Technical Committee on Fire Pumps (FIM-AAA)

M E M O R A N D U M

DATE: September 19, 2016

TO: Principal and Alternate Members of the Technical Committee on Fire Pumps (FIM-AAA)

FROM: Chad Duffy, NFPA Staff Liaison
Office: (617) 984-7562 Email: cduffy@nfpa.org

SUBJECT: **AGENDA – NFPA 20 First Draft Meeting (Annual 2018)**

Enclosed is the agenda for the First Draft meeting for NFPA 20, *Standard on the Installation of Stationary Pumps for Fire Protection*, which will be held at the Buena Vista Palace, Lake Buena Vista, FL **8:00am to 5:00pm ET on Tuesday October 4, 2016, Wednesday, October 5, 2016 and Thursday October 6, 2016.**

Please submit requests for additional agenda items to the chair at least seven days prior to the meeting, and notify the chair and staff liaison as soon as possible if you plan to introduce any first revisions at the meeting.

All NFPA Technical Committee meetings are open to the public. Please contact me for information on attending a meeting as a guest. Read NFPA's Regulations Governing the Development of NFPA Standards (Section 3.3.3.3) for further information.

Additional Meeting Information:
See the Meeting Notice on the Document Information Page (www.nfpa.org/20next) for meeting location details. If you have any questions, please feel free to contact **Sarah Caldwell**, *Project Administrator* at 617-984-7950 or by email scaldwell@nfpa.org.

C. Standards Administration

Technical Committee on Fire Pumps (FIM-AAA)

NFPA 20 First Draft Meeting (Annual 2018)

Tuesday, Oct.4, 2016, Wednesday, Oct. 5, 2016,
and Thursday Oct. 6, 2016, 8:00am – 5:00pm ET
Buena Vista Palace, Lake Buena Vista, FL

AGENDA

Tuesday, October 4, 2016

1. Task Group Meetings 8:00 AM – 12:00 PM

2. Call to Order – 1:00 PM

3. Introductions and Attendance

4. Review Agenda

5. NFPA Staff Liaison Presentation and Review of Key Dates in Current Cycle

6. Chairman Comments

7. Approval of Previous Meeting Minutes

8. Committee Members identify any Committee Input (proposals) that may require extended discussion.

9. Act on Public Input for NFPA 20- Tentative order of presentation

a. **Task Group 8 – Connectivity –** Doug Stephens – Chair
b. **Task Group 1 – Chapter 4, 6 & 7 – Pump Chapters -** Darrell Snyder – Chair
c. **Task Group 2 – Chapter 9, 10, & 12 – Electrical -** John Kovacik - Chair
d. **Task Group 3 – Chapter 5 – High Rise -** David Fuller - Chair
e. **Task Group 4 – Chapters 8 – Positive Displacement –** Jennifer McGrath – Chair
f. **Task Group 5 – Chapter 11 – Engines –** John Whitney – Chair
g. **Task Group 6 – Chapters 13 – Steam -** Alan Dorini – Chair
h. **Task Group 7 – Chapter 14 – Testing –** Terry Victor – Chair
i. **Task Group 9 – Coordination with NFPA 25 –** Kerry Bell - Chair

10. Adjourn - TBD

Wednesday, October 5, 2016

1. Call to Order – 8:00 AM

2. Act on Public Input for NFPA 20

3. Adjourn – TBD

Technical Committee on Fire Pumps (FIM-AAA)

NFPA 20 First Draft Meeting (Annual 2018)

Tuesday, Oct.4, 2016, Wednesday, Oct. 5, 2016,
and Thursday Oct. 6, 2016, 8:00am – 5:00pm ET
Buena Vista Palace, Lake Buena Vista, FL

Thursday, October 6, 2016

1. Call to Order – 8:00 AM
2. Complete Action on Public Input for NFPA 20
3. Dissolution of current task groups
4. Assignment of new task groups
5. New business
6. Adjourn Meeting – TBD

Please submit requests for additional agenda items to the chair at least seven days prior to the meeting.

Please notify the chair and staff liaison as soon as possible if you plan to introduce any committee input at the meeting.

Key Dates for the Annual 2018 Revision Cycle

Input Closing Date	June 29, 2016
Final Date for First Draft Meeting	**December 7, 2016**
Posting of First Draft and TC Ballot	January 25, 2017
Ballots Returned By	**February 15, 2017**
Post Final First Draft	March 1, 2017
Comment Closing Date	May 10, 2017
Final Date for Second Draft Meeting	**November 8, 2017**
Posting of Second Draft and TC Ballot	December 20, 2017
Ballots Returned By	**January 10, 2018**
Posting Final Second Draft	January 24, 2018
Closing Date for Notice of Intent to Make a Motion (NITMAM)	February 21, 2018
Issuance of Consent Document (No NITMAMs)	*April 29, 2018*
NFPA Annual Meeting	June 4-7, 2018
Issuance of Document with NITMAM	*August 14, 2018*

Technical Committee deadlines are in **bold**.

Meeting Preparation

Committee members are strongly encouraged to review the published input prior to the meeting and to be prepared to act on each item.

Handout materials should be submitted to the chair at least seven days prior to the meeting.

Only one posting of the input will be made; it will be arranged in section/order and will be pre-numbered. This will be posted to the NFPA Document information pages located at www.nfpa.org/20. If you have trouble accessing the website please contact Sarah Caldwell at scaldwell@nfpa.org.

Mandatory Materials:

- Last edition of the standard
- Meeting agenda
- Public input/comments
- Committee Officers' Guide (Chairs)
- Roberts' Rules of Order (Chairs; An abbreviated version may be found in the Committee Officer's Guide)

Optional Materials:

- NFPA Annual Directory
- NFPA Manual of Style
- Prepared committee input/comments (If applicable)

Regulations and Guiding Documents

All committee members are expected to behave in accordance with the Guide for the Conduct of Participants in the NFPA Codes and Standards Development Process.

All actions during and following the committee meetings will be governed in accordance with the Regulations Governing the Development of NFPA Standards. Failure to comply with these regulations could result in challenges to the standards-making process. A successful challenge on procedural grounds could prevent or delay publication of the document.

The style of the document must comply with the Manual of Style for NFPA Technical Committee Documents.

General Procedures for Meetings

- Use of tape recorders or other means capable of producing verbatim transcriptions of any NFPA Committee Meeting is not permitted.
- Attendance at all NFPA Committee Meetings is open. All guests must sign in and identify their affiliation.
- Participation in NFPA Committee Meetings is generally limited to committee members and NFPA staff. Participation by guests is limited to individuals, who have received prior approval from the chair to address the committee on a particular item, or who wish to speak regarding public input or comments that they submitted.
- The chairman reserves the right to limit the amount of time available for any presentation.
- No interviews will be allowed in the meeting room at any time, including breaks.
- All attendees are reminded that formal votes of committee members will be secured by letter ballot. Voting at this meeting is used to establish a sense of agreement, but only the results of the formal letter ballot will determine the official action of the committee.
- Note to Special Experts: Particular attention is called to Section 3.3(e) of the NFPA Guide for the Conduct of Participants in the NFPA Codes and Standards Development Process in the NFPA Directory. This section requires committee members to declare any interest they may represent, other than their official designation as shown on the committee roster. This typically occurs when a special expert is retained by and represents another interest category on a particular subject. If such a situation exists on a specific issue or issues, the committee member shall declare those interests to the committee and refrain from voting on any action relating to those issues.
- Smoking is not permitted at NFPA Committee Meetings.

Technical Committee Roster

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Previous Meeting Minutes

MINUTES of the

NFPA 20 – 2nd Draft meeting

Northbrook, IL – October 21 thru 22, 2014

Tuesday; October 21

1. Chairman Gayle Pennel called the meeting to order at 8 AM.
2. All attendees delivered their self-introductions. See attendance.
3. Chairman Pennel provided standard meeting instructions.
4. Chairman Pennel called for a motion to accept minutes of October 2013 Public Input meeting of the Technical Committee in Orlando, FL. Motion passed unanimously.
5. Staff Liaison Chad Duffy instructed Technical Committee on Roster update and attendance log.
6. Chairman Pennel entertained a discussion led by Jim Nasby on the topic of "Controller Connectivity". After significant deliberation, Chairman Pennel assigned members of the Technical Committee to a Task Group for a recommendation by Wednesday, October 22.
7. The Technical Committee began the review and action process on 36 Public Comments beginning with Task Group reports and actions:
    a) Task Group 1 (Darrell Snyder) on Chps 4, 6, &7
    b) Task Group 2 (Michael Aaron) on Chp 5
    c) Task Group 4 (John Kovacik) on Chps 9 & 10
    d) Task Group 5 (John Whitney) on Chps 11 & 12
    e) Task Group 7 (Bill Harvey) on Chp 14
8. Session recessed at 5:05 PM

Wednesday; October 22

9. Technical Committee reconvened at 8:00 AM on 10/22 and continued the review and action process on the Public Comments

10. Chairman Pennel appointed the following Task Groups (first UPPERCASED name denotes Group Chair)

    - Task Group 1 – **Pumps, Chapters 4, 6 and 7:** DARRELL SNYDER, Michael Aaron, Pat Brock, Mohammad Dadgardoust, Hatem Ezzat Kheir, Jennifer McGrath, Charles McKnight, Hansford Stewart, Kenneth Isman

    - Task Group 2 – **Electrical, Chapters 9, 10, and 12:** JOHN KOVACIK, James Nasby, Richard Schneider, William Stelter, Doug Stephens, Louis Guerrazzi

    - Task Group 3 - **High Rise, Chapter 5:** DAVID FULLER, Michael Aaron, Marinus Both, Jerald Huff, Joseph Sanford, William Stelter

    - Task Group 4 - **Positivie Displacement Pumps, Chapter 8**: JENNIFER MCGRATH, Michael Aaron, Charles McKnight, Terry Victor

    - Task Group 5 – **Engines, Chapter 11:** JOHN WHITNEY, Charles McKnight, Darrell Snyder, Hansford Stewart, Kerry Bell, Mohammad Dadgardoust, Hatem Ezzat Kheir, Matthew Paine, Robert Montgomery

    - Task Group 6 - **Steam Chapter 13:** ALAN DORINI, Joseph Sanford

    - Task Group 7 - **Testing Chapter 14:** TERRY VICTOR, Marinus Both, Bill M. Harvey, Hatem Ezzat Kheir, Brian Buscher, Floyd Luinstra, Matthew Paine, Thomas G. Wellen, Damon Pietraz, Michael Herron

    - Task Group 8 - **Connectivit**y: DOUG STEPHENS, Gayle Pennel, James Nasby, Richard Schneider, Brian Buscher, William Stelter, Roger Montembeault, Loiuis Guerrazzi, Damon Pietraz

    - Task Group 9 - **Coordination with NFPA 25:** KERRY BELL, Marinus Both, Milosh Puchovsky, John Whitney, Kenneth Isman, Floyd Luinstra, Darrell Underwood

11. Chairman Pennel announced that a ballot for this NFPA 20 meeting on Public Comments will be forwarded to the Technical Committee members for their official vote.

12. Chairman Pennel called for a motion to adjourn the meeting at 2:15 PM. Motion passed unanimously.

Respectfully submitted,

R. T. Leicht, Secretary

Attendees:

Gayle Pennel, Chair
R. T. Leicht, Secretary
Chad Duffy, NFPA Staff Liaison

Principals

Michael Aaron
Marinus Both
Pat Brock
Stephen Clark
Mohammad Dadgardoust
Bill Harvey
Hatem Kheir
John Kovacik
Jennifer McGrath
Charles McKnight
James Nasby
Peter Petrus
Milosh Puchovsky
Jeffrey Roberts
Richard Schneider
Darrell Snyder
Hansford Stewart
Terry Victor
John Whitney

Alternates

Kerry Bell
Brad Cronin
Leroy Franklin
Jerald Huff
Kenneth Isman
Michael Koska
Floyd Luinstra
Matthew Paine
Joseph Sanford
William Stelter

Edward Leedy, Member Emeritus

Guests

Louis Guerrazzi
Michael Herron
Roger Montembault
Darrell Underwood
Doug Stephens

Public Input Report

(A2018)

Public Input No. 3-NFPA 20-2015 [Chapter 2]

Chapter 2 Referenced Publications

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2016 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection,* 2013 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* 2016 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2014 edition.

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines,* 2014 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,* 2014 edition.

NFPA 70® , *National Electrical Code®,* 2014 edition.

NFPA 70E® , *Standard for Electrical Safety in the Workplace®,* 2015 edition.

NFPA 72® , *National Fire Alarm and Signaling Code,* 2016 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* 2016 edition.

NFPA 1963, *Standard for Fire Hose Connections,* 2014 edition.

2.3 Other Publications.

2.3.1 AGMA Publications.

American Gear Manufacturers Association, 1001 N. Fairfax Street, 5th Floor, Alexandria, VA 22314-1560.

AGMA 2011, *Cylindrical Wormgearing Tolerance and Inspection Methods*, ~~2004~~ **Revision B14, 2014** .

2.3.2 ANSI Publications.

American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI B11.19, *Performance Requirements for Safeguarding*, 2010.

2.3.3 ASCE Publications.

American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

SEI/ASCE 7, *Minimum Design Loads for Buildings and Other Structures*, 2010.

2.3.4 ASME Publications.

~~American Society of Mechanical Engineers~~ **ASME International** , Two Park Avenue, New York, NY 10016-5990.

Boiler and Pressure Vessel Code, ~~2013~~ **2015** .

2.3.5 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM SI10, *Standard for Use of the International System of Units (SI): The Modern Metric System* , 2010.

2.3.5 AWS Publications.

American Welding Society, 8669 NW 36 Street, Suite 130, ~~Doral~~ **Miami** , FL 33166**-6672** .

AWS D1.1**/D1.1M** , *Structural Welding Code — Steel*, ~~2010~~ **2015** .

2.3.6 HI Publications.

Hydraulic Institute, 6 Campus Drive, First Floor North, Parsippany, NJ 07054-4406.

Hydraulic Institute Standards for Centrifugal, Rotary, and Reciprocating Pumps, 14th edition, 1983.

HI 3.6, *Rotary Pump Tests*, 2010.

2.3.7 IEEE Publications.

IEEE, Three Park Avenue, 17th Floor, New York, NY 10016-5997.

~~IEEE/ASTM SI10, *Standard for Use of the International System of Units (SI): The Modern Metric System* , 2010.~~

ANSI/IEEE 62.1, *IEEE Standard for Gapped Silicon-Carbide Surge Arresters for AC Power Circuits*, 1989. **(Withdrawn)**

~~ANSI/~~ IEEE C62.11, *IEEE Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1 kV)*, 2012.

~~ANSI/~~ IEEE C62.41, *Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits*, 1991. **(Withdrawn)**

~~ANSI/~~ IEEE C62.41.2, *IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits*, 2002**, Corrigendum, 2012** .

2.3.8 ISO Publications.

International Organization for Standardization, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO 15540, *Fire Resistance of Hose Assemblies*, 1999.

2.3.9 NEMA Publications.

National Electrical Manufacturers Association, 1300 North 17th Street, Suite 900, Arlington, VA 22209.

NEMA MG-1, *Motors and Generators*, 2011.

2.3.10 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 142, *Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids,* 2013.

ANSI/UL 508, *Standard for Industrial Control Equipment*, 2013.

ANSI/UL 1449, *Standard for Surge Protective Devices*, 2013.

2.3.11 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2013 edition.

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines,* 2014 edition.

NFPA 70® , *National Electrical Code®,* 2014 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* 2016 edition.

NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program,* 2013 edition.

NFPA 5000® , *Building Construction and Safety Code®,* 2015 edition.

Statement of Problem and Substantiation for Public Input

Referenced current SDO names, addresses, standard names, numbers, and editions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4-NFPA 20-2015 [Chapter D]	

Submitter Information Verification

Submitter Full Name: Aaron Adamczyk
Organization: [Not Specified]
Street Address:
City:
State:
Zip:
Submittal Date: Sun Dec 20 19:53:19 EST 2015

Public Input No. 100-NFPA 20-2016 [Section No. 2.3.6]

Updates to NFPA 2.3.6

Hydraulic Institute

6 Campus Drive, First Floor North

Parsippany, New Jersey 07054-4406

www.Pumps.org

ANSI/HI 3.1-3.5 Rotary Pumps for Nomenclature, Definitions, Design & Application, Installation, Operation and Maintenance

ANSI/HI 1.1-1.2 Rotodynamic (Centrifugal) Pumps for Nomenclature and Definitions

ANSI/HI 2.1-2.2 Rotodynamic (Vertical) Pumps for Nomenclature and Definitions

ANSI/HI 1.3 Rotodynamic (Centrifugal) Pumps for Design and Application

ANSI/HI 2.3 Rotodynamic (Vertical) Pumps for Design and Application

ANSI/HI 14.6 Rotodynamic Pumps for Hydraulic Performance Acceptance Tests

ANSI/HI 9.6.4 Rotodynamic Pumps for Vibration Measurements and Allowable Values2.3.6 HI Publications.

Hydraulic Institute, 6 Campus Drive, First Floor North, Parsippany, NJ 07054-4406.

Hydraulic Institute Standards for Centrifugal, Rotary, and Reciprocating Pumps, 14th edition, 1983.

HI 3.6, *Rotary Pump Tests*, 2010.

Statement of Problem and Substantiation for Public Input

This is in order to update standards referenced to current H.I. standards.

Submitter Information Verification

Submitter Full Name: Michael Herron
Organization: Patterson Pump
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 20 09:48:59 EDT 2016

Public Input No. 167-NFPA 20-2016 [Section No. 2.3.10]

2.3.10 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 142, *Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids,* 2013, Revised 2014 .

ANSI/UL 508, *Standard for Industrial Control Equipment*, 2013.

ANSI/UL 1449, *Standard for Surge Protective Devices*, 2013, Revised 2016 .

Statement of Problem and Substantiation for Public Input

This proposal updates the referenced UL Standards to the referenced edition.

Submitter Information Verification

Submitter Full Name: Ronald Farr
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 27 15:37:21 EDT 2016

Public Input No. 200-NFPA 20-2016 [New Section after 3.3.25.1]

Torsional Coupling.

A driveline component capable of transmitting torque having a very low spring constant along the axis of rotation. The effect of this component is to “detune” the driveline system and move any damaging resonances safely below operating speed.

Statement of Problem and Substantiation for Public Input

The changes proposed to 7.5.1.6 are considerable and unfortunately to present in the normal strikethrough and underline method became too confusing, therefore I have presented the proposal in final language form with all paragraphs.

Summary, in the changes no requirements have been eliminated, however much additional guidance in the form of requirements and ANNEX material has been added to help package designers through the evaluation of mass elastic systems. Since the 2016 edition it has been learned that a 2 mass torsional analysis is not adequate for this type of system, therefore the requirement has change to a 3 mass torsional analysis with guidance as to how to elevate the analytical process for systems that result in marginal 3 mass calculations to determine if these systems can be predicted as reliable.

Submitter Information Verification

Submitter Full Name: John Whitney
Organization: Clarke Fire Protection Product
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jul 05 10:23:01 EDT 2016

Public Input No. 37-NFPA 20-2016 [Section No. 3.3.39]

3.3.39 Power

3.3.39.1 Alternate Power. A power source that is available independently of the primary power supply.

3.3.39.2 On-Site Power Production Facility.

~~The~~ An on-site normal supply of electric power ~~for the site~~ that is expected to be constantly producing power.

3.3.39.3 On-Site Standby Generator. A facility producing electric power on site as the alternate supply of electrical power. It differs from an on-site power production facility, in that it is not constantly producing power. [**70:** 695.2]

3.3.39.4 Standby Power: An alternate power source this is normally inactive but becomes active whenever the primary power is lost.

Statement of Problem and Substantiation for Public Input

Need to differentiate between standby power and alternate power, which includes standby power but may also includes continuously operating power sources

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 39-NFPA 20-2016 [Section No. 5.5]	
Public Input No. 40-NFPA 20-2016 [Section No. A.14.2.6.5]	
Public Input No. 41-NFPA 20-2016 [Section No. C.8.2.9.1]	
Public Input No. 84-NFPA 20-2016 [Section No. 4.26.9]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jan 18 16:20:20 EST 2016

Public Input No. 43-NFPA 20-2016 [New Section after 3.3.42.2]

TITLE OF NEW CONTENT

3.3.42.2* ***Lowest Permissible*** ***Suction Pressure.*** The lowest suction pressure permitted by this standard and the authority having jurisdiction. Type your content here ...

Statement of Problem and Substantiation for Public Input

This definition allows for a better understanding of the maximum available flow by connecting it to a suction pressure.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 45-NFPA 20-2016 [Section No. 4.6.2.3.1]	
Public Input No. 46-NFPA 20-2016 [Section No. 4.6.5.2]	
Public Input No. 47-NFPA 20-2016 [Section No. 4.15.3.1]	
Public Input No. 48-NFPA 20-2016 [Section No. 4.21.3.4]	
Public Input No. 49-NFPA 20-2016 [Section No. 4.28.4]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 19 09:01:32 EST 2016

Public Input No. 134-NFPA 20-2016 [New Section after 3.3.68]

3.3.69 Self-Regulating Variable Speed Pump Unit (renumber the remaining items in this chapter)

Is a Fire Pump unit that includes Fire Pump, Electric Motor, Variable Speed Drive, and self-regulating control, tested and listed as a factory built integrated pump unit to act as a Variable Speed Pressure Limiting Control. The self-regulating variable speed pump unit has onboard factory embedded logic that enable it to know and communicate the operating flow and head pressure that it is generating. All accessories required to perform the discharge pressure limiting, net pressure limiting, and power limiting functions by pump speed regulation are integrated in the pump unit.

Statement of Problem and Substantiation for Public Input

This proposed item would be an alternative to a variable speed fire pump controller for electric variable speed applications. The same technology is currently being successfully used for other applications such as HVAC, with products listed to UL778. For fire pump applications new listing criteria will need to be established.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 135-NFPA 20-2016 [New Section after 3.3.68]	
Public Input No. 136-NFPA 20-2016 [New Section after 6.2.2.1]	
Public Input No. 138-NFPA 20-2016 [New Section after 10.4.5.1.2]	
Public Input No. 139-NFPA 20-2016 [New Section after 10.10.3.5]	
Public Input No. 141-NFPA 20-2016 [New Section after 10.10.4.2]	
Public Input No. 143-NFPA 20-2016 [Section No. 10.10.6.1.1]	

Submitter Information Verification

Submitter Full Name: Steven Baird
Organization: Armstrong Fluid Technology
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 24 11:09:45 EDT 2016

Public Input No. 135-NFPA 20-2016 [New Section after 3.3.68]

3.3.70 Variable Speed Maximum Power Limiting Control (renumber the remaining items in this chapter)

Is an on-board embedded speed control system used to limit the Maximum Power draw of the self-regulating variable speed pump unit up to the limit of the electrical rating of the self-regulating variable speed pump unit (by power, or amps), beyond the rated requirements of 150% flow at 65% of rated head, by reducing the pump driver speed from rated speed. Below 150% of the rated flow there shall be no speed regulation in response to power draw. Ref 3.3.69 for operating speed regulation below 150 of rated flow.

Statement of Problem and Substantiation for Public Input

This proposed item would be an alternative to a variable speed fire pump controller for electric variable speed applications. The same technology is currently being successfully used for other applications such as HVAC, with products listed to UL778. For fire pump applications new listing criteria will need to be established.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 134-NFPA 20-2016 [New Section after 3.3.68]	This submission is the definition of the control logic to be used in the newly defined Self-Regulating Variable Speed Pump Unit.

Submitter Information Verification

Submitter Full Name: Steven Baird
Organization: Armstrong Fluid Technology
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 24 11:11:27 EDT 2016

Public Input No. 186-NFPA 20-2016 [Section No. 4.3.1]

4.3.1

In the event of fire pump operation, qualified personnel shall respond to the fire pump location to determine that the fire pump is operating in a satisfactory manner.

4.3.2

Both the fire pump and the controller shall be installed at an elevation above the assumed flooding level of the room.

Statement of Problem and Substantiation for Public Input

I have seen fire pumps mounted well above the flood line of the room but the bottom of the controller is well below this.

Submitter Information Verification

Submitter Full Name:	Michael Anthony
Organization:	University of Michigan | Business & Finanance Plant Operations | @StandardsUMich
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jun 29 16:31:02 EDT 2016

Public Input No. 50-NFPA 20-2016 [Section No. 4.3.1]

4.3.1

~~In the event of fire pump operation, qualified~~

Except as permitted in 4.3.2, qualified personnel shall respond to the fire pump location to determine that the fire pump is operating in a satisfactory manner whenever the fire pump is operating .

4.3.2 Where remote monitoring that meets NFPA 72 and all of the following requirements, qualified personnel shall be permitted to monitor the no-flow test remotely.

1) Visual observation adequate to verify the appropriate water discharge thought the packing.

2) Visual observation of both sides of the pump adequate to identify smoke emitted from the pump, pump driver or controller.

3) Smoke detection

4) Suction pressure

5) Discharge pressure

6) Unusual noise

7) Diesel engine temperature and oil pressure

8) Room temperature

9) Pump Speed

10) Pump or motor vibration

11) Flow through the circulation relief valve

12) Discharge through the main pressure relief valve (when provided)

13) Temperature of pump impeller casing

14) Temperature of pump packing

15) Visual and audible alarm for abnormal

a) Suction pressure

b) Discharge pressure

c) Diesel engine temperature

d) Room temperature

e) Pump Speed (in excess of ±5% of rated speed)

f) Pump or motor vibration

g) Flow through the circulation relief valve

h) Discharge through the main pressure relief valve (when provided)

i) Temperature of pump impeller casing

j) Temperature of pump packing

16) Qualified shall respond to the pump house on an abnormal alarm within 5 minutes

17) The value of each point monitored shall be recorded a minimum frequency of every 2 minutes for a 10 minute test and every 5 minutes for a 30 minute test.

Statement of Problem and Substantiation for Public Input

Currently some automatic no-flow fire pump tests are being performed without a qualified person in attendance, and some no-flow tests are not performed because of cost and inconvenience. This proposed change provides requirements that permit an acceptable automatic test with remote monitoring. In the long term, permitting appropriate remote monitoring may help to improve compliance with testing requirements and increase reliability.

