

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

TRANSCRIPT OF AUDIO RECORDING OF  
NFPA TECHNICAL MEETING  
DAY ONE  
JUNE 8, 2022

ATKINSON-BAKER, A VERITEXT COMPANY  
(800) 288-3376

TRANSCRIBED BY: MARY HARLOW  
FILE NO: 5285364

Page 1

A P P E A R A N C E S

JAMES GOLINVEAUX

UNIDENTIFIED FEMALE SPEAKERS

RODGER REISWIG

FRANKLIN SWITZER

JOHN OLSEN

TED JABLKOWSKI

GERARD ALSTON

MARCELO HIRSCHLER

JAMES CONRAD

KEVIN CHONG

BARRY BADDERS

UNIDENTIFIED MALE SPEAKERS

JOHN STAHL

ART PARKER

SHAMIM RASHID - SUMAR

1 DICK DAVIS  
2  
3 BEN CALDWELL  
4  
5 BILL FISKE  
6  
7 NORRIS HARVEY  
8  
9 JAMES BIGGINS  
10  
11 BILL PFISTER  
12  
13 CHRIS SEARLES  
14  
15 MATTHEW PACE  
16  
17 ANDREW TANNER  
18  
19 HOWARD HOPPER  
20  
21 RICK SWAN  
22  
23 MERTON BUNKER  
24  
25 BRIAN SCHOLL  
26  
27 SHARON BONESTEEL  
28  
29 DAVE RAYBORN  
30  
31  
32  
33  
34  
35 DAVE BERNZWEIG

1 KENNETH BUSH  
2  
3 BRADFORD CRONIN  
4  
5 TOP MYERS  
6  
7 BILL KOFFEL  
8  
9 JIM PETERKIN  
10  
11 TERRY VICTOR  
12  
13 CHAD BEEBE  
14  
15  
16 LENNON PEAKE  
17  
18  
19 KEVIN HALL  
20  
21  
22 CHUCK STORMER  
23  
24  
25 DAVE DESJUNET ( PHONETIC )

TRANSCRIPT OF AUDIO RECORDING OF  
NFPA TECHNICAL MEETING

DAY ONE

JUNE 8, 2022

JAMES GOLINVEAUX: Now we're live. Good afternoon, and welcome, ladies and gentlemen to the 2022 NFPA Technical Meeting. I am James Golinveaux, and it is my distinct pleasure to serve as your Standards Council Chair, and to take part in this year's meeting.

Before we go any further, I would like to introduce, on my far left, Dawn Michele Bellis, who will serve as Secretary of the Standards Council, and Suzanne Gallagher on my immediate left, who is NFPA Counsel.

As you know, the NFPA Standards Development Process is a consensus process that encourages the participation of all facets of the industry, trades, government, enforcers, and anyone interested in improving the safety, and reducing fire loss.

Through this process, countless volunteers share their expertise and time to ensure that the NFPA Standards are developed, and updated, revised to

Page 5

1 address the safety concerns and technologies. It is  
2 my pleasure to recognize some of the outstanding NFPA  
3 participants who have gone above and beyond to further  
4 NFPA's mission. Please join me in thanking each award  
5 recipient, and recognizing the stellar contributions  
6 each has made to the NFPA Standards.

7 The first award category is the Special  
8 Achievement Award. The Special Achievement Award is  
9 presented to recognize significant contributions of a  
10 Committee member to a single project that has enhanced  
11 the NFPA's Standards Development Process. We have one  
12 Special Achievement Award that will be presented  
13 today. The award goes to James B. Biggins of CAC  
14 Specialty Natural Resources, Manhattans, Illinois. I  
15 would like to ask James to please come to the podium.

16 (applause)

17 FEMALE SPEAKER: James is being recognized  
18 today for his active role with the Energy Storage  
19 Systems Project. He has been a consistent and strong  
20 advocate in promoting Energy Storage Systems Project.  
21 In 2016, the rapidly progressing and emerging  
22 technology of stationary energy storage systems was  
23 brought to the attention of NFPA as a safety concern  
24 for the public, and industry. As these systems began  
25 to find their way to the marketplace, it was quickly

1 noted that an industry standard was needed to address  
2 life safety and property protection. Recognizing this  
3 need, the Standards Council approved the project, and  
4 in January of 2016, put a call for membership to  
5 development NFPA 855, Standard for the Installation of  
6 Stationary Energy Storage Systems, a standard that  
7 would provide the much needed guidance on how these  
8 systems should be protected to reduce risk of life and  
9 property.

10 James was given the critical and challenging  
11 role of Chair of this new committee, which he guided  
12 through draft development, the first draft, and second  
13 draft, resulting in the issuance of the first edition,  
14 published in 2020.

15 Because of James' work on NFPA 855, he has been  
16 given the same charge for NFPA 200, another new  
17 Standard focused on the hanging and bracing of fire  
18 protection systems.

19 In addition to his Chair responsibilities, he  
20 also serves as an active member on other technical  
21 committees, including Energy Storage Systems, Internal  
22 Combustion Engines from 1992 to present. He acted as  
23 Chair from 1993 to 2003. The Technical Correlating  
24 Committee on Automatic Sprinkler Systems, 2006 to the  
25 present. He has also served on the following

1 associated technical committee - technical committees,  
2 excuse me: Private Water Supply Piping Systems from  
3 1996 to present, being Chair from 2006 to 2010.  
4 Hanging and Bracing of Water Based Fire Protection  
5 Systems, 1998 to present, and Chair from 2010 to 2019.  
6 Finally, he also served on the Technical Committee on  
7 Fire Protection for Nuclear Facilities from 1990  
8 through 2011.

9 JAMES GOLINVEAUX: So please join me in  
10 congratulating James on his Special Achievement Award.

11 (applause)

12 JAMES GOLINVEAUX: This concludes the Special  
13 Achievement Awards. Now for the Committee Service  
14 Awards. The Committee Service Award is given to a  
15 technical committee member for continuous and  
16 exemplary service on one or more committees over a  
17 substantial period of time, and in recognition and  
18 appreciation of a distinguished service to the NFPA in  
19 the development of NFPA Codes and Standards. I am  
20 pleased to present this award today to the following  
21 worthy individuals.

22 Our first recipient of Committee Service Award  
23 is Gerard Back (phonetic).

24 FEMALE SPEAKER: Gerard G. Back of Jensen  
25 Hughes in Baltimore, Maryland, serves on the Technical



1 Committees on Energy Storage Systems, from 2020 until  
2 present; Airport Facilities, 2017 to present; Aircraft  
3 Rescue and Firefighting, 2014 to present;  
4 Shipbuilding, Repair, and Layup, 2014 to present;  
5 Water Mist Fire Suppression Systems, 2013 until the  
6 present; Foam, 2010 to the present; and Merchant  
7 Vessels, 1997 to the present.

8 JAMES GOLINVEAUX: Thank you, Gerard, for your  
9 many years of service to NFPA, and the Standards  
10 Development process.

11 (applause)

12 JAMES GOLINVEAUX: Now let's welcome the  
13 Committee Service Award winner, Arnold Dix (phonetic).  
14 Accepting on behalf of Arnold is Norris Harvey, Chair  
15 of NFPA 502.

16 FEMALE SPEAKER: Arnold Dix of School of  
17 Medicine, UWS, Burwick, Victoria, Australia, serves on  
18 the Technical Committees on Road, Tunnel, and Highway  
19 Fire Protection, 2006 to present; Fixed Guideway  
20 Transit and Passenger Rail Systems, 2005 to present.

21 JAMES GOLINVEAUX: Thank you - thank you to  
22 Arnold for his many years of service to the NFPA  
23 Standards Development Process, and thank you, Norris,  
24 for accepting on Arnold's behalf. The next Committee  
25 Service Award goes to Peter Lawrenson (phonetic).

1 Peter, please join me on stage.

2 FEMALE SPEAKER: Peter Lawrenson of Martin  
3 Thermal Engineering Incorporated in San Luis Obispo,  
4 California, serves on the Technical Committee on  
5 Merchant Vessels. He's been on this committee from  
6 1994 to the present.

7 JAMES GOLINVEAUX: Apparently, Peter is not  
8 present, so I will accept this on Peter's behalf.  
9 Please join me in congratulating Peter on his award.

10 (applause)

11 JAMES GOLINVEAUX: And it's going home with me.  
12 The next recipient of the NFPA Committee Service Award  
13 is John McDonald. John, please join me on stage.

14 (applause)

15 FEMALE SPEAKER: John McDonald of the US  
16 General Services Administration in Potomac, Maryland,  
17 serves on the Technical Committees on: Aircraft,  
18 Rescue and Firefighting, 2009 to present; Ambulances,  
19 2009 to present; Fire Department Apparatus, 1991 to  
20 present; and Emergency - try that again - Emergency  
21 Vehicle Technicians Professional Qualifications, 2005  
22 to present.

23 JAMES GOLINVEAUX: Thank you, John, for your  
24 years of service to NFPA and the Standards Development  
25 Process.

Page 10

1 (applause)

2 JAMES GOLINVEAUX: Next, we have Franklin  
3 Switzer. Franklin, please join me on stage.

4 (applause)

5 FEMALE SPEAKER: Franklin Switzer of Safe, Inc.  
6 in Big Flats, New York, serves on the Technical  
7 Committees on: Fluid Heaters, 2012 to present; Gas  
8 Process Safety, 2011 to present. He's been the Chair  
9 since 2013. The National Fuel Gas Code, 2009 to  
10 present; Ovens and Furnaces, 2002 to present, and  
11 Chair since 2016. He also serves on the Boiler  
12 Combustion Systems Hazard Technical Committees on  
13 Fundamentals of Boiler Combustion Systems, 2003 to  
14 present; Single Burner Boilers, 2003 to present; and  
15 Multiple Burner Boilers, 2003 to present.

16 JAMES GOLINVEAUX: Thank you, Franklin, for  
17 your years of service to the NFPA and the Standards  
18 Development Process.

19 (applause)

20 JAMES GOLINVEAUX: We have nine other Committee  
21 Service Award recipients who are not here with us  
22 today. We would like to acknowledge them and thank  
23 them for their service, despite their absence.

24 FEMALE SPEAKER: The remaining NFPA Technical  
25 Committee members receiving awards today are Steven

Page 11

1 Austin of Cumberland Valley Volunteer Fireman's  
2 Association, Emergency Responder Safety Institute in  
3 Newark, Delaware. Steven serves on the Correlating  
4 Committee on Professional Qualifications, and these  
5 associated Technical Committees: Traffic Control  
6 Incident Management Professional Qualifications, from  
7 2010 as Chair, to the present. Fire Investigator  
8 Professional Qualifications, 1986 through 2006. He  
9 was Chair from 1990 to 2000.

10           Oops. Next, we have Robert J. Athanis  
11 (phonetic). He's retired FDNY, for SAFE-IR, Inc., out  
12 of Montgomery, New York. Robert serves on the  
13 Correlating Committee on Fire and Emergency Protective  
14 Clothing and Equipment. He's been on the Committee  
15 from 2012 to present; and the Associated Technical  
16 Committee on Electronic Safety Equipment, from 2003 to  
17 the present. He was Chair since 2012.

18           Dr. Sandy Bogucki, Yale University Emergency  
19 Medicine, New Haven, Connecticut. Dr. Bogucki serves  
20 on the Technical Committees on: Emergency Responders  
21 Occupational Health, from 2019 to present; Emergency  
22 Medical Services Protective Clothing and Equipment,  
23 2015 to present; and Fire Service Occupational Safety,  
24 1996 to present.

25           Rupert P. Chandler, US Joiner, LLC, Crozet,

1 Virginia. Rupert serves on the Technical Committee on  
2 Merchant Vessels. He's been on the Committee since  
3 1994.

4 William D. Cummings, Lakeside Fire, LLC,  
5 Belgrade, Maine. William serves on the Technical  
6 Committee on Merchant Vessels since 1994, and he's  
7 been Chair since 2014. He also serves on the  
8 Technical Committee on Smoke Management Systems, from  
9 1993 to 1994.

10 Rob Early of the Compressed Gas Association in  
11 Alma, New York. Rob serves on the Technical  
12 Committees on: Vehicular Alternative Fuel Systems,  
13 2018 to present; Oxygen Enriched Atmospheres, 2018 to  
14 present; Hazardous Chemicals, 2018 to present;  
15 Building Code and Safety To Life, Industrial Storage,  
16 and Miscellaneous Occupancies, since 2018; Hydrogen  
17 Technologies from 2012 to present; Gas Process Safety  
18 from the same time period; Industrial Medical Gasses,  
19 2006 to present, and he's serving as the Chair since  
20 2018. He also serves on the Technical Committee on  
21 Electrical Equipment and Chemical Atmospheres. That  
22 stint ran from 2015 through 2017.

23 Katherine Fagerlund, EFK Consulting, North  
24 Vancouver, British Columbia, Canada. Katherine serves  
25 on the Technical Committee on Fixed Guideway Transit

1 and Passenger Rail Systems, 2003 to present.

2 Craig E. Hofmeister, The Fire Consultants,  
3 Inc., Apex, North Carolina. Craig serves on the  
4 Technical Committees on: Merchant Vessels, from 2006  
5 to present; as well as Laboratories Using Chemicals,  
6 2003 to present. He also serves on the Technical  
7 Committee on Telecommunications, from 2008 through  
8 2012.

9 And finally, Dr. Richard J. Martin, of Martin  
10 Thermal Engineering, Incorporated, San Luis Obispo,  
11 California. Dr. Martin serves on the Technical  
12 Committee on Fluid Heaters. He has been a member  
13 since 2010.

14 JAMES GOLINVEAUX: Again, let's show our thanks  
15 and appreciation for these award recipients and their  
16 efforts.

17 (applause)

18 JAMES GOLINVEAUX: Thank you for that sincere  
19 appreciation. I'm going to go off script here just  
20 for a second. It's been a couple of years since we've  
21 had a live Technical Meeting, and I want to remind the  
22 makers of the motion to please make your way to a  
23 green microphone when it is your turn to make the  
24 motion. The Moderator will recognize you. When you  
25 make the motion, identify yourself, your company

Page 14

1 and/or affiliation, then move your motion, move to  
2 accept your motion. And then wait for the Moderator  
3 to obtain a second. After the Moderator will obtain a  
4 second to your motion if there is a second, the  
5 Moderator will then return to you as the microphone,  
6 to present your argument or your statement in support  
7 of your motion. And they'll follow the procedures  
8 from there.

9 If you're speaking into a microphone for or  
10 against, the green microphones, obviously, are  
11 speaking for the motion. The red microphones are  
12 against the motion. Each and every time you come to a  
13 microphone, you need to state your name, your company  
14 affiliation, and whether you're speaking for, or  
15 against. The, the transcript of this doesn't have an  
16 - a video of you, at what color microphone you're at.  
17 So, state your name, your company and/or affiliation,  
18 and state whether you're speaking for or against the  
19 motion, then begin your argument. So just to try to  
20 keep it a little bit smother, I wanted to go off  
21 script a little bit.

22 I'll now to turn the, the meeting over to  
23 Rodger Reiswig, the Presiding Officer who will proceed  
24 with the Order of Business for the 2022 Technical  
25 Meeting. Thank you.

1           RODGER REISWIG: Thank you, James. As  
2 introduced, I am Rodger Reiswig. And as Presiding  
3 Officer, I declare that a quorum is present for  
4 purposes of conducting business. Let me remind you,  
5 being a safety organization, NFPA is always concerned  
6 for your safety. While you are here, we want you to  
7 be safe, so please pay close attention to the  
8 following safety procedures.

9           The fire alarm signal at the Boston Convention  
10 and Exhibition Center is an initial positive alarm  
11 sequence, a long tone, followed by a series of four  
12 beep tones, repeated four times over the public  
13 address system, and the flashing strobe lights on the  
14 fire alarm beacons will activate. If you hear the  
15 alarm, please quietly leave the room, using the exit  
16 nearest you. Remember, the nearest exit may be behind  
17 you.

18           If there is an emergency requiring evacuation,  
19 a three pattern temporal code sounds until the  
20 building is cleared for re-occupancy. If the facility  
21 requires evacuation without alarm activation, a long  
22 tone will be generated by the Public Safety Command  
23 Center, through the facility emergency public address  
24 system, followed by specific instructions for the  
25 evacuation. Convention Center staff will help anyone



1     needing special assistance.

2             During the Technical Meeting, the use of  
3     recording devices of any type is prohibited. The  
4     votes cast at the Technical Meeting, in conjunction  
5     with the debate, are an integral and important  
6     contribution to NFPA's consensus process. Through  
7     motions, debate, and voting, you, our NFPA membership,  
8     make recommendations to the Standards Council. The  
9     majority vote results today are for the sole purpose  
10    of providing recommendations to the Standards Council  
11    prior to the issuance of any Standards.

12            Any appeal based upon Technical Meeting actions  
13    must be filed with the Standards Council by June 29,  
14    2022 - that is 20 days following the adjournment of  
15    this meeting. An appeal for any amendment passed at  
16    this meeting which fails Technical Committee or  
17    Correlating Committee ballot, shall be filed no later  
18    than five days after publication of the Technical  
19    Committee Ballot Results in accordance with Section  
20    1.6.2(v) of the regulations.

21            Typically, results of amendment ballots are  
22    published within 20 days of the Technical Meeting  
23    adjournment. The Standards Council decision on  
24    issuance is based upon the entire record before it,  
25    including the Pre-Technical Meeting Position

1 Statements submitted, debate, and resulting votes at  
2 the Technical Meeting. The Standards Council will  
3 meet on August 10th through the 12th, 2022, to hear  
4 appeals and make final determinations on issuing  
5 Standards.

6 Today's sessions will include Certified  
7 Amending Motions, CAMs, on NFPA 86, 130, 285, 502,  
8 855, and 25, in that order, as posted in the agenda,  
9 or at [NFPA.org/2022 Tech Session](https://www.nfpa.org/2022-Tech-Session).

10 Before we move onto the Certified Amending  
11 Motions for consideration and debate today, let's be  
12 certain that everyone's voting application is working.  
13 For anyone who is a member with voting rights at  
14 today's session who has yet to download the  
15 application for voting, please do so at this time.  
16 Staff is in the rear of the room, and they can assist  
17 you.

18 Any registered, eligible voting member who does  
19 not have a smart phone device may request use of a  
20 limited number of voting devices at the back table.  
21 These members will also be required to log into the  
22 app with an assigned key code, and complete the test  
23 question prior to submission of the first vote.

24 So to verify that the app is in working order,  
25 please scroll down, and select 'Call the Question'. I

1 will ask that you vote, choosing either Yes or No  
2 after I announce the voting is open. I'll give you a  
3 few seconds to get there, for those that are not. All  
4 right. So voting is now open. Please cast a vote,  
5 Yes or No, for Call of the Question. Voting will  
6 close in five seconds. Voting is now closed. You  
7 will see the results now appear, as will results  
8 throughout the session, on the center screen. So in  
9 this case, we had a Yes of 147, and a No of 21.

10 So now that you're comfortable with the  
11 process, and your voting device is ready, let's begin.

12 The first report under consideration is that of  
13 the Technical Committee on Ovens and Furnaces. Here  
14 to present the Committee Report is Committee Chair,  
15 Franklin R. Switzer, Jr. of SAFE, Incorporated, Big  
16 Flats, New York. The Committee Report, that is the  
17 first and second draft reports, is located on the  
18 Document Information Page for NFPA 86, on NFPA's  
19 website. All Certified Amending Motions are  
20 identified in the NFPA Technical Meeting, Tech Session  
21 Agenda, included in the report of the Motions  
22 Committee, and we - and will be displayed behind me on  
23 the screen as they are under debate.

24 The text, in which case is a little larger, so  
25 an indication of this will be a page on which you can

1 locate the complete text within the report of the  
2 Motions Committee, will be indicated.

3 Mr. Switzer will be stepping down as Chair due  
4 to the tenure policy, and I would like to express our  
5 thanks to Franklin for his leadership. Thank you,  
6 Sir. Mr. Switzer, will you present the Chair Report,  
7 please.

8 FRANKLIN SWITZER: Yes. The report of the  
9 Technical Committee on Ovens and Furnaces is presented  
10 as found in the first draft report, and second draft  
11 reports for the annual 2022 of NFPA 86, Standards for  
12 Ovens and Furnaces. The revisions were submitted to  
13 letter ballot of the responsible committee -  
14 committees, in accordance with the regulations  
15 governing the development of NFPA Standards. The  
16 reports and ballots results can be found on the Next  
17 Edition tab of the Document Information Page for NFPA  
18 86, at [www.nfpa.org/86next](http://www.nfpa.org/86next).

19 RODGER REISWIG: Thank you, Mr. Switzer. Let's  
20 now proceed with the discussion on Certified Amending  
21 Motion on NFPA 86-6. Is Mr. John Olsen in the room?

22 JOHN OLSEN: Hello. My name is John Olsen. I  
23 am Director of Engineering and New Product Development  
24 for Thermal Products Solutions. We represent company  
25 brands Baker Furnace, Blue M, Gruenberg, Lindberg/MPH,

1     Lunaire, Penny, and Wisconsin Oven.

2             RODGER REISWIG: I just need a motion, Sir.

3             JOHN OLSEN: So my motion is to reject the  
4     changes to NFPA 86, specifically the elimination of  
5     the exception of 5.3.1. The removal of explosion  
6     relief shall not be required on ovens and furnaces  
7     with shell construction having 3/16s of an inch for .3  
8     - I mean, 4.8 millimeters, or heavier steel plate.

9             RODGER REISWIG: All right, Sir. Hold on a  
10    second. So there is a motion on the floor to reject  
11    Second Revision Number 7. Is there a second?

12            MALE SPEAKER: I second.

13            RODGER REISWIG: We do have a second. Please  
14    proceed with the discussion on the motion.

15            JOHN OLSEN: Okay. I have six points that my  
16    colleagues and I put together regarding the motion  
17    substantiation. Number One is, there does not appear  
18    to be a need for removing the 3/16ths plate exception  
19    for explosion relief. Experience has shown us that  
20    there has been, when there has many deflagration  
21    events in an oven or furnace with 3/16ths plate, steel  
22    construction, the exterior shell remains intact.

23            Number Two - on many pieces of equipment, there  
24    is not sufficient area available on ovens or furnace  
25    shell to place explosion relief. This occurs when the

Page 21

1 oven or furnace has accessories that require  
2 penetration through the wall or the roof, or frequent  
3 structural members of the exterior shell. So we use  
4 the 3/16ths to make the oven safer.

5           Number Three - the NFPA guidelines state that  
6 explosion relief panels should not exceed five pounds  
7 per square foot in weight. For conventional oven  
8 designs that utilize the sheet metal line - interior  
9 and outer skins with mineral wool insulation, this is  
10 achievable. However, for higher temperature designs,  
11 heavier construction utilizing 3/16ths is required.  
12 With that insulation of 9 to 12 inches, the weight of  
13 these designs can be in excess of 15 to 20 pounds.  
14 And then when we use for castable linings, it can  
15 exceed a hundred pounds per square foot, making them  
16 ineffective, and potentially dangerous for explosion  
17 relief.

18           And then for higher temperatures that require  
19 plate construction - there are no furnace or oven  
20 shell designs available that provide explosion relief,  
21 that offer sufficient insulating characteristics.  
22 These insulation materials, such as cast linings, or  
23 factory brick, and ceramic modules, cannot be design  
24 with explosion relief, since their weight requires  
25 substantial attachment points that would be too stout

1 to break away during deflagration.

2 Number Five - the ovens operating above 1200  
3 degrees or higher, the explosion relief - oh. That's  
4 the one minute, or the --

5 RODGER REISWIG: One minute.

6 JOHN OLSEN: Okay. They would pose significant  
7 danger if there's a deflagration event, because those  
8 high temperature, for a factory environment, the, the  
9 furnaces operate up to like, 2000 degrees or higher.  
10 That radiant heat from that exposed surface after it's  
11 - could spontaneously cause combustion of nearby  
12 materials.

13 And then our Sixth point was that considering  
14 that ignition of flammable surfaces, you know, that -  
15 our ovens that use this construction go over 700  
16 degrees, usually there is no buildup of fumes, or  
17 potential explosive materials, because it's operating  
18 above the temperature, and the fumes are consumed as  
19 they're being emitted.

20 And summary - removing the explosion relief  
21 exception for the 3/16ths plate construction would  
22 make the equipment less safe.

23 RODGER REISWIG: Thank you. Mr. Switzer, would  
24 you like to offer the Committee's position?

25 FRANKLIN SWITZER: Yes. Though it has existed

1 in NFPA 86 for many years, the Committee has been  
2 unable to substantiate the exemption of explosion  
3 relief for ovens and furnaces with a 3/16ths shell  
4 plate, or equivalent strength construction. The  
5 3/16ths plate, thick plate's construction was first  
6 introduced to the NFPA Standard in 1985, under Section  
7 2-2.3.1, Exception Number One. However, there is no  
8 mention of it in the Report on Committee's - on, on  
9 comments from the '84 Fall meeting, and no  
10 substantiation for adding it was ever documented.

11 The '86, '85 edition, 1985 edition was first,  
12 the first time that NFPA 86-A and 86-B were actually  
13 combined together into a single document, which is  
14 when this requirement came to be.

15 Furthermore, the requirement to be reinforced  
16 with structural steel beams or buck stays does not  
17 specify an intended strength or spacing. Therefore,  
18 the requirement is perceived to have an indeterminate  
19 effect on the effectiveness of the shell thickness.  
20 Since the Standard is not a design handbook, as stated  
21 in 81.5, as the Committee's position that these  
22 requirements should be left to the furnace designer to  
23 determine when required.

24 In addition, the requirements for Class C and D  
25 furnaces were removed from this section at this time,



1 because those types of furnaces are covered elsewhere  
2 in the Standard, under separate requirements.

3 RODGER REISWIG: Thank you. With that, we will  
4 open debate up for the motion. Please provide your  
5 name, affiliation, and whether you are speaking in  
6 support of, or against the motion. Microphone Two,  
7 did you want to speak again, or --

8 JOHN OLSEN: Yeah. My name is John Olsen, with  
9 TPS. I am not sure how to respond. All I know is  
10 that the - experience has shown us over the last 30  
11 years, when (unintelligible) --

12 RODGER REISWIG: Sir, I'm sorry. I need you to  
13 state whether you're for or against the motion.

14 JOHN OLSEN: I am - oh, sorry. I am for the  
15 motion to reject that elimination. The - what we've  
16 found is when looking at thinner wall ovens with  
17 explosion relief, the ovens, when there is a  
18 deflagration event, the explosion relief materials  
19 come off, but the oven usually requires substantial  
20 repair, or furnace. And we also have seen where, even  
21 with the explosion relief under that thinner  
22 construction, the equipment could pose risk for, you  
23 know, people standing nearby because of the, the way  
24 that the ovens are constructed. The 3/16ths, however,  
25 we have not seen one actually fail, and it holds up

Page 25

1 much better to these deflagration events. But if you  
2 were to try to weaken it or add enough explosion  
3 relief area, and try to comply with the rest of those  
4 codes, we cannot come up with a design that actually  
5 will make the equipment safer. So the 3/16ths does  
6 survive under deflagration events.

7 RODGER REISWIG: Thank you. Are there any  
8 further discussions on Motion 86-6 to reject Second  
9 Revision No. 7? Mr. Switzer, would you like to offer  
10 any final comments?

11 MALE SPEAKER: I think we have a commenter  
12 coming up.

13 RODGER REISWIG: Oh, I'm sorry. Microphone  
14 Number Five.

15 TED JABLKOWSKI: Good afternoon, my esteemed  
16 colleagues. My name is Ted Jablkowski. I represent  
17 Fives North American Combustion, and I'm here to speak  
18 against this motion.

19 I did some research. I've been on NFPA 86  
20 since 1999, and a current member. And I did some  
21 research to try to bring some of the Committee's prior  
22 work on this topic to light. And so, in the 1999  
23 edition, this was Section 3.3.1. And in the 2003  
24 Report on Proposals, my colleague, Al Underys of A.  
25 Finkl and Sons, put forth a, a input to eliminate the

1 language, having 3/16ths inch or heavier steel plates,  
2 shells - excuse me - reinforced with structural steel  
3 beams and buck stays that support and retain  
4 refractory or insulating materials required for  
5 temperature endurance - which makes them unsuitable  
6 for the installation of explosion relief.

7 Those are the words that Mr. Underys brought  
8 forward to remove, specifically to remove this 3/16th  
9 inch thickness requirement.

10 And in the substantiation, he offered that the  
11 current exception mandates a certain type of  
12 construction and material, instead of considering the  
13 engineering concepts that the prescribed construction  
14 is trying to achieve. And then he went on to offer  
15 calculations. He brought up the spacing that's not  
16 defined, and ultimately, calculated a uniform load of  
17 a hundred pounds per cubic feet.

18 Well, in 2003, the Committee rejected this  
19 proposal. And their substantiation for rejecting was  
20 --

21 RODGER REISWIG: One minute.

22 TED JABLKOWSKI: The practice of not allowing  
23 explosion relief was based on the use of heavy  
24 refractories. Accepting the proposal would extend the  
25 elimination of explosion relief to those that do not

1 use refractory linings. Now, in some of our meetings,  
2 people ask, 'What is a buck stay, anyway?' Webster  
3 defines it as, 'Either of two connecting garters used  
4 on each side of the masonry structure of a furnace or  
5 flue, to take the thrust of an arch.'

6 So we have requirements that are impossible to  
7 substantiate. And I respectfully ask that you all in  
8 attendance respect the work of the '86 Technical  
9 Committee, and vote against this motion. Thank you.

10 RODGER REISWIG: Thank you. Microphone Two,  
11 are you there to speak, or - if you're going to come  
12 to the mic-- or if you're going to speak, I need you  
13 to come to the microphones and be prepared. I don't  
14 know if you're standing next to it, or looking --

15 JOHN OLSEN: Yeah. I'm, I'm standing here,  
16 mainly. My name is John Olsen. I am with TPS. I'm  
17 here to - for the motion to reject the changes by  
18 eliminating the exception. I'm not familiar with the  
19 process. So I thought since it's such a long ways to  
20 walk, that I'd just stand here, and be able to keep  
21 things moving quickly, and respond.

22 Based off of our, you know, many years of  
23 experience, myself engineering the equipment and  
24 actually visiting sites where this is installed, many  
25 times the explosion relief, I - we do understand the

1 intention to make the equipment safer. However, in,  
2 you know, removing the 3/16ths, it would actually  
3 cause, you know, more companies to go with a thinner  
4 wall construction, when applicable, and would be a  
5 less safe design over time.

6 So my main purpose is to just be standing by to  
7 address any of those concerns. We do see that the  
8 3/16ths construction does survive even after repeated  
9 deflagration events, and that with - when we do use  
10 the explosion relief on the thinner wall construction,  
11 that there has been injuries, and there has been  
12 people who have actually been seriously injured by,  
13 you know, the equipment when, you know, an event like  
14 this happens.

15 So we've seen that the 3/16ths is a much safer  
16 construction when applicable. And we design the  
17 equipment, as much as we can, to comply with explosion  
18 relief. But the way that the Code is written, if that  
19 is eliminated, we would find it difficult to build or  
20 design the ovens to match the current Code, if NFPA 86  
21 is changed to eliminate that exception. Thank you.

22 RODGER REISWIG: Thank you. Are there any  
23 further discussion on Motion 86-6, to reject Second  
24 Revision No. 7? Mr. Switzer, would you like to make  
25 any final comments?

1 FRANKLIN SWITZER: I guess the only thing I'll  
2 reiterate is that the - as far as the Committee is  
3 concerned, we are not prohibiting the use of 3/16ths  
4 plate. We are merely taking it from the Standard, and  
5 we're not - we, we don't see it's been substantiated  
6 in any way scientifically. And therefore, with the  
7 buck stay also not defined, there is an indeterminate  
8 amount of effect, and it can be achieved through the  
9 design conditions that a furnace, a furnace designer  
10 would do, and it would be up to them to determine what  
11 they want to put in place.

12 RODGER REISWIG: Thank you for your final  
13 comments. Before we let - before we vote, let me  
14 restate the motion. The motion on the floor is to  
15 reject Second Revision No. 7. To vote, touch the Vote  
16 button. If you wish to vote in support of the motion,  
17 and recommend the text, touch Yes. If you wish to  
18 vote against the motion and the recommended text,  
19 touch No. Please record your vote now. Voting will  
20 close in five seconds. Voting is now closed. Thank  
21 you.

22 The results of the vote - 46 Yes, or in  
23 support, 103 against, or No. So the motion has  
24 failed. Are there any other further discussions on  
25 NFPA 86? Seeing none, we will move to go on to the

1 next Standard.

2 I will call, now call the next Standard on the  
3 agenda, NFPA 130. The next report under consideration  
4 is that of the Technical Committee on Fixed Guideway  
5 Transit and Passenger Rail Systems. Here to present  
6 the Committee Report is Committee Chair, Gerard Alston  
7 of ARUP, New York, New York. The Committee Report,  
8 that is the First and Second Draft Reports, is located  
9 on the Document Information Page for NFPA 130, on the  
10 NFPA website. All Certified Amending Motions are  
11 identified in the NFPA Technical Meeting Tech Session  
12 Agenda, included in the report on the Motions - of the  
13 Motions Committee, and will be displayed behind me on  
14 the screen as they are under debate. Mr. Alston, will  
15 you present the Chair Report?

16 GERARD ALSTON: Yes. Thank you. The report of  
17 the Technical Committee on Fixed Guideway Transit and  
18 Passenger Rail Systems is presented as found in the  
19 First Draft Report, and Second Draft Report, the 2023  
20 Edition of NFPA 130, Standard for Fixed Guideway  
21 Transit and Passenger Rail Systems.

22 The revisions were submitted to letter ballot  
23 of the responsible Technical Committees, and  
24 Correlating Committee in accordance with the  
25 regulations governing the developing of NFPA

Page 31

1 Standards. The reports and ballot results can be  
2 found on the Next Edition tab of the Document  
3 Information Page for NFPA 130, at  
4 [www.nfpa.orgdoc#next](http://www.nfpa.orgdoc#next).

5 RODGER REISWIG: Thank you. Let's now proceed  
6 with the discussion on Certified Amending Motion 130-  
7 9. David Mammarella, are you in the, in the audience?  
8 Certified Amending Motion No. 16 appears on our  
9 agenda, however, no authorized individual has signed  
10 in, or approached the microphone to make the motion.  
11 Seeing that the maker of the motion, nor an identified  
12 designated representative has approached to make the  
13 motion for No. 16, in accordance with NFPA Rules,  
14 Convention Rules at Section 2.7, the motion may not be  
15 considered by the assembly as Certified Amending  
16 Motion, and is removed from the agenda. We will now,  
17 now move on to the next motion.

18 MALE SPEAKER: 130-9.

19 RODGER REISWIG: I'm sorry, it was 130-9, for  
20 Second Revision No. 16. Let me say that again.  
21 Sorry. Certified Amending Motion 130-9 appeared on  
22 our agenda. However, no authorized individual has  
23 approached the microphones to make that motion.  
24 Seeing that the maker of the motion, nor an identified  
25 designated representative has approached to make



1 Motion 130-9, in accordance with NFPA Rules,  
2 Convention Rules, Section 2.7, the motion may not be  
3 considered by the assembly as a Certified Amending  
4 Motion, and is removed from the agenda. We will now  
5 move to the next motion. Sorry about that.

6 Now let's proceed with discussion on Certified  
7 Amending Motion 130-3.

8 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
9 International for NFPA, and I move 130-3, please.

10 RODGER REISWIG: Thank you. There is a motion  
11 on the floor to reject Second Revision No. 19, and any  
12 related portions of First Revision. Is there a  
13 second?

14 FEMALE SPEAKER: Second.

15 RODGER REISWIG: Thank you. We do have a  
16 second. Please proceed with the discussion on the  
17 motion.

18 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
19 International for NFPA. I'm a member of the NFPA 150  
20 --

21 RODGER REISWIG: Are you for or against the  
22 motion?

23 MARCELO HIRSCHLER: I am, I'm the maker of the  
24 motion. I'm for the motion.

25 RODGER REISWIG: Thank you.

1 MARCELO HIRSCHLER: And a - I'm a member of  
2 NFPA 130 Committee, but not speaking for the  
3 Committee, of course. This motion recommends deleting  
4 some duplication, and potentially misleading  
5 information. It's cables are power and control  
6 cables; they're not communications cables, or ethernet  
7 cables. That's abundantly clear from what is stated  
8 in the NEC. NFPA Codes and Standards should not  
9 contain information that can be misleading. The body  
10 of the Standard states that the requirement in  
11 8.6.7.1.2 applied to low voltage power and control  
12 wires and cables less than 100 volts, and 150 DC. If  
13 the requirements apply to power and control cables,  
14 they clearly do not apply to communication and  
15 ethernet cables, since communication and ethernet  
16 cables are neither power, nor control cables.

17 The supposed clarification leads to potential  
18 confusion because a user might interpret it as stating  
19 that communication and ethernet cables could be power  
20 or control cables, which they are not.

21 The Committee Chair's statement says that  
22 anecdotally, someone heard that people might confuse  
23 one type of cable for another. If we're going to add  
24 information to a Standard because of some anecdote  
25 that someone heard that maybe someone does not know

1 what a power cable is, then we would be filling  
2 Standards with a lot of extraneous information. If we  
3 believe such information is necessary because of  
4 anecdotes, should we also tell users (unintelligible)  
5 130 that trains are not busses, and that the  
6 requirements in the Standard don't apply to busses?  
7 Obviously not. Where do responses to anecdotes end?

8 The last two sentences of the new Section are  
9 severely misleading. The purported fact that, as the  
10 sentence states communication and ethernet cables use  
11 thin insulation and jackets that do not comply with  
12 your thickness and performance requirements of a  
13 standard 7.1.2 is of no consequence since, as  
14 explained above, such cables are not required to  
15 comply with the Standards --

16 RODGER REISWIG: One minute.

17 MARCELO HIRSCHLER: -- re - in A.8.6.7.1.2.  
18 Bananas also don't comply with this Standard, and  
19 we're not saying that you need to comply with bananas.  
20 The requirements do not need to say things that don't  
21 apply. The final sentence brings in another purported  
22 fact, which is also of no consequence. Cables are not  
23 required to comply with 8.6.7.1.2. Also  
24 (unintelligible) material (unintelligible) which is  
25 relevant. Consequently as has been stated above, the

Page 35

1 language in the Annex Section is both unnecessary and  
2 misleading, introduces inappropriate information for  
3 (unintelligible) Standard. Thank you.

4 RODGER REISWIG: Thank you. Mr. Alston, would  
5 you like to offer the Committee's position?

6 GERARD ALSTON: Thank you. Yes. Dr.  
7 Hirschler's motion relates to informational Annex  
8 language developed to clarify the application of  
9 Section 8.6.7.1.2, which pertains to low voltage,  
10 power, and control wires and cables. The additional  
11 language identified a representative list of cable  
12 types, which were - to which the requirements were not  
13 intended to apply, and would not be able to satisfy  
14 the requirements. This list is provided in, in front  
15 of you in the text, and involves CAT 5, CAT 6, and,  
16 and similar type cables.

17 Dr. Hirschler does not refute the intent of the  
18 clarifying language, but just simply that it is  
19 unnecessary on the basis that the charging statement  
20 of Section 8.6.7.1.2 is clear with respect to the  
21 scope and applicability to low power (unintelligible)  
22 cables. However, the reality is, it is indeed being  
23 misapplied to the cable types being identified within  
24 the Annex. Therefore, it was the majority opinion of  
25 the Committee that such clarification would be of

1 value to the rolling stock manufacturing industry in  
2 clarifying the extent and scope of the Section  
3 8.6.7.1.2. The voting was, out of 29 eligible, 23  
4 affirmative and one negative, that being Dr.  
5 Hirschler.

6 He goes on to say that including clarifying  
7 information could lead to confusion in classifying, or  
8 characterizing communication and ethernet cables as  
9 low voltage power, and control wires and cables,  
10 insomuch that a specific exception is being made.  
11 However, it is the intent of the informational Annex  
12 material to clarify that such cables cannot be  
13 considered as such. In doing so, the Committee was  
14 attempting to make the interpretation, application,  
15 and enforcement of the Standard clearer as it is  
16 utilized and applied by practitioners with a wide  
17 range of expertise.

18 The final points to which Dr. Hirschler has  
19 taken issue is the additional information to why  
20 requirements such as those identified in the section  
21 cannot apply to ethernet and communications cable.  
22 While the list is not exhaustive - that is conceded,  
23 as is the list of cable types, additional context is  
24 being provided as to why the attempted enforcement of  
25 the section would be inappropriate. As evidenced by

1 the near consensus vote, it was the Committee's  
2 opinion that such information was of value to the  
3 industry.

4 RODGER REISWIG: Thank you, Mr. Alston. With  
5 that, we will open debate on the motion. Please  
6 provide your name, affiliation, and whether you are  
7 speaking in support of, or against the motion.  
8 Microphone Number Two.

9 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
10 International for NFPA, and in support of the motion.  
11 Note that the Chair did not reference what is in his  
12 Chair's statement, that there's anecdotal information  
13 that people mischaracterize. I don't think anyone who  
14 understands what a cable is will not know that a  
15 communication cable or an ethernet cable is not a  
16 power cable. It's clear - it's clear - the - if we're  
17 going to start putting, every time we say something  
18 that we have to clarify, then our Standards go in - on  
19 forever. Then, also we have, including but not  
20 limited - these laundry lists mean that we have some  
21 material - some designations that are there. Does  
22 that mean they're all of them? No, they're not. And  
23 we're going to next thing - same information, the same  
24 type of information in the, in the next motion.

25 This is a list of some products that happen to

1 be those of interest to the maker of the original  
2 public input. Maybe they're - they're all - and I'm  
3 pretty sure they're not all. So what do people do  
4 with a list of what things don't apply to, and  
5 consequently don't need to be included in here. Thank  
6 you.

7 RODGER REISWIG: Thank you. Microphone Number  
8 One.

9 JAMES CONRAD: Oh, thank you. My name's James  
10 Conrad. I work for RFCC, and been active in the 130  
11 Committee for about 10 or 15 years, and I speak in -  
12 against the motion. The reason I speak against the  
13 motion is we added this informational note into the  
14 Annex because over the last several cycles, the car  
15 business has changed. And if you read 130 8.6.7.1.2,  
16 it really addresses to UL Standards - UL 83 and UL 44.

17 These communication cables that we're talking  
18 about in this CAM is really to let the users of this  
19 Standard know that 130 didn't address them properly.  
20 And this was a quick way of fixing it to say, 'No,  
21 these do not apply, don't need to comply with UL 83 or  
22 44.' And as it says there, they don't. The  
23 insulation's usually thinner, and they don't - they  
24 have their own Standards.

25 And we're still working on trying to get

1 Chapter Eight a little further along over the next  
2 couple cycles, to address all types of cables that are  
3 currently being used. But it is a revolving door. As  
4 the industry changes, and more and more different  
5 types of cables are used on these sophisticated cars  
6 now, we're going to have more and more notes to guide  
7 the people. And again, I speak in - against the  
8 motion. Thank you.

9 RODGER REISWIG: Thank you. Microphone Number  
10 Five.

11 KEVIN CHONG: My name is Kevin Chong. In this  
12 capacity, I'm speaking on behalf of my own company,  
13 MKC Engineering. I previously submitted --

14 RODGER REISWIG: Are you for or against the  
15 motion, Sir?

16 KEVIN CHONG: Sorry. Against the motion.

17 RODGER REISWIG: Thank you.

18 KEVIN CHONG: I previously submitted  
19 information to NFPA 130, in conjunction with Katherine  
20 Fagerlund and Harold Locke, because of the specifics  
21 of the wire and cable. I worked on all the SkyTrain  
22 projects in Vancouver, British Columbia. The reason  
23 I'm against it is, obviously with ethernet cabling,  
24 there are situations where we use power over ethernet,  
25 and those are the types of situations where the



1 confusion can arise. So as a result, I think the, the  
2 fact that this is an Informational Annex. It does  
3 help the people that are a little confused about  
4 whether POE is considered power by NFPA 130. Thank  
5 you.

6 RODGER REISWIG: Thank you. Are there any  
7 further dis-- Microphone Number Two.

8 MARCELA HIRSCHLER: Marcela Hirschler, GBH  
9 International for NFPA, and for the motion. It's  
10 interesting - since both Jim Conrad and the, the  
11 gentleman who just spoke, they say this is a, a real  
12 problem. But neither of them have submitted a public  
13 info, public comment to actually address what they  
14 think is a problem, by fixing the Standard - not the  
15 Annex, which is information and can be ignored. And  
16 when we put into the Annex information that is  
17 potentially misleading, we are causing a disservice.  
18 Thank you.

19 RODGER REISWIG: Thank you. Are there any  
20 further discussions for Motion 130-3 to Reject Second  
21 Revision No. 19, and Any Related Portions of First  
22 Revisions? Mr. Alston, would you like the - to make a  
23 final comment?

24 GERARD ALSTON: No. No, nothing further at  
25 this time.

1           RODGER REISWIG: Thank you. Before we vote,  
2 let me restate the motion. The motion on the floor is  
3 to Reject Second Revision No. 19, and Any Related  
4 Portions of First Revisions. To vote, touch the Vote  
5 button. If you wish to vote in support of the motion  
6 and recommend the screen - the text on Screen One,  
7 vote Yes. If you wish to vote against the motion, and  
8 recommend the text on Screen Two, touch No. Please  
9 record your vote now. Voting will close in five  
10 seconds. Voting is now closed. Oh, sorry - looking  
11 up here for the screen. 394 in support, and 121  
12 against, No. The motion has failed.

13           Let's proceed with the discussion on Certified  
14 Amending Motion 130-5. Microphone Number Two.

15           MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
16 International for NFPA, and I move the - accept Motion  
17 130.5, please.

18           RODGER REISWIG: Thank you. There is a motion  
19 on the floor to Accept an Identifiable Part of Public  
20 Comment No. 11. Is there a second?

21           MALE SPEAKER: Second.

22           RODGER REISWIG: We do have a second. Please  
23 proceed with the discussion on the motion.

24           MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
25 International for NFPA, and in support of the motion.

1 I'm a member of NFPA 130, but I don't speak for the  
2 Committee. This motion is associated with the  
3 previous one. This says - it proposes to eliminate  
4 this sentence. It gives examples of type of cable  
5 that potentially are used in trains. The - it - some  
6 examples of designations for cables potentially using  
7 - include Category A, etc., etc.

8 The list of examples of categories that are  
9 potentially used - what does that mean? Whenever a  
10 Code of Standard contains a list of examples, that  
11 brings the potential for confusion, because the list  
12 is necessarily incomplete. The sentence states that  
13 those type of cables are potentially used. Well, we,  
14 we just discussed in the previous section that they're  
15 not used in the application which is covered by this  
16 section.

17 So the question now - does this mean that any  
18 cable of that designation must be accepted by the AHA?  
19 Clearly, that does not - it's not what it means. Does  
20 it means that other (unintelligible) cable cannot be  
21 used for the application? Again, clearly, that's not  
22 what it means. The list clearly says it contains some  
23 examples. How I can a user approach this information?  
24 Does a user have to look at every cable designation  
25 and see whether it is included in the list? And what

1 happens if it's not included?

2 The Technical Committee dealt with another  
3 note, with another list of examples, in the case of  
4 categories with UL designation that's actually found  
5 in the NEC, by deleting that, for - with PC 17, with a  
6 statement, 'The addition of exemplary installation  
7 instructions are unnecessary, should not be included,  
8 as not all examples can be added, and examples might  
9 be misleading.' I fully agree with that sentence, and  
10 that sentence applies to this exactly, here, too.  
11 Same concept applies to this list, and it should not  
12 be - this sentence should be deleted, just like the  
13 Committee did in PC 17. That's what this CAM  
14 proposes. Thank you.

15 RODGER REISWIG: Thank you. Microphone Number  
16 One.

17 JAMES CONRAD: Yeah. Thank you. James Conrad,  
18 RSCC (unintelligible) Cable Company, and I speak  
19 against the motion on the floor. The reason we added  
20 this is the same argument as last time. Cars - train  
21 cars are becoming very sophisticated, and more and  
22 more different types of category cables are being, you  
23 know, required, you know, by the different car  
24 builders. And we feel that we have to continue to put  
25 these notes in there to guide the users of the

Page 44

1 Standard, what we really mean. And yes, we will  
2 continue working on the 130 Standard to try to address  
3 all these cables in the future. Thank you.

4 RODGER REISWIG: Thank you. And I just  
5 realized that I should have went to the Chair next.  
6 Mr. Alston, I --

7 GERARD ALSTON: That's fine.

8 RODGER REISWIG: -- apologize for that.  
9 Please, could you offer the Committee's statement?

10 GERARD ALSTON: Sorry. Very similar issue as  
11 to the last one, in terms of providing a list. Well,  
12 again, to acknowledge - it may not be exhaustive, it  
13 is providing the characteristics and type of, of cable  
14 that is being contemplated by the section under  
15 consideration. Again, this voting was nearly  
16 unanimous, 29 eligible, 25 affirmative, including the  
17 submitter of the, the, the Amending Motion here today.

