applicable			

6 Fire-Endurance Test

6.1 Test assembly assemblies

6.1.1 The ceiling damper or ceiling air diffuser shall be installed in a ~~suspended~~ ceiling of a type construction previously tested in a rated fire resistive floor-ceiling or roof-ceiling assembly. Each test assembly shall include a reference hinged-door type damper installed in a floor-ceiling test construction identical to that used with the ceiling damper or ceiling air diffuser installation. The ceiling compartments containing the reference hinged-door damper and the ceiling damper or ceiling air diffuser assemblies shall be separated by means of an insulated wall or barrier to prevent heat transfer from one ceiling compartment to the other during the fire-endurance test. ~~See also 6.1.2.~~

6.1.2 The duct outlet provided with the reference hinged-door damper is to be representative of the smallest duct outlet size for which comparative performance data is desired. ~~sized to protect a standard 12-inch (305 mm) diameter duct outlet. Other size duct outlets may be used with the reference hinged-door damper. The in either case, the comparative performance data shall apply to hourly rated assemblies incorporating hinged-door sheet metal type dampers protecting duct outlets of the size tested and larger.~~

6.1.3 The area of each ceiling construction exposed to fire shall not be less ~~than that~~ 48 58 square feet (4.5 5.4 m²), with neither dimension less than 70 inches 6-feet (1.8 m). The dimensions of the ceiling incorporating the reference hinged-door damper and the dimensions of the ceiling with the ceiling test damper or ceiling air diffuser assembly shall be identical.

6.1.4 Ceiling dampers and ceiling air diffusers tested in ~~membrane~~ ceilings with exposed grid suspension systems are eligible for installation in ceilings of rated assemblies with exposed or and concealed grid suspension systems or with "hard" ceilings of gypsum wallboard or plaster. Ceiling dampers and ceiling air diffusers tested in ~~membrane~~ ceilings with concealed grids suspension systems are eligible for installation only in ceilings of rated assemblies with concealed grids suspension systems or with "hard" ceilings of gypsum wallboard or plaster only. Ceiling dampers and ceiling air diffusers tested in "hard" ceilings of gypsum wallboard or plaster are only eligible for installation in rated assemblies with "hard" ceilings. The ceiling dampers or ceiling air diffuser shall be tested in a ceiling incorporating the least number of ceiling grid-system hanger wire supports in the vicinity of the air-handling opening duct-outlet as specified for the rated assemblies in which the ceiling damper or ceiling air diffuser is intended to be installed.

6.1.5 The floor is to consist of cellular steel floor units topped with concrete. The cellular steel floor units shall be provided with steel hanger tabs for the attachment of ceiling hanger wires. ~~The support for each floor-ceiling construction shall consist of Type 8K1 steel bar joists spaced 24 inches (610 mm) apart. The joists shall be placed parallel with the larger dimension of the assembly. The floor shall consist of precast concrete units not less than 3 inches (76.2 mm) thick placed on top of the joists with the joints grouted. Insulation shall be placed between the floor and the top of the dividing wall and the precast units separating the ceiling compartments to prevent heat transfer transmission between adjacent compartments. The suspended ceiling shall be located 16 48 to 22 inches (406 467 to 559 599 mm) below the underside of the floor slab.~~

(DELETED)

6.1.6 ~~For installation where the 24 inches (610 mm) joist spacing will not accommodate the width of the duct, the bar joists shall be spaced 48 inches (1219 mm) apart with a Type TS, 4 by 2 1/2 by 0.120 inch (100 by 64 by 3.05 mm) structural steel tube placed midway between the joists.~~

(DELETED)

6.1.7 ~~The steel ducts and suspended ceiling shall be supported by means of steel channels and tie wire in accordance with the details shown for the ceiling and duct used in the rated design, except that support of the duct shall be accomplished by means of single steel channels, with channels located adjacent to the duct drop and intermediate channels spaced 48 inches (1219 mm) apart. The duct shall be centered within its compartment.~~

6.1.8 The steel ducts and duct drops used with the reference hinged-door damper and with ceiling dampers shall be fabricated from galvanized sheet steel having a nominal thickness of 0.034 inch (0.86 mm). The duct shall be rectangular in shape, and shall be 6 inches (152 mm) larger in width than the width or diameter of the duct drop. The duct shall not be less than 6 8 feet (1.8 2.4 m) in length and the ends shall be capped. The duct drop shall be centered under each the duct and extended 7 to 7-1/4 inches (178 to 184 mm) below the duct.