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 19 10:33:52 EST 2016

Public Input No. 45-NFPA 20-2016 [Section No. 4.6.2.3.1]

4.6.2.3.1

Where the maximum flow available from ~~the water supply~~ a public or private service main cannot provide a flow of 150 percent of the rated flow of the pump, ~~but the~~ at the lowest permissible suction pressure, but the water supply can provide the greater of 100 percent of rated flow or the maximum flow demand of the fire protection system(s) at the lowest permissible suction pressure , the water supply shall be deemed to be adequate. In this case, the maximum flow shall be considered the highest flow that the water supply can achieve at the lowest permissible suction pressure,

New 4 .6.2.3.2

The pipe between the connection to the public or private service main and the fire pump suction shall be hydraulically sized to limit the friction loss to a maximum of 3 psi at a 150% of rated flow.

New 4.6.2.3.3

The available flow at the fire pump discharge at the lowest permissable suction pressure shall be a minimum of 100% of rated flow.

New 4.6.2.3.4

The available flow and pressure at the fire pump discharge shall be adequate to meet the maximum fire protection demand.

Statement of Problem and Substantiation for Public Input

Makes "highest flow" more definitive and clarifies this section applies to service mains, not water storage tanks.

The friction loss from the water source to the fire pump suction should be limited because the water supply is already marginal, i.e. cannot provide 150% of rated flow.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 43-NFPA 20-2016 [New Section after 3.3.42.2]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 19 09:12:17 EST 2016

Public Input No. 46-NFPA 20-2016 [Section No. 4.6.5.2]

4.6.5.2

Where the water supply cannot provide a flow of 150 percent of the rated flow of the pump at the lowest permissible suction pressure, but the water supply can provide the greater of 100 percent of the rated flow or the flow demand of the fire protection system(s) ~~, the~~ at the lowest permissible suction pressure, the head available from the water supply shall be permitted to be calculated on the basis of the maximum flow ~~available as allowed by 4.6.2.3.1 .~~ available at the lowest permissible suction pressure. .

Statement of Problem and Substantiation for Public Input

Makes "maximum flow" more definitive.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 43-NFPA 20-2016 [New Section after 3.3.42.2]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 19 09:17:07 EST 2016

Public Input No. 185-NFPA 20-2016 [Section No. 4.7.2]

4.7.2

Acceptable drivers for pumps at a single installation shall be electric motors, diesel engines, steam turbines, or a combination thereof. Shared fire pumps for multi-building campus style building arrangements shall be permitted.

Statement of Problem and Substantiation for Public Input

We would appreciate some recognition of this possibility when engineered correctly. There are obvious economic advantages on educational campuses and, when engineered and maintained correctly, can reduce #TotalCostofOwnership -- a high priority for the education facilities industry.

Submitter Information Verification

Submitter Full Name:	Michael Anthony
Organization:	University of Michigan | Business & Finance Plant Operations | @StandardsUMich
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jun 29 16:26:05 EDT 2016

Public Input No. 77-NFPA 20-2016 [New Section after 4.7.7.1]

4.7.7.1.1

Where the water supply is a public waterworks system, consideration must be given to the water supply fluctuation to confirm maximum static pressure is properly addressed in the design.

Statement of Problem and Substantiation for Public Input

This proposal just recognizes the fluctuation of public water supplies to include high static fluctuation affecting fire pump design and selection criteria.

Submitter Information Verification

Submitter Full Name: Bob Morgan
Organization: Fort Worth Fire Department
Street Address:
City:
State:
Zip:
Submittal Date: Thu Mar 24 16:41:12 EDT 2016

Public Input No. 193-NFPA 20-2016 [New Section after 4.10.2]

4.10.3

The nameplate shall indicate the maximum pump horsepower demand required to power the pump at any flow including all flows less than or greater than 150%.

Statement of Problem and Substantiation for Public Input

Many installations with recirculation loops are running their maintenance tests in full recirculation. This has shown us that some pumps have the ability to require more horsepower than is displayed on their nameplates. This excess power demand can be detrimental to the driver resulting in premature component failures.

Submitter Information Verification

Submitter Full Name: John Whitney
Organization: Clarke Fire Protection Product
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jul 01 14:48:49 EDT 2016

Public Input No. 8-NFPA 20-2016 [New Section after 4.13.1.2]

TITLE OF NEW CONTENT 4.13.1.2.3

4.13.1.2.3 Detached fire pump units shall be installed in an environmentally sound building / enclosure which meets or exceeds the requirements of 4.13.1, as well as the requirements of the International Building Code (IBC) for the location in which they are installed.

Additional Proposed Changes

File Name	Description	Approved
nfpa_public_comment_form_4-13-1-2-3.docx		

Statement of Problem and Substantiation for Public Input

The addition of 4.13.1.2.3 removes all doubt as to the degree of protection this committee believes necessary to properly house and protect a fire pump unit.

Submitter Information Verification

Submitter Full Name: Michael Herron
Organization: Patterson Pump
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jan 08 13:24:52 EST 2016

NFPA Public Comment Form
(For Proposing Revisions to the First Draft)

NOTE: All Public Comments must be received by 5:00 pm EST/EDST on the published Public Comment Closing Date.

For further information on the standards-making process, please contact the Codes and Standards Administration at 617-984-7249 or visit www.nfpa.org/codes.

For technical assistance, please call NFPA at 1-800-344-3555

FOR OFFICE USE ONLY

Log #:

Date Rec'd:

Date 10-16-2015 **Name** Michael Herron **Tel. No.** 706-297-2855

Company Patterson Pump Company **Email** mherron@pattersonpumps.com

Street Address 2129 Ayersville Road **City** Toccoa **State** GA **Zip** 30577

Please indicate organization represented (if any)

1. (a) NFPA Document Title NFPA 20 **NFPA No. & Year** 2016

(b) Section/Paragraph 4.13.1.2

2. Identify First Revision and/or Input to which Comment relates: No(s). Addition of a part 4.13.1.2.3

2. Public Comment Recommends (check one): ☒ new text ☐ revised text ☐ deleted text

3. Proposed Text of Public Comment (include proposed new or revised wording, or identification of wording to be deleted):
[Note: Proposed text should be in legislative format showing proposed changes to the First Draft; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

4.13.1.2.3 Detached fire pump units shall be installed in an environmentally sound building / enclosure which meets or exceeds the requirements of 4.13.1, as well as the requirements of the International Building Code (IBC) for the location in which they are installed.

4. Statement of Problem and Substantiation for Public Comment: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Public Comment, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

The addition of 4.13.1.2.3 removes all doubt as to the degree of protection this committee believes necessary to properly house and protect a fire pump unit.

5. Copyright Assignment

(a) ☒ I am the author of the text or other material (such as illustrations, graphs) proposed in the Public Comment.

(b) ☐ Some or all of the text or other material proposed in this Public Comment was not authored by me. Its source is as follows: (please identify which material and provide complete information on its source)

I hereby grant and assign to the NFPA all and full rights in copyright in this Public Comment (including both the Proposed Text and the Statement of Problem and Substantiation). I understand that I acquire no rights in any publication of NFPA in which this Public Comment in this or another similar or analogous form is used. Except to the extent that I do not have authority to make an assignment in materials that I have identified in (b) above, I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this assignment.

Signature (Required)

PLEASE USE SEPARATE FORM FOR EACH PUBLIC COMMENT

To: Secretary, Standards Council National Fire Protection Association
1 Batterymarch Park · Quincy, MA 02169-7471 OR
Fax to: (617) 770-3500 OR Email to: publicinput_comments@nfpa.org

7/14/2016

Public Input No. 7-NFPA 20-2016 [Section No. 4.13.1.2]

4.13.1.2

~~Outdoor~~

Detatched Fire Pump Units.

4.13.1.2.1

Fire pump units that are ~~outdoors~~ detached shall be located at least 50 ft (15.3 m) away from any buildings and other fire exposures exposing with the potential to compromise the fire pump building.

4.13.1.2.2

~~Outdoor~~

Detatched installations shall be required to be provided with protection against possible interruption, in accordance with 4.13.1 .

Additional Proposed Changes

File Name	Description	Approved
nfpa_public_comment_form_4-13-1-2.docx		

Statement of Problem and Substantiation for Public Input

These portions of the standard, as well as many other portions of this standard, emphasize the fact that fire pump units are to be housed in a "building." Therefore the title and wording "outdoor" of this section are misstatements. To remove the word "outdoor" and replace it with "detached" gives a more definitive description of the degree of protection required to house the fire pump units.

Submitter Information Verification

Submitter Full Name: Michael Herron
Organization: Patterson Pump
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jan 08 13:06:18 EST 2016

NFPA Public Comment Form
(For Proposing Revisions to the First Draft)

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For further information on the standards-making process, please contact the Codes and Standards Administration at 617-984-7249 or visit www.nfpa.org/codes.

For technical assistance, please call NFPA at 1-800-344-3555

FOR OFFICE USE ONLY

Log #:

Date Rec'd:

Date 10-16-2015 **Name** Michael Herron **Tel. No.** 706-297-2855

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Street Address 2129 Ayersville Road **City** Toccoa **State** GA **Zip** 30577

Please indicate organization represented (if any)

1. (a) NFPA Document Title NFPA 20 **NFPA No. & Year** 2016

(b) Section/Paragraph 4.13.1.2

2. Identify First Revision and/or Input to which Comment relates: No(s).

2. Public Comment Recommends (check one): ☐ new text ☒ revised text ☐ deleted text

3. Proposed Text of Public Comment (include proposed new or revised wording, or identification of wording to be deleted):
[Note: Proposed text should be in legislative format showing proposed changes to the First Draft; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

4.13.1.2 ~~Outdoor~~ ***Detached*** Fire Pump Units.

4.13.1.2.1 Fire pump units that are ~~outdoors~~ ***detached*** shall be located at least 50 ft (15.3 m) away from any buildings and other fire exposures ~~exposing~~ ***with the potential to compromise*** the ***fire pump*** building.

4.13.1.2.2 ~~Outdoor~~ ***Detached*** installations shall be required to be provided with protection against possible interruption, in accordance with 4.13.1.

4. Statement of Problem and Substantiation for Public Comment: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Public Comment, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

These portions of the standard, as well as many other portions of this standard, emphasize the fact that fire pump units are to be housed in a "building". Therefore the title and the wording "outdoor" of this section are misstatements. To remove the word "outdoor" and replace it with detached gives a more definitive description of the degree of protection required to house the fire pump units.

5. Copyright Assignment

(a) ☒ I am the author of the text or other material (such as illustrations, graphs) proposed in the Public Comment.

(b) ☐ Some or all of the text or other material proposed in this Public Comment was not authored by me. Its source is as follows: (please identify which material and provide complete information on its source)

I hereby grant and assign to the NFPA all and full rights in copyright in this Public Comment (including both the Proposed Text and the Statement of Problem and Substantiation). I understand that I acquire no rights in any publication of NFPA in which this Public Comment in this or another similar or analogous form is used. Except to the extent that I do not have authority to make an assignment in materials that I have identified in (b) above, I hereby warrant that I am the author of this Public Comment and that I have full power and authority to enter into this assignment.

Signature (Required)

PLEASE USE SEPARATE FORM FOR EACH PUBLIC COMMENT

To: Secretary, Standards Council National Fire Protection Association
1 Batterymarch Park · Quincy, MA 02169-7471 OR
Fax to: (617) 770-3500 OR Email to: publicinput_comments@nfpa.org

Public Input No. 173-NFPA 20-2016 [Section No. 4.13.2.1.1]

4.13.2.1.1

Except as provided in 4.13.2.1.1.1, fire pump rooms not directly accessible from the outside shall be accessible through an enclosed passageway from an enclosed stairway ~~or~~ with a door to the exterior or exterior exit.

4.13.2.1.1.1

Fire pump units supplying only local application fire protection systems shall be accessible by a path that is not subject to exposure from a fire in any hazard protected by the fire pump.

Statement of Problem and Substantiation for Public Input

An enclosed stairway may discharge to the interior of the building and have no door to the exterior. If it is the committee's intent to maintain protected access to the fire pump room from the exterior of the building, it should clarify the stair used to access the fire pump room must have a door to the exterior.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 170-NFPA 20-2016 [Section No. 4.13.2.1.1 [Excluding any Sub-Sections]]	Both PIs seek to clarify the same section.

Submitter Information Verification

Submitter Full Name: Sarina Hart
Organization: Koffel Associates, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 28 10:09:15 EDT 2016

Public Input No. 163-NFPA 20-2016 [Section No. 4.13.2.1.1 [Excluding any Sub-Sections]]

Except as provided in 4.13.2.1.1.1 or 4.13.2.1.1.2 , fire pump rooms not directly accessible from the outside shall be accessible through an enclosed passageway from an enclosed stairway or exterior exit. This enclosed passageway shall not be required to be considered an exit passageway for egress purposes.

Statement of Problem and Substantiation for Public Input

There are two proposed changes being made to this section. The first is to add a new exception, which will be explained in the substantiation for that new section. The second is to try and clarify an issue that appears to be causing problems in the application of the egress portions of building codes, fire codes and the Life Safety Code. In these codes, the concept of an "Exit Passageway" exits to extend the exit into the building to create more usable space and still allow building occupants to be within the allowable travel distance to an exit from any point in the building.

The purpose of this section is not to create any changes to the means of egress. People will still need to get out of the building using whatever egress is appropriate. the purpose of this section of NFPA 20 is to allow protected travel for a person going INTO the building. The standard requires a person to be in the pump room monitoring the pump while it is running, including the situation where it is running during a fire. Some protected path needs to be provided so that this person can safety get to the pump room during a fire. The protected passageway is provided into the building, but is not required to be a portion of the means of egress. Other code enforcement professionals will be helped by this clarification.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 164-NFPA 20-2016 [New Section after 4.13.2.1.1.1]	
Public Input No. 165-NFPA 20-2016 [New Section after A.4.13.1.1.5]	

Submitter Information Verification

Submitter Full Name: Kenneth Isman
Organization: University of Maryland
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 27 09:47:33 EDT 2016

Public Input No. 170-NFPA 20-2016 [Section No. 4.13.2.1.1 [Excluding any Sub-Sections]]

Except as provided in 4.13.2.1.1.1, fire pump rooms not directly accessible from the outside shall be accessible through ~~an enclosed passageway~~ a fire-resistance rated corridor from an enclosed stairway or exterior exit.

Statement of Problem and Substantiation for Public Input

The term 'passageway' is vague and undefined. AHJs may interpret this section as requiring the corridor between the stair or exterior and the fire pump room be protected as an exit passageway. However, the LSC prohibits normally unoccupied rooms, such as a fire pump room, from opening directly into an exit enclosure. The requirement for an exit passageway leading to the fire pump room would require an intervening corridor or vestibule to separate the fire pump room from the exit passageway. Additionally, the restriction on utilities allowed within or passing through an exit passageway could significantly impact the routing of utilities on the typically congested lower levels of buildings.

Providing a fire-resistance rated corridor would offer prolonged protection to personnel responding to the fire pump in the event of an emergency without imposing the additional restrictions associated with an exit passageway.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 173-NFPA 20-2016 [Section No. 4.13.2.1.1]	

Submitter Information Verification

Submitter Full Name: Sarina Hart
Organization: Koffel Associates, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 28 09:46:55 EDT 2016

Public Input No. 99-NFPA 20-2016 [Section No. 4.13.2.1.1 [Excluding any Sub-Sections]]

Except as provided in 4.13.2.1.1.1, fire pump rooms not directly accessible from the outside shall be accessible through an enclosed ~~passageway~~ exit passageway from an enclosed stairway or exterior exit.

Statement of Problem and Substantiation for Public Input

The term "passageway" has caused confusion when designing access to the fire pump room as the term is not defined in the Code while the term "exit passageway" contains requirements and explanatory material in NFPA 101 Section 7.2.6. If it is not the committee's intent that access to the fire pump room be provided by a "sterile" exit passageway, the language should be modified to a 1-hour or 2-hour fire-resistance rated corridor / enclosure.

NFPA 101 does not permit a normally unoccupied room, such as a fire pump room, to open to an exit passageway. Another PI will be submitted to address the issue.

Submitter Information Verification

Submitter Full Name: Lennon Peake
Organization: Koffel Associates, Inc.
Street Address:
City:
State:
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Submittal Date: Fri May 13 10:13:03 EDT 2016

Public Input No. 164-NFPA 20-2016 [New Section after 4.13.2.1.1.1]

4.13.2.1.1.2* Where a fire pump is installed in a parking garage or some other portion of a building separated from the rest of the building by fire rated construction equivalent to the pump room and the portion of the building containing the fire pump is protected by a sprinkler system that does not rely on the fire pump, the protected access to the pump room shall not be required.

Statement of Problem and Substantiation for Public Input

The purpose of the protected access to the pump room is to make sure that the person being sent to the pump room is not exposed to the fire while they travel to the pump room. By putting the pump in an area that does not need the pump to control the fire, this task is accomplished without needing protected access. The most common application of this arrangement is putting the pump in a parking garage, which already needs to be separated from the rest of the building, but there are other situations where it could be used as well.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 163-NFPA 20-2016 [Section No. 4.13.2.1.1 [Excluding any Sub-Sections]]	
Public Input No. 165-NFPA 20-2016 [New Section after A.4.13.1.1.5]	

Submitter Information Verification

Submitter Full Name: Kenneth Isman
Organization: University of Maryland
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Submittal Date: Mon Jun 27 09:57:41 EDT 2016

Public Input No. 172-NFPA 20-2016 [Section No. 4.13.2.1.2]

4.13.2.1.2

The enclosed passageway ~~shall~~ , and stairway if required, shall have a fire-resistance rating not less than the fire-resistance rating of the fire pump room.

Statement of Problem and Substantiation for Public Input

Section 4.13.2.1.1 only requires a stair used to access the fire pump room to be “enclosed.” It does not specify the required rating of the stair enclosure. The fire pump room and passageway may require 2-hr enclosures, but nothing currently requires the stair to carry the same rating. If the intent is to provide a continuous level of protection from the exterior of the building to the fire pump room, any enclosed stair in that path should also be required to match the rating of the fire pump room

Submitter Information Verification

Submitter Full Name: Sarina Hart
Organization: Koffel Associates, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 28 10:03:18 EDT 2016

Public Input No. 180-NFPA 20-2016 [New Section after 4.15.1]

Add new 4.15.1.3:

Where pumps are installed in series, the size of the discharge from the previous pump is permitted to be less than the 10 times the pipe diameter from the suction pipe subsequent pumps.

Statement of Problem and Substantiation for Public Input

Paragraph 4.15.3.3 says that the size of that portion of the suction pipe located within 10 pipe diameters upstream of the pump suction flange shall be not less than that specified in Section 4.27. Regarding pumps in series, one or more pumps can be within 10 pipe diameters of subsequent pumps. The discharge from the upstream pump supplying the suction of subsequent pumps has a smaller pipe diameter than that specified by 4.27. The 10 pipe diameters should not have to include the discharge of the pump provided the supply is a straight feed into the subsequent pump.

Submitter Information Verification

Submitter Full Name: Thomas Wellen
Organization: American Fire Sprinkler Association
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 29 14:34:56 EDT 2016

Public Input No. 47-NFPA 20-2016 [Section No. 4.15.3.1]

4.15.3.1

Unless the requirements of 4.15.3.2 are met, the size of the suction pipe for a single pump or of the suction header pipe for multiple pumps (designed to operate together) shall be such that, with all pumps operating at maximum flow (150 percent of rated capacity or the maximum flow available from the water ~~supply~~ supply at the lowest permissible suction pressure, as discussed in 4.6.2.3.1), the gauge pressure at the pump suction flanges shall be 0 psi (0 bar) or higher.

Statement of Problem and Substantiation for Public Input

Makes "maximum flow" more definitive.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 43-NFPA 20-2016 [New Section after 3.3.42.2]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 19 09:21:43 EST 2016

Public Input No. 97-NFPA 20-2016 [Section No. 4.15.3.2]

4.15.3.2*

The requirements of 4.15.3.1 shall not apply where the supply is a suction tank with its base at or above the same elevation as the pump, and the gauge pressure at the pump suction flange shall be permitted to drop to -3 psi (-0.2 bar) at 150% of rated flow with the lowest water level after the maximum system demand and duration have been supplied.

Statement of Problem and Substantiation for Public Input

Clarifies that the -3 psi is permissible only at 150% of rated flow

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Wed May 11 17:25:36 EDT 2016

Public Input No. 48-NFPA 20-2016 [Section No. 4.21.3.4]

4.21.3.4 Pipe Size.

The pipe size shall be in accordance with one of the following two methods:

(1) Where the pipe between the hose valve header and the connection to the pump discharge pipe is over 15 ft (4.5 m) in length, the next larger pipe size than that required by 4.21.3.1.3 shall be used.

(2) * This pipe is permitted to be sized by hydraulic calculations shall match the actual test configuration based on a total flow of 150 percent of rated pump capacity, ~~including the~~ and include the following:

(3) This calculation shall include the pitot pressure and the friction loss for the total length of pipe plus equivalent lengths of fittings, control valve, and hose valves, plus elevation loss, from the pump discharge flange to the

~~hose valve outlets~~

(a) flowing .

(b) The installation shall be proven by a test flowing the

~~maximum water available.~~

(a) lessor of 150% of rated flow or the maximum flow available at the lowest permissable suction pressure..

Statement of Problem and Substantiation for Public Input

Clarifies that the pitot pressure and friction loss in fire hose must be included in the calculation.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 43-NFPA 20-2016 [New Section after 3.3.42.2]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 19 09:30:58 EST 2016

Public Input No. 84-NFPA 20-2016 [Section No. 4.26.9]

4.26.9

The pressure maintenance pump shall not be required to have ~~secondary~~ alternate or standby power.

Statement of Problem and Substantiation for Public Input

The terminology Standby, Emergency, and Auxiliary Power have all used within this standard for Alternate Power with some confusion over requirements. This standard should use consistent terminology.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 37-NFPA 20-2016 [Section No. 3.3.39]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Jensen Hughes
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 14 15:54:28 EDT 2016

Public Input No. 83-NFPA 20-2016 [Section No. 4.27]

4.27 Summary of Centrifugal Fire Pump Data.

The sizes indicated in Table 4.27(a) and Table 4.27(b) shall be used as a minimum.

Table 4.27(a) Summary of Centrifugal Fire Pump Data (U.S. Customary)

Pump Rating (gpm)	Minimum Pipe Sizes (Nominal) (in.)						
	Suction[a,b,c]	Discharge[a]	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of Hose Valves	Hose Header Supply
25	1	1	¾	1	1¼	1 — 1½	1
50	1½	1¼	1¼	1½	2	1 — 1½	1½
100	2	2	1½	2	2½	1 — 2½	2½
150	2½	2½	2	2½	3	1 — 2½	2½
200	3	3	2	2½	3	1 — 2½	2½
250	3½	3	2	2½	3½	1 — 2½	3
300	4	4	2½	3½	3½	1 — 2½	3
400	4	4	3	5	4	2 — 2½	4
450	5	5	3	5	4	2 — 2½	4
500	5	5	3	5	5	2 — 2½	4
750	6	6	4	6	5	3 — 2½	6
1000	8	6	4	8	6	4 — 2½	6
1250	8	8	6	8	6	6 — 2½	8
1500	8	8	6	8	8	6 — 2½	8
2000	10	10	6	10	8	6 — 2½	8
2500	10	10	6	10	8	8 — 2½	10
3000	12	12	8	12	8	12 — 2½	10
3500	12	12	8	12	10	12 — 2½	12
4000	14	12	8	14	10	16 — 2½	12
4500	16	14	8	14	10	16 — 2½	12
5000	16	14	8	14	10	20 — 2½	12

Notes:

(1) The pressure relief valve is permitted to be sized in accordance with 4.19.2.1.

(2) The pressure relief valve discharge is permitted to be sized in accordance with 4.19.6.2.

(3) The flowmeter device is permitted to be sized in accordance with 4.21.2.3.

(4) The hose header supply is permitted to be sized in accordance with 4.21.3.4.

[a]Actual diameter of pump flange is permitted to be different from pipe diameter.

[b]Applies only to that portion of suction pipe specified in 4.15.3.3.

[c]Suction pipe sizes in Table 4.27(a) are based on a maximum velocity at 150 percent rated capacity to 15 ft/sec (4.6 m/sec) in most cases.

Table 4.27(b) Summary of Centrifugal Fire Pump Data (Metric)

Pump Rating (L/min)	Minimum Pipe Sizes (Nominal) (mm)						
	Suction[a,b,c]	Discharge[a]	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of Hose Valves	Hose Header Supply
95	25	25	19	25	32	1 — 38	25
189	38	32	32	38	50	1 — 38	38
379	50	50	38	50	65	1 — 65	65

Pump Rating (L/min)	Minimum Pipe Sizes (Nominal) (mm)						
	Suction[a,b,c]	Discharge[a]	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of Hose Valves	Hose Header Supply
568	65	65	50	65	75	1 — 65	65
757	75	75	50	65	75	1 — 65	65
946	85	75	50	65	85	1 — 65	75
1,136	100	100	65	85	85	1 — 65	75
1,514	100	100	75	125	100	2 — 65	100
1,703	125	125	75	125	100	2 — 65	100
1,892	125	125	75	125	125	2 — 65	100
2,839	150	150	100	150	125	3 — 65	150
3,785	200	150	100	200	150	4 — 65	150
4,731	200	200	150	200	150	6 — 65	200
5,677	200	200	150	200	200	6 — 65	200
7,570	250	250	150	250	200	6 — 65	200
9,462	250	250	150	250	200	8 — 65	250
11,355	300	300	200	300	200	12 — 65	250
13,247	300	300	200	300	250	12 — 65	300
15,140	350	300	200	350	250	16 — 65	300
17,032	400	350	200	350	250	16 — 65	300
18,925	400	350	200	350	250	20 — 65	300

Notes:

(1) The pressure relief valve is permitted to be sized in accordance with 4.19.2.1.

(2) The pressure relief valve discharge is permitted to be sized in accordance with 4.19.6.2.

(3) The flow meter device is permitted to be sized in accordance with 4.21.2.3.

(4) The hose header supply is permitted to be sized in accordance with 4.21.3.4.

[a]Actual diameter of pump flange is permitted to be different from pipe diameter.

[b]Applies only to that portion of suction pipe specified in 4.15.3.3.

[c]Suction pipe sizes in Table 4.27(b) are based on a maximum velocity at 150 percent rated capacity to 15 ft/sec (4.6 m/sec) in most cases.