18 With respect to the, to the list, Dr. Hirschler  
19 contends that the Committee disposed of other lists  
20 during the current cycle. However, this example is  
21 dissimilar, in that it was referring to UL  
22 designations for electrical circuit integrity systems.  
23 In such case, the, the listing was unnecessary as it  
24 was redundant to the statement that circuit integrity  
25 systems be tested as a complete assembly. The FHIT

1 identifier is associated with a particular cable  
2 system, and identifies the particular installation  
3 instructions, as would be necessary for any system to  
4 comply with its tested conditions and certification.

5 He also asserts that stating cables potentially  
6 used in a rail transportation vehicle offers a  
7 loophole that all cables may be contemplated for use  
8 in rolling stock that would comply to applicable  
9 requirements, would forcibly be required to be  
10 accepted by NIHA. However, any such cable would still  
11 be subject to the requirements of Section 86711 of the  
12 Standard, which establishes flame spread and smoke  
13 release criteria for cables and installation in  
14 rolling stock.

15 RODGER REISWIG: Thank you, Mr. Alston. And  
16 again, I apologize for going out of turn.

17 GERARD ALSTON: That's --

18 RODGER REISWIG: I'm sure I'll lose a strike  
19 from that one. So with that, we will open up debate  
20 on the motion. Please provide your name, affiliation,  
21 and whether you are speaking in support, or against  
22 the motion. Microphone Number Two.

23 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
24 International for, for NFPA, and in support of the  
25 motion. It's very interesting. This list is the same

1 list that we discussed in the previous motion. The  
2 previous motion, we said it's not covered. Now we're  
3 saying, again, these are potentially used, but we  
4 don't know what the hell they're used for, because  
5 they're not covered by the Standard. So we put a - in  
6 one, say - Annex note, we say, 'Make sure that you,  
7 you realize that these cables are not covered by the  
8 requirements.' Now we say they can be used. But we  
9 don't cover them in the requirements. What, what,  
10 what does that mean? What does a user do with that  
11 information? We have a list of cables that are not  
12 covered, but we don't know what they cover. And yes,  
13 this information is being brought forward by the  
14 (unintelligible) Company, who clearly has an interest  
15 in this. And - but they have not brought any public  
16 input that addresses what to do with these cables,  
17 other than say they're used, but we won't know what to  
18 do, what, what to do about them. Thank you.

19 RODGER REISWIG: Thank you. Are there any  
20 other further discussions on Motion 130-5, to Accept  
21 an Identifiable Part of Public Comment No. 11? Mr.  
22 Alston, would you like some final comments?

23 GERARD ALSTON: No, nothing further at this  
24 time.

25 RODGER REISWIG: Thank you. So before we vote,

1 let me restate the motion. The motion on the floor,  
2 for 130-5 is to Accept an Identifiable Part of Public  
3 Comment No. 11. Touch Vote to vote now. If you wish  
4 to vote in support of the motion and recommend the  
5 text on Screen One, touch Yes. If you wish to vote  
6 against the motion and recommend the text on Screen  
7 Two, touch No. Please record your vote. Voting will  
8 close in five seconds. Voting is now closed. The  
9 results are 54 yes, in support, and 162 against. The  
10 motion has failed.

11 Let's now proceed with the discussion on  
12 Certified Amending Motions NFPA 130-2. Microphone  
13 Number Two.

14 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
15 International for NFPA, and I move CAM No. 2.

16 RODGER REISWIG: Thank you. There is a motion  
17 on the floor to Accept an Identifiable Part of Public  
18 Comment No. 6. Is there a second?

19 MALE SPEAKER: Second.

20 RODGER REISWIG: We do have a second. Please  
21 proceed with the discussion on the motion.

22 MARCELO HIRSCHLER: Thank you. Marcelo  
23 Hirschler, GBH International for NFPA, and in support  
24 of the motion. NFPA's - the 130 is required for  
25 several editions, at least until 2010, that all wires



1 and cables, and all stations meet a certain fire test,  
2 namely the cable fire, trade fire test for flame  
3 spread and smoke in IEEE 1202 UL 1685. The Committee  
4 chose to delete this requirement for cables in open  
5 stations. This is a decrease in fire safety, and  
6 these - this motion seeks to reverse that decrease.

7 The Chair's statement is that wires and cables  
8 must meet the requirements of the National Electrical  
9 Code. But the National Electrical Code has no  
10 specific requirement for (unintelligible), for  
11 generation transform. In fact, the NEC states, among  
12 the things that are not covered - installation of  
13 railways for generation, transformation, transmission,  
14 energy storage, or distribution of (unintelligible)  
15 operation of rolling stock or installation used  
16 exclusively for signaling and communications purposes  
17 - is not covered. So in other words, when we take  
18 this out, nothing is covered.

19 So NFPA 130 requires that open stations be  
20 constructed of Type Two construction, noncombustible  
21 construction; also requires in all stations, including  
22 open stations, be no noncombustible furnishings unless  
23 a fire assessment be made; also requires that all  
24 rubbish containers, and all lockers and so on, so  
25 forth, be constructed of noncombustible material.

1           Now, suddenly, after many years of requiring  
2     the same fire tests for wires and cables in all other  
3     stations, the new edition decide fire safety is not  
4     important, and can be decreased. There has not been  
5     any fire hazard assessment done to demonstrate that  
6     the change is acceptable. In fact, normally any time  
7     you change to increase the fire hazard and eliminate a  
8     fire test requirement, inevitably that increases fire  
9     hazard, and it needs to be based on new evidence. No  
10    new evidence was submitted.

11           The public input on which this revision was  
12    based only --

13           RODGER REISWIG: One minute.

14           MARCEL HIRSCHLER: -- provided editorial change  
15    to correct an, an omission. My PC was rejected with a  
16    simple statement, 'Cables are installed in open  
17    stations, open trainways do not pose a significant  
18    flame spread and smoke release hazard, and do not  
19    require additional protection.' How does the  
20    Committee know this? They haven't done anything about  
21    it.

22           The Chair's statement, I already discussed it.  
23    This CAM simply proposes to reinstate the longstanding  
24    requirement for wires and cables. The Chair's  
25    statement about wires and cables encased in

1 noncombustible raceways has nothing to do with this.  
2 This CAM does not address wires and cable encased in  
3 concrete - simply addresses open stations. The  
4 (unintelligible) issue. Evidence has shown that when  
5 you have product associated with a project, and they  
6 need to need some - most of your requirements in one  
7 area, than another, there's potential for confusion,  
8 and mix-up of product. That potential is eliminated  
9 if we keep the requirements the same for all. Thank  
10 you.

11 RODGER REISWIG: Thank you. Mr. Alston, would  
12 you like to present the Committee's position?

13 GERARD ALSTON: Thank you. Yes. This area of  
14 wires and cables in Chapter 12 is hotly contested  
15 through, through this edition, and was an area of  
16 significant debate within the Technical Committee and  
17 its Task Groups. Dr. Hirschler has expressed his  
18 opposition to the Committee action, which was to carve  
19 out two exceptions from the requirements of Section  
20 12-2-1 of the 2020 edition, which requires all cables  
21 - all wires and cables to achieve certain  
22 (unintelligible) and total smoke release criteria when  
23 tested to the FT4 IEEE exposure of (unintelligible) UL  
24 1685, or certain flames for a distance, an optical  
25 density requirement when tested to NFPA 262.

1           The two exceptions which were identified,  
2       encasement in concrete and use in open stations,  
3       recognized both alternative means for mitigating fire  
4       hazards, and the different level of risk associated  
5       with open versus enclosed stations.

6           And to go over the history a little bit of the,  
7       of the requirements - these requirements originally  
8       applied only to vital circuits in the original  
9       editions, and that was expanded to all circuits within  
10      the stations as of the 2010 edition, for  
11      simplification in interpretation, and enforcement, not  
12      for a specific safety reason. The substantiation  
13      provided for the expanded scope was first given in the  
14      2003 edition, and applied only to trainways or  
15      tunnels, to refer to all wire in the trainways,  
16      instead of trying to differentiate between specific  
17      wiring, for ease in interpretation.

18           The same requirements were not expanded to  
19      stations until 2010, a cycle in which there was  
20      significant effort expended to principally harmonize  
21      and make consistent requirements across stations,  
22      trainways, and tunnels, and the Emergency Ventilation  
23      chapters, rather than address a specific safety need.

24           Accordingly, the requirements for fire testing  
25      of wires and cables have not always been in NFPA 130

1 as Dr. Hirschler contends. Previously, the fire  
2 hazard posed by wire and cable installation for all  
3 circuits has been historically addressed through  
4 installation methods where all conductors are required  
5 to be enclosed in their entirety, in noncombustible  
6 armor sheets, conduits, or enclosed raceways. This is  
7 still the case.

8 This is an approach that is consistent with the  
9 installation requirements of NFPA 70 for Wiring and  
10 Spaces, used for environmental air, (unintelligible).

11 Dr. Hirschler also contends that the proposal  
12 omits any safety requirements for wires and cables in  
13 open stations. This is untrue, as they are still  
14 required to comply to NFPA 70. The section that he  
15 was citing refers to traction power, and data and  
16 communication cables, which are dealt with separately.

17 What was vital and considered through much  
18 debate within the (unintelligible) Committee and  
19 respective Task Groups was the fire risk profile for  
20 open versus enclosed stations. An open station is  
21 defined as one that is constructed such that it is  
22 directly open to the atmosphere, and smoke and heat  
23 are allowed to disperse directly into the atmosphere  
24 without accumulation, and without impacting tenability  
25 and egress routes. The dispersal is effectively

1 natural ventilation control for a fire heat - fire  
2 generated heat and smoke.

3 The relative fire risks of open and closed  
4 facilities are addressed elsewhere in the Standard, as  
5 well, such as with differing requirements for interior  
6 finish in enclosed versus open stations, and also  
7 requirements for emergency ventilation in enclosed  
8 stations. The differentiation is also evident in the  
9 requirements for open versus enclosed trainways.

10 Therefore, the actions taken by the Committee  
11 to identify the two exceptions to the section - to  
12 Section 12.2.1, Flame Spread and Smoke Production  
13 Requirements of Wires and Cables were carefully  
14 considered, factoring fire risk factors, mitigating  
15 measures, and alternative means of protection.

16 The voting on this proposal included 23  
17 affirmative, one negative out of 29 eligible, at first  
18 revision; and 25 affirmative and four not returned at  
19 second revision.

20 RODGER REISWIG: Thank you, Mr. Alston. With  
21 that, we will open debate on the motion. Please  
22 provide your name, affiliation, and whether you're  
23 speaking in support of, or against the motion.  
24 Microphone Number Two.

25 MARCELO HIRSCHLER: Marcelo Hirschler, GBH

1 International for NFPA, and for the motion. I want to  
2 point out three things. Number one - Mr. - the  
3 Chairman said that the NFPA 70 governs these, but NFPA  
4 70 explicitly excludes trains, and not just power  
5 cables, but also insulation used for signaling and  
6 communication purposes. So in actual fact, when we  
7 eliminate oh, wires and cables in open stations, we're  
8 eliminating all requirements. The NEC has nothing.

9 Number two - you keep bringing up the encased  
10 in concrete, which is not part of this motion.  
11 Encased in concrete still remains. So please, rebut  
12 the, the issues that were brought to the table.

13 And number three - yes, the - this issue was  
14 discussed, and the Committee considered it. But the  
15 Committee did not do any fire hazard assessment. And  
16 the, the requirements for open stations on every other  
17 combustible are exactly the same as the requirements  
18 for closed stations, on every other combustible. Only  
19 exception is wires and cables. So clearly, this is  
20 causing any - a decrease in fire safety. Thank you.

21 RODGER REISWIG: Thank you. Microphone Number  
22 One.

23 JAMES CONRAD: Thank you, Mr. Chair. My name's  
24 James Conrad with RSCC Wire and Cable, and I speak in  
25 opposition of the motion on the floor. This has been

1 a heavily debated issue for many Code cycles now. And  
2 my colleague, Mr. Hirschler and I have come to  
3 disagree on a few things. The important thing to  
4 remember, and Gerard gave some history - if you look  
5 back through NFPA 130, the idea was, you know, when  
6 you're in a tunnel or in a underground trainway, we  
7 had to maybe heighten the flammability and smoke  
8 requirements of wire and cable.

9 And Mr. Hirschler's statement that these cables  
10 will be dangerous is, is - I don't, I don't agree with  
11 that. These cables have to meet the National Electric  
12 Code. We say that right in 130. We say all cables  
13 must meet the National Electric Code, except as  
14 amended herein.

15 And over the many cycles, it was always  
16 intended to only add additional flame and smoke  
17 requirements for underground stations and trainways.  
18 It got mixed up in the rewrite, when we tried to  
19 combine all the electricals into one chapter, which is  
20 what we have now. And we're just trying to correct  
21 that and go back.

22 There is no need, other than the National  
23 Electric Code, a UL listed, or some type of listed  
24 product to an industry standard - like a building wire  
25 you have in here - yeah, to meet for open stations.



1 You do not need the additional flame and smoke  
2 requirements that we say you need for the enclosed  
3 underground stations or trainways. And I speak  
4 against the motion. Thank you.

5 RODGER REISWIG: Thank you. Microphone Number  
6 Five.

7 KEVIN CHONG: Thank you, Mr. Chair. My name's  
8 Kevin Chong, and again, I'm representing MKC  
9 Engineering. My prior proposals to NFPA 130 were  
10 based on many of these issues, and in one --

11 RODGER REISWIG: Sorry - for or against the  
12 motion, please.

13 KEVIN CHONG: Sorry. Speaking against the  
14 motion. I wanted to mention that we also follow the  
15 Building Code. And the Building Code is generally  
16 where the original fire and smoke developed, and flame  
17 spread ratings come from. And I originally made the,  
18 the prior proposals because of the difficulty we had  
19 meeting the specific requirements, especially as  
20 mentioned just a little bit ago - the fire protected  
21 cables. So - thank you.

22 RODGER REISWIG: Thank you. Microphone Number  
23 Two.

24 MARCELO HIRSCHLER: Thank you. Marcelo  
25 Hirschler, GBH International for NFPA, and for the

1 motion. We just heard that they follow the Building  
2 Code. Building Code doesn't have wire and cable  
3 requirements. The wire and cable requirements in the  
4 Building Code sends you to the NEC, the National  
5 Electrical Code, NFPA 70. Whether you're talking  
6 about the International Building Code, the IBC, or  
7 you're talking about NFPA 5000 - both of them will  
8 send you - so if you're looking for requirements for  
9 wire and cable in the, in the Building Code, you're  
10 looking in the wrong place.

11 Number two - we, we heard twice, three times  
12 that you go to the NEC for the requirements for wire  
13 and cable. There are no requirements for wire and  
14 cable in the NEC, for trains. I read you the section  
15 that exclude - explicitly excludes them. So yes,  
16 maybe you, you shouldn't do, do things. But don't  
17 come up with the argument that that's because the NEC  
18 has it. The NEC explicitly excludes anything to do  
19 with rail. Thank you.

20 RODGER REISWIG: Thank you. Are there any  
21 further discussions on Motion 130-2 to Accept an  
22 Identifiable Part of Public Comment No. 6? With that,  
23 Mr. Alston, would you like an opportunity for final  
24 comment?

25 GERARD ALSTON: Just two points. Dr. Hirschler

1 keeps going back and saying that I'm arguing the  
2 intent on the encased in concrete. I am not. I was  
3 referring to installation methods within conduit,  
4 noncombustible conduit, as is recognized in NFPA 70,  
5 for installation in, in tunnels or shafts, and the  
6 like; or alternative, FT-4, FT-6 type cable.

7 What was my other point? Oh - in, in - in  
8 addition, in terms of the, the level of fire safety  
9 within enclosed stations, that remains heightened from  
10 the adoption and - of smoke production requirements  
11 back in the 2003-2006 edition. So enclosed stations  
12 remain at a heightened level of safety, as had  
13 preceded it. The only exception here is to the  
14 different level of hazard and fire risk associated  
15 with open stations. So - thank you.

16 RODGER REISWIG: Thank you, Mr. Alston. Before  
17 we vote, let me restate the motion. The motion on the  
18 floor is to Accept an Identifiable Part of Public  
19 Comment No. 6. To vote, touch the Vote button. If  
20 you wish to vote in support of the motion and the  
21 recommended text on Screen One, vote Yes. If you wish  
22 to vote against the motion and the recommended text on  
23 Screen Two, touch No. Record your vote now, please.  
24 Voting will end in five seconds. Voting is now  
25 closed. Thank you.

1 MALE SPEAKER: (unintelligible) --

2 RODGER REISWIG: Oh.

3 MALE SPEAKER: -- the voting device  
4 (unintelligible) work.

5 RODGER REISWIG: Hold on a second.

6 MALE SPEAKER: (unintelligible) isn't working.  
7 (various voices, overlapping)

8 RODGER REISWIG: All right. Hold up. Let's go  
9 ahead, and we'll revote. Everybody clear out. And is  
10 there - I'll wait for NFPA, for the staff to give us  
11 indication on - to proceed. Hold on. Yeah. All  
12 right. Let's go ahead and revote. Voting is open  
13 now. All right. Five seconds. And voting is closed.  
14 Thank you. The results are 52 in favor, or support,  
15 and 169 against. The motion has failed.

16 With that, we will move on to the next Standard  
17 on the agenda, NFPA 285.

18 FEMALE SPEAKER: (unintelligible)

19 RODGER REISWIG: There was no - there was no  
20 (unintelligible)

21 FEMALE SPEAKER: (unintelligible)

22 RODGER REISWIG: Okay. The next report under  
23 consideration is that of the Technical Committee on  
24 Fire Tests. Here to present the Committee Report is  
25 Committee Chair, Barry Badders, of Intertek Testing

Page 60

1 Services of Elmendorf, Texas.

2 The Committee Report, that is the First and  
3 Second Draft Reports, is located on the, on the  
4 Document Information Page for NFPA 285, on the NFPA  
5 website. All Certified Amending Motions are  
6 identified in the NFPA Technical Meeting Tech Session  
7 Agenda included in the report of the Motions  
8 Committee, and will be displayed behind me on the  
9 screens as they are under debate. Mr. Badders will be  
10 stepping down as Chair, due to the tenure policy, and  
11 I would like to express our thanks to Barry for his  
12 leadership. Thank you, Sir.

13 BARRY BADDERS: Thank you.

14 (applause)

15 RODGER REISWIG: Mr. Badders, could you present  
16 the Chair's Report, please.

17 BARRY BADDERS: Certainly. The Report of the  
18 Technical Committee on Fire Tests is presented as  
19 found in the First Draft Report, and Second Draft  
20 Report for the 2023 Edition of NFPA 285, Standard Fire  
21 Test Method for Evaluation of Fire Propagation  
22 Characteristics of Exterior Wall Assemblies Containing  
23 Combustible Components. The revisions were submitted  
24 to letter ballot of the responsible Committee, in  
25 accordance with the regulations governing the

Page 61

1 development of NFPA Standards. The reports, and  
2 ballot results can be found in the Next Edition Tab of  
3 the Document Information page for NFPA 285 at  
4 [www.nfpa.org/285next](http://www.nfpa.org/285next). Thank you.

5 RODGER REISWIG: Thank you, Sir. Let's now  
6 proceed with the discussion on Certified Amending  
7 Motions for NFPA 285. The next motion for NFPA 285-7  
8 appeared on our agenda. However, the authorized maker  
9 of the motion, the designated representative, has  
10 notified NFPA that this motion will not be pursued.  
11 Therefore, in accordance with the rules, Convention  
12 Rules at Section 2.7, the motion may not be considered  
13 by the assembly, and is removed from the agenda, and  
14 we will now move to the next motion. Mr. Stahl, are  
15 you there?

16 JOHN STAHL: Yes, I'm here.

17 RODGER REISWIG: I don't know where here is.  
18 Oh. If you would like to say something about the  
19 motion, we'll give you a few seconds.

20 JOHN STAHL: Yes, I'm John Stahl. My company  
21 is Preferred Solutions Incorporated, in Cleveland,  
22 Ohio. We are a spray foam insulation manufacturer for  
23 the past 38 years. I am recommending adoption of my  
24 particular motion. And as I understand it, I'm  
25 supposed to indicate that my motion is to Reject an

1 Identifiable Part of Second Revision 7 --

2 RODGER REISWIG: I'm sorry, Sir.

3 JOHN STAHL: Yeah.

4 RODGER REISWIG: Could you hold on a second?

5 JOHN STAHL: Yes.

6 RODGER REISWIG: NFPA was informed you were not  
7 going to pursue the motion?

8 FEMALE SPEAKER: (unintelligible)

9 JOHN STAHL: Are, are we on --

10 RODGER REISWIG: 285.

11 JOHN STAHL: -- Number --

12 RODGER REISWIG: 285-7.

13 JOHN STAHL: Oh, -7. No. I, I am withdrawing  
14 that particular recommendation, and the reason is that  
15 when I made the original proposal, it was only to  
16 eliminate the last four words in this sentence. And I  
17 apparently, because of procedural methods that I  
18 apparently overlooked, the motion became to eliminate  
19 the entire sentence. And so I am not interested in  
20 eliminating the entire sentence. So on that basis,  
21 I'm requesting withdrawal, because it's also been  
22 related to two other motions. Thank you.

23 RODGER REISWIG: Thank you. So with this  
24 motion not being pursued, and by the rules of the  
25 Convention, cannot be acted upon. Now let's proceed

Page 63

1 with the discussion on Certified Amending Motion 285-  
2 12. Mr. Stahl.

3 JOHN STAHL: Yes. John Stahl, Preferred  
4 Solutions, Inc., recommending adoption of this  
5 particular recommendation. And I guess the --

6 RODGER REISWIG: There is a motion on the  
7 floor. Let me get, let me get a second. There's a  
8 motion on the floor to Reject an Identifiable Part of  
9 Second Revision No. 7 and Related Portions of First  
10 Revision No. 15. Is there a second?

11 MALE SPEAKER: Second.

12 RODGER REISWIG: We do have a second. Please  
13 proceed with the discussion.

14 JOHN STAHL: Yes. There's just some real quick  
15 background, because some people may not be familiar  
16 with the importance of NFPA 285. It's essentially a  
17 test that measures the vertical propagation of a fire  
18 up the side of tall buildings, to try to eliminate  
19 issues that happened, like with the Grenfell Tower.  
20 Over the years, engineering judgments have been used  
21 to probably qualify over 50% of the assemblies that  
22 are being installed, because there's thousands of  
23 combinations that can actually be tested.

24 So the purpose of Annex B, which is a very good  
25 Annex, a very good first cut, is now being recommended

Page 64



1 in general. And my whole reason for proposing what I  
2 am is that there are some inconsistencies, which has  
3 been acknowledged by the Committee. But I would - my  
4 goal here is just to try to at least eliminate one  
5 inconsistency.

6 The way that you qualify products that have not  
7 actually been 285 tested is to do comparative fire  
8 tests, where you test materials that have not actually  
9 been 285 tested, compared to materials that were. And  
10 if the fire properties of the non-tested 285 materials  
11 are equal or better than what actually was tested,  
12 then those are acceptable.

13 Many fire protection engineers, and fire  
14 protection organizations have different knowledge,  
15 different viewpoints, and so there's not been any  
16 consistency of writing these engineering judgments.  
17 And that's the whole purpose of Annex B. So that's  
18 the good, the good part.

19 Normally, and for many products that are  
20 actually in this Annex, you are allowed to take  
21 comparative fire test data from any generic --

22 RODGER REISWIG: One minute.

23 JOHN STAHL: -- product that is in that, in  
24 that list. So if you have a polystyrene foam, then  
25 you can run comparative tests on anyone's foam, and

1 show that it's been tested, and show that it's better.  
2 This is not true, for some reason, for spray foam  
3 insulation. The requirements for spray foam  
4 insulation is you always have to stay within that  
5 manufacturer's product. And it's not true for these  
6 other products. So there's some discrimination here.  
7 And I presented this information to the Committee.  
8 They did make some changes in wording, but the, the  
9 wording for the spray foam insulation remains the  
10 same. So I am making this proposal to eliminate the  
11 need to limit testing within a manufacturer's brand.  
12 Thank you.

13 RODGER REISWIG: Thank you. Mr. Badders, would  
14 you like to offer the Committee's position?

15 BARRY BADDERS: Yes, please. For many years,  
16 engineering judgments have been used to extend data  
17 from NFPA 285 assembly test the systems that have not  
18 been fully tested. In 2018, the Fire Test Committee  
19 developed a Task Group to come up with guidance for  
20 engineers to use when developing these judgments. The  
21 Task Group worked for over four years and held dozens  
22 of meetings, all of which were open for any observers  
23 to attend. They developed multiple drafts, and  
24 reported back to the full Committee at both the First  
25 Draft meeting, and the Second Draft meeting.

1           The Committee added the language into the new  
2   Annex B as non-mandatory guidance during the First  
3   Draft. The Annex describes when substitutions can be  
4   made without compromising test results, and what types  
5   of substitutions would cross the line and require the  
6   assembly to be tested. The ballot during the first draft  
7   passed with zero negative votes. One public comment  
8   was, was received to try to move the language to the  
9   body of the Standard, but the Committee did not accept  
10   that comment. The Second Revision was developed to  
11   further revise the Annex, and passed.

12           The two Certified Amending Motions related to  
13   285 involve two sections within the Annex language  
14   related to spray polyurethane foam plastic SPF  
15   insulation. CAM 285-12 involves Section B.8.5.1.1.3.  
16   This section prohibits substitution of SPF from one  
17   manufacturer based on test data from a different  
18   manufacturer. Similar requirements are included for  
19   other types of insulation, including XPS, poly-iso,  
20   and EPS.

21           In summary, the Committee has been fully  
22   supportive of the Annex language. SPF has not been  
23   treated differently than other types of insulation,  
24   and no public comments were received related to SPF.  
25   There were many opportunities for participation in the

1 four years it took to develop this Annex. Thank you.

2 RODGER REISWIG: Thank you, Mr. Badders. With  
3 that, we will open debate on the motion. Please  
4 provide your name, affiliation, and whether you are  
5 speaking in support of, or against the motion.  
6 Microphone Number Five.

7 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
8 International, for NFPA, and against the motion. I am  
9 a member of NFPA Fire Test Committee, of course. I am  
10 not speaking for the NFPA Fire Test Committee. Just  
11 to clarify, the - Mr. Stahl said that you use  
12 individual tests on individual materials to qualify  
13 them for NFPA 285. That is not true. You do not.  
14 The only way that you qualify an assembly is by  
15 running the NFPA 285 test as a whole.

16 What the Annex does is give you permission to  
17 replace some materials, if one material has been  
18 tested in an assembly, and another one has not been  
19 tested. And in this particular case what we're  
20 talking about is testing to ASTM E1354. Some of you  
21 may know that as the (unintelligible), which has been  
22 found (unintelligible) is used for assessing  
23 difference in fire performance properties individual  
24 materials.

25 The - Barry Badders pointed out that there was

1 one public comment, just to make this into a mandatory  
2 section. That was my public comment. I failed. I  
3 fully support what the Committee did. It was not my  
4 first preference, but it, it is what the Committee  
5 did. It is what the consensus does.

6 What, what, what we know is why we are strongly  
7 in opposition to replacing one material from  
8 Manufacturer A by a material that Manufacturer B says  
9 is identical, is that we have no idea whether  
10 Manufacturer's A material and Manufacturer B's  
11 material have the same fire performance, have the same  
12 composition. We cannot know that. So it's, it's not  
13 acceptable to replace one by another.

14 And as was pointed out also, this is not  
15 something that applies only to SPF foam. It applies  
16 to various other materials, as well. And the  
17 gentleman said that he submitted information to the  
18 Committee. I participated in all the meetings of the  
19 Committee. He never participated in the meetings of  
20 the Committee. He, you know, did not provide public  
21 input, or public comments. Now, it's too late.  
22 Please disapprove. Thank you.

23 RODGER REISWIG: Thank you. Microphone Number  
24 Six.

25 JOHN STAHL: Well, just a couple - John Stahl,

1 Preferred Solutions, Inc., proponent. Just a couple  
2 of --

3 RODGER REISWIG: Speaking for or against the  
4 motion?

5 JOHN STAHL: Speaking for my motion. Just a  
6 couple of comments in rebuttal to some of the comments  
7 that were made by others. There definitely are  
8 sections in the Annex that allow materials to be  
9 tested from all manufacturers. Secondly, I did attend  
10 the meetings. There's actually word changes that were  
11 made as a result of my input to the meetings. And  
12 while there are inconsistencies in the Annex, it's  
13 still a very good Annex, very much needed. My whole  
14 goal is only to reduce some of the conflicts, and some  
15 of the inconsistencies. Thank you.

16 RODGER REISWIG: Thank you. Microphone Number  
17 Five.

18 ART PARKER: Good afternoon. My name is Art  
19 Parker with Jensen Hughes. I'm speaking in opposition  
20 to the motion on the floor. I'm the principle voting  
21 member for Jensen Hughes on the Fire Test Committee,  
22 and I'm speaking for myself. I was also actively  
23 involved in the Task Group, and the Committee work  
24 over the last few years on developing the new Annex B  
25 information to be included into NFPA 285.

Page 70

1           The Annex sections being addressed by this  
2 motion states that each foam manufacturer must conduct  
3 testing on their own product to demonstrate compliance  
4 with the applicable Code requirements - in this case,  
5 NFPA 285. We cannot use one manufacturer's data to be  
6 used to qualify another manufacturer's product,  
7 because as Dr. Hirschler said, we cannot be completely  
8 sure that each foam product will perform exactly the  
9 same way and obtain the same testing results.

10           When evaluating exterior wall assemblies  
11 containing a specific product, I need to have testing  
12 data on that specific product to ensure that I have an  
13 understanding of how the foam performs, to be able to  
14 establish that compliance. This reference testing  
15 data that forms the basis for, for a technically sound  
16 engineering judgment. Removal of this section would  
17 imply or allow use of another manufacturer's  
18 proprietary testing data to support another  
19 manufacturer's product performance, which is not  
20 technically appropriate.

21           Through the years of experience of testing, I  
22 know that some foams, for example, inter-mass  
23 (phonetic) more than others, and this may have an  
24 impact on the fire performance of the test assembly  
25 being evaluated. I'm also pretty confident that no

1 product manufacturer would want their specific foam  
2 product fire testing data to be used by a competitor  
3 to gain acceptance for their foam product. In a fire  
4 testing world, every manufacturer needs to conduct  
5 their own testing to demonstrate the fire performance  
6 of their product, so as to alleviate any questions of  
7 suitability or qualification. Based on this, I urge  
8 the membership to oppose the motion, and uphold the  
9 Fire Test Committee's work over the last four years,  
10 and by leaving this section in the Annex as developed.  
11 Thank you.

12 RODGER REISWIG: Thank you. And back to Number  
13 Five, Microphone Number Five.

14 SHAMIM RASHID-SUMAR: Shamim Rashid-Sumar, also  
15 principle voting member for the Technical Committee on  
16 Fire Tests, speaking on behalf of myself and my  
17 organization, the National Ready Mixed Concrete  
18 Association. I wanted --

19 RODGER REISWIG: Are you speaking for, or  
20 against the motion?

21 SHAMIM RASHID-SUMAR: I apologize. Speaking  
22 against the motion.

23 RODGER REISWIG: Thank you.

24 SHAMIM RASHID-SUMAR: I want to stress, on a  
25 couple of points that our Committee Chair, as well as



1 some of the previous speakers said, because it's very  
2 important. The language that you see that's being  
3 stricken here in this Amended Motion - it actually  
4 appears in other places in the proposed Appendix. It  
5 is not just for SPF. The same language appears in the  
6 proposed Appendix for XPS insulation - that's extruded  
7 polystyrene foam plastic insulation. It appears for  
8 polyisocyanurate foam plastic insulation, and it  
9 appears for EPS - expanded polystyrene foam plastic  
10 insulation. There's no discrimination here.

11 So I'm going to ask the question - why is this  
12 language being stricken for SPF insulation, and not  
13 for the other types of insulation that I mentioned?  
14 We need to hold SPF insulation to the same standard as  
15 all of the other types of insulation that this  
16 Appendix covers. Striking this language will result  
17 in a reduction of life safety. Therefore, I  
18 respectfully request the membership to vote No. Thank  
19 you.

20 RODGER REISWIG: Thank you. We'll go over to  
21 Microphone Three.

22 DICK DAVIS: Dick Davis, FM Global, speaking in  
23 opposition to the motion. I'm a member of the Fire  
24 Test Committee, but I'm speaking for myself and not on  
25 behalf of the Committee.

1           There are - I don't want to reiterate what's  
2   already been said. As our partner mentioned, there  
3   are some issues associated with who owns the data from  
4   the large scale tests, that the comparative tests are  
5   being, you know, compared against. And I think it's  
6   important that we get this document out. There has  
7   been a lot of unjustified substitutions of components,  
8   for either the cladding, the insulation, or water  
9   resistive barrier in the assemblies that have passed  
10   this intermediate scale test. And I urge everyone to  
11   vote against this motion.

12           RODGER REISWIG: Thank you. Number Five,  
13   Microphone Five.

14           BEN CALDWELL: Hello. My name is Ben Caldwell.  
15   I'm an architect at Skidmore, Owens, and Merrill -  
16   against the motion. And I'm also on the Fire Test  
17   Committee, a principle on the Fire Test Committee.  
18   The Annex B Guide language has been carefully crafted  
19   to help write a credible NFPA 285 engineering  
20   judgment, assessing component substitutions based on a  
21   tested assembly. This engineering judgment is then  
22   used to assure the authority having jurisdiction, and  
23   the design professionals, that the deviations of the  
24   proposed product from the actual test is minimal, and  
25   known.

1           This Amending Motion is asking that the spray  
2   foam products by different manufacturers, that are  
3   proprietary and almost certainly of a different  
4   composition, to be deemed as equal. If accepted, this  
5   Amending Motion introduces an unknown element into an  
6   engineering judgment. We now have uncertainty within  
7   an engineering judgment, and that uncertainty - and,  
8   and - and excuse me - and uncertainty even that the,  
9   the engineering judgment is valid. This defeats the  
10   whole purpose of an engineering judgment. Please  
11   reject this Amending Motion. Please vote No.

12           RODGER REISWIG: Thank you. Microphone Number  
13   One.

14           BILL FISKE: Thank you. I am Bill Fiske from  
15   Intertek, and I'm speaking against this motion. As  
16   noted, I am employed by Intertek, as is the Committee  
17   Chair, and as most people know, independent testing  
18   laboratories are strongly bound to client  
19   confidentiality. And interchangeable test results  
20   inevitably results in giving away confidential test  
21   data, and the testing laboratories can - unknowingly,  
22   and without their participation - violate the rules  
23   that govern them in ISO IEC 17025, and in OSHA's  
24   regulations governing independent laboratories. Thank  
25   you.

1           RODGER REISWIG: Thank you. Are there any  
2 further discussions on Motion 285-12, to Reject an  
3 Identifiable Part of Second Revision No. 7 and Related  
4 Portions of First Revision No. 15? Mr. Badders, would  
5 you like to make any final comments?

6           BARRY BADDERS: Only that I encourage the  
7 membership to support the Committee.

8           RODGER REISWIG: Thank you. Before we vote,  
9 let me restate the motion. The motion on the floor is  
10 to Reject an Identifiable Part of Second Revision No.  
11 7, and Related Portion of First Revision No. 15. To  
12 vote, touch the Vote button. If you wish to vote in  
13 support of the motion and the recommended text on  
14 Screen One, touch Yes. If you wish to vote against  
15 the motion and the recommended text on Screen Two,  
16 touch No. Please record your vote now. Five seconds.  
17 And voting's now closed. So we have - the motion has  
18 failed - 7 in support, or Yes; and 209 reject, or vote  
19 No. Thank you.

20           Let's, let's proceed with the discussion on  
21 Certified Amending Motion 285-13. Microphone Number  
22 Six.

23           JOHN STAHL: John Stahl, Preferred Solutions,  
24 Incorporated. This is basically just another section  
25 dealing with not allowing products to be compared with

1 various manufacturers.

2 RODGER REISWIG: The motion, Sir?

3 JOHN STAHL: Yeah, the motion is - my motion is  
4 to support this particular item, which is to Reject an  
5 Identifiable Part of Second Revision 7, and Related  
6 Portion of First Revision No. 15.

7 RODGER REISWIG: Thank you. There's a motion  
8 on the floor to Reject an Identifiable Part of Second  
9 Revision 7, and Related Portion of First Revision No.  
10 15. Is there a second?

11 MALE SPEAKER: Second.

12 RODGER REISWIG: We have a second. Please  
13 proceed with your discussion, Sir.

14 JOHN STAHL: I have not too much else to offer,  
15 other than what I had mentioned before. But it is a  
16 fact that there are various products in this Annex - I  
17 can mention fire retardant treated wood; I can mention  
18 mats; I can mention water barriers, etc., that are  
19 permitted to be compared to various manufacturers. So  
20 there is inconsistency, just for that reason, you  
21 know, alone. And unfortunately, there hasn't really  
22 been presented any technical information that  
23 justifies why you shouldn't be able to compare actual  
24 fire test data on generic reports. The materials do  
25 not know what their name is, who the manufacturer is.

Page 77

1 So by limiting the ability to compare fire test data  
2 from, from comparative product seems to be, to me, be  
3 fair, very fair and reasonable. Thank you.

4 RODGER REISWIG: Thank you. Mr. Badders, would  
5 you like to offer the Committee's position?

6 BARRY BADDERS: Yes, certainly. Similar to the  
7 previous motion, this CAM addresses the same concept,  
8 only in a different section of a newly developed  
9 Annex. The Committee has been fully supportive of  
10 this non-mandatory Annex language. The SPF has not  
11 been treated differently than other types of  
12 insulation. No public comments were received related  
13 to SPF. There were many opportunities for  
14 participation in the four years it took to develop the  
15 Annex. Thank you.

16 RODGER REISWIG: Thank you. With that, we will  
17 open debate on the motion. Please provide your name,  
18 affiliation, and whether you are speaking in support  
19 of, or against the motion. Microphone Number Five.

20 ART PARKER: Good afternoon. My name is Art  
21 Parker with Jensen Hughes. I'm speaking in opposition  
22 to the motion. Again, as we've already stated, SPF  
23 products are not being treated any differently than  
24 other products that are in an exterior wall assembly.  
25 Everybody's specific foam data, or product data needs

1 to be evaluated for their own family of products, and  
2 we don't intermix this. We've heard a lot of the  
3 arguments. We don't need to reiterate them. But I'd  
4 urge the, the motion to fail. Thank you.

5 RODGER REISWIG: Thank you. I'll stay at  
6 Microphone Number Five.

7 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
8 International for NFPA, and against the motion. I'm  
9 not going to repeat all the things that we said  
10 before. This is identical to the previous motion.  
11 Please be consistent in your vote. Vote, vote it  
12 down, just like you did the previous one. It's  
13 identical. Thank you.

14 RODGER REISWIG: Thank you. And I'll still  
15 stay at Microphone Number Five.

16 SHAMIM RASHID-SUMAR: Shamim Rashid-Sumar,  
17 National Ready Mixed Concrete Association, speaking  
18 against the motion. Again, all of the same points as  
19 before. Striking this language will result in the  
20 reduction of life safety. Urging you to vote No once  
21 again. Thank you.

22 RODGER REISWIG: Thank you. And Microphone  
23 Number Five.

24 BEN CALDWELL: Hello, again. Ben Caldwell,  
25 Architect, Skidmore, Owens and Merrill, speaking

1 against the motion. And again, accepting this motion  
2 introduces an unknown element into engineering  
3 judgments, and I urge everybody here to vote No.  
4 Thank you.

5 RODGER REISWIG: Thank you. Are there any  
6 further discussion on Motion 285-13, to Reject an  
7 Identifiable Part of Second Revision No. 7, and  
8 Related Portion of First Revision No. 15? Mr.  
9 Badders, would you like to offer any final comments?

10 BARRY BADDERS: Certainly. Once again, I  
11 encourage the membership to support the Committee.  
12 Thank you.

13 RODGER REISWIG: Thank you. Before we vote,  
14 let me restate the motion. The motion on the floor is  
15 to Reject an Identifiable Part of Second Revision No.  
16 7, and Related Portion of First Revision No. 15. To,  
17 to vote, touch the Vote button. If you wish to vote  
18 in support of the motion and the recommended text on  
19 Screen One, touch Yes. If you wish to vote against  
20 the motion and the recommended text on Screen Two,  
21 touch No. Record your vote now, please. Voting will  
22 close in five seconds. Voting is now closed. Thank  
23 you. We have two in support, in favor of the motion.  
24 We have 215 against the motion. The motion has  
25 failed.



1           We will now move on to the next Standard, No.  
2   502. The next report under consideration is that of  
3   the Technical Committee on Road Tunnels and Highway  
4   Fire Protection. Here to present the Committee Report  
5   is Committee Chair, Norris Harvey of Mott MacDonald,  
6   from Selden, New York.

7           The Committee Report, that is the First and  
8   Second Draft Reports, is located on the Document  
9   Information Page for NFPA 502, on the NFPA website.  
10   All Certified Amending Motions are identified in the  
11   NFPA Tech - Technical Meeting, Tech Session Agenda  
12   included in the report of the Motions Committee, and  
13   will be displayed behind me on the screen as they are  
14   under debate. There are others that are too  
15   extensive. In that case, the page will be identified  
16   as we move through this. Mr. Harvey, before we start,  
17   we would like to offer you - well, we - would you like  
18   to offer the Chair Report?

19           NORRIS HARVEY: Um-hmm. Thank you. The report  
20   of the Technical Committee on Road Tunnel and Highway  
21   Fire Protection is presented as found in the First  
22   Draft Report, and Second Draft Report for the 2023  
23   Edition of NFPA 502, Road Tunnels, Bridges, and Other  
24   Limited Access Highways. The revisions were submitted  
25   to letter ballot of the responsible Technical

1 Committees, and Correlating Committee in accordance  
2 with regulations governing the development of NFPA  
3 Standards. The reports and ballot results can be  
4 found on the Next Edition tab of the Document  
5 Information Tab for NFPA 502, at the web, web address.

6 RODGER REISWIG: Okay. Thank you, Mr. Harvey.  
7 Let's now proceed with the discussion on the Certified  
8 Amending Motions for NFPA 502. First up is 502-2.  
9 Microphone Number Two.

10 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
11 International for NFPA, and I make a motion, CAM  
12 Number 502-2.

13 RODGER REISWIG: Thank you. There is a motion  
14 on the floor to Accept Public Comment No. 2 - No. 12,  
15 I'm sorry - Public Comment No. 12. Is there a second?

16 FEMALE SPEAKER: Second.

17 RODGER REISWIG: Thank you. We do have a  
18 second. Please proceed with the discussion.

19 MARCELO HIRSCHLER: Thank you. This is Marcelo  
20 Hirschler, GBH International for NFPA. This is a  
21 complex issue, so let me try to explain. Well,  
22 throughout all the NFPA Codes and Standards, we have  
23 various ways in which describe what is a  
24 noncombustible material. One is, the material that  
25 has - do nothing. It doesn't ignite, doesn't burn,

1 doesn't support combustion, or release flammable  
2 vapors - any, any of that.

3 But the most common thing, way in which we, we  
4 describe whether material is noncombustible, is by  
5 testing. We test to ASTM E-136. And throughout all  
6 the NFPA documents, including NFPA 130, including NFPA  
7 1, and, and we - if a material passes ASTM E-136, it  
8 is noncombustible.

9 But in order to pass ASTM E-136, you can have  
10 flame; you can lose mass; you can lose and have some  
11 results of the (unintelligible) combusted. So that  
12 means that if this is the definition of  
13 noncombustible, and then you go to Section 4.8 that  
14 says, 'For this Standard, noncombustible is something  
15 that passes ASTM E-136,' that's inconsistent, because  
16 Section 4.8 tells you that all you need to do is pass  
17 ASTM E-136. So if you pass ASTM E-136, you will not  
18 comply with this definition.

19 And before this change was made, the - this  
20 section was together in 4.8, so there were various  
21 options in 4.8. One was the material doesn't ignite  
22 and doesn't do anything. One, does it pass ASTM 136.  
23 One, does it pass the ISO standard. And one, does it  
24 pass the BS standard. All of those are testing.

25 But the other one is this - this is one option.

1 This is not the entire thing. And the Standard we  
2 discussed just before --

3 RODGER REISWIG: One minute.

4 MARCELO HIRSCHLER: -- this, which was ASTM -  
5 sorry, NFPA 130, which is the companion Standard to  
6 this Standard, has that distinction very clearly.  
7 There is a section in the Standard, in Chapter Four,  
8 that describes all the various ways in which you can  
9 be noncombustible, and there is no definition. That  
10 definition just simply leads you to that. This was  
11 the same here, but this particular comment changes  
12 that, and makes the definition inconsistent with the  
13 Standard. Thank you.

14 RODGER REISWIG: Thank you. Before I go to the  
15 Chair, I just want to clarify. I believe I misspoke.  
16 So we're at Motion 502-2, and this is to Accept Public  
17 Comment No. 12 - just to clarify. Mr. Harvey, would  
18 you like to comment, or offer the Committee's  
19 position?

20 NORRIS HARVEY: Okay. First, I would want to  
21 say thank you to Dr. Hirschler for bringing this to  
22 our attention. Dr. Hirschler made a public comment  
23 for the First Revision, to remove Annex language  
24 related to the definition of noncombustible material.  
25 The Committee agreed with Dr. Hirschler and removed

1 the Annex language.

2 In the process of reviewing the change, the  
3 Committee determined to remove the reference to NFPA  
4 502, Section 4.8, and add a definition in NFPA 502  
5 Section 3.3.44, 'A material that in the form in which  
6 it is used, and under the conditions anticipated, will  
7 not ignite, burn, support combustion, or release  
8 flammable vapors when subjected to fire or heat.' The  
9 voting was 27 affirmative, two no response - a near  
10 unanimous decision.

11 Dr. Hirschler is objecting to the addition of  
12 the definition in this location. Part of the  
13 justification to reject this motion is the assertion  
14 that this language is not consistent with language in  
15 NFPA documents, such as NFPA 1, 101, 5000, or 130.  
16 Upon review of NFPA 101, the stated definition of  
17 noncombustible material refers to Section 4.6.13,  
18 which states, 'Noncombustible material, or material  
19 with any of the following, shall be considered a  
20 noncombustible material. The material in the form in  
21 which it is used and under the conditions anticipated,  
22 will not ignite, burn, support combustion, or release  
23 flammable vapors when subjected to fire or heat.'  
24 This definition is identical to the definition  
25 inserted by the Committee and, and NFPA 502, Section

1 3.3.44, and is not considered inconsistent with other  
2 NFPA documents, such as NFPA 101.

3 The Committee's stated substantiation for the  
4 addition of the definition follows. The definition  
5 should not be a reference to the main body of the  
6 Standard. Therefore, definition of noncombustible  
7 material was added, Annex language deleted as the  
8 information is redundant, and the same information is  
9 brought under Section 4.8.

10 The Committee respectfully requests the CAM  
11 motion to be rejected.

12 RODGER REISWIG: Thank you, Mr. Harvey. With  
13 that, we will open debate on the motion. Please  
14 provide your name, affiliation, and whether you are  
15 speaking in support of, or against the motion. I'll  
16 start at Microphone Number Six.

17 DICK DAVIS: Dick Davis, FM Global, speaking in  
18 support of the motion. I'm speaking on my own behalf,  
19 but I am a member of the Fire Test Committee, and the  
20 Building Construction Committee, which is responsible  
21 for NFPA 220 and, and portions of the NFPA 5000, which  
22 includes this definition. And in NFPA 220, the -  
23 which I have in front of me, for noncombustible  
24 material, it says, 'See 4.15.' And - in which it, it  
25 elaborates on how you would achieve that, which as

1 Marcelo indicated, would be by passing either ASTM E-  
2 136, or E-2652.

3 So as this is proposed, this would be  
4 consistent with what is NFPA 220 and 5000 for the  
5 definition of noncombustible, and the performance  
6 requirements, which do not belong in the definition  
7 section.

8 RODGER REISWIG: Thank you. Marcelo, did you  
9 want to talk?

10 MARCELO HIRSCHLER: Yes.

11 RODGER REISWIG: Microphone Number Two.

12 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
13 International for NFPA, and in support of the motion.  
14 The Chairman wrote - read a little bit of the  
15 definition of noncombustible in NFPA 5000. He read  
16 the first section, not all four sections. NFPA 5000,  
17 like NFPA 101, like NFPA 130, like NFPA 1, like NFPA  
18 98, and I keep go - yeah, I can go through all, all  
19 these Standards, gives you various options for what is  
20 noncombustible. NFPA 502, by putting this in the  
21 revision, cuts out this option. It has to be this or  
22 nothing. And then, in 4.8, it says - 'No, ignore all  
23 that that I said in, in the definition. Use all -  
24 everything else, not what I said in the definition.'

25 So the - adding this in the definition is

1 inconsistent with the - its own Standard, and  
2 inconsistent with all other NFPA documents. Thank  
3 you.