(NEW)

6.1.8A The steel ducts are to be supported by means of trapeze supports consisting of steel channels and steel hanger wires. The trapeze supports shall be located adjacent to each side of the duct drop and near each end of the duct. The duct is to be centered within its compartment.

6.1.9 The reference hinged-door damper shall be fabricated from 0.075 inch (1.91 mm) thick sheet steel 0.075 inch (1.91 mm) thick, 14 by 14 inches (356 by 356 mm), with 1/16 inch (1.6 mm) thick ceramic fiber paper adhered to both faces, with a sodium silicate adhesive or equivalent. The damper is to be sized to lap 1 inch (25 mm) beyond all sides of the duct drop.

(CURRENT)

6.1.10 ~~The reference hinged-door damper shall be installed in the duct and centered over the duct outlet. A minimum of three steel sheet metal screws, equally space, shall be used to attach the steel air diffuser to the reference hinged-door damper duct drop. The test ceiling damper shall be subjected to 150 cycles of opening and closing in accordance with the test method described in the Closing Reliability Test, Section 7. After the cycling test, the test damper shall be installed in its duct drop and located at the maximum height above the ceiling as specified in the manufacturer's installation instructions.~~

(PROPOSED)

6.1.10 The reference hinged-door damper shall be installed in the duct and centered over the duct outlet. A minimum of three steel sheet metal screws, equally spaced, are to be used to attach the steel air diffuser to the reference hinged-door damper duct drop.

6.1.10A The ceiling damper shall be installed in its duct drop and located at the maximum height above the ceiling as specified in the manufacturer's installation instructions.

(NEW)

6.1.10B The ceiling air diffuser shall be installed in the center of the ceiling in accordance with the manufacturer's installation instructions. Any Class 0 or Class 1 air duct connector used with the ceiling air diffuser shall be reliably supported, independent of the ceiling, with the end opposite its connection to that ceiling air diffuser capped.

(DELETED)

6.1.11 The frame or collar portion of the diffuser shall be attached to the duct drop in accordance with the manufacturer's installation instructions. A minimum of three No. 10, 5/8 inch long (12.7 mm diameter, 15.9 mm long) steel sheet metal screws, equally spaced, shall be used to attach the diffuser frame to the reference hinged door damper duct drop. The grille portion of the diffuser shall be omitted from the reference hinged door and ceiling damper assemblies to permit visual observation of the ceiling damper during the fire endurance test.

(DELETED)

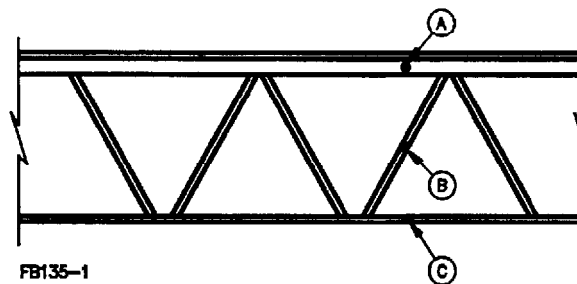
6.1.12 For ceiling dampers with other than surface mounted diffuser grilles, the grille portion of the diffuser shall be provided, in which case the diffuser grille shall also be provided with the reference hinged door damper duct drop.

(DELETED)

6.2 Joist temperatures

6.2.1 A total of seven thermocouples shall be attached to the joists for each ceiling compartment, three thermocouples located on each of the two joists adjacent to the center line of the duct outlet, and one on the bottom chord of the center joist, or on the bottom face of the structural steel tube, directly over the center of the duct outlet. The locations of the thermocouples with respect to the joist components are shown by Figure 6.1. Temperature readings shall be taken at intervals not exceeding 5 minutes.