Additional Proposed Changes

File Name	Description	Approved
Test_Outlets_Tables_4.7.2._a_and_b_Submitted_041416.docx	Added Stortz connections as an alternative to hose valve outlets on pump test headers	

Statement of Problem and Substantiation for Public Input

Testing procedures have changed significantly over the years with more use of Hose Monsters. Stortz connections provide a better adaptation to new methods than traditional hose valves and are a viable alternative.

Submitter Information Verification

Submitter Full Name: Gayle Pennel

Organization: Jensen Hughes

Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 14 15:48:51 EDT 2016

4.27 Summary of Centrifugal Fire Pump Data.
The sizes indicated in Table 4.27(a) and Table 4.27(b) shall be used as a minimum.

Table 4.27(a) Summary of Centrifugal Fire Pump Data (U.S. Customary)

Pump Rating (gpm)	Minimum Pipe Sizes (Nominal) (in.)							
	Suction[a,b,c]	Discharge[a]	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of ~~Hose Valves~~		Hose Header Supply
						Hose Valves	Storz Outlets	
25	1	1	¾	1	1¼	1 — 1½	1 — 5	1
50	1½	1¼	1¼	1½	2	1 — 1½	1 — 5	1½
100	2	2	1½	2	2½	1 — 2½	1 — 5	2½
150	2½	2½	2	2½	3	1 — 2½	1 — 5	2½
200	3	3	2	2½	3	1 — 2½	1 — 5	2½
250	3½	3	2	2½	3½	1 — 2½	1 — 5	3
300	4	4	2½	3½	3½	1 — 2½	1 — 5	3
400	4	4	3	5	4	2 — 2½	1 — 5	4
450	5	5	3	5	4	2 — 2½	1 — 5	4
500	5	5	3	5	5	2 — 2½	1 — 5	4
750	6	6	4	6	5	3 — 2½	1 — 5	6
1000	8	6	4	8	6	4 — 2½	1 — 5	6
1250	8	8	6	8	6	6 — 2½	1 — 5	8
1500	8	8	6	8	8	6 — 2½	1 — 5	8
2000	10	10	6	10	8	6 — 2½	2 — 5[d]	8
2500	10	10	6	10	8	8 — 2½	2 — 5[d]	10
3000	12	12	8	12	8	12 — 2½	2 — 5[d]	10

Pump Rating (gpm)	Minimum Pipe Sizes (Nominal) (in.)							
	Suction[a,b,c]	Discharge[a]	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of ~~Hose Valves~~		Hose Header Supply
3500	12	12	8	12	10	12 — 2½	3 — 5[d]	12
4000	14	12	8	14	10	16 — 2½	3 — 5[d]	12
4500	16	14	8	14	10	16 — 2½	3 — 5[d]	12
5000	16	14	8	14	10	20 — 2½	3 — 5[d]	12

Notes:
(1) The pressure relief valve is permitted to be sized in accordance with 4.19.2.1.
(2) The pressure relief valve discharge is permitted to be sized in accordance with 4.19.6.2.
(3) The flowmeter device is permitted to be sized in accordance with 4.21.2.3.
(4) The hose header supply is permitted to be sized in accordance with 4.21.3.4.
(5) Other type of test outlets, sizes, and quantity are permitted when approved by the authority having jurisdiction
[a]Actual diameter of pump flange is permitted to be different from pipe diameter.
[b]Applies only to that portion of suction pipe specified in 4.15.3.3.
[c]Suction pipe sizes in Table 4.27(a) are based on a maximum velocity at 150 percent rated capacity to 15 ft/sec (4.6 m/sec) in most cases.
[d]Provide a control valve on each outlet where more than one Storz outlet is required.

Table 4.27(b) Summary of Centrifugal Fire Pump Data (Metric)

Pump Rating (L/min)	Minimum Pipe Sizes (Nominal) (in.)							
	Suction[a,b,c]	Discharge[a]	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of ~~Hose Valves~~		Hose Header Supply
						Hose Valves	Storz Outlets	
95	25	25	19	25	32	1 — 38	1 — 100	25
189	38	32	32	38	50	1 — 38	1 — 100	38
379	50	50	38	50	65	1 — 65	1 — 100	65
568	65	65	50	65	75	1 — 65	1 — 100	65

Pump Rating (L/min)	Minimum Pipe Sizes (Nominal) (in.)							
	Suction[a,b,c]	Discharge[a]	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of ~~Hose~~ ~~Valves~~		Hose Header Supply
757	75	75	50	65	75	1 — 65	1 — 100	65
946	85	75	50	65	85	1 — 65	1 — 100	75
1,136	100	100	65	85	85	1 — 65	1 — 100	75
1,514	100	100	75	125	100	2 — 65	1 — 100	100
1,703	125	125	75	125	100	2 — 65	1 — 100	100
1,892	125	125	75	125	125	2 — 65	1 — 100	100
2,839	150	150	100	150	125	3 — 65	1 — 100	150
3,785	200	150	100	200	150	4 — 65	1 — 125	150
4,731	200	200	150	200	150	6 — 65	1 — 125	200
5,677	200	200	150	200	200	6 — 65	1 — 125	200
7,570	250	250	150	250	200	6 — 65	2 — 125[d]	200
9,462	250	250	150	250	200	8 — 65	2 — 125[d]	250
11,355	300	300	200	300	200	12 — 65	2 — 125[d]	250
13,247	300	300	200	300	250	12 — 65	3 — 125[d]	300
15,140	350	300	200	350	250	16 — 65	3 — 125[d]	300
17,032	400	350	200	350	250	16 — 65	3 — 125[d]	300
18,925	400	350	200	350	250	20 — 65	3 — 125[d]	300

Notes:
(1) The pressure relief valve is permitted to be sized in accordance with 4.19.2.1.
(2) The pressure relief valve discharge is permitted to be sized in accordance with 4.19.6.2.
(3) The flowmeter device is permitted to be sized in accordance with 4.21.2.3.
(4) The hose header supply is permitted to be sized in accordance with 4.21.3.4.

(5) Other type of test outlets are permitted when approved by the authority having jurisdiction
[a]Actual diameter of pump flange is permitted to be different from pipe diameter.
[b]Applies only to that portion of suction pipe specified in 4.15.3.3.
[c]Suction pipe sizes in Table 4.27(a) are based on a maximum velocity at 150 percent rated capacity to 15 ft/sec (4.6 m/sec) in most cases.
[d]Provide a control valve on each outlet where more than one Storz outlet is required.

Table 4.27(b) Summary of Centrifugal Fire Pump Data (Metric)
Notes:
(1) The pressure relief valve is permitted to be sized in accordance with 4.19.2.1.
(2) The pressure relief valve discharge is permitted to be sized in accordance with 4.19.6.2.
(3) The flow meter device is permitted to be sized in accordance with 4.21.2.3.
(4) The hose header supply is permitted to be sized in accordance with 4.21.3.4.
(5) Other type of test outlets, sizes, and quantity are permitted when approved by the authority having jurisdiction
[a]Actual diameter of pump flange is permitted to be different from pipe diameter.
[b]Applies only to that portion of suction pipe specified in 4.15.3.3.
[c]Suction pipe sizes in Table 4.27(b) are based on a maximum velocity at 150 percent rated capacity to 15 ft/sec (4.6 m/sec) in most cases.

Public Input No. 49-NFPA 20-2016 [Section No. 4.28.4]

4.28.4 Evaluation.

4.28.4.1– Backflow Prevention Device

4.28.4.1.1

Where the authority having jurisdiction requires the installation of a backflow prevention device or assembly in connection with the pump, special consideration shall be given to the increased pressure loss resulting from the installation.

4.28.4.1. 2

Where a backflow prevention device is installed, the final arrangement shall provide effective pump performance ~~with a minimum~~ at the higher pump suction pressure of 0 psi (0 bar)~~ at the gauge at 150 percent of rated capacity~~ , or the lowest permissible suction pressure .

4.28.4. 1. 3

~~If available suction supplies do not permit the flowing of 150 percent of rated pump capacity, the final arrangement of the backflow prevention device shall provide effective pump performance with a minimum suction pressure of 0 psi (0 bar) at the gauge at the maximum allowable discharge~~ The discharge flow rate shall exceed the fire protection system design flow .

4.28.4. 1. 4

The discharge flow rate shall exceed 100% of the fire ~~protection system design flow.~~ pump rated flow rate

4.28.4.1. 5

Determination of effective pump performance shall be documented by engineering calculations and tests.

4.28.4.1. 6

Retroactive installation of a backflow prevention device shall not reduce the suction pressure below that permitted in this standard and accepted by the authority having jurisdiction.

4.28.4.1. 7

Retroactive installation of a backflow prevention device shall not result in a discharge pressure that does not meet the maximum system demand and 100% of the rated lfow rate for thefire pump .

Statement of Problem and Substantiation for Public Input

Clarifies the requirements

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 43-NFPA 20-2016 [New Section after 3.3.42.2]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:

State:
Zip:
Submittal Date: Tue Jan 19 10:10:09 EST 2016

Public Input No. 183-NFPA 20-2016 [New Section after 4.31.1]

TITLE OF NEW CONTENT

Alternately, a listed pressure sensing assembly, remote from the controller, may be provided for all pump installations, including jockey pumps, and include the following:

(1) Individual pressure sensing line connections for each discharge port or suction port.

(2) Individual pressure-actuated switches or electronic pressure transducers for each port providing a pressure signal to the controller

(3) Solenoid drain valve per 12.7.2.1.2.2

(4) Globe valves and gages for manually dropping the pressure to test the operation of the controller per 12.7.2.1.7

Statement of Problem and Substantiation for Public Input

The introduction of the pressure sensing assembly in the pump room remote from the controller would solve the problem of running all of the piping to one location on the controller. This will get very cumbersome as we begin to mount suction pressure, discharge pressure, and VFD pressure transducers plus the solenoid drain valve to the side of the controllers. Removing the sensing lines from the controller provides the installer with a great deal more flexibility in piping. The assembly can be located anywhere in the pump room which makes sense. Simple transducer signal cables connect the pressure sensing assembly to the controller. This also streamlines the controller providing more flexibility in where it is located.

Submitter Information Verification

Submitter Full Name: Doug Stephens
Organization: Asco Power Technologies
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jun 29 14:43:00 EDT 2016

Public Input No. 184-NFPA 20-2016 [Section No. 4.31.1.1]

4.31.1.1

Every multistage multiport pump for each discharge port shall have its own individual pressure sensing line connected to the fire pump controller.

Alternately, a listed pressure sensing assembly, remote from the controller, may be provided for the discharge ports in 4.31.1.1 and shall include the following:

(1) Individual pressure sensing line connections for each port .

(2) Individual pressure-actuated switches or electronic pressure transducers for each port providing a pressure signal to the controller.

(3) Globe valves and gages for manually dropping the pressure to test the operation of the controller per 12.7.2. 1 .7

4.31.1.1.1

The pressure maintenance pump controller for each discharge port shall have its own individual pressure sensing line.

Alternately, a listed pressure sensing assembly, remote from the controller, may be provided for the discharge ports in 4.31.1.1.1 and shall include the following:

(1) Individual pressure sensing line connections for each port.

(2) Individual pressure-actuated switches or electronic pressure transducers for each port providing a pressure signal to the controller.

(3) Globe valves and gages for manually dropping the pressure to test the operation of the controller per 12.7.2.1.7

Statement of Problem and Substantiation for Public Input

See substantiation for public input no 183

Submitter Information Verification

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State:
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Submittal Date: Wed Jun 29 14:50:07 EDT 2016

Public Input No. 39-NFPA 20-2016 [Section No. 5.5]

5.5 ~~Auxiliary~~ Alternate Power.

Where electric motor–driven fire pump(s) are used, a reliable ~~emergency~~ alternate source of power in accordance with Section 9.6 or a back-up fire pump in accordance with Section 9.3 shall be provided for the fire pump installation.

Statement of Problem and Substantiation for Public Input

The alternate source of power may not be an emergency source of power.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 37-NFPA 20-2016 [Section No. 3.3.39]	Complementary changes

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
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Submittal Date: Mon Jan 18 18:52:19 EST 2016

Public Input No. 136-NFPA 20-2016 [New Section after 6.2.2.1]

Maximum shutoff head for variable speed applications

Wherever the pumps are run using a variable speed drive the shutoff head will range from a minimum of 101 percent to a maximum of 120 percent of rated head.

Statement of Problem and Substantiation for Public Input

VFD can reduce the speed instantaneously and avoid over pressure build up in the system. So, if we reduce the max pressure limit over-designing of the system can be avoided.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 134-NFPA 20-2016 [New Section after 3.3.68]	New testing requirements that will also affect the newly defined Self-Regulating Variable Speed Pump Unit.

Submitter Information Verification

Submitter Full Name: Steven Baird
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Submittal Date: Fri Jun 24 11:19:22 EDT 2016

Public Input No. 195-NFPA 20-2016 [New Section after 6.5.2]

6.5.3 Mass Elastic System

6.5.3 Mass Elastic System

6.5.3.1* Separately coupled-type pumps driven by a diesel engine, a torsional coupling shall be used and mounted on the engine side of the flexible coupling or flexible connecting shaft.

A.6.5.3.1

Torsional couplings are very useful at moving harmful stresses out of the operating speed ranges of these pump systems. However, if the stiffness or damping characteristic of the coupling is not selected correctly it can actually make the system torsional activity worse at operating speed.

6.5.3.1.1 For drive systems that include a diesel engine, torsional coupling, and horizontal shaft pump, the pump manufacturer shall provide at minimum a 2–mass torsional frequency calculation indicating that the first two natural frequencies of the system and the critical speeds associated with engine firing frequency are found to at minimum be 25% above or 25% below when the pump is operating at rated speed.

6.5.3.1.1.1* The torsional frequency calculation specified in 6.5.3.1.1 shall include the mass elastic characteristics for a wetted pump with the specific impeller(s) trim, torsional coupling, flexible coupling or flexible connecting shaft, and the engine.

A.6.5.3.1.1.1

The system should be considered as two lumped inertias (M1, M2) connected by one springs (Kh).

TO BE PROVIDED

Figure A.6.5.3.1.1.1 lumped inertia definition

Figure Legend

E1 - total inertia of engine and flywheel (kgm^2)

E2 - torsional coupling primary inertia (kgm^2)

G1 - torsional coupling secondary inertia (kgm^2)

G2 - coupling total inertia (kgm^2)

G3 - inertia of companion flange (kgm^2)

P1 – Pn - wetted inertia of pump impeller(s) (kgm^2)

Kh - dynamic torsional stiffness of torsional coupling element (Nm/rad)

6.5.3.1.2* When the calculations required in 6.5.3.1.1 indicate that critical speeds are found to fall within 25% above or within 25% below of pump rated speed, then a further detailed set of forced response calculations are required of the vertical components and horizontal components indicating there are no damaging vibratory stresses or torques.

A.6.5.3.1.2

The calculated forced response results should be compared against manufacturers' recommended limits for each component. For torsional couplings this comparison would include vibratory torque and heat dissipation if the spring element is a viscoelastic material.

6.5.3.1.2.1* The torsional analysis specified in 6.5.3.1.2 shall include the mass elastic characteristics required in 6.5.3.1.1.1 plus;

(a) the excitation characteristics of the specific engine and rating

(b) a fully flexible lumped parameter model having multiple elements along the length of the engine crankshaft, the horizontal shafting, and pump impeller

(c) include the effect of engine misfire

A.6.5.3.1.2.1

As a result of the influence of emission laws engine combustion processes have changed considerably over the years. The cylinder and injection pressures of modern diesel engines are very different than older engines. Therefore when doing the calculations of 6.5.3.1.2 it is desirable to have specific engine manufacturer and rating excitation data. Older hand books that provide diesel engine excitation data are typically inadequate for these calculations.

This is often referred to as a multi-mass analysis.

6.5.3.1.3 For a system defined in 6.5.3.1 that use a variable speed diesel driver the operating speed for the analytical speeds shall be define as a minimum of 25% above pump rated speed and 25% below the lowest possible speed of the variable speed driver.

6.5.3.1.4 The torsional coupling required in par. 6.5.3.1 shall be permitted to be omitted when a complete mass elastic system torsional analysis is provided and accepted by the authority having jurisdiction indicating the system meets the requirements of 6.5.3.1.2 without a torsional coupling being included in the system.

6.5.3.1.4.1 In addition to the requirements of 6.5.3.1.2 results shall include engine critical response i.e. crankshaft stress, crankshaft damper heat dissipation,

Additional Proposed Changes

File Name	Description	Approved
16.06.29h_JWhitney_MassElasticSystem_6.5.3_.docx	word version of public input	

Statement of Problem and Substantiation for Public Input

Torsional failures of horizontal pump systems typically resulting in broken pump shafts have been happening too often the last few years. There is no obvious smoking gun at this time, therefore I am proposing a solution equal to the requirements that been developed over a number NFPA 20 revision cycles.

Submitter Information Verification

Submitter Full Name: John Whitney
Organization: Clarke Fire Protection Product
Street Address:
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Submittal Date: Tue Jul 05 09:21:03 EDT 2016

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Log #:

Date Rec'd:

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1. (a) Title of NFPA Standard NFPA 20 **NFPA No. & Year** 2016

(b) Section/Paragraph 6.5.3

2. Public Input Recommends (check one): ☒ new text ☐ revised text ☐ deleted text

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6.5.3 Mass Elastic System

6.5.3.1* Separately coupled-type pumps driven by a diesel engine, a torsional coupling shall be used and mounted on the engine side of the flexible coupling or flexible connecting shaft.

A.6.5.3.1
Torsional couplings are very useful at moving harmful stresses out of the operating speed ranges of these pump systems. However, if the stiffness or damping characteristic of the coupling is not selected correctly it can actually make the system torsional activity worse at operating speed.

6.5.3.1.1 For drive systems that include a diesel engine, torsional coupling, and horizontal shaft pump, the pump manufacturer shall provide at minimum a 2–mass torsional frequency calculation indicating that the first two natural frequencies of the system and the critical speeds associated with engine firing frequency are found to at minimum be 25% above or 25% below when the pump is operating at rated speed.

6.5.3.1.1.1* The torsional frequency calculation specified in 6.5.3.1.1 shall include the mass elastic characteristics for a wetted pump with the specific impeller(s) trim, torsional coupling, flexible coupling or flexible connecting shaft, and the engine.

A.6.5.3.1.1.1
The system should be considered as two lumped inertias (M1, M2) connected by one springs (K_H).

TO BE PROVIDED

Figure A.6.5.3.1.1.1 lumped inertia definition

Figure Legend

E1 - total inertia of engine and flywheel (kgm^2)
E2 - torsional coupling primary inertia (kgm^2)
G1 - torsional coupling secondary inertia (kgm^2)
G2 - coupling total inertia (kgm^2)
G3 - inertia of companion flange (kgm^2)

P1 – Pn - wetted inertia of pump impeller(s) (kgm^2)
KH - dynamic torsional stiffness of torsional coupling element (Nm/rad)

6.5.3.1.2* When the calculations required in 6.5.3.1.1 indicate that critical speeds are found to fall within 25% above or within 25% below of pump rated speed, then a further detailed set of forced response calculations are required of the vertical components and horizontal components indicating there are no damaging vibratory stresses or torques.

A.6.5.3.1.2
The calculated forced response results should be compared against manufacturers' recommended limits for each component. For torsional couplings this comparison would include vibratory torque and heat dissipation if the spring element is a viscoelastic material.

6.5.3.1.2.1* The torsional analysis specified in 6.5.3.1.2 shall include the mass elastic characteristics required in 6.5.3.1.1.1 plus;
(a) the excitation characteristics of the specific engine and rating
(b) a fully flexible lumped parameter model having multiple elements along the length of the engine crankshaft, the horizontal shafting, and pump impeller
(c) include the effect of engine misfire

A.6.5.3.1.2.1
As a result of the influence of emission laws engine combustion processes have changed considerably over the years. The cylinder and injection pressures of modern diesel engines are very different than older engines. Therefore when doing the calculations of 6.5.3.1.2 it is desirable to have specific engine manufacturer and rating excitation data. Older hand books that provide diesel engine excitation data are typically inadequate for these calculations.

This is often referred to as a multi-mass analysis.

6.5.3.1.3 For a system defined in 6.5.3.1 that use a variable speed diesel driver the operating speed for the analytical speeds shall be define as a minimum of 25% above pump rated speed and 25% below the lowest possible speed of the variable speed driver.

6.5.3.1.4 The torsional coupling required in par. 6.5.3.1 shall be permitted to be omitted when a complete mass elastic system torsional analysis is provided and accepted by the authority having jurisdiction indicating the system meets the requirements of 6.5.3.1.2 without a torsional coupling being included in the system.

6.5.3.1.4.1 In addition to the requirements of 6.5.3.1.2 results shall include engine critical response i.e. crankshaft stress, crankshaft damper heat dissipation,

4. Statement of Problem and Substantiation for Public Input: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Public Input, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

Torsional failures of horizontal pump systems typically resulting in broken pump shafts have been happening too often the last few years. There is no obvious smoking gun at this time, therefore I am proposing a solution equal to the requirements that been developed over a number NFPA 20 revision cycles.

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Signature (Required)

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To: Secretary, Standards Council National Fire Protection Association
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Fax to: (617) 770-3500 OR Email to: proposals_comments@nfpa.org

7/14/2016

Public Input No. 196-NFPA 20-2016 [New Section after 6.5.2]

6.5.3

Pumps and drivers on separately coupled–type pumps shall be equipped to contain the debris should there be failure of the flexible coupling, flexible connecting shaft or pump shaft.

Statement of Problem and Substantiation for Public Input

There have been many failures of the power transmission components between the driver and a separately mounted pump/right angle gear resulting flying debris. The personnel safety guards are not adequate to contain this heavy debris. NFPA 25 requires personnel to be in attendance when these systems are operating, therefore these systems must be constructed that will not put personnel in possible harm's way were experience has should there is a risk.

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Public Input No. 85-NFPA 20-2016 [Section No. 7.5.1.1]

7.5.1.1

The driver provided shall be so constructed that the total thrust of the pump, which includes the weight of the shaft, impellers, and hydraulic thrust, can be carried on a thrust bearing of ample capacity so that it will have an average life rating of ~~5 years continuous operation~~ 15,000 hours .

Statement of Problem and Substantiation for Public Input

NFPA 20, is unnecessarily ambiguous. NFPA 20, section 8.6.2.1.3 defines the life of the bearing system to be L10 15,000 hours.

Submitter Information Verification

Submitter Full Name: Tony Sample
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Submittal Date: Tue Apr 26 13:20:37 EDT 2016

Public Input No. 86-NFPA 20-2016 [Section No. 7.5.1.4]

7.5.1.4

The requirements of 7.5.1.3 shall not apply to diesel engines and steam turbines designed and listed for vertical installation with vertical shaft turbine–type pumps, which shall be permitted to employ solid shafts and shall not require a right-angle gear drive but shall require a nonreverse ~~ratchet~~ mechanism .

Statement of Problem and Substantiation for Public Input

Listed fire pump systems, have been using non-reverse ratchets decades. However, there are more reliable and safer solutions. By opening the definition of the non-reverse system, better solutions can be provided.

A non-reverse ratchet typically includes a set of hardened steel pins and a ratchet plate made from cast iron. Concerns are, (1) Over time the pins will wear a groove into the ratchet plate, making the system less reliable. (2) Sparks from sudden reversal of the forward rotation, as in the cases of a backfire.

Submitter Information Verification

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Submittal Date: Tue Apr 26 13:30:38 EDT 2016

Public Input No. 199-NFPA 20-2016 [New Section after 7.5.1.6]

7.5.1.6 Mass Elastic System

7.5.1.6.1* For vertical turbine pumps using right angle gear drives driven by a diesel engine, a torsional coupling shall be used and mounted on the engine side of the driveshaft.

A.7.5.1.6.1 Torsional couplings are very useful at moving harmful stresses out of the operating speed ranges of these pump systems. However, if the stiffness or damping characteristic of the coupling is not selected correctly it can actually make the system torsional activity worse at operating speed.

7.5.1.6.1.1 For drive systems that include a diesel engine, torsional coupling, right angle gear drive and vertical shaft pump, the pump manufacturer shall provide at minimum a 3–mass torsional frequency calculation indicating that the first two natural frequencies of the system and the critical speeds associated with engine firing frequency are found to at minimum be 25% above or 25% below when the pump is operating at rated speed.

7.5.1.6.1.1.1* The torsional frequency calculation specified in 7.5.1.6.1.1 shall include the mass elastic characteristics for a wetted pump with the specific impeller(s) trim, torsional coupling, right-angle gear, gear ratio, flexible connecting shaft, and the engine.

A.7.5.1.6.1.1.1 The system should be considered as three lumped inertias (M1, M2, M3) connected by two springs (Kh , Kv).

Figure A.7.5.1.6.1.1.1 lumped inertia definition (see attached for Figure)

E1 - total inertia of engine and flywheel (kgm^2)

E2 - torsional coupling primary inertia (kgm^2)

G1 - torsional coupling secondary inertia (kgm^2)

G2 - cardan shaft total inertia (kgm^2)

G3 - inertia of companion flange (kgm^2)

G4a - inertia of RAG horizontal shaft assembly including gear (kgm^2)

G4b - inertia of RAG vertical shaft assembly including gear and clutch (kgm^2)

P1 – Pn - wetted inertia of pump impeller(s) (kgm^2)

Kh - dynamic torsional stiffness of torsional coupling element (Nm/rad)

Kv - series torsional stiffness of shafting between top nut at RAG and top pump impeller (Nm/rad)

Note: G4b, Kv and all pump impeller inertia to be corrected by the RAG ratio

7.5.1.6.1.2* When the calculations required in 7.5.1.6.1.1 indicate that critical speeds are found to fall within 25% above or within 25% below of pump rated speed, then a further detailed set of forced response calculations are required of the vertical components and horizontal components indicating there are no damaging vibratory stresses or torques.

A.7.5.1.6.1.2 The calculated forced response results should be compared against manufacturers' recommended limits for each component. For torsional couplings this comparison would include vibratory torque and heat dissipation if the spring element is a viscoelastic material.