4 RODGER REISWIG: Thank you. Are there any  
5 further discussions on Motion 502-2, to Accept Public  
6 Comment No. 12? Seeing none - Mr. Harvey, would you  
7 like any final comments?

8 NORRIS HARVEY: Yes. Just real quick. Dr.  
9 Hirschler has stated that there's inconsistency with  
10 other Standards. The Committee determined, and by a  
11 near unanimous vote without objection, that they would  
12 prefer to see the definition, which is the same - it  
13 is an intent. That definition is further clarified in  
14 Section 4.8. So we, we don't find an inconsistency.  
15 Thank you.

16 RODGER REISWIG: Thank you, Mr. Harvey.

17 MARCELO HIRSCHLER: Mr. Chair?

18 RODGER REISWIG: Go ahead. I'll, I'll let you  
19 have one minute, Mr. Hirschler.

20 MARCELO HIRSCHLER: Thank you. Marcelo  
21 Hirschler, GBH International for NFPA, in support.  
22 There is inconsistency between 3.3.45 and 4.8. They  
23 are in opposition. Thank you.

24 RODGER REISWIG: Mr. Harvey, would you like to  
25 comment?



1 NORRIS HARVEY: I just stated that we do not  
2 agree with that position.

3 RODGER REISWIG: All right, thank you. Before  
4 we vote, let me restate the motion. The motion on the  
5 floor is to Accept Public Comment No. 12. To vote,  
6 touch the Vote button. If you wish to vote in support  
7 of the motion and the recommended text on Screen One,  
8 touch Yes. If you wish to vote against the motion and  
9 recommend the recommended text on Screen Two, touch  
10 No. Please record your vote now. Voting will close  
11 in five seconds. Voting is now closed. Thank you.  
12 We have 106 in support, or affirmative. We have 94  
13 against. This motion has passed.

14 Let's now proceed with the discussion on  
15 Certified Amending Motion 502-4. Microphone Number  
16 Two.

17 MARCELO HIRSCHLER: Sorry, give me, give me one  
18 minute, please.

19 RODGER REISWIG: Sure.

20 MARCELO HIRSCHLER: Thank you very much.  
21 Marcelo Hirschler, GBH International for NFPA, and I  
22 move CAM 502-4, please.

23 RODGER REISWIG: Thank you. There is a motion  
24 on the floor to Accept an Identifiable Part of Public  
25 Comment No. 13. Is there a second?

1 FEMALE SPEAKER: Second.

2 RODGER REISWIG: We do have a second. Please  
3 proceed with the discussion.

4 MARCELO HIRSCHLER: Thank you. Marcelo  
5 Hirschler, GBH International for NFPA, and in support  
6 of the motion. This is a companion to what we just  
7 did. What you just did is delete the definition for  
8 4.8. Now what I'm - what this motion does is put it  
9 into 4.8 as one of the options.

10 So Section 4.8 of 4, 502 explains that there  
11 are several options for a material to be  
12 noncombustible for use in the standard, as for use in  
13 most other NFPA Codes and Standards. Unless this  
14 motion approve, the option of the material in the  
15 formula which is used - will not ignite etc., is not  
16 one of the options. Without that addition, materials  
17 would have to be tested, one of the prior tests there,  
18 irrespective of whether we know that it's  
19 noncombustible. Most other NFPA documents, including  
20 the Companion Standard in NFPA 130, as well as various  
21 others - I'm not going to have to go to the list -  
22 include those materials (unintelligible) no response  
23 to a thermal insult. Language proposed has a critical  
24 issue that's resolved by this CAM. Thank you very  
25 much.

Page 90

1           RODGER REISWIG: Thank you. Mr. Harvey, would  
2 you like to offer the Committee's position?

3           NORRIS HARVEY: Hmm. In light of the previous  
4 pass of the motion for 502-2, on Motion 502-2, I wish  
5 to not oppose this, this motion. It, it's, it's  
6 necessary --

7           RODGER REISWIG: Thank you.

8           NORRIS HARVEY: -- too.

9           RODGER REISWIG: With that, we will open debate  
10 on the motion. Please provide your name, affiliation,  
11 and whether you are speaking in support of, or against  
12 the motion. I'll start at Microphone Number Two.

13           SHAMIM RASHID-SUMAR: Yes, thank you. This is  
14 Shamim Rashid-Sumar, speaking for the motion,  
15 representing the National Ready Mixed Concrete  
16 Association. The - this amendment is extremely  
17 necessary. Without it, now the definition is going to  
18 be incomplete. So based on your previous action, I  
19 urge the membership to vote Yes.

20           RODGER REISWIG: Thank you. Just seeing some  
21 people walking around. Want to make sure -  
22 (unintelligible). Okay. Are there any further  
23 discussions for Motion 502-4, to Accept an  
24 Identifiable Part of Public Comment No. 13? Mr.  
25 Harvey, would you like any final comments?

1 NORRIS HARVEY: No. Thank you.

2 RODGER REISWIG: All right. Thank you. Before  
3 we vote, let me restate the motion. The motion on the  
4 floor is to Accept an Identifiable Part of Public  
5 Comment No. 13. To vote, touch the Vote button. If  
6 you wish to vote in support of the motion and the  
7 recommended text found on page 256, please touch Yes.  
8 If you wish to vote against the motion and the  
9 recommended text found on page 256, touch No. Please  
10 record your vote now. Hold on a second. We know  
11 it's, it's coming up here. We'll give you time.  
12 Okay? How about five more seconds. A few more  
13 seconds, just in case. Is it working? All right.  
14 Thank you. Voting's closed. We have 194 in support  
15 of the motion, and 15 against the motion. The motion  
16 has passed.

17 Let's now proceed with the discussion on  
18 Certified Amending Motion 502-9. Microphone Number  
19 Two.

20 MARCELO HIRSCHLER: Please give me a couple  
21 seconds.

22 RODGER REISWIG: When you are ready, Sir.

23 MARCELO HIRSCHLER: Thank you very much.  
24 Marcelo Hirschler, GBH International for NFPA, and  
25 maker of the motion CAM 502-9, please.

1           RODGER REISWIG: Thank you. There's a motion  
2 on the floor to Accept an Identifiable Part of Public  
3 Comment No. 13. Is there a second?

4           FEMALE SPEAKER: Second.

5           MALE SPEAKER: Second.

6           RODGER REISWIG: We do have a second. Please  
7 proceed with the discussion on the motion.

8           MARCELO HIRSCHLER: Thank you, Mr. Chairman.  
9 Again, this is a weird thing about testing, and I'm a  
10 fire testing geek, so I, I apologize to the group.  
11 EN-13501-1 contains two different sets of requirements  
12 based on the ISO 1182 Noncombustible (unintelligible).  
13 One of them is Class A-1, the other one is Class A-2.  
14 Both of them are within Class A of EN 13501-1.

15           Class A-2 is roughly equivalent to what, in the  
16 NFPA system, is limited combustible materials, because  
17 it allows a very significant amount of burning to  
18 happen when tested to the ISO 1182. On the hand,  
19 Class A material - one - sorry, Class A-1 materials  
20 are similar materials to comply with ASTM  
21 (unintelligible) 136, which it was just discussed  
22 before.

23           NFPA 502 does not allow limited combustible  
24 materials for any application. But if we don't  
25 specify that has to be EN 13501-1, Class A-1. If we

1 allow Class A-2 materials, then we would allow limited  
2 combustible materials everywhere. That is not  
3 consistent with NFPA state to - 502 states otherwise.  
4 The statement by the Committee Chair addresses BS 54 -  
5 476, which is not part of this motion. It's not being  
6 addressed.

7 Fact that the Committee was not aware that  
8 Class A-1 and Class A-2 materials are different is a  
9 reflection of the fact that I'm a fire test geek, and  
10 very familiar, probably too familiar with the subtle  
11 differences in fire test requirements. This CAM is  
12 simply clarification to ensure that the correct  
13 (unintelligible) criteria used are those in EN 13501-  
14 1, which is the European Standard for reaction of fire  
15 requirements in Europe. It contains, as said before,  
16 two (unintelligible) materials, A-1, and A-2. We need  
17 to make sure that A-1 is used, which is the equivalent  
18 of what we use here in this country, for ASTM E136.  
19 That criteria for A-1 is very similar to ASTM E136.  
20 Criteria for A-2 is similar to --

21 RODGER REISWIG: One minute.

22 MARCELO HIRSCHLER: -- (unintelligible)  
23 combustible materials. If the information approved by  
24 the Committee is approved, means NFPA 502 would in  
25 practice, allow materials similar to limited

1 combustible materials for every application  
2 (unintelligible) and so on, which is not what, what  
3 you want. Thank you very much.

4 RODGER REISWIG: Thank you. Mr. Harvey, would  
5 you like to offer the Committee's position?

6 NORRIS HARVEY: Sure. I'd like to emphasize  
7 that the, the NFPA 502 Committee is, is - has 30  
8 voting members, 10 of which are international in  
9 nature. The 502 Standard is truly an international  
10 standard, and it is recognized globally. And hence  
11 the, the desire to bring international standards into  
12 the, into the body of the Standard.

13 My written statement here is CAM Number 9, NFPA  
14 502, 2023, would like to add text to NFPA 502, Section  
15 4.8.4. The current proposed language is  
16 (unintelligible) from the NFPA 502, Next Edition  
17 website, and represents what is currently proposed for  
18 the Standard, which is - I won't get into reading all  
19 of that to you.

20 The proposed change, according to CAM Number 9  
21 is to add for Class A-1 as shown below, as Marcelo  
22 just elaborated on. When the Committee discussed PC  
23 13 and created the creation of SR-1, the discussion  
24 only revolved around the parts of PC 13 concerning the  
25 applicability of test standards. The Committee

1 decided to keep BS 476 in the requirements, and  
2 created a second revision updating the Subsection 3,  
3 the split testing requirements, to clarify that either  
4 BS 476-4, or EN 13501 needs to be met, and not both.

5 Inclusion of for Class A-1 was not focus - not  
6 a focus of discussion. And I'll leave it at that.

7 RODGER REISWIG: Thank you, Mr. Harvey. With  
8 that, we will open debate on the motion. Please  
9 provide your name, affiliation, and whether you are  
10 speaking in support of, or against the motion.

11 Microphone Number Two.

12 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
13 International for NFPA, and for the motion. Just to  
14 clarify what the Chairman just said - they didn't  
15 think about whether use A-1 or A-2. I understand  
16 that. I'm a - and a, a number of people are not fire  
17 test geeks like I am. I, I know a lot more about what  
18 the individual fire tests require and don't require.  
19 If we don't specify which it is, we're going to put  
20 materials in there that we don't want. I have no  
21 objection to BS 476. It is not part of the, of the  
22 CAM, it's not part of the motion. I have no objection  
23 to the fact that this is an international standard,  
24 absolutely, and it is - I am very happy that you  
25 include the European, the (unintelligible) 13501-1. I



1 just want to make clear that you don't want to start  
2 including materials that burn more than you want. So  
3 please, allow you to put A-1, and please support the  
4 motion. Thank you.

5 RODGER REISWIG: Thank you. Is there any  
6 further discussion on Motion 502-9 to Accept an  
7 Identifiable Part of Public Comment Number 13? Mr.  
8 Harvey, would you like to offer any final comments?

9 NORRIS HARVEY: No further comment.

10 RODGER REISWIG: Thank you. Before we vote,  
11 let me restate the motion. The motion on the floor is  
12 to Accept an Identifiable Part of Public Comment No.  
13 13. To vote, touch the Vote button. If you wish to  
14 vote in support of the motion and the recommended text  
15 on page 263 of the report of the Motions Committee,  
16 touch Yes. If you wish to vote against the motion and  
17 the recommended text as shown on page 263, touch No.  
18 Please record your vote now. Five seconds. Voting is  
19 now closed. We have 141 in favor, support of the  
20 motion, and we have 34 against the motion. The motion  
21 has passed.

22 Let's proceed with the discussion on Certified  
23 Amending Motion 502-7.

24 MARCELO HIRSCHLER: Give me one - a couple of  
25 minutes, please.

1 RODGER REISWIG: Yes, Sir.

2 MARCELO HIRSCHLER: I'm sorry.

3 RODGER REISWIG: It's okay.

4 MARCELO HIRSCHLER: Thank you. Marcelo  
5 Hirschler, GBH International for NFPA, and the maker  
6 of - I move CAM 502-7, please.

7 RODGER REISWIG: There is a motion on the floor  
8 to Accept Public Comment No. 18. Is there a second?

9 MALE SPEAKER: Second.

10 FEMALE SPEAKER: Second.

11 RODGER REISWIG: We do have a second. Please  
12 proceed with the discussion on the motion.

13 MARCELO HIRSCHLER: This CAM addresses  
14 something completely different, but still, still in  
15 the terms of fire testing, which is my thing. This  
16 addresses fire time temperature curves. The time  
17 temperature curve in the RWS Standard - report from  
18 Efectis - was developed specifically for fire safety  
19 of tunnels, has been in NFPA 502 for multiple editions  
20 - not just any curve, but it's the only standard time  
21 temperature curve that's severe enough to make it  
22 suitable for tunnels, as stated before. It has been  
23 the required for curve for many editions.

24 Recently ASTM Committee E-5, Committee on Fire  
25 Standards, developed ASTM E-3134, which is entitled,

Page 98

1 Specification for Transportation Tunnel Structural  
2 Components of Passive Fire Protection System -  
3 contains the exact same temperature curve as the RWS  
4 does, the same acceptance criteria, critical ones  
5 being transmission of heat, and spalling. By  
6 referencing ASTM 3134, NFPA 502 references a consensus  
7 standard, rather than a proprietary test method.

8 In fact, the Technical Committee accepted that.  
9 They deleted reference to the RWS curve, and to the  
10 associated report in the first draft, in the Reference  
11 Standards. Therefore, this now retain the reference,  
12 and it's inconsistent between one section and the  
13 other section. There is any consistent within the  
14 Standard.

15 The mention of the RWS curve needs to be  
16 deleted from this section, and its necessary  
17 reference, the ASTM 3134, which has already been  
18 accepted by the Committee, into the section on  
19 Informational references.

20 The CAM also does one more thing. It deletes  
21 any reference to potential alternate tests. That is  
22 a, a safety measure, because it has been shown that  
23 the RWS curve, or the ASTM 3134 curve, which is, which  
24 is the same, is the most severe fire resistance test  
25 curve available, and it was specifically designed for

1 the fire resistance in tunnels. It was specifically  
2 designed for fire resistance in tunnels. Therefore,  
3 it should not be acceptable to offer a less suitable  
4 alternative, lower fire safety, unless --

5 RODGER REISWIG: One minute.

6 MARCELO HIRSCHLER: -- an engineering analysis  
7 is done, which is consistent with existing language,  
8 also. Let me clarify. This CAM does not add any new  
9 requirements or an engineering analysis. If you could  
10 read that, it has the exact same (unintelligible)  
11 engineering analysis as before - no change in that.  
12 This CAM does, does do - make two changes.

13 First, it deletes the RSW curve, which the  
14 Committee already deleted in part, but not in total,  
15 and replace it with the ASTM curve which has the exact  
16 same curve, and is the consensus standard. And two,  
17 it deletes the unsafe statement that instead of the  
18 RWS curve, you could use another recognized standard -  
19 because we know that no other recognized standard is  
20 as appropriate as the RWS curve. Thank you.

21 RODGER REISWIG: Thank you. With that, Mr.  
22 Harvey, would you like to offer the Committee's  
23 position?

24 NORRIS HARVEY: Thank you. Okay. Dr.  
25 Hirschler would like the acceptance of Public Comment

1 No. 18, which has the changes as shown on the screen.  
2 And the Committee disagree with Dr. Hirschler's  
3 recommending, recommendation, with the following  
4 justification.

5 The proposed change restricts the scope of the  
6 clause to specific sub-elements of structural fire  
7 durability, which is contrary to the current language.  
8 The Standard already contains specific requirements re  
9 compliance in the clause 7.3.3, 7.3.4, and 7.3.6. But  
10 the proposed language requires an engineering analysis  
11 to demonstrate that the curve was applicable, which is  
12 restricting AHJ. This requirement is not the same as  
13 the AHJ accepting a curve, as an engineering analysis.

14 One of the members of the Committee was  
15 actually on the standard that established the ASTM  
16 3431 time temperature curve standard. There were 27  
17 affirmative votes, with, with no - two no responses.  
18 And, and so the Committee expressed intent was to  
19 maintain the language as - in terms of rejecting the  
20 motion that's on the table.

21 RODGER REISWIG: Thank you. With that, we will  
22 open debate on the motion. Please provide your name,  
23 affiliation, and whether you are speaking in support  
24 of, or against the motion. Microphone Number Two.

25 MARCELO HIRSCHLER: Marcelo Hirschler, GBH

1 International for NFPA, and for the motion. I, I'm  
2 not sure how often I, I need to say it - please read  
3 the, the language. The language says unless  
4 acceptable to the AHJ following engineer analysis  
5 today, and unless an engineering analysis acceptable  
6 to AHJ with my change. That is exactly the same. So  
7 there's nothing new about engineering analysis, that -  
8 and the Annex of NFPA 502 as accepted, already says  
9 that E-3134 is identical to RWS. And RWS has been  
10 deleted in part, but only in part, and not in total.

11 So what this does, it makes consistent what is  
12 in the body of, of NFPA 502, what's in the Annex of -  
13 Annex of 502. If not, we're going to have a Standard  
14 referenced, but not referenced in, in part, a Standard  
15 included in one part, but the reference not included.  
16 This just brings consistency, and doesn't add any new  
17 requirements. ASTM E-3134, and Barry Badders was -  
18 who was here earlier - was the person who moved this  
19 through ASTM E5. E-3134 has the exact same fire curve  
20 as the RWS curve. Thank you.

21 RODGER REISWIG: Thank you. Microphone Number  
22 One.

23 JAMES CONRAD: Thank you. James Conrad, RSCC,  
24 and I speak in opposition to the motion on the floor.  
25 I am a voting member of NFPA 502. This was heavily

1 debated. And as the Chair stated, this is truly an  
2 international standard. We have numerous countries.  
3 And when we start talking specific US, or North  
4 America standards, especially on the fire test curves,  
5 we get a lot of pushback, and a lot of debate. And  
6 after numerous debates, we decided to leave the, the  
7 statement that's in there for rejecting it. That fits  
8 well within our committee, and again, I urge you to  
9 speak against, or vote against the motion. Thank you.

10 RODGER REISWIG: Thank you. Microphone Number  
11 Four.

12 BARRY BADDERS: Yes. Barry Badders with  
13 Intertek, in support of the motion. Just like  
14 Marcelo, I know fire testing, been involved with this  
15 for 20 years. And I was leader of the Task Group that  
16 developed E-3134, which is based on the RSW curve. E-  
17 3134 is a consensus standard, and a consensus process.  
18 This is just not a reference to a specific curve. It  
19 has details in it that, that could be important. And,  
20 and I think the membership should take that into  
21 consideration so we're not just referencing a time  
22 temperature curve - we're actually referencing a  
23 consensus standard. So I encourage you to support the  
24 motion. Thank you.

25 RODGER REISWIG: Thank you. Microphone Number

1 Two.

2 MARCELO HIRSCHLER: Marcelo Hirschler, GBH  
3 International for NFPA, and in support. One other  
4 comment I wanted to point out. The RWS time  
5 temperature curve is not a Standard. And that's one  
6 of the things, one of the reasons why ASTM E-5 under  
7 Barry Badders put this, the effort into developing a  
8 standard.

9 I fully agree that NFPA 502 is an international  
10 standard. It's adopted everywhere, which is why, in  
11 all our NFPA Standards, we want to adopt Standards  
12 included in there, not just propriety curves. RSW is  
13 a propriety curve. Thank you.

14 RODGER REISWIG: Thank you. Are there any  
15 further discussion on Motion 502-7 to Accept Public  
16 Comment No. 18? Seeing none, Mr. Harvey, would you  
17 like to add any final comments?

18 NORRIS HARVEY: Yes, I do. A couple of things.  
19 First thing - strictly speaking, ASTM 34, 3431, or  
20 3134, time temperature curve is not identical to the  
21 RWS time temperature curve. There are some  
22 differences between the two. The ASTM 3134 Standards  
23 is a young standard, and one of the things that was in  
24 the perspective of the Committee was the UL listing,  
25 yeah, or the listed, listing requirements and, and the

Page 104



1 additional burden of, of testing an introduction of a  
2 very young Standard would, would bring to the  
3 tunneling community. The RWS curve is internationally  
4 recognized, and there is a testing standard for it,  
5 which is the effect - which has just been revised in  
6 the past year or two by Efectis.

7 So we tabled the inclusion of the ASTM curve to  
8 allow it some time to mature, and to - and also to  
9 just give the community time to recognize that there  
10 is a new standard out there, and move in that  
11 direction.

12 RODGER REISWIG: Thank you, Mr. Harvey. With  
13 that, before we vote, let me restate the motion. The  
14 motion on the floor is to Accept Public Comment No.  
15 18. To vote, touch the Vote button. If you wish to  
16 vote in support of the motion and the recommended text  
17 on Screen One, vote Yes. If you wish to vote against  
18 the motion and the recommended text on Screen Two,  
19 touch No. Please record your vote now. Voting will  
20 close in five seconds. Voting is now closed. We have  
21 108 in support. We have 80 against. The motion has  
22 passed.

23 With that, we will now proceed with our next  
24 Certified Amending Motion, 502-5 on our agenda.  
25 Microphone Number Two.

1 MARCELO HIRSCHLER: Thank you. Marcelo  
2 Hirschler, GBH International for NFPA, and I move CAM  
3 5, please.

4 RODGER REISWIG: Thank you. There is a motion  
5 on the floor to Accept Public Comment No. 17. Is  
6 there a second?

7 FEMALE SPEAKER: Second.

8 RODGER REISWIG: We do have a second. Please  
9 proceed with the discussion on the motion.

10 MARCELO HIRSCHLER: Thank you, Mr. Chairman.  
11 Marcelo Hirschler, GBH International for NFPA, and in  
12 support of the motion. This CAM addresses the  
13 exposure time during fire resistant rating - fire  
14 resistance testing. The required exposure time of two  
15 hours or 120 minutes has been in the Standard until  
16 the 2017 Edition, and represents a clear demarcation  
17 of fire safety. An exposure time of 120 minutes means  
18 a fire resistance rating of two hours. Clearly, if  
19 the exposure time is permitted to be shorter, meaning  
20 the lower fire resistance rating is allowed, fire  
21 safety is lowered.

22 The change that was made for the 2020 Edition  
23 was intended to correlate with Section 732, which  
24 requires an engineering analysis be made for any  
25 deviation from the door exposure time. Clearly, no

1 engineer analysis required to increase the exposure  
2 time, because a high exposure time, or a higher fire  
3 resistance rating will clearly improve fire safety.  
4 However, the use of a lower exposure time, as would be  
5 permitted by the approved language, is a lowering of  
6 fire safety. And the language approved for Section  
7 7.3.3 does not require an engineering analysis.

8 The - excuse me - thus, it forces the AHJ to  
9 determine whether a lower exposure time and lower fire  
10 safety is acceptable, without any associated guidance,  
11 or any information on how much lower the exposure time  
12 would be acceptable. Is a fire exposure time of one  
13 minute acceptable? Clearly not. But the Standard  
14 does not say that it is not, and provides no  
15 information to the AHJ as to what minimal exposure  
16 time is needed. This CAM requires the exposure time  
17 in the fire resistance test must be no less than two  
18 hours, or 120 minutes, meaning the fire resistance  
19 rating must be at least two hours.

20 If you notice, the only difference we're here -  
21 is that it says there, 'or other time acceptable to  
22 the (unintelligible)' and that's perfectly fine, as  
23 long as the time is not less than 120 minutes. Thank  
24 you.

25 RODGER REISWIG: Thank you. Mr. Harvey, would

1 you like to offer the Committee's position?

2 NORRIS HARVEY: Yes. Thank you. All right.  
3 So, Dr. Hirschler is objecting to the potential  
4 reduction of the minimum fire exposure time of 120  
5 minutes. The Committee disagrees with Dr. Hirschler's  
6 position. The Committee views the Standard NFPA 502  
7 as a performance standard, augmented with prescriptive  
8 elements. All highway tunnels are bespoke, and the  
9 Committee's intent is to provide flexibility to the  
10 Authority Having Jurisdiction for fit-for-purpose  
11 application.

12 The language in the Standard provides the  
13 ability for change via an approval process which  
14 directly involves the AHJ, if a change is established.  
15 We're not reducing the 120 minute time period, as  
16 stated. It's not being reduced, but only at the  
17 approval of the AHJ.

18 The Committee's substantiation for rejection -  
19 for rejecting the motion is, the proposed P.I. does  
20 not improve the existing language, and removes the  
21 option of AHJ approval for shorter time periods for  
22 special cases, therefore is rejected. And the voting,  
23 again, was 27 affirmative, and two no response. The  
24 Committee respectfully disagrees with Dr. Hirschler's  
25 NITMAM, and requests for a rejection of this CAM.

Page 108

1           RODGER REISWIG: Thank you, Mr. Harvey. With  
2 that, we will open debate on the motion. Please  
3 provide your name, affiliation, and whether you are  
4 speaking in support of, or against the motion. We'll  
5 start with Microphone Number Two.

6           MARCELO HIRSCHLER: Thank you. Marcelo  
7 Hirschler, GBH International for NFPA, and in support  
8 of the motion. Just want to point, point out that  
9 this allows the AHJ full leverage to choose any time,  
10 but it establishes a minimum. We should not have a  
11 fire resistance rating less than two hours. That's  
12 what we always had. If you take the language that the  
13 Committee approves, the AHJ could choose any time that  
14 it wants. That's not - and typically, the AHJ is not  
15 as technically versed as the members of the Committee,  
16 or as geeky as a fire testing idiot like me. That's  
17 why I'm insisting that the minimum time should be 120  
18 minutes, two hours. Thank you.

19           RODGER REISWIG: Thank you. Are there any  
20 further discussion on Motion 502-5, to Accept Public  
21 Comment No. 17? Mr. Harvey, would you like to add any  
22 final comments.

23           NORRIS HARVEY: Yes. I'd just like to  
24 reinforce that this, this, as it stands right now,  
25 this does not reduce the two hour fire exposure

1 requirement. Okay.

2 RODGER REISWIG: Thank you. Before we vote,  
3 let me restate the motion. The motion on the floor is  
4 to Accept Public Comment No. 17. To vote, touch the  
5 Vote button. If you wish to vote in support of the  
6 motion and the recommended text on Screen One, vote  
7 Yes. If you wish to vote against the motion, and  
8 recommended the text on Screen Two, touch No. Please  
9 record your vote now.

10 FEMALE SPEAKER: (unintelligible)

11 MALE SPEAKER: (unintelligible)

12 RODGER REISWIG: We're working on it.

13 FEMALE SPEAKER: (unintelligible)

14 RODGER REISWIG: All right. Try it now.

15 Please record your vote now. Five seconds. And  
16 voting is closed. With that, we have 137 in support  
17 of the motion, and we have 68 against. That motion  
18 has passed.

19 Before we move on, are there any further  
20 discussions of NFPA 502? Seeing none - before we move  
21 on to the next Standard, let's take a 10 minute break.  
22 Ten minutes, and we'll start back up with Document No.  
23 855.

24 (BREAK IS TAKEN)

25 RODGER REISWIG: All right. Let's go ahead and

Page 110

1 find our seats, and get restarted.

2 (background voices)

3 RODGER REISWIG: All right. Let's go ahead and  
4 get started. The next report under consideration is  
5 that of the Technical Committee on Energy Storage  
6 Systems - Energy Storage Systems. Here to present the  
7 Committee Report is Committee Chair, James Biggins of  
8 CAC Specialty Natural Resources, Manhattan, Illinois.

9 The Committee Report, that is, the First and  
10 Second Draft Reports, is located on the Document  
11 Information Page for NFPA 855, on the NFPA website.  
12 All Certified Amending Motions are identified in the  
13 NFPA Technical Committee, that's the Tech Session  
14 Meeting and Agenda included in the report of the  
15 Motions Committee, and will be displayed behind me on  
16 the screen as they are under debate; or if the text is  
17 too extensive, will display the page.

18 Mr. Biggins, will present the Chair Report,  
19 please? Oh, please take your seats if you could.  
20 This gets a little confusing, so we know who's at the  
21 microphone and not. Thank you. Sorry, Mr. Biggins.

22 JAMES BIGGINS: Okay. The report of the  
23 Technical Committee on Energy Storage Systems is  
24 presented as found in the First Draft Report, and  
25 Second Draft Report for the 2022 Edition of NFPA 855,

Page 111

1 Standard for the Installation of Stationary Energy  
2 Storage Systems.

3 The revisions were submitted to letter ballot  
4 of the responsible Committee, in accordance with the  
5 regulations governing the development of NFPA  
6 Standards. The reports and ballot results can be  
7 found on the Next Edition Tab of the Document  
8 Information Page for NFPA 855, at  
9 [www.nfpa.org/855next](http://www.nfpa.org/855next).

10 RODGER REISWIG: Thank you, Sir. With that,  
11 let's now proceed with the discussion on the Certified  
12 Amending Motions for NFPA 855. We'll start with  
13 Number Three. Microphone Number Two.

14 BILL PFISTER: Good afternoon. Bill Pfister  
15 with the Edison Electrical Institute, and I move CAM  
16 855-3, also known as Public Comment 71.

17 RODGER REISWIG: Thank you. There is a motion  
18 on the floor to Accept Public Comment No. 71. Is  
19 there a second?

20 MALE SPEAKER: Second.

21 RODGER REISWIG: We do have a second. Please  
22 proceed with the discussion on the motion.

23 BILL PFISTER: Again, Bill Pfister with the  
24 Edison Electrical Institute, in support of the motion.  
25 I am here to discuss the handling of energy storage



1 systems within the appropriate code-making bodies. To  
2 quote the esteemed Michael Johnston in a recent  
3 article, 'The demarcation between NFPA's National  
4 Electrical Code, and IEEE's National Electrical Safety  
5 Code is the service point.'

6 Differentiating the line side covered by NEC -  
7 excuse me, NESC, and the load side for premises  
8 wiring, covered by NEC. Utilities are on the line  
9 side. This supports the logical conclusion that  
10 energy storage should be under the - energy storage  
11 under the exclusive control of an electric utility  
12 should be handled within the NESC.

13 We've been making this point for at least four  
14 years. NFPA has largely been ignoring this point for  
15 almost as many years. Three years ago at the  
16 Technical Meeting in San Antonio, this issue was  
17 supported by the majority of the fire protection  
18 experts during the floor vote. Then the 855 Technical  
19 Committee effectively overruled that voice. Then we  
20 appealed to the Standards Council, where we were again  
21 overruled.

22 However, the Standards Council acknowledged and  
23 corrected some inappropriate participation on the 855  
24 Technical Committee. Of course, that inappropriate  
25 participation included the loudest voice opposing

1 utilities. But it was too late. The damage was  
2 already done. NFPA was effectively unwilling to  
3 revisit the utility coverage issue.

4 I have the greatest respect for the men and  
5 women who dedicate their careers in making our, our  
6 lives safer through development, application, and  
7 enforcement of codes and standards. I also deeply  
8 respect the organizations that make this happen - like  
9 NFPA, IEEE, and IFC. Unfortunately, I believe this is  
10 an example when the code development --

11 RODGER REISWIG: One minute.

12 BILL PFISTER: -- didn't work as it should.  
13 Even if we win a floor vote today, I see no path where  
14 NFPA and the whole of the 855 Technical Committee  
15 would acknowledge that energy storage under the  
16 exclusive control of utilities should be handled  
17 within NSC - NESC.

18 Seeing no path forward, my purpose here today  
19 is solely to enter these remarks on the record, in  
20 hopes that we can learn from this experience and do  
21 better in the future. With that, I respectfully  
22 withdraw Motions 855-3 and 4.

23 RODGER REISWIG: I think that may be out of  
24 order. We had a motion, and seconded. Hold on a  
25 second. All right. So that would be out of order,

1 Sir. So you can - your motion has been made; it's  
2 been seconded. It's now on the floor. So I'm going  
3 to turn to Mr. Biggins, if you would like to offer a  
4 Committee position.

5 JAMES BIGGINS: In light of EEI's request, I am  
6 going to just vary from what I was going to say, and  
7 say that the Committee does - did recognize the  
8 electric utilities' position. And the Committee's  
9 position has always been that while a lot of things  
10 were addressed within the National Electric Safety  
11 Code, the primary issues of personnel and first  
12 responder safety were not. And that is primarily the  
13 reason the Committee has always felt that all  
14 electrical energy storage systems should be treated  
15 the same way, regardless who is the entity controlling  
16 them.

17 RODGER REISWIG: Mr. Biggins, thank you. At  
18 NFPA, it's about the process, and the process has now  
19 been unfolded. So thank you for that. And with that,  
20 we will open debate of the motion. Please provide  
21 your name, affiliation, and whether you are speaking  
22 in support or against the motion. Are there any  
23 further discussions on the Motion for 855-3, to Accept  
24 Public Comment No. 71.

25 MALE SPEAKER: Microphone One.

1           RODGER REISWIG: Oh, sorry. Microphone Number  
2 One.

3           CHRIS SEARLES: Chris Searles, CGS and  
4 Associates, Vice Chair of the IEEE Energy Storage and  
5 Stationary Battery Committee. Since the motion is on  
6 the floor, I'd like to go on record. Speaking on the  
7 consensus of the Officers of the Energy Storage and  
8 Stationary Battery Committee, three years ago in San  
9 Antonio, we were a part of the speakers who were very  
10 active in wanting to modify the scope. And of course,  
11 the result was that no scope was put into the  
12 Standard. However, I think in light of the fact that  
13 855 has proven itself to have tenets that are very  
14 important to energy storage - and energy storage  
15 really is becoming much more complex than it used to  
16 be, because we're dealing in things that go beyond  
17 just the grid, and renewables, and EVs, and vehicle to  
18 grid, and other things.

19           But with respect to the electric utilities  
20 having a total exemption, I think recent incidents  
21 prove the fact that there needs to be some control.  
22 And as was stated, the Committee broadened itself,  
23 brought in a lot of people from the different  
24 technologies, and interests, and Bill Biggins has done  
25 a great job, really, in managing 855. And so, for the

Page 116

1 Energy Storage and Stationary Battery Committee, we  
2 say that we do not object, and would vote No on this.

3 RODGER REISWIG: Sir, before you go away - I  
4 neglected stop you. Could you say if you're for, or  
5 against the motion, please?

6 CHRIS SEARLES: I just said I'm against it.

7 RODGER REISWIG: Okay. I just wanted to make  
8 sure, capture it on the record. Thank you. Is there  
9 - Microphone Number One.

10 MATTHEW PACE: Yeah. I'm Matthew Pace with  
11 Pacific Northwest National Laboratories, speaking  
12 against the motion. I would like to request that the  
13 room honor the request of the submitter, just through  
14 the error of the - opening this motion, that this be  
15 rejected. Energy storage systems have no idea what  
16 side of the fence they sit on. We've seen failures  
17 that result in injuries, and fatalities around the  
18 world, not under the NESC.

19 But more importantly, the NESC is not adopted  
20 in all states, and it's critical that we provide best  
21 practices for all installations. Thank you.

22 RODGER REISWIG: Thank you. Just give a second  
23 here. So with that, are there any further discussions  
24 on Motion 855-3 to Accept Public Comment No. 71? Mr.  
25 - Mr. Biggins, would you like to offer any final

1        comments?

2                JAMES BIGGINS:    Nothing further to add.

3                RODGER REISWIG:    All right.    Seeing none -  
4        before we vote, let's restate the motion.    The motion  
5        on the floor is to Accept Public Comment No. 71.    To  
6        vote, touch the Vote button.    If you wish to vote in  
7        support of the motion and recommended with the text on  
8        Screen One, touch Yes.    If you wish to vote against  
9        the motion and recommended text on Screen Two, touch  
10       No.    Please vote now.    We'll have five seconds to end  
11       voting.    Voting's now closed.    43 in the affirmative,  
12       and 200 against.    That makes the motion failed.

13               All right, for the next motion, Certified  
14        Amending Motion 855-4, the motion has appeared on our  
15        agenda.    However, the authorized maker of the motion  
16        has notified NFPA that this motion will not be  
17        pursued.    Therefore, in accordance with NFPA Rules,  
18        Convention Rules, at Section 2.7, the motion may not  
19        be considered by the assembly, and is removed from the  
20        agenda.    We will now move to the next motion.

21               Let's proceed with the next Certified Amending  
22        Motion, 855-5.    Microphone Number Four.

23               ANDREW TANNER:    Thank you, Mr. Chair.    I am  
24        Andrew Tanner, representing Yotta Energy.    I move to  
25        Accept CAM 855-5, to Accept Public Comment No. 177.

Page 118

1           RODGER REISWIG: Thank you. There is a motion  
2 on the floor to Accept Public Comment No. 177. Is  
3 there a second?

4           MALE SPEAKER: Second.

5           MALE SPEAKER: Second.

6           RODGER REISWIG: We have a second. Please  
7 proceed with the discussion on the motion.

8           ANDREW TANNER: Thank you, Mr. Chair, and good  
9 afternoon, ladies and gentlemen. My name is Andrew  
10 Tanner, and I speak for the motion. I am an engineer  
11 with over 20 years of experience developing renewable  
12 energy technologies. I have an esteemed career that  
13 includes numerous awards, such as the Australian  
14 Global Australian of the Year Award for Renewable  
15 Energy.

16           Yotta Energy is an Austin based manufacturer  
17 currently in discussion with the US Department of  
18 Energy to scale manufacturing here in the US, and  
19 create American jobs. Unlike large, containerized  
20 energy storage technologies that the vast majority of  
21 you visualize when you hear energy storage, Yotta  
22 manufactures a briefcase-sized energy storage unit  
23 that has the capacity of only one kilowatt hour. It  
24 is explicitly designed to install beneath solar  
25 modules, and is therefore, distributed across rooftops

1 in a decentralized nature.

2 Our technology has been validated by the  
3 National Renewable Energy Laboratory, the Renewable  
4 Energy Test Center, and the Southwest Research  
5 Institute. Further, UL 9548 testing of our LFP based  
6 energy storage technology demonstrated no external  
7 flaming during fire and explosion testing.

8 The CAM proposed seeks to address an oversight  
9 in the Standard for small, foam factor energy storage  
10 technologies that are installed on rooftops in a  
11 decentralized architecture and demonstrate no external  
12 flaming during fire and explosion testing. Currently,  
13 the Standard allows for centralized systems that do  
14 externally flame on rooftops, but failed to concede a  
15 safe, decentralized architectures.

16 The bar of producing no external flaming is  
17 extremely high. Indeed, this is the bar that an  
18 energy storage system must meet to be installed  
19 indoor, and in the basement --

20 RODGER REISWIG: One minute.

21 ANDREW TANNER: -- of a home. The section  
22 referenced in the CAM is impractical for new and  
23 innovative decentralized technologies. The CAM does  
24 not erode fire safety on a rooftop. In fact, it does  
25 the exact opposite. It raises the bar. This approach

Page 120



1 delivers separation of small, foam factor energy  
2 storage technology - an approach which is a pillar of  
3 Fire Code.

4 Over the past few months, we have engaged with  
5 numerous Technical Committee members, a number of whom  
6 will speak in favor of the CAM today, and recognize  
7 oversight during the process. Ladies and gentlemen,  
8 we appreciate your consideration of this CAM today so  
9 that the Standard can keep pace with the innovation of  
10 new, safe, decentralized energy storage technology.  
11 Thank you, Chair.

12 RODGER REISWIG: Thank you. Mr. Biggins, would  
13 you like to offer the Committee's position?

14 JAMES BIGGINS: Yes, I would. Mr. Tanner's  
15 proposed a change to add an additional section to NFPA  
16 855 that would allow energy storage systems to be  
17 installed on roofs without needing to meet specific  
18 rooftop requirements, provided that each is less than  
19 20 kilowatt hours in size, and demonstrate through  
20 fire testing that the ESS will demonstrate no flaming  
21 outside of the energy storage system itself.

22 The Technical Committee took the position - is  
23 that systems greater than 20 kilowatt hours in  
24 aggregate, connected to rooftop PV systems, are  
25 covered through changes made to Section 1.3 of the

1 Standard, addressing the application of the Standard  
2 to include threshold quantities for outdoor areas.  
3 Additionally, the Technical Committee was concerned  
4 that there might be other requirements in the Standard  
5 impacted by this proposed revision.

6 RODGER REISWIG: Thank you, Sir. With that, we  
7 will open debate on the motion. Please provide your  
8 name, affiliation, and whether you are speaking in  
9 support of, or against the motion. Microphone One.

10 HOWARD HOPPER: Howard Hopper, UL. On this  
11 motion, I'm representing the International Association  
12 of Fire Chiefs, Fire and Life Safety Section. We're  
13 speaking against the motion.

14 When energy storage systems are provided on  
15 rooftops, NFPA 855 includes some well thought out  
16 requirements addressing firefighting operations, and  
17 firefighter safety up on the rooftops. This includes  
18 providing firefighters access to the rooftop, having  
19 a, a standpipe outlet available, making sure the ESS  
20 is not too close to the access point so that they're  
21 not walking in immediately to a, a unit that may be in  
22 - having an event, and also having service walkways so  
23 they can deploy the hoses, drag hoses, and conduct  
24 firefighting operations.

25 There's - and there's also restrictions in the

1 rooftop requirements that you can't place the ESS too  
2 close to the edge of the roof, because if it's too  
3 close, you have more likely, that if you have ESS  
4 event, that it may impact adjacent properties.

5 So allowing exceptions to all of these  
6 requirements for some of these units is, is real,  
7 really kind of overreaching. If there was just a  
8 single 20-kilowatt hour unit up there, that would be  
9 one thing. But the proposal, as written, would allow  
10 an unlimited, aggregate quantity of energy storage up  
11 on the roof, and it would exempt all of the  
12 firefighting safety capabilities.

13 So the, the concept has merit to address the  
14 safety of these, but the execution of the motion is a  
15 little bit too far reaching. Because of that the Fire  
16 and Life Safety Section would urge you to support  
17 firefighter safety, and to vote against the motion.  
18 Thank you.

19 RODGER REISWIG: Thank you. I'll move to  
20 Microphone Number Four.

21 MATTHEW PACE: My name is Matthew Pace. I'm  
22 with the Pacific Northwest National Laboratories. I  
23 am speaking for the motion. As a Technical Committee  
24 member on 855, and a former 23-year firefighter, I  
25 have a unique perspective on this.

1           This language - and it's really important that  
2     the folks in the room understand that there's a  
3     difference between the proponent, his company, and his  
4     product, and the language that's being proposed. We  
5     need to vote on the language, not whether or not their  
6     product will do what it says. All right. I wish them  
7     the best of luck.

8           The real key here is we need to provide  
9     opportunities for energy storage situations -  
10    applications outdoors, wherever possible. It's -  
11    there's known risks that under thermal runaway, there  
12    are flammable gasses released. So when I look at this  
13    language, I see somebody looking for an application  
14    where it has to be approved by the AHJ, and it has to  
15    meet the indoor requirements for an energy storage  
16    system, and it has to be a small battery, for an  
17    outdoor installation. That is a very high bar that  
18    currently is not in 855.

19          So, from the National Labs, we would like to  
20    see more opportunities for energy storage to be  
21    installed in a safe manner. Integrating in a PV array  
22    was never considered by 855. The language on the  
23    rooftop requirement only addressed large enclosures,  
24    close together. And unfortunately, during this last  
25    revision, we didn't get any public inputs to change

1 it. We didn't, as a committee, didn't put any in to  
2 change the rooftop requirements.

3 And so now we have some innovative new  
4 technology that doesn't have - even have an  
5 opportunity for the next three years to apply their,  
6 their technology.

7 So, you know, what I'm going to be doing today,  
8 and I ask all of you to consider, is the language  
9 right there still allows the AHJ to look at the  
10 installation --

11 RODGER REISWIG: One minute.

12 MATTHEW PACE: -- and provide an energy storage  
13 system that cannot have any fire come outside of it.  
14 What we heard earlier by my good friend and colleague  
15 from UL is stating their concern about more than one;  
16 said we're not concerned about one - but it's many of  
17 them. Well, the UL 9548 requirements sets a, a  
18 separation standard. If we're saying that you can't  
19 have them three feet apart, or you can't trust the  
20 large scale fire test of it, that's a problem with the  
21 product standard that needs to be addressed. That's  
22 not the job of this Standard. We cite the standards,  
23 the product safety standards, and I urge your support  
24 of this. Thank you.

25 RODGER REISWIG: Move over to Microphone Number

1 Three.

2 RICK SWAN: Rick Swan, International  
3 Association of Firefighters, speaking against the  
4 motion. And what we'd like to do, the International  
5 Association of Firefighters, would echo the  
6 understanding and the words spoken by the  
7 International Association of Fire Chiefs, the first  
8 speaker. And while I understand the need and the  
9 importance of supporting new technology, as the last  
10 speaker just spoke, and I respect what, what - as -  
11 what Matt was saying this, is that if these things are  
12 small and are, you know, going to be a few places  
13 around the tops of the roof, there's no reason why  
14 that they cannot also be required to meet the  
15 requirements of 4.4.4.2. And some of those are very  
16 important - that - about having access around - for  
17 the firefighters to make, and, and service folks to  
18 make access; to have a, a spot where they can come up,  
19 and not have these energy storage boxes around. And,  
20 and, and having them away from the, the edges of the  
21 roof.

22 There's some simple things here that, that the  
23 current requirement, the current Standard,  
24 4.4.4.4.2s requires, and the - if they're small  
25 enough, there's no reason why they can't meet that -

Page 126

1 the current requirements, as it states also. We would  
2 respectfully ask you to vote against.

3 RODGER REISWIG: Thank you. Microphone Number  
4 Four.

5 MERTON BUNKER: Thank you, Mr. Chairman.  
6 Merton Bunker, Merton Bunker and Associates, Stafford,  
7 Virginia, speaking for the motion. 855 is not  
8 currently written to address a distributed technology,  
9 and it's preventing innovation. Okay - the previous  
10 person at the microphone just indicated that there are  
11 several things that should be done. Some of those  
12 cannot be done on an open rooftop for a distributed  
13 system. Case in point is a radiant energy sensing  
14 fire detection system cannot be used on a rooftop.  
15 Lighting, and sunlight, and other sources of IR and UV  
16 trans-- or radiation, would cause nuisance alarms  
17 frequently. So that would not even be possible, okay.

18 So, the rejection of PC 177 results in the  
19 prohibition of systems that would be tested and found  
20 safe, with zero flaming. So that would obviate the  
21 need for many of those, if not all of those things  
22 that are listed in 4.4.4.4.2. Energy storage indoors  
23 is inherently more dangerous than on a rooftop, due to  
24 buildup of gasses. And yet, we're prohibiting this  
25 from being installed outdoors.

1           So we are - we are stifling innovation. The,  
2           the proposed requirement is so stringent that no one  
3           can currently meet it. It's a very high bar. And it  
4           is not product specific. So it gives no advantage to  
5           any one company. So we should not be preventing  
6           technology that, that promotes clean energy in this  
7           time of the energy crisis.

8           And lastly, we have a safety built into this  
9           thing, where it's got to be approved by the AHJ. So  
10          with all of those things, I urge your support for this  
11          motion. Thank you, Sir.

12          RODGER REISWIG: Thank you. Go to Microphone  
13          Number One.

14          BRIAN SCHOLL: Thank you. My name's Brian  
15          Scholl. I'm with the Phoenix Fire Department, and I'm  
16          against this proposal. I am on 855, but not speaking  
17          for the Committee. This motion creates a huge hazard  
18          to our firefighters, as it allows large battery  
19          systems to be installed on roofs without providing a  
20          water supply through the standpipes on the roof to  
21          safely put out a fire involving these batteries.

22          As a committee, we decided that battery systems  
23          on roofs should be required to have certain fire and  
24          life safety components, to include standpipes. This  
25          proposal does not include standpipes. So I urge you



1 to vote no to this motion. Thank you.

2 RODGER REISWIG: Microphone Number Six.

3 SHARON BONESTEEL: Sharon Bonesteel, Salt River  
4 Project, speaking in support of the motion. One of  
5 the big challenges that we are going to have moving  
6 forward is that 859 - 855 cannot keep up with the  
7 technology. Our Code process can't keep up with the  
8 speed of changing technology. We have to put some  
9 trust in the skills that we require in our AHJs. Why  
10 do we require building officials and fire officials to  
11 be so well trained, and so well educated, if we're not  
12 going to rely upon their judgment in certain areas  
13 such as this, to say, 'Well, you know, if it's a  
14 building that high, it's going to need a standpipe on  
15 the roof anyway. So, you know, we've got it covered.'

16 I think this is one good example of where we've  
17 got enough criteria in there to maintain the  
18 firefighters' safety, and still encourage innovative  
19 technology. Thank you.