Figure 6.1 Joist thermocouple locations



(NEW)

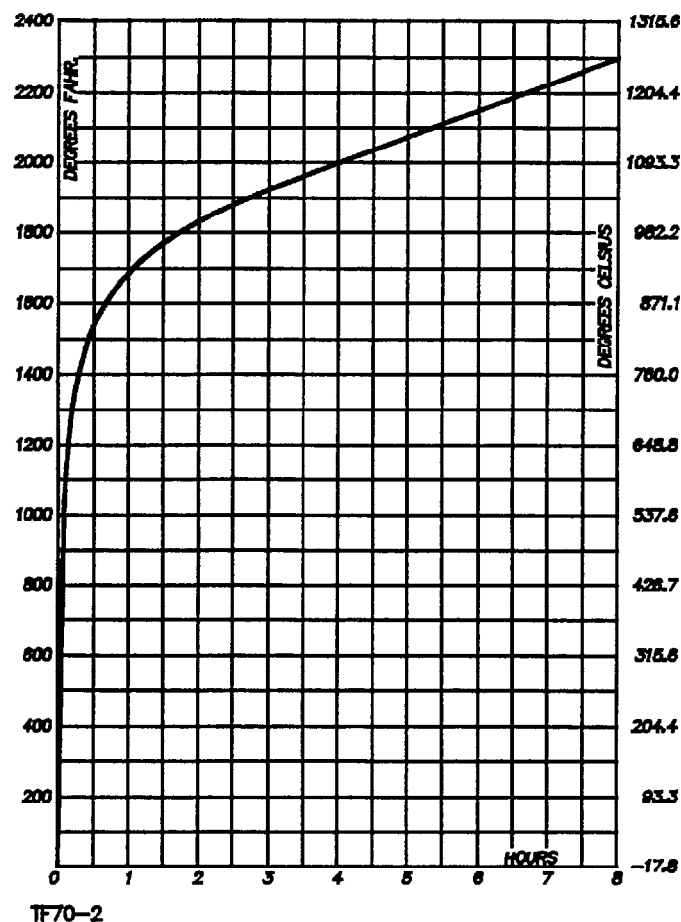
6.2A Conditioning of test specimen

6.2A.1 Prior to conducting the fire test, the concrete floor is to have achieved a moisture content corresponding to drying to equilibrium with air in the range of 50 to 75 percent relative humidity at $73 \pm 5^\circ\text{F}$ ($23 \pm 3^\circ\text{C}$).

6.2A.2 The method for determining the relative humidity within hardened concrete by use of electric sensing elements is described in Appendix 1 of a paper by Carl A Menzel, "A Method for Determining the Moisture Condition of Hardened Concrete in Terms of Relative Humidity", Proceedings, ASTM, Volume 55, Page 1085 (1955). A similar procedure with electric sensing elements can be used to determine the relative humidity within a structure or joint system made of materials other than concrete.

6.2A.3 Prior to the start of the fire test, the reference hinged-door damper shall be placed in the closed position and the ceiling damper or ceiling air diffuser is to be placed in the fully open position.

Figure 6.2 – Time-temperature curve



(DELETED)**6.3 ~~Conditioning of test specimen~~**

6.3.1 ~~Prior to conducting the fire endurance test, the concrete floor slabs shall have achieved a moisture content corresponding to drying to equilibrium with air in the range of not greater than 75 percent relative humidity at $73 \pm 5^\circ\text{F}$ ($23 \pm 3^\circ\text{C}$).~~

6.3.2 ~~Prior to the start of the test, the reference hinged door damper shall be placed in the closed position and the test ceiling dampers in the fully open position.~~

(CURRENT)**6.4 ~~Control and conduct of fire tests~~**

6.4.1 ~~The conduct of fire test fire exposure of ceiling dampers and ceiling air diffusers shall be controlled by the standard Time temperature curve shown in Figure 6.2. The points on of the curve that determine its character are:~~