7.5.1.6.1.2.1* The torsional analysis specified in 7.5.1.6.1.2 shall include the mass elastic characteristics required in 7.5.1.6.1.1.1 plus;

(a) the excitation characteristics of the specific engine and rating

(b) a fully flexible lumped parameter model having multiple elements along the length of the engine crankshaft, the horizontal shafting, and vertical shafting to all pump stages

(c) include the effect of engine misfire

A.7.5.1.6.1.2.1 As a result of the influence of emission laws engine combustion processes have changed considerably over the years. The cylinder and injection pressures of modern diesel engines are

very different than older engines. Therefore when doing the calculations of 7.5.1.6.1.2 it is desirable to have specific engine manufacturer and rating excitation data. Older hand books that provide diesel engine excitation data are typically inadequate for these calculations.

This is often referred to as a multi-mass analysis.

7.5.1.6.1.3 For a system defined in 7.5.1.6.1 that use a variable speed diesel driver the operating speed for the analytical speeds shall be define as a minimum of 25% above pump rated speed and 25% below the lowest possible speed of the variable speed driver.

7.5.1.6.1.4 The torsional coupling required in par. 7.5.1.6.1 shall be permitted to be omitted when a complete mass elastic system torsional analysis is provided and accepted by the authority having jurisdiction indicating the system meets the requirements of 7.5.1.6.1.2 without a torsional coupling being included in the system.

7.5.1.6.1.4.1 In addition to the requirements of 7.5.1.6.1.2 results shall include engine critical response i.e. crankshaft stress, crankshaft damper heat dissipation,

7.5.1.6.2 For variable speed vertical hollow shaft electric motors, the pump manufacturer shall provide a complete mass elastic system torsional analysis to ensure there are no damaging stresses or critical speeds within 25 percent above and below the operating speed of the pump and drive.

Additional Proposed Changes

File Name	Description	Approved
16.06.29g_JWhitney_MassElasticSystem_7.5.1.6_.docx	word version of public input with Figure included.	

Statement of Problem and Substantiation for Public Input

The changes proposed to 7.5.1.6 are considerable and unfortunately to present in the normal strikethrough and underline method became too confusing, therefore I have presented the proposal in final language form with all paragraphs.

Summary, in the changes no requirements have been eliminated, however much additional guidance in the form of requirements and ANNEX material has been added to help package designers through the evaluation of mass elastic systems. Since the 2106 edition it has been learned that a 2 mass torsional analysis is not adequate for this type of system, therefore the requirement has change to a 3 mass torsional analysis with guidance as to how to elevate the analytical process for systems that result in marginal 3 mass calculations to determine if these systems can be predicted as reliable.

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Submittal Date: Tue Jul 05 10:17:10 EDT 2016

NFPA Public Input Form

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Street Address 100 Progress Place **City** Cincinnati **State** OH **Zip** 45246

Please indicate organization represented (if any)

1. (a) Title of NFPA Standard NFPA 20 **NFPA No. & Year** 2016

(b) Section/Paragraph 7.5.1.6 & 3.3.new

2. Public Input Recommends (check one): ☐ new text ☒ revised text ☐ deleted text

3. Proposed Text of Public Input (include proposed new or revised wording, or identification of wording to be deleted): [Note: Proposed text should be in legislative format; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

7.5.1.6 Mass Elastic System

7.5.1.6.1* For vertical turbine pumps using right angle gear drives driven by a diesel engine, a torsional coupling shall be used and mounted on the engine side of the driveshaft.

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7.5.1.6.1.1.1* The torsional frequency calculation specified in 7.5.1.6.1.1 shall include the mass elastic characteristics for a wetted pump with the specific impeller(s) trim, torsional coupling, right-angle gear, gear ratio, flexible connecting shaft, and the engine.

A.7.5.1.6.1.1.1 The system should be considered as three lumped inertias (M1, M2, M3) connected by two springs (K_H, K_V).

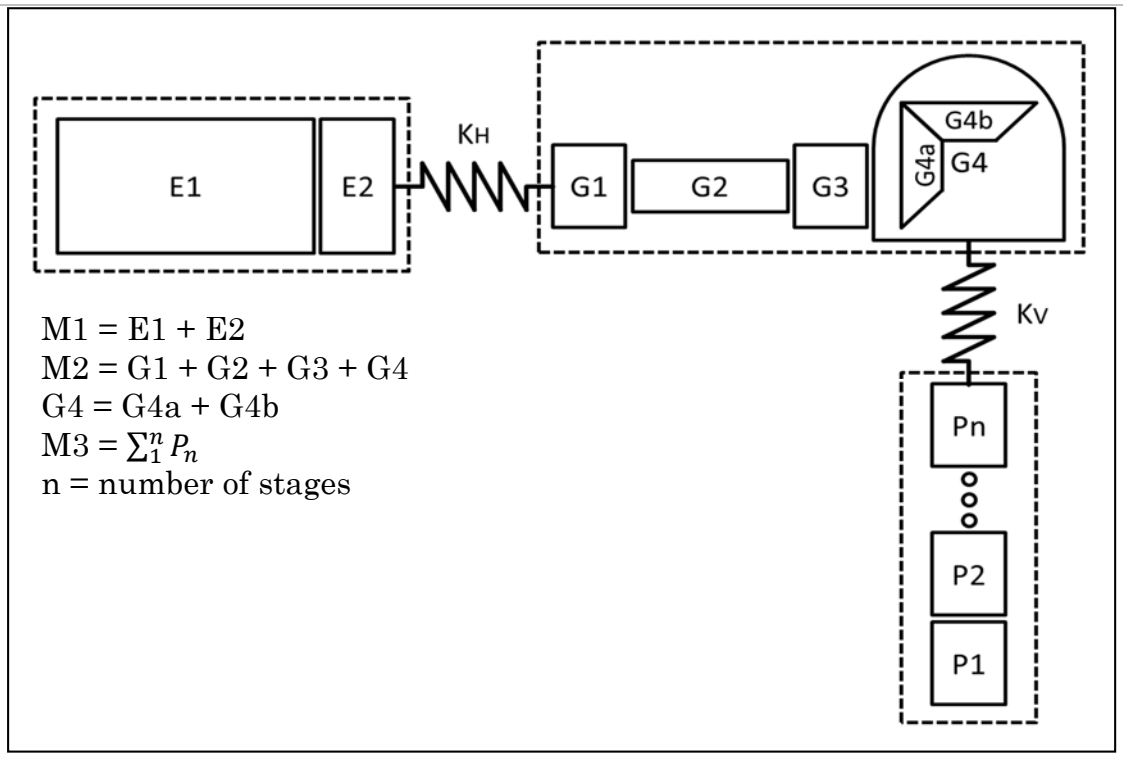

Figure A.7.5.1.6.1.1.1 lumped inertia definition

E1 - total inertia of engine and flywheel (kgm^2)
E2 - torsional coupling primary inertia (kgm^2)
G1 - torsional coupling secondary inertia (kgm^2)
G2 - cardan shaft total inertia (kgm^2)
G3 - inertia of companion flange (kgm^2)
G4a - inertia of RAG horizontal shaft assembly including gear (kgm^2)
G4b - inertia of RAG vertical shaft assembly including gear and clutch (kgm^2)
P1 – Pn - wetted inertia of pump impeller(s) (kgm^2)
KH - dynamic torsional stiffness of torsional coupling element (Nm/rad)
KV - series torsional stiffness of shafting between top nut at RAG and top pump impeller (Nm/rad)

Note: G4b, KV and all pump impeller inertia to be corrected by the RAG ratio

7.5.1.6.1.2* When the calculations required in 7.5.1.6.1.1 indicate that critical speeds are found to fall within 25% above or within 25% below of pump rated speed, then a further detailed set of forced response calculations are required of the vertical components and horizontal components indicating there are no damaging vibratory stresses or torques.

A.7.5.1.6.1.2
The calculated forced response results should be compared against manufacturers' recommended limits for each component. For torsional couplings this comparison would include vibratory torque and heat dissipation if the spring element is a viscoelastic material.

7.5.1.6.1.2.1* The torsional analysis specified in 7.5.1.6.1.2 shall include the mass elastic characteristics required in 7.5.1.6.1.1 plus;
(a) the excitation characteristics of the specific engine and rating
(b) a fully flexible lumped parameter model having multiple elements along the length of the engine crankshaft, the horizontal shafting, and vertical shafting to all pump stages
(c) include the effect of engine misfire

A.7.5.1.6.1.2.1 As a result of the influence of emission laws engine combustion processes have changed considerably over the years. The cylinder and injection pressures of modern diesel engines are very different than older engines. Therefore when doing the calculations of 7.5.1.6.1.2 it is desirable to have specific engine manufacturer and rating excitation data. Older hand books that provide diesel engine excitation data are typically inadequate for these calculations.

This is often referred to as a multi-mass analysis.

7.5.1.6.1.3 For a system defined in 7.5.1.6.1 that use a variable speed diesel driver the operating speed for the analytical speeds shall be define as a minimum of 25% above pump rated speed and 25% below the lowest possible speed of the variable speed driver.

7.5.1.6.1.4 The torsional coupling required in par. 7.5.1.6.1 shall be permitted to be omitted when a complete mass elastic system torsional analysis is provided and accepted by the authority having jurisdiction indicating the system meets the requirements of 7.5.1.6.1.2 without a torsional coupling being included in the system.

7.5.1.6.1.4.1 In addition to the requirements of 7.5.1.6.1.2 results shall include engine critical response i.e. crankshaft stress, crankshaft damper heat dissipation,

7.5.1.6.2 For variable speed vertical hollow shaft electric motors, the pump manufacturer shall provide a complete mass elastic system torsional analysis to ensure there are no damaging stresses or critical speeds within 25 percent above and below the operating speed of the pump and drive.

3.3.New Torsional Coupling. A driveline component capable of transmitting torque having a very low spring constant along the axis of rotation. The effect of this component is to "detune" the driveline system and move any damaging resonances safely below operating speed.

4. Statement of Problem and Substantiation for Public Input: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Public Input, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

The changes proposed to 7.5.1.6 are considerable and unfortunately to present in the normal strikethrough and underline method became too confusing, therefore I have presented the proposal in final language form with all paragraphs.

Summary, in the changes no requirements have been eliminated, however much additional guidance in the form of requirements and ANNEX material has been added to help package designers through the evaluation of mass elastic systems. Since the 2106 edition it has been learned that a 2 mass torsional analysis is not adequate for this type of system, therefore the requirement has change to a 3 mass torsional analysis with guidance as to how to elevate the analytical process for systems that result in marginal 3 mass calculations to determine if these systems can be predicted as reliable.

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Signature (Required)

PLEASE USE SEPARATE FORM FOR EACH PUBLIC INPUT

To: Secretary, Standards Council National Fire Protection Association
1 Batterymarch Park · Quincy, MA 02169-7471 OR
Fax to: (617) 770-3500 OR Email to: proposals_comments@nfpa.org

7/14/2016

Public Input No. 88-NFPA 20-2016 [Section No. 7.5.1.7.3]

7.5.1.7.3

The gear drive shall be equipped with a nonreverse ~~ratchet~~ mechanisim .

Statement of Problem and Substantiation for Public Input

Listed fire pump systems, have been using non-reverse ratchets decades. However, there are more reliable and safer solutions. By opening the definition of the non-reverse system, better solutions can be provided.

A non-reverse ratchet typically includes a set of hardened steel pins and a ratchet plate made from cast iron. Concerns are, (1) Over time the pins will wear a groove into the ratchet plate, making the system less reliable. (2) Sparks from sudden reversal of the forward rotation, as in the cases of a backfire.

Submitter Information Verification

Submitter Full Name: Tony Sample
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Street Address:
City:
State:
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Submittal Date: Tue Apr 26 14:06:13 EDT 2016

Public Input No. 87-NFPA 20-2016 [Section No. 7.5.1.7.4]

7.5.1.7.4

All gear drives shall be listed and rated by the manufacturer at a load equal to the ~~maximum horsepower~~ continuous power and thrust of the pump for at least 15,000 hours of operation, as well as being capable of transfering the minimum and maximum conditions as defined by the pump manufacturer, for which the gear drive is intended.

Statement of Problem and Substantiation for Public Input

1. Recommendation that "horsepower", be replaced with "power". Currently, the statement specifies a unit of power measurement, when it should instead assert that the power of the pump be addressed.
2. Recommendation that instead of selecting gearboxes based on the maximum power and thrust of the pump, they be chosen based on their ability to transmit the continuous power and thrust of the pump for a minimum of 15,000 hrs (ref. 8.6.2.1.3) as well as have the capability of carrying the minimum and maximum thrust conditions, as described by the pump manufacturer.

The expected life of a fire pump as described by the L10 hours of the bearings is 15,000 hours. The operational life a fire pump as described by the engine's testing and fuel tank requirements is ~550 hours. It has been the standard practice in the industry to apply a SF= 1.50 to the pump power specified, when driven by an IC engine, for selecting a gearbox. NFPA 20's requirement of using the pump's maximum power, and the use of a SF=1.50 results in the gears calculated life of at least 15,000 hrs., and can approach 100,000 hrs. Also, the use of the pump's maximum thrust for rating the gearbox's thrust capacity, will cause a similar increase in the L10 life of the bearings.

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Public Input No. 197-NFPA 20-2016 [New Section after 7.5.1.8.4]

7.5.1.8.New

Right angle gears and drivers connected with a flexible connecting shaft shall be equipped to contain the debris should there be failure of the torsional vibration coupling, flexible connecting shaft, or right angle gear input shaft.

Statement of Problem and Substantiation for Public Input

There have been many failures of the power transmission components between the driver and a separately mounted pump/right angle gear resulting flying debris. The personnel safety guards are not adequate to contain this heavy debris. NFPA 25 requires personnel to be in attendance when these systems are operating, therefore these systems must be constructed that will not put personnel in possible harm's way were experience has should there is a risk.

Submitter Information Verification

Submitter Full Name: John Whitney
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Submittal Date: Tue Jul 05 10:09:58 EDT 2016

Public Input No. 89-NFPA 20-2016 [Section No. 7.6.2.2]

7.6.2.2

When spare or replacement parts are ordered, for the pump, then the pump serial number stamped on the nameplate fastened to the pump head shall be included in order to make sure the proper parts are provided. When spare or replacement parts are ordered, for the gearbox, then the gearbox's serial number stamped on the nameplate fastened to the gear case shall be included in order to make sure the proper parts are provided.

Statement of Problem and Substantiation for Public Input

In order to provide the approved OEM parts for the gearbox, the serial number is necessary.

Submitter Information Verification

Submitter Full Name: Tony Sample
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Submittal Date: Tue Apr 26 14:09:54 EDT 2016

Public Input No. 90-NFPA 20-2016 [Section No. 8.6.2.1.1]

8.6.2.1.1

Reduction gears shall meet the requirements ~~of~~ of AGMA ~~2011, *Cylindrical Wormgearing Tolerance and Inspection Methods*~~ 6013 A06, *Standard for Industrial Enclosed Gear Drives* .

Statement of Problem and Substantiation for Public Input

The reverenced AGMA standard is irrelevant regarding fire pump drive gearboxes. Whereas, AGMA 6013 A06, covers the type of gearboxes used in fire fighting systems.

Submitter Information Verification

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City:
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Submittal Date: Mon May 02 15:30:44 EDT 2016

Public Input No. 174-NFPA 20-2016 [Section No. 9.2]

9.2* Normal Power.

9.2.1

An electric motor–driven fire pump shall be provided with a normal source of power as a continually available source.

9.2.2

The normal source of power required in 9.2.1 and its routing shall be arranged in accordance with one of the following:

(1) Service connection dedicated to the fire pump installation

(2) On-site power production facility connection dedicated to the fire pump installation

(3) Dedicated feeder connection derived directly from the dedicated service to the fire pump installation

(4) As a feeder connection where all of the following conditions are met:

(5) The protected facility is part of a multibuilding campus-style arrangement.

(6) A backup source of power is provided from a source independent of the normal source of power.

(7) It is impractical to supply the normal source of power through the arrangement in 9.2.2 (1), 9.2.2 (2), or 9.2.2 (3).

(8) The arrangement is acceptable to the authority having jurisdiction.

(9) The overcurrent protection device(s) in each disconnecting means is selectively coordinated with any other supply side overcurrent protective device(s).

(10) Dedicated transformer connection directly from the service meeting the requirements of Article 695 of *NFPA 70*

9.2.3

For fire pump installations using the arrangement in 9.2.2 (1), 9.2.2 (2), 9.2.2 (3), or 9.2.2 (5) for the normal source of power, ~~no more than one~~ a single disconnecting means ~~and associated overcurrent protection device~~ shall be installed in the power supply to the fire pump controller.

9.2.3.1

Where the single disconnecting means ~~permitted~~ required by 9.2.3 is installed, the disconnecting means shall meet all of the following requirements:

(1) It shall ~~be identified as being suitable for use as service~~ have a rating not less than 125 percent of the sum of the fire pump motor(s) and pressure maintenance motor(s) full-load current(s), and 100 percent of the associated fire pump accessory equipment.

(2) It shall be lockable in both the closed position and the open position.

(3) * It shall be located remote from other building disconnecting means.

(4) * It shall be located remote from other fire pump source disconnecting means.

(5) It shall be marked “Fire Pump Disconnecting Means” in letters that are no less than 1 in. (25 mm) in height and that can be seen without having to open enclosure doors or covers.

9.2.3.2

Where the single disconnecting means ~~permitted~~ required by 9.2.3 is installed, a placard shall be placed adjacent to the fire pump controller stating the location of this disconnecting means and the location of any key needed to unlock the disconnect.

9.2.3.3

Where the single disconnecting means ~~permitted~~ required by 9.2.3 is installed, the disconnect shall be supervised in the closed position by one of the following methods:

(1) Central station, proprietary, or remote station signal device

(2) Local signaling service that will cause the sounding of an audible signal at a constantly attended location

(3) Locking the disconnecting means in the closed position

(4) Where the disconnecting means is located within fenced enclosures or in buildings under the control of the owner, sealing the disconnecting means and performing approved weekly recorded inspections

9.2.3.4

Where the ~~overcurrent protection permitted by~~ single disconnecting means required by 9.2.3 contains integral overcurrent protection, it shall be identified as being suitable for use as service equipment.

9.2.3 .5

If an overcurrent protection device is installed integral to the disconnecting means required by 9.2.3 , the overcurrent protection device shall be rated to carry indefinitely the sum of the locked rotor current of the largest pump motor and the full-load current of all of the other pump motors and accessory equipment.

9.2.3. ~~4~~ **5 .1** –

Alternatively, compliance with 9.2.3.4 shall be based on an assembly listed for fire pump service that complies with the following:

(1) The overcurrent protection device shall not open within 2 minutes at 600 percent full-load current.

(2) The overcurrent protection device shall not open with a restart transient of 24 times the full-load current.

(3) The overcurrent protection device shall not open within 10 minutes at 300 percent full-load current.

(4) The trip point for circuit breakers shall not be field adjustable.

9.2.3.4 5 .2 Overcurrent Device Selection.

An instantaneous trip circuit breaker shall be permitted in lieu of the overcurrent devices specified in 10.8.2.2 (2) provided it is part of a transfer switch assembly listed for fire pump service and complies with 9.2.3.4.1.

Additional Proposed Changes

File Name	Description	Approved
20-Chapter_9-2_Technical_Committee_Proposed_Change_-_Final.docx	This document is an accurate reflection of the proposed changes - the online editor added some underlines that may not have been intended.	

Statement of Problem and Substantiation for Public Input

re: Proposed Change to NFPA 20, Chapter 9.2

Substantiation:

As NFPA 70, Chapter 695 currently reads, the normal power feed to an electric fire pump controller can be tapped on the bus directly from the utility, upstream of the main building disconnect device, with no specific requirement for any disconnecting means between the bus tap and the fire pump controller [70:695.3 (A)(1)]. However, NFPA 20, 9.2.3 specifically requires no more than one disconnecting means in the power feed to a fire pump controller. Electrical engineers, plan reviewers and installers are not installing disconnecting means in the electrical feeder circuits, as they are not required by NFPA 70 and can be interpreted as optional in NFPA 20.

In the event of repair, maintenance, or replacement of the electric fire pump controller, the utility feed would need

to be disconnected at the transformer, resulting in an entire facility loss of power for the duration of the repair. If the fire pump is out of service due to malfunction, the delay in scheduling the power shutdown and repair could also be significant and may require additional fire watch.

As currently written, NFPA 20-9.2.3 states that 'no more than one' disconnect switch and associated overcurrent device in the fire pump controller Normal Power feed shall be installed. This proposed change makes a single disconnecting means a mandatory requirement in the fire pump controller normal power feed. An overcurrent protective device is permitted, but is not required, as suitable overcurrent protection is integral to a listed electric fire pump controller.

Having the ability to disconnect the normal power feed to the controller will eliminate the need to shut off power to the entire facility – or sections of the facility served by that utility - for repair or maintenance of the fire pump controller.

Workplace safety is maintained as repairs, maintenance or replacement can be performed on a completely de-energized controller utilizing a code-mandated disconnecting means.

Submitter Information Verification

Submitter Full Name: Michael Moffat
Organization: Moffat Group Incorp
Street Address:
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Submittal Date: Wed Jun 29 12:27:12 EDT 2016

Proposed Change:

Reference NFPA 20, Chapter 9.2

9.2* Normal Power.
9.2.1 An electric motor–driven fire pump shall be provided with a normal source of power as a continually available source.
9.2.2 The normal source of power required in 9.2.1 and its routing shall be arranged in accordance with one of the following:
(1) Service connection dedicated to the fire pump installation
(2) On-site power production facility connection dedicated to the fire pump installation
(3) Dedicated feeder connection derived directly from the dedicated service to the fire pump installation
(4) As a feeder connection where all of the following conditions are met:
(a) The protected facility is *part* of a multibuilding campus-style arrangement.
(b) A backup source of power is provided from a source independent of the normal source of power.
(c) It is impractical to supply the normal source of power through the arrangement in 9.2.2(1), 9.2.2(2), or 9.2.2(3).
(d) The arrangement is acceptable to the authority having jurisdiction.
(e) The overcurrent protection device(s) in each disconnecting means is selectively coordinated with any other supply side overcurrent protective device(s).
(5) Dedicated transformer connection directly from the service meeting the requirements of Article 695 of *NFPA 70*
9.2.3 For fire pump installations using the arrangement in 9.2.2(1), 9.2.2(2), 9.2.2(3), or 9.2.2(5) for the normal source of power, ~~no more than one~~ a single disconnecting means ~~and or associated overcurrent protection device~~ shall be installed in the power supply to the fire pump controller.
9.2.3.1 Where the single disconnecting means ~~permitted~~ required by 9.2.3 is installed, the disconnecting means shall meet all of the following requirements:
(1) It shall ~~be identified as being suitable for use as service Equipment~~have a rating not less than 125 percent of the sum of the fire pump motor(s) and pressure maintenance motor(s) full-load current(s), and 100 percent of the associated fire pump accessory equipment.
(2) It shall be lockable in both the closed position and the open position.
(3)* It shall be located remote from other building disconnecting means.

(4)* It shall be located remote from other fire pump source disconnecting means.
(5) It shall be marked "Fire Pump Disconnecting Means" in letters that are no less than 1 in. (25 mm) in height and that can be seen without having to open enclosure doors or covers.

9.2.3.2 Where the single disconnecting means ~~permitted~~ required by 9.2.3 is installed, a placard shall be placed adjacent to the fire pump controller stating the location of this disconnecting means and the location of any key needed to unlock the disconnect.

9.2.3.3 Where the single disconnecting means ~~permitted~~ required by 9.2.3 is installed, the disconnect shall be supervised in the closed position by one of the following methods:
(1) Central station, proprietary, or remote station signal device
(2) Local signaling service that will cause the sounding of an audible signal at a constantly attended location
(3) Locking the disconnecting means in the closed position
(4) Where the disconnecting means is located within fenced enclosures or in buildings under the control of the owner, sealing the disconnecting means and performing approved weekly recorded inspections

9.2.3.4 Where the single disconnecting means required by 9.2.3 contains integral overcurrent protection, it shall be identified as being suitable for use as service equipment.

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9.2.3.~~5~~4 ~~Where the~~If an overcurrent protection device is installed integral to the disconnecting means ~~permitted~~ required by 9.2.3 ~~is installed~~, the overcurrent protection device shall be rated to carry indefinitely the sum of the locked rotor current of the largest pump motor and the full-load current of all of the other pump motors and accessory equipment.

9.2.3.~~5~~4.1 Alternatively, compliance with 9.2.3.4 shall be based on an assembly listed for fire pump service that complies with the following:
(1) The overcurrent protection device shall not open within 2 minutes at 600 percent full-load current.
(2) The overcurrent protection device shall not open with a restart transient of 24 times the full-load current.
(3) The overcurrent protection device shall not open within 10 minutes at 300 percent full-load current.
(4) The trip point for circuit breakers shall not be field adjustable.

9.2.3.~~5~~4.2 Overcurrent Device Selection. An instantaneous trip circuit breaker shall be permitted in lieu of the overcurrent devices specified in 10.8.2.2(2) provided it is part of a transfer switch assembly listed for fire pump service and complies with 9.2.3.4.1.

~~Substantiation:~~

~~As NFPA 70, Chapter 695 currently reads, the normal power feed to an electric fire pump controller can be tapped on the bus directly from the utility, upstream of the main building disconnect device, with no specific requirement for any disconnecting means between the bus tap and the fire pump controller [70:695.3 (A)(1)]. However, NFPA 20, 9.2.3 specifically requires no more than one disconnecting means in the power feed to a fire pump controller. Electrical engineers, plan reviewers and installers are not installing disconnecting means in the electrical feeder circuits, as they are not required by NFPA 70 and can be interpreted as optional in NFPA 20.~~

~~In the event of repair, maintenance, or replacement of the electric fire pump controller, the utility feed would need to be disconnected at the transformer, resulting in an entire facility loss of power for the duration of the repair. If the fire pump is out of service due to malfunction, the delay in scheduling the power shutdown and repair could also be significant and may require additional fire watch.~~

~~As currently written, NFPA 20 9.2.3 states that 'no more than one' disconnect switch and associated overcurrent device in the fire pump controller Normal Power feed shall be installed. This proposed change makes a single disconnecting means a mandatory requirement in the fire pump controller normal power feed. An overcurrent protective device is permitted, but is not required, as suitable overcurrent protection is integral to a listed electric fire pump controller.~~

~~Having the ability to disconnect the normal power feed to the controller will eliminate the need to shut off power to the entire facility – or sections of the facility served by that utility – for repair or maintenance of the fire pump controller.~~

~~Workplace safety is maintained as repairs, maintenance or replacement can be performed on a completely de-energized controller utilizing a code-mandated disconnecting means.~~

~~Further revisions to the chapter reinforce the requirement of a single disconnecting means.~~

Public Input No. 106-NFPA 20-2016 [Section No. 9.2.2]

9.2.2

The normal source of power required in 9.2.1 and its routing shall be arranged in accordance with one of the following:

(1) Service connection dedicated to the fire pump installation. This connection shall be verified as a reliable power source by the utility company.