20 RODGER REISWIG: Microphone Number Three.

21 DAVE RAYBORN: Yes. Dave Rayborn, Cape Coral  
22 Fire Department, 43-year veteran, and I'm speaking  
23 against this. I actually had to read some of this  
24 just to see where we were, so I can bring myself up to  
25 speed. I am also an AHJ. I also use these Codes as a

1 reference. So for me to be well referenced in  
2 everything in NFPA Codes to make a decision on my own  
3 is a little tough. So I go by what subject matter  
4 experts put into the Code. And taking this out of the  
5 Code is going to put our firefighters at risk, and I  
6 cannot allow that, personally. So I implore you to  
7 vote against this. Thank you.

8 RODGER REISWIG: Microphone Number Four.

9 ANDREW TANNER: My name is Andrew Tanner, and I  
10 speak for this motion. I would like to, to highlight  
11 to everybody in this room that the first words in  
12 this, this CAM here is, 'Where approved by the AHJ.'  
13 Okay. Now, as it turns out, for our technology, we  
14 install on the racking of, of PD (phonetic) equipment.  
15 So we are bound by the rules that are, that are  
16 stipulated for the installation of a solar array on a  
17 rooftop. So it is completely impractical, and  
18 illogical that any AHJ is going to accept that our  
19 battery, and any other distributed battery, would be  
20 installed within four feet of the perimeter of a  
21 rooftop.

22 Now, this Standard actually provides relief for  
23 the results of UL-9548 testing, when it comes to  
24 egress. It's allowed to reduce from 10 feet to three  
25 feet, based on the outcome of the Standard.

1           Now, what we are saying here is, if you reach  
2       this extremely high bar where you don't externally  
3       flame, then you - and you're under 20 kilowatt hours -  
4       that you're going to be afforded relief. And you  
5       heard from Matthew Pace from PNNL. You heard from  
6       Merton Bunker. These are experts. Right? Like,  
7       please don't fear innovation. Please help it - adopt  
8       it. Thank you very much.

9           RODGER REISWIG: Microphone Number Three.

10          DAVE BERNZWEIG: Dave Bernzweig, International  
11       Association of Firefighters. I don't want to beat  
12       this death, but you know, 4.4.4.2 --

13          RODGER REISWIG: I'm sorry. Are you against,  
14       or for the motion?

15          DAVE BERNZWEIG: I'm speaking against the  
16       motion. Section 4.4.4.2 are safeguards for the Fire  
17       Service, right. There are nine requirements in there,  
18       and all of those are, are meant to keep us safe when  
19       we are operating on rooftops. Now, there is more than  
20       just external flaming from the box. There is gas  
21       accumulation, (unintelligible). There are a lot of  
22       requirements of that - and, and this industry is still  
23       developing. You know, we're looking at 855 to provide  
24       safety for the Fire Service. And by, by having a  
25       carve-out like this, it actually makes us, you know,

Page 131

1 less safe. So - against the motion. Thank you.

2 RODGER REISWIG: Microphone Number Four.

3 MERTON BUNKER: Thank you, Mr. Chairman.

4 Merton Bunker, Merton Bunker and Associates, Stafford,  
5 Virginia. Many of the requirements for egress would  
6 already be satisfied, because you would need to leave  
7 spaces between the equipment for --

8 RODGER REISWIG: I'm --

9 MERTON BUNKER: -- service --

10 RODGER REISWIG: I'm sorry. Can you say if  
11 you're for or against the motion?

12 MERTON BUNKER: Oh, I'm sorry. I'm for the  
13 motion. So, many of the requirements for egress would  
14 already be satisfied because they would need to leave  
15 some room for servicing and maintenance of the  
16 equipment. So I think the issue of, of egress for  
17 firefighters' access is really a moot point. Thank  
18 you.

19 RODGER REISWIG: Are there any further  
20 discussions on Motion 855-5, to Accept Public Comment  
21 No. 177? Seeing none. Mr. Biggins, would you like to  
22 make any final comments?

23 JAMES BIGGINS: Yes. I just want to say that  
24 this was, you know, discussed and, you know, debated  
25 during the, the meetings. And furthermore, today

1 we've had Committee members speaking on both sides.  
2 So you know, it - I'm not going to say, you know,  
3 support or don't support. I'll let the group decide.

4 RODGER REISWIG: Thank you. Before we vote,  
5 let me restate the motion. The motion on the floor is  
6 to Accept Public Comment No. 177. To vote, touch the  
7 Vote button. If you wish to vote in support of the  
8 motion and the recommended text on Screen One, touch  
9 Yes. If you wish to vote against the motion and  
10 recommended the text on Screen Number Two, touch No.  
11 Please record your vote now. Okay. We'll have about  
12 five seconds. Voting's now closed. Voting is 110 in  
13 support of the motion, and 143 against the motion.  
14 The motion has failed.

15 With that, before we move on to the next  
16 standard, I would like to introduce Kenneth Bush,  
17 Member of the Standards Council, and Chair of the  
18 Motions Committee, who will be the Presiding Officer  
19 for motions before the NFPA membership for NFPA 25  
20 today, and will open debate on motions tomorrow for  
21 NFPA 70. Thank you.

22 KENNETH BUSH: Thank you, Rodger. Good  
23 afternoon. And as introduced, I'm Kenneth Bush. It  
24 is my distinct pleasure to act as the Presiding  
25 Officer for the final NFPA Standard with Certified

1 Attending Motions under consideration here today.

2 The last report under consideration today is  
3 that of the Technical Committee on Inspection,  
4 Testing, and Maintenance of Water Based Systems. The  
5 Motions Committee received a request from the  
6 Healthcare Section Board to amend the order of CAMS  
7 25-10, 25-2, and 25-3, as approved and posted in the  
8 agenda. The Motions Committee considered the request,  
9 and has made the decision to proceed with the debate  
10 and vote of these motions in the order as posted in  
11 the agenda. However, for the assembly's information,  
12 and for clarity, please note that these three motions  
13 are related, and comments offered on one CAM may  
14 reference and describe the potential impact of one CAM  
15 in the context of the three.

16 Here to present the Committee Report is  
17 Committee Chair Bradford Cronin of the Newport Fire  
18 Department, Newport, Rhode Island. The Committee  
19 Report, that is the First and Second Draft Reports, is  
20 located on the Document Information Page for NFPA 25,  
21 on the NFPA website. Mr. Cronin, would you please  
22 present the Committee - the Chair Report.

23 BRADFORD CRONIN: Thank you, Ken. The report  
24 of the Committee on Inspection Testing and Maintenance  
25 of Water Based Systems is presented as found in the

Page 134

1 First Draft Report, and Second Draft Report, for the  
2 annual 2022 cycle of NFPA 25, Standard for the  
3 Inspection, Testing, and Maintenance of Water Based  
4 Fire Protection Systems. The revisions were submitted  
5 to letter ballot of the responsible Technical  
6 Committee, in accordance with the regulations  
7 governing the development of NFPA Standards. The  
8 reports and ballots can be found on the Next Edition  
9 Tab of the Document Information Page for NFPA 25, at  
10 [www.nfpa.org/25next](http://www.nfpa.org/25next).

11 KENNETH BUSH: Thank you. Let's proceed with  
12 the discussion on Certified Amending Motion 25-10.  
13 Microphone Number Four, please.

14 TOP MYERS: Two.

15 KENNETH BUSH: Sorry. Microphone Number Two.

16 TOP MYERS: My name is Top Myers, and I'm with  
17 Myers Risk Services, and I move to reject Second  
18 Revision No. 4.

19 KENNETH BUSH: Thank you. There is a motion on  
20 the floor to Reject Second Revision No. 4. Is there a  
21 second.

22 MALE SPEAKER: Second. Second.

23 KENNETH BUSH: We do have a second. Please  
24 proceed with discussion on the motion.

25 TOP MYERS: We recognize that there is an issue

1 from time to time with compatibility, and CPVC in  
2 buildings, which have resulted in unfortunate water  
3 damage and things of that nature. We also are very  
4 concerned that this does not belong in Chapter 4 of  
5 NFPA 25, which is an Inspection, and, and Testing, and  
6 Maintenance Standard, versus an Installation Standard,  
7 because this is more of an installation issue.

8 To further clarify the difficulty, an owner  
9 would have the responsibility to handle all of this.  
10 Underwriters Laboratories and - formed a Task Group.  
11 Their Standard UL 1821B, and that was done in 2015.  
12 That Task Group was made up of a number of people that  
13 were from the industry, from the manufacturers of CPP  
14 piping and fittings, from Factory Mutual, and, and a  
15 lot of other people, such as myself. That started in  
16 2015. It's now 2022, and we're still in the process  
17 of trying to figure out a good way in which to test  
18 various products for their compatibility with CPVC.

19 So, if some of the best experts in CPVC pipe  
20 and fittings in the country have not answered that  
21 solution, I'm not sure that it's fair to put it on the  
22 owners to have that responsibility. Thank you.

23 KENNETH BUSH: Thank you. Mr. Cronin, would  
24 you like to offer the Committee's position?

25 BRADFORD CRONIN: Yes. Thank you. And, and



1     thank you, Top as the submitter of this CAM. The  
2     proposed CAM seeks to remove new Section 4.1.3 on  
3     nonmetallic sprinkler pipe. This section was added to  
4     make the owner or their representatives aware of the  
5     compatibility challenges between nonmetallic pipe and  
6     other components and material that may intentionally  
7     or unintentionally come in contact with nonmetallic  
8     sprinkler pipe. It is the position of the Committee  
9     that it is the owner or their representative's  
10    responsibility to know what is taking place in their  
11    building, and to identify these changes.

12           New Section 4.1.3 also lets the owner know what  
13    this needs to be considered - that this needs to be  
14    considered before they do something that may affect  
15    sprinkler system piping. New Section 4.1.3 passed  
16    ballot with only four negative votes. Thank you.

17           KENNETH BUSH: Thank you. With that, we will  
18    open debate on the motion. Please provide your name,  
19    affiliation, and whether you are speaking in support  
20    or against the motion. Microphone Number Four.

21           BILL KOFFEL: Bill Koffel, Koffel Associates  
22    speaking for the motion, speaking for myself. I am  
23    the submitter of CAM 25-2, which is - addresses this  
24    issue in a different way, which did receive support of  
25    a majority of the Committee; failed ballot by one

1 vote. However, as the Chair indicated, 25-10, 25-2,  
2 25-3 are all related. The interested parties that  
3 we've been able to identify have all gotten together  
4 and have agreed to support, to the best of my  
5 knowledge, 25-10 and 25-3. Based upon that agreement,  
6 I am letting the NFPA know that I will not be pursuing  
7 25-2, in favor of accepting this motion for 25-10 and  
8 for 25-3.

9 KENNETH BUSH: Thank you. Microphone Number  
10 Six.

11 JIM PETERKIN: Thank you. Jim Peterkin, TLC  
12 Engineering Solutions, speaking in support of the  
13 motion. I'm also speaking on behalf of the Healthcare  
14 Section. The Healthcare Section Board met at the  
15 Annual Section Business Meeting, and voted to support  
16 this motion.

17 As the proponent pointed out, there is just too  
18 many unknown products for any owner to know what these  
19 issues would be and how to address them. So I think  
20 we've agreed to try to develop Task Groups to look at  
21 this issue over the next cycle to try to develop a  
22 better solution than as proposed in this current  
23 language. So I would urge support of the motion.  
24 Thank you.

25 KENNETH BUSH: Thank you. Microphone Number

1 Two.

2 TERRY VICTOR: My name is Terry Victor. I'm  
3 with Johnson Controls, and I'm speaking for myself,  
4 and I'm in favor of the motion. This is our first  
5 attempt in NFPA 25 to address this incompatibility  
6 issue. And I'm, I'm telling you right now, it's not  
7 ready for prime time. So I support Top's motion to  
8 get this language out of the Standard as it exists  
9 right now, based on the Second Draft Report. And  
10 we're going to put together, as Bill said, Bill Koffel  
11 said, a Task Group to work on what's the best way to  
12 address this incompatibility issue.

13 There are issues where it's, it's really tough  
14 to identify what materials might come in contact,  
15 either during construction or after construction, with  
16 nonmetallic pipes. And those materials can cause  
17 failures in, in nonmetallic pipes. CPVC is, is one of  
18 the issues specifically, of a product that has had  
19 numerous incompatibility products come in contact with  
20 it. And in some cases, it's after the fact that the  
21 installation contractor has installed the CPVC, and  
22 some kind of a bioside, or some CAT-5 cable comes in  
23 contact with the CPVC pipe after the fact, and causes  
24 a failure.

25 It's very onerous for the owners to be

Page 139

1 responsible to identify those incompatibilities. It's  
2 very onerous for anyone, at this stage of the game, to  
3 know what might be compatible, what might not be  
4 compatible. We need to address this in a different  
5 way than to have this new section in Chapter 4, and we  
6 have all the interested parties agreeing to do that.  
7 So I ask the membership to please vote in favor of  
8 this motion, and let's go back and do this right the  
9 next time around. Thank you.

10 KENNETH BUSH: Thank you. Microphone Number  
11 Six.

12 CHAD BEEBE: Chad Beebe, American Society for  
13 Healthcare Engineering of the American Hospital  
14 Association, speaking in support of the motion - one  
15 of the interested parties that Mr. Koffel mentioned.  
16 I think we have a really good plan. I just wanted to  
17 make sure it was really clear here. We don't believe  
18 it's up to the owners to identify this, but we also  
19 don't believe that it's up to the contractors. I  
20 think we have a really good plan here to, between  
21 cycles, to get together, and come up with an approach  
22 that works for everybody, and really addresses this  
23 going forward. Thank you.

24 KENNETH BUSH: Thank you. Is there any further  
25 discussion on Motion 25-10 to Reject Second Revision

1 No. 4? Mr. Cronin, any final comments?

2 BRADFORD CRONIN: No, thank you.

3 KENNETH BUSH: Okay. Seeing none, we will go  
4 onto a vote. Before we vote, let me restate the  
5 motion. The motion on the floor is to Reject Second  
6 Revision No. 4. To vote, touch the Vote button. If  
7 you wish to vote in support of the motion and  
8 recommend the text on Screen One, touch Yes. If you  
9 wish to vote against the motion and recommend the text  
10 on Screen Two, touch No. Please record your vote.  
11 The voting will close in five seconds. The voting is  
12 closed. The results of the vote are 189 in support of  
13 the motion, and recommend the text on Screen One, and  
14 16 against the motion and recommend the text on Screen  
15 Two. The motion has passed.

16 Let us now proceed with discussion on Certified  
17 Amending Motion No. 25-2. Microphone Number Four.

18 BILL KOFFEL: Bill Koffel, Koffel Associates,  
19 submitter of 25-2. As previously noted, I will not  
20 make this motion.

21 MALE SPEAKER: Not pursued, right?

22 KENNETH BUSH: Okay. This motion on NFPA 25,  
23 25-2 appeared on our agenda. However, the authorized  
24 maker of the motion has notified NFPA that this motion  
25 will not be pursued. Therefore in accordance with the

1 NFPA Rules, Convention Rules A-twenty - sorry - 20,  
2 Section 2.7, the motion may not be considered by the  
3 assembly, and is removed from the agenda. We will now  
4 move on to the next motion.

5 The next motion on the agenda is a Certified  
6 Amending Motion 25-3. Microphone Number Four.

7 LENNON PEAKE: Hi. I'm Lennon Peake with  
8 Koffel, and I would like to make a motion to Accept an  
9 Identifiable Part of Committee Comment No. 3.

10 KENNETH BUSH: Thank you. There is a motion on  
11 the floor to Accept an Identifiable Part of Committee  
12 Comment No. 3. Is there a second?

13 MALE SPEAKER: Second.

14 KENNETH BUSH: We do have a second. Please  
15 proceed with discussion on the motion.

16 LENNON PEAKE: Thank you. During the First  
17 Draft stage, there was some language proposed via  
18 Committee input that is very similar to what you see  
19 on the screen if this motion passes. And the  
20 Committee Statement said, clarifying that what is in  
21 contact with the pipe must be subjecting the pipe to  
22 weight to be an issue. So the Committee went on  
23 record saying that items touching the pipe were not as  
24 much of a concern as items, items that were being  
25 supported by the pipe.

1           So then in the Second Draft stage, this whole  
2       issue of compatibility got raised. And since the  
3       compatibility then, in the Second Draft stage became  
4       part of this section, that's why it ended up failing  
5       the vote.

6           So, so what I'm trying to do is have this part  
7       be accepted. And I've dropped the issue of the  
8       compatibility. I've worked with the American Society  
9       of Healthcare Engineering Regulatory Affairs Committee  
10      to draft this language. They published a white paper  
11      in 2020 that took a lot of data from hospitals, which  
12      are very heavily regulated. And this issue has been  
13      causing them to spend an enormous amounts of money  
14      just for compliance, without - with this section -  
15      without really providing very much life safety.

16           The Committee has gone on record saying that  
17      items touching the pipe are not an issue. So I urge  
18      you to support this motion. The healthcare industry  
19      has been wasting enormous amounts of money on this  
20      issue. And once again, I please urge you to support  
21      the motion. Thank you.

22           KENNETH BUSH: Thank you. Mr. Cronin, would  
23      you like to offer the Committee's position?

24           BRADFORD CRONIN: Yes. Thank you. This CAM  
25      seeks to remove the language, 'subjected to external

1 loads by materials either resting on the pipe, or hung  
2 from the pipe'. This language has existed in the  
3 Standard for a couple of decades, remaining unchanged.  
4 This language provides the inspector with a task that  
5 can be accomplished during a visual inspection from  
6 the ground. The issue was considered as a Second  
7 Revision, but failed ballot by the Committee. Thank  
8 you.

9 KENNETH BUSH: Thank you. With that, we will  
10 open debate on the motion. Please provide your name,  
11 affiliation, and whether you are speaking in support  
12 or against the motion. Microphone Number Six, please.

13 JIM PETERKIN: Thank you. Jim Peterkin, TLC  
14 Engineering Solutions, speaking in support of the  
15 motion; again, also as Chair of the Healthcare  
16 Section. The Healthcare Section met, and at the  
17 annual Business Meeting, and voted to support the  
18 motion. Just to further what Lennon has said - this  
19 is NFPA 25, which the sprinkler inspectors may come  
20 out and do an inspection, and look at these items, and  
21 know what's truly being supported, or what's just  
22 touching the pipe.

23 Problem is that there's other agencies out  
24 there that healthcare is subjected to, that they come  
25 out and look at this, and interpret it - is it



1 touching the pipe. It could be ductwork insulation  
2 next to the pipe, but it's touching the pipe. And  
3 it's not causing any structural load on the sprinkler  
4 pipe, but yet we're having to spend, again - as, as he  
5 pointed out, enormous amounts, enormous amounts of  
6 money for something that does not affect life safety,  
7 and is causing a lot of concern in hospitals. So I  
8 again, would urge your support for the motion. Thank  
9 you.

10 KENNETH BUSH: Thank you. Microphone Number  
11 Four.

12 BILL KOFFEL: Bill Koffel, Koffel Associates,  
13 speaking for the motion, speaking for myself. This  
14 was the item that really started the whole discussion  
15 in the 25 Committee, to address the concerns of the  
16 healthcare industry. In the Second Revision, we not  
17 only had the proposed text, but also added the issue  
18 of incompatibility. As Lennon indicated, the item  
19 failed ballot. It failed ballot by one vote. And if  
20 you look at the ballots, it appears that many of the  
21 negative ballots were associated with the  
22 compatibility issue, not with this issue.

23 If you support the motion, the language in NFPA  
24 25 will be consistent with the language in NFPA 13,  
25 the Installation Standard. As it stands today, the

1 language in 25 is more restrictive than the language  
2 in the Installation Standard. I encourage your  
3 support.

4 KENNETH BUSH: Thank you. Microphone Number  
5 Two.

6 KEVIN HALL: Thank you. Kevin Hall with the  
7 American Fire Sprinkler Association, speaking in  
8 support of the motion. Echoing the comments of Bill  
9 Koffel, this does correlate now with NFPA 13, and  
10 unlike the nonmetallic sprinkler pipe, this is a  
11 inspection that can be performed with reasonable  
12 certainty. Thank you.

13 KENNETH BUSH: Thank you. Microphone Number  
14 Six.

15 CHAD BEEBE: Chad Beebe, American Society for  
16 Healthcare Engineering, in support of the motion.  
17 Obviously, the - the, the term 'resting on' is very  
18 subjective. We're very in support of, of removing  
19 this out. I did want to address the fact that the  
20 white paper that was mentioned by Lennon Peake is  
21 available on ASHE's website, if anybody in this room  
22 is, is interested in taking a look at it, it is  
23 available for free download at ASHE.org. I encourage  
24 your support. Thank you.

25 KENNETH BUSH: Thank you. Microphone Number

1 Six.

2 CHUCK STORMER: Hello. Chuck Stormer, USGSA,  
3 speaking in support of the motion. The Committee's  
4 position fails to provide for pre-action systems, and  
5 any type of initiating systems that are on sprinkler  
6 pipe. I would submit that the - having the weight of  
7 the, of the non-system component is what primarily  
8 impacts the pipe in a negative manner.

9 KENNETH BUSH: Thank you. Microphone Number  
10 Two.

11 TERRY VICTOR: Terry Victor with Johnson  
12 Controls, speaking in favor of the motion, speaking  
13 for myself. As a long-term member of NFPA 25, I agree  
14 with, with Chairman Cronin there that this language  
15 has been in there for quite a while. That doesn't  
16 make, mean that it's good language. So the changes  
17 that are being made here are consistent with what  
18 really, we should be looking for. We don't want non-  
19 system components being supported off the sprinkler  
20 pipe. That's the intent. This does correlate with  
21 NFPA 13, as Mr. Koffel said, and I would encourage you  
22 to vote in favor of this, this motion. So, thank you.

23 KENNETH BUSH: Thank you. Is there any further  
24 discussion on Motion 25-3, to Accept an Identifiable  
25 Part of Committee Comment No. 3? Mr. Chair, any final

Page 147

1        comments?

2                BRADFORD CRONIN:    No, thank you.

3                KENNETH BUSH:    Seeing none, we will move to a  
4        vote.    Before we vote, let me restate the motion.    The  
5        motion on the floor is to Accept an Identifiable Part  
6        of Committee Comment Number Three.    To vote, touch the  
7        Vote button.    If you wish to vote in support of the  
8        motion and recommend the text on Screen One, touch  
9        Yes.    If you wish to vote against the motion and  
10        recommend the text on Screen Two, touch No.    Please  
11        record your vote.    The voting will close in five  
12        seconds.    The voting is closed.    The results of the  
13        vote are 209 in support of the motion and recommend  
14        the text on Screen One, and 13 against the motion and  
15        recommend the text on Screen Two.    The motion has  
16        passed.

17                Let's proceed with discussion on Certified  
18        Amending Motion 25-17.    Microphone Number Six.

19                JIM PETERKIN:    Thank you.    Jim Peterkin, TLC  
20        Engineering Solutions, and I would like to move CAM  
21        25-17.

22                KENNETH BUSH:    Thank you.    There is a motion on  
23        the floor to Reject an Identifiable Part of Second  
24        Revision No. 13.    Is there a second?

25                MALE SPEAKER:    Second.

Page 148

1 FEMALE SPEAKER: Second.

2 KENNETH BUSH: We do have a second. Please  
3 proceed with the discussion on the motion.

4 JIM PETERKIN: Thank you, Chair - or Speaker.  
5 Yeah, this motion here seems like it's pretty minor.  
6 But we're concerned with, with the results of what  
7 this motion will do, or this new section will do.  
8 It's added a, a requirement at the Table, that's  
9 already in the text. And it's, and it's included a  
10 frequency of annual. And the text clearly says that  
11 it's something that is - shall be maintained - so it's  
12 something that's continuously. And again, we're  
13 speaking on the - behalf of hospitals. This is  
14 something that is continuously monitored and, and  
15 inspected.

16 And our fear is that by putting the word  
17 'annually' in there, there are some users that are  
18 going to say, 'Well, I only have to check it once a  
19 year.' Or, 'The inspector checked it, and it was, it  
20 was fine.' It, it could be that, yeah, the day they  
21 looked at it, it was fine. But the day before, or the  
22 day after, it may not be. So it really needs to be a  
23 continuous process, and we think that adding the word  
24 'annual' will actually be detrimental in, in this  
25 case. So I urge your support. Thank you.

Page 149

1 KENNETH BUSH: Thank you. Mr. Cronin, would  
2 you like to offer the Committee's position?

3 BRADFORD CRONIN: Yes, thank you. So the  
4 proposed CAM seeks to remove the line, 'sprinkler  
5 clearance to storage' from the Table 5.1.1.2. The  
6 Table was updated to align with the requirements and  
7 changes made to Chapter 5 during the revision cycle.  
8 For clearance to storage, the Table points to 5.2.1.2,  
9 which is correct. However, as indicated by the  
10 submitter, Section 5.2.1.2 does not specifically  
11 mention an annual frequency.

12 Committee added the frequency to the Table to  
13 ensure that someone was looking at the issue at least  
14 during the annual inspection. Again, this passed  
15 ballots, and this passed with no negative comments.  
16 Thank you.

17 KENNETH BUSH: Thank you. With that, we will  
18 open debate on the motion. Please provide your name,  
19 affiliation, and whether you are speaking in support  
20 of or against the motion. Microphone Number Six.

21 DAVE DESJUNET: Yes, thank you. Dave Desjunet  
22 (phonetic), with Douglas Hospitals, speaking on behalf  
23 of the Healthcare Section, in favor of the motion. So  
24 as we've heard from the Chair, we do have two  
25 different statements - one in the Table, and then one

1 in the text. And the problem that that brings to us  
2 is it creates confusion for the users. We believe  
3 these things have to be maintained on an ongoing  
4 basis, and a specific requirement to inspect these on  
5 an annual basis, quite frankly, one could consider  
6 that fool's work. You're inspecting something that  
7 the Code already requires to be maintained constantly.  
8 So to throw a date in that conflicts with the body of  
9 the, of the document, could actually confuse it, and  
10 make it worse than what we currently have. So the  
11 Healthcare Section recommends that you vote in favor  
12 of this motion.

13 KENNETH BUSH: Thank you. Microphone Number  
14 Two.

15 TERRY VICTOR: Terry Victor with Johnson  
16 Controls, speaking in favor of the motion. When Mr.  
17 Peterkin first submitted this NITMAM and we saw that  
18 it was certified as a CAM, I looked at it, and I'm  
19 like, 'I don't understand what he's trying to do here,  
20 because he's not trying to delete the requirement to  
21 perform this inspection. He's just trying to take it  
22 out of the Table.' And I said, 'That doesn't  
23 accomplish anything because the Table is just supposed  
24 to be a synopsis. It's not the Code or the Standard  
25 itself.' But when I understood what he's, what he's

1 getting at here, he's correct, and there's no reason  
2 to put 'annual' in the Table when it doesn't belong in  
3 the text. It's really an error.

4 So I think by removing this reference in the  
5 Table, it more accurately reflects what's supposed to  
6 be done - annually, and at all times. I think this is  
7 a, a mistake, and the Committee was in error, and I  
8 support the, the motion.

9 KENNETH BUSH: Thank you. Is there any further  
10 discussion on Motion 25-17 to Reject an Identifiable  
11 Part of Second Revision No. 13? Mr. Chair, any final  
12 comments?

13 BRADFORD CRONIN: I do not have any further  
14 comments. Thank you.

15 KENNETH BUSH: Seeing none, we will move on to  
16 a vote. Before we vote, let me restate the motion.  
17 The motion on the floor is to Reject an Identifiable  
18 Part of Second Revision No. 13. To vote, touch the  
19 Vote button. If you wish to vote in support of the  
20 motion and recommend the text on Screen One, text -  
21 vote - I'm sorry - touch Yes. If you wish to vote  
22 against the motion and recommend the text on Screen  
23 Two, touch No. Please record your vote. The voting  
24 will close in five seconds. Voting is closed. The  
25 results of the vote are 140 in support of the motion



1 and recommend the text on Screen One, and 68 against  
2 the motion and recommend the text on Screen Two. The  
3 motion has passed.

4 Let us proceed with discussion on Certified  
5 Attending Motion 25-16. Microphone Number --

6 MALE SPEAKER: Six.

7 KENNETH BUSH: Six.

8 JIM PETERKIN: Thank you, Speaker. Jim  
9 Peterkin, TLC Engineering Solutions, and I'd like to  
10 move 25-16.

11 KENNETH BUSH: Thank you. There is a motion on  
12 the floor to Reject Second Revision No. 2. Is there a  
13 second?

14 MALE SPEAKER: Second.

15 KENNETH BUSH: We do have a second. Please  
16 proceed with the discussion on the motion.

17 JIM PETERKIN: Yes. I promise, this is my last  
18 one. The - what we're concerned here is that this  
19 section was added based on some anecdotal evidence.  
20 And there's really no technical data to support this  
21 change, and it would add something into the Standard  
22 that would require ongoing inspection, testing and  
23 maintenance that may or may not be justified.

24 What we think, or what we're proposing is,  
25 let's look at this at the next cycle, and the American

1 Society of Healthcare Engineering has agreed that we  
2 will poll our hospitals, and we will provide technical  
3 data to find out if this truly is a problem, and other  
4 industries we can poll, as well. But we've committed  
5 to do that, and come back to the Committee with  
6 technical data to say, 'Yes, this is a problem, and,  
7 and we need to do this.' Or, 'No, it's not, and let's  
8 not waste our time and money on something that isn't  
9 an issue.' So I would urge your support for this  
10 motion. Thank you.

11 KENNETH BUSH: Thank you. Mr. Cronin, would  
12 you like to offer the Committee's position?

13 BRADFORD CRONIN: Yes, thank you. This  
14 proposed CAM seeks to remove a new section, 5.2.1.1.1,  
15 and its subset on a new inspection requirement for  
16 concealed sprinklers. This requirement was added  
17 based on anecdotal data provided around the failure of  
18 concealed sprinklers in the field. The anecdotal data  
19 stated that sprinklers showing no signs of  
20 degradation, either on the cover plate or the  
21 surrounding ceiling of the concealed sprinkler, were  
22 prematurely discharging.

23 The Technical Committee realizes that this  
24 inspection request goes beyond the normal visual  
25 inspection from the ground, and may require the use of

1 ladders or lifts in some installations. Due to the  
2 possible need for ladders or lifts, the inspection  
3 frequency was set at five years, the same frequency  
4 for other ITM activities that may require ladders or  
5 lifts. The requirement also limits the inspection to  
6 a sample area, versus trying to remove and inspect the  
7 sprinkler under every cover plate. The new section  
8 and its subset passed ballot with eight negative  
9 votes. Thank you.

10 KENNETH BUSH: Thank you. With that, we will  
11 now open debate on the motion. Please provide your  
12 name, affiliation, and whether you are speaking in  
13 support of or against the motion. Microphone Number  
14 Four.

15 BILL KOFFEL: Bill Koffel, Koffel Associates,  
16 speaking in support of the motion, speaking for  
17 myself. Up until about an hour and a half ago, I was  
18 in a different position. I was prepared to speak  
19 against this item. I chaired the NFPA 25 Committee in  
20 the past revision cycle, and that's at the point where  
21 the contractor came to us and said, 'There is a  
22 problem.' And in fact, the contractor came to us and  
23 said, 'The Committee needs to address this, and tell  
24 contractors - do we have to do this inspection, or do  
25 we not have to do this inspection.' And we added an

Page 155

1 Annex note.

2 This cycle, the Committee went a little bit  
3 further - again, recognizing that our data sample's  
4 relatively small, but recognizing that it's an also an  
5 issue - decided to put in a five year inspection  
6 frequency for a representative sample.

7 What I heard, and what I was told about an hour  
8 and a half ago is that ASHE is willing to step up to  
9 the plate and collect data, and present it to the  
10 Committee. If there are other user groups in the  
11 audience, I would encourage you to do the same, so  
12 that we can expand that data to occupancies other than  
13 hospitals.

14 I would note two things. There will still be  
15 an Annex note that will address this. And the Annex  
16 note says if there's evidence of corrosion on the  
17 cover plate, then the inspection should be done. But  
18 I don't have to do it if there's no evidence of  
19 corrosion on the cover plate assembly.

20 Lastly, just for your information, Chair, if  
21 this motion passes, which I hope it does, there is the  
22 need for a follow-up motion to Reject an Identifiable  
23 Part of Second Revision 13.

24 KENNETH BUSH: Thank you. Microphone Number  
25 Six.

1 CHAD BEEBE: Chad Beebe, with the American  
2 Society for Healthcare Engineering, speaking in  
3 support of the motion. As you've heard, the data was  
4 a very small sample. It was very anecdotal. I think  
5 we need to have better data to make Code changes. As  
6 you heard two previous presenters say, ASHE would be  
7 willing to do a study out of the nation's hospitals -  
8 about 90% of the hospitals are our members. We would  
9 be more than happy to collect as much data as we  
10 possibly can from that pool to bolster this data, and  
11 make a decision for next cycle. I urge your support  
12 for this motion, and, and then take this out. Thank  
13 you.

14 KENNETH BUSH: Thank you. Microphone Number  
15 Six.

16 DAVE DESJUNET: Thank you. Dave Desjunct,  
17 Wentworth Douglas Hospitals, speaking on behalf of the  
18 Healthcare Section, in favor of the motion. By all  
19 means, if there's a problem with sprinkler heads,  
20 Healthcare wants to take care of it. What we have  
21 right now is we're trying to fix a problem that we  
22 don't even know exists. So there's a commitment to  
23 validate if there's an issue. And if there's in fact  
24 an issue that is substantiated by technical data, then  
25 let's make the change. But not - let's not create

1 Code requirements just in case there might be a  
2 problem. I urge you to vote in favor of the motion.

3 KENNETH BUSH: Thank you. Microphone Number  
4 Six.

5 CHUCK STORMER: Chuck Stormer, USGSA, speaking  
6 in support of the motion. In my experience, I've only  
7 seen one cover plate that was adhered to a ceiling.  
8 There has been no loss history associated with this.  
9 5.2.2 - or excuse me, 5.2.1.1.1 already discusses if  
10 there is problems with the sprinkler, loading,  
11 corrosion, whatever, then it just gets replaced. So I  
12 would support that - I'll talk with Frable (phonetic)  
13 and see if we can get some data from our buildings, as  
14 well.

15 KENNETH BUSH: Thank you. Is there any further  
16 discussion on Motion 25-16 to Reject Second Revision  
17 No. 2? Mr. Chair, any final comments?

18 BRADFORD CRONIN: No, thank you.

19 KENNETH BUSH: Seeing none, we will move on to  
20 a vote. Before we vote, let me restate the motion.  
21 The motion on the floor is to Reject Second Revision  
22 No. 2. To vote, touch the Vote button. If you wish  
23 to vote in support of the motion and recommend the  
24 text on Screen One, touch Yes. If you wish to vote  
25 against the motion and recommend the, the text on

1 Screen Two, touch No. Please vote.

2 (background voices)

3 KENNETH BUSH: Okay. Hold on. Okay. Thank  
4 you for your patience. We're working on it. Please  
5 record your vote now.

6 (background voices)

7 KENNETH BUSH: Okay - still not working?

8 MALE SPEAKER: No.

9 KENNETH BUSH: Still working to resolve the  
10 issue.

11 FEMALE SPEAKER: It worked.

12 MALE SPEAKER: It's working now.

13 KENNETH BUSH: Okay. Please record your vote  
14 now.

15 (background voices)

16 KENNETH BUSH: Still not working?

17 MALE SPEAKER: No.

18 (background voices)

19 KENNETH BUSH: Okay. If you're having issues  
20 with your voting machines, would you please raise your  
21 hand? Yeah - just hold. Take your hands down. Thank  
22 you.

23 (background voices)

24 KENNETH BUSH: Voting now? Okay. Please  
25 record your vote now.

1 (background voices)

2 KENNETH BUSH: Still having issues?

3 (background voices)

4 KENNETH BUSH: Anyone still having problems,  
5 please raise your hand. I see one.

6 FEMALE SPEAKER: (unintelligible)

7 KENNETH BUSH: Anyone else having problems,  
8 please raise your hand. Okay. Voting - the voting  
9 will be closed. Voting is closed. The results of the  
10 vote are 147 in support of the motion and recommend  
11 the text on Screen One; and, and 80 against the motion  
12 and recommend the text on Screen Two. The motion has  
13 passed.

14 (background voices)

15 FEMALE SPEAKER: Oh, yes. (unintelligible)

16 KENNETH BUSH: Okay. Okay. The next motion on  
17 NFPA 25 appeared on our agenda. However, the  
18 authorized maker of the motion has notified NFPA that  
19 this motion will not be pursued. Therefore, in  
20 accordance with the NFPA Rules, Convention Rules at  
21 Section 2.7, the motion may not be considered by the  
22 assembly, and is removed from the agenda.

23 The next motion on NFPA 25, that's 25-18,  
24 appear on the agenda. However, the authorized maker  
25 of the motion has notified NFPA that this motion will



1 not be pursued. Therefore, in accordance with NFPA  
2 Rules, Convention Rules at Section 2.7, the motion may  
3 not be considered by the assembly, and is removed from  
4 the agenda. Microphone Number Four?

5 BILL KOFFEL: Bill Koffel, Koffel Associates,  
6 speaking for myself. I have a follow-up motion  
7 related to the action on CAM 25-16.

8 KENNETH BUSH: Okay. There is a motion on the  
9 floor to have a follow-up motion made on 25-16. As  
10 Presiding Officer, I have determined that this is a  
11 valid motion. A follow-up motion requires two  
12 seconds. Do we have a second?

13 SEVERAL SPEAKERS: Second.

14 KENNETH BUSH: Okay. Do we have a second -  
15 second?

16 SEVERAL SPEAKERS: Second.

17 KENNETH BUSH: All right. Please proceed with  
18 discussion on the motion.

19 BILL KOFFEL: The motion is to Reject an  
20 Identifiable Part of Second Revision 13. That is  
21 Table 5.1.1.2. Under inspection, there was a line  
22 added that said, 'Sprinklers (concealed) frequency  
23 every five years' - referenced paragraph 5.2.1.1.1.  
24 My motion is to reject that Identifiable Part.  
25 There's no related First Revision text.

1 KENNETH BUSH: Thank you. Mr. Chair, would you  
2 like to offer the Committee position?

3 BRADFORD CRONIN: If the language does not  
4 appear in the body of the Standard, then the language  
5 should not appear in the Table for the chapter. Thank  
6 you.

7 KENNETH BUSH: Thank you. With that, we will  
8 now open debate on the motion. Please provide your  
9 name, affiliation, and whether you are speaking in  
10 support of, or against the motion. Microphone Number  
11 Four.

12 BILL KOFFEL: Bill Koffel, Koffel Associates,  
13 speaking for myself, speaking in favor of the motion.  
14 I think the Chair just told us everything we need to  
15 know. We deleted the paragraph. It should be deleted  
16 from the table.

17 KENNETH BUSH: Is there any further discussion  
18 on the follow-up to a motion for CAM 25-16? Mr.  
19 Chair, any final comments?

20 BRADFORD CRONIN: No, thank you.

21 KENNETH BUSH: Seeing none, we will move to a  
22 vote. Before we vote, let me restate the motion. The  
23 motion on the floor is a follow-up motion to CAM 25-  
24 16. To vote, touch the Vote button. If you wish to  
25 vote in support of the motion and recommend the text

1 on Screen One --

2 FEMALE SPEAKER: (unintelligible)

3 (background voices)

4 KENNETH BUSH: Okay. It'll be coming up.

5 MALE SPEAKER: Just a point of order. Point of  
6 order.

7 KENNETH BUSH: Yes.

8 MALE SPEAKER: We just need to clarify that you  
9 need to scroll all the way down to the very end. The  
10 next to the last line says Follow-Up Motion. That's  
11 the button you need to push.

12 KENNETH BUSH: Okay. You heard what was  
13 stated. Scroll all the way down for the Follow-Up  
14 vote Motion. If you wish to vote in support of the  
15 motion and recommend text, touch Yes. If you wish to  
16 vote against the motion and recommended on Screen Two,  
17 touch No. Please record your vote. The voting will  
18 close in five seconds.

19 MALE SPEAKER: (unintelligible) on the screen.  
20 It's the old motion.

21 KENNETH BUSH: Voting is closed. The results  
22 of the vote are 168 in favor of the motion; 20 against  
23 the motion. The follow-up motion has passed.

24 MALE SPEAKER: (unintelligible)

25 (background voices)

1 KENNETH BUSH: Is there any final discussion on  
2 NFPA 25? Anything else? Okay. Thank you. With  
3 that, this officially concludes today's agenda for the  
4 2022 Association Technical Meeting. I want to thank  
5 you for your participation, interest, and support. I  
6 now declare today's meeting adjourned. Please note  
7 that the meeting will begin promptly at 8 a.m.  
8 tomorrow. Have a good evening.

9 (applause)

10

11 (END OF MEETING - DAY ONE)

12

13

14

15

16

17

18

19

20

21

22

23

24

25

TRANSCRIBER'S CERTIFICATE

I, MARY HARLOW, attest that the foregoing proceedings  
provided to me via audio were transcribed by me to the  
best of my ability.

I further attest that I am not a relative or employee  
to any attorney or party nor financially interested in  
this action.

I declare under penalty of perjury under the laws of  
the state of California that the foregoing is true and  
correct.

Dated this 23rd day of June, 2022.



MARY HARLOW

[1 - 23]

<b>1</b>	<b>130</b> 18:7 31:3,9,20 32:3,6 34:2 35:5 39:10,15,19 40:19 41:4 43:1 45:2 48:24 49:19 52:25 56:5,12 57:9 83:6 84:5 85:15 87:17 90:20 <b>130-2</b> 48:12 58:21 <b>130-3</b> 33:7,9 41:20 <b>130-5</b> 42:14 47:20 48:2 <b>130-9</b> 32:18,19,21 33:1 <b>130.5</b> 42:17 <b>13501</b> 94:13 96:4 <b>13501-1</b> 93:11,14 93:25 96:25 <b>136</b> 83:5,7,9,15,17 83:17,22 87:2 93:21 <b>137</b> 110:16 <b>140</b> 152:25 <b>141</b> 97:19 <b>143</b> 133:13 <b>147</b> 19:9 160:10 <b>15</b> 22:13 39:11 64:10 76:4,11 77:6,10 80:8,16 92:15 <b>150</b> 33:19 34:12 <b>16</b> 32:8,13,20 141:14 162:24 <b>162</b> 48:9 <b>168</b> 163:22 <b>1685</b> 49:3 51:24 <b>169</b> 60:15 <b>17</b> 44:5,13 106:5 109:21 110:4 <b>17025</b> 75:23	<b>177</b> 118:25 119:2 127:18 132:21 133:6 <b>18</b> 98:8 101:1 104:16 105:15 <b>1821b</b> 136:11 <b>189</b> 141:12 <b>19</b> 33:11 41:21 42:3 <b>194</b> 92:14 <b>1985</b> 24:6,11 <b>1986</b> 12:8 <b>1990</b> 8:7 12:9 <b>1991</b> 10:19 <b>1992</b> 7:22 <b>1993</b> 7:23 13:9 <b>1994</b> 10:6 13:3,6,9 <b>1996</b> 8:3 12:24 <b>1997</b> 9:7 <b>1998</b> 8:5 <b>1999</b> 26:20,22	14:6 26:23 27:18 52:14 <b>2003-2006</b> 59:11 <b>2005</b> 9:20 10:21 <b>2006</b> 7:24 8:3 9:19 12:8 13:19 14:4 <b>2008</b> 14:7 <b>2009</b> 10:18,19 11:9 <b>2010</b> 8:3,5 9:6 12:7 14:13 48:25 52:10,19 <b>2011</b> 8:8 11:8 <b>2012</b> 11:7 12:15,17 13:17 14:8 <b>2013</b> 9:5 11:9 <b>2014</b> 9:3,4 13:7 <b>2015</b> 12:23 13:22 136:11,16 <b>2016</b> 6:21 7:4 11:11 <b>2017</b> 9:2 13:22 106:16 <b>2018</b> 13:13,13,14 13:16,20 66:18 <b>2019</b> 8:5 12:21 <b>2020</b> 7:14 9:1 51:20 106:22 143:11 <b>2022</b> 1:4 5:5,9 15:24 17:14 18:3 18:9 20:11 111:25 135:2 136:16 164:4 165:18 <b>2023</b> 31:19 61:20 81:22 95:14 <b>209</b> 76:18 148:13 <b>21</b> 19:9 <b>215</b> 80:24 <b>220</b> 86:21,22 87:4 <b>23</b> 37:3 54:16 123:24
	<b>2</b>		
	<b>2</b> 48:15 82:14 93:13,15 94:1,8,16 94:20 96:15 153:12 158:17,22 <b>2-2.3.1</b> 24:7 <b>2.7</b> 32:14 33:2 62:12 118:18 142:2 160:21 161:2 <b>20</b> 17:14,22 22:13 103:15 119:11 121:19,23 123:8 131:3 142:1 163:22 <b>200</b> 7:16 118:12 <b>2000</b> 12:9 23:9 <b>2002</b> 11:10 <b>2003</b> 7:23 11:13,14 11:15 12:16 14:1		

[23rd - 800]

<p><b>23rd</b> 165:18  <b>25</b> 18:8 45:16  54:18 133:19  134:20 135:2,9  136:5 139:5  141:22 144:19  145:15,24 146:1  147:13 155:19  160:17,23 162:23  164:2  <b>25-10</b> 134:7  135:12 138:1,5,7  140:25  <b>25-16</b> 153:5,10  158:16 161:7,9  162:18  <b>25-17</b> 148:18,21  152:10  <b>25-18</b> 160:23  <b>25-2</b> 134:7 137:23  138:1,7 141:17,19  141:23  <b>25-3</b> 134:7 138:2,5  138:8 142:6  147:24  <b>256</b> 92:7,9  <b>25next</b> 135:10  <b>262</b> 51:25  <b>263</b> 97:15,17  <b>2652</b> 87:2  <b>27</b> 85:9 101:16  108:23  <b>27585</b> 165:24  <b>285</b> 18:7 60:17  61:4,20 62:3,7  63:10 64:1,16  65:7,9,10 66:17  67:13 68:13,15  70:25 71:5 74:19  <b>285-12</b> 67:15 76:2</p>	<p><b>285-13</b> 76:21 80:6  <b>285-7</b> 62:7 63:12  <b>285next</b> 62:4  <b>288-3376</b> 1:20  <b>29</b> 17:13 37:3  45:16 54:17</p> <p><b>3</b></p> <p><b>3</b> 21:7 96:2 142:9  142:12 147:25  <b>3.3.1.</b> 26:23  <b>3.3.44</b> 85:5 86:1  <b>3.3.45</b> 88:22  <b>3/16s</b> 21:7  <b>3/16th</b> 27:8  <b>3/16ths</b> 21:18,21  22:4,11 23:21  24:3,5 25:24 26:5  27:1 29:2,8,15  30:3  <b>30</b> 25:10 95:7  <b>3134</b> 98:25 99:6,17  99:23 102:9,17,19  103:16,17 104:20  104:22  <b>34</b> 97:20 104:19  <b>3431</b> 101:16  104:19  <b>38</b> 62:23  <b>394</b> 42:11</p> <p><b>4</b></p> <p><b>4</b> 59:6 90:10  114:22 135:18,20  136:4 140:5 141:1  141:6  <b>4.1.3</b> 137:2,12,15  <b>4.15.'</b> 86:24  <b>4.4.4.2</b> 131:12,16  <b>4.4.4.2.</b> 126:15  <b>4.4.4.4.2.</b> 127:22</p>	<p><b>4.4.4.4.2s</b> 126:24  <b>4.6.13</b> 85:17  <b>4.8</b> 21:8 83:13,16  83:20 85:4 87:22  90:9,10  <b>4.8.</b> 83:21 86:9  88:14,22 90:8  <b>4.8.4.</b> 95:15  <b>43</b> 118:11 129:22  <b>44</b> 39:16  <b>44.'</b> 39:22  <b>46</b> 30:22  <b>476</b> 94:5 96:1,21  <b>476-4</b> 96:4</p> <p><b>5</b></p> <p><b>5</b> 36:15 98:24  104:6 106:3  139:22 150:7  <b>5.1.1.2.</b> 150:5  161:21  <b>5.2.1.1.1</b> 154:14  158:9  <b>5.2.1.1.1.</b> 161:23  <b>5.2.1.2</b> 150:8,10  <b>5.2.2</b> 158:9  <b>5.3.1.</b> 21:5  <b>50</b> 64:21  <b>5000</b> 58:7 85:15  86:21 87:4,15,16  <b>502</b> 9:15 18:7 81:2  81:9,23 82:5,8  85:4,4,25 87:20  90:10 93:23 94:3  94:24 95:7,9,14,14  95:16 98:19 99:6  102:8,12,13,25  104:9 108:6  110:20  <b>502-2</b> 82:8,12  84:16 88:5 91:4,4</p>	<p><b>502-4</b> 89:15,22  91:23  <b>502-5</b> 105:24  109:20  <b>502-7</b> 97:23 98:6  104:15  <b>502-9</b> 92:18,25  97:6  <b>52</b> 60:14  <b>5285364</b> 1:25  <b>54</b> 48:9 94:4</p> <p><b>6</b></p> <p><b>6</b> 36:15 48:18  58:22 59:6,19  <b>68</b> 110:17 153:1</p> <p><b>7</b></p> <p><b>7</b> 21:11 26:9 29:24  30:15 63:1,13  64:9 76:3,11,18  77:5,9 80:7,16  <b>7.1.2</b> 35:13  <b>7.3.3</b> 101:9 107:7  <b>7.3.4</b> 101:9  <b>7.3.6.</b> 101:9  <b>70</b> 53:9,14 55:3,4  58:5 59:4 133:21  <b>700</b> 23:15  <b>71</b> 112:16,18  115:24 117:24  118:5  <b>732</b> 106:23</p> <p><b>8</b></p> <p><b>8</b> 1:4 5:5 164:7  <b>8.6.7.1.2</b> 34:11  36:9,20 39:15  <b>8.6.7.1.2.</b> 35:23  37:3  <b>80</b> 105:21 160:11  <b>800</b> 1:20</p>
--	---	---	--