~~1000°F (538°C)~~	~~at 5 minutes~~
~~1300°F (704°C)~~	~~at 10 minutes~~
~~1550°F (843°C)~~	~~at 30 minutes~~
~~1700°F (927°C)~~	~~at 1 hour~~
~~1850°F (1010°C)~~	~~at 2 hours~~
~~2000°F (1093°C)~~	~~at 4 hours~~
~~2300°F (1260°C)~~	~~at 8 hours~~
~~— or over~~	

(PROPOSED)

6.4 Time-temperature curve

6.4.1 The conduct of fire tests of ceiling dampers and ceiling air diffusers shall be controlled by the standard time-temperature curve shown in Figure 6.2. The point on the curve that determine its character are:

50 to 90 °F (10 to 32°C)	at 0 minutes
1000°F (538°C)	at 5 minutes
1300°F (704°C)	at 10 minutes
1550°F (843°C)	at 30 minutes
1700°F (927°C)	at 1 hour
1850°F (1010°C)	at 2 hours
2000°F (1093°C)	at 4 hours
2300°F (1260°C)	at 8 hours

For a more precise definition of the time-temperature curve, see Figure 6.2, Time-temperature curve.

(CURRENT)

~~6.4.2 The temperature fixed by the curve shall be the average temperature obtained from the readings of not less than 9 thermocouples symmetrically disposed and distributed to show the temperature near all parts of the test assembly. The thermocouples shall be enclosed in sealed porcelain tubes, 3/4 inch (19.1 mm) in outside diameter and 1/8 inch (3.2 mm) in wall thickness or, as an alternative in the case of base metal thermocouples, enclosed in sealed, standard weight 1/2 inch (12.7 mm) black wrought-steel or black wrought iron pipe. See Welded and Seamless Wrought Steel Pipe, ANSI/ASME B36.10M-1985. The exposed length of the pyrometer tube and thermocouple in the furnace chamber shall not be less than 12 inches (305 mm). Other types of protecting tubes or pyrometers may be used that, under test conditions, give the same indications as the above standard within the limit of accuracy that applies for furnace temperature measurements. The junction of the thermocouples shall be placed 12 inches (305 mm) away from the exposed face of the ceiling at the beginning of the test and, during the test, shall not touch the assembly as a result of its deflection.~~

(PROPOSED)

6.4.2 The measured temperature to be compared with the standard time-temperature curve shall be the average temperature obtained from the readings of not less than nine thermocouples symmetrically disposed and distributed to show the temperature near all parts of the test assembly.

6.4.2A Each furnace thermocouple shall be enclosed in a sealed protection tube. The exposed length of protection tube and thermocouple in the furnace chamber is not to be less than 12 inches (305 mm).

6.4.2B The time constant of the protected thermocouple assembly shall be within the range of 5.0 – 7.2 minutes. A typical thermocouple assembly complying with this time constant can be fabricated by fusion-welding the twisted ends of No. 18 AWG (0.82 mm²) chromel-alumel wires, mounting the leads in

porcelain insulators and inserting the assembly into a standard weight 1/2 inch (13 mm) outside diameter black wrought iron, black wrought steel or Inconel pipe, and sealing the end of the pipe that is inside the furnace. The thermocouple junction is to be inside the pipe, 1/2 inch (13 mm) from the sealed end.

6.4.2C The junction of each thermocouple shall be placed 12 inches (305 mm) away from the exposed face of the ceiling at the beginning of the test and, during the test, shall not touch the assembly as a result of assembly deflection.

6.4.3 The temperatures shall be read at intervals not exceeding 5 minutes throughout the fire test during the first 2 hours, and the intervals thereafter may be increased to not more than 10 minutes.

(CURRENT)

6.4.4 The temperature accuracy of the furnace control shall be controlled such that the area under the time-temperature curve, obtained by averaging the results from the pyrometer readings, is within 10 percent of the corresponding area under the Time-Temperature Curve shown in Figure 6.2 for fire tests of 1 hour or less duration, within 7.5 percent for those over 1 hour and not more than 2 hours, and within 5 percent for tests exceeding 2 hours in duration.