(2) On-site power production facility connection dedicated to the fire pump installation

(3) Dedicated feeder connection derived directly from the dedicated service to the fire pump installation

(4) As a feeder connection where all of the following conditions are met:

(5) _ The protected facility is part of a multibuilding campus-style arrangement.

(6) _ A backup source of power is provided from a source independent of the normal source of power.

(7) _ It is impractical to supply the normal source of power through the arrangement in 9.2.2 (1), 9.2.2 (2), or 9.2.2 (3).

(8) _ The arrangement is acceptable to the authority having jurisdiction.

(9) _ The overcurrent protection device(s) in each disconnecting means is selectively coordinated with any other supply side overcurrent protective device(s).

(10) Dedicated transformer connection directly from the service meeting the requirements of Article 695 of *NFPA 70*

Statement of Problem and Substantiation for Public Input

With the installation of the fire pump from a direct service connection, documentation shall be given to the authority having jurisdiction to prove that the power source has not failed for more than 4 hours within a one year time period of plan submittal is reliable. This documentation shall come from the utility company and shall be stamped by a professional engineer with the utility company. This requirement shall be given at the plan submittal stage.

Submitter Information Verification

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Zip:
Submittal Date: Mon Jun 20 15:49:02 EDT 2016

Public Input No. 118-NFPA 20-2016 [New Section after 9.3.6]

TITLE OF NEW CONTENT

Type your content here ...

9.3.6.1 Protective devices shall not be installed in the load side of the power transfer switch.

Statement of Problem and Substantiation for Public Input

The normal source overcurrent protection for the line side follows NFPA 70, but the load side must still be in accordance with NFPA 20.

Submitter Information Verification

Submitter Full Name: Vince Baclawski
Organization: Nema
Street Address:
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Submittal Date: Fri Jun 24 08:20:15 EDT 2016

Public Input No. 119-NFPA 20-2016 [Section No. 9.4.2]

9.4.2

The requirements of 9.4.1 shall not apply to emergency-run mechanical starting. *(See 10.5.3.2.), provided a successful start can be demonstrated on the standby gen-set.*

Statement of Problem and Substantiation for Public Input

It's always been assumed that this is the case, but it has never been required. This gives guidance to the gen-set supplier.

Submitter Information Verification

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Submittal Date: Fri Jun 24 08:23:20 EDT 2016

Public Input No. 61-NFPA 20-2016 [Section No. 9.6.2.2]

~~9.6.2.2~~ –

~~The generator shall run and continue to produce rated nameplate power without shutdown or derate for alarms and warnings or failed engine sensors, except for overspeed shutdown.~~

Statement of Problem and Substantiation for Public Input

This is in conflict with the requirements of 9.6.2.1 related to meeting NFPA 110 requirements. NFPA 110 5.6.5 Control Functions specifically address the required shutdowns which are different than what is indicated in this section. The requirement of the generator should remain consistent with NFPA 110 requirements as referenced in 9.6.2.1. Otherwise a conflict is set up between the two documents.

Submitter Information Verification

Submitter Full Name: Jonathan Hartsell
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Submittal Date: Fri Mar 04 16:09:50 EST 2016

Public Input No. 120-NFPA 20-2016 [Section No. 9.6.5.1]

9.6.5.1

Protective devices installed in the fire pump circuits of the on-site generator power source ~~circuits at the generator~~ shall allow instantaneous pickup of the full pump room load and shall comply with *NFPA 70*, Section 700.28.

Statement of Problem and Substantiation for Public Input

As originally written, this paragraph implies that the circuit protection must be "at the generator". This allows the connection to be at the generator switch gear.

Submitter Information Verification

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Submittal Date: Fri Jun 24 08:26:57 EDT 2016

Public Input No. 121-NFPA 20-2016 [Section No. 9.6.5.2]

9.6.5.2

~~Circuit breakers shall~~ Protective devices in the fire pump circuit shall all have supervision by remote monitoring.

Statement of Problem and Substantiation for Public Input

Fuses can be used for circuit protection as well as circuit breakers. This requires that both be monitored.

Submitter Information Verification

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Zip:
Submittal Date: Fri Jun 24 08:30:30 EDT 2016

Public Input No. 175-NFPA 20-2016 [New Section after 10.3.3.3]

TITLE OF NEW CONTENT

The front of the fire pump controller enclosure shall be rated for arc resistance with pressure relieving vents on the top or sides per IEEE C37.20.7, or equivalent standard.

Statement of Problem and Substantiation for Public Input

As section 9.1.8.2 of NFPA 20 - 2016 specifically prohibits the use of arc fault interruption on any fire pump control or power circuit, alternate means need to be provided on this equipment to protect the workers interacting with it that doesn't jeopardize the reliability of the installation. Arc flash hazards are significantly larger with this equipment than with standard electrical equipment, and typically very high arc flash incident energy values are calculated. This hazard is an exposure to any worker within the flash hazard boundary during testing (use of start/stop controls) of the fire pump controller. The worker can be seriously burned and would require hospitalization. Workers who regularly (monthly for example) test the fire pump controller will be exposed to this hazard during every test.

For equipment to meet the IEEE C37.20.7 arc resistant standard, all doors and covers must remain closed during an arc flash incident. No parts can be ejected from the equipment, and the arc may not burn any holes in the exterior of the structure.

Submitter Information Verification

Submitter Full Name: Richard Holub
Organization: The DuPont Company, Inc.
Street Address:
City:
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Submittal Date: Wed Jun 29 13:50:22 EDT 2016

Public Input No. 182-NFPA 20-2016 [Section No. 10.3.4.3]

10.3.4.3

Means shall be provided on the exterior of the controller to read all line currents and all line voltages with an accuracy within ~~±5 percent~~ ±1 percent of motor nameplate voltage and current.

Statement of Problem and Substantiation for Public Input

Line voltages and line currents can nowadays be measured easily within +/- 1 percent. Our current standard calls for 5 percent which if applied to a 480V motor would be 24V which is a very gross measurement by today's standards. All of our transfer switch panels have to operate on far tighter voltage tolerances than +/- 5 percent. Brings controller instrumentation in line with current digital measurement technology and with other instrumentation in the pump room.

Submitter Information Verification

Submitter Full Name: Doug Stephens
Organization: Asco Power Technologies
Street Address:
City:
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Zip:
Submittal Date: Wed Jun 29 14:40:06 EDT 2016

Public Input No. 122-NFPA 20-2016 [New Section after 10.3.4.5.3]

TITLE OF NEW CONTENT

Type your content here ...

10.3.4.5.4 Neither a fire pump controller nor a fire pump power transfer switch, where provided, shall be used as a junction box to splice incoming or outgoing wires. (See 9.7).

Statement of Problem and Substantiation for Public Input

Presently paragraph 9.7 only requires this "Where fire pump wiring to or from a fire pump controller is routed through a junction box...". This makes it a requirement to use a junction box as allowed by 9.7.

Submitter Information Verification

Submitter Full Name: Vince Baclawski
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Submittal Date: Fri Jun 24 08:33:24 EDT 2016

Public Input No. 123-NFPA 20-2016 [New Section after 10.3.4.5.3]

TITLE OF NEW CONTENT

Type your content here ...

10.3.4.5.5 Neither a fire pump controller nor a fire pump power transfer switch, where provided, shall be used as a junction box for external surge suppression connections. (See 9.7).

Statement of Problem and Substantiation for Public Input

Presently paragraph 9.7 only requires this "Where fire pump wiring to or from a fire pump controller is routed through a junction box...". This makes it a requirement to use a junction box as allowed by 9.7.

Submitter Information Verification

Submitter Full Name: Vince Baclawski
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Submittal Date: Fri Jun 24 08:37:45 EDT 2016

Public Input No. 124-NFPA 20-2016 [New Section after 10.3.4.5.3]

TITLE OF NEW CONTENT

Type your content here ...

10.3.4.5.6 If a redundant fire pump not required by this standard is provided as a standby fire pump, a lockout may be provided between the standby and required fire pump controllers.

10.3.4.5.6.1 Where supplied, this lockout shall be indicated by a visible indicator and provisions for annunciating the condition at a remote location.

Statement of Problem and Substantiation for Public Input

This allows the use of a redundant, non-required, fire pump without having to upsizing the normal power source or emergency generator for this pump.

Submitter Information Verification

Submitter Full Name: Vince Baclawski
Organization: Nema
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City:
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Zip:
Submittal Date: Fri Jun 24 08:42:19 EDT 2016

Public Input No. 150-NFPA 20-2016 [Section No. 10.4.3.3.1 [Excluding any Sub-Sections]]

The circuit breaker shall have the following electrical characteristics:

(1) A continuous current rating not less than 115 percent of the rated full-load current of the motor

(2) Overcurrent-sensing elements of the nonthermal type

(3) Instantaneous short-circuit overcurrent protection

(4)* An adequate interrupting rating to provide the suitability rating of the controller discussed in 10.1.2.2

(5) Capability of allowing normal and emergency starting and running of the motor without tripping *(see 10.5.3.2)*

(6) An instantaneous trip setting of not more than ~~20~~ 25 times the full-load current

Additional Proposed Changes

File Name	Description	Approved
Problem_of_motor_protection_and_high_motor_inrush_currents_EE.pdf	article EEP -see end of page #3	

Statement of Problem and Substantiation for Public Input

there is more high efficiency electrical motor on the market and those electrical motors has a very high inrush trasnient current that sometimes exceed 20 times the FLA for the first hald cycle. it is then necessary to select a circuit breaker with a higher instanteneous trip setpoint.

Submitter Information Verification

Submitter Full Name: Daniel Gendebien
Organization: Tornatech
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Submittal Date: Mon Jun 27 07:32:01 EDT 2016

Public Input No. 51-NFPA 20-2016 [Section No. 10.4.3.3.1.2]

10.4.3.3.1.2 * _

The circuit breaker or contactor shall not trip when power is interrupted from a running pump, or if the pump is restarted in less than 3 seconds after being shut down. If a control circuit preventing a re-start within 3 seconds is provided, this requirement shall not apply.

Statement of Problem and Substantiation for Public Input

non-latched contactors for fire pumps pose problem of loss of drive during transient voltage dips or momentary loss of power supply, which is against the spirit of NFPA20. Proposed change tries to correct the situation.

Submitter Information Verification

Submitter Full Name: Raghunath Rompicherla
Organization: WorleyParsons Engineering (Oman) LLC
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Zip:
Submittal Date: Wed Jan 20 01:48:35 EST 2016

Public Input No. 137-NFPA 20-2016 [Section No. 10.4.5.1 [Excluding any Sub-Sections]]

~~The~~ Unless the requirements on 10.4.5.1.3 are met , the motor contactor shall be horsepower rated and shall be of the magnetic type with a contact in each ungrounded conductor.

Statement of Problem and Substantiation for Public Input

Listed variable speed pump units are designed to eliminate drive and motor failures caused by mismatched components which are found in non-integrated units. Looking at the reliability of current VSDs (Variable Speed Drives's) the failure rates are extremely low. VSD failure rates are significantly lower than Motor failure rates; therefore there is no longer a need for having VSD bypass. Hence there is no need to provide a load isolation for VSD.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 138-NFPA 20-2016 [New Section after 10.4.5.1.2]	

Submitter Information Verification

Submitter Full Name: Steven Baird
Organization: Armstrong Fluid Technology
Street Address:
City:
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Zip:
Submittal Date: Fri Jun 24 11:24:32 EDT 2016

Public Input No. 138-NFPA 20-2016 [New Section after 10.4.5.1.2]

Motor Contactor sizing wiht Self-Regulating Variable Speed Pump Unit

10.4.5.1.3 If a listed self-regulating variable speed pump unit is used then 10.4.5.1, 10.4.5.1.1 & 10.4.5.1.2 shall not apply. The running and starting contactors shall be sized for 125% of the variable speed drive current rating.

Statement of Problem and Substantiation for Public Input

Listed variable speed pump units are designed to eliminate drive and motor failures caused by mismatched components which are found in non-integrated units. Looking at the reliability of current VSDs (Variable Speed Drives's) the failure rates are extremely low. VSD failure rates are significantly lower than Motor failure rates; therefore there is no longer a need for having VSD bypass. Hence there is no need to provide a load isolation for VSD. Refer to attached article published from Armstrong for the details.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 134-NFPA 20-2016 [New Section after 3.3.68]	Motor contactor requirements to be used with the newly defined Self-Regulating Variable Speed Pump Unit.
Public Input No. 137-NFPA 20-2016 [Section No. 10.4.5.1 [Excluding any Sub-Sections]]	

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Submittal Date: Fri Jun 24 11:29:23 EDT 2016

Public Input No. 126-NFPA 20-2016 [New Section after 10.4.5.6]

TITLE OF NEW CONTENT

Type your content here ...

10.4.5.6.1 For controllers of 500 V or less, the operating coil(s) for any motor contactor(s) and any bypass contactor(s), if provided, shall be supplied directly from the main power voltage and not through a transformer.

10.4.5.6.2 For controllers rated above 500 V but not more than 600V a transformer may be permitted to supply the operating coils referred to in 10.4.5.6.1.

Statement of Problem and Substantiation for Public Input

Contactor operating coils rated above 500 V (550 or 575V for example) are less and less available in the market place due to the movement in the industry to wide-range electronic contactor coils which are limited to 500V. This proposal would give the controller manufacturer the option to use a 575V control transformer in a 575V controller to reduce the voltage of the operating coil(s) to 480V or less.

Submitter Information Verification

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Public Input No. 127-NFPA 20-2016 [Section No. 10.4.5.6]

10.4.5.6 Operating Coils.

~~For controllers of 600 V or less, the operating coil(s) for any motor contactor(s) and any bypass contactor(s), if provided, shall be supplied directly from the main power voltage and not through a transformer.~~

Statement of Problem and Substantiation for Public Input

Contactor operating coils rated above 500 V (550 or 575V for example) are less and less available in the market place due to the movement in the industry to wide-range electronic contactor coils which are limited to 500V. This proposal would give the controller manufacturer the option to use a 575V control transformer in a 575V controller to reduce the voltage of the operating coil(s) to 480V or less. See new text for 10.4.5.6.1 and 10.4.5.6.2.

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Public Input No. 131-NFPA 20-2016 [New Section after 10.4.7]

10.4.7.2.5 Controller trouble

10.4.7.2.5.1

This fire pump alarm shall actuacte whenever a ground fault alarm (10.4.5.9), a pressure sensing device alarm (10.5.2.1.3.1 - 10.5.2.1.3.2), a fail to start alarm (10.5.2.7.5), a lock rotor overcurrent protection (10.6.9.1) occurs.

Statement of Problem and Substantiation for Public Input

in chapter 10, several alarms are required to be on the controller and are not part of any remote alarm signal.
It is important to report as a minimum of one commun alarm at remote location.
The most important alarm to be remotely reported is the electronic pressure device (10.5.2.1.3) because immediate intervention is required on the controller.

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Public Input No. 132-NFPA 20-2016 [Section No. 10.4.7]

10.4.7* Fire Pump Alarm and Signal Devices Remote from Controller.

10.4.7.1

Where the pump room is not constantly attended, audible or visible signals powered by a separate reliable supervised source not exceeding 125 V shall be provided at a point of constant attendance.

10.4.7.2

These fire pump alarms and signals shall indicate the information in 10.4.7.2.1 through 10.4.7.2.4.

10.4.7.2.1 Pump or Motor Running.

The signal shall actuate whenever the controller has operated into a motor-running condition.

10.4.7.2. ~~1.1~~

~~This signal circuit shall be energized by a separate reliable supervised power source or from the pump motor power, reduced to not more than 125 V.~~

~~10.4.7.~~ 2 ~~.2~~ Loss of Phase.

10.4.7.2.2.1

The fire pump alarm shall actuate whenever any phase at the line terminals of the motor contactor is lost.

10.4.7.2.2.2

All phases shall be monitored. Such monitoring shall detect loss of phase whether the motor is running or at rest.

10.4.7.2.2.3

When power is supplied from multiple power sources, monitoring of each power source for phase loss shall be permitted at any point electrically upstream of the line terminals of the contactor, provided all sources are monitored.

10.4.7.2.3 Phase Reversal.

~~This fire pump alarm circuit shall be energized by a separate reliable supervised power source or from the pump motor power, reduced to not more than 125 V. (See~~ 10.4. ~~6.2.)~~

~~10.4.~~

7.2.3.1

The fire pump alarm shall actuate whenever the three-phase power at the line terminals of the motor contactor is reversed.

10.4.7.2.4 Controller Connected to Alternate Source.

10.4.7.2.4.1

Where two sources of power are supplied to meet the requirements of 9.3.2, this signal shall indicate whenever the alternate source is the source supplying power to the controller.

~~10.4.7.2.4.2~~

~~This signal circuit shall be energized by a separate, reliable, supervised power source, reduced to not more than 125 V.~~

Statement of Problem and Substantiation for Public Input

I think 10.4.7.1 is the general and should not be repeated in other subclauses

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Submittal Date: Fri Jun 24 10:19:51 EDT 2016

Public Input No. 125-NFPA 20-2016 [Section No. 10.5.2.1]

10.5.2.1* Water Pressure Control.

10.5.2.1.1 Pressure ~~-Actuated Switches~~ sensing device .

10.5.2.1.1.1

~~A pressure-actuated switch or~~ a pressure sensing device, either a pressure actuatec switch of electronic pressure sensor~~- having~~ , having adjustable high- and low-calibrated set-points shall be provided as part of the controller.

10.5.2.1.1.2

For multistage multiport pumps, a dedicated pressure ~~-actuated switch or electronic pressure sensor~~ sensing device as described in 10.5.2.1.1.1 shall be provided for each discharge port of the pump as part of the controller.

10.5.2.1.1.3

For multistage multiport pumps, a dedicated pressure recorder as described in 10.5.2.1.8.2 shall be provided for each discharge port of the pump as part of the controller.

10.5.2.1.1.4

The requirements of 10.5.2.1.1.1 and 10.5.2.1.1.2 shall not apply in a non-pressure-actuated controller, where the pressure ~~-actuated switch~~ sensing device shall not be required.

10.5.2.1.2

There shall be no pressure snubber or restrictive orifice employed within the ~~pressure switch or pressure responsive means~~ sensing device .

10.5.2.1.3*

Where an electronic pressure sensor is used to automatically control fire pump operation, the fire pump controller shall monitor ~~the transducer~~ this electronic pressure sensor during automatic testing.

10.5.2.1.3.1*

Where the ~~transducer~~ electronic pressure sensor reading exceeds 10 psi (0.68 bar) during any automatic pump start that was initiated by the solenoid drain valve, as required by 10.5.2.1.8.3, the controller shall activate a visual and audible alarm, that can be silenced.

10.5.2.1.3.2*

Where an electronic pressure sensor is used to control fire pump operation, the fire pump controller shall monitor for and provide a signal for the following electronic pressure sensor conditions:

(1) Any time the ~~transducer~~ electronic pressure sensor output is less than 10 percent of rated span or below its rated zero pressure output

(2) Any time the electronic pressure ~~transducer reading~~ sensor reading is more than 10 percent above its rated full-scale output

10.5.2.1.4

There shall be no valve or other restrictions within the controller ahead of the pressure ~~switch or pressure responsive means~~ sensing device .

10.5.2.1.5

This ~~switch~~ pressure sensing device shall be responsive to water pressure in the fire protection system.

10.5.2.1.6

The pressure sensing ~~element of the switch~~ device shall be capable of withstanding a momentary surge pressure of 400 psi (27.6 bar) or 133 percent of fire pump controller rated operating pressure, whichever is higher, without losing its accuracy.

10.5.2.1.7

Suitable provision shall be made for relieving pressure to the ~~pressure-actuated switch~~ preessure sensing device to allow testing of the operation of the controller and the pumping unit. *[See Figure A.4.31(a) and Figure A.4.31(b).]*

10.5.2.1.8

Water pressure control shall be in accordance with 10.5.2.1.8.1 through 10.5.2.1.8.6.

10.5.2.1.8.1

Pressure ~~switch actuation~~ sensing element of the pressure sensing device at the low adjustment setting shall initiate pump starting sequence (if pump is not already in operation).

10.5.2.1.8.2*

A pressure recording device shall record the pressure in each fire pump controller pressure-sensing line at the input to the controller.

10.5.2.1.8.3

The pressure recorder shall be listed as part of the controller or shall be a separately listed unit installed to sense the pressure at the input of the controller.

10.5.2.1.8.4

The recorder shall be capable of operating for at least 7 days without being reset or rewound.

10.5.2.1.8.5

The pressure sensing element of the recorder shall be capable of withstanding a momentary surge pressure of at least 400 psi (27.6 bar) or 133 percent of fire pump controller rated operating pressure, whichever is greater, without losing its accuracy.

10.5.2.1.8.6

For variable speed pressure limiting control, a ½ in. (12.7 mm) nominal size inside diameter pressure line shall be connected to the discharge piping at a point recommended by the variable speed control manufacturer. The connection shall be between the discharge check valve and the discharge control valve.

10.5.2.1.8.7

Access to the recorder data shall not require opening the controller, nor require taking the controller out of service.

Statement of Problem and Substantiation for Public Input

this chapter is not constant with the vocabulary.
this chapter uses the following terms for the same equipment : presure actuated switches, electronic pressure sensor, pressure switch, pressure responsive means, pressure sensor, pressure transducer.

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Public Input No. 133-NFPA 20-2016 [Section No. 10.5.2.1]

10.5.2.1* Water Pressure Control.

10.5.2.1.1 Pressure-Actuated Switches.

10.5.2.1.1.1

~~A~~ there shall be provided as part of the controller two pressure-actuated ~~switch~~ switches or ~~electronic~~ two pressure ~~sensor~~ sensing devices having adjustable high ~~–~~ and low ~~-~~ calibrated set ~~-~~ points ~~shall be provided as part of the controller~~ .

10.5.2.1.1.2

For multistage multiport pumps, a dedicated pressure-actuated switch or electronic pressure sensor as described in 10.5.2.1.1.1 shall be provided for each discharge port of the pump as part of the controller.

10.5.2.1.1.3

For multistage multiport pumps, a dedicated pressure recorder as described in 10.5.2.1.8.2 shall be provided for each discharge port of the pump as part of the controller.

10.5.2.1.1.4

The requirements of 10.5.2.1.1.1 and 10.5.2.1.1.2 shall not apply in a non-pressure-actuated controller, where the pressure-actuated switch shall not be required.

10.5.2.1.2

There shall be no pressure snubber or restrictive orifice employed within the pressure switch or pressure responsive means.

10.5.2.1.

3 * —

Where an electronic pressure sensor is used to automatically control fire pump operation, the fire pump controller shall monitor the transducer during automatic testing.

3 _ pressure actuation

10.5.2.1.3.1

* —

Where the transducer pressure reading exceeds 10 psi (0.68 bar) during any automatic pump start that was initiated by the solenoid drain valve, as required by

If two pressure-actuated switches are used, they shall be electrically connected in such a way that either switch will start the pump

10.5.2.1.

8.3, the controller shall activate a visual and audible alarm, that can be silenced.

3.2

If two electronic pressure devices are used, any pressure reading below set points will start the pump

10.5.2.1.3.

2 * —

Where an

3

If two _ electronic pressure

sensor is used to control fire pump operation, the fire pump controller shall monitor for and provide a signal for the following electronic pressure sensor conditions:

- Any time the transducer output is less than 10 percent of rated span or below its rated zero pressure output

Any time the pressure transducer reading is more than 10 percent above its rated full-scale output

devices are used, any pressure deviance between electronic pressure devices more than 10 psi triggers a visual and audible alarm on the controller.

10.5.2.1.4

There shall be no valve or other restrictions within the controller ahead of the pressure switch or pressure responsive means.

10.5.2.1.5

This switch shall be responsive to water pressure in the fire protection system.

10.5.2.1.6

The pressure sensing element of the switch shall be capable of withstanding a momentary surge pressure of 400 psi (27.6 bar) or 133 percent of fire pump controller rated operating pressure, whichever is higher, without losing its accuracy.

10.5.2.1.7

Suitable provision shall be made for relieving pressure to the pressure-actuated switch to allow testing of the operation of the controller and the pumping unit. *[See Figure A.4.31(a) and Figure A.4.31(b).]*

10.5.2.1.8

Water pressure control shall be in accordance with 10.5.2.1.8.1 through 10.5.2.1.8.6.

10.5.2.1.8.1

Pressure switch actuation at the low adjustment setting shall initiate pump starting sequence (if pump is not already in operation).

10.5.2.1.8.2*

A pressure recording device shall record the pressure in each fire pump controller pressure-sensing line at the input to the controller.

10.5.2.1.8.3

The pressure recorder shall be listed as part of the controller or shall be a separately listed unit installed to sense the pressure at the input of the controller.

10.5.2.1.8.4

The recorder shall be capable of operating for at least 7 days without being reset or rewound.

10.5.2.1.8.5

The pressure sensing element of the recorder shall be capable of withstanding a momentary surge pressure of at least 400 psi (27.6 bar) or 133 percent of fire pump controller rated operating pressure, whichever is greater, without losing its accuracy.

10.5.2.1.8.6

For variable speed pressure limiting control, a ½ in. (12.7 mm) nominal size inside diameter pressure line shall be connected to the discharge piping at a point recommended by the variable speed control manufacturer. The connection shall be between the discharge check valve and the discharge control valve.

10.5.2.1.8.7

Access to the recorder data shall not require opening the controller, nor require taking the controller out of service.