[81.5 - adoption]

<b>81.5</b> 24:21 <b>83</b> 39:16,21 <b>855</b> 7:5,15 18:8 110:23 111:11,25 112:8,12 113:18 113:23 114:14 116:13,25 121:16 122:15 123:24 124:18,22 127:7 128:16 129:6 131:23 <b>855-3</b> 112:16 114:22 115:23 117:24 <b>855-4</b> 118:14 <b>855-5</b> 118:22,25 132:20 <b>855next</b> 112:9 <b>859</b> 129:6 <b>86</b> 18:7 19:18 20:11,18 21:4 24:1,12,12 26:19 29:20 30:25 <b>86-6</b> 20:21 26:8 29:23 <b>86711</b> 46:11 <b>86next</b> 20:18	<b>able</b> 28:20 36:13 71:13 77:23 138:3 <b>absence</b> 11:23 <b>absolutely</b> 96:24 <b>abundantly</b> 34:7 <b>accept</b> 10:8 15:2 42:16,19 47:20 48:2,17 58:21 59:18 67:9 82:14 84:16 88:5 89:5 89:24 91:23 92:4 93:2 97:6,12 98:8 104:15 105:14 106:5 109:20 110:4 112:18 115:23 117:24 118:5,25,25 119:2 130:18 132:20 133:6 142:8,11 147:24 148:5 <b>acceptable</b> 50:6 65:12 69:13 100:3 102:4,5 107:10,12 107:13,21 <b>acceptance</b> 72:3 99:4 100:25 <b>accepted</b> 43:18 46:10 75:4 99:8 99:18 102:8 143:7 <b>accepting</b> 9:14,24 27:24 80:1 101:13 138:7 <b>access</b> 81:24 122:18,20 126:16 126:18 132:17 <b>accessories</b> 22:1 <b>accomplish</b> 151:23 <b>accomplished</b> 144:5 <b>accumulation</b> 53:24 131:21	<b>accurately</b> 152:5 <b>achievable</b> 22:10 <b>achieve</b> 27:14 51:21 86:25 <b>achieved</b> 30:8 <b>achievement</b> 6:8,8 6:12 8:10,13 <b>acknowledge</b> 11:22 45:12 114:15 <b>acknowledged</b> 65:3 113:22 <b>act</b> 133:24 <b>acted</b> 7:22 63:25 <b>action</b> 51:18 91:18 147:4 161:7 165:10 <b>actions</b> 17:12 54:10 <b>activate</b> 16:14 <b>activation</b> 16:21 <b>active</b> 6:18 7:20 39:10 116:10 <b>actively</b> 70:22 <b>activities</b> 155:4 <b>actual</b> 55:6 74:24 77:23 <b>add</b> 26:2 34:23 56:16 85:4 95:14 95:21 100:8 102:16 104:17 109:21 118:2 121:15 153:21 <b>added</b> 39:13 44:8 44:19 67:1 86:7 137:3 145:17 149:8 150:12 153:19 154:16 155:25 161:22 <b>adding</b> 24:10 87:25 149:23	<b>addition</b> 7:19 24:24 44:6 59:8 85:11 86:4 90:16 <b>additional</b> 36:10 37:19,23 50:19 56:16 57:1 105:1 121:15 <b>additionally</b> 122:3 <b>address</b> 6:1 7:1 16:13,23 29:7 39:19 40:2 41:13 45:2 51:2 52:23 82:5 120:8 123:13 127:8 138:19 139:5,12 140:4 145:15 146:19 155:23 156:15 <b>addressed</b> 53:3 54:4 71:1 94:6 115:10 124:23 125:21 <b>addresses</b> 39:16 47:16 51:3 78:7 94:4 98:13,16 106:12 137:23 140:22 <b>addressing</b> 122:1 122:16 <b>adhered</b> 158:7 <b>adjacent</b> 123:4 <b>adjourned</b> 164:6 <b>adjournment</b> 17:14,23 <b>administration</b> 10:16 <b>adopt</b> 104:11 131:7 <b>adopted</b> 104:10 117:19 <b>adoption</b> 59:10 62:23 64:4
<b>9</b>			
<b>9</b> 22:12 32:7 95:13 95:20 <b>90</b> 157:8 <b>94</b> 89:12 <b>9548</b> 120:5 125:17 130:23 <b>98</b> 87:18			
<b>a</b>			
<b>a.8.6.7.1.2.</b> 35:17 <b>a.m.</b> 164:7 <b>ability</b> 78:1 108:13 165:5			



[advantage - apart]

<b>advantage</b> 128:4 <b>advocate</b> 6:20 <b>affairs</b> 143:9 <b>affect</b> 137:14 145:6 <b>affiliation</b> 15:1,14 15:17 25:5 38:6 46:20 54:22 68:4 78:18 86:14 91:10 96:9 101:23 109:3 115:21 122:8 137:19 144:11 150:19 155:12 162:9 <b>affirmative</b> 37:4 45:16 54:17,18 85:9 89:12 101:17 108:23 118:11 <b>afforded</b> 131:4 <b>afternoon</b> 5:8 26:15 70:18 78:20 112:14 119:9 133:23 <b>agencies</b> 144:23 <b>agenda</b> 18:8 19:21 31:3,12 32:9,16,22 33:4 60:17 61:7 62:8,13 81:11 105:24 111:14 118:15,20 134:8 134:11 141:23 142:3,5 160:17,22 160:24 161:4 164:3 <b>aggregate</b> 121:24 123:10 <b>ago</b> 57:20 113:15 116:8 155:17 156:8 <b>agree</b> 44:9 56:10 89:2 104:9 147:13	<b>agreed</b> 84:25 138:4,20 154:1 <b>agreeing</b> 140:6 <b>agreement</b> 138:5 <b>aha</b> 43:18 <b>ahead</b> 60:9,12 88:18 110:25 111:3 <b>ahj</b> 101:12,13 102:4,6 107:8,15 108:14,17,21 109:9,13,14 124:14 125:9 128:9 129:25 130:18 <b>ahj.'</b> 130:12 <b>ahjs</b> 129:9 <b>air</b> 53:10 <b>aircraft</b> 9:2 10:17 <b>airport</b> 9:2 <b>al</b> 26:24 <b>alarm</b> 16:9,10,14 16:15,21 <b>alarms</b> 127:16 <b>align</b> 150:6 <b>alleviate</b> 72:6 <b>allow</b> 70:8 71:17 93:23 94:1,1,25 97:3 105:8 121:16 123:9 130:6 <b>allowed</b> 53:23 65:20 106:20 130:24 <b>allowing</b> 27:22 76:25 123:5 <b>allows</b> 93:17 109:9 120:13 125:9 128:18 <b>alma</b> 13:11 <b>alston</b> 2:12 31:6 31:14,16 36:4,6	38:4 41:22,24 45:6,7,10 46:15,17 47:22,23 51:11,13 54:20 58:23,25 59:16 <b>alternate</b> 99:21 <b>alternative</b> 13:12 52:3 54:15 59:6 100:4 <b>ambulances</b> 10:18 <b>amend</b> 134:6 <b>amended</b> 56:14 73:3 <b>amending</b> 18:7,10 19:19 20:20 31:10 32:6,8,15,21 33:3 33:7 42:14 45:17 48:12 61:5 62:6 64:1 67:12 75:1,5 75:11 76:21 81:10 82:8 89:15 92:18 97:23 105:24 111:12 112:12 118:14,21 135:12 141:17 142:6 148:18 <b>amendment</b> 17:15 17:21 91:16 <b>america</b> 103:4 <b>american</b> 26:17 119:19 140:12,13 143:8 146:7,15 153:25 157:1 <b>amount</b> 30:8 93:17 <b>amounts</b> 143:13 143:19 145:5,5 <b>analysis</b> 100:6,9 100:11 101:10,13 102:4,5,7 106:24 107:1,7	<b>andrew</b> 3:13 118:23,24 119:8,9 120:21 130:9,9 <b>anecdotal</b> 38:12 153:19 154:17,18 157:4 <b>anecdotaly</b> 34:22 <b>anecdote</b> 34:24 <b>anecdotes</b> 35:4,7 <b>annex</b> 36:1,7,24 37:11 39:14 41:2 41:15,16 47:6 64:24,25 65:17,20 67:2,3,11,13,22 68:1,16 70:8,12,13 70:24 71:1 72:10 74:18 77:16 78:9 78:10,15 84:23 85:1 86:7 102:8 102:12,13 156:1 156:15,15 <b>announce</b> 19:2 <b>annual</b> 20:11 135:2 138:15 144:17 149:10 150:11,14 151:5 <b>annually</b> 152:6 <b>annually'</b> 149:17 <b>annual'</b> 149:24 152:2 <b>answered</b> 136:20 <b>anticipated</b> 85:6 85:21 <b>antonio</b> 113:16 116:9 <b>anybody</b> 146:21 <b>anyone's</b> 65:25 <b>anyway</b> 28:2 129:15 <b>apart</b> 125:19
--	--	---	---

[apex - authority]

<p><b>apex</b> 14:3</p> <p><b>apologize</b> 45:8 46:16 72:21 93:10</p> <p><b>app</b> 18:22,24</p> <p><b>apparatus</b> 10:19</p> <p><b>apparently</b> 10:7 63:17,18</p> <p><b>appeal</b> 17:12,15</p> <p><b>appealed</b> 113:20</p> <p><b>appeals</b> 18:4</p> <p><b>appear</b> 19:7 21:17 160:24 162:4,5</p> <p><b>appeared</b> 32:21 62:8 118:14 141:23 160:17</p> <p><b>appears</b> 32:8 73:4 73:5,7,9 145:20</p> <p><b>appendix</b> 73:4,6 73:16</p> <p><b>applause</b> 6:16 8:11 9:11 10:10 10:14 11:1,4,19 14:17 61:14 164:9</p> <p><b>applicability</b> 36:21 95:25</p> <p><b>applicable</b> 29:4,16 46:8 71:4 101:11</p> <p><b>application</b> 18:12 18:15 36:8 37:14 43:15,21 93:24 95:1 108:11 114:6 122:1 124:13</p> <p><b>applications</b> 124:10</p> <p><b>applied</b> 34:11 37:16 52:8,14</p> <p><b>applies</b> 44:10,11 69:15,15</p> <p><b>apply</b> 34:13,14 35:6,21 36:13 37:21 39:4,21</p>	<p>125:5</p> <p><b>appreciate</b> 121:8</p> <p><b>appreciation</b> 8:18 14:15,19</p> <p><b>approach</b> 43:23 53:8 120:25 121:2 140:21</p> <p><b>approached</b> 32:10 32:12,23,25</p> <p><b>appropriate</b> 71:20 100:20 113:1</p> <p><b>approval</b> 108:13 108:17,21</p> <p><b>approve</b> 90:14</p> <p><b>approved</b> 7:3 94:23,24 107:5,6 124:14 128:9 130:12 134:7</p> <p><b>approves</b> 109:13</p> <p><b>arch.'</b> 28:5</p> <p><b>architect</b> 74:15 79:25</p> <p><b>architecture</b> 120:11</p> <p><b>architectures</b> 120:15</p> <p><b>area</b> 21:24 26:3 51:7,13,15 155:6</p> <p><b>areas</b> 122:2 129:12</p> <p><b>arguing</b> 59:1</p> <p><b>argument</b> 15:6,19 44:20 58:17</p> <p><b>arguments</b> 79:3</p> <p><b>armor</b> 53:6</p> <p><b>arnold</b> 9:13,14,16 9:22</p> <p><b>arnold's</b> 9:24</p> <p><b>array</b> 124:21 130:16</p>	<p><b>art</b> 2:23 70:18,18 78:20,20</p> <p><b>article</b> 113:3</p> <p><b>arup</b> 31:7</p> <p><b>ashe</b> 156:8 157:6</p> <p><b>ashe.org.</b> 146:23</p> <p><b>ashe's</b> 146:21</p> <p><b>asking</b> 75:1</p> <p><b>assemblies</b> 61:22 64:21 71:10 74:9</p> <p><b>assembly</b> 32:15 33:3 45:25 62:13 66:17 67:6 68:14 68:18 71:24 74:21 78:24 118:19 142:3 156:19 160:22 161:3</p> <p><b>assembly's</b> 134:11</p> <p><b>assertion</b> 85:13</p> <p><b>asserts</b> 46:5</p> <p><b>assessing</b> 68:22 74:20</p> <p><b>assessment</b> 49:23 50:5 55:15</p> <p><b>assigned</b> 18:22</p> <p><b>assist</b> 18:16</p> <p><b>assistance</b> 17:1</p> <p><b>associated</b> 8:1 12:5,15 43:2 46:1 51:5 52:4 59:14 74:3 99:10 107:10 145:21 158:8</p> <p><b>associates</b> 116:4 127:6 132:4 137:21 141:18 145:12 155:15 161:5 162:12</p> <p><b>association</b> 12:2 13:10 72:18 79:17 91:16 122:11 126:3,5,7 131:11</p>	<p>140:14 146:7 164:4</p> <p><b>assure</b> 74:22</p> <p><b>astm</b> 68:20 83:5,7 83:9,15,17,17,22 84:4 87:1 93:20 94:18,19 98:24,25 99:6,17,23 100:15 101:15 102:17,19 104:6,19,22 105:7</p> <p><b>athanis</b> 12:10</p> <p><b>atkinson</b> 1:19</p> <p><b>atmosphere</b> 53:22 53:23</p> <p><b>atmospheres</b> 13:13,21</p> <p><b>attachment</b> 22:25</p> <p><b>attempt</b> 139:5</p> <p><b>attempted</b> 37:24</p> <p><b>attempting</b> 37:14</p> <p><b>attend</b> 66:23 70:9</p> <p><b>attendance</b> 28:8</p> <p><b>attending</b> 134:1 153:5</p> <p><b>attention</b> 6:23 16:7 84:22</p> <p><b>attest</b> 165:3,6</p> <p><b>attorney</b> 165:8</p> <p><b>audience</b> 32:7 156:11</p> <p><b>audio</b> 1:1 5:2 165:4</p> <p><b>augmented</b> 108:7</p> <p><b>august</b> 18:3</p> <p><b>austin</b> 12:1 119:16</p> <p><b>australia</b> 9:17</p> <p><b>australian</b> 119:13 119:14</p> <p><b>authority</b> 74:22 108:10</p>
---	--	--	---

[authorized - break]

<p><b>authorized</b> 32:9 32:22 62:8 118:15 141:23 160:18,24 <b>automatic</b> 7:24 <b>available</b> 21:24 22:20 99:25 122:19 146:21,23 <b>award</b> 6:4,7,8,8,12 6:13 8:10,14,20,22 9:13,25 10:9,12 11:21 14:15 119:14 <b>awards</b> 8:13,14 11:25 119:13 <b>aware</b> 94:7 137:4</p>	<p>112:6 135:5 137:16,25 144:7 145:19,19 155:8 <b>ballots</b> 17:21 20:16 135:8 145:20,21 150:15 <b>baltimore</b> 8:25 <b>bananas</b> 35:18,19 <b>bar</b> 120:16,17,25 124:17 128:3 131:2 <b>barrier</b> 74:9 <b>barriers</b> 77:18 <b>barry</b> 2:18 60:25 61:11,13,17 66:15 68:25 76:6 78:6 80:10 102:17 103:12,12 104:7 <b>based</b> 8:4 17:12,24 27:23 28:22 50:9 50:12 57:10 67:17 72:7 74:20 91:18 93:12 103:16 119:16 120:5 130:25 134:4,25 135:3 138:5 139:9 153:19 154:17 <b>basement</b> 120:19 <b>basically</b> 76:24 <b>basis</b> 36:19 63:20 71:15 151:4,5 <b>batteries</b> 128:21 <b>battery</b> 116:5,8 117:1 124:16 128:18,22 130:19 130:19 <b>beacons</b> 16:14 <b>beams</b> 24:16 27:3 <b>beat</b> 131:11 <b>becoming</b> 44:21 116:15</p>	<p><b>beebe</b> 4:13 140:12 140:12 146:15,15 157:1,1 <b>beep</b> 16:12 <b>began</b> 6:24 <b>behalf</b> 9:14,24 10:8 40:12 72:16 73:25 86:18 138:13 149:13 150:22 157:17 <b>belgrade</b> 13:5 <b>believe</b> 35:3 84:15 114:9 140:17,19 151:2 <b>bellis</b> 5:14 <b>belong</b> 87:6 136:4 152:2 <b>ben</b> 3:2 74:14,14 79:24,24 <b>beneath</b> 119:24 <b>bernzweig</b> 3:25 131:10,10,15 <b>bespoke</b> 108:8 <b>best</b> 117:20 124:7 136:19 138:4 139:11 165:5 <b>better</b> 26:1 65:11 66:1 114:21 138:22 157:5 <b>beyond</b> 6:3 116:16 154:24 <b>big</b> 11:6 19:15 129:5 <b>biggins</b> 3:7 6:13 111:7,18,21,22 115:3,5,17 116:24 117:25 118:2 121:12,14 132:21 132:23 <b>bill</b> 3:4,8 4:5 75:14 75:14 112:14,14</p>	<p>112:23,23 114:12 116:24 137:21,21 139:10,10 141:18 141:18 145:12,12 146:8 155:15,15 161:5,5,19 162:12 162:12 <b>bioside</b> 139:22 <b>bit</b> 15:20,21 52:6 57:20 87:14 123:15 156:2 <b>blue</b> 20:25 <b>board</b> 134:6 138:14 <b>bodies</b> 113:1 <b>body</b> 34:9 67:9 86:5 95:12 102:12 151:8 162:4 <b>bogucki</b> 12:18,19 <b>boiler</b> 11:11,13 <b>boilers</b> 11:14,15 <b>bolster</b> 157:10 <b>bonesteel</b> 3:20 129:3,3 <b>boston</b> 16:9 <b>bound</b> 75:18 130:15 <b>box</b> 131:20 <b>boxes</b> 126:19 <b>bracing</b> 7:17 8:4 <b>bradford</b> 4:2 134:17,23 136:25 141:2 143:24 148:2 150:3 152:13 154:13 158:18 162:3,20 <b>brand</b> 66:11 <b>brands</b> 20:25 <b>break</b> 23:1 110:21 110:24</p>
<p><b>b</b></p>			
<p><b>b</b> 6:13 24:12 64:24 65:17 67:2 69:8 70:24 74:18 <b>b.8.5.1.1.3.</b> 67:15 <b>back</b> 8:23,24 18:20 56:5,21 59:1,11 66:24 72:12 110:22 140:8 154:5 <b>background</b> 64:15 111:2 159:2,6,15 159:18,23 160:1,3 160:14 163:3,25 <b>badders</b> 2:18 60:25 61:9,13,15 61:17 66:13,15 68:2,25 76:4,6 78:4,6 80:9,10 102:17 103:12,12 104:7 <b>baker</b> 1:19 20:25 <b>ballot</b> 17:17,19 20:13 31:22 32:1 61:24 62:2 67:6 81:25 82:3 112:3</p>			

[brian - cat]

<p><b>brian</b> 3:19 128:14 128:14 <b>brick</b> 22:23 <b>bridges</b> 81:23 <b>briefcase</b> 119:22 <b>bring</b> 26:21 95:11 105:2 129:24 <b>bringing</b> 55:9 84:21 <b>brings</b> 35:21 43:11 102:16 151:1 <b>british</b> 13:24 40:22 <b>broadened</b> 116:22 <b>brought</b> 6:23 27:7 27:15 47:13,15 55:12 86:9 116:23 <b>bs</b> 83:24 94:4 96:1 96:4,21 <b>buck</b> 24:16 27:3 28:2 30:7 <b>build</b> 29:19 <b>builders</b> 44:24 <b>building</b> 13:15 16:20 56:24 57:15 57:15 58:1,2,4,6,9 86:20 129:10,14 137:11 <b>buildings</b> 64:18 136:2 158:13 <b>buildup</b> 23:16 127:24 <b>built</b> 128:8 <b>bunker</b> 3:17 127:5 127:6,6 131:6 132:3,4,4,9,12 <b>burden</b> 105:1 <b>burn</b> 82:25 85:7 85:22 97:2 <b>burner</b> 11:14,15</p>	<p><b>burning</b> 93:17 <b>burwick</b> 9:17 <b>bush</b> 4:1 133:16 133:22,23 135:11 135:15,19,23 136:23 137:17 138:9,25 140:10 140:24 141:3,22 142:10,14 143:22 144:9 145:10 146:4,13,25 147:9 147:23 148:3,22 149:2 150:1,17 151:13 152:9,15 153:7,11,15 154:11 155:10 156:24 157:14 158:3,15,19 159:3 159:7,9,13,16,19 159:24 160:2,4,7 160:16 161:8,14 161:17 162:1,7,17 162:21 163:4,7,12 163:21 164:1 <b>business</b> 15:24 16:4 39:15 138:15 144:17 <b>busses</b> 35:5,6 <b>button</b> 30:16 42:5 59:19 76:12 80:17 89:6 92:5 97:13 105:15 110:5 118:6 133:7 141:6 148:7 152:19 158:22 162:24 163:11 <b>b's</b> 69:10</p>	<p>38:14,15,15,16 40:21 43:4,18,20 43:24 44:18 45:13 46:1,10 49:2 51:2 53:2 55:24 56:8 58:2,3,9,13,14 59:6 139:22 <b>cables</b> 34:5,6,6,7 34:12,13,15,16,16 34:19,20 35:10,14 35:22 36:10,16,22 37:8,9,12 39:17 40:2,5 43:6,13 44:22 45:3 46:5,7 46:13 47:7,11,16 49:1,4,7 50:2,16 50:24,25 51:14,20 51:21 52:25 53:12 53:16 54:13 55:5 55:7,19 56:9,11,12 57:21 <b>cabing</b> 40:23 <b>cac</b> 6:13 111:8 <b>calculated</b> 27:16 <b>calculations</b> 27:15 <b>caldwell</b> 3:2 74:14 74:14 79:24,24 <b>california</b> 10:4 14:11 165:14 <b>call</b> 7:4 18:25 19:5 31:2,2 <b>cam</b> 39:18 44:13 48:15 50:23 51:2 67:15 78:7 82:11 86:10 89:22 90:24 92:25 94:11 95:13 95:20 96:22 98:6 98:13 99:20 100:8 100:12 106:2,12 107:16 108:25 112:15 118:25</p>	<p>120:8,22,23 121:6 121:8 130:12 134:13,14 137:1,2 137:23 143:24 148:20 150:4 151:18 154:14 161:7 162:18,23 <b>cams</b> 18:7 134:6 <b>canada</b> 13:24 <b>can't</b> 123:1 125:18 125:19 126:25 129:7 <b>capabilities</b> 123:12 <b>capacity</b> 40:12 119:23 <b>cape</b> 129:21 <b>capture</b> 117:8 <b>car</b> 39:14 44:23 <b>care</b> 157:20 <b>career</b> 119:12 <b>careers</b> 114:5 <b>carefully</b> 54:13 74:18 <b>carolina</b> 14:3 <b>cars</b> 40:5 44:20,21 <b>carve</b> 51:18 131:25 <b>case</b> 19:9,24 44:3 45:23 53:7 68:19 71:4 81:15 92:13 127:13 149:25 158:1 <b>cases</b> 108:22 139:20 <b>cast</b> 17:4 19:4 22:22 <b>castable</b> 22:14 <b>cat</b> 36:15,15 139:22</p>
	<p><b>c</b> 2:1 24:24 <b>cable</b> 34:23 35:1 36:11,23 37:21,23</p>		

[categories - close]

<b>categories</b> 43:8 44:4 <b>category</b> 6:7 43:7 44:22 <b>cause</b> 23:11 29:3 127:16 139:16 <b>causes</b> 139:23 <b>causing</b> 41:17 55:20 143:13 145:3,7 <b>ceiling</b> 154:21 158:7 <b>center</b> 16:10,23,25 19:8 120:4 <b>centralized</b> 120:13 <b>ceramic</b> 22:23 <b>certain</b> 18:12 27:11 49:1 51:21 51:24 128:23 129:12 <b>certainly</b> 61:17 75:3 78:6 80:10 <b>certainty</b> 146:12 <b>certificate</b> 165:1 <b>certification</b> 46:4 <b>certified</b> 18:6,10 19:19 20:20 31:10 32:6,8,15,21 33:3 33:6 42:13 48:12 61:5 62:6 64:1 67:12 76:21 81:10 82:7 89:15 92:18 97:22 105:24 111:12 112:11 118:13,21 133:25 135:12 141:16 142:5 148:17 151:18 153:4 <b>cgs</b> 116:3 <b>chad</b> 4:13 140:12 140:12 146:15,15	157:1,1 <b>chair</b> 5:11 7:11,19 7:23 8:3,5 9:14 11:8,11 12:7,9,17 13:7,19 19:14 20:3,6 31:6,15 38:11 45:5 55:23 57:7 60:25 61:10 72:25 75:17 81:5 81:18 84:15 88:17 94:4 103:1 111:7 111:18 116:4 118:23 119:8 121:11 133:17 134:17,22 138:1 144:15 147:25 149:4 150:24 152:11 156:20 158:17 162:1,14 162:19 <b>chaired</b> 155:19 <b>chairman</b> 55:3 87:14 93:8 96:14 106:10 127:5 132:3 147:14 <b>chair's</b> 34:21 38:12 49:7 50:22 50:24 61:16 <b>challenges</b> 129:5 137:5 <b>challenging</b> 7:10 <b>chandler</b> 12:25 <b>change</b> 50:6,7,14 83:19 85:2 95:20 100:11 101:5 102:6 106:22 108:13,14 121:15 124:25 125:2 153:21 157:25 <b>changed</b> 29:21 39:15	<b>changes</b> 21:4 28:17 40:4 66:8 70:10 84:11 100:12 101:1 121:25 137:11 147:16 150:7 157:5 <b>changing</b> 129:8 <b>chapter</b> 40:1 51:14 56:19 84:7 136:4 140:5 150:7 162:5 <b>chapters</b> 52:23 <b>characteristics</b> 22:21 45:13 61:22 <b>characterizing</b> 37:8 <b>charge</b> 7:16 <b>charging</b> 36:19 <b>check</b> 149:18 <b>checked</b> 149:19 <b>chemical</b> 13:21 <b>chemicals</b> 13:14 14:5 <b>chiefs</b> 122:12 126:7 <b>chong</b> 2:17 40:11 40:11,16,18 57:7,8 57:13 <b>choose</b> 109:9,13 <b>choosing</b> 19:1 <b>chose</b> 49:4 <b>chris</b> 3:10 116:3,3 117:6 <b>chuck</b> 4:22 147:2 147:2 158:5,5 <b>circuit</b> 45:22,24 <b>circuits</b> 52:8,9 53:3 <b>cite</b> 125:22	<b>citing</b> 53:15 <b>cladding</b> 74:8 <b>clarification</b> 34:17 36:25 94:12 <b>clarified</b> 88:13 <b>clarify</b> 36:8 37:12 38:18 68:11 84:15 84:17 96:3,14 100:8 136:8 163:8 <b>clarifying</b> 36:18 37:2,6 142:20 <b>clarity</b> 134:12 <b>class</b> 24:24 93:13 93:13,14,15,19,19 93:25 94:1,8,8 95:21 96:5 <b>classifying</b> 37:7 <b>clause</b> 101:6,9 <b>clean</b> 128:6 <b>clear</b> 34:7 36:20 38:16,16 60:9 97:1 106:16 140:17 <b>clearance</b> 150:5,8 <b>cleared</b> 16:20 <b>clearer</b> 37:15 <b>clearly</b> 34:14 43:19,21,22 47:14 55:19 84:6 106:18 106:25 107:3,13 149:10 <b>cleveland</b> 62:21 <b>client</b> 75:18 <b>close</b> 16:7 19:6 30:20 42:9 48:8 80:22 89:10 105:20 122:20 123:2,3 124:24 141:11 148:11 152:24 163:18
---	--	---	--

[closed - committee's]

<p><b>closed</b> 19:6 30:20 42:10 48:8 54:3 55:18 59:25 60:13 76:17 80:22 89:11 92:14 97:19 105:20 110:16 118:11 133:12 141:12 148:12 152:24 160:9,9 163:21 <b>clothing</b> 12:14,22 <b>code</b> 11:9 13:15 16:19 18:22 29:18 29:20 43:10 49:9 49:9 56:1,12,13,23 57:15,15 58:2,2,4 58:5,6,9 71:4 113:1,4,5 114:10 115:11 121:3 129:7 130:4,5 151:7,24 157:5 158:1 <b>codes</b> 8:19 26:4 34:8 82:22 90:13 114:7 129:25 130:2 <b>colleague</b> 26:24 56:2 125:14 <b>colleagues</b> 21:16 26:16 <b>collect</b> 156:9 157:9 <b>color</b> 15:16 <b>columbia</b> 13:24 40:22 <b>combinations</b> 64:23 <b>combine</b> 56:19 <b>combined</b> 24:13 <b>combusted</b> 83:11 <b>combustible</b> 55:17 55:18 61:23 93:16</p>	<p>93:23 94:2,23 95:1 <b>combustion</b> 7:22 11:12,13 23:11 26:17 83:1 85:7 85:22 <b>come</b> 6:15 15:12 25:19 26:4 28:11 28:13 56:2 57:17 58:17 66:19 125:13 126:18 137:7 139:14,19 140:21 144:19,24 154:5 <b>comes</b> 130:23 139:22 <b>comfortable</b> 19:10 <b>coming</b> 26:12 92:11 163:4 <b>command</b> 16:22 <b>comment</b> 41:13,23 42:20 47:21 48:3 48:18 58:22,24 59:19 67:7,10 69:1,2 82:14,15 84:11,17,18,22 88:6,25 89:5,25 91:24 92:5 93:3 97:7,9,12 98:8 100:25 104:4,16 105:14 106:5 109:21 110:4 112:16,18 115:24 117:24 118:5,25 119:2 132:20 133:6 142:9,12 147:25 148:6 <b>commenter</b> 26:11 <b>comments</b> 24:9 26:10 29:25 30:13 47:22 67:24 69:21</p>	<p>70:6,6 76:5 78:12 80:9 88:7 91:25 97:8 104:17 109:22 118:1 132:22 134:13 141:1 146:8 148:1 150:15 152:12,14 158:17 162:19 <b>commitment</b> 157:22 <b>committed</b> 154:4 <b>committee</b> 6:10 7:11,24 8:1,6,13 8:14,15,22 9:13,24 10:4,5,12 11:20,25 12:4,13,14,16 13:1 13:2,6,8,20,25 14:7,12 17:16,17 17:19 19:13,14,14 19:16,22 20:2,9,13 24:1 27:18 28:9 30:2 31:4,6,6,7,13 31:17,24 34:2,3,21 36:25 37:13 39:11 43:2 44:2,13 45:19 49:3 50:20 51:16,18 53:18 54:10 55:14,15 60:23,24,25 61:2,8 61:18,24 65:3 66:7,18,24 67:1,9 67:21 68:9,10 69:3,4,18,19,20 70:21,23 72:15,25 73:24,25 74:17,17 75:16 76:7 78:9 80:11 81:3,4,5,7 81:12,20 82:1 84:25 85:3,25 86:10,19,20 88:10 94:4,7,24 95:7,22</p>	<p>95:25 97:15 98:24 98:24 99:8,18 100:14 101:2,14 101:18 103:8 104:24 108:5,6,24 109:13,15 111:5,7 111:7,9,13,15,23 112:4 113:19,24 114:14 115:4,7,13 116:5,8,22 117:1 121:5,22 122:3 123:23 125:1 128:17,22 133:1 133:18 134:3,5,8 134:16,17,18,22 134:24 135:6 137:8,25 142:9,11 142:18,20,22 143:9,16 144:7 145:15 147:25 148:6 150:12 152:7 154:5,23 155:19,23 156:2 156:10 162:2 <b>committees</b> 7:21 8:1,16 9:1,18 10:17 11:7,12 12:5,20 13:12 14:4 20:14 31:23 82:1 <b>committee's</b> 23:24 24:8,21 26:21 36:5 38:1 45:9 51:12 66:14 72:9 78:5 84:18 86:3 91:2 95:5 100:22 108:1,9,18 115:8 121:13 136:24 143:23 147:3 150:2 154:12</p>
---	--	---	--

[common - containers]

<b>common</b> 83:3 <b>communication</b> 34:14,15,19 35:10 37:8 38:15 39:17 53:16 55:6 <b>communications</b> 34:6 37:21 49:16 <b>community</b> 105:3 105:9 <b>companies</b> 29:3 <b>companion</b> 84:5 90:6,20 <b>company</b> 1:19 14:25 15:13,17 20:24 40:12 44:18 47:14 62:20 124:3 128:5 <b>comparative</b> 65:7 65:21,25 74:4 78:2 <b>compare</b> 77:23 78:1 <b>compared</b> 65:9 74:5 76:25 77:19 <b>compatibility</b> 136:1,18 137:5 143:2,3,8 145:22 <b>compatible</b> 140:3 140:4 <b>competitor</b> 72:2 <b>complete</b> 18:22 20:1 45:25 <b>completely</b> 71:7 98:14 130:17 <b>complex</b> 82:21 116:15 <b>compliance</b> 71:3 71:14 101:9 143:14 <b>comply</b> 26:3 29:17 35:11,15,18,19,23	39:21 46:4,8 53:14 83:18 93:20 <b>component</b> 74:20 147:7 <b>components</b> 61:23 74:7 99:2 128:24 137:6 147:19 <b>composition</b> 69:12 75:4 <b>compressed</b> 13:10 <b>compromising</b> 67:4 <b>concealed</b> 154:16 154:18,21 161:22 <b>concede</b> 120:14 <b>conceded</b> 37:22 <b>concept</b> 44:11 78:7 123:13 <b>concepts</b> 27:13 <b>concern</b> 6:23 125:15 142:24 145:7 <b>concerned</b> 16:5 30:3 122:3 125:16 136:4 149:6 153:18 <b>concerning</b> 95:24 <b>concerns</b> 6:1 29:7 145:15 <b>concludes</b> 8:12 164:3 <b>conclusion</b> 113:9 <b>concrete</b> 51:3 52:2 55:10,11 59:2 72:17 79:17 91:15 <b>conditions</b> 30:9 46:4 85:6,21 <b>conduct</b> 71:2 72:4 122:23 <b>conducting</b> 16:4	<b>conductors</b> 53:4 <b>conduit</b> 59:3,4 <b>conduits</b> 53:6 <b>confident</b> 71:25 <b>confidential</b> 75:20 <b>confidentiality</b> 75:19 <b>conflicts</b> 70:14 151:8 <b>confuse</b> 34:22 151:9 <b>confused</b> 41:3 <b>confusing</b> 111:20 <b>confusion</b> 34:18 37:7 41:1 43:11 51:7 151:2 <b>congratulating</b> 8:10 10:9 <b>conjunction</b> 17:4 40:19 <b>connected</b> 121:24 <b>connecticut</b> 12:19 <b>connecting</b> 28:3 <b>conrad</b> 2:15 39:9 39:10 41:10 44:17 44:17 55:23,24 102:23,23 <b>consensus</b> 5:19 17:6 38:1 69:5 99:6 100:16 103:17,17,23 116:7 <b>consequence</b> 35:13,22 <b>consequently</b> 35:25 39:5 <b>consider</b> 125:8 151:5 <b>consideration</b> 18:11 19:12 31:3 45:15 60:23 81:2	103:21 111:4 121:8 134:1,2 <b>considered</b> 32:15 33:3 37:13 41:4 53:17 54:14 55:14 62:12 85:19 86:1 118:19 124:22 134:8 137:13,14 142:2 144:6 160:21 161:3 <b>considering</b> 23:13 27:12 <b>consistency</b> 65:16 102:16 <b>consistent</b> 6:19 52:21 53:8 79:11 85:14 87:4 94:3 99:13 100:7 102:11 145:24 147:17 <b>constantly</b> 151:7 <b>constructed</b> 25:24 49:20,25 53:21 <b>construction</b> 21:7 21:22 22:11,19 23:15,21 24:4,5 25:22 27:12,13 29:4,8,10,16 49:20 49:21 86:20 139:15,15 <b>consultants</b> 14:2 <b>consulting</b> 13:23 <b>consumed</b> 23:18 <b>contact</b> 137:7 139:14,19,23 142:21 <b>contain</b> 34:9 <b>containerized</b> 119:19 <b>containers</b> 49:24
---	---	---	--

[containing - davis]

<p><b>containing</b> 61:22 71:11 <b>contains</b> 43:10,22 93:11 94:15 99:3 101:8 <b>contemplated</b> 45:14 46:7 <b>contends</b> 45:19 53:1,11 <b>contested</b> 51:14 <b>context</b> 37:23 134:15 <b>continue</b> 44:24 45:2 <b>continuous</b> 8:15 149:23 <b>continuously</b> 149:12,14 <b>contractor</b> 139:21 155:21,22 <b>contractors</b> 140:19 155:24 <b>contrary</b> 101:7 <b>contribution</b> 17:6 <b>contributions</b> 6:5 6:9 <b>control</b> 12:5 34:5 34:11,13,16,20 36:10 37:9 54:1 113:11 114:16 116:21 <b>controlling</b> 115:15 <b>controls</b> 139:3 147:12 151:16 <b>convention</b> 16:9 16:25 32:14 33:2 62:11 63:25 118:18 142:1 160:20 161:2 <b>conventional</b> 22:7</p>	<p><b>coral</b> 129:21 <b>correct</b> 50:15 56:20 94:12 150:9 152:1 165:16 <b>corrected</b> 113:23 <b>correlate</b> 106:23 146:9 147:20 <b>correlating</b> 7:23 12:3,13 17:17 31:24 82:1 <b>corrosion</b> 156:16 156:19 158:11 <b>council</b> 5:11,15 7:3 17:8,10,13,23 18:2 113:20,22 133:17 <b>counsel</b> 5:17 <b>countless</b> 5:23 <b>countries</b> 103:2 <b>country</b> 94:18 136:20 <b>couple</b> 14:20 40:2 69:25 70:1,6 72:25 92:20 97:24 104:18 144:3 <b>course</b> 34:3 68:9 113:24 116:10 <b>cover</b> 47:9,12 154:20 155:7 156:17,19 158:7 <b>coverage</b> 114:3 <b>covered</b> 25:1 43:15 47:2,5,7,12 49:12,17,18 113:6 113:8 121:25 <b>covered.'</b> 129:15 <b>covers</b> 73:16 <b>cpp</b> 136:13 <b>cpvc</b> 136:1,18,19 139:17,21,23</p>	<p><b>crafted</b> 74:18 <b>craig</b> 14:2,3 <b>create</b> 119:19 157:25 <b>created</b> 95:23 96:2 <b>creates</b> 128:17 151:2 <b>creation</b> 95:23 <b>credible</b> 74:19 <b>crisis</b> 128:7 <b>criteria</b> 46:13 51:22 94:13,19,20 99:4 129:17 <b>critical</b> 7:10 90:23 99:4 117:20 <b>cronin</b> 4:2 134:17 134:21,23 136:23 136:25 141:1,2 143:22,24 147:14 148:2 150:1,3 152:13 154:11,13 158:18 162:3,20 <b>cross</b> 67:5 <b>crozet</b> 12:25 <b>cubic</b> 27:17 <b>cumberland</b> 12:1 <b>cummings</b> 13:4 <b>current</b> 26:20 27:11 29:20 45:20 95:15 101:7 126:23,23 127:1 138:22 <b>currently</b> 40:3 95:17 119:17 120:12 124:18 127:8 128:3 151:10 <b>curve</b> 98:17,20,21 98:23 99:3,9,15,23 99:23,25 100:13 100:15,16,18,20</p>	<p>101:11,13,16 102:19,20 103:16 103:18,22 104:5 104:13,20,21 105:3,7 <b>curves</b> 98:16 103:4 104:12 <b>cut</b> 64:25 <b>cuts</b> 87:21 <b>cycle</b> 45:20 52:19 135:2 138:21 150:7 153:25 155:20 156:2 157:11 <b>cycles</b> 39:14 40:2 56:1,15 140:21</p> <tr> <td colspan="4"><b>d</b></td></tr> <tr> <td colspan="4"> <p><b>d</b> 13:4 24:24 <b>damage</b> 114:1 136:3 <b>danger</b> 23:7 <b>dangerous</b> 22:16 56:10 127:23 <b>data</b> 53:15 65:21 66:16 67:17 71:5 71:12,15,18 72:2 74:3 75:21 77:24 78:1,25,25 143:11 153:20 154:3,6,17 154:18 156:3,9,12 157:3,5,9,10,24 158:13 <b>date</b> 151:8 <b>dated</b> 165:18 <b>dave</b> 3:22,25 4:25 129:21,21 131:10 131:10,15 150:21 150:21 157:16,16 <b>david</b> 32:7 <b>davis</b> 3:1 73:22,22 86:17,17</p> </td></tr>	<b>d</b>				<p><b>d</b> 13:4 24:24 <b>damage</b> 114:1 136:3 <b>danger</b> 23:7 <b>dangerous</b> 22:16 56:10 127:23 <b>data</b> 53:15 65:21 66:16 67:17 71:5 71:12,15,18 72:2 74:3 75:21 77:24 78:1,25,25 143:11 153:20 154:3,6,17 154:18 156:3,9,12 157:3,5,9,10,24 158:13 <b>date</b> 151:8 <b>dated</b> 165:18 <b>dave</b> 3:22,25 4:25 129:21,21 131:10 131:10,15 150:21 150:21 157:16,16 <b>david</b> 32:7 <b>davis</b> 3:1 73:22,22 86:17,17</p>			
<b>d</b>											
<p><b>d</b> 13:4 24:24 <b>damage</b> 114:1 136:3 <b>danger</b> 23:7 <b>dangerous</b> 22:16 56:10 127:23 <b>data</b> 53:15 65:21 66:16 67:17 71:5 71:12,15,18 72:2 74:3 75:21 77:24 78:1,25,25 143:11 153:20 154:3,6,17 154:18 156:3,9,12 157:3,5,9,10,24 158:13 <b>date</b> 151:8 <b>dated</b> 165:18 <b>dave</b> 3:22,25 4:25 129:21,21 131:10 131:10,15 150:21 150:21 157:16,16 <b>david</b> 32:7 <b>davis</b> 3:1 73:22,22 86:17,17</p>											



[dawn - differentiation]

<p><b>dawn</b> 5:14</p> <p><b>day</b> 1:3 5:4 149:20 149:21,22 164:11 165:18</p> <p><b>days</b> 17:14,18,22</p> <p><b>dc</b> 34:12</p> <p><b>dealing</b> 76:25 116:16</p> <p><b>dealt</b> 44:2 53:16</p> <p><b>death</b> 131:12</p> <p><b>debate</b> 17:5,7 18:1 18:11 19:23 25:4 31:14 38:5 46:19 51:16 53:18 54:21 61:9 68:3 78:17 81:14 86:13 91:9 96:8 101:22 103:5 109:2 111:16 115:20 122:7 133:20 134:9 137:18 144:10 150:18 155:11 162:8</p> <p><b>debated</b> 56:1 103:1 132:24</p> <p><b>debates</b> 103:6</p> <p><b>decades</b> 144:3</p> <p><b>decentralized</b> 120:1,11,15,23 121:10</p> <p><b>decide</b> 50:3 133:3</p> <p><b>decided</b> 96:1 103:6 128:22 156:5</p> <p><b>decision</b> 17:23 85:10 130:2 134:9 157:11</p> <p><b>declare</b> 16:3 164:6 165:12</p> <p><b>decrease</b> 49:5,6 55:20</p>	<p><b>decreased</b> 50:4</p> <p><b>dedicate</b> 114:5</p> <p><b>deemed</b> 75:4</p> <p><b>deeply</b> 114:7</p> <p><b>defeats</b> 75:9</p> <p><b>defined</b> 27:16 30:7 53:21</p> <p><b>defines</b> 28:3</p> <p><b>definitely</b> 70:7</p> <p><b>definition</b> 83:12 83:18 84:9,10,12 84:24 85:4,12,16 85:24,24 86:4,4,6 86:22 87:5,6,15,23 87:25 88:12,13 90:7 91:17</p> <p><b>definition.'</b> 87:24</p> <p><b>deflagration</b> 21:20 23:1,7 25:18 26:1 26:6 29:9</p> <p><b>degradation</b> 154:20</p> <p><b>degrees</b> 23:3,9,16</p> <p><b>delaware</b> 12:3</p> <p><b>delete</b> 49:4 90:7 151:20</p> <p><b>deleted</b> 44:12 86:7 99:9,16 100:14 102:10 162:15,15</p> <p><b>deletes</b> 99:20 100:13,17</p> <p><b>deleting</b> 34:3 44:5</p> <p><b>delivers</b> 121:1</p> <p><b>demarcation</b> 106:16 113:3</p> <p><b>demonstrate</b> 50:5 71:3 72:5 101:11 120:11 121:19,20</p> <p><b>demonstrated</b> 120:6</p>	<p><b>density</b> 51:25</p> <p><b>department</b> 10:19 119:17 128:15 129:22 134:18</p> <p><b>deploy</b> 122:23</p> <p><b>describe</b> 82:23 83:4 134:14</p> <p><b>describes</b> 67:3 84:8</p> <p><b>design</b> 22:23 24:20 26:4 29:5,16,20 30:9 74:23</p> <p><b>designated</b> 32:12 32:25 62:9</p> <p><b>designation</b> 43:18 43:24 44:4</p> <p><b>designations</b> 38:21 43:6 45:22</p> <p><b>designed</b> 99:25 100:2 119:24</p> <p><b>designer</b> 24:22 30:9</p> <p><b>designs</b> 22:8,10,13 22:20</p> <p><b>desire</b> 95:11</p> <p><b>desjunct</b> 4:25 150:21,21 157:16 157:16</p> <p><b>despite</b> 11:23</p> <p><b>details</b> 103:19</p> <p><b>detection</b> 127:14</p> <p><b>determinations</b> 18:4</p> <p><b>determine</b> 24:23 30:10 107:9</p> <p><b>determined</b> 85:3 88:10 161:10</p> <p><b>detrimental</b> 149:24</p> <p><b>develop</b> 68:1 78:14 138:20,21</p>	<p><b>developed</b> 5:25 36:8 57:16 66:19 66:23 67:10 72:10 78:8 98:18,25 103:16</p> <p><b>developing</b> 31:25 66:20 70:24 104:7 119:11 131:23</p> <p><b>development</b> 5:18 6:11 7:5,12 8:19 9:10,23 10:24 11:18 20:15,23 62:1 82:2 112:5 114:6,10 135:7</p> <p><b>deviation</b> 106:25</p> <p><b>deviations</b> 74:23</p> <p><b>device</b> 18:19 19:11 60:3</p> <p><b>devices</b> 17:3 18:20</p> <p><b>dick</b> 3:1 73:22,22 86:17,17</p> <p><b>didn't</b> 39:19 96:14 114:12 124:25 125:1,1</p> <p><b>difference</b> 68:23 107:20 124:3</p> <p><b>differences</b> 94:11 104:22</p> <p><b>different</b> 40:4 44:22,23 52:4 59:14 65:14,15 67:17 75:2,3 78:8 93:11 94:8 98:14 116:23 137:24 140:4 150:25 155:18</p> <p><b>differentiate</b> 52:16</p> <p><b>differentiating</b> 113:6</p> <p><b>differentiation</b> 54:8</p>
--	--	---	---

[differently - effect]