(PROPOSED)

6.4.4 The temperature of the furnace shall be controlled such that the area under the measured time-temperature curve, obtained by averaging the results from the thermocouple reading is within:

- a) 10 percent of the corresponding area under the standard time-temperature curve for fire test of 1 hour or less duration;
- b) 7.5 percent of the corresponding area under the standard time-temperature cure for fire tests longer than 1 hour but not longer than 2 hours; and
- c) 5 percent of the corresponding area under the standard time-temperature curve for fire tests exceeding 2 hours in duration.

(NEW)

6.4A Furnace pressure

(CURRENT)

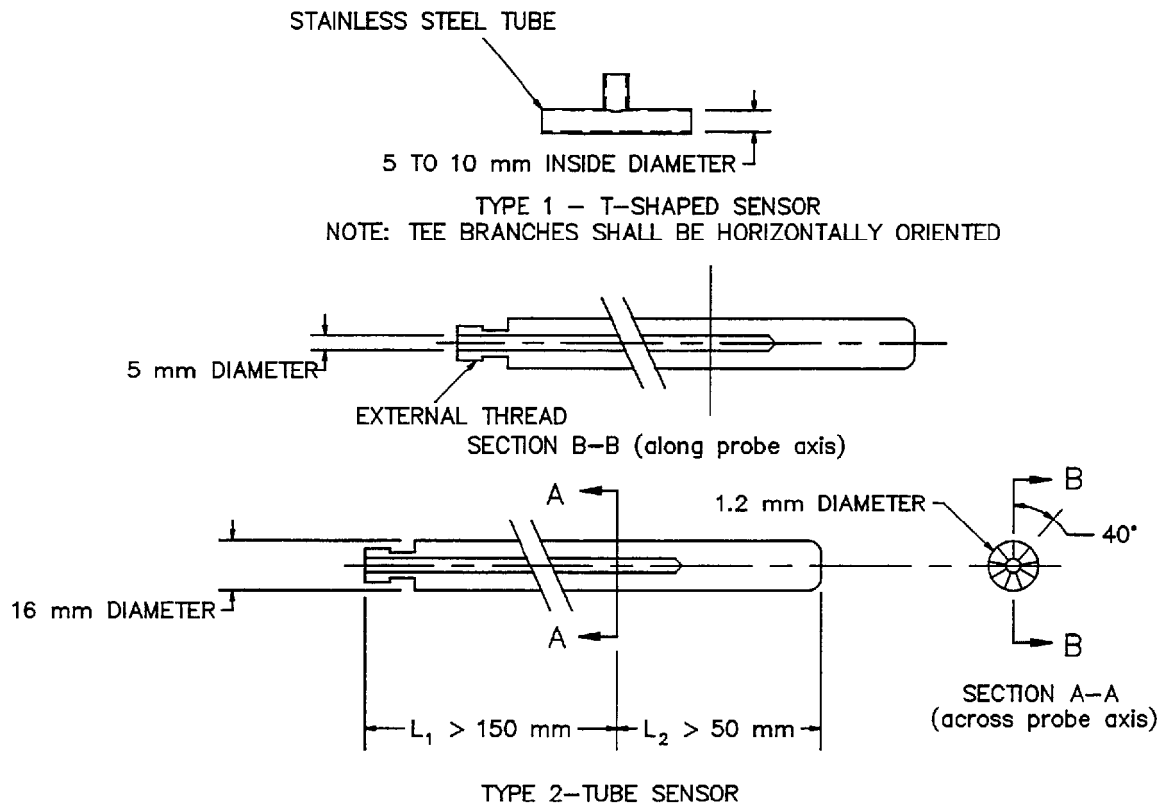
6.4.5 The pressure in the furnace chamber during the fire test shall be maintained as nearly equal to atmospheric pressure as possible.