Additional Proposed Changes

File Name	Description	Approved
12156.pdf	offical recall of pressure trasnducers	
advisory-dfs-dps-fire-pump-recall.pdf	offical recall	

Statement of Problem and Substantiation for Public Input

This proposal was already requested in previous version (ref 20-114 log 64). the statement for rejection was 'transducers are not inherently unreliable'.
As per formal recall of 25.000 transducers on the market, it is now an evidence that any transducers may failed.
The actual 10.5.2.1.3 is not enough efficient because it monitors the transducer only during automatic test - why not monitoring this drift all the time.
A drift to the higher value is giving a false pressure indication to the system that could not see a real pressure drop in case of transducer failure.

This industry needs a more reliable solution. Two transducers that are monitored for any drifting is much more reliable (and already exists in HVAC system).
With one pressure transducer, even well monitored, the controller is out of order until the transducer is replaced. The fire protection cannot be left out of order until replacing a part - it could take days maybe weeks before intervention!

With two transducers the time of intervention is less critical, as one transducer is a back up.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 162-NFPA 20-2016 [Section No. 12.7.2]	

Submitter Information Verification

Submitter Full Name: Daniel Gendebien
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Submittal Date: Fri Jun 24 11:05:07 EDT 2016

The Commonwealth of Massachusetts
Executive Office of Public Safety and Security
Department of Fire Services
Department of Public Safety
www.mass.gov

DEVAL L. PATRICK
GOVERNOR

TIMOTHY P. MURRAY
LT. GOVERNOR

MARY ELIZABETH HEFFERNAN
SECRETARY

ADVISORY

TO: Heads of Fire Department; All Municipal Building Departments; State Building Inspectors

FROM: Stephen D. Coan
State Fire Marshal

Thomas G. Gatzunis, P.E., C.B.O.
Commissioner, Department of Public Safety

DATE: May 7, 2012

RE: Fire Pump Sensor Recall Information

This memorandum is issued to advise of a recall that affects the operation of fire pumps. The recall is specific to a pressure sensor, which is used to automatically start the pump in the event of sprinkler operation.

The U. S. Consumer Product Safety Commission (CPSC) issued the following information on 24 April, 2012:

WASHINGTON, D.C. - The U.S. Consumer Product Safety Commission, in cooperation with the firm named below, today announced a voluntary recall of the following consumer product. Consumers should stop using recalled products immediately unless otherwise instructed. It is illegal to resell or attempt to resell a recalled consumer product.

Name of Product: Gems 3100 Pressure Detectors/Transducers

Units: About 25,000

Importer: Gems Sensors Inc., of Plainville, Conn.

Hazard: The transducer can fail to accurately detect water pressure in a fire suppression sprinkler system. This could cause the sprinkler system to fail to activate and pump water to the sprinklers in the event of a fire.

Incidents/Injuries: None.

Description: The Gems 3100 Pressure Transducer is used to detect pressure in a range of applications, including the detection of water pressure as part of a fire pump controller in a fire suppression sprinkler system. The transducer has "Gems Sensors & Controls," as well as the 18- digit part number, printed on a label affixed to the center of the transducer. Part numbers beginning with "3100" are included in this recall.

Sold by: Gems sold the recalled 3100 Pressure Transducers directly to end-users and through distributors from January 2006 through February 2012 for about $250.

Manufactured in: England

Remedy: Contact Gems to receive enhanced twice monthly inspection instructions and information about a free replacement transducer, when warranted. End-users who use the 3100 Pressure Transducer in other applications in which water pressure is measured should contact Gems to determine if their units are affected.

Consumer Contact: For additional information, call the company toll-free at (855) 877-9666, between 8 a.m. and 4:30 p.m. ET, Monday through Friday, or visit the firm's website at http://www.gemssensors.com

This information should be shared with any facilities that have fire pumps in your jurisdiction. The owners should contact their fire pump maintenance companies to review their fire pumps. If these are found they should be immediately replaced and the fire pump considered to be out of service until the repair is completed.

If Fire Departments have any questions please contact the Code Compliance and Enforcement Unit or the Technical Service Unit at 978-567-3375 or in Western MA 413-587-3181. For Building Officials, please contact your District State Building Inspector or Building Code technical staff at the Department of Public Safety 617-727-3200.

NEWS from CPSC

U.S. Consumer Product Safety Commission

Office of Communications | Washington, D.C.

FOR IMMEDIATE RELEASE
April 24, 2012
Release #12-156

Firm's Recall Hotline: (855) 877-9666
CPSC Recall Hotline: (800) 638-2772
CPSC Media Contact: (301) 504-7908

Gems Sensors Recalls Pressure Transducers Used in Fire Pump Controllers Due to Risk of Failure in a Fire

WASHINGTON, D.C. - The U.S. Consumer Product Safety Commission, in cooperation with the firm named below, today announced a voluntary recall of the following consumer product. Consumers should stop using recalled products immediately unless otherwise instructed. It is illegal to resell or attempt to resell a recalled consumer product.

Name of Product: Gems 3100 Pressure Detectors/Transducers

Units: About 25,000

Importer: Gems Sensors Inc., of Plainville, Conn.

Hazard: The transducer can fail to accurately detect water pressure in a fire suppression sprinkler system. This could cause the sprinkler system to fail to activate and pump water to the sprinklers in the event of a fire.

Incidents/Injuries: None.

Description: The Gems 3100 Pressure Transducer is used to detect pressure in a range of applications, including the detection of water pressure as part of a fire pump controller in a fire suppression sprinkler system. The transducer has "Gems Sensors & Controls," as well as the 18- digit part number, printed on a label affixed to the center of the transducer. Part numbers beginning with "3100" are included in this recall.

Sold by: Gems sold the recalled 3100 Pressure Transducers directly to end-users and through distributors from January 2006 through February 2012 for about $250.

Manufactured in: England

Remedy: Contact Gems to receive enhanced twice monthly inspection instructions and information about a free replacement transducer, when warranted. End-users who use the 3100 Pressure Transducer in other applications in which water pressure is measured should contact Gems to determine if their units are affected.

Consumer Contact: For additional information, call the company toll-free at (855) 877-9666, between 8 a.m. and 4:30 p.m. ET, Monday through Friday, or visit the firm's website at http://www.gemssensors.com

Gems 3100 Pressure Transducer

The U.S. Consumer Product Safety Commission (CPSC) is still interested in receiving incident or injury reports that are either directly related to this product recall or involve a different hazard with the same product. Please tell us about your experience with the product on SaferProducts.gov

CPSC is charged with protecting the public from unreasonable risks of injury or death associated with the use of the thousands of consumer products under the agency's jurisdiction. Deaths, injuries, and property damage from consumer product incidents cost the nation more than $900 billion annually. CPSC is committed to protecting consumers and families from products that pose a fire, electrical, chemical, or mechanical hazard. CPSC's work to ensure the safety of consumer products - such as toys, cribs, power tools, cigarette lighters, and household chemicals - contributed to a decline in the rate of deaths and injuries associated with consumer products over the past 30 years.

Under federal law, it is illegal to attempt to sell or resell this or any other recalled product.

To report a dangerous product or a product-related injury, go online to: SaferProducts.gov, call CPSC's Hotline at (800) 638-2772 or teletypewriter at (301) 595-7054 for the hearing and speech impaired. Consumers can obtain this news release and product safety information at www.cpsc.gov. To join a free e-mail subscription list, please go to www.cpsc.gov/cpsclist.aspx.

Public Input No. 108-NFPA 20-2016 [Section No. 10.5.2.1.1]

10.5.2.1.1 Pressure-Actuated Switches.

10.5.2.1.1.1

A pressure-actuated switch or electronic pressure sensor having adjustable high- and low-calibrated set-points shall be provided ~~as part of~~ and listed for use with the controller.

10.5.2.1.1.2

For multistage multiport pumps, a dedicated pressure-actuated switch or electronic pressure sensor as described in 10.5.2.1.1.1 shall be provided for each discharge port of the pump ~~as part of~~ and listed for use with the controller.

10.5.2.1.1.3

For multistage multiport pumps, a dedicated pressure recorder as described in 10.5.2.1.8.2 shall be provided for each discharge port of the pump ~~as part of~~ and listed for use with the controller.

10.5.2.1.1.4

The requirements of 10.5.2.1.1.1 and 10.5.2.1.1.2 shall not apply in a non-pressure-actuated controller, where the pressure-actuated switch shall not be required.

[NEW 10.5.2.1.1.5]

Pressure-actuated switches and electric pressure sensors shall be arranged as follows:

(1) For indoor fire pump units, located within the pump room or pump house.

(2) For outdoor fire pump units, located at least 50 ft. (15.3 m) away from any building and other fire exposures exposing the building.

(3) Located outside of any controller.

(4) Wired to the controller as recommended by the controller manufacturer

Statement of Problem and Substantiation for Public Input

The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

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Submittal Date: Thu Jun 23 19:11:46 EDT 2016

Public Input No. 109-NFPA 20-2016 [Section No. 10.5.2.1.4]

10.5.2.1.4

~~There~~ Unless permitted in section 4.30, there shall be no ~~valve~~ valves or other restrictions ~~within the controller~~ ahead of the pressure switch or pressure responsive means.

Statement of Problem and Substantiation for Public Input

This PI is submitted in support of PI-108. The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

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Public Input No. 110-NFPA 20-2016 [Section No. 10.5.2.1.6]

10.5.2.1.6

The pressure sensing element of the switch shall be capable of withstanding a momentary surge pressure of 400 psi (27.6 bar) or 133 percent of ~~fire pump controller~~ the switch rated operating pressure, whichever is higher, without losing its accuracy.

Statement of Problem and Substantiation for Public Input

This PI is submitted in support of PI-108. The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

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Public Input No. 111-NFPA 20-2016 [Section No. 10.5.2.1.8]

10.5.2.1.8

Water pressure control shall be in accordance with 10.5.2.1.8.1 through 10.5.2.1.8.6.

10.5.2.1.8.1

Pressure switch actuation at the low adjustment setting shall initiate pump starting sequence (if pump is not already in operation).

10.5.2.1.8.2*

A pressure recording device shall record the pressure in each fire pump ~~controller~~ pressure-sensing line ~~at the input to the controller~~.

10.5.2.1.8.3

The pressure recorder shall be listed as part of the controller or shall be a separately listed unit ~~installed to sense the pressure at the input of the controller~~.

10.5.2.1.8.4

The recorder shall be capable of operating for at least 7 days without being reset or rewound.

10.5.2.1.8.5

The pressure sensing element of the recorder shall be capable of withstanding a momentary surge pressure of at least 400 psi (27.6 bar) or 133 percent of ~~fire pump controller~~ recorder rated operating pressure, whichever is greater, without losing its accuracy.

10.5.2.1.8.6

For variable speed pressure limiting control, a ½ in. (12.7 mm) nominal size inside diameter pressure line shall be connected to the discharge piping at a point recommended by the variable speed control manufacturer. The connection shall be between the discharge check valve and the discharge control valve.

10.5.2.1.8.7

Access to the recorder data shall not require opening the controller, nor require taking the controller out of service.

Statement of Problem and Substantiation for Public Input

This PI is submitted in support of PI-108. The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

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Public Input No. 179-NFPA 20-2016 [Section No. 10.5.2.4]

10.5.2.4 Manual Electric Control at Remote Station.

Where additional control stations for causing nonautomatic continuous operation of the pumping unit, independent of the pressure-actuated switch, are provided at locations remote from the controller, such stations shall not be operable to stop the motor.

Exception: In industrial establishments where maintenance and supervision ensure that only qualified persons service the installation, a remote station shall be allowed to include a remote stop as long as the remote station is installed within sight of the fire pump controller.

Statement of Problem and Substantiation for Public Input

Fire pump controllers have very high arc fault energies and as such, workers who perform the required monthly and yearly testing are required to wear overly restrictive PPE, and in some cases PPE isn't available to protect the individuals should an arcing fault occur while testing the equipment. Starting and stopping this equipment exercises the contactor and that is the most likely time a failure would occur. Our sites have been installing remote start/stop push button stations with approval of the local AHJ to address this hazard but it should not be left up to each AHJ to decide whether such installations should be acceptable. A remote stop within sight of the controller is a perfectly acceptable solution. Article 695 of the NEC° could even go further and require such devices and their wiring be installed in rigid metal conduit, or underground, etc. as needed. Such an installation, if properly done, does not reduce the reliability of the overall fire pump controller.

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Public Input No. 145-NFPA 20-2016 [Section No. 10.5.2.7.3]

10.5.2.7.3

A ~~solenoid~~ electrically operated valve drain on the pressure control line shall be the initiating means.

Statement of Problem and Substantiation for Public Input

to be more generic. Also solenoid valve having a high pressure diferential (system pressure / atmospheric pressure) requires high power and closing is not reliable.

Submitter Information Verification

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Submittal Date: Mon Jun 27 04:00:31 EDT 2016

Public Input No. 42-NFPA 20-2016 [Section No. 10.5.3.2.1 [Excluding any Sub-Sections]]

~~The~~ Whenever the power source is adequate to start the fire pump, the controller shall be equipped with an emergency-run handle or lever that operates to mechanically close the motor-circuit switching mechanism.

Statement of Problem and Substantiation for Public Input

Bypassing the reducing voltage starting feature on controllers could result in damaging the motor, possibly resulting in a fire.

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Public Input No. 146-NFPA 20-2016 [Section No. 10.5.3.3]

10.5.3.3 Manual Testing of Automatic Operation.

10.5.3.3.1

The controller shall be arranged to manually ~~start the motor by opening the solenoid valve drain when so initiated by the operator.~~ initate a automatic testing as described in 10.5.

~~3.3.~~

2

~~For a non-pressure-actuated controller, the manual test shall be permitted to be initiated by a means other than a solenoid valve.~~ .7

Statement of Problem and Substantiation for Public Input

easier to read, Otherwise some sentences are missing in this clause - see 10.5.2.7.3, 10.2.7.5

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Submittal Date: Mon Jun 27 04:12:00 EDT 2016

Public Input No. 166-NFPA 20-2016 [Section No. 10.5.4]

10.5.4 Methods of Stopping.

Shutdown shall be accomplished by the methods in 10.5.4.1 and 10.5.4.2.

10.5.4.1 Manual.

Manual shutdown shall be accomplished by operation of a pushbutton ~~on the outside of the controller enclosure that, in the case of automatic controllers,~~ externally operated on the conrtroller.

10.5.4.1.1 After manual shutdown, automatic controller shall return the controller to the full automatic position.

10.5.4. 1. 2

~~Automatic Shutdown After Automatic Start~~

Activation of manual shutdown pushbutton shall stop the motor even starting or running causes are present.

10.5.4.2 _ Automatic .

Automatic shutdown shall not be permitted if starting and running causes are present.

10.5.4.2.1

Automatic shutdown shall be permitted only in the following circumstances:

(1) * During automatic testing in accordance with 10.5.2.7

(2) ~~Where~~ after an automatic start and where approved by the authority having jurisdiction

10.5.4.2.2

Where automatic shutdown after automatic start is permitted, a minimum run timer set for at least 10 minutes shall be used.

10.5.4.3 Remote

10.5.4.3.1 Shutdown from a remote location is not permitted except ;

(a) approved by the authority having juridiction

(b) where pumps are arranged in series (see 4.20.2.2.(1))

Additional Proposed Changes

File Name	Description	Approved
Page_84_de_OEPA-BFPman-rev12_16_14_v3.pdf	extract from web site file:///C:/a%20effacer/nfpa%2020/OEPA-BFPman-rev12_16_14_v3%20see%20page%2084.pdf	

Statement of Problem and Substantiation for Public Input

Manual - woridng similar as 10.4.2.2 f for better comprehension
THe stop push button should have the stopr priortiy.
Auotmatic- woring
Remote : On actual version - 10.5.2.4 does not allow remote stop, but 4.20.2.2 (1) requires remote stop. Also, some juridiction requires remote shutdow (for example low city pressure
also manu controller manufacturers have this feature in their product catalog

Submitter Information Verification

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Submittal Date:	Mon Jun 27 10:14:49 EDT 2016

this arrangement is applied, such that a tank is filled through an air gap and the booster pump takes suction from the tank. Direct connections of booster pumps to a service line or main should consider the hydraulic impacts on the distribution system in the effectedaffected area.

For a domestic use booster pump not intended to be used for fire suppression, and iif it is necessary and acceptable to directly connect the suction side of a booster pump to a service line receiving water from a public water system, a low suction pressure cut-off device must be installed to prevent the pump from reducing the service line pressure below 10 psig.

For a booster pump used in a fire protection suppression system, ,alsosystem, also referred to as a fire pump, if it is necessary to directly connect the suction side of a booster fire pump to a service line receiving water from a public water system, an approved method must be in place and operational such that a minimum suction pressure of at least 10 psig is maintained. either The methods acceptable under OAC Rule 3745-95-07 are: a low suction pressure cut-off device (only for installations prior to September 4August 8, 2008 which are not or will not be significantly modified); or, a minimum pressure sustaininglow suction throttling valve (newly installed or overhauled installations on or after September 4, 2008); or, a variable speed suction limiting control system must be installed to prevent the pump from reducing the service line pressure below 10 psig.

See Ohio Administrative Code Rule 3745-95-07 in Appendix I for detailed rule language. (See LAW W*riter*® Ohio Laws and Rules website at http://codes.ohio.gov/. to view this rule and other regulations in Ohio.)

Operation

1. The low suction pressure cut-off device is electrical and consists of a controller unit which is designed to shut down the booster pump driving motor or engine when the water supply pressure drops to 10 psig or less at the suction side of the pump. No automatic reset may be provided. Once shut down, the pump must be restarted manually.

2. An acceptable method of preventing the electrical cut-off device from shutting off the booster pump is by hydraulically controlling the volume of water discharged by the pump. This method includes the installation of a pilot-controlled/hydraulically-operated minimum pressure sustaining low suction throttling valve on the booster pump discharge which throttles, when necessary, the discharge of the pump so that the suction pressure will not be reduced below 10 psig while the pump is operating.

Public Input No. 147-NFPA 20-2016 [New Section after 10.6.3]

10.6.3.3 The requirements of 10.6.3.1 shall not apply where the requirement of 10.6.3.2 is met.

Statement of Problem and Substantiation for Public Input

precision

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Public Input No. 112-NFPA 20-2016 [Section No. 10.6.4]

[Note to Editor: Delete 10.6.4 ~~– Pressure-Actuated Switch Location.~~

~~Special precautions shall be taken in locating the pressure-actuated switch called for in 10.5.2.1 to prevent any water leakage from coming in contact with high-voltage components.~~

and renumber remaining paragraphs.]

Statement of Problem and Substantiation for Public Input

This PI is submitted in support of PI-108. The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

Submitter Information Verification

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Public Input No. 149-NFPA 20-2016 [Section No. 10.6.4]

10.6.4 ~~Pressure-Actuated Switch Location~~ Pressure sensing device Location .

Special precautions shall be taken in locating ~~the pressure-actuated switch~~ thepressure sensing device called for in 10.5.2.1 ~~to prevent~~ .1 to prevent any water leakage from coming in contact with high-voltage components.

Statement of Problem and Substantiation for Public Input

to be more generic

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Submittal Date: Mon Jun 27 04:29:21 EDT 2016

Public Input No. 107-NFPA 20-2016 [Section No. 10.8.2.2]

10.8.2.2 Arrangement II (Individually Listed Fire Pump Controller and Power Transfer Switch).

The following shall be provided:

(1) A fire pump controller power transfer switch complying with Sections 9.6 and 10.8 and a fire pump controller shall be provided. The overcurrent protection required by 10.8.2.2(2) and the isolating switch required by 10.8.2.2(3) shall be permitted to be provided in a separate enclosure upstream of the transfer switch.

(2) The transfer switch overcurrent protection for both the normal and alternate sources shall comply with 9.2.3.4 or 9.2.3.4.1.

(3) An instantaneous trip circuit breaker shall be permitted in lieu of the overcurrent devices specified in 10.8.2.2(2) provided it is part of a transfer switch assembly listed for fire pump service and complies with 9.2.3.4.1.

(4) An isolating switch ahead of the alternate source input terminals of the transfer switch shall meet the following requirements:

(a) The isolating switch shall be externally operable and lockable in both the closed and the open position.

(b) A placard shall be externally installed on the isolating switch stating “Fire Pump Isolating Switch,” with letters at least 1 in. (25 mm) in height.

(c) A placard shall be placed adjacent to the fire pump controller stating the location of the isolating switch and the location of the key (if the isolating switch is locked).

(d) The isolating switch shall be supervised by one of the following methods to indicate when it is not closed:

i. Central station, proprietary, or remote station signal service

ii. Local signaling service that will cause the sounding of an audible signal at a constantly attended point

iii. Locking the isolating switch closed

iv. Sealing of isolating switches and approved weekly recorded inspections where isolating switches are located within fenced enclosures or in buildings under the control of the owner

(e) This supervision shall operate an audible and visible signal on the transfer switch and permit monitoring at a remote point, where required.

(5) The isolation switch shall not have short circuit or overcurrent protection as part of the switching mechanism of the isolating switch.

(6) The transfer switch shall be the delayed transition type with a maximum delay time of 3 seconds.

Additional Proposed Changes

File Name	Description	Approved
TIA_20_16_1.pdf	NFPA TIA 16-1 Log No 1199	

Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 16-1 (Log 1199) issued by the Standards Council on April 6, 2016 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Substantiation:

This TIA seeks to address the following problem: Clause 10.8.2.2(3) conflicts with clause 10.8.2.2(2). This TIA will address and resolve this conflict. Clause 10.8.2.2(2) requires compliance with 9.2.3.4 or 9.2.3.4.1. Clauses 9.2.3.4 and 9.2.3.4.1 are two allowable methods of selecting overcurrent protection installed in the power supply to the fire pump controller as permitted by 9.2.3. Clause 10.8.2.2(3) prohibits using clause 9.2.3.4.1 when the alternate source is a second utility, in other words, it only permits the use of clause 9.2.3.4.1 if the alternate source is a generator. This was not the intent of the NFPA 20 Committee. Regardless of the type of alternate source, the option of using 9.3.2.4.1 should be allowed for the alternate source overcurrent protection. This conflict may have been created when the Committee added the requirement to the 2013 edition for the transfer switch to have the same overcurrent protection on both the normal and alternate sources (10.8.2.2(2)). When the Committee made this change they may have overlooked the need to revise or delete 10.8.2.2(3). Therefore, it is proposed to delete Clause 10.8.2.2(3) as it is obsolete and no longer necessary.
Emergency Nature:
The current text of 10.8.2.2 creates a conflict for designers, installers and owners of fire pump equipment which utilizes an alternate source of power. Attempts to use and apply the present requirements in 10.8.2.2 of NFPA 20 2013 have led to confusion, inconsistent application, and disruption in the marketplace. Further, AHJ's can point to 10.8.2.2(3) and reject a fully legitimate installation installed in accordance with 10.8.2.2(2). Clause 10.8.2.2(2) allows compliance with either 9.2.3.4 or 9.2.3.4.1 for both the normal and alternate sources regardless of whether the source is a utility or generator. Clause 10.8.2.2(3) requires the transfer switch overcurrent protection to be selected or set to indefinitely carry the locked rotor current of the fire pump motor when the alternate source is supplied by a second utility. Although not specified explicitly by this clause, the current wording of 10.8.2.2(3) restricts compliance to 9.2.3.4 only for the transfer switch overcurrent protection. Clause 9.2.3.4 specifies that the overcurrent protection be selected or set to indefinitely carry the locked rotor current of the fire pump motor. This is clearly in conflict with 10.8.2.2(2) which allows the sizing of the overcurrent protection to comply with either 9.2.3.4 or 9.2.3.4.1. The reference to 9.2.3.4 was not included in 10.8.2.2(3) because the text of 10.8.2.2(3) was in the standard before the option of allowing the transfer switch overcurrent protection to comply with either 9.2.3.4 or 9.2.3.4.1 was added. When 10.8.2.2(2) was added to allow the sizing of the overcurrent protection to comply with either 9.2.3.4 or 9.2.3.4.1, 10.8.2.2(3) was not correspondingly revised. Clauses 9.2.3.4, 9.2.3.4.1 and 10.8.2.2(2) were all revised/added for the 2013 Edition of NFPA 20 but not Clause 10.8.2.2(3).

There is a critical need to clarify the present text of 10.8.2.2 in the 2013 Edition of NFPA 20 and such clarification cannot wait until the next available revision cycle which would be for the 2019 Edition of NFPA 20. The process of publishing the 2016 edition of NFPA 20 is nearly complete and there is no opportunity to introduce changes to the text of 10.8.2.2 for the 2016 Edition.

Submitter Information Verification

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Submittal Date: Tue Jun 21 13:16:37 EDT 2016

Tentative Interim Amendment

NFPA® 20

Standard for the Installation of Stationary Pumps for Fire Protection

2016 Edition

Reference: 10.8.2.2
TIA 16-1
(SC 16-4-1 / TIA Log #1199)

Pursuant to Section 5 of the NFPA *Regulations Governing the Development of NFPA Standards*, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2016 edition. The TIA was processed by the Technical Committee on Fire Pumps, and was issued by the Standards Council on April 6, 2016, with an effective date of April 26, 2016.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a public input of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Update the reference in 10.8.2.2(1), delete 10.8.2.2(3) and renumber the remainder of this section accordingly:

10.8.2.2 Arrangement II (Individually Listed Fire Pump Controller and Power Transfer Switch). The following shall be provided:

(1) A fire pump controller power transfer switch complying with Sections 9.6 and 10.8 and a fire pump controller shall be provided. The overcurrent protection required by 10.8.2.2(2) and the isolating switch required by 10.8.2.2(3) shall be permitted to be provided in a separate enclosure upstream of the transfer switch.
(2) The transfer switch overcurrent protection for both the normal and alternate sources shall comply with 9.2.3.4 or 9.2.3.4.1.
(3) An instantaneous trip circuit breaker shall be permitted in lieu of the overcurrent devices specified in 10.8.2.2(2) provided it is part of a transfer switch assembly listed for fire pump service and complies with 9.2.3.4.1.
(4) …
(5) …
(6) …

Issue Date: April 6, 2016

Effective Date: April 26, 2016

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist**)**

Public Input No. 128-NFPA 20-2016 [Section No. 10.8.3.4]

10.8.3.4 Horsepower or Ampere Rating.

~~10.8.3.4.1~~ ~~–~~

~~Where rated in horsepower, the~~

~~–~~

The power transfer switch shall have ~~a horsepower rating at least equal to the motor horsepower.~~

~~10.8.3.4.2 –~~

~~Where rated in amperes, the power transfer switch shall have~~ an ampere rating not less than 115 percent of the motor full-load current and also be suitable for switching the motor locked rotor current.