<p><b>differently</b> 67:23 78:11,23 <b>differing</b> 54:5 <b>difficult</b> 29:19 <b>difficulty</b> 57:18 136:8 <b>direction</b> 105:11 <b>directly</b> 53:22,23 108:14 <b>director</b> 20:23 <b>dis</b> 41:7 <b>disagree</b> 56:3 101:2 <b>disagrees</b> 108:5,24 <b>disapprove</b> 69:22 <b>discharging</b> 154:22 <b>discrimination</b> 66:6 73:10 <b>discuss</b> 112:25 <b>discussed</b> 43:14 47:1 50:22 55:14 84:2 93:21 95:22 132:24 <b>discusses</b> 158:9 <b>discussion</b> 20:20 21:14 29:23 32:6 33:6,16 42:13,23 48:11,21 62:6 64:1,13 76:20 77:13 80:6 82:7 82:18 89:14 90:3 92:17 93:7 95:23 96:6 97:6,22 98:12 104:15 106:9 109:20 112:11,22 119:7 119:17 135:12,24 140:25 141:16 142:15 145:14 147:24 148:17</p>	<p>149:3 152:10 153:4,16 158:16 161:18 162:17 164:1 <b>discussions</b> 26:8 30:24 41:20 47:20 58:21 76:2 88:5 91:23 110:20 115:23 117:23 132:20 <b>dispersal</b> 53:25 <b>disperse</b> 53:23 <b>display</b> 111:17 <b>displayed</b> 19:22 31:13 61:8 81:13 111:15 <b>disposed</b> 45:19 <b>disservice</b> 41:17 <b>dissimilar</b> 45:21 <b>distance</b> 51:24 <b>distinct</b> 5:10 133:24 <b>distinction</b> 84:6 <b>distinguished</b> 8:18 <b>distributed</b> 119:25 127:8,12 130:19 <b>distribution</b> 49:14 <b>dix</b> 9:13,16 <b>document</b> 19:18 20:17 24:13 31:9 32:2 61:4 62:3 74:6 81:8 82:4 110:22 111:10 112:7 134:20 135:9 151:9 <b>documented</b> 24:10 <b>documents</b> 83:6 85:15 86:2 88:2 90:19 <b>doesn't</b> 15:15 58:2 82:25,25 83:1,21</p>	<p>83:22 102:16 125:4 147:15 151:22 152:2 <b>doing</b> 37:13 125:7 <b>don't</b> 28:13 30:5 35:6,18,20 38:13 39:4,5,21,22,23 43:1 47:4,9,12 56:10 58:16 62:17 74:1 79:2,3 88:14 93:24 96:18,19,20 97:1 131:2,7,11 133:3 140:17,19 147:18 151:19 156:18 157:22 <b>door</b> 40:3 106:25 <b>douglas</b> 150:22 157:17 <b>download</b> 18:14 146:23 <b>dozens</b> 66:21 <b>dr</b> 12:18,19 14:9 14:11 36:6,17 37:4,18 45:18 51:17 53:1,11 58:25 71:7 84:21 84:22,25 85:11 88:8 100:24 101:2 108:3,5,24 <b>draft</b> 7:12,12,13 19:17 20:10,10 31:8,19,19 61:3,19 61:19 66:25,25 67:3,6 81:8,22,22 99:10 111:10,24 111:25 134:19 135:1,1 139:9 142:17 143:1,3,10 <b>drafts</b> 66:23 <b>drag</b> 122:23</p>	<p><b>dropped</b> 143:7 <b>ductwork</b> 145:1 <b>due</b> 20:3 61:10 127:23 155:1 <b>duplication</b> 34:4 <b>durability</b> 101:7</p> <tr> <td colspan="4"><b>e</b></td></tr> <tr> <td colspan="4"> <p><b>e</b> 2:1,1 14:2 83:5,7 83:9,15,17,17 87:1 87:2 98:24,25 102:9,17,19 103:16,16 104:6 <b>e1354</b> 68:20 <b>e136</b> 94:18,19 <b>e5</b> 102:19 <b>earlier</b> 102:18 125:14 <b>early</b> 13:10 <b>ease</b> 52:17 <b>echo</b> 126:5 <b>echoing</b> 146:8 <b>edge</b> 123:2 <b>edges</b> 126:20 <b>edison</b> 112:15,24 <b>edition</b> 7:13 20:17 24:11,11 26:23 31:20 32:2 50:3 51:15,20 52:10,14 59:11 61:20 62:2 81:23 82:4 95:16 106:16,22 111:25 112:7 135:8 <b>editions</b> 48:25 52:9 98:19,23 <b>editorial</b> 50:14 <b>educated</b> 129:11 <b>eei's</b> 115:5 <b>efectis</b> 98:18 105:6 <b>effect</b> 24:19 30:8 105:5</p> </td></tr>	<b>e</b>				<p><b>e</b> 2:1,1 14:2 83:5,7 83:9,15,17,17 87:1 87:2 98:24,25 102:9,17,19 103:16,16 104:6 <b>e1354</b> 68:20 <b>e136</b> 94:18,19 <b>e5</b> 102:19 <b>earlier</b> 102:18 125:14 <b>early</b> 13:10 <b>ease</b> 52:17 <b>echo</b> 126:5 <b>echoing</b> 146:8 <b>edge</b> 123:2 <b>edges</b> 126:20 <b>edison</b> 112:15,24 <b>edition</b> 7:13 20:17 24:11,11 26:23 31:20 32:2 50:3 51:15,20 52:10,14 59:11 61:20 62:2 81:23 82:4 95:16 106:16,22 111:25 112:7 135:8 <b>editions</b> 48:25 52:9 98:19,23 <b>editorial</b> 50:14 <b>educated</b> 129:11 <b>eei's</b> 115:5 <b>efectis</b> 98:18 105:6 <b>effect</b> 24:19 30:8 105:5</p>			
<b>e</b>											
<p><b>e</b> 2:1,1 14:2 83:5,7 83:9,15,17,17 87:1 87:2 98:24,25 102:9,17,19 103:16,16 104:6 <b>e1354</b> 68:20 <b>e136</b> 94:18,19 <b>e5</b> 102:19 <b>earlier</b> 102:18 125:14 <b>early</b> 13:10 <b>ease</b> 52:17 <b>echo</b> 126:5 <b>echoing</b> 146:8 <b>edge</b> 123:2 <b>edges</b> 126:20 <b>edison</b> 112:15,24 <b>edition</b> 7:13 20:17 24:11,11 26:23 31:20 32:2 50:3 51:15,20 52:10,14 59:11 61:20 62:2 81:23 82:4 95:16 106:16,22 111:25 112:7 135:8 <b>editions</b> 48:25 52:9 98:19,23 <b>editorial</b> 50:14 <b>educated</b> 129:11 <b>eei's</b> 115:5 <b>efectis</b> 98:18 105:6 <b>effect</b> 24:19 30:8 105:5</p>											

[effectively - event]

<p><b>effectively</b> 53:25 113:19 114:2</p> <p><b>effectiveness</b> 24:19</p> <p><b>effort</b> 52:20 104:7</p> <p><b>efforts</b> 14:16</p> <p><b>efk</b> 13:23</p> <p><b>egress</b> 53:25 130:24 132:5,13 132:16</p> <p><b>eight</b> 40:1 155:8</p> <p><b>either</b> 19:1 28:3 74:8 87:1 96:3 139:15 144:1 154:20</p> <p><b>elaborated</b> 95:22</p> <p><b>elaborates</b> 86:25</p> <p><b>electric</b> 56:11,13 56:23 113:11 115:8,10 116:19</p> <p><b>electrical</b> 13:21 45:22 49:8,9 58:5 112:15,24 113:4,4 115:14</p> <p><b>electricals</b> 56:19</p> <p><b>electronic</b> 12:16</p> <p><b>element</b> 75:5 80:2</p> <p><b>elements</b> 101:6 108:8</p> <p><b>eligible</b> 18:18 37:3 45:16 54:17</p> <p><b>eliminate</b> 26:25 29:21 43:3 50:7 55:7 63:16,18 64:18 65:4 66:10</p> <p><b>eliminated</b> 29:19 51:8</p> <p><b>eliminating</b> 28:18 55:8 63:20</p> <p><b>elimination</b> 21:4 25:15 27:25</p>	<p><b>elmendorf</b> 61:1</p> <p><b>emergency</b> 10:20 10:20 12:2,13,18 12:20,21 16:18,23 52:22 54:7</p> <p><b>emerging</b> 6:21</p> <p><b>emitted</b> 23:19</p> <p><b>emphasize</b> 95:6</p> <p><b>employed</b> 75:16</p> <p><b>employee</b> 165:6</p> <p><b>en</b> 93:11,14,25 94:13 96:4</p> <p><b>encased</b> 50:25 51:2 55:9,11 59:2</p> <p><b>encasement</b> 52:2</p> <p><b>enclosed</b> 52:5 53:5 53:6,20 54:6,7,9 57:2 59:9,11</p> <p><b>enclosures</b> 124:23</p> <p><b>encourage</b> 76:6 80:11 103:23 129:18 146:2,23 147:21 156:11</p> <p><b>encourages</b> 5:19</p> <p><b>ended</b> 143:4</p> <p><b>endurance</b> 27:5</p> <p><b>energy</b> 6:18,20,22 7:6,21 9:1 49:14 111:5,6,23 112:1 112:25 113:10,10 114:15 115:14 116:4,7,14,14 117:1,15 118:24 119:12,15,16,18 119:20,21,22 120:3,4,6,9,18 121:1,10,16,21 122:14 123:10 124:9,15,20 125:12 126:19 127:13,22 128:6,7</p>	<p><b>enforcement</b> 37:15,24 52:11 114:7</p> <p><b>enforcers</b> 5:21</p> <p><b>engaged</b> 121:4</p> <p><b>engineer</b> 102:4 107:1 119:10</p> <p><b>engineering</b> 10:3 14:10 20:23 27:13 28:23 40:13 57:9 64:20 65:16 66:16 71:16 74:19,21 75:6,7,9,10 80:2 100:6,9,11 101:10 101:13 102:5,7 106:24 107:7 138:12 140:13 143:9 144:14 146:16 148:20 153:9 154:1 157:2</p> <p><b>engineers</b> 65:13 66:20</p> <p><b>engines</b> 7:22</p> <p><b>enhanced</b> 6:10</p> <p><b>enormous</b> 143:13 143:19 145:5,5</p> <p><b>enriched</b> 13:13</p> <p><b>ensure</b> 5:24 71:12 94:12 150:13</p> <p><b>enter</b> 114:19</p> <p><b>entire</b> 17:24 63:19 63:20 84:1</p> <p><b>entirety</b> 53:5</p> <p><b>entitled</b> 98:25</p> <p><b>entity</b> 115:15</p> <p><b>environment</b> 23:8</p> <p><b>environmental</b> 53:10</p> <p><b>eps</b> 67:20 73:9</p> <p><b>equal</b> 65:11 75:4</p>	<p><b>equipment</b> 12:14 12:16,22 13:21 21:23 23:22 25:22 26:5 28:23 29:1 29:13,17 130:14 132:7,16</p> <p><b>equivalent</b> 24:4 93:15 94:17</p> <p><b>erode</b> 120:24</p> <p><b>error</b> 117:14 152:3,7</p> <p><b>especially</b> 57:19 103:4</p> <p><b>ess</b> 121:20 122:19 123:1,3</p> <p><b>essentially</b> 64:16</p> <p><b>establish</b> 71:14</p> <p><b>established</b> 101:15 108:14</p> <p><b>establishes</b> 46:12 109:10</p> <p><b>esteemed</b> 26:15 113:2 119:12</p> <p><b>ethernet</b> 34:6,15 34:15,19 35:10 37:8,21 38:15 40:23,24</p> <p><b>europe</b> 94:15</p> <p><b>european</b> 94:14 96:25</p> <p><b>evacuation</b> 16:18 16:21,25</p> <p><b>evaluated</b> 71:25 79:1</p> <p><b>evaluating</b> 71:10</p> <p><b>evaluation</b> 61:21</p> <p><b>evening</b> 164:8</p> <p><b>event</b> 23:7 25:18 29:13 122:22 123:4</p>
--	---	---	---

[events - felt]

<b>events</b> 21:21 26:1 26:6 29:9 <b>everybody</b> 60:9 80:3 130:11 140:22 <b>everybody's</b> 78:25 <b>everyone's</b> 18:12 <b>evidence</b> 50:9,10 51:4 153:19 156:16,18 <b>evidenced</b> 37:25 <b>evident</b> 54:8 <b>evs</b> 116:17 <b>exact</b> 99:3 100:10 100:15 102:19 120:25 <b>exactly</b> 44:10 55:17 71:8 102:6 <b>example</b> 45:20 71:22 114:10 129:16 <b>examples</b> 43:4,6,8 43:10,23 44:3,8,8 <b>exceed</b> 22:6,15 <b>exception</b> 21:5,18 23:21 24:7 27:11 28:18 29:21 37:10 55:19 59:13 <b>exceptions</b> 51:19 52:1 54:11 123:5 <b>excess</b> 22:13 <b>exclude</b> 58:15 <b>excludes</b> 55:4 58:15,18 <b>exclusive</b> 113:11 114:16 <b>exclusively</b> 49:16 <b>excuse</b> 8:2 27:2 75:8 107:8 113:7 158:9	<b>execution</b> 123:14 <b>exemplary</b> 8:16 44:6 <b>exempt</b> 123:11 <b>exemption</b> 24:2 116:20 <b>exhaustive</b> 37:22 45:12 <b>exhibition</b> 16:10 <b>existed</b> 23:25 144:2 <b>existing</b> 100:7 108:20 <b>exists</b> 139:8 157:22 <b>exit</b> 16:15,16 <b>expand</b> 156:12 <b>expanded</b> 52:9,13 52:18 73:9 <b>expended</b> 52:20 <b>experience</b> 21:19 25:10 28:23 71:21 114:20 119:11 158:6 <b>expertise</b> 5:24 37:17 <b>experts</b> 113:18 130:4 131:6 136:19 <b>explain</b> 82:21 <b>explained</b> 35:14 <b>explains</b> 90:10 <b>explicitly</b> 55:4 58:15,18 119:24 <b>explosion</b> 21:5,19 21:25 22:6,16,20 22:24 23:3,20 24:2 25:17,18,21 26:2 27:6,23,25 28:25 29:10,17 120:7,12	<b>explosive</b> 23:17 <b>exposed</b> 23:10 <b>exposure</b> 51:23 106:13,14,17,19 106:25 107:1,2,4,9 107:11,12,15,16 108:4 109:25 <b>express</b> 20:4 61:11 <b>expressed</b> 51:17 101:18 <b>extend</b> 27:24 66:16 <b>extensive</b> 81:15 111:17 <b>extent</b> 37:2 <b>exterior</b> 21:22 22:3 61:22 71:10 78:24 <b>external</b> 120:6,11 120:16 131:20 143:25 <b>externally</b> 120:14 131:2 <b>extraneous</b> 35:2 <b>extremely</b> 91:16 120:17 131:2 <b>extruded</b> 73:6 <b>f</b> <b>facets</b> 5:20 <b>facilities</b> 8:7 9:2 54:4 <b>facility</b> 16:20,23 <b>fact</b> 35:9,22 41:2 49:11 50:6 55:6 77:16 94:7,9 96:23 99:8 116:12 116:21 120:24 139:20,23 146:19 155:22 157:23 <b>factor</b> 120:9 121:1	<b>factoring</b> 54:14 <b>factors</b> 54:14 <b>factory</b> 22:23 23:8 136:14 <b>fagerlund</b> 13:23 40:20 <b>fail</b> 25:25 79:4 <b>failed</b> 30:24 42:12 48:10 60:15 69:2 76:18 80:25 118:12 120:14 133:14 137:25 144:7 145:19,19 <b>failing</b> 143:4 <b>fails</b> 17:16 147:4 <b>failure</b> 139:24 154:17 <b>failures</b> 117:16 139:17 <b>fair</b> 78:3,3 136:21 <b>fall</b> 24:9 <b>familiar</b> 28:18 64:15 94:10,10 <b>family</b> 79:1 <b>far</b> 5:14 30:2 123:15 <b>fatalities</b> 117:17 <b>favor</b> 60:14 80:23 97:19 121:6 138:7 139:4 140:7 147:12,22 150:23 151:11,16 157:18 158:2 162:13 163:22 <b>fdny</b> 12:11 <b>fear</b> 131:7 149:16 <b>feel</b> 44:24 <b>feet</b> 27:17 125:19 130:20,24,25 <b>felt</b> 115:13
--	---	--	--

[female - foam]

<p><b>female</b> 2:5 6:17 8:24 9:16 10:2,15 11:5,24 33:14 60:18,21 63:8 82:16 90:1 93:4 98:10 106:7 110:10,13 149:1 159:11 160:6,15 163:2 <b>fence</b> 117:16 <b>fhit</b> 45:25 <b>field</b> 154:18 <b>figure</b> 136:17 <b>file</b> 1:25 <b>filed</b> 17:13,17 <b>filling</b> 35:1 <b>final</b> 18:4 26:10 29:25 30:12 35:21 37:18 41:23 47:22 58:23 76:5 80:9 88:7 91:25 97:8 104:17 109:22 117:25 132:22 133:25 141:1 147:25 152:11 158:17 162:19 164:1 <b>finally</b> 8:6 14:9 <b>financially</b> 165:8 <b>find</b> 6:25 29:19 88:14 111:1 154:3 <b>fine</b> 45:7 107:22 149:21 <b>fine.'</b> 149:20 <b>finish</b> 54:6 <b>finkl</b> 26:25 <b>fire</b> 5:22 7:17 8:4 8:7 9:5,19 10:19 12:7,13,23 13:4 14:2 16:9,14 49:1 49:2,2,5,23 50:2,3</p>	<p>50:5,7,8,8 52:3,24 53:1,19 54:1,1,3 54:14 55:15,20 57:16,20 59:8,14 60:24 61:18,20,21 64:17 65:7,10,13 65:13,21 66:18 68:9,10,23 69:11 70:21 71:24 72:2 72:3,5,9,16 73:23 74:16,17 77:17,24 78:1 81:4,21 85:8 85:23 86:19 93:10 94:9,11,14 96:16 96:18 98:15,16,18 98:24 99:2,24 100:1,2,4 101:6 102:19 103:4,14 106:13,13,17,18 106:20,20 107:2,3 107:6,9,12,17,18 108:4 109:11,16 109:25 113:17 120:7,12,24 121:3 121:20 122:12,12 123:15 125:13,20 126:7 127:14 128:15,21,23 129:10,22 131:16 131:24 134:17 135:4 146:7 <b>firefighter</b> 122:17 123:17,24 <b>firefighters</b> 122:18 126:3,5,17 128:18 130:5 131:11 <b>firefighters'</b> 129:18 132:17 <b>firefighting</b> 9:3 10:18 122:16,24 123:12</p>	<p><b>fireman's</b> 12:1 <b>first</b> 6:7 7:12,13 8:22 18:23 19:12 19:17 20:10 24:5 24:11,12 31:8,19 33:12 41:21 42:4 52:13 54:17 61:2 61:19 64:9,25 66:24 67:2,6 69:4 76:4,11 77:6,9 80:8,16 81:7,21 82:8 84:20,23 87:16 99:10 100:13 104:19 111:9,24 115:11 126:7 130:11 134:19 135:1 139:4 142:16 151:17 161:25 <b>fiske</b> 3:4 75:14,14 <b>fit</b> 108:10 <b>fits</b> 103:7 <b>fittings</b> 136:14,20 <b>five</b> 17:18 19:6 22:6 23:2 26:14 30:20 40:10 42:9 48:8 57:6 59:24 60:13 68:6 70:17 72:13,13 74:12,13 76:16 78:19 79:6 79:15,23 80:22 89:11 92:12 97:18 105:20 110:15 118:10 133:12 141:11 148:11 152:24 155:3 156:5 161:23 163:18 <b>fives</b> 26:17 <b>fix</b> 157:21</p>	<p><b>fixed</b> 9:19 13:25 31:4,17,20 <b>fixing</b> 39:20 41:14 <b>flame</b> 46:12 49:2 50:18 54:12 56:16 57:1,16 83:10 120:14 131:3 <b>flames</b> 51:24 <b>flaming</b> 120:7,12 120:16 121:20 127:20 131:20 <b>flammability</b> 56:7 <b>flammable</b> 23:14 83:1 85:8,23 124:12 <b>flashing</b> 16:13 <b>flats</b> 11:6 19:16 <b>flexibility</b> 108:9 <b>floor</b> 21:10 30:14 33:11 42:2,19 44:19 48:1,17 55:25 59:18 64:7 64:8 70:20 76:9 77:8 80:14 82:14 89:5,24 92:4 93:2 97:11 98:7 102:24 105:14 106:5 110:3 112:18 113:18 114:13 115:2 116:6 118:5 119:2 133:5 135:20 141:5 142:11 148:5,23 152:17 153:12 158:21 161:9 162:23 <b>flue</b> 28:5 <b>fluid</b> 11:7 14:12 <b>fm</b> 73:22 86:17 <b>foam</b> 9:6 62:22 65:24,25 66:2,3,9</p>
--	---	---	--

[foam - go]

67:14 69:15 71:2 71:8,13 72:1,3 73:7,8,9 75:2 78:25 120:9 121:1 <b>foams</b> 71:22 <b>focus</b> 96:5,6 <b>focused</b> 7:17 <b>folks</b> 124:2 126:17 <b>follow</b> 15:7 57:14 58:1 156:22 161:6 161:9,11 162:18 162:23 163:10,13 163:23 <b>followed</b> 16:11,24 <b>following</b> 7:25 8:20 16:8 17:14 85:19 101:3 102:4 <b>follows</b> 86:4 <b>fool's</b> 151:6 <b>foot</b> 22:7,15 <b>forces</b> 107:8 <b>forcibly</b> 46:9 <b>foregoing</b> 165:3 165:14 <b>forever</b> 38:19 <b>form</b> 85:5,20 <b>formed</b> 136:10 <b>former</b> 123:24 <b>forms</b> 71:15 <b>formula</b> 90:15 <b>forth</b> 26:25 49:25 <b>forward</b> 27:8 47:13 114:18 129:6 140:23 <b>found</b> 20:10,16 25:16 31:18 32:2 44:4 61:19 62:2 68:22 81:21 82:4 92:7,9 111:24 112:7 127:19 134:25 135:8	<b>four</b> 16:11,12 54:18 63:16 66:21 68:1 72:9 78:14 84:7 87:16 103:11 113:13 118:22 123:20 127:4 130:8,20 132:2 135:13 137:16,20 141:17 142:6 145:11 155:14 161:4 162:11 <b>frable</b> 158:12 <b>franklin</b> 2:8 11:2,3 11:5,16 19:15 20:5,8 23:25 30:1 <b>frankly</b> 151:5 <b>free</b> 146:23 <b>frequency</b> 149:10 150:11,12 155:3,3 156:6 161:22 <b>frequent</b> 22:2 <b>frequently</b> 127:17 <b>friend</b> 125:14 <b>front</b> 36:14 86:23 <b>ft</b> 59:6,6 <b>ft4</b> 51:23 <b>fuel</b> 11:9 13:12 <b>full</b> 66:24 109:9 <b>fully</b> 44:9 66:18 67:21 69:3 78:9 104:9 <b>fumes</b> 23:16,18 <b>fundamentals</b> 11:13 <b>furnace</b> 20:25 21:21,24 22:1,19 24:22 25:20 28:4 30:9,9 <b>furnaces</b> 11:10 19:13 20:9,12 21:6 23:9 24:3,25	25:1 <b>furnishings</b> 49:22 <b>further</b> 5:13 6:3 26:8 29:23 30:24 40:1 41:7,20,24 47:20,23 58:21 67:11 76:2 80:6 88:5,13 91:22 97:6,9 104:15 109:20 110:19 115:23 117:23 118:2 120:5 132:19 136:8 140:24 144:18 147:23 152:9,13 156:3 158:15 162:17 165:6 <b>furthermore</b> 24:15 132:25 <b>future</b> 45:3 114:21 <b>g</b> <b>g</b> 8:24 <b>gain</b> 72:3 <b>gallagher</b> 5:16 <b>game</b> 140:2 <b>garters</b> 28:3 <b>gas</b> 11:7,9 13:10 13:17 131:20 <b>gasses</b> 13:18 124:12 127:24 <b>gbh</b> 33:8,18 38:9 41:8 42:15,24 46:23 48:14,23 54:25 57:25 68:7 79:7 82:10,20 87:12 88:21 89:21 90:5 92:24 96:12 98:5 101:25 104:2 106:2,11 109:7 <b>geek</b> 93:10 94:9	<b>geeks</b> 96:17 <b>geeky</b> 109:16 <b>general</b> 10:16 65:1 <b>generally</b> 57:15 <b>generated</b> 16:22 54:2 <b>generation</b> 49:11 49:13 <b>generic</b> 65:21 77:24 <b>gentleman</b> 41:11 69:17 <b>gentlemen</b> 5:8 119:9 121:7 <b>gerard</b> 2:12 8:23 8:24 9:8 31:6,16 36:6 41:24 45:7 45:10 46:17 47:23 51:13 56:4 58:25 <b>getting</b> 152:1 <b>give</b> 19:2 60:10 62:19 68:16 89:17 89:17 92:11,20 97:24 105:9 117:22 <b>given</b> 7:10,16 8:14 52:13 <b>gives</b> 43:4 87:19 128:4 <b>giving</b> 75:20 <b>global</b> 73:22 86:17 119:14 <b>globally</b> 95:10 <b>go</b> 5:13 14:19 15:20 23:15 29:3 30:25 38:18 52:6 56:21 58:12 60:8 60:12 73:20 83:13 84:14 87:18,18 88:18 90:21 110:25 111:3
---	---	---	---

[go - hirschler]

<p>116:6,16 117:3 128:12 130:3 140:8 141:3 <b>goal</b> 65:4 70:14 <b>goes</b> 6:13 9:25 37:6 154:24 <b>going</b> 10:11 14:19 28:11,12 34:23 38:17,23 40:6 46:16 59:1 63:7 73:11 79:9 90:21 91:17 96:19 102:13 115:2,6,6 125:7 126:12 129:5,12,14 130:5 130:18 131:4 133:2 139:10 140:23 149:18 <b>golinveaux</b> 2:3 5:7 5:9 8:9,12 9:8,12 9:21 10:7,11,23 11:2,16,20 14:14 14:18 <b>good</b> 5:7 26:15 64:24,25 65:18,18 70:13,18 78:20 112:14 119:8 125:14 129:16 133:22 136:17 140:16,20 147:16 164:8 <b>gotten</b> 138:3 <b>govern</b> 75:23 <b>governing</b> 20:15 31:25 61:25 75:24 82:2 112:5 135:7 <b>government</b> 5:21 <b>governs</b> 55:3 <b>great</b> 116:25 <b>greater</b> 121:23</p>	<p><b>greatest</b> 114:4 <b>green</b> 14:23 15:10 <b>grenfell</b> 64:19 <b>grid</b> 116:17,18 <b>ground</b> 144:6 154:25 <b>group</b> 66:19,21 70:23 93:10 103:15 133:3 136:10,12 139:11 <b>groups</b> 51:17 53:19 138:20 156:10 <b>gruenberg</b> 20:25 <b>guess</b> 30:1 64:5 <b>guidance</b> 7:7 66:19 67:2 107:10 <b>guide</b> 40:6 44:25 74:18 <b>guided</b> 7:11 <b>guidelines</b> 22:5 <b>guideway</b> 9:19 13:25 31:4,17,20</p>	<p><b>happy</b> 96:24 157:9 <b>harlow</b> 1:24 165:3 165:25 <b>harmonize</b> 52:20 <b>harold</b> 40:20 <b>harvey</b> 3:5 9:14 81:5,16,19 82:6 84:17,20 86:12 88:6,8,16,24 89:1 91:1,3,8,25 92:1 95:4,6 96:7 97:8,9 100:22,24 104:16 104:18 105:12 107:25 108:2 109:1,21,23 <b>hasn't</b> 77:21 <b>haven</b> 12:19 <b>haven't</b> 50:20 <b>hazard</b> 11:12 50:5 50:7,9,18 53:2 55:15 59:14 128:17 <b>hazardous</b> 13:14 <b>hazards</b> 52:4 <b>heads</b> 157:19 <b>health</b> 12:21 <b>healthcare</b> 134:6 138:13,14 140:13 143:9,18 144:15 144:16,24 145:16 146:16 150:23 151:11 154:1 157:2,18,20 <b>hear</b> 16:14 18:3 119:21 <b>heard</b> 34:22,25 58:1,11 79:2 125:14 131:5,5 150:24 156:7 157:3,6 163:12</p>	<p><b>heat</b> 23:10 53:22 54:1,2 99:5 <b>heat.'</b> 85:8,23 <b>heaters</b> 11:7 14:12 <b>heavier</b> 21:8 22:11 27:1 <b>heavily</b> 56:1 102:25 143:12 <b>heavy</b> 27:23 <b>heighten</b> 56:7 <b>heightened</b> 59:9 59:12 <b>held</b> 66:21 <b>hell</b> 47:4 <b>hello</b> 20:22 74:14 79:24 147:2 <b>help</b> 16:25 41:3 74:19 131:7 <b>he's</b> 10:5 11:8 12:11,14 13:2,6,19 151:19,20,21,25 151:25 152:1 <b>hi</b> 142:7 <b>high</b> 23:8 107:2 120:17 124:17 128:3 129:14 131:2 <b>higher</b> 22:10,18 23:3,9 107:2 <b>highlight</b> 130:10 <b>highway</b> 9:18 81:3 81:20 108:8 <b>highways</b> 81:24 <b>hirschler</b> 2:14 33:8,8,18,18,23 34:1 35:17 36:17 37:5,18 38:9,9 41:8,8 42:15,15,24 42:24 45:18 46:23 46:23 48:14,14,22 48:23 50:14 51:17</p>
	<p><b>h</b></p>		
	<p><b>half</b> 155:17 156:8 <b>hall</b> 4:19 146:6,6 <b>hand</b> 93:18 159:21 160:5,8 <b>handbook</b> 24:20 <b>handle</b> 136:9 <b>handled</b> 113:12 114:16 <b>handling</b> 112:25 <b>hands</b> 159:21 <b>hanging</b> 7:17 8:4 <b>happen</b> 38:25 93:18 114:8 <b>happened</b> 64:19 <b>happens</b> 29:14 44:1</p>		

[hirschler - inconsistency]

53:1,11 54:25,25 56:2 57:24,25 58:25 68:7,7 71:7 79:7,7 82:10,10,19 82:20 84:4,21,22 84:25 85:11 87:10 87:12,12 88:9,17 88:19,20,21 89:17 89:20,21 90:4,5 92:20,23,24 93:8 94:22 96:12,12 97:24 98:2,4,5,13 100:6,25 101:25 101:25 104:2,2 106:1,2,10,11 108:3 109:6,7 <b>hirschler's</b> 56:9 <b>hirschler's</b> 36:7 101:2 108:5,24 <b>historically</b> 53:3 <b>history</b> 52:6 56:4 158:8 <b>hmm</b> 81:19 91:3 <b>hofmeister</b> 14:2 <b>hold</b> 21:9 60:5,8 60:11 63:4 73:14 92:10 114:24 159:3,21 <b>holds</b> 25:25 <b>home</b> 10:11 120:21 <b>honor</b> 117:13 <b>hope</b> 156:21 <b>hopes</b> 114:20 <b>hopper</b> 3:14 122:10,10 <b>hoses</b> 122:23,23 <b>hospital</b> 140:13 <b>hospitals</b> 143:11 145:7 149:13 150:22 154:2	156:13 157:7,8,17 <b>hotly</b> 51:14 <b>hour</b> 109:25 119:23 123:8 155:17 156:7 <b>hours</b> 106:15,18 107:18,19 109:11 109:18 121:19,23 131:3 <b>howard</b> 3:14 122:10,10 <b>huge</b> 128:17 <b>hughes</b> 8:25 70:19 70:21 78:21 <b>hundred</b> 22:15 27:17 <b>hung</b> 144:1 <b>hydrogen</b> 13:16 <b>i</b> <b>ibc</b> 58:6 <b>idea</b> 56:5 69:9 117:15 <b>identical</b> 69:9 79:10,13 85:24 102:9 104:20 <b>identifiable</b> 42:19 47:21 48:2,17 58:22 59:18 63:1 64:8 76:3,10 77:5 77:8 80:7,15 89:24 91:24 92:4 93:2 97:7,12 142:9,11 147:24 148:5,23 152:10 152:17 156:22 161:20,24 <b>identified</b> 19:20 31:11 32:11,24 36:11,23 37:20 52:1 61:6 81:10 81:15 111:12	<b>identifier</b> 46:1 <b>identifies</b> 46:2 <b>identify</b> 14:25 54:11 137:11 138:3 139:14 140:1,18 <b>idiot</b> 109:16 <b>iec</b> 75:23 <b>ieee</b> 49:3 51:23 114:9 116:4 <b>ieee's</b> 113:4 <b>ifc</b> 114:9 <b>ignite</b> 82:25 83:21 85:7,22 90:15 <b>ignition</b> 23:14 <b>ignore</b> 87:22 <b>ignored</b> 41:15 <b>ignoring</b> 113:14 <b>illinois</b> 6:14 111:8 <b>illogical</b> 130:18 <b>immediate</b> 5:16 <b>immediately</b> 122:21 <b>impact</b> 71:24 123:4 134:14 <b>impacted</b> 122:5 <b>impacting</b> 53:24 <b>impacts</b> 147:8 <b>implore</b> 130:6 <b>imply</b> 71:17 <b>importance</b> 64:16 126:9 <b>important</b> 17:5 50:4 56:3 73:2 74:6 103:19 116:14 124:1 126:16 <b>importantly</b> 117:19 <b>impossible</b> 28:6	<b>impractical</b> 120:22 130:17 <b>improve</b> 107:3 108:20 <b>improving</b> 5:22 <b>inappropriate</b> 36:2 37:25 113:23 113:24 <b>inch</b> 21:7 27:1,9 <b>inches</b> 22:12 <b>incident</b> 12:6 <b>incidents</b> 116:20 <b>include</b> 18:6 43:7 90:22 96:25 122:2 128:24,25 <b>included</b> 19:21 31:12 39:5 43:25 44:1,7 54:16 61:7 67:18 70:25 81:12 102:15,15 104:12 111:14 113:25 149:9 <b>includes</b> 86:22 119:13 122:15,17 <b>including</b> 7:21 17:25 37:6 38:19 45:16 49:21 67:19 83:6,6 90:19 97:2 <b>inclusion</b> 96:5 105:7 <b>incompatibilities</b> 140:1 <b>incompatibility</b> 139:5,12,19 145:18 <b>incomplete</b> 43:12 91:18 <b>inconsistencies</b> 65:2 70:12,15 <b>inconsistency</b> 65:5 77:20 88:9,14,22
---	---	--	---



[inconsistent - international]

<p><b>inconsistent</b> 83:15 84:12 86:1 88:1,2 99:12 <b>incorporated</b> 10:3 14:10 19:15 62:21 76:24 <b>increase</b> 50:7 107:1 <b>increases</b> 50:8 <b>independent</b> 75:17 75:24 <b>indeterminate</b> 24:18 30:7 <b>indicate</b> 62:25 <b>indicated</b> 20:2 87:1 127:10 138:1 145:18 150:9 <b>indication</b> 19:25 60:11 <b>individual</b> 32:9,22 68:12,12,23 96:18 <b>individuals</b> 8:21 <b>indoor</b> 120:19 124:15 <b>indoors</b> 127:22 <b>industrial</b> 13:15 13:18 <b>industries</b> 154:4 <b>industry</b> 5:20 6:24 7:1 37:1 38:3 40:4 56:24 131:22 136:13 143:18 145:16 <b>ineffective</b> 22:16 <b>inevitably</b> 50:8 75:20 <b>info</b> 41:13 <b>information</b> 19:18 20:17 31:9 32:3 34:5,9,24 35:2,3 36:2 37:7,19 38:2</p>	<p>38:12,23,24 40:19 41:15,16 43:23 47:11,13 61:4 62:3 66:7 69:17 70:25 77:22 81:9 82:5 86:8,8 94:23 107:11,15 111:11 112:8 134:11,20 135:9 156:20 <b>informational</b> 36:7 37:11 39:13 41:2 99:19 <b>informed</b> 63:6 <b>inherently</b> 127:23 <b>initial</b> 16:10 <b>initiating</b> 147:5 <b>injured</b> 29:12 <b>injuries</b> 29:11 117:17 <b>innovation</b> 121:9 127:9 128:1 131:7 <b>innovative</b> 120:23 125:3 129:18 <b>input</b> 26:25 39:2 47:16 50:11 69:21 70:11 142:18 <b>inputs</b> 124:25 <b>inserted</b> 85:25 <b>insisting</b> 109:17 <b>insomuch</b> 37:10 <b>inspect</b> 151:4 155:6 <b>inspected</b> 149:15 <b>inspecting</b> 151:6 <b>inspection</b> 134:3 134:24 135:3 136:5 144:5,20 146:11 150:14 151:21 153:22 154:15,24,25 155:2,5,24 156:5</p>	<p>156:17 161:21 <b>inspection.'</b> 155:25 <b>inspector</b> 144:4 149:19 <b>inspectors</b> 144:19 <b>install</b> 119:24 130:14 <b>installation</b> 7:5 27:6 44:6 46:2,13 49:12,15 53:2,4,9 59:3,5 112:1 124:17 125:10 130:16 136:6,7 139:21 145:25 146:2 <b>installations</b> 117:21 155:1 <b>installed</b> 28:24 50:16 64:22 120:10,18 121:17 124:21 127:25 128:19 130:20 139:21 <b>institute</b> 12:2 112:15,24 120:5 <b>instructions</b> 16:24 44:7 46:3 <b>insulating</b> 22:21 27:4 <b>insulation</b> 22:9,12 22:22 35:11 55:5 62:22 66:3,4,9 67:15,19,23 73:6,7 73:8,10,12,13,14 73:15 74:8 78:12 145:1 <b>insulation's</b> 39:23 <b>insult</b> 90:23 <b>intact</b> 21:22</p>	<p><b>integral</b> 17:5 <b>integrating</b> 124:21 <b>integrity</b> 45:22,24 <b>intended</b> 24:17 36:13 56:16 106:23 <b>intent</b> 36:17 37:11 59:2 88:13 101:18 108:9 147:20 <b>intention</b> 29:1 <b>intentionally</b> 137:6 <b>inter</b> 71:22 <b>interchangeable</b> 75:19 <b>interest</b> 39:1 47:14 164:5 <b>interested</b> 5:21 63:19 138:2 140:6 140:15 146:22 165:8 <b>interesting</b> 41:10 46:25 <b>interests</b> 116:24 <b>interior</b> 22:8 54:5 <b>intermediate</b> 74:10 <b>intermix</b> 79:2 <b>internal</b> 7:21 <b>international</b> 33:9 33:19 38:10 41:9 42:16,25 46:24 48:15,23 55:1 57:25 58:6 68:8 79:8 82:11,20 87:13 88:21 89:21 90:5 92:24 95:8,9 95:11 96:13,23 98:5 102:1 103:2 104:3,9 106:2,11 109:7 122:11</p>
---	---	--	---

[international - judgment]

126:2,4,7 131:10 <b>internationally</b> 105:3 <b>interpret</b> 34:18 144:25 <b>interpretation</b> 37:14 52:11,17 <b>intertek</b> 60:25 75:15,16 103:13 <b>introduce</b> 5:14 133:16 <b>introduced</b> 16:2 24:6 133:23 <b>introduces</b> 36:2 75:5 80:2 <b>introduction</b> 105:1 <b>investigator</b> 12:7 <b>involve</b> 67:13 <b>involved</b> 70:23 103:14 <b>involves</b> 36:15 67:15 108:14 <b>involving</b> 128:21 <b>ir</b> 12:11 127:15 <b>irrespective</b> 90:18 <b>island</b> 134:18 <b>isn't</b> 60:6 154:8 <b>iso</b> 67:19 75:23 83:23 93:12,18 <b>issuance</b> 7:13 17:11,24 <b>issue</b> 37:19 45:10 51:4 55:13 56:1 82:21 90:24 113:16 114:3 132:16 135:25 136:7 137:24 138:21 139:6,12 142:22 143:2,7,12 143:17,20 144:6	145:17,22,22 150:13 156:5 157:23,24 159:10 <b>issue.</b> 154:9 <b>issues</b> 55:12 57:10 64:19 74:3 115:11 138:19 139:13,18 159:19 160:2 <b>issuing</b> 18:4 <b>item</b> 77:4 145:14 145:18 155:19 <b>items</b> 142:23,24,24 143:17 144:20 <b>itm</b> 155:4 <b>itself.</b> 151:25 <b>it'll</b> 163:4 <b>it's</b> 10:11 14:20 23:10,17 28:19 30:5 34:5 38:16 38:16 41:9 43:19 44:1 46:25 47:2 63:21 64:16 66:1 66:1,5 69:12,12,21 70:12 73:1 74:5 79:12 90:18 91:5 91:5 92:11,11 94:5 96:22 98:3 98:20 99:12 104:10 108:16 115:1,2,18 117:20 123:2 124:1,10 125:16 127:9 128:3,9 129:13,14 130:24 136:16,21 139:6,13,13,20,25 140:1,19 145:2,3 147:16 149:5,8,9,9 149:11,11 151:24 152:3 154:7 156:4 159:12 163:20	<b>i'd</b> 28:20 79:3 95:6 109:23 116:6 153:9 <b>i'll</b> 15:22 19:2 30:1 46:18 60:10 79:5 79:14 86:15 88:18 88:18 91:12 96:6 123:19 133:3 158:12 <b>i'm</b> 14:19 25:12 26:13,17 28:15,15 28:16,18 32:19 33:19,23,24 34:1 39:2 40:12,23 43:1 46:18 57:8 59:1 62:16,20,24 63:2,21 70:19,20 70:22 71:25 73:11 74:15,16 75:15 78:21 79:8 82:15 86:18 90:8,21 93:9 94:9 96:16 98:2 102:1 109:17 115:2 117:6,10 122:11 123:21 125:7 128:15,15 129:22 131:13,15 132:8,10,12,12 133:2,23 135:16 136:21 138:13 139:2,3,4,6,6 142:7 143:6 151:18 152:21 <b>i've</b> 26:19 143:7,8 158:6	<b>james</b> 2:3,15 3:7 5:7,9 6:13,15,17 7:10 8:9,10,12 9:8 9:12,21 10:7,11,23 11:2,16,20 14:14 14:18 16:1 39:9,9 44:17,17 55:23,24 102:23,23 111:7 111:22 115:5 118:2 121:14 132:23 <b>james'</b> 7:15 <b>january</b> 7:4 <b>jensen</b> 8:24 70:19 70:21 78:21 <b>jim</b> 4:7 41:10 138:11,11 144:13 144:13 148:19,19 149:4 153:8,8,17 <b>job</b> 116:25 125:22 <b>jobs</b> 119:19 <b>john</b> 2:9,21 10:13 10:13,15,23 20:21 20:22,22 21:3,15 23:6 25:8,8,14 28:15,16 62:16,20 62:20 63:3,5,9,11 63:13 64:3,3,14 65:23 69:25,25 70:5 76:23,23 77:3,14 <b>johnson</b> 139:3 147:11 151:15 <b>johnston</b> 113:2 <b>join</b> 6:4 8:9 10:1,9 10:13 11:3 <b>joiner</b> 12:25 <b>jr</b> 19:15 <b>judgment</b> 71:16 74:20,21 75:6,7,9 75:10 129:12
		<b>j</b> <b>j</b> 12:10 14:9 <b>jablkowski</b> 2:11 26:15,16 27:22 <b>jackets</b> 35:11	

[judgments - light]

<b>judgments</b> 64:20 65:16 66:16,20 80:3 <b>june</b> 1:4 5:5 17:13 165:18 <b>jurisdiction</b> 74:22 108:10 <b>justification</b> 85:13 101:4 <b>justified</b> 153:23 <b>justifies</b> 77:23	163:21 164:1 <b>kevin</b> 2:17 4:19 40:11,11,16,18 57:7,8,13 146:6,6 <b>key</b> 18:22 124:8 <b>kilowatt</b> 119:23 121:19,23 123:8 131:3 <b>kind</b> 123:7 139:22 <b>know</b> 5:18 23:14 25:9,23 28:14,22 29:2,3,13,13 34:25 38:14 39:19 44:23 44:23 47:4,12,17 50:20 56:5 62:17 68:21 69:6,12,20 71:22 74:5 75:17 77:21,25 90:18 92:10 96:17 100:19 103:14 111:20 125:7 126:12 129:13,15 131:12,23,25 132:24,24 133:2,2 137:10,12 138:6 138:18 140:3 144:21 157:22 162:15 <b>knowledge</b> 65:14 138:5 <b>known</b> 74:25 112:16 124:11 <b>koffel</b> 4:5 137:21 137:21,21 139:10 140:15 141:18,18 141:18 142:8 145:12,12,12 146:9 147:21 155:15,15,15 161:5,5,5,19 162:12,12,12	<b>l</b> <b>laboratories</b> 14:5 75:18,21,24 117:11 123:22 136:10 <b>laboratory</b> 120:3 <b>labs</b> 124:19 <b>ladders</b> 155:1,2,4 <b>ladies</b> 5:8 119:9 121:7 <b>lakeside</b> 13:4 <b>language</b> 27:1 36:1,8,11,18 67:1 67:8,13,22 73:2,5 73:12,16 74:18 78:10 79:19 84:23 85:1,14,14 86:7 90:23 95:15 100:7 101:7,10,19 102:3 102:3 107:5,6 108:12,20 109:12 124:1,4,5,13,22 125:8 138:23 139:8 142:17 143:10,25 144:2,4 145:23,24 146:1,1 147:14,16 162:3,4 <b>large</b> 74:4 119:19 124:23 125:20 128:18 <b>largely</b> 113:14 <b>larger</b> 19:24 <b>lastly</b> 128:8 156:20 <b>late</b> 69:21 114:1 <b>laundry</b> 38:20 <b>lawrenson</b> 9:25 10:2 <b>laws</b> 165:12 <b>layup</b> 9:4	<b>lead</b> 37:7 <b>leader</b> 103:15 <b>leadership</b> 20:5 61:12 <b>leads</b> 34:17 84:10 <b>learn</b> 114:20 <b>leave</b> 16:15 96:6 103:6 132:6,14 <b>leaving</b> 72:10 <b>left</b> 5:14,16 24:22 <b>lennon</b> 4:16 142:7 142:7,16 144:18 145:18 146:20 <b>letter</b> 20:13 31:22 61:24 81:25 112:3 135:5 <b>letting</b> 138:6 <b>let's</b> 9:12 14:14 18:11 19:11 20:19 32:5 33:6 42:13 48:11 60:8,12 62:5 63:25 76:20 76:20 82:7 89:14 92:17 97:22 110:21,25 111:3 112:11 118:4,21 135:11 140:8 148:17 153:25 154:7 157:25,25 <b>level</b> 52:4 59:8,12 59:14 <b>leverage</b> 109:9 <b>lfp</b> 120:5 <b>life</b> 7:2,8 13:15 73:17 79:20 122:12 123:16 128:24 143:15 145:6 <b>lifts</b> 155:1,2,5 <b>light</b> 26:22 91:3 115:5 116:12
<b>k</b>			
<b>katherine</b> 13:23 13:24 40:19 <b>keep</b> 15:20 28:20 51:9 55:9 87:18 96:1 121:9 129:6 129:7 131:18 <b>keeps</b> 59:1 <b>ken</b> 134:23 <b>kenneth</b> 4:1 133:16,22,23 135:11,15,19,23 136:23 137:17 138:9,25 140:10 140:24 141:3,22 142:10,14 143:22 144:9 145:10 146:4,13,25 147:9 147:23 148:3,22 149:2 150:1,17 151:13 152:9,15 153:7,11,15 154:11 155:10 156:24 157:14 158:3,15,19 159:3 159:7,9,13,16,19 159:24 160:2,4,7 160:16 161:8,14 161:17 162:1,7,17 162:21 163:4,7,12			

[lighting - marcelo]