(PROPOSED)

6.4A.1 The pressure in the furnace chamber with respect to atmospheric pressure is to be calculated based on measurements taken near the vertical centerline of two opposing furnace walls and based on the linear pressure gradient of the furnace. The linear pressure gradient of the furnace is to be determined by the difference in measured pressure of at least two pressure sensors separated by a vertical distance in the furnace. The pressure sensors are to be located where they will not be subjected to direct impingement of convection currents. Tubing connected to each pressure sensor is to be horizontal both in the furnace and at its egress through the furnace wall such that the pressure is relative to the same elevation from the inside to the outside of the furnace.

6.4A.2 The pressure sensors are to be either of the "T" type or the "tube" type as illustrated in Figure 6.3 and are to be manufactured from stainless steel or other suitable material.

Figure 6.3
Pressure sensors



SM655

6.4A.3 The differential pressure is to be measured by means of a manometer or equivalent transducer capable of reading pressure in increments of 0.01 inch water (2.5 Pa) with a measurement precision of 0.005 inch water (1.25 Pa). The differential pressure measuring instrument is to be located to minimize "stack" effects caused by vertical runs of pressure tubing between the furnace probe and instrument locations.

6.4A.4 The furnace pressure 8 inches (200 mm) below the exposed surface of the ceiling shall be maintained as nearly equal to atmospheric pressure as possible.

(NEW)**6.4B Concealed space temperatures**

6.4B.1 The temperatures of the concealed space above the ceiling of each compartment are to be measured with at least nine thermocouples. The wires for the thermocouples are not to be heavier than No. 18 AWG (0.82 mm²). The thermocouples are to be installed in a 24 by 24 inch (610 by 610 mm) grid over the central 48 by 48 inch (1219 by 1219 mm) area of each ceiling with the thermocouple grid centered over the air-handling opening. Each thermocouple is to be located 3 inches (76 mm) below the floor.

6.4B.2 Temperature readings are to be taken at intervals not exceeding 5 minutes throughout the fire test.

(NEW)**6.4C Conduct of fire test**

6.4C.1 The test assembly is to be sealed against the furnace with an insulating gasket between the test assembly and the furnace.

6.4C.2 The test equipment and test assembly are to be protected from any condition of wind or weather that might influence the test results. The ambient air temperature at the beginning of the test is to be within the range of 50 – 90°F (10 – 32°C). The velocity of the air moving horizontally across the unexposed surface of the test sample, measured immediately before the test begins, is not to exceed 4.4 feet per second (1.3 m/s) as determined by an anemometer placed at right angles to the unexposed surface. If mechanical ventilation is employed during the test, an air stream is not to be directed across the surface of the sample.

6.4C.3 Observations of the exposed and unexposed surfaces of the test assembly are to be made throughout the fire test. All significant observation such as disruption of the ceiling membrane are to be recorded.

(CURRENT)

6.4.6 ~~The fire test shall be continued until failure occurs or until the ceiling damper assembly has withstood the test conditions and has complied with 6.5.1 and 6.5.2 for a period of time equal to the maximum fire resistance rating of the assembly.~~

(PROPOSED)

6.4C.3 The fire test shall be continued until failure occurs or until the ceiling damper or ceiling air diffuser assembly has withstood the test conditions and has complied with 6.5.1 and 6.5.2 for a period of time equal to the maximum fire resistance rating of the assembly.

6.5 Conditions of acceptance

6.5.1 The closing of the ceiling damper or ceiling air diffuser is not to cause disruption of the ceiling membrane ~~Ceiling dampers shall close and latch automatically (if a latch is provided) during the fire test first 60 seconds of the fire endurance test or before the furnace temperature at the fusible element location reaches 285°F (141°C), the temperature of the Time Temperature Curve, Figure 6.2, at 1 minute.~~

6.5.2 The average temperatures of the concealed space above the ceiling ~~bar joists~~ in the assembly in which the ceiling damper is located shall not exceed the average temperatures of the concealed space above the ceiling ~~bar joists~~ in the assembly in which the reference hinged-door damper is located after 30 minutes of the fire test for the same intervals of time throughout the rating period.