Statement of Problem and Substantiation for Public Input

UL and FM have determined that transfer switches are only rated in amps and that a horsepower rating does not apply.

Submitter Information Verification

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Submittal Date: Fri Jun 24 08:59:07 EDT 2016

Public Input No. 129-NFPA 20-2016 [Sections 10.8.3.10.2, 10.8.3.10.3]

Sections 10.8.3.10.2, 10.8.3.10.3

10.8.3.10.2

The use of an intentional delay via an open neutral position of the transfer switch to comply with the requirements of 10.8.3.10 shall be ~~prohibited for Arrangement I~~ permitted .

~~10.8.3.10.3~~ –

~~The use of an intentional delay via an open neutral position of the transfer switch to comply with the requirements of 10.8.3.10 shall be permitted for Arrangement II.~~

-

Statement of Problem and Substantiation for Public Input

These transfer switches are presently UL listed for emergency applications and have been listed for decades. If this arrangement is suitable for arrangement II, so it should also be suitable for arrangement I.

Submitter Information Verification

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Submittal Date: Fri Jun 24 09:03:49 EDT 2016

Public Input No. 140-NFPA 20-2016 [Section No. 10.10.3]

10.10.3* Bypass Operation. Unless the requirements of 10.10.3.6 are met then variable speed pressure limiting control shall meet the following:

10.10.3.1*

Upon failure of the variable speed pressure limiting control to keep the system pressure at or above the set pressure of the variable speed pressure limiting control system, the controller shall bypass and isolate the variable speed pressure limiting control system and operate the pump at rated speed.

10.10.3.1.1 Low Pressure.

If the system pressure remains below the set pressure for more than 15 seconds, the bypass operation shall occur.

10.10.3.1.2* Drive Not Operational.

If the variable speed drive indicates that it is not operational within 5 seconds, the bypass operation shall occur.

10.10.3.1.3*

Means shall be provided to prevent higher than normal in-rush currents when transferring the fire pump motor from the variable speed mode to the bypass mode.

10.10.3.2

When the variable speed pressure limiting control is bypassed, the unit shall remain bypassed until manually restored.

10.10.3.3

The bypass contactors shall be operable using the emergency-run handle or lever defined in 10.5.3.2.

10.10.3.4 Automatic Shutdown.

When the variable speed pressure limiting control is bypassed, automatic shutdown of the controller shall be as permitted by 10.5.4.2.

10.10.3.5

When the manual selection means required in 10.10.7.3 is used to initiate a switchover from variable speed to bypass mode, if the pump is running in the variable speed mode and none of the conditions in 10.10.3 that require the controller to initiate the bypass operation exist, the controller shall be arranged to provide a restart delay to allow the motor to be de-energized before it is re-energized in the bypass mode.

Statement of Problem and Substantiation for Public Input

Listed self-regulating variable speed pump units are designed to eliminate drive and motor failures caused by mismatched components which are found in non-integrated units. Looking at the reliability of current VSDs the failure rates are extremely low. VSD failure rates are significantly lower than Motor failure rates; therefore there is no longer a need for having VSD bypass. Hence there is no need to provide a load isolation for VSD.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 139-NFPA 20-2016 [New Section after 10.10.3.5]	Modifies section 10.10.3 to account for proposed new section 10.10.3.6

Submitter Information Verification

Submitter Full Name: Steven Baird

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Submittal Date:	Fri Jun 24 11:41:21 EDT 2016

Public Input No. 139-NFPA 20-2016 [New Section after 10.10.3.5]

BYPASS OPERATION with Self-Regulating Variable Speed Pump Unit

10.10.3.6 If a listed self-regulating variable speed pump unit is used a VSD bypass is not required. Then 10.10.3.1, 10.10.3.1.1, 10.10.3.1.2, 10.10.3.1.3, 10.10.3.2, 10.10.3.3, 10.10.3.4, 10.10.3.5 shall not apply.

Statement of Problem and Substantiation for Public Input

Listed self-regulating variable speed pump units are designed to eliminate drive and motor failures caused by mismatched components which are found in non-integrated units. Looking at the reliability of current VSDs the failure rates are extremely low. VSD failure rates are significantly lower than Motor failure rates; therefore there is no longer a need for having VSD bypass. Hence there is no need to provide a load isolation for VSD. Refer to attached article published from Armstrong for the details.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 134-NFPA 20-2016 [New Section after 3.3.68]	Bypass requirements for newly defined Self-Regulating Variable Speed Pump Unit.
Public Input No. 140-NFPA 20-2016 [Section No. 10.10.3]	

Submitter Information Verification

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Submittal Date: Fri Jun 24 11:37:23 EDT 2016

Public Input No. 142-NFPA 20-2016 [Section No. 10.10.4]

10.10.4 Isolation. Unless the requirements of 10.10.4.3 are met the following shall apply:

10.10.4.1

The variable speed drive shall be line and load isolated when not in operation.

10.10.4.2

The variable speed drive load isolation contactor and the bypass contactor shall be mechanically and electrically interlocked to prevent simultaneous closure.

Statement of Problem and Substantiation for Public Input

Listed variable speed pump units are designed to eliminate drive and motor failures caused by mismatched components which are found in non-integrated units. Looking at the reliability of current VSDs the failure rates are extremely low. VSD failure rates are significantly lower than Motor failure rates; therefore there is no longer a need for having VSD bypass. Hence there is no need to provide a load isolation for VSD.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 141-NFPA 20-2016 [New Section after 10.10.4.2]	

Submitter Information Verification

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Submittal Date: Fri Jun 24 11:47:58 EDT 2016

Public Input No. 141-NFPA 20-2016 [New Section after 10.10.4.2]

Load isolation contact requirements for Self-Regulating Variable Speed Pump Unit

10.10.4.3 If a listed self-regulating variable speed pump unit is used a VSD load isolation contact is not required, only line isolation is required. Then 10.10.4.1 and 10.10.4.2 shall not apply.

Statement of Problem and Substantiation for Public Input

Listed variable speed pump units are designed to eliminate drive and motor failures caused by mismatched components which are found in non-integrated units. Looking at the reliability of current VSDs the failure rates are extremely low. VSD failure rates are significantly lower than Motor failure rates; therefore there is no longer a need for having VSD bypass. Hence there is no need to provide a load isolation for VSD.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 134-NFPA 20-2016 [New Section after 3.3.68]	Load isolation contact requirements for newly defined Self-Regulating Variable Speed Pump Unit
Public Input No. 142-NFPA 20-2016 [Section No. 10.10.4]	

Submitter Information Verification

Submitter Full Name: Steven Baird
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Submittal Date: Fri Jun 24 11:44:45 EDT 2016

Public Input No. 143-NFPA 20-2016 [Section No. 10.10.6.1.1]

10.10.6.1.1

As a minimum, 5 percent line ~~reactance~~ reactance or equivalent DC link choke shall be provided.

Statement of Problem and Substantiation for Public Input

Most of the current VSDs have in-built Line reactor / DC Link choke. A DC link choke is a power quality correction device that's installed inside the variable speed drive.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 134-NFPA 20-2016 [New Section after 3.3.68]	Power quality requirement for newly defined Self-Regulating Variable Speed Pump Unit

Submitter Information Verification

Submitter Full Name: Steven Baird
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Zip:
Submittal Date: Fri Jun 24 11:49:45 EDT 2016

Public Input No. 192-NFPA 20-2016 [New Section after 11.2.4.1.2]

11.2.4.1.3

Mechanical fuel injection engines with a mechanical governor speed control device shall be allowed to employ an electric actuated speed control override system to achieve speed control of less than 10% provided the requirements of 11.2.4.1.1 are still met should any component of the electric actuator speed control system fail.

Statement of Problem and Substantiation for Public Input

There are several types of mechanical governors used on diesel engines. These various types of governors have constant speed control percentages that range from as good as 3% to those that have no constant speed control ability. It is sometimes a practice for gen sets to use an electric actuated speed control to override the mechanical governor to achieve the desired speed regulation. Any of the mechanical governors defined could be used with an electric actuated speed control system which would be the resulting speed regulation of the fire pump if the override system were to fail.

The proposed language is intended to not be restrictive and allow the use of an electric actuated speed control system to provide better speed regulation than required by this minimum standard. However it is the intent of this proposal to insure the speed regulation requirement of 11.2.4.1.1 is not jeopardized and the sprinkler system plumbing is not put at risk of over-pressure.

This standard has already set precedence of how speed control is to be insured when there is an overriding speed control system for an approved purpose. Paragraph 11.2.4.3.3 says; “In the event of a failure of the variable speed control system, the engine shall operate at pump-rated speed with the governor defined in 11.2.4.1.” This proposal applies the same requirement to this override system.

Submitter Information Verification

Submitter Full Name: John Whitney
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Submittal Date: Fri Jul 01 14:46:06 EDT 2016

Public Input No. 151-NFPA 20-2016 [Section No. 11.2.4.2.3.2]

11.2.4.2.3~~.2~~ 6 .2 1 Supervision.

A visual indicator shall be provided on the engine instrument panel, and a supervisory signal shall be provided to the controller when the ECM selector switch is positioned to the alternate ECM.

Statement of Problem and Substantiation for Public Input

I think this article should be located under 11.2.4.2.6 ECM engine supervision.
And this ECM engine supervison should have two paragraphs 11.2.6.2.6.1 / 11.2.6.2.6.2

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 152-NFPA 20-2016 [Section No. 11.2.4.2.6]	

Submitter Information Verification

Submitter Full Name: Daniel Gendebien
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Submittal Date: Mon Jun 27 07:52:11 EDT 2016

Public Input No. 152-NFPA 20-2016 [Section No. 11.2.4.2.6]

11.2.4.2.6 ECM Engine Supervision.

A common supervisory signal shall be provided to the controller as a minimum for the following events:

(1) Fuel injection trouble

(2) Low fuel pressure

(3) Any primary sensor failure

Statement of Problem and Substantiation for Public Input

group supervision under same paragraph

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 151-NFPA 20-2016 [Section No. 11.2.4.2.3.2]	

Submitter Information Verification

Submitter Full Name: Daniel Gendebien
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Submittal Date: Mon Jun 27 07:56:38 EDT 2016

Public Input No. 153-NFPA 20-2016 [Section No. 11.2.4.4.7.1]

11.2.4.4.7.1

Means shall be provided on the engine for testing the operation of the low engine temperature signal to the controller, resulting in visible and common audible alarm on the controller as required in 12.4.1. ~~3.~~ 4

Statement of Problem and Substantiation for Public Input

wrong reference

Submitter Information Verification

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Submittal Date: Mon Jun 27 08:02:35 EDT 2016

Public Input No. 201-NFPA 20-2016 [Section No. 11.2.7.2.1]

11.2.7.2.1 Batteries.

11.2.7.2.1.1

Each engine shall be provided with two storage battery units battery A and battery B .

11.2.7.2.1.2

Lead-acid batteries shall be furnished in a dry charge condition with electrolyte liquid in a separate container.

11.2.7.2.1.3

Nickel-cadmium or other kinds of batteries shall be permitted to be installed in lieu of lead-acid batteries, provided they meet the engine manufacturer's requirements and the charging voltage levels of the chargers in 12.5.3 are coordinated to meet the requirements of the specific batteries.

11.2.7.2.1.4 *

At 40°F (4°C), ~~each~~ battery unit A shall have ~~twice~~ the capacity sufficient to maintain the cranking speed recommended by the engine manufacturer ~~through a 3-minute attempt-to-start cycle,~~ which is ~~six~~ 6 consecutive cycles of 15 seconds of cranking and 15 seconds of rest.

11.2.7.2.1.5

*

~~Batteries~~ At 40°F (4°C), ~~each~~ battery unit **B** shall have the capacity sufficient to maintain the cranking speed recommended by the engine manufacturer which is 6 consecutive cycles of 15 seconds of cranking and 15 seconds of rest.

A.11.2.7.2.1.4 & 5 The combination of battery unit A and battery unit B provide sufficient capacity for a total of 12 consecutive cycles of 15 seconds of cranking and 15 seconds of rest. The controller will complete 6 of these cycles before stopping the attempt to start and sending the Failure To Start alarm. Battery units A and B are sized to have sufficient capacity to provide another full cranking cycle in an attempt to get the engine started after the operator has taken corrective action.

11.2.7.2.1.6 *

Battery unit A and battery B combined shall be sized, based on calculations, to have capacity to carry the loads defined in 11.2.7.2.3 for 72 hours of standby power followed by ~~three 15-second attempt-to-start cycles per battery unit as defined in~~ 11.2.7.2.1.4 6 consecutive cycles of 15-seconds of cranking and 15 seconds rest , without ac power being available for battery charging.

Statement of Problem and Substantiation for Public Input

There has always been confusion between the battery requirements of the chapter 11 and the 3 minute cranking cycle as defined in the chapter 12. Although attempts to clarity have made, but the addition of the 72 hour requirement provided more confusion. This is another attempt to clarify the remaining confusion.

Submitter Information Verification

Submitter Full Name: John Whitney
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Submittal Date: Tue Jul 05 10:30:13 EDT 2016

Public Input No. 178-NFPA 20-2016 [New Section after 11.2.7.2.1.5]

TITLE OF NEW CONTENT

11.2.7.2.1.6 Provisions shall be made on the engine for landing two remote sensing leads from each of the battery chargers for the purpose of accurately measuring the voltage across each of the battery terminals under all load conditions.

Statement of Problem and Substantiation for Public Input

Remote sensing from chargers would provide improved accuracy in measuring the voltage at the battery terminals. Remote sensing would permit voltage measurement independent of charging current. This is critical in the tight control of charging needed for new battery chemistries, especially maintenance free batteries. It would reduce boiling the battery and extend the life of the battery.

Submitter Information Verification

Submitter Full Name: Doug Stephens
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Submittal Date: Wed Jun 29 14:27:33 EDT 2016

Public Input No. 191-NFPA 20-2016 [Section No. 11.2.7.3]

11.2.7.3 Hydraulic Starting.

11.2.7.3.1

Where hydraulic starting is used, the accumulators and other accessories shall be enclosed or so protected that they are not subject to mechanical injury.

11.2.7.3.2

The ~~enclosure~~ enclosed hydraulic accumulator system shall be installed as close to the engine as practical so as to prevent serious pressure drop between the engine and the ~~enclosure~~ hydraulic accumulator system

(a) The piping between the engine and the hydraulic accumulator system shall be installed in accordance with the manufacturers maximum allowed pressure drop recommendations .

11.2.7.3.3

The diesel engine as installed shall be without starting aid except that as required in 11.2.8.2.

11.2.7.3.4

The diesel as installed shall be capable of carrying its full rated load within 20 seconds after cranking is initiated with the intake air, room ambient temperature, and all starting equipment at 32°F (0°C).

11.2.7.3.5

Hydraulic starting means shall comply with the following conditions:

(1) The hydraulic cranking ~~device~~ system shall be a self-contained system that will provide the required cranking forces and engine starting revolutions per minute (rpm) as recommended by the engine manufacturer.

(2) Electrically operated means shall automatically recharge and maintain the stored hydraulic pressure ~~within~~ to the predetermined pressure ~~limits.~~ requirements. (a) Air operated means to automatically recharge and maintain the stored hydraulic pressure shall be allowed as an alternative to electrically operated means.

(3) The means of automatically maintaining the hydraulic system within the predetermined pressure limits shall be energized from the main bus and the final emergency bus if one is provided.

(4) Engine driven means shall be provided to recharge the hydraulic system when the engine is running.

(5) Means shall be provided to manually recharge, bleed, and purge the hydraulic accumulator system.
~~The~~

(6) When the engine is equipped with multiple cranking systems (of different types), one system must be defined as a primary cranking system, and the other as a secondary cranking system.

(7) When used as the only or primary cranking system, the capacity of the hydraulic cranking system shall ~~provide~~ be capable of providing not fewer than ~~six~~ 12 cranking cycles of not less than 15 seconds each (capacity for 180 seconds of total crank time) .
~~Each cranking cycle — the first three~~

(8) (a) The total capacity shall be provided from 2 separate, equally sized accumulator systems. (b) The first 6 attempts are to be automatic from the signaling source, alternating between accumulator systems. (c) The second 6 attempts are to be manually activated from either engine or controller, with each button push initiating a complete 15 second crank attempt.

(9) When used as a secondary cranking system, the capacity of the hydraulic cranking system shall be capable of providing not fewer than 6 cranking cycles of not less than 15 seconds each (capacity for 90 seconds of total crank time). (a) No restrictions on how to achieve the total accumulator system capacity. (b) The first 3 attempts are to be automatic from the signaling source . (c) The second 3 attempts are to be manually activated from either engine or controller, with each button push initiating a complete 15 second crank attempt.

(10) Each cranking cycle — shall provide the necessary number of revolutions at the required rpm to permit the diesel engine to meet the requirements of carrying its full rated load within 20 seconds after cranking is initiated with intake air, room ambient temperature, and hydraulic cranking system at 32°F (0°C).

(11) ~~The capacity of the hydraulic cranking system sufficient for three starts under conditions described in 11.2.7.3.5 (6) shall be held in reserve and arranged so that the operation of a single control by one person will permit the reserve capacity to be employed.~~

(12) All controls for engine shutdown in the event of overspeed shall be 12 V dc or 24 V dc source to accommodate controls supplied on the engine, and the following also shall apply:

(13) In the event of such failure, the hydraulic cranking system shall provide an interlock to prevent the engine from recranking.

(14) The interlock shall be manually reset for automatic starting when engine failure is corrected.

Additional Proposed Changes

File Name	Description	Approved
16.06.28a_KTingle_Hydraulic_Starting_11.2.7.3.docx	See attachment for formatted sections.	

Statement of Problem and Substantiation for Public Input

Current NFPA 20 language does not distinguish hydraulic cranking systems use as primary vs. secondary

cranking systems. Oil companies want hydraulic cranking systems to serve as secondary (backup to the primary electric cranking system). There is currently no guidance for sizing and controlling a secondary system. This proposal provides guidance for use as primary or secondary system. If used as a primary (or only starter system), the proposal provides consistency to the electric cranking system (i.e. requiring capacity for a total of 12 cranking cycles).

Recommend a controller task force be established, in order to define necessary interface and function.

Submitter Information Verification

Submitter Full Name: Kyle Tingle
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City:
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Submittal Date: Fri Jul 01 12:42:22 EDT 2016

NFPA Public Input Form

NOTE: All Public Input must be received by 5:00 pm EST/EDST on the published Public Input Closing Date.

For further information on the standards-making process, please contact the Codes and Standards Administration at 617-984-7249 or visit www.nfpa.org/codes.

For technical assistance, please call NFPA at 1-800-344-3555

FOR OFFICE USE ONLY

Log #:

Date Rec'd:

Date 28 Jun 16 **Name** Kyle Tingle **Tel. No.** 513 630 3082

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Please indicate organization represented (if any)

1. (a) Title of NFPA Standard NFPA 20 **NFPA No. & Year** 2016

(b) Section/Paragraph 11.2.7.3 Hydraulic Starting

2. Public Input Recommends (check one): ☒ new text ☐ revised text ☐ deleted text

3. Proposed Text of Public Input (include proposed new or revised wording, or identification of wording to be deleted): [Note: Proposed text should be in legislative format; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

11.2.7.3 Hydraulic Starting.

11.2.7.3.2 The ~~enclosure~~ enclosed hydraulic accumulator system shall be installed as close to the engine as practical so as to prevent serious pressure drop between the engine and the hydraulic accumulator system ~~enclosure~~.

(a) The piping between the engine and the hydraulic accumulator system shall be installed in accordance with the manufacturers maximum allowed pressure drop recommendations.

11.2.7.3.5 Hydraulic starting means shall comply with the following conditions:

(1) The hydraulic cranking ~~device~~ system shall be a self-contained system that will provide the required cranking forces and engine starting revolutions per minute (rpm) as recommended by the engine manufacturer.

(2) Electrically operated means shall automatically recharge and maintain the stored hydraulic pressure ~~within~~ to the predetermined pressure ~~limits~~ requirements.

(a) Air operated means to automatically recharge and maintain the stored hydraulic pressure shall be allowed as an alternative to electrically operated means.

(5) Means shall be provided to manually recharge, bleed, and purge the hydraulic accumulator system.

(6) When the engine is equipped with multiple cranking systems (of different types), one system must be defined as a primary cranking system, and the other as a secondary cranking system.

~~(6)~~ (7) When used as the only or primary cranking system, the capacity of the hydraulic cranking system shall ~~provide~~ be capable of providing not fewer than ~~six~~ 12 cranking cycles of not less than 15 seconds each (capacity for 180 seconds of total crank time).

(a) The total capacity shall be provided from 2 separate, equally sized accumulator systems.

(b) The first 6 attempts are to be automatic from the signaling source, alternating between accumulator systems.

(c) The second 6 attempts are to be manually activated from either engine or controller, with each button push initiating a complete 15 second crank attempt.

(8) When used as a secondary cranking system, the capacity of the hydraulic cranking system shall be capable of providing not fewer than 6 cranking cycles of not less than 15 seconds each (capacity for 90 seconds of total crank time).

(a) No restrictions on how to achieve the total accumulator system capacity.

(b) The first 3 attempts are to be automatic from the signaling source.

(c) The second 3 attempts are to be manually activated from either engine or controller, with each button push initiating a complete 15 second crank attempt.

~~(7)~~ (9) Each cranking cycle ~~– the first three to be automatic from the signaling source –~~ shall provide the necessary number of revolutions at the required rpm to permit the diesel engine to meet the requirements of carrying its full rated load within 20 seconds after cranking is initiated with intake air, room ambient temperature, and hydraulic cranking system at 32°F (0°C).
~~(8)~~ (10) ~~The capacity of the hydraulic cranking system sufficient for three starts under conditions described in 11.2.7.3.5(6) shall be held in reserve and arranged so that the operation of a single control by one person will permit the reserve capacity to be employed.~~

4. Statement of Problem and Substantiation for Public Input: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Public Input, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

Current NFPA 20 language does not distinguish hydraulic cranking systems use as primary vs. secondary cranking systems. Oil companies want hydraulic cranking systems to serve as secondary (backup to the primary electric cranking system). There is currently no guidance for sizing and controlling a secondary system. This proposal provides guidance for use as primary or secondary system. If used as a primary (or only starter system), the proposal provides consistency to the electric cranking system (i.e. requiring capacity for a total of 12 cranking cycles).

Recommend a controller task force be established, in order to define necessary interface and function.

5. Copyright Assignment

(a) ☒ **I am the author of the text or other material (such as illustrations, graphs) proposed in the Public Input.**

(b) ☐ **Some or all of the text or other material proposed in this Public Input was not authored by me. Its source is as follows:** (please identify which material and provide complete information on its source)

I hereby grant and assign to the NFPA all and full rights in copyright in this Public Input (including both the Proposed Text and the Statement of Problem and Substantiation). I understand that I acquire no rights in any publication of NFPA in which this Public Input in this or another similar or analogous form is used. Except to the extent that I do not have authority to make an assignment in materials that I have identified in (b) above, I hereby warrant that I am the author of this Public Input and that I have full power and authority to enter into this assignment.

Signature (Required)

PLEASE USE SEPARATE FORM FOR EACH PUBLIC INPUT

To: Secretary, Standards Council National Fire Protection Association
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Fax to: (617) 770-3500 OR Email to: proposals_comments@nfpa.org

7/14/2016

Public Input No. 190-NFPA 20-2016 [Section No. 11.2.7.4.4]

11.2.7.4.4* Air Starting Supply.

11.2.7.4.4.1 ~~–~~

~~The~~

1 When the engine is equipped with multiple cranking systems (of different types), one system must be defined as a primary cranking system, and the other as a secondary cranking system.

11.2.7.4.4.2

When used as the only or primary cranking system, the air supply container shall be sized for 180 seconds of continuous cranking without recharging.

(a) The total capacity shall be provided from 2 separate, equally sized air supply containers A and B.

(b) The first start attempt shall be automatic from the signaling source, pulling from air supply container A, with 90 seconds of crank duration.

(c) The second start attempt shall be manually activated from either engine or controller, pulling from air supply container B, only cranking while the button is held in.

11.2.7.4.4.

~~2~~ –

3 When used as a secondary cranking system, the air supply container shall be sized for 90 seconds of continuous cranking without recharging.

(a) No restrictions on how to achieve the total air supply capacity.

(b) The first start attempt shall be automatic from the signaling source with 45 seconds of crank duration.

(c) The second start attempt shall be manually activated from either engine or controller, only cranking while the button is held in.

11.2.7.4.4.4

There shall be a separate, suitably powered automatic air compressor or means of obtaining air from some other system, independent of the compressor driven by the fire pump engine.

11.2.7.4.4.3 – 5

Suitable supervisory service shall be maintained to indicate high and low air pressure conditions.

11.2.7.4.4.4 – 6

A bypass conductor with a manual valve or switch shall be installed for direct application of air from the air container to the engine starter in the event of control circuit failure.

Statement of Problem and Substantiation for Public Input

Current NFPA 20 language does not distinguish air starting systems use as primary vs. secondary cranking systems. Oil companies want air cranking systems to serve as secondary (backup to the primary electric cranking system). There is currently no guidance for sizing and controlling a secondary system. This proposal provides guidance for use as primary or secondary system.

Recommend a controller task force be established, in order to define necessary interface and function.

Submitter Information Verification

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Submittal Date:	Fri Jul 01 12:36:43 EDT 2016

Public Input No. 155-NFPA 20-2016 [New Section after 11.4.1.5.8]

11.4.1.5.8.1

The fuel leakage condition shall initiate a supervisory signal

Statement of Problem and Substantiation for Public Input

the last sentence of 11.4.1.5.8 - THe signal shall be of the supervisory type - is not very clear. and should be replaced according previous wording in htis chapter

Submitter Information Verification

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Submittal Date: Mon Jun 27 08:10:34 EDT 2016

Public Input No. 156-NFPA 20-2016 [Section No. 11.4.1.5.8]

11.4.1.5.8

If a double-wall tank is installed, the interstitial space between the shells of the diesel fuel storage tank shall be monitored for fuel leakage and annunciated by the engine drive controller. The signal shall be of the supervisory type.