<b>lighting</b> 127:15 <b>lights</b> 16:13 <b>limit</b> 66:11 <b>limited</b> 18:20 38:20 81:24 93:16 93:23 94:1,25 <b>limiting</b> 78:1 <b>limits</b> 155:5 <b>lindberg</b> 20:25 <b>line</b> 22:8 67:5 113:6,8 150:4 161:21 163:10 <b>linings</b> 22:14,22 28:1 <b>list</b> 36:11,14 37:22 37:23 38:25 39:4 43:8,10,11,22,25 44:3,11 45:11,18 46:25 47:1,11 65:24 90:21 <b>listed</b> 56:23,23 104:25 127:22 <b>listing</b> 45:23 104:24,25 <b>lists</b> 38:20 45:19 <b>little</b> 15:20,21 19:24 40:1 41:3 52:6 57:20 87:14 111:20 123:15 130:3 156:2 <b>live</b> 5:7 14:21 <b>lives</b> 114:6 <b>llc</b> 12:25 13:4 <b>load</b> 27:16 113:7 145:3 <b>loading</b> 158:10 <b>loads</b> 144:1 <b>locate</b> 20:1 <b>located</b> 19:17 31:8 61:3 81:8 111:10 134:20	<b>location</b> 85:12 <b>locke</b> 40:20 <b>lockers</b> 49:24 <b>log</b> 18:21 <b>logical</b> 113:9 <b>long</b> 16:11,21 28:19 107:23 147:13 <b>longstanding</b> 50:23 <b>look</b> 43:24 56:4 124:12 125:9 138:20 144:20,25 145:20 146:22 153:25 <b>looked</b> 149:21 151:18 <b>looking</b> 25:16 28:14 42:10 58:8 58:10 124:13 131:23 147:18 150:13 <b>loophole</b> 46:7 <b>lose</b> 46:18 83:10 83:10 <b>loss</b> 5:22 158:8 <b>lot</b> 35:2 74:7 79:2 96:17 103:5,5 115:9 116:23 131:21 136:15 143:11 145:7 <b>loudest</b> 113:25 <b>low</b> 34:11 36:9,21 37:9 <b>lower</b> 100:4 106:20 107:4,9,9 107:11 <b>lowered</b> 106:21 <b>lowering</b> 107:5 <b>luck</b> 124:7	<b>luis</b> 10:3 14:10 <b>lunaire</b> 21:1 <hr/> <b>m</b> <hr/> <b>m</b> 20:25 <b>macdonald</b> 81:5 <b>machines</b> 159:20 <b>main</b> 29:6 86:5 <b>maine</b> 13:5 <b>maintain</b> 101:19 129:17 <b>maintained</b> 149:11 151:3,7 <b>maintenance</b> 132:15 134:4,24 135:3 136:6 153:23 <b>majority</b> 17:9 36:24 113:17 119:20 137:25 <b>maker</b> 32:11,24 33:23 39:1 62:8 92:25 98:5 118:15 141:24 160:18,24 <b>makers</b> 14:22 <b>making</b> 22:15 66:10 113:1,13 114:5 122:19 <b>male</b> 2:20 21:12 26:11 32:18 42:21 48:19 60:1,3,6 64:11 77:11 93:5 98:9 110:11 112:20 115:25 119:4,5 135:22 141:21 142:13 148:25 153:6,14 159:8,12,17 163:5 163:8,19,24 <b>mammarella</b> 32:7 <b>management</b> 12:6 13:8	<b>managing</b> 116:25 <b>mandates</b> 27:11 <b>mandatory</b> 67:2 69:1 78:10 <b>manhattan</b> 111:8 <b>manhattans</b> 6:14 <b>manner</b> 124:21 147:8 <b>manufacturer</b> 62:22 67:17,18 69:8,8,10 71:2 72:1,4 77:25 119:16 <b>manufacturers</b> 70:9 75:2 77:1,19 136:13 <b>manufacturer's</b> 66:5,11 69:10 71:5,6,17,19 <b>manufactures</b> 119:22 <b>manufacturing</b> 37:1 119:18 <b>marcel</b> 50:14 <b>marcela</b> 41:8,8 <b>marcelo</b> 2:14 33:8 33:8,18,18,23 34:1 35:17 38:9,9 42:15,15,24,24 46:23,23 48:14,14 48:22,22 54:25,25 57:24,24 68:7,7 79:7,7 82:10,10,19 82:19 84:4 87:1,8 87:10,12,12 88:17 88:20,20 89:17,20 89:21 90:4,4 92:20,23,24 93:8 94:22 95:21 96:12 96:12 97:24 98:2 98:4,4,13 100:6
--	--	--	---

[marcelo - minor]

101:25,25 103:14 104:2,2 106:1,1,10 106:11 109:6,6 <b>marketplace</b> 6:25 <b>martin</b> 10:2 14:9,9 14:11 <b>mary</b> 1:24 165:3 165:25 <b>maryland</b> 8:25 10:16 <b>masonry</b> 28:4 <b>mass</b> 71:22 83:10 <b>match</b> 29:20 <b>material</b> 27:12 35:24 37:12 38:21 49:25 68:17 69:7 69:8,10,11 82:24 82:24 83:4,7,21 84:24 85:5,17,18 85:18,20,20 86:7 86:24 90:11,14 93:19 137:6 <b>materials</b> 22:22 23:12,17 25:18 27:4 65:8,9,10 68:12,17,24 69:16 70:8 77:24 90:16 90:22 93:16,19,20 93:24 94:1,2,8,16 94:23,25 95:1 96:20 97:2 139:14 139:16 144:1 <b>mats</b> 77:18 <b>matt</b> 126:11 <b>matter</b> 130:3 <b>matthew</b> 3:11 117:10,10 123:21 123:21 125:12 131:5 <b>mature</b> 105:8	<b>mcdonald</b> 10:13 10:15 <b>mean</b> 21:8 38:20 38:22 43:9,17 45:1 47:10 147:16 <b>meaning</b> 106:19 107:18 <b>means</b> 43:19,20,22 52:3 54:15 83:12 94:24 106:17 157:19 <b>meant</b> 131:18 <b>measure</b> 99:22 <b>measures</b> 54:15 64:17 <b>medical</b> 12:22 13:18 <b>medicine</b> 9:17 12:19 <b>meet</b> 18:3 49:1,8 56:11,13,25 120:18 121:17 124:15 126:14,25 128:3 <b>meeting</b> 1:2 5:3,9 5:12 14:21 15:22 15:25 17:2,4,12,15 17:16,22,25 18:2 19:20 24:9 31:11 57:19 61:6 66:25 66:25 81:11 111:14 113:16 138:15 144:17 164:4,6,7,11 <b>meetings</b> 28:1 66:22 69:18,19 70:10,11 132:25 <b>member</b> 6:10 7:20 8:15 14:12 18:13 18:18 26:20 33:19 34:1 43:1 68:9	70:21 72:15 73:23 86:19 102:25 123:24 133:17 147:13 <b>members</b> 11:25 18:21 22:3 95:8 101:14 109:15 121:5 133:1 157:8 <b>membership</b> 7:4 17:7 72:8 73:18 76:7 80:11 91:19 103:20 133:19 140:7 <b>men</b> 114:4 <b>mention</b> 24:8 57:14 77:17,17,18 99:15 150:11 <b>mentioned</b> 57:20 73:13 74:2 77:15 140:15 146:20 <b>merchant</b> 9:6 10:5 13:2,6 14:4 <b>merely</b> 30:4 <b>merit</b> 123:13 <b>merrill</b> 74:15 79:25 <b>merton</b> 3:17 127:5 127:6,6 131:6 132:3,4,4,9,12 <b>met</b> 96:4 138:14 144:16 <b>metal</b> 22:8 <b>method</b> 61:21 99:7 <b>methods</b> 53:4 59:3 63:17 <b>mic</b> 28:12 <b>michael</b> 113:2 <b>michele</b> 5:14 <b>microphone</b> 14:23 15:5,9,13,16 25:6 26:13 28:10 32:10	38:8 39:7 40:9 41:7 42:14 44:15 46:22 48:12 54:24 55:21 57:5,22 68:6 69:23 70:16 72:13 73:21 74:13 75:12 76:21 78:19 79:6,15,22 82:9 86:16 87:11 89:15 91:12 92:18 96:11 101:24 102:21 103:10,25 105:25 109:5 111:21 112:13 115:25 116:1 117:9 118:22 122:9 123:20 125:25 127:3,10 128:12 129:2,20 130:8 131:9 132:2 135:13,15 137:20 138:9,25 140:10 141:17 142:6 144:12 145:10 146:4,13,25 147:9 148:18 150:20 151:13 153:5 155:13 156:24 157:14 158:3 161:4 162:10 <b>microphones</b> 15:10,11 28:13 32:23 <b>millimeters</b> 21:8 <b>mineral</b> 22:9 <b>minimal</b> 74:24 107:15 <b>minimum</b> 108:4 109:10,17 <b>minor</b> 149:5
---	--	--	--

[minute - move]

<b>minute</b> 23:4,5 27:21 35:16 50:13 65:22 84:3 88:19 89:18 94:21 100:5 107:13 108:15 110:21 114:11 120:20 125:11	<b>moot</b> 132:17 <b>motion</b> 14:22,24 14:25 15:1,2,4,7 15:11,12,19 20:21 21:2,3,10,14,16 25:4,6,13,15 26:8 26:18 28:9,17 29:23 30:14,14,16 30:18,23 32:6,8,10 32:11,13,14,16,17 32:21,23,24 33:1,2 33:4,5,7,10,17,22 33:24,24 34:3 36:7 38:5,7,10,24 39:12,13 40:8,15 40:16 41:9,20 42:2,2,5,7,12,14 42:16,18,23,25 43:2 44:19 45:17 46:20,22,25 47:1,2 47:20 48:1,1,4,6 48:10,16,21,24 49:6 54:21,23 55:1,10,25 57:4,12 57:14 58:1,21 59:17,17,20,22 60:15 62:7,9,10,12 62:14,19,24,25 63:7,18,24 64:1,6 64:8 68:3,5,8 70:4 70:5,20 71:2 72:8 72:20,22 73:3,23 74:11,16 75:1,5,11 75:15 76:2,9,9,13 76:15,17,21 77:2,3 77:3,7 78:7,17,19 78:22 79:4,8,10,18 80:1,1,6,14,14,18 80:20,23,24,24 82:11,13 84:16 85:13 86:11,13,15	86:18 87:13 88:5 89:4,4,7,8,13,15 89:23 90:6,8,14 91:4,4,5,10,12,14 91:23 92:3,3,6,8 92:15,15,15,18,25 93:1,7 94:5 96:8 96:10,13,22 97:4,6 97:11,11,14,16,20 97:20,20,23 98:7 98:12 101:20,22 101:24 102:1,24 103:9,13,24 104:15 105:13,14 105:16,18,21,24 106:4,9,12 108:19 109:2,4,8,20 110:3 110:3,6,7,17,17 112:17,22,24 114:24 115:1,20 115:22,23 116:5 117:5,12,14,24 118:4,4,7,9,12,13 118:14,14,15,16 118:18,20,22 119:1,7,10 122:7,9 122:11,13 123:14 123:17,23 126:4 127:7 128:11,17 129:1,4 130:10 131:14,16 132:1 132:11,13,20 133:5,5,8,9,13,13 133:14 135:12,19 135:24 137:18,20 137:22 138:7,13 138:16,23 139:4,7 140:8,14,25 141:5 141:5,7,9,13,14,15 141:17,20,22,24 141:24 142:2,4,5,6	142:8,10,15,19 143:18,21 144:10 144:12,15,18 145:8,13,23 146:8 146:16 147:3,12 147:22,24 148:4,5 148:8,9,13,14,15 148:18,22 149:3,5 149:7 150:18,20 150:23 151:12,16 152:8,10,16,17,20 152:22,25 153:2,3 153:5,11,16 154:10 155:11,13 155:16 156:21,22 157:3,12,18 158:2 158:6,16,20,21,23 158:25 160:10,11 160:12,16,18,19 160:21,23,25,25 161:2,6,8,9,11,11 161:18,19,24 162:8,10,13,18,22 162:23,23,25 163:10,14,15,16 163:20,22,23,23 <b>motions</b> 17:7 18:7 18:11 19:19,21 20:2 31:10,12,13 48:12 61:5,7 62:7 63:22 67:12 81:10 81:12 82:8 97:15 111:12,15 112:12 114:22 133:18,19 133:20 134:1,5,8 134:10,12 <b>mott</b> 81:5 <b>move</b> 15:1,1 18:10 30:25 32:17 33:5 33:9 42:16 48:15 60:16 62:14 67:8
---	--	--	---

[move - nfpa]

81:1,16 89:22 98:6 105:10 106:2 110:19,20 112:15 118:20,24 123:19 125:25 133:15 135:17 142:4 148:3,20 152:15 153:10 158:19 162:21 <b>moved</b> 102:18 <b>moving</b> 28:21 129:5 <b>mph</b> 20:25 <b>multiple</b> 11:15 66:23 98:19 <b>mutual</b> 136:14 <b>myers</b> 4:4 135:14 135:16,16,17,25	120:3 123:22 124:19 <b>nation's</b> 157:7 <b>natural</b> 6:14 54:1 111:8 <b>nature</b> 95:9 120:1 136:3 <b>near</b> 38:1 85:9 88:11 <b>nearby</b> 23:11 25:23 <b>nearest</b> 16:16,16 <b>nearly</b> 45:15 <b>nec</b> 34:8 44:5 49:11 55:8 58:4 58:12,14,17,18 113:6,8 <b>necessarily</b> 43:12 <b>necessary</b> 35:3 46:3 91:6,17 99:16 <b>need</b> 7:3 15:13 21:2,18 25:12 28:12 35:19,20 39:5,21 51:6,6 52:23 56:22 57:1 57:2 66:11 71:11 73:14 79:3 83:16 94:16 102:2 124:5 124:8 126:8 127:21 129:14 132:6,14 140:4 154:7 155:2 156:22 157:5 162:14 163:8,9,11 <b>needed</b> 7:1,7 70:13 107:16 <b>needing</b> 17:1 121:17 <b>needs</b> 50:9 72:4 78:25 96:4 99:15	116:21 125:21 137:13,13 149:22 155:23 <b>negative</b> 37:4 54:17 67:7 137:16 145:21 147:8 150:15 155:8 <b>neglected</b> 117:4 <b>neither</b> 34:16 41:12 <b>nesc</b> 113:7,12 114:17 117:18,19 <b>never</b> 69:19 124:22 <b>new</b> 7:11,16 11:6 12:12,19 13:11 19:16 20:23 31:7 31:7 35:8 50:3,9 50:10 67:1 70:24 81:6 100:8 102:7 102:16 105:10 120:22 121:10 125:3 126:9 137:2 137:12,15 140:5 149:7 154:14,15 155:7 <b>newark</b> 12:3 <b>newly</b> 78:8 <b>newport</b> 134:17 134:18 <b>nfpa</b> 1:2 5:3,9,16 5:18,24 6:2,6,23 7:5,15,16 8:18,19 9:9,15,22 10:12,24 11:17,24 16:5 17:7 18:7 19:18 19:20 20:11,15,17 20:21 21:4 22:5 24:1,6,12 26:19 29:20 30:25 31:3 31:9,10,11,20,25	32:3,13 33:1,9,19 33:19 34:2,8 38:10 40:19 41:4 41:9 42:16,25 43:1 46:24 48:12 48:15,23 49:19 51:25 52:25 53:9 53:14 55:1,3,3 56:5 57:9,25 58:5 58:7 59:4 60:10 60:17 61:4,4,6,20 62:1,3,7,7,10 63:6 64:16 66:17 68:8 68:9,10,13,15 70:25 71:5 74:19 79:8 81:9,9,11,23 82:2,5,8,11,20,22 83:6,6,6 84:5 85:3 85:4,15,15,16,25 86:2,2,21,21,22 87:4,13,15,16,17 87:17,17,17,20 88:2,21 89:21 90:5,13,19,20 92:24 93:16,23 94:3,24 95:7,13,14 95:16 96:13 98:5 98:19 99:6 102:1 102:8,12,25 104:3 104:9,11 106:2,11 108:6 109:7 110:20 111:11,11 111:13,25 112:5,8 112:12 113:14 114:2,9,14 115:18 118:16,17 121:15 122:15 130:2 133:19,19,21,25 134:20,21 135:2,7 135:9 136:5 138:6 139:5 141:22,24
<b>n</b>			
<b>n</b> 2:1 <b>name</b> 15:13,17 20:22 25:5,8 26:16 28:16 38:6 40:11 46:20 54:22 68:4 70:18 74:14 77:25 78:17,20 86:14 91:10 96:9 101:22 109:3 115:21 119:9 122:8 123:21 130:9 135:16 137:18 139:2 144:10 150:18 155:12 162:9 <b>name's</b> 39:9 55:23 57:7 128:14 <b>national</b> 11:9 49:8 49:9 56:11,13,22 58:4 72:17 79:17 91:15 113:3,4 115:10 117:11			

[nfpa - open]

142:1 144:19 145:23,24 146:9 147:13,21 155:19 160:17,18,20,23 160:25 161:1 164:2 <b>nfpa.org</b> 18:9 <b>nfpa's</b> 6:4,11 17:6 19:18 48:24 113:3 <b>niha</b> 46:10 <b>nine</b> 11:20 131:17 <b>nitmam</b> 108:25 151:17 <b>non</b> 65:10 67:2 78:10 147:7,18 <b>noncombustible</b> 49:20,22,25 51:1 53:5 59:4 82:24 83:4,8,13,14 84:9 84:24 85:17,18,20 86:6,23 87:5,15,20 90:12,19 93:12 <b>nonmetallic</b> 137:3 137:5,7 139:16,17 146:10 <b>normal</b> 154:24 <b>normally</b> 50:6 65:19 <b>norris</b> 3:5 9:14,23 81:5,19 84:20 88:8 89:1 91:3,8 92:1 95:6 97:9 100:24 104:18 108:2 109:23 <b>north</b> 13:23 14:3 26:17 103:3 <b>northwest</b> 117:11 123:22 <b>note</b> 38:11 39:13 44:3 47:6 134:12 156:1,14,15,16	164:6 <b>noted</b> 7:1 75:16 141:19 <b>notes</b> 40:6 44:25 <b>notice</b> 107:20 <b>notified</b> 62:10 118:16 141:24 160:18,25 <b>nsc</b> 114:17 <b>nuclear</b> 8:7 <b>nuisance</b> 127:16 <b>number</b> 18:20 21:11,17,23 22:5 23:2 24:7 26:14 38:8 39:7 40:9 41:7 42:14 44:15 46:22 48:13 54:24 55:2,9,13,21 57:5 57:22 58:11 63:11 68:6 69:23 70:16 72:12,13 74:12 75:12 76:21 78:19 79:6,15,23 82:9,12 86:16 87:11 89:15 91:12 92:18 95:13 95:20 96:11,16 97:7 101:24 102:21 103:10,25 105:25 109:5 112:13,13 116:1 117:9 118:22 121:5 123:20 125:25 127:3 128:13 129:2,20 130:8 131:9 132:2 133:10 135:13,15 136:12 137:20 138:9,25 140:10 141:17 142:6 144:12 145:10 146:4,13,25 147:9	148:6,18 150:20 151:13 153:5 155:13 156:24 157:14 158:3 161:4 162:10 <b>numerous</b> 103:2,6 119:13 121:5 139:19  <b>o</b>  <b>obispo</b> 10:3 14:10 <b>object</b> 117:2 <b>objecting</b> 85:11 108:3 <b>objection</b> 88:11 96:21,22 <b>observers</b> 66:22 <b>obtain</b> 15:3,3 71:9 <b>obviate</b> 127:20 <b>obviously</b> 15:10 35:7 40:23 146:17 <b>occupancies</b> 13:16 156:12 <b>occupancy</b> 16:20 <b>occupational</b> 12:21,23 <b>occurs</b> 21:25 <b>offer</b> 22:21 23:24 26:9 27:14 36:5 45:9 66:14 77:14 78:5 80:9 81:17 81:18 84:18 91:2 95:5 97:8 100:3 100:22 108:1 115:3 117:25 121:13 136:24 143:23 150:2 154:12 162:2 <b>offered</b> 27:10 134:13 <b>offers</b> 46:6	<b>officer</b> 15:23 16:3 133:18,25 161:10 <b>officers</b> 116:7 <b>officially</b> 164:3 <b>officials</b> 129:10,10 <b>oh</b> 23:3 25:14 26:13 39:9 42:10 55:7 59:7 60:2 62:18 63:13 111:19 116:1 132:12 160:15 <b>ohio</b> 62:22 <b>okay</b> 21:15 23:6 60:22 82:6 84:20 91:22 92:12 98:3 100:24 110:1 111:22 117:7 127:9,17 130:13 133:11 141:3,22 159:3,3,7,13,19,24 160:8,16,16 161:8 161:14 163:4,12 164:2 <b>old</b> 163:20 <b>olsen</b> 2:9 20:21,22 20:22 21:3,15 23:6 25:8,8,14 28:15,16 <b>omission</b> 50:15 <b>omits</b> 53:12 <b>once</b> 79:20 80:10 143:20 149:18 <b>onerous</b> 139:25 140:2 <b>ones</b> 99:4 <b>ongoing</b> 151:3 153:22 <b>on'</b> 146:17 <b>oops</b> 12:10 <b>open</b> 19:2,4 25:4 38:5 46:19 49:4
--	--	--	---



[open - people]

49:19,22 50:16,17 51:3 52:2,5 53:13 53:20,20,22 54:3,6 54:9,21 55:7,16 56:25 59:15 60:12 66:22 68:3 78:17 86:13 91:9 96:8 101:22 109:2 115:20 122:7 127:12 133:20 137:18 144:10 150:18 155:11 162:8 <b>opening</b> 117:14 <b>operate</b> 23:9 <b>operating</b> 23:2,17 131:19 <b>operation</b> 49:15 <b>operations</b> 122:16 122:24 <b>opinion</b> 36:24 38:2 <b>opportunities</b> 67:25 78:13 124:9 124:20 <b>opportunity</b> 58:23 125:5 <b>oppose</b> 72:8 91:5 <b>opposing</b> 113:25 <b>opposite</b> 120:25 <b>opposition</b> 51:18 55:25 69:7 70:19 73:23 78:21 88:23 102:24 <b>optical</b> 51:24 <b>option</b> 83:25 87:21 90:14 108:21 <b>options</b> 83:21 87:19 90:9,11,16 <b>order</b> 15:24 18:8 18:24 83:9 114:24 114:25 134:6,10	163:5,6 <b>organization</b> 16:5 72:17 <b>organizations</b> 65:14 114:8 <b>original</b> 39:1 52:8 57:16 63:15 <b>originally</b> 52:7 57:17 <b>osha's</b> 75:23 <b>outcome</b> 130:25 <b>outdoor</b> 122:2 124:17 <b>outdoors</b> 124:10 127:25 <b>outer</b> 22:9 <b>outlet</b> 122:19 <b>outside</b> 121:21 125:13 <b>outstanding</b> 6:2 <b>oven</b> 21:1,21 22:1 22:4,7,19 25:19 <b>ovens</b> 11:10 19:13 20:9,12 21:6,24 23:2,15 24:3 25:16,17,24 29:20 <b>overlapping</b> 60:7 <b>overlooked</b> 63:18 <b>overreaching</b> 123:7 <b>overruled</b> 113:19 113:21 <b>oversight</b> 120:8 121:7 <b>owens</b> 74:15 79:25 <b>owner</b> 136:8 137:4 137:9,12 138:18 <b>owners</b> 136:22 139:25 140:18 <b>owns</b> 74:3	<b>oxygen</b> 13:13 <b>p</b> <b>p</b> 2:1,1 12:25 <b>p.i.</b> 108:19 <b>pace</b> 3:11 117:10 117:10 121:9 123:21,21 125:12 131:5 <b>pacific</b> 117:11 123:22 <b>page</b> 19:18,25 20:17 31:9 32:3 61:4 62:3 81:9,15 92:7,9 97:15,17 111:11,17 112:8 134:20 135:9 <b>panels</b> 22:6 <b>paper</b> 143:10 146:20 <b>paragraph</b> 161:23 162:15 <b>parker</b> 2:23 70:18 70:19 78:20,21 <b>part</b> 5:11 42:19 47:21 48:2,17 55:10 58:22 59:18 63:1 64:8 65:18 76:3,10 77:5,8 80:7,15 85:12 89:24 91:24 92:4 93:2 94:5 96:21 96:22 97:7,12 100:14 102:10,10 102:14,15 116:9 142:9,11 143:4,6 147:25 148:5,23 152:11,18 156:23 161:20,24 <b>participants</b> 6:3 <b>participated</b> 69:18 69:19	<b>participation</b> 5:20 67:25 75:22 78:14 113:23,25 164:5 <b>particular</b> 46:1,2 62:24 63:14 64:5 68:19 77:4 84:11 <b>parties</b> 138:2 140:6,15 <b>partner</b> 74:2 <b>parts</b> 95:24 <b>party</b> 165:8 <b>pass</b> 83:9,16,17,22 83:23 91:4 <b>passed</b> 17:15 67:7 67:11 74:9 89:13 92:16 97:21 105:22 110:18 137:15 141:15 148:16 150:14,15 153:3 155:8 160:13 163:23 <b>passenger</b> 9:20 14:1 31:5,18,21 <b>passes</b> 83:7,15 142:19 156:21 <b>passing</b> 87:1 <b>passive</b> 99:2 <b>path</b> 114:13,18 <b>patience</b> 159:4 <b>pattern</b> 16:19 <b>pay</b> 16:7 <b>pc</b> 44:5,13 50:15 95:22,24 127:18 <b>pd</b> 130:14 <b>peake</b> 4:16 142:7,7 142:16 146:20 <b>penalty</b> 165:12 <b>penetration</b> 22:2 <b>penny</b> 21:1 <b>people</b> 25:23 28:2 29:12 34:22 38:13
---	---	--	---

[people - possibly]

<p>39:3 40:7 41:3 64:15 75:17 91:21 96:16 116:23 136:12,15 <b>perceived</b> 24:18 <b>perfectly</b> 107:22 <b>perform</b> 71:8 151:21 <b>performance</b> 35:12 68:23 69:11 71:19,24 72:5 87:5 108:7 <b>performed</b> 146:11 <b>performs</b> 71:13 <b>perimeter</b> 130:20 <b>period</b> 8:17 13:18 108:15 <b>periods</b> 108:21 <b>perjury</b> 165:12 <b>permission</b> 68:16 <b>permitted</b> 77:19 106:19 107:5 <b>person</b> 102:18 127:10 <b>personally</b> 130:6 <b>personnel</b> 115:11 <b>perspective</b> 104:24 123:25 <b>pertains</b> 36:9 <b>peter</b> 9:25 10:1,2,7 10:9 <b>peterkin</b> 4:7 138:11,11 144:13 144:13 148:19,19 149:4 151:17 153:8,9,17 <b>peter's</b> 10:8 <b>pfister</b> 3:8 112:14 112:14,23,23 114:12</p>	<p><b>phoenix</b> 128:15 <b>phone</b> 18:19 <b>phonetic</b> 4:25 8:23 9:13,25 12:11 71:23 130:14 150:22 158:12 <b>pieces</b> 21:23 <b>pillar</b> 121:2 <b>pipe</b> 136:19 137:3 137:5,8 139:23 142:21,21,23,25 143:17 144:1,22 145:1,2,2,4 146:10 147:6,8,20 <b>pipes</b> 139:16,17 <b>pipe'</b> 144:2 <b>pipng</b> 8:2 136:14 137:15 <b>place</b> 21:25 30:11 58:10 123:1 137:10 <b>places</b> 73:4 126:12 <b>plan</b> 140:16,20 <b>plastic</b> 67:14 73:7 73:8,9 <b>plate</b> 21:8,18,21 22:19 23:21 24:4 24:5 30:4 154:20 155:7 156:9,17,19 158:7 <b>plates</b> 27:1 <b>plate's</b> 24:5 <b>please</b> 6:4,15 8:9 10:1,9,13 11:3 14:22 16:7,15 18:15,25 19:4 20:7 21:13 25:4 30:19 33:9,16 38:5 42:8,17,22 45:9 46:20 48:7 48:20 54:21 55:11</p>	<p>57:12 59:23 61:16 64:12 66:15 68:3 69:22 75:10,11 76:16 77:12 78:17 79:11 80:21 82:18 86:13 89:10,18,22 90:2 91:10 92:7,9 92:20,25 93:6 96:8 97:3,3,18,25 98:6,11 101:22 102:2 105:19 106:3,8 109:2 110:8,15 111:19 111:19 112:21 115:20 117:5 118:10 119:6 122:7 131:7,7 133:11 134:12,21 135:13,23 137:18 140:7 141:10 142:14 143:20 144:10,12 148:10 149:2 150:18 152:23 153:15 155:11 159:1,4,13 159:20,24 160:5,8 161:17 162:8 163:17 164:6 <b>pleased</b> 8:20 <b>pleasure</b> 5:10 6:2 133:24 <b>pnnl</b> 131:5 <b>podium</b> 6:15 <b>poe</b> 41:4 <b>point</b> 23:13 55:2 59:7 104:4 109:8 109:8 113:13,14 122:20 127:13 132:17 155:20 163:5,5</p>	<p><b>point.'</b> 113:5 <b>pointed</b> 68:25 69:14 138:17 145:5 <b>points</b> 21:15 22:25 37:18 58:25 72:25 79:18 150:8 <b>policy</b> 20:4 61:10 <b>poll</b> 154:2,4 <b>poly</b> 67:19 <b>polyisocyanurate</b> 73:8 <b>polystyrene</b> 65:24 73:7,9 <b>polyurethane</b> 67:14 <b>pool</b> 157:10 <b>portion</b> 76:11 77:6 77:9 80:8,16 <b>portions</b> 33:12 41:21 42:4 64:9 76:4 86:21 <b>pose</b> 23:6 25:22 50:17 <b>posed</b> 53:2 <b>position</b> 17:25 23:24 24:21 36:5 51:12 66:14 78:5 84:19 89:2 91:2 95:5 100:23 108:1 108:6 115:4,8,9 121:13,22 136:24 137:8 143:23 147:4 150:2 154:12 155:18 162:2 <b>positive</b> 16:10 <b>possible</b> 124:10 127:17 155:2 <b>possibly</b> 157:10</p>
--	---	---	--

[posted - proposals]

<p><b>posted</b> 18:8 134:7 134:10</p> <p><b>potential</b> 23:17 34:17 43:11 51:7 51:8 99:21 108:3 134:14</p> <p><b>potentially</b> 22:16 34:4 41:17 43:5,6 43:9,13 46:5 47:3</p> <p><b>potomac</b> 10:16</p> <p><b>pounds</b> 22:6,13,15 27:17</p> <p><b>power</b> 34:5,11,13 34:16,19 35:1 36:10,21 37:9 38:16 40:24 41:4 53:15 55:4</p> <p><b>practice</b> 27:22 94:25</p> <p><b>practices</b> 117:21</p> <p><b>practitioners</b> 37:16</p> <p><b>pre</b> 17:25 147:4</p> <p><b>preceded</b> 59:13</p> <p><b>prefer</b> 88:12</p> <p><b>preference</b> 69:4</p> <p><b>preferred</b> 62:21 64:3 70:1 76:23</p> <p><b>prematurely</b> 154:22</p> <p><b>premises</b> 113:7</p> <p><b>prepared</b> 28:13 155:18</p> <p><b>prescribed</b> 27:13</p> <p><b>prescriptive</b> 108:7</p> <p><b>present</b> 7:22,25 8:3,5,20 9:2,2,3,4 9:6,6,7,19,20 10:6 10:8,18,19,20,22 11:7,8,10,10,14,14 11:15 12:7,15,17</p>	<p>12:21,23,24 13:13 13:14,14,17,19</p> <p>14:1,5,6 15:6 16:3 19:14 20:6 31:5 31:15 51:12 60:24 61:15 81:4 111:6 111:18 134:16,22 156:9</p> <p><b>presented</b> 6:9,12 20:9 31:18 61:18 66:7 77:22 81:21 111:24 134:25</p> <p><b>presenters</b> 157:6</p> <p><b>presiding</b> 15:23 16:2 133:18,24 161:10</p> <p><b>pretty</b> 39:3 71:25 149:5</p> <p><b>preventing</b> 127:9 128:5</p> <p><b>previous</b> 43:3,14 47:1,2 73:1 78:7 79:10,12 91:3,18 127:9 157:6</p> <p><b>previously</b> 40:13 40:18 53:1 141:19</p> <p><b>primarily</b> 115:12 147:7</p> <p><b>primary</b> 115:11</p> <p><b>prime</b> 139:7</p> <p><b>principally</b> 52:20</p> <p><b>principle</b> 70:20 72:15 74:17</p> <p><b>prior</b> 17:11 18:23 26:21 57:9,18 90:17</p> <p><b>private</b> 8:2</p> <p><b>probably</b> 64:21 94:10</p> <p><b>problem</b> 41:12,14 125:20 144:23</p>	<p>151:1 154:3,6 157:19,21 158:2</p> <p><b>problem.</b> 155:22</p> <p><b>problems</b> 158:10 160:4,7</p> <p><b>procedural</b> 63:17</p> <p><b>procedures</b> 15:7 16:8</p> <p><b>proceed</b> 15:23 20:20 21:14 32:5 33:6,16 42:13,23 48:11,21 60:11 62:6 63:25 64:13 76:20 77:13 82:7 82:18 89:14 90:3 92:17 93:7 97:22 98:12 105:23 106:9 112:11,22 118:21 119:7 134:9 135:11,24 141:16 142:15 148:17 149:3 153:4,16 161:17</p> <p><b>proceedings</b> 165:3</p> <p><b>process</b> 5:19,19,23 6:11 9:10,23 10:25 11:8,18 13:17 17:6 19:11 28:19 85:2 103:17 108:13 115:18,18 121:7 129:7 136:16 149:23</p> <p><b>producing</b> 120:16</p> <p><b>product</b> 20:23 51:5,8 56:24 65:23 66:5 71:3,6 71:8,11,12,19 72:1 72:2,3,6 74:24 78:2,25 124:4,6 125:21,23 128:4 139:18</p>	<p><b>production</b> 54:12 59:10</p> <p><b>products</b> 20:24 38:25 65:6,19 66:6 75:2 76:25 77:16 78:23,24 79:1 136:18 138:18 139:19</p> <p><b>professional</b> 10:21 12:4,6,8</p> <p><b>professionals</b> 74:23</p> <p><b>profile</b> 53:19</p> <p><b>progressing</b> 6:21</p> <p><b>prohibited</b> 17:3</p> <p><b>prohibiting</b> 30:3 127:24</p> <p><b>prohibition</b> 127:19</p> <p><b>prohibits</b> 67:16</p> <p><b>project</b> 6:10,19,20 7:3 51:5 129:4</p> <p><b>projects</b> 40:22</p> <p><b>promise</b> 153:17</p> <p><b>promotes</b> 128:6</p> <p><b>promoting</b> 6:20</p> <p><b>promptly</b> 164:7</p> <p><b>propagation</b> 61:21 64:17</p> <p><b>properly</b> 39:19</p> <p><b>properties</b> 65:10 68:23 123:4</p> <p><b>property</b> 7:2,9</p> <p><b>proponent</b> 70:1 124:3 138:17</p> <p><b>proposal</b> 27:19,24 53:11 54:16 63:15 66:10 123:9 128:16,25</p> <p><b>proposals</b> 26:24 57:9,18</p>
---	--	---	--

[proposed - realizes]

<b>proposed</b> 73:4,6 74:24 87:3 90:23 95:15,17,20 101:5 101:10 108:19 120:8 121:15 122:5 124:4 128:2 137:2 138:22 142:17 145:17 150:4 154:14 <b>proposes</b> 43:3 44:14 50:23 <b>proposing</b> 65:1 153:24 <b>proprietary</b> 71:18 75:3 99:7 <b>propriety</b> 104:12 104:13 <b>protected</b> 7:8 57:20 <b>protection</b> 7:2,18 8:4,7 9:19 54:15 65:13,14 81:4,21 99:2 113:17 135:4 <b>protection.</b> 50:19 <b>protective</b> 12:13 12:22 <b>prove</b> 116:21 <b>proven</b> 116:13 <b>provide</b> 7:7 22:20 25:4 38:6 46:20 54:22 68:4 69:20 78:17 86:14 91:10 96:9 101:22 108:9 109:3 115:20 117:20 122:7 124:8 125:12 131:23 137:18 144:10 147:4 150:18 154:2 155:11 162:8	<b>provided</b> 36:14 37:24 50:14 52:13 121:18 122:14 154:17 165:4 <b>provides</b> 107:14 108:12 130:22 144:4 <b>providing</b> 17:10 45:11,13 122:18 128:19 143:15 <b>public</b> 6:24 16:12 16:22,23 39:2 41:12,13 42:19 47:15,21 48:2,17 50:11 58:22 59:18 67:7,24 69:1,2,20 69:21 78:12 82:14 82:15 84:16,22 88:5 89:5,24 91:24 92:4 93:2 97:7,12 98:8 100:25 104:15 105:14 106:5 109:20 110:4 112:16,18 115:24 117:24 118:5,25 119:2 124:25 132:20 133:6 <b>publication</b> 17:18 <b>published</b> 7:14 17:22 143:10 <b>purported</b> 35:9,21 <b>purpose</b> 17:9 29:6 64:24 65:17 75:10 108:10 114:18 <b>purposes</b> 16:4 49:16 55:6 <b>pursue</b> 63:7 <b>pursued</b> 62:10 63:24 118:17 141:21,25 160:19	161:1 <b>pursuing</b> 138:6 <b>push</b> 163:11 <b>pushback</b> 103:5 <b>put</b> 7:4 21:16 26:25 30:11 41:16 44:24 47:5 90:8 96:19 97:3 104:7 116:11 125:1 128:21 129:8 130:4,5 136:21 139:10 152:2 156:5 <b>putting</b> 38:17 87:20 149:16 <b>pv</b> 121:24 124:21	<b>racking</b> 130:14 <b>radiant</b> 23:10 127:13 <b>radiation</b> 127:16 <b>rail</b> 9:20 14:1 31:5 31:18,21 46:6 58:19 <b>railways</b> 49:13 <b>raise</b> 159:20 160:5 160:8 <b>raised</b> 143:2 <b>raises</b> 120:25 <b>ran</b> 13:22 <b>range</b> 37:17 <b>rapidly</b> 6:21 <b>rashid</b> 2:25 72:14 72:14,21,24 79:16 79:16 91:13,14 <b>rating</b> 106:13,18 106:20 107:3,19 109:11 <b>ratings</b> 57:17 <b>rayborn</b> 3:22 129:21,21 <b>reach</b> 131:1 <b>reaching</b> 123:15 <b>reaction</b> 94:14 <b>read</b> 39:15 58:14 87:14,15 100:10 102:2 129:23 <b>reading</b> 95:18 <b>ready</b> 19:11 72:17 79:17 91:15 92:22 139:7 <b>real</b> 41:11 64:14 88:8 123:6 124:8 <b>reality</b> 36:22 <b>realize</b> 47:7 <b>realized</b> 45:5 <b>realizes</b> 154:23
<b>q</b>			
<b>qualification</b> 72:7 <b>qualifications</b> 10:21 12:4,6,8 <b>qualify</b> 64:21 65:6 68:12,14 71:6 <b>quantities</b> 122:2 <b>quantity</b> 123:10 <b>question</b> 18:23 19:5 43:17 73:11 <b>questions</b> 72:6 <b>question'</b> 18:25 <b>quick</b> 39:20 64:14 88:8 <b>quickly</b> 6:25 28:21 <b>quietly</b> 16:15 <b>quite</b> 147:15 151:5 <b>quorum</b> 16:3 <b>quote</b> 113:2			
<b>r</b>			
<b>r</b> 2:1 19:15 <b>raceways</b> 51:1 53:6			

[really - reismig]

<b>really</b> 39:16,18 45:1 77:21 116:15 116:25 123:7 124:1 132:17 139:13 140:16,17 140:20,22 143:15 145:14 147:18 149:22 152:3 153:20	152:20,22 153:1,2 158:23,25 160:10 160:12 162:25 163:15	<b>redundant</b> 45:24 86:8	27:21 28:10 29:22 30:12 32:5,19 33:10,15,21,25 35:16 36:4 38:4 39:7 40:9,14,17 41:6,19 42:1,18,22 44:15 45:4,8 46:15,18 47:19,25 48:16,20 50:13 51:11 54:20 55:21 57:5,11,22 58:20 59:16 60:2,5,8,19 60:22 61:15 62:5 62:17 63:2,4,6,10 63:12,23 64:6,12 65:22 66:13 68:2 69:23 70:3,16 72:12,19,23 73:20 74:12 75:12 76:1 76:8 77:2,7,12 78:4,16 79:5,14,22 80:5,13 82:6,13,17 84:3,14 86:12 87:8,11 88:4,16,18 88:24 89:3,19,23 90:2 91:1,7,9,20 92:2,22 93:1,6 94:21 95:4 96:7 97:5,10 98:1,3,7 98:11 100:5,21 101:21 102:21 103:10,25 104:14 105:12 106:4,8 107:25 109:1,19 110:2,12,14,25 111:3 112:10,17 112:21 114:11,23 115:17 116:1 117:3,7,22 118:3 119:1,6 120:20 121:12 122:6
<b>rear</b> 18:16	<b>recommendation</b> 63:14 64:5 101:3	<b>refer</b> 52:15	
<b>reason</b> 39:12 40:22 44:19 52:12 63:14 65:1 66:2 77:20 115:13 126:13,25 152:1	<b>recommendations</b> 17:8,10	<b>reference</b> 38:11 71:14 85:3 86:5 99:9,10,11,17,21 102:15 103:18 130:1 134:14 152:4	
<b>reasonable</b> 78:3 146:11	<b>recommended</b> 30:18 59:21,22 64:25 76:13,15 80:18,20 89:7,9 92:7,9 97:14,17 105:16,18 110:6,8 118:7,9 133:8,10 163:16	<b>referenced</b> 102:14 102:14 120:22 130:1 161:23	
<b>reasons</b> 104:6	<b>recommending</b> 62:23 64:4 101:3	<b>references</b> 99:6,19	
<b>rebut</b> 55:11	<b>recommends</b> 34:3 151:11	<b>referencing</b> 99:6 103:21,22	
<b>rebuttal</b> 70:6	<b>record</b> 17:24 30:19 42:9 48:7 59:23 76:16 80:21 89:10 92:10 97:18 105:19 110:9,15 114:19 116:6 117:8 133:11 141:10 142:23 143:16 148:11 152:23 159:5,13 159:25 163:17	<b>referring</b> 45:21 59:3	
<b>receive</b> 137:24		<b>refers</b> 53:15 85:17	
<b>received</b> 67:8,24 78:12 134:5		<b>reflection</b> 94:9	
<b>receiving</b> 11:25		<b>reflects</b> 152:5	
<b>recipient</b> 6:5 8:22 10:12		<b>refractories</b> 27:24	
<b>recipients</b> 11:21 14:15		<b>refractory</b> 27:4 28:1	
<b>recognition</b> 8:17		<b>refute</b> 36:17	
<b>recognize</b> 6:2,9 14:24 105:9 115:7 121:6 135:25		<b>regarding</b> 21:16	
<b>recognized</b> 6:17 52:3 59:4 95:10 100:18,19 105:4		<b>regardless</b> 115:15	
<b>recognizing</b> 6:5 7:2 156:3,4		<b>registered</b> 18:18	
<b>recommend</b> 30:17 42:6,8 48:4,6 89:9 141:8,9,13,14 148:8,10,13,15		<b>regulated</b> 143:12	
	<b>recording</b> 1:1 5:2 17:3	<b>regulations</b> 17:20 20:14 31:25 61:25 75:24 82:2 112:5 135:6	
	<b>red</b> 15:11	<b>regulatory</b> 143:9	
	<b>reduce</b> 7:8 70:14 109:25 130:24	<b>reinforce</b> 109:24	
	<b>reduced</b> 108:16	<b>reinforced</b> 24:15 27:2	
	<b>reducing</b> 5:22 108:15	<b>reinstate</b> 50:23	
	<b>reduction</b> 73:17 79:20 108:4	<b>reismig</b> 2:6 15:23 16:1,2 20:19 21:2 21:9,13 23:5,23 25:3,12 26:7,13	

[reiswig - requirements]

<p>123:19 125:11,25 127:3 128:12 129:2,20 130:8 131:9,13 132:2,8 132:10,19 133:4 <b>reiterate</b> 30:2 74:1 79:3 <b>reject</b> 21:3,10 25:15 26:8 28:17 29:23 30:15 33:11 41:20 42:3 62:25 64:8 75:11 76:2 76:10,18 77:4,8 80:6,15 85:13 135:17,20 140:25 141:5 148:23 152:10,17 153:12 156:22 158:16,21 161:19,24 <b>rejected</b> 27:18 50:15 86:11 108:22 117:15 <b>rejecting</b> 27:19 101:19 103:7 108:19 <b>rejection</b> 108:18 108:25 127:18 <b>related</b> 33:12 41:21 42:3 63:22 64:9 67:12,14,24 76:3,11 77:5,9 78:12 80:8,16 84:24 134:13 138:2 161:7,25 <b>relates</b> 36:7 <b>relative</b> 54:3 165:6 <b>relatively</b> 156:4 <b>release</b> 46:13 50:18 51:22 83:1 85:7,22</p>	<p><b>released</b> 124:12 <b>relevant</b> 35:25 <b>relief</b> 21:6,19,25 22:6,17,20,24 23:3 23:20 24:3 25:17 25:18,21 26:3 27:6,23,25 28:25 29:10,18 130:22 131:4 <b>rely</b> 129:12 <b>remain</b> 59:12 <b>remaining</b> 11:24 144:3 <b>remains</b> 21:22 55:11 59:9 66:9 <b>remarks</b> 114:19 <b>remember</b> 16:16 56:4 <b>remind</b> 14:21 16:4 <b>removal</b> 21:5 71:16 <b>remove</b> 27:8,8 84:23 85:3 137:2 143:25 150:4 154:14 155:6 <b>removed</b> 24:25 32:16 33:4 62:13 84:25 118:19 142:3 160:22 161:3 <b>removes</b> 108:20 <b>removing</b> 21:18 23:20 29:2 146:18 152:4 <b>renewable</b> 119:11 119:14 120:3,3 <b>renewables</b> 116:17 <b>repair</b> 9:4 25:20 <b>repeat</b> 79:9</p>	<p><b>repeated</b> 16:12 29:8 <b>replace</b> 68:17 69:13 100:15 <b>replaced</b> 158:11 <b>replacing</b> 69:7 <b>report</b> 19:12,14,16 19:21 20:1,6,8,10 24:8 26:24 31:3,6 31:7,12,15,16,19 31:19 60:22,24 61:2,7,16,17,19,20 81:2,4,7,12,18,19 81:22,22 97:15 98:17 99:10 111:4 111:7,9,14,18,22 111:24,25 134:2 134:16,19,22,23 135:1,1 139:9 <b>reported</b> 66:24 <b>reports</b> 19:17 20:11,16 31:8 32:1 61:3 62:1 77:24 81:8 82:3 111:10 112:6 134:19 135:8 <b>represent</b> 20:24 26:16 <b>representative</b> 32:12,25 36:11 62:9 156:6 <b>representatives</b> 137:4 <b>representative's</b> 137:9 <b>representing</b> 57:8 91:15 118:24 122:11 <b>represents</b> 95:17 106:16</p>	<p><b>request</b> 18:19 73:18 115:5 117:12,13 134:5,8 154:24 <b>requesting</b> 63:21 <b>requests</b> 86:10 108:25 <b>require</b> 22:1,18 50:19 67:5 96:18 96:18 107:7 129:9 129:10 153:22 154:25 155:4 <b>required</b> 18:21 21:6 22:11 24:23 27:4 35:14,23 44:23 46:9 48:24 53:4,14 98:23 106:14 107:1 126:14 128:23 <b>requirement</b> 24:14,15,18 27:9 34:10 49:4,10 50:8,24 51:25 101:12 110:1 124:23 126:23 128:2 149:8 151:4 151:20 154:15,16 155:5 <b>requirements</b> 24:22,24 25:2 28:6 34:13 35:6 35:12,20 36:12,14 37:20 46:9,11 47:9 49:8 51:6,9 51:19 52:7,7,18,21 52:24 53:9,12 54:5,7,9,13 55:8 55:16,17 56:8,17 57:2,19 58:3,3,8 58:12,13 59:10 66:3 67:18 71:4</p>
--	---	---	---

[requirements - rodger]

87:6 93:11 94:11 94:15 96:1,3 100:9 101:8 102:17 104:25 121:18 122:4,16 123:1,6 124:15 125:2,17 126:15 127:1 131:17,22 132:5,13 150:6 158:1 <b>requirements.'</b> 47:8 <b>requires</b> 16:21 22:24 25:19 49:19 49:21,23 51:20 101:10 106:24 107:16 126:24 151:7 161:11 <b>requiring</b> 16:18 50:1 <b>rescue</b> 9:3 10:18 <b>research</b> 26:19,21 120:4 <b>resistance</b> 99:24 100:1,2 106:14,18 106:20 107:3,17 107:18 109:11 <b>resistant</b> 106:13 <b>resistive</b> 74:9 <b>resolve</b> 159:9 <b>resolved</b> 90:24 <b>resources</b> 6:14 111:8 <b>respect</b> 28:8 36:20 45:18 114:4,8 116:19 126:10 <b>respectfully</b> 28:7 73:18 86:10 108:24 114:21 127:2	<b>respective</b> 53:19 <b>respond</b> 25:9 28:21 <b>responder</b> 12:2 115:12 <b>responders</b> 12:20 <b>response</b> 85:9 90:22 108:23 <b>responses</b> 35:7 101:17 <b>responsibilities</b> 7:19 <b>responsibility</b> 136:9,22 137:10 <b>responsible</b> 20:13 31:23 61:24 81:25 86:20 112:4 135:5 140:1 <b>rest</b> 26:3 <b>restarted</b> 111:1 <b>restate</b> 30:14 42:2 48:1 59:17 76:9 80:14 89:4 92:3 97:11 105:13 110:3 118:4 133:5 141:4 148:4 152:16 158:20 162:22 <b>resting</b> 144:1 146:17 <b>restricting</b> 101:12 <b>restrictions</b> 122:25 <b>restrictive</b> 146:1 <b>restricts</b> 101:5 <b>result</b> 41:1 70:11 73:16 79:19 116:11 117:17 <b>resulted</b> 136:2 <b>resulting</b> 7:13 18:1	<b>results</b> 17:9,19,21 19:7,7 20:16 30:22 32:1 48:9 60:14 62:2 67:4 71:9 75:19,20 82:3 83:11 112:6 127:18 130:23 141:12 148:12 149:6 152:25 160:9 163:21 <b>retain</b> 27:3 99:11 <b>retardant</b> 77:17 <b>retired</b> 12:11 <b>return</b> 15:5 <b>returned</b> 54:18 <b>reverse</b> 49:6 <b>review</b> 85:16 <b>reviewing</b> 85:2 <b>revise</b> 67:11 <b>revised</b> 5:25 105:5 <b>revision</b> 21:11 26:9 29:24 30:15 32:20 33:11,12 41:21 42:3 50:11 54:18,19 63:1 64:9,10 67:10 76:3,4,10,11 77:5 77:6,9,9 80:7,8,15 80:16 84:23 87:21 96:2 122:5 124:25 135:18,20 140:25 141:6 144:7 145:16 148:24 150:7 152:11,18 153:12 155:20 156:23 158:16,21 161:20,25 <b>revisions</b> 20:12 31:22 41:22 42:4 61:23 81:24 112:3 135:4	<b>revisit</b> 114:3 <b>revolved</b> 95:24 <b>revolving</b> 40:3 <b>revote</b> 60:9,12 <b>rewrite</b> 56:18 <b>rfcc</b> 39:10 <b>rhode</b> 134:18 <b>richard</b> 14:9 <b>rick</b> 3:16 126:2,2 <b>right</b> 19:4 21:9 56:12 60:8,12,13 89:3 92:2,13 108:2 109:24 110:14,25 111:3 114:25 118:3,13 124:6 125:9 131:6 131:17 139:6,9 140:8 141:21 157:21 161:17 <b>rights</b> 18:13 <b>risk</b> 7:8 25:22 52:4 53:19 54:14 59:14 130:5 135:17 <b>risks</b> 54:3 124:11 <b>river</b> 129:3 <b>road</b> 9:18 81:3,20 81:23 <b>rob</b> 13:10,11 <b>robert</b> 12:10,12 <b>rodger</b> 2:6 15:23 16:1,2 20:19 21:2 21:9,13 23:5,23 25:3,12 26:7,13 27:21 28:10 29:22 30:12 32:5,19 33:10,15,21,25 35:16 36:4 38:4 39:7 40:9,14,17 41:6,19 42:1,18,22 44:15 45:4,8 46:15,18 47:19,25
--	--	---	---