7 Closing Reliability Test

7.1 Closing reliability of ceiling dampers and ceiling air diffusers is evaluated on the basis that air-conditioning and ventilation systems are automatically shut down when a fire occurs as described in the various provisions of the Standard for the Installation of Air Conditioning and Ventilating Systems, ANSI/NFPA No. 90A-~~1989~~ 1993. Therefore, the ratings are applicable to ceiling dampers and ceiling air diffusers installed in systems where air movement is effectively stopped at the start of a fire.

7.2 A ceiling damper or ceiling air diffuser assembly shall close and latch automatically (if a latch is provided) from the open position during each of 250 operations and shall, throughout this test, show no evidence of damage which will impair the fire performance of the ceiling damper or ceiling air diffuser.

7.3 Ceiling dampers and ceiling air diffusers assemblies ~~intended for horizontal installation~~ shall be tested in a horizontal plane and shall not depend on installation in an inclined position for intended operation.

(DELETED)

8 Dust-Loading Test

~~8.1 A damper assembly shall close and latch automatically (if a latch is provided) following exposure for 7 hours to an air-blown circulating grain dust air mixture. The grain dust shall pass through a No. 100-mesh screen, sieve opening 0.0059 inch (0.149 mm) as described in the Specification for Wire-Cloth Sieves for Testing Purposes, ASTM E11-87.~~

~~8.2 The test chamber is to be approximately 5 by 7 1/2 by 5 feet (1.5 by 2.3 by 1.5 m) high. It shall be provided with observation windows, and with auxiliary equipment to produce a circulating grain dust air mixture toward the sample and the dust particles are to accumulate on the various parts of the damper assembly.~~

9 Salt-Spray Exposure Test

9.1 A ceiling damper or ceiling air diffuser assembly shall close and latch automatically (if a latch is provided) following exposure to salt spray for a period of 5 days when tested as described in 9.2-9.7.

9.2 Prior to the test, all grease or oil is to be removed from the test sample using organic solvents.

9.3 The test sample is to be installed in the test chamber with the damper open and is to be supported in the position of intended use and exposed to the salt spray for a period of 120 hours. The temperature of the test sample and the test chamber is to be maintained at 95°F plus 2 or minus 3°F (35°C plus 1 or minus 2°C) throughout the test period.

9.4 The apparatus to be used for salt-spray (fog) testing is to consist of (1) a fog chamber having a salt solution reservoir, (2) a supply of conditioned compressed air, (3) a dispersion tower for producing a salt fog, (4) specimen supports, (5) a provision for heating the chamber, and (6) necessary means of control. The dispersion tower is to be located in the center of the chamber and is to be supplied with salt solution and with warmed, humidified air at a pressure of 17 to 19 pounds per square inch gauge (psig) (117-129 kPa) so as to disperse the salt solution in the form of a fine mist or fog throughout the interior of the chamber.

9.5 The salt solution is to consist of 20 percent common salt (sodium chloride) by weight and distilled water. The pH value of this solution, as collected after spraying in the test apparatus, is to be between 6.5 and 7.2 and the specified gravity between 1.126 and 1.157 at 95°F (35°C).

9.6 At the conclusion of the test, the test sample is to be removed from the chamber and allowed to dry for a minimum of 24 hours at room temperature. It is then to be placed in its intended mounting position and tested for closing and latching (if a latch is provided).

9.7 In cases where the salt solution has created excessive build-up of zinc chloride due to a reaction with galvanized steel coatings, such parts may be painted and a second sample subjected to test.

10 Spring Closing Force Test

10.1 A spring-operated ceiling damper or ceiling air diffuser is to ~~assembly~~ employ a spring or springs capable of exerting a force of 2-1/2 times that required to close and automatically latch (if a latch is provided) the ceiling damper or ceiling air diffuser.

10.2 All springs are to be disconnected and the ceiling damper or ceiling air diffuser ~~assembly~~ placed in the intended operating position.