Statement of Problem and Substantiation for Public Input

precision

Submitter Information Verification

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Submittal Date: Mon Jun 27 08:15:07 EDT 2016

Public Input No. 187-NFPA 20-2016 [New Section after 11.6.5.1]

11.6.5.2

In locations where electrical power is not considered reliable, and there is a risk of pump room freezing, an emergency generator power source shall be provided to maintain space heating, battery charging, engine block heating, and lighting.

Statement of Problem and Substantiation for Public Input

Experience in northern latitudes has seen plumbing in the pump room freeze and burst, ultimately leading to diesel engines starting and running without coolant water and destroying the engine.

Submitter Information Verification

Submitter Full Name: Justin Strousse
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Submittal Date: Fri Jul 01 10:37:41 EDT 2016

Public Input No. 157-NFPA 20-2016 [New Section after 11.6.6]

11.6.6.3

any emergency equipement that prevents engine to be started by engine drive controller shall be within locked enclosure having breakable feature and a supervisory signal shall be provided to the controller when the emergency equipment disables starting by engine drive controller

Statement of Problem and Substantiation for Public Input

I had had the confirmation from a major engine fire pump manufacturer that the engine instrument panel is equiped with a 'mode' switch.
This 'mode' switch must be activated to use the emergency sequence.
If this 'mode' switch is left in 'emergency' position, the fire pump controller is disabled and the entire installation is in OFF position.
This 'mode' switch is as important as the main switch in the controller (see 12.3 for locking features).
It must be at least supervised by the controller and should trigger a remote alarm - could be the same remote indication as 12.4.2.3 (2)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 160-NFPA 20-2016 [Section No. 12.4.1.4]	
Public Input No. 161-NFPA 20-2016 [Section No. 12.4.2.3]	

Submitter Information Verification

Submitter Full Name: Daniel Gendebien
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Submittal Date: Mon Jun 27 08:18:36 EDT 2016

Public Input No. 113-NFPA 20-2016 [New Section after 12.3.5.3.4]

[NEW 12.3.6] External Operation

All switching equipment for manual use in placing a fire pump unit between the off, automatic, or manual mode and for the starting and stopping of the diesel engine shall be externally operable.

[NOTE TO EDITOR: Renumber the paragraphs that follow.]

Statement of Problem and Substantiation for Public Input

This proposal is being submitted to reduce the need for personnel to enter a diesel fire pump controller when it is energized to control and operate the diesel engine. The intent is to reduce exposures to arc flash hazard (even what may be considered a low arc flash hazard) within a diesel controller.

Submitter Information Verification

Submitter Full Name: Richard Gallagher
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Submittal Date: Thu Jun 23 20:06:34 EDT 2016

Public Input No. 158-NFPA 20-2016 [Section No. 12.4.1.3]

12.4.1.3

Separate visible indicators and a common audible fire pump alarm capable of being heard while the engine is running and operable in all positions of the main switch except the off position shall be provided to immediately indicate the following conditions:

(1) Critically low oil pressure in the lubrication system

(2) High engine temperature

(3) Failure of engine to start automatically

(4) Shutdown from overspeed

(5) High cooling water temperature

~~12.4.1.3.1~~ –

~~The controller shall provide means for testing the low oil pressure alarms and circuit in conjunction with the engine circuit testing method.~~

~~12.4.1.3.2~~ –

~~Instructions shall be provided on how to test the operation of the signals in 12.4.1.3 .~~

Statement of Problem and Substantiation for Public Input

This is not a controller feature.
it is already described in 11.2.4.5.1 /11.2.4.4.6.1/11.2.4.4.7.1/11.2.4.4.8

Submitter Information Verification

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Submittal Date: Mon Jun 27 08:53:46 EDT 2016

Public Input No. 159-NFPA 20-2016 [Section No. 12.4.1.4]

12.4.1.4

Separate visible indicators and a common audible signal capable of being heard while the engine is running and operable in all positions of the main switch except the off position shall be provided to ~~immediately~~ indicate the following conditions:

(1) * Battery failure or missing battery. ~~Each~~ controller shall be provided with a separate visible indicator for each battery. The battery failure signal shall initiate at no lower than two-thirds of battery nominal voltage rating (8.~~0 V dc~~ 0Vdc on a ~~12 V dc system~~ 12Vdc system / 16.0Vdc on a 24Vdc system). Sensing shall be delayed to prevent nuisance signals.

(2) Battery charger failure. ~~Each~~ controller shall be provided with a separate visible indicator for battery charger failure and shall not require the audible signal for battery charger failure.

(3) Low air or hydraulic pressure. Where air or hydraulic starting is provided *(see 11.2.7 and 11.2.7.4)*, each pressure tank shall provide to the controller separate visible indicators to indicate low pressure.

(4) System overpressure, for engines equipped with variable speed pressure limiting controls ~~, to~~ see 11.2.4.3 to actuate at 115 percent of set pressure.

(5) ECM selector switch in alternate ECM position (only for engines with ECM control ~~only~~ see 11.2.4.2.3).

(6) * Common alarm for fuel injection malfunction (only for engines with ECM ~~control~~ control11.2.4.2.6).

(7) Low fuel level. Signal at two-thirds tank capacity (see 11 .4.1.5.6)

(8) Low air/hydrailic pressure (~~air-starting engine controllers only). The air supply container shall be provided with a separate visible indicator to indicate low air pressure.~~ only for hydraulic start - see 11.2.7.3 or air starting see 11.2.7.4 engine).

(9) Low engine temperature.
~~Supervisory signal for interstitial space liquid intrusion.~~

(10) (see 11.2.4.4.7)

(11) Fuel tank leakage (only for double-wall tank see 11.4.1.5.8)

(12) High cooling water temperature.(see 11.2.4.4.8)

(13) Fuel maintenance needed ~~if automatic~~ (only for engine with active fuel maintenance system ~~is provided.~~ see 11.6.4.4.2)

Statement of Problem and Substantiation for Public Input

addition of reference for better understanding- / some are optional

Submitter Information Verification

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Organization: Tornatech
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Submittal Date: Mon Jun 27 08:57:31 EDT 2016

Public Input No. 160-NFPA 20-2016 [Section No. 12.4.1.4]

12.4.1.4

Separate visible indicators and a common audible signal capable of being heard while the engine is running and operable in all positions of the main switch except the off position shall be provided to immediately indicate the following conditions:

(1) * Battery failure or missing battery. Each controller shall be provided with a separate visible indicator for each battery. The battery failure signal shall initiate at no lower than two-thirds of battery nominal voltage rating (8.0 V dc on a 12 V dc system). Sensing shall be delayed to prevent nuisance signals.

(2) Battery charger failure. Each controller shall be provided with a separate visible indicator for battery charger failure and shall not require the audible signal for battery charger failure.

(3) Low air or hydraulic pressure. Where air or hydraulic starting is provided *(see 11.2.7 and 11.2.7.4)*, each pressure tank shall provide to the controller separate visible indicators to indicate low pressure.

(4) System overpressure, for engines equipped with variable speed pressure limiting controls, to actuate at 115 percent of set pressure.

(5) ECM selector switch in alternate ECM position (only for engines with ECM control only).

(6) * Common alarm for fuel injection malfunction (only for engines with ECM control).

(7) Low fuel level. Signal at two-thirds tank capacity.

(8) Low air pressure (air-starting engine controllers only). The air supply container shall be provided with a separate visible indicator to indicate low air pressure.

(9) Low engine temperature.

(10) Supervisory signal for interstitial space liquid intrusion.

(11) High cooling water temperature.

(12) Fuel maintenance needed if automatic fuel maintenance system is provided

(13) Automatic starting disable (see 11 . 6.6.3)

Statement of Problem and Substantiation for Public Input

important to add this visible indicator - signal comming form the engine control panel - supervision of the mode swith)

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 157-NFPA 20-2016 [New Section after 11.6.6]	supervision of this switch

Submitter Information Verification

Submitter Full Name: Daniel Gendebien
Organization: Tornatech
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Submittal Date: Mon Jun 27 09:29:59 EDT 2016

Public Input No. 161-NFPA 20-2016 [Section No. 12.4.2.3]

12.4.2.3

The remote panel shall indicate the following:

(1) The engine is running (separate signal).

(2) The controller main switch has been turned to the off or manual position (see 12.3.4); or the engine instrument panel mode switch diisabling the automatic starting by the controller (see 11.6.6) (separate signal or common signals).

(3) * There is trouble on the controller or engine (separate or common signals). *(See 12.4.1.4 and 12.4.1.5.)*

Statement of Problem and Substantiation for Public Input

Important to monitor the mode switch to a remote location

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 157-NFPA 20-2016 [New Section after 11.6.6]	

Submitter Information Verification

Submitter Full Name: Daniel Gendebien
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Submittal Date: Mon Jun 27 09:34:23 EDT 2016

Public Input No. 114-NFPA 20-2016 [Section No. 12.4.4]

12.4.4* Pressure Recorder.

12.4.4.1

A listed pressure recording device shall be installed to sense and record the pressure in each fire pump controller pressure-sensing line~~- at the input to the controller~~ .

12.4.4.2

The recorder shall be capable of operating for at least 7 days without being reset or rewound.

12.4.4.3

The pressure-sensing element of the recorder shall be capable of withstanding a momentary surge pressure of at least 400 psi (27.6 bar) or 133 percent of ~~fire pump controller~~ recorder rated operating pressure, whichever is higher, without losing its accuracy.

12.4.4.4

The pressure recording device shall be spring wound mechanically or driven by reliable electrical means.

12.4.4.5

The pressure recording device shall not be solely dependent upon alternating current (ac) electric power as its primary power source.

12.4.4.6

Upon loss of ac electric power, the electric-driven recorder shall be capable of at least 24 hours of operation.

12.4.4.7

In a non-pressure-actuated controller, the pressure recorder shall not be required.

Statement of Problem and Substantiation for Public Input

This PI is submitted in support of PI-115. The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

Submitter Information Verification

Submitter Full Name: Richard Gallagher
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Submittal Date: Thu Jun 23 20:14:53 EDT 2016

Public Input No. 198-NFPA 20-2016 [Section No. 12.5]

~~12.~~ Move the following sections back to Chapter 11 and number as follows:

11.2.7.2. 5* Battery Recharging.

~~12.~~ 11.2.7.2. 5.1~~–~~

Two means for recharging storage batteries shall be provided.

~~12.~~ 11.2.7.2. 5.2~~–~~

One method shall be the generator or alternator furnished with the engine.

~~12.~~ 11.2.7.2. 5.3~~–~~

The other method shall be an automatically controlled charger taking power from an ac power source.

Renumber the following in Chapter 12:

12 .5.4 – 1

If an ac power source is not available or is not reliable, another charging method in addition to the generator or alternator furnished with the engine shall be provided.

Statement of Problem and Substantiation for Public Input

When the requirements for the AC automatic battery chargers were moved to chapter 12, the requirements for the engine to include a generator/alternator should not have been moved to chapter 12. This is to put the engine requirements back in chapter 11.

Submitter Information Verification

Submitter Full Name: John Whitney
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Street Address:
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State:
Zip:
Submittal Date: Tue Jul 05 10:11:55 EDT 2016

Public Input No. 177-NFPA 20-2016 [New Section after 12.6]

TITLE OF NEW CONTENT

(13) The charger(s) shall not inhibit the engine alternator from charging the batteries while the engine is running.

Statement of Problem and Substantiation for Public Input

The battery is charged by 1) the engine alternator and 2) the charger in the controller simultaneously every time the engine runs. If the charger's output is higher than the output of the alternator at the battery as measured by the alternator's regulator, the regulator can shut down the alternator leaving the 10 amp charger in the circuit to take the battery through its automatic charging cycle. It is far more efficient to use the 40 amp alternator on the engine to bring the battery up to full charge. Moreover, this is the intention of equipping the engine with an alternator in the first place. This would extend the life of the battery eliminating the need for the charger to pass the battery through a unnecessary fast charge, possibly "boiling" the battery. Charging the battery from the controller must be suspended when the engine is running so the alternator can do its job.

Submitter Information Verification

Submitter Full Name: Doug Stephens
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Submittal Date: Wed Jun 29 14:22:52 EDT 2016

Public Input No. 181-NFPA 20-2016 [Section No. 12.6]

12.6 Battery Chargers.

The requirements for battery chargers shall be as follows:

(1) Chargers shall be specifically listed for fire pump service and be part of the diesel fire pump controller.

(2) Additional chargers also listed for fire pump service shall be permitted to be installed external to the diesel fire pump controller for added capacity or redundancy.

(3) The rectifier shall be a semiconductor type.

(4) The charger for a lead-acid battery shall be a type that automatically reduces the charging rate to less than 500 mA when the battery reaches a full charge condition.

(5) The battery charger at its rated voltage shall be capable of delivering energy into a fully discharged battery in such a manner that it will not damage the battery.

(6) The battery charger shall restore to the battery 100 percent of the battery's reserve capacity or ampere-hour rating within 24 hours.

(7) The charger shall be marked with the reserve capacity or ampere-hour rating of the largest capacity battery that it can recharge in compliance with 12.6 (4).

(8) ~~An ammeter with an accuracy of ±5 percent of the normal charging rate shall be furnished to indicate the operation of the charger~~ Means shall be provided on the exterior of the controller to read the voltage and charging current of each battery within an accuracy of ±1 percent .

(9) The charger shall be designed such that it will not be damaged or blow fuses during the cranking cycle of the engine when operated by an automatic or manual controller.

(10) The charger shall automatically charge at the maximum rate whenever required by the state of charge of the battery.

(11) The battery charger shall be arranged to indicate loss of current output on the load side of the direct current (dc) overcurrent protective device where not connected through a control panel. *[See 12.4.1.4 (2).]*

(12) The charger(s) shall remain in float mode or switch from equalize to float mode while the batteries are under the loads in 12.5.2.

Statement of Problem and Substantiation for Public Input

The battery voltage and charging current can easily be measured nowadays within +/- 1 percent. This accuracy and resolution is necessary to properly follow the battery manufacturer's charging specifications especially with new battery chemistries requiring the charger to measure differences in output between 100 to 200 miV to switch stages in the automatic charging cycle. Our present standard requiring an accuracy of only 5 percent is 600 mV for a 12V battery which is way to sloppy for properly charging a battery.

Submitter Information Verification

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Submittal Date: Wed Jun 29 14:37:08 EDT 2016

Public Input No. 162-NFPA 20-2016 [Section No. 12.7.2]

12.7.2 Automatic Operation of Controller.

12.7.2.1 Water Pressure Control.

12.7.2.1.1 Pressure-Actuated Switch.

12.7.2.1.1.1

A pressure-actuated switch or electronic pressure sensor having adjustable high- and low-calibrated set-points as part of the controller shall be provided.

12.7.2.1.1.2

For multistage multiport pumps, a dedicated pressure-actuated switch or electronic pressure sensor as described in 12.7.2.1.1.1 shall be provided for each discharge port of the pump as part of the controller.

12.7.2.1.1.3

For multistage multiport pumps, a dedicated pressure recorder as described in 12.4.4.1 shall be provided for each discharge port of the pump as part of the controller.

12.7.2.1.1.4

The requirements of 12.7.2.1.1.1 and 12.7.2.1.1.2 shall not apply to a non-pressure-actuated controller, where the pressure-actuated switch or pressure responsive means shall not be required.

12.7.2.1.2

There shall be no pressure snubber or restrictive orifice employed within the pressure switch or pressure responsive means.

12.7.2.1.3*

Where an electronic pressure sensor is used to automatically control fire pump operation, the fire pump controller shall monitor the transducer during automatic testing.

12.7.2.1.3.1*

When the transducer pressure reading exceeds 10 psi (0.68 bar) during any automatic pump start where initiated by the solenoid drain valve as required by 12.7.2.1.2.2, the controller shall activate a visual and audible alarm that can be silenced.

12.7.2.1.3.2*

Where an electronic pressure sensor is used to control fire pump operation, the fire pump controller shall monitor for and provide a signal for the following electronic pressure sensor conditions.

(1) Any time the transducer output is less than 10 percent of rated span or below its rated zero pressure output

(2) Any time the pressure transducer reading is more than 10 percent above its rated full-scale output

12.7.2.1.4

There shall be no valve or other restrictions within the controller ahead of the pressure switch or pressure responsive means.

12.7.2.1.5

This switch shall be responsive to water pressure in the fire protection system.

12.7.2.1.6

The pressure sensing element of the switch shall be capable of a momentary surge pressure of 400 psi (27.6 bar) or 133 percent of fire pump controller rated operating pressure, whichever is higher, without losing its accuracy.

12.7.2.1.7

Suitable provision shall be made for relieving pressure to the pressure-actuated switch to allow testing of the operation of the controller and the pumping unit. *[See Figure A.4.31(a) and Figure A.4.31(b).]*

12.7.2.1.8

Water pressure control shall be as follows:

(1) There shall be no shutoff valve in the pressure sensing line.

(2) Pressure switch actuation at the low adjustment setting shall initiate the pump starting sequence if the pump is not already in operation.

12.7.2.2 Fire Protection Equipment Control.

12.7.2.2.1

Where the pump supplies special water control equipment (e.g., deluge valves, dry-pipe valves), the engine shall be permitted to start before the pressure-actuated switch(es) would do so.

12.7.2.2.2

Under such conditions, the controller shall be equipped to start the engine upon operation of the fire protection equipment.

12.7.2.2.3

Starting of the engine shall be initiated by the opening of the control circuit loop containing this fire protection equipment.

12.7.2.3 Manual Electric Control at Remote Station.

Where additional control stations for causing nonautomatic continuous operation of the pumping unit, independent of the pressure-actuated switch or control valve, are provided at locations remote from the controller, such stations shall not be operable to stop the engine.

12.7.2.4

Automatic starting upon loss of ac power shall not be permitted unless required by the authority having jurisdiction.

12.7.2.5 Sequence Starting of Pumps.

12.7.2.5.1

The controller for each unit of multiple pump units shall incorporate a sequential timing device to prevent any one driver from starting simultaneously with any other driver.

12.7.2.5.2

Each pump supplying suction pressure to another pump shall be arranged to start within 10 seconds before the pump it supplies.

12.7.2.5.2.1

The controllers for pumps arranged in series shall be interlocked to ensure the correct pump starting sequence.

12.7.2.5.3

If water requirements call for more than one pumping unit to operate, the units shall start at intervals of 5 to 10 seconds.

12.7.2.5.4

Failure of a leading driver to start shall not prevent subsequent drivers from starting.

12.7.2.6 External Circuits Connected to Controllers.

12.7.2.6.1

With pumping units operating singly or in parallel, the control conductors entering or leaving the fire pump controller and extending outside the fire pump room shall be so arranged as to prevent failure to start due to fault.

12.7.2.6.2

Breakage, disconnecting, shorting of the wires, or loss of power to these circuits shall be permitted to cause continuous running of the fire pump but shall not prevent the controller(s) from starting the fire pump(s) due to causes other than these external circuits.

12.7.2.6.3

All control conductors within the fire pump room that are not fault tolerant shall be protected against mechanical injury.

12.7.2.6.4

When a diesel driver is used in conjunction with a positive displacement pump, the diesel controller shall provide a circuit and timer to actuate and then close the dump valve after engine start is finished.

12.7.2.7 Automatic Testing.

12.7.2.7.1

The controller equipment shall be arranged to automatically start, run, and shut down the engine at the minimum no-flow test frequency and duration required by NFPA 25.

12.7.2.7.2

Performance of this weekly program timer shall be recorded as a pressure drop indication on the pressure recorder. *(See 12.4.4.)*

12.7.2.7.3

A solenoid valve drain on the pressure control line shall be the initiating means.

12.7.2.7.4

The engine shall shut down automatically on high engine temperature, low oil pressure, or high cooling water temperature if no other starting or running cause exists.

12.7.2.7.5

If after shudown a starting cause occurs, the controller shall restart the engine and override the high engine temperature, low oil pressure, or high cooling water temperature shutdowns and run in accordance with 12.7.5.2.

12.7.2.7.6

In a non-pressure-actuated controller, the weekly test shall be permitted to be initiated by means other than a solenoid valve.

12.7.2.7.7

The controller shall use the opposite battery bank (every other bank) for cranking on subsequent weeks.

Statement of Problem and Substantiation for Public Input

same as my previous poroposal to change have a constant wording Pressure sensing device - and to have two pressure sensing device to monitor the system pressure

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 133-NFPA 20-2016 [Section No. 10.5.2.1]	

Submitter Information Verification

Submitter Full Name: Daniel Gendebien
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Submittal Date: Mon Jun 27 09:41:20 EDT 2016

Public Input No. 115-NFPA 20-2016 [Section No. 12.7.2.1.1]

12.7.2.1.1 Pressure-Actuated Switch.

12.7.2.1.1.1

A pressure-actuated switch or electronic pressure sensor having adjustable high- and low-calibrated set-points ~~as part of the controller~~ shall be provided and listed for use with the controller.

12.7.2.1.1.2

For multistage multiport pumps, a dedicated pressure-actuated switch or electronic pressure sensor as described in 12.7.2.1.1.1 shall be provided for each discharge port of the pump ~~as part of~~ and listed for use with the controller.

12.7.2.1.1.3

For multistage multiport pumps, a dedicated pressure recorder as described in 12.4.4.1 shall be provided for each discharge port of the pump as part of the controller.

12.7.2.1.1.4

The requirements of 12.7.2.1.1.1 and 12.7.2.1.1.2 shall not apply to a non-pressure-actuated controller, where the pressure-actuated switch or pressure responsive means shall not be required.

[NEW 12.7.2.1.1.5]

Pressure-actuated switches and electric pressure sensors shall be arranged as follows:

(1) For indoor fire pump units, located within the pump room or pump house.

(2) For outdoor fire pump units, located at least 50 ft. (15.3 m) away from any building and other fire exposures exposing the building.

(3) Located outside of any controller.

(4) Wired to the controller as recommended by the controller manufacturer

Statement of Problem and Substantiation for Public Input

The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

Submitter Information Verification

Submitter Full Name: Richard Gallagher
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City:
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Submittal Date: Thu Jun 23 20:17:01 EDT 2016

Public Input No. 116-NFPA 20-2016 [Section No. 12.7.2.1.4]

12.7.2.1.4

~~There~~ Unless permitted in Section 4.30, there shall be no ~~valve~~ valves or other restrictions ~~within the controller~~ ahead of the pressure switch or pressure responsive means.

Statement of Problem and Substantiation for Public Input

This PI is submitted in support of PI-115. The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

Submitter Information Verification

Submitter Full Name: Richard Gallagher
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Submittal Date: Thu Jun 23 20:20:11 EDT 2016

Public Input No. 117-NFPA 20-2016 [Section No. 12.7.2.1.6]

12.7.2.1.6

The pressure sensing element of the switch shall be capable of a momentary surge pressure of 400 psi (27.6 bar) or 133 percent of ~~fire pump controller~~ the switch rated operating pressure, whichever is higher, without losing its accuracy.

Statement of Problem and Substantiation for Public Input

This PI is submitted in support of PI-115. The intent is to replace the current practice of extending water-filled and water-pressurized tubing into a controller housing energized electrical equipment. This reduces the likelihood of a release of water coming in contact with energized electrical equipment creating an electrical hazard and a potential to damage a controller leading to an extended impairment. This exposure is already recognized in the standard for controllers rated in excess of 600 V. The proposal is to address this exposure for all controllers.

Submitter Information Verification

Submitter Full Name: Richard Gallagher
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Submittal Date: Thu Jun 23 20:21:07 EDT 2016

Public Input No. 82-NFPA 20-2016 [New Section after 14.2.6.1.3]

TITLE OF NEW CONTENT

Type your content here ...14.2.6.1.4 Concealed discharge and sensing orifices shall be internally inspected every five years and shall be free of damage and obstructions that could affect the accuracy of the measurement

Statement of Problem and Substantiation for Public Input

Provides requirements for concealed orifices that could become tuburculated, clogged or damaged.

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Jensen Hughes
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Submittal Date: Thu Apr 14 15:24:47 EDT 2016

Public Input No. 5-NFPA 20-2015 [New Section after A.1.1]

A.1.5

It is the intent of the committee to recognize that future editions of this standard are a further refinement of this edition and earlier editions. The changes in future editions will reflect the continuing input of the fire protection community in its attempt to meet the purpose stated in this standard. Compliance with all requirements of a future edition could be considered as providing an equivalent level of system integrity and performance of the system.

Statement of Problem and Substantiation for Public Input

Many AHJ's will not recognize future editions. This annex note is intended to give guidance that use of an entire future edition of the standard could be considered an equivalency as allowed in 1.5. This language will be proposed to other sprinkler standards and has been accepted by NFPA 14 & NFPA 25.

Submitter Information Verification

Submitter Full Name: Peter Schwab
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Zip:
Submittal Date: Tue Dec 22 10:33:59 EST 2015

Public Input No. 44-NFPA 20-2016 [New Section after A.3.3.42.2]

TITLE OF NEW CONTENT

A.3.42.2 The lowest pressure permitted by the authority having jurisdiction will likely be upstream of the backflow prevention device or at the connection to the water utility main. The permissible pressure at the pump suction may be lower than the limited stated by the authority having jurisdiction and can be determined by adding the friction loss and pressure elevation change between the cited location and the fire pump suction. ...

Statement of Problem and Substantiation for Public Input

Supports the proposed definition of "Lowest Permissible Suction Pressure".

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
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Submittal Date: Tue Jan 19 09:07:45 EST 2016

Public Input No. 9-NFPA 20-2016 [Section No. A.4.13.1]

A.4.13.1

A fire pump that is inoperative for any reason at any time constitutes an impairment to the fire protection system. It should be returned to service without delay.

Rain and intense heat from the sun ~~are~~ , blown freezing rain, blowing sand / dust, flood, fodents, insects and vandals are adverse conditions to equipment not installed in a completely protective enclosure. At a minimum, equipment installed outdoors should be ~~shielded~~ shield?ed by a roof or deck. Detached equipment shall be installed in an environmentally sound building as described in part 4.13.1.2.3.

Additional Proposed Changes

File Name	Description	Approved
nfpa_public_comment_form_A.4.13.1.docx		

Statement of Problem and Substantiation for Public Input

This would need to be reworded in the event that the proposed addition of part "4.13.1.2.3, Detached fire pump units shall be installed in an environmentally sound building / enclosure which meets or exceeds the requirements of 4.13.12, as well as the requirements of the International Building Code (IBC) for the location in which they are installed," is adopted.

Submitter Information Verification