[rodger - second]

48:16,20 50:13 51:11 54:20 55:21 57:5,11,22 58:20 59:16 60:2,5,8,19 60:22 61:15 62:5 62:17 63:2,4,6,10 63:12,23 64:6,12 65:22 66:13 68:2 69:23 70:3,16 72:12,19,23 73:20 74:12 75:12 76:1 76:8 77:2,7,12 78:4,16 79:5,14,22 80:5,13 82:6,13,17 84:3,14 86:12 87:8,11 88:4,16,18 88:24 89:3,19,23 90:2 91:1,7,9,20 92:2,22 93:1,6 94:21 95:4 96:7 97:5,10 98:1,3,7 98:11 100:5,21 101:21 102:21 103:10,25 104:14 105:12 106:4,8 107:25 109:1,19 110:2,12,14,25 111:3 112:10,17 112:21 114:11,23 115:17 116:1 117:3,7,22 118:3 119:1,6 120:20 121:12 122:6 123:19 125:11,25 127:3 128:12 129:2,20 130:8 131:9,13 132:2,8 132:10,19 133:4 133:22 <b>role</b> 6:18 7:11	<b>rolling</b> 37:1 46:8 46:14 49:15 <b>roof</b> 22:2 123:2,11 126:13,21 128:20 129:15 <b>roofs</b> 121:17 128:19,23 <b>rooftop</b> 120:24 121:18,24 122:18 123:1 124:23 125:2 127:12,14 127:23 130:17,21 <b>rooftops</b> 119:25 120:10,14 122:15 122:17 131:19 <b>room</b> 16:15 18:16 20:21 117:13 124:2 130:11 132:15 146:21 <b>roughly</b> 93:15 <b>routes</b> 53:25 <b>rsc</b> 44:18 55:24 102:23 <b>rsw</b> 100:13 103:16 104:12 <b>rubbish</b> 49:24 <b>rules</b> 32:13,14 33:1,2 62:11,12 63:24 75:22 118:17,18 130:15 142:1,1 160:20,20 161:2,2 <b>run</b> 65:25 <b>runaway</b> 124:11 <b>running</b> 68:15 <b>rupert</b> 12:25 13:1 <b>rws</b> 98:17 99:3,9 99:15,23 100:18 100:20 102:9,9,20 104:4,21 105:3	<b>s</b> <b>s</b> 2:1 <b>safe</b> 11:5 12:11 16:7 19:15 23:22 29:5 120:15 121:10 124:21 127:20 131:18 132:1 <b>safeguards</b> 131:16 <b>safely</b> 128:21 <b>safer</b> 22:4 26:5 29:1,15 114:6 <b>safety</b> 5:22 6:1,23 7:2 11:8 12:2,16 12:23 13:15,17 16:5,6,8,22 49:5 50:3 52:12,23 53:12 55:20 59:8 59:12 73:17 79:20 98:18 99:22 100:4 106:17,21 107:3,6 107:10 113:4 115:10,12 120:24 122:12,17 123:12 123:14,16,17 125:23 128:8,24 129:18 131:24 143:15 145:6 <b>salt</b> 129:3 <b>sample</b> 155:6 156:6 157:4 <b>sample's</b> 156:3 <b>san</b> 10:3 14:10 113:16 116:8 <b>sandy</b> 12:18 <b>satisfied</b> 132:6,14 <b>satisfy</b> 36:13 <b>saw</b> 151:17 <b>saying</b> 35:19 47:3 59:1 125:18 126:11 131:1	142:23 143:16 <b>says</b> 34:21 39:22 43:3,22 69:8 83:14 86:24 87:22 102:3,8 107:21 124:6 149:10 156:16 163:10 <b>scale</b> 74:4,10 119:18 125:20 <b>scholl</b> 3:19 128:14 128:15 <b>school</b> 9:16 <b>scientifically</b> 30:6 <b>scope</b> 36:21 37:2 52:13 101:5 116:10,11 <b>screen</b> 19:8,23 31:14 42:6,6,8,11 48:5,6 59:21,23 76:14,15 80:19,20 81:13 89:7,9 101:1 105:17,18 110:6,8 111:16 118:8,9 133:8,10 141:8,10,13,14 142:19 148:8,10 148:14,15 152:20 152:22 153:1,2 158:24 159:1 160:11,12 163:1 163:16,19 <b>screens</b> 61:9 <b>script</b> 14:19 15:21 <b>scroll</b> 18:25 163:9 163:13 <b>searles</b> 3:10 116:3 116:3 117:6 <b>seats</b> 111:1,19 <b>second</b> 7:12 14:20 15:3,4,4 19:17 20:10 21:10,11,11
--	---	--	--



[second - signal]

21:12,13 26:8 29:23 30:15 31:8 31:19 32:20 33:11 33:13,14,16 41:20 42:3,20,21,22 48:18,19,20 54:19 60:5 61:3,19 63:1 63:4 64:7,9,10,11 64:12 66:25 67:10 76:3,10 77:5,8,10 77:11,12 80:7,15 81:8,22 82:15,16 82:18 89:25 90:1 90:2 92:10 93:3,4 93:5,6 96:2 98:8,9 98:10,11 106:6,7,8 111:10,25 112:19 112:20,21 114:25 117:22 119:3,4,5,6 134:19 135:1,17 135:20,21,22,22 135:23 139:9 140:25 141:5 142:12,13,14 143:1,3 144:6 145:16 148:23,24 148:25 149:1,2 152:11,18 153:12 153:13,14,15 156:23 158:16,21 161:12,13,14,15 161:16,20 <b>seconded</b> 114:24 115:2 <b>secondly</b> 70:9 <b>seconds</b> 19:3,6 30:20 42:10 48:8 59:24 60:13 62:19 76:16 80:22 89:11 92:12,13,21 97:18 105:20 110:15	118:10 133:12 141:11 148:12 152:24 161:12 163:18 <b>secretary</b> 5:15 <b>section</b> 17:19 24:6 24:25 26:23 32:14 33:2 35:8 36:1,9 36:20 37:2,20,25 43:14,16 45:14 46:11 51:19 53:14 54:11,12 58:14 62:12 67:15,16 69:2 71:16 72:10 76:24 78:8 83:13 83:16,20 84:7 85:4,5,17,25 86:9 87:7,16 88:14 90:10 95:14 99:12 99:13,16,18 106:23 107:6 118:18 120:21 121:15,25 122:12 123:16 131:16 134:6 137:2,3,12 137:15 138:14,14 138:15 140:5 142:2 143:4,14 144:16,16 149:7 150:10,23 151:11 153:19 154:14 155:7 157:18 160:21 161:2 <b>sections</b> 67:13 70:8 71:1 87:16 <b>see</b> 19:7 29:7 30:5 43:25 73:2 86:24 88:12 114:13 124:13,20 129:24 142:18 158:13 160:5	<b>seeing</b> 30:25 32:11 32:24 88:6 91:20 104:16 110:20 114:18 118:3 132:21 141:3 148:3 152:15 158:19 162:21 <b>seeks</b> 49:6 120:8 137:2 143:25 150:4 154:14 <b>seen</b> 25:20,25 29:15 117:16 158:7 <b>selden</b> 81:6 <b>select</b> 18:25 <b>send</b> 58:8 <b>sends</b> 58:4 <b>sensing</b> 127:13 <b>sentence</b> 35:10,21 43:4,12 44:9,10,12 63:16,19,20 <b>sentences</b> 35:8 <b>separate</b> 25:2 <b>separately</b> 53:16 <b>separation</b> 121:1 125:18 <b>sequence</b> 16:11 <b>series</b> 16:11 <b>seriously</b> 29:12 <b>serve</b> 5:10,15 <b>served</b> 7:25 8:6 <b>serves</b> 7:20 8:25 9:17 10:4,17 11:6 11:11 12:3,12,19 13:1,5,7,11,20,24 14:3,6,11 <b>service</b> 8:13,14,16 8:18,22 9:9,13,22 9:25 10:12,24 11:17,21,23 12:23 113:5 122:22	126:17 131:17,24 132:9 <b>services</b> 10:16 12:22 61:1 135:17 <b>servicing</b> 132:15 <b>serving</b> 13:19 <b>session</b> 18:9,14 19:8,20 31:11 61:6 81:11 111:13 <b>sessions</b> 18:6 <b>set</b> 155:3 <b>sets</b> 93:11 125:17 <b>severe</b> 98:21 99:24 <b>severely</b> 35:9 <b>shafts</b> 59:5 <b>shamim</b> 2:25 72:14,14,21,24 79:16,16 91:13,14 <b>share</b> 5:24 <b>sharon</b> 3:20 129:3 129:3 <b>sheet</b> 22:8 <b>sheets</b> 53:6 <b>shell</b> 21:7,22,25 22:3,20 24:3,19 <b>shells</b> 27:2 <b>shipbuilding</b> 9:4 <b>shorter</b> 106:19 108:21 <b>shouldn't</b> 58:16 77:23 <b>show</b> 14:14 66:1,1 <b>showing</b> 154:19 <b>shown</b> 21:19 25:10 51:4 95:21 97:17 99:22 101:1 <b>side</b> 28:4 64:18 113:6,7,9 117:16 <b>sides</b> 133:1 <b>signal</b> 16:9
---	---	--	--

[signaling - specifically]

<p><b>signaling</b> 49:16 55:5 <b>signature</b> 165:24 <b>signed</b> 32:9 <b>significant</b> 6:9 23:6 50:17 51:16 52:20 93:17 <b>signs</b> 154:19 <b>similar</b> 36:16 45:10 67:18 78:6 93:20 94:19,20,25 142:18 <b>simple</b> 50:16 126:22 <b>simplification</b> 52:11 <b>simply</b> 36:18 50:23 51:3 84:10 94:12 <b>sincere</b> 14:18 <b>single</b> 6:10 11:14 24:13 123:8 <b>sir</b> 20:6 21:2,9 25:12 40:15 61:12 62:5 63:2 77:2,13 92:22 98:1 112:10 115:1 117:3 122:6 128:11 <b>sit</b> 117:16 <b>sites</b> 28:24 <b>situations</b> 40:24 40:25 124:9 <b>six</b> 21:15 69:24 76:22 86:16 129:2 138:10 140:11 144:12 146:14 147:1 148:18 150:20 153:6,7 156:25 157:15 158:4</p>	<p><b>sixth</b> 23:13 <b>size</b> 121:19 <b>sized</b> 119:22 <b>skidmore</b> 74:15 79:25 <b>skills</b> 129:9 <b>skins</b> 22:9 <b>skytrain</b> 40:21 <b>small</b> 120:9 121:1 124:16 126:12,24 156:4 157:4 <b>smart</b> 18:19 <b>smoke</b> 13:8 46:12 49:3 50:18 51:22 53:22 54:2,12 56:7,16 57:1,16 59:10 <b>smother</b> 15:20 <b>society</b> 140:12 143:8 146:15 154:1 157:2 <b>solar</b> 119:24 130:16 <b>sole</b> 17:9 <b>solely</b> 114:19 <b>solution</b> 136:21 138:22 <b>solutions</b> 20:24 62:21 64:4 70:1 76:23 138:12 144:14 148:20 153:9 <b>somebody</b> 124:13 <b>sons</b> 26:25 <b>sophisticated</b> 40:5 44:21 <b>sorry</b> 25:12,14 26:13 32:19,21 33:5 40:16 42:10 45:10 57:11,13 63:2 82:15 84:5</p>	<p>89:17 93:19 98:2 111:21 116:1 131:13 132:10,12 135:15 142:1 152:21 <b>sound</b> 71:15 <b>sounds</b> 16:19 <b>sources</b> 127:15 <b>southwest</b> 120:4 <b>spaces</b> 53:10 132:7 <b>spacing</b> 24:17 27:15 <b>spalling</b> 99:5 <b>speak</b> 25:7 26:17 28:11,12 39:11,12 40:7 43:1 44:18 55:24 57:3 102:24 103:9 119:10 121:6 130:10 155:18 <b>speaker</b> 6:17 8:24 9:16 10:2,15 11:5 11:24 21:12 26:11 32:18 33:14 42:21 48:19 60:1,3,6,18 60:21 63:8 64:11 77:11 82:16 90:1 93:4,5 98:9,10 106:7 110:10,11 110:13 112:20 115:25 119:4,5 126:8,10 135:22 141:21 142:13 148:25 149:1,4 153:6,8,14 159:8 159:11,12,17 160:6,15 163:2,5,8 163:19,24 <b>speakers</b> 2:5,20 73:1 116:9 161:13 161:16</p>	<p><b>speaking</b> 15:9,11 15:14,18 25:5 34:2 38:7 40:12 46:21 54:23 57:13 68:5,10 70:3,5,19 70:22 72:16,19,21 73:22,24 75:15 78:18,21 79:17,25 86:15,17,18 91:11 91:14 96:10 101:23 104:19 109:4 115:21 116:6 117:11 122:8,13 123:23 126:3 127:7 128:16 129:4,22 131:15 133:1 137:19,22,22 138:12,13 139:3 140:14 144:11,14 145:13,13 146:7 147:3,12,12 149:13 150:19,22 151:16 155:12,16 155:16 157:2,17 158:5 161:6 162:9 162:13,13 <b>special</b> 6:7,8,12 8:10,12 17:1 108:22 <b>specialty</b> 6:14 111:8 <b>specific</b> 16:24 37:10 49:10 52:12 52:16,23 57:19 71:11,12 72:1 78:25 101:6,8 103:3,18 121:17 128:4 151:4 <b>specifically</b> 21:4 27:8 98:18 99:25</p>
--	---	---	---

[specifically - storage]

100:1 139:18 150:10 <b>specification</b> 99:1 <b>specifics</b> 40:20 <b>specify</b> 24:17 93:25 96:19 <b>speed</b> 129:8,25 <b>spend</b> 143:13 145:4 <b>spf</b> 67:14,16,22,24 69:15 73:5,12,14 78:10,13,22 <b>split</b> 96:3 <b>spoke</b> 41:11 126:10 <b>spoken</b> 126:6 <b>spontaneously</b> 23:11 <b>spot</b> 126:18 <b>spray</b> 62:22 66:2,3 66:9 67:14 75:1 <b>spread</b> 46:12 49:3 50:18 54:12 57:17 <b>sprinkler</b> 7:24 137:3,8,15 144:19 145:3 146:7,10 147:5,19 150:4 154:21 155:7 157:19 158:10 <b>sprinklers</b> 154:16 154:18,19 161:22 <b>square</b> 22:7,15 <b>sr</b> 95:23 <b>staff</b> 16:25 18:16 60:10 <b>stafford</b> 127:6 132:4 <b>stage</b> 10:1,13 11:3 140:2 142:17 143:1,3	<b>stahl</b> 2:21 62:14 62:16,20,20 63:3,5 63:9,11,13 64:2,3 64:3,14 65:23 68:11 69:25,25 70:5 76:23,23 77:3,14 <b>stand</b> 28:20 <b>standard</b> 7:1,5,6 7:17 24:6,20 25:2 30:4 31:1,2,20 34:10,24 35:6,13 35:18 36:3 37:15 39:19 41:14 43:10 45:1,2 46:12 47:5 54:4 56:24 60:16 61:20 67:9 73:14 81:1 83:14,23,24 84:1,5,6,7,13 86:6 88:1 90:12,20 94:14 95:9,10,12 95:18 96:23 98:17 98:20 99:7,14 100:16,18,19 101:8,15,16 102:13,14 103:2 103:17,23 104:5,8 104:10,23 105:2,4 105:10 106:15 107:13 108:6,7,12 110:21 112:1 116:12 120:9,13 121:9 122:1,1,4 125:18,21,22 126:23 130:22,25 133:16,25 135:2 136:6,6,11 139:8 144:3 145:25 146:2 151:24 153:21 162:4	<b>standards</b> 5:11,15 5:18,25 6:6,11 7:3 8:19 9:9,23 10:24 11:17 17:8,10,11 17:13,23 18:2,5 20:11,15 32:1 34:8 35:2,15 38:18 39:16,24 62:1 82:3,22 87:19 88:10 90:13 95:11,25 98:25 99:11 103:4 104:11,11,22 112:6 113:20,22 114:7 125:22,23 133:17 135:7 <b>standing</b> 25:23 28:14,15 29:6 <b>standpipe</b> 122:19 129:14 <b>standpipes</b> 128:20 128:24,25 <b>stands</b> 109:24 145:25 <b>start</b> 38:17 81:16 86:16 91:12 97:1 103:3 109:5 110:22 112:12 <b>started</b> 111:4 136:15 145:14 <b>state</b> 15:13,17,18 22:5 25:13 94:3 165:14 <b>stated</b> 24:20 34:7 35:25 78:22 85:16 86:3 88:9 89:1 98:22 103:1 108:16 116:22 154:19 163:13 <b>statement</b> 15:6 34:21 36:19 38:12	44:6 45:9,24 49:7 50:16,22,25 56:9 94:4 95:13 100:17 103:7 142:20 <b>statements</b> 18:1 150:25 <b>states</b> 34:10 35:10 43:12 49:11 71:2 85:18 94:3 117:20 127:1 <b>stating</b> 34:18 46:5 125:15 <b>station</b> 53:20 <b>stationary</b> 6:22 7:6 112:1 116:5,8 117:1 <b>stations</b> 49:1,5,19 49:21,22 50:3,17 51:3 52:2,5,10,19 52:21 53:13,20 54:6,8 55:7,16,18 56:17,25 57:3 59:9,11,15 <b>stay</b> 28:2 30:7 66:4 79:5,15 <b>stays</b> 24:16 27:3 <b>steel</b> 21:8,21 24:16 27:1,2 <b>stellar</b> 6:5 <b>step</b> 156:8 <b>stepping</b> 20:3 61:10 <b>steven</b> 11:25 12:3 <b>stifling</b> 128:1 <b>stint</b> 13:22 <b>stipulated</b> 130:16 <b>stock</b> 37:1 46:8,14 49:15 <b>stop</b> 117:4 <b>storage</b> 6:18,20,22 7:6,21 9:1 13:15
---	---	---	---

[storage - systems]

<p>49:14 111:5,6,23 112:2,25 113:10 113:10 114:15 115:14 116:4,7,14 116:14 117:1,15 119:20,21,22 120:6,9,18 121:2 121:10,16,21 122:14 123:10 124:9,15,20 125:12 126:19 150:8 <b>storage'</b> 150:5 <b>storge</b> 127:22 <b>stormer</b> 4:22 147:2,2 158:5,5 <b>stout</b> 22:25 <b>strength</b> 24:4,17 <b>stress</b> 72:24 <b>stricken</b> 73:3,12 <b>strictly</b> 104:19 <b>strike</b> 46:18 <b>striking</b> 73:16 79:19 <b>stringent</b> 128:2 <b>strobe</b> 16:13 <b>strong</b> 6:19 <b>strongly</b> 69:6 75:18 <b>structural</b> 22:3 24:16 27:2 99:1 101:6 145:3 <b>structure</b> 28:4 <b>study</b> 157:7 <b>sub</b> 101:6 <b>subject</b> 46:11 130:3 <b>subjected</b> 85:8,23 143:25 144:24 <b>subjecting</b> 142:21</p>	<p><b>subjective</b> 146:18 <b>submission</b> 18:23 <b>submit</b> 147:6 <b>submitted</b> 18:1 20:12 31:22 40:13 40:18 41:12 50:10 61:23 69:17 81:24 112:3 135:4 151:17 <b>submitter</b> 45:17 117:13 137:1,23 141:19 150:10 <b>subsection</b> 96:2 <b>subset</b> 154:15 155:8 <b>substantial</b> 8:17 22:25 25:19 <b>substantiate</b> 24:2 28:7 <b>substantiated</b> 30:5 157:24 <b>substantiation</b> 21:17 24:10 27:10 27:19 52:12 86:3 108:18 <b>substitution</b> 67:16 <b>substitutions</b> 67:3 67:5 74:7,20 <b>subtle</b> 94:10 <b>suddenly</b> 50:1 <b>sufficient</b> 21:24 22:21 <b>suitability</b> 72:7 <b>suitable</b> 98:22 100:3 <b>sumar</b> 2:25 72:14 72:14,21,24 79:16 79:16 91:13,14 <b>summary</b> 23:20 67:21</p>	<p><b>sunlight</b> 127:15 <b>supply</b> 8:2 128:20 <b>support</b> 15:6 25:6 27:3 30:16,23 38:7,10 42:5,11,25 46:21,24 48:4,9,23 54:23 59:20 60:14 68:5 69:3 71:18 76:7,13,18 77:4 78:18 80:11,18,23 83:1 85:7,22 86:15,18 87:13 88:21 89:6,12 90:5 91:11 92:6 92:14 96:10 97:3 97:14,19 101:23 103:13,23 104:3 105:16,21 106:12 109:4,7 110:5,16 112:24 115:22 118:7 122:9 123:16 125:23 128:10 129:4 133:3,3,7,13 137:19,24 138:4 138:12,15,23 139:7 140:14 141:7,12 143:18 143:20 144:11,14 144:17 145:8,23 146:3,8,16,18,24 147:3 148:7,13 149:25 150:19 152:8,19,25 153:20 154:9 155:13,16 157:3 157:11 158:6,12 158:23 160:10 162:10,25 163:14 164:5</p>	<p><b>supported</b> 113:17 142:25 144:21 147:19 <b>supporting</b> 126:9 <b>supportive</b> 67:22 78:9 <b>supports</b> 113:9 <b>supposed</b> 34:17 62:25 151:23 152:5 <b>suppression</b> 9:5 <b>sure</b> 25:9 39:3 46:18 47:6 71:8 89:19 91:21 94:17 95:6 102:2 117:8 122:19 136:21 140:17 <b>surface</b> 23:10 <b>surfaces</b> 23:14 <b>surrounding</b> 154:21 <b>survive</b> 26:6 29:8 <b>suzanne</b> 5:16 <b>swan</b> 3:16 126:2,2 <b>switzer</b> 2:8 11:3,5 19:15 20:3,6,8,19 23:23,25 26:9 29:24 30:1 <b>synopsis</b> 151:24 <b>system</b> 16:13,24 46:2,3 93:16 99:2 120:18 121:21 124:16 125:13 127:13,14 137:15 147:7,19 <b>systems</b> 6:19,20,22 6:24 7:6,8,18,21 7:24 8:2,5 9:1,5 9:20 11:12,13 13:8,12 14:1 31:5 31:18,21 45:22,25</p>
--	--	---	--

[systems - thank]

66:17 111:6,6,23 112:2 113:1 115:14 117:15 120:13 121:16,23 121:24 122:14 127:19 128:19,22 134:4,25 135:4 147:4,5	<b>tech</b> 18:9 19:20 31:11 61:6 81:11 81:11 111:13 <b>technical</b> 1:2 5:3,9 7:20,23 8:1,1,6,15 8:25 9:18 10:4,17 11:6,12,24 12:5,15 12:20 13:1,5,8,11 13:20,25 14:4,6,11 14:21 15:24 17:2 17:4,12,16,18,22 17:25 18:2 19:13 19:20 20:9 28:8 31:4,11,17,23 44:2 51:16 60:23 61:6 61:18 72:15 77:22 81:3,11,20,25 99:8 111:5,13,23 113:16,18,24 114:14 121:5,22 122:3 123:23 134:3 135:5 153:20 154:2,6,23 157:24 164:4 <b>technically</b> 71:15 71:20 109:15 <b>technicians</b> 10:21 <b>technologies</b> 6:1 13:17 116:24 119:12,20 120:10 120:23 <b>technology</b> 6:22 120:2,6 121:2,10 125:4,6 126:9 127:8 128:6 129:7 129:8,19 130:13 <b>ted</b> 2:11 26:15,16 27:22 <b>telecommunicati...</b> 14:7	<b>tell</b> 35:4 155:23 <b>telling</b> 139:6 <b>tells</b> 83:16 <b>temperature</b> 22:10 23:8,18 27:5 98:16,17,21 99:3 101:16 103:22 104:5,20 104:21 <b>temperatures</b> 22:18 <b>temporal</b> 16:19 <b>ten</b> 110:22 <b>tenability</b> 53:24 <b>tenets</b> 116:13 <b>tenure</b> 20:4 61:10 <b>term</b> 146:17 147:13 <b>terms</b> 45:11 59:8 98:15 101:19 <b>terry</b> 4:10 139:2,2 147:11,11 151:15 151:15 <b>test</b> 18:22 49:1,2 50:8 61:21 64:17 65:8,21 66:17,18 67:4,17 68:9,10,15 70:21 71:24 72:9 73:24 74:10,16,17 74:24 75:19,20 77:24 78:1 83:5 86:19 94:9,11 95:25 96:17 99:7 99:24 103:4 107:17 120:4 125:20 136:17 <b>tested</b> 45:25 46:4 51:23,25 64:23 65:7,9,10,11 66:1 66:18 67:6 68:18 68:19 70:9 74:21	90:17 93:18 127:19 <b>testing</b> 52:24 60:25 66:11 68:20 71:3,9,11,14,18,21 72:2,4,5 75:17,21 83:5,24 93:9,10 96:3 98:15 103:14 105:1,4 106:14 109:16 120:5,7,12 121:20 130:23 134:4,24 135:3 136:5 153:22 <b>tests</b> 50:2 60:24 61:18 65:8,25 68:12 72:16 74:4 74:4 90:17 96:18 99:21 <b>texas</b> 61:1 <b>text</b> 19:24 20:1 30:17,18 36:15 42:6,8 48:5,6 59:21,22 76:13,15 80:18,20 89:7,9 92:7,9 95:14 97:14,17 105:16 105:18 110:6,8 111:16 118:7,9 133:8,10 141:8,9 141:13,14 145:17 148:8,10,14,15 149:9,10 151:1 152:3,20,20,22 153:1,2 158:24,25 160:11,12 161:25 162:25 163:15 <b>thank</b> 9:8,21,21,23 10:23 11:16,22 14:18 15:25 16:1 20:5,19 23:23 25:3 26:7 28:9,10
<b>t</b>			
<b>tab</b> 20:17 32:2 62:2 82:4,5 112:7 135:9 <b>table</b> 18:20 55:12 101:20 149:8 150:5,6,8,12,25 151:23 152:2,5 161:21 162:5,16 <b>table.’</b> 151:22 <b>tabled</b> 105:7 <b>take</b> 5:11 28:5 49:17 65:20 103:20 109:12 110:21 111:19 151:21 157:12,20 159:21 <b>taken</b> 37:19 54:10 110:24 <b>talk</b> 87:9 158:12 <b>talking</b> 39:17 58:5 58:7 68:20 103:3 <b>tall</b> 64:18 <b>tanner</b> 3:13 118:23,24 119:8 119:10 120:21 130:9,9 <b>tanner’s</b> 121:14 <b>task</b> 51:17 53:19 66:19,21 70:23 103:15 136:10,12 138:20 139:11 144:4			

[thank - time]

29:21,22 30:12,20 31:16 32:5 33:10 33:15,25 36:3,4,6 38:4 39:5,7,9 40:8 40:9,17 41:4,6,18 41:19 42:1,18 44:14,15,17 45:3,4 46:15 47:18,19,25 48:16,22 51:9,11 51:13 54:20 55:20 55:21,23 57:4,5,7 57:21,22,24 58:19 58:20 59:15,16,25 60:14 61:12,13 62:4,5 63:22,23 66:12,13 68:1,2 69:22,23 70:15,16 72:11,12,23 73:18 73:20 74:12 75:12 75:14,24 76:1,8,19 77:7 78:3,4,15,16 79:4,5,13,14,21,22 80:4,5,12,13,22 81:19 82:6,13,17 82:19 84:13,14,21 86:12 87:8 88:2,4 88:15,16,20,23 89:3,11,20,23 90:4 90:24 91:1,7,13,20 92:1,2,14,23 93:1 93:8 95:3,4 96:7 97:4,5,10 98:4 100:20,21,24 101:21 102:20,21 102:23 103:9,10 103:24,25 104:13 104:14 105:12 106:1,4,10 107:23 107:25 108:2 109:1,6,18,19 110:2 111:21	112:10,17 115:17 115:19 117:8,21 117:22 118:23 119:1,8 121:11,12 122:6 123:18,19 125:24 127:3,5 128:11,12,14 129:1,19 130:7 131:8 132:1,3,17 133:4,21,22 134:23 135:11,19 136:22,23,25 137:1,16,17 138:9 138:11,24,25 140:9,10,23,24 141:2 142:10,16 143:21,22,24 144:7,9,13 145:8 145:10 146:4,6,12 146:13,24,25 147:9,22,23 148:2 148:19,22 149:4 149:25 150:1,3,16 150:17,21 151:13 152:9,14 153:8,11 154:10,11,13 155:9,10 156:24 157:12,14,16 158:3,15,18 159:3 159:21 162:1,5,7 162:20 164:2,4 <b>thanking</b> 6:4 <b>thanks</b> 14:14 20:5 61:11 <b>that's</b> 23:3 27:15 34:7 43:21 44:4 44:13 45:7 46:17 58:17 65:17,17 73:2,6 83:15 90:24 98:21 101:20 103:7	104:5 107:22 109:11,14,16 111:13 124:4 125:20,21 143:4 147:20 149:8,12 155:20 160:23 163:10 <b>there's</b> 23:7 38:12 51:7 64:7,14,22 65:15 66:6 70:10 73:10 77:7 88:9 93:1 102:7 122:25 122:25 124:2,11 126:13,22,25 144:23 152:1 153:20 156:16,18 157:19,22,23,23 161:25 <b>thermal</b> 10:3 14:10 20:24 90:23 124:11 <b>they'll</b> 15:7 <b>they're</b> 23:19 34:6 38:22,22 39:2,2,3 43:14 47:4,5,17 122:20 126:24 <b>thick</b> 24:5 <b>thickness</b> 24:19 27:9 35:12 <b>thin</b> 35:11 <b>thing</b> 30:1 38:23 56:3 83:3 84:1 93:9 98:15 99:20 104:19 123:9 128:9 <b>things</b> 28:21 35:20 39:4 49:12 55:2 56:3 58:16 79:9 104:6,18,23 115:9 116:16,18 126:11 126:22 127:11,21	128:10 136:3 151:3 156:14 <b>think</b> 26:11 38:13 41:1,14 74:5 96:15 103:20 114:23 116:12,20 129:16 132:16 138:19 140:16,20 149:23 152:4,6 153:24 157:4 162:14 <b>thinner</b> 25:16,21 29:3,10 39:23 <b>this.'</b> 154:7 <b>thought</b> 28:19 122:15 <b>thousands</b> 64:22 <b>three</b> 16:19 22:5 55:2,13 58:11 73:21 112:13 113:15 116:8 125:5,19 126:1 129:20 130:24 131:9 134:12,15 148:6 <b>threshold</b> 122:2 <b>throw</b> 151:8 <b>thrust</b> 28:5 <b>time</b> 5:24 8:17 13:18 15:12 18:15 24:12,25 29:5 38:17 41:25 44:20 47:24 50:6 92:11 98:16,16,20 101:16 103:21 104:4,20,21 105:8 105:9 106:13,14 106:17,19,25 107:2,2,4,9,11,12 107:16,16,21,23 108:4,15,21 109:9
---	--	--	--

[time - unchanged]

<p>109:13,17 128:7 136:1,1 139:7 140:9 154:8 <b>times</b> 16:12 28:25 58:11 152:6 <b>tlc</b> 138:11 144:13 148:19 153:9 <b>today</b> 6:13,18 8:20 11:22,25 17:9 18:11 45:17 102:5 114:13,18 121:6,8 125:7 132:25 133:20 134:1,2 145:25 <b>today's</b> 18:6,14 164:3,6 <b>told</b> 156:7 162:14 <b>tomorrow</b> 133:20 164:8 <b>tone</b> 16:11,22 <b>tones</b> 16:12 <b>top</b> 4:4 135:14,16 135:16,25 137:1 <b>topic</b> 26:22 <b>tops</b> 126:13 <b>top's</b> 139:7 <b>total</b> 51:22 100:14 102:10 116:20 <b>touch</b> 30:15,17,19 42:4,8 48:3,5,7 59:19,23 76:12,14 76:16 80:17,19,21 89:6,8,9 92:5,7,9 97:13,16,17 105:15,19 110:4,8 118:6,8,9 133:6,8 133:10 141:6,8,10 148:6,8,10 152:18 152:21,23 158:22 158:24 159:1 162:24 163:15,17</p>	<p><b>touching</b> 142:23 143:17 144:22 145:1,2 <b>tough</b> 130:3 139:13 <b>tower</b> 64:19 <b>tps</b> 25:9 28:16 <b>traction</b> 53:15 <b>trade</b> 49:2 <b>trades</b> 5:20 <b>traffic</b> 12:5 <b>train</b> 44:20 <b>trained</b> 129:11 <b>trains</b> 35:5 43:5 55:4 58:14 <b>trainway</b> 56:6 <b>trainways</b> 50:17 52:14,15,22 54:9 56:17 57:3 <b>trans</b> 127:16 <b>transcribed</b> 1:24 165:4 <b>transcriber's</b> 165:1 <b>transcript</b> 1:1 5:2 15:15 <b>transform</b> 49:11 <b>transformation</b> 49:13 <b>transit</b> 9:20 13:25 31:5,17,21 <b>transmission</b> 49:13 99:5 <b>transportation</b> 46:6 99:1 <b>treated</b> 67:23 77:17 78:11,23 115:14 <b>tried</b> 56:18 <b>true</b> 66:2,5 68:13 165:14</p>	<p><b>truly</b> 95:9 103:1 144:21 154:3 <b>trust</b> 125:19 129:9 <b>try</b> 10:20 15:19 26:2,3,21 45:2 64:18 65:4 67:8 82:21 110:14 138:20,21 <b>trying</b> 27:14 39:25 52:16 56:20 136:17 143:6 151:19,20,21 155:6 157:21 <b>tunnel</b> 9:18 56:6 81:20 99:1 <b>tunneling</b> 105:3 <b>tunnels</b> 52:15,22 59:5 81:3,23 98:19,22 100:1,2 108:8 <b>turn</b> 14:23 15:22 46:16 115:3 <b>turns</b> 130:13 <b>twenty</b> 142:1 <b>twice</b> 58:11 <b>two</b> 21:23 25:6 28:3,10 35:8 38:8 41:7 42:8,14 46:22 48:7,13 49:20 51:19 52:1 54:11,24 55:9 57:23 58:11,25 59:23 63:22 67:12 67:13 76:15 80:20 80:23 82:9 85:9 87:11 89:9,16 91:12 92:19 93:11 94:16 96:11 100:12,16 101:17 101:24 104:1,22 105:6,18,25</p>	<p>106:14,18 107:17 107:19 108:23 109:5,11,18,25 110:8 112:13 118:9 133:10 135:14,15 139:1 141:10,15 146:5 147:10 148:10,15 150:24 151:14 152:23 153:2 156:14 157:6 159:1 160:12 161:11 163:16 <b>type</b> 17:3 27:11 34:23 36:16 38:24 43:4,13 45:13 49:20 56:23 59:6 147:5 <b>types</b> 25:1 36:12 36:23 37:23 40:2 40:5,25 44:22 67:4,19,23 73:13 73:15 78:11 <b>typically</b> 17:21 109:14</p>
<b>u</b>			
<p><b>ul</b> 39:16,16,16,21 44:4 45:21 49:3 51:23 56:23 104:24 120:5 122:10 125:15,17 130:23 136:11 <b>ultimately</b> 27:16 <b>um</b> 81:19 <b>unable</b> 24:2 <b>unanimous</b> 45:16 85:10 88:11 <b>uncertainty</b> 75:6,7 75:8 <b>unchanged</b> 144:3</p>			

[underground - vote]

<p><b>underground</b> 56:6 56:17 57:3 <b>understand</b> 28:25 62:24 96:15 124:2 126:8 151:19 <b>understanding</b> 71:13 126:6 <b>understands</b> 38:14 <b>understood</b> 151:25 <b>underwriters</b> 136:10 <b>undersys</b> 26:24 27:7 <b>unfolded</b> 115:19 <b>unfortunate</b> 136:2 <b>unfortunately</b> 77:21 114:9 124:24 <b>unidentified</b> 2:5 2:20 <b>uniform</b> 27:16 <b>unintelligible</b> 25:11 35:4,24,24 36:3,21 43:20 44:18 47:14 49:10 49:14 51:4,22,23 53:10,18 60:1,4,6 60:18,20,21 63:8 68:21,22 83:11 90:22 91:22 93:12 93:21 94:13,16,22 95:2,16 96:25 100:10 107:22 110:10,11,13 131:21 160:6,15 163:2,19,24 <b>unintentionally</b> 137:7 <b>unique</b> 123:25</p>	<p><b>unit</b> 119:22 122:21 123:8 <b>units</b> 123:6 <b>university</b> 12:18 <b>unjustified</b> 74:7 <b>unknowingly</b> 75:21 <b>unknown</b> 75:5 80:2 138:18 <b>unlimited</b> 123:10 <b>unnecessary</b> 36:1 36:19 44:7 45:23 <b>unsafe</b> 100:17 <b>unsuitable</b> 27:5 <b>untrue</b> 53:13 <b>unwilling</b> 114:2 <b>updated</b> 5:25 150:6 <b>updating</b> 96:2 <b>uphold</b> 72:8 <b>urge</b> 72:7 74:10 79:4 80:3 91:19 103:8 123:16 125:23 128:10,25 138:23 143:17,20 145:8 149:25 154:9 157:11 158:2 <b>urging</b> 79:20 <b>use</b> 17:2 18:19 22:3,14 23:15 27:23 28:1 29:9 30:3 35:10 40:24 46:7 52:2 66:20 68:11 71:5,17 87:23 90:12,12 94:18 96:15 100:18 107:4 129:25 154:25 <b>user</b> 34:18 43:23 43:24 47:10</p>	<p>156:10 <b>users</b> 35:4 39:18 44:25 149:17 151:2 <b>usgsa</b> 147:2 158:5 <b>usually</b> 23:16 25:19 39:23 <b>utilities</b> 113:8 114:1,16 116:19 <b>utilities'</b> 115:8 <b>utility</b> 113:11 114:3 <b>utilize</b> 22:8 <b>utilized</b> 37:16 <b>utilizing</b> 22:11 <b>uv</b> 127:15 <b>uws</b> 9:17</p> <hr/> <p><b>v</b></p> <hr/> <p><b>v</b> 17:20 <b>valid</b> 75:9 161:11 <b>validate</b> 157:23 <b>validated</b> 120:2 <b>valley</b> 12:1 <b>value</b> 37:1 38:2 <b>vancouver</b> 13:24 40:22 <b>vapors</b> 83:2 85:8 85:23 <b>various</b> 60:7 69:16 77:1,16,19 82:23 83:20 84:8 87:19 90:20 136:18 <b>vary</b> 115:6 <b>vast</b> 119:20 <b>vehicle</b> 10:21 46:6 116:17 <b>vehicular</b> 13:12 <b>ventilation</b> 52:22 54:1,7 <b>verify</b> 18:24</p>	<p><b>veritext</b> 1:19 <b>versed</b> 109:15 <b>versus</b> 52:5 53:20 54:6,9 136:6 155:6 <b>vertical</b> 64:17 <b>vessels</b> 9:7 10:5 13:2,6 14:4 <b>veteran</b> 129:22 <b>vice</b> 116:4 <b>victor</b> 4:10 139:2,2 147:11,11 151:15 151:15 <b>victoria</b> 9:17 <b>video</b> 15:16 <b>viewpoints</b> 65:15 <b>views</b> 108:6 <b>violate</b> 75:22 <b>virginia</b> 13:1 127:7 132:5 <b>visiting</b> 28:24 <b>visual</b> 144:5 154:24 <b>visualize</b> 119:21 <b>vital</b> 52:8 53:17 <b>voice</b> 113:19,25 <b>voices</b> 60:7 111:2 159:2,6,15,18,23 160:1,3,14 163:3 163:25 <b>voltage</b> 34:11 36:9 37:9 <b>volts</b> 34:12 <b>volunteer</b> 12:1 <b>volunteers</b> 5:23 <b>vote</b> 17:9 18:23 19:1,4 28:9 30:13 30:15,15,16,18,19 30:22 38:1 42:1,4 42:4,5,7,7,9 47:25 48:3,3,4,5,7 59:17</p>
--	---	---	--



[vote - wires]

59:19,19,20,21,22 59:23 73:18 74:11 75:11 76:8,12,12 76:12,14,16,18 79:11,11,11,20 80:3,13,17,17,17 80:19,21 88:11 89:4,5,6,6,8,10 91:19 92:3,5,5,6,8 92:10 97:10,13,13 97:14,16,18 103:9 105:13,15,15,16 105:17,17,19 110:2,4,5,5,6,7,9 110:15 113:18 114:13 117:2 118:4,6,6,6,8,10 123:17 124:5 127:2 129:1 130:7 133:4,6,7,7,9,11 134:10 138:1 140:7 141:4,4,6,6 141:7,9,10,12 143:5 145:19 147:22 148:4,4,6,7 148:7,9,11,13 151:11 152:16,16 152:18,19,19,21 152:21,23,25 158:2,20,20,22,22 158:23,24 159:1,5 159:13,25 160:10 162:22,22,24,24 162:25 163:14,14 163:16,17,22 <b>voted</b> 138:15 144:17 <b>votes</b> 17:4 18:1 67:7 101:17 137:16 155:9	<b>voting</b> 17:7 18:12 18:13,15,18,20 19:2,4,5,6,11 30:19,20 37:3 42:9,10 45:15 48:7,8 54:16 59:24,24 60:3,12 60:13 70:20 72:15 80:21,22 85:9 89:10,11 95:8 97:18 102:25 105:19,20 108:22 110:16 118:11 133:12 141:11,11 148:11,12 152:23 152:24 159:20,24 160:8,8,9 163:17 163:21 <b>voting's</b> 76:17 92:14 118:11 133:12	117:7 140:16 <b>wanting</b> 116:10 <b>wants</b> 109:14 157:20 <b>waste</b> 154:8 <b>wasting</b> 143:19 <b>water</b> 8:2,4 9:5 74:8 77:18 128:20 134:4,25 135:3 136:2 <b>way</b> 6:25 14:22 25:23 29:18 30:6 39:20 65:6 68:14 71:9 83:3 115:15 136:17 137:24 139:11 140:5 163:9,13 <b>ways</b> 28:19 82:23 84:8 <b>weaken</b> 26:2 <b>web</b> 82:5,5 <b>website</b> 19:19 31:10 61:5 81:9 95:17 111:11 134:21 146:21 <b>webster</b> 28:2 <b>weight</b> 22:7,12,24 142:22 147:6 <b>weird</b> 93:9 <b>welcome</b> 5:8 9:12 <b>went</b> 27:14 45:5 142:22 156:2 <b>wentworth</b> 157:17 <b>we'd</b> 126:4 <b>we'll</b> 60:9 62:19 92:11 109:4 110:22 112:12 118:10 133:11 <b>we're</b> 5:7 30:5 34:23 35:19 38:16 38:23 39:17,25	40:6 47:2 55:7 56:20 68:19 84:16 96:19 102:13 103:21,22 107:20 108:15 110:12 116:16 122:12 125:16,18 127:24 129:11 131:23 136:16 139:10 145:4 146:18 149:6,12 153:18 153:24 157:21 159:4 <b>we've</b> 14:20 25:15 29:15 78:22 79:2 113:13 117:16 129:15,16 133:1 138:3,20 150:24 154:4 <b>what's</b> 74:1 102:12 139:11 144:21,21 152:5 <b>white</b> 143:10 146:20 <b>who's</b> 111:20 <b>wide</b> 37:16 <b>william</b> 13:4,5 <b>willing</b> 156:8 157:7 <b>win</b> 114:13 <b>winner</b> 9:13 <b>wire</b> 40:21 52:15 53:2 55:24 56:8 56:24 58:2,3,9,12 58:13 <b>wires</b> 34:12 36:10 37:9 48:25 49:7 50:2,24,25 51:2,14 51:21 52:25 53:12 54:13 55:7,19
	<b>w</b>		
	<b>wait</b> 15:2 60:10 <b>walk</b> 28:20 <b>walking</b> 91:21 122:21 <b>walkways</b> 122:22 <b>wall</b> 22:2 25:16 29:4,10 61:22 71:10 78:24 <b>want</b> 14:21 16:6 25:7 30:11 55:1 72:1,24 74:1 84:15,20 87:9 91:21 95:3 96:20 97:1,1,2 104:11 109:8 131:11 132:23 146:19 147:18 164:4 <b>wanted</b> 15:20 57:14 72:18 104:4		

[wiring - '86]

<b>wiring</b> 52:17 53:9 113:8 <b>wisconsin</b> 21:1 <b>wish</b> 30:16,17 42:5 42:7 48:3,5 59:20 59:21 76:12,14 80:17,19 89:6,8 91:4 92:6,8 97:13 97:16 105:15,17 110:5,7 118:6,8 124:6 133:7,9 141:7,9 148:7,9 152:19,21 158:22 158:24 162:24 163:14,15 <b>withdraw</b> 114:22 <b>withdrawal</b> 63:21 <b>withdrawing</b> 63:13 <b>women</b> 114:5 <b>won't</b> 47:17 95:18 <b>wood</b> 77:17 <b>wool</b> 22:9 <b>word</b> 70:10 149:16 149:23 <b>wording</b> 66:8,9 <b>words</b> 27:7 49:17 63:16 126:6 130:11 <b>work</b> 7:15 26:22 28:8 39:10 60:4 70:23 72:9 114:12 139:11 151:6 <b>worked</b> 40:21 66:21 143:8 159:11 <b>working</b> 18:12,24 39:25 45:2 60:6 92:13 110:12 159:4,7,9,12,16	<b>works</b> 140:22 <b>world</b> 72:4 117:18 <b>worse</b> 151:10 <b>worthy</b> 8:21 <b>write</b> 74:19 <b>writing</b> 65:16 <b>written</b> 29:18 95:13 123:9 127:8 <b>wrong</b> 58:10 <b>wrote</b> 87:14 <b>www.nfpa.org</b> 20:18 62:4 112:9 135:10 <b>www.nfpa.orgdoc</b> 32:4 <b>x</b> <b>xps</b> 67:19 73:6 <b>y</b> <b>yale</b> 12:18 <b>yeah</b> 25:8 28:15 44:17 56:25 60:11 63:3 77:3 87:18 104:25 117:10 149:5,20 159:21 <b>year</b> 105:6 119:14 123:24 129:22 156:5 <b>year.'</b> 149:19 <b>years</b> 9:9,22 10:24 11:17 14:20 24:1 25:11 28:22 39:11 50:1 62:23 64:20 66:15,21 68:1 70:24 71:21 72:9 78:14 103:15 113:14,15,15 116:8 119:11 125:5 155:3 <b>years'</b> 161:23	<b>year's</b> 5:12 <b>york</b> 11:6 12:12 13:11 19:16 31:7 31:7 81:6 <b>yotta</b> 118:24 119:16,21 <b>young</b> 104:23 105:2 <b>you're</b> 15:9,14,16 15:18 19:10 25:13 28:11,12,14 54:22 56:6 58:5,7,8,9 117:4 131:3,4 132:11 151:6 159:19 <b>you've</b> 157:3 <b>z</b> <b>zero</b> 67:7 127:20 <b>,</b> <b>'</b> 28:2 83:15 107:22 <b>'84</b> 24:9 <b>'85</b> 24:11 <b>'86</b> 24:11 28:8
---	--	--