10.3 The force required to close and latch the ceiling damper or ceiling air diffuser is to be measured at each of a series of positions assumed by the ceiling damper or ceiling air diffuser from fully open to closed (latched). The force is to be applied through, and at the point of connection of, the spring to the ceiling damper or ceiling air diffuser blade or operating arm.

10.4 Three samples of each spring employed for closing and latching are to be tested for force exerted over the range of extension or compression required for the motion involved in the assembly. The force available from the action of the spring or springs is to be 2-1/2 times that required for the closing and latching (if a latch is provided) of the ceiling damper or ceiling air diffuser at any position of travel from fully open to closed (latched).

11 Metallic Coating Thickness Test

11.1 The solution to be used for this test is to be made from distilled water and is to contain 200 g/L of chemically pure chromic acid (CrO_3); and 50 g/L of chemically pure concentrated sulfuric acid (H_2SO_4). The latter is equivalent to 27 ml/L of chemically pure concentrated sulfuric acid, with a specific gravity of 1.84, containing 96 percent of H_2SO_4 .

11.2 The test solution is to be contained in a glass vessel such as a separatory funnel with the outlet equipped with a stopcock and a capillary tube of approximately 0.025 inch (0.64 mm) inside bore and 5.5 inches (140 mm) long. The lower end of the capillary tube is tapered to form a tip, the drops from which are approximately 0.025 milliliters each. To preserve an effectively constant level, a small glass tube is inserted in the top of the funnel through a rubber stopper and its position is to be adjusted so that, when the stopcock is open, the rate of dropping is 100 ± 5 drops per minute. If desired, an additional stopcock may be used in place of the glass tube to control the rate of flow.

11.3 The sample and the test solution are to be kept in the test room long enough to acquire the temperature of the room, which shall be noted and recorded. The test is to be conducted at an ambient temperature of 70 – 90°F (21.1 – 32.2°C).

11.4 Each sample is to be thoroughly cleaned before testing. All grease, lacquer, paint, and other nonmetallic coatings are to be removed completely by means of suitable solvents. Samples are then to be thoroughly rinsed in water and dried. Care should be exercised to avoid contact of the cleaned surface with the hands or any foreign material.

11.5 The sample to be tested is to be supported from 0.7 – 1 inch (18 – 25 17.8–25.4 mm) below the orifice, so that the drops of solution strike the point to be tested and run off quickly. The surface to be tested should be inclined approximately 45 degrees from horizontal.

11.6 The stopcock is to be opened and the time in seconds is to be measured until the dropping solution dissolves the protective metallic coating, exposing the base metal. The end point is the first appearance of the base metal recognizable by the change in color at the point.

11.7 Each sample of a test lot is to be subjected to the test at an equal number of three or more points on both sides of a surface, excluding cut, stenciled, and threaded surfaces, at places where the metallic coating may be expected to be the thinnest. On parts made from precoated sheets, external corners that are subjected to the greatest deformation may have thin coatings.

11.8 To calculate the thickness of the coating being tested, the appropriate thickness factor for the temperature at which the test was conducted is to be selected from Table 11.1 and multiplied by the time in seconds required to expose base metal as noted in 11.6.

Table 11.1
Coating thickness factors

Temperature, degrees F (C)	Thickness factors, cadmium platings 0.00001 inches (0.0003 mm) per second
70 (21.1)	1.331
71 (21.7)	1.340
72 (22.2)	1.352
73 (22.8)	1.362
74 (23.3)	1.372
75 (23.9)	1.383
76 (24.4)	1.395
77 (25.0)	1.405
78 (25.6)	1.416
79 (26.1)	1.427
80 (26.7)	1.438
81 (27.2)	1.450
82 (27.8)	1.460
83 (28.3)	1.470
84 (28.9)	1.480
85 (29.4)	1.490
86 (30.0)	1.501
87 (30.6)	1.513
88 (31.1)	1.524
89 (31.7)	1.534
90 (32.2)	1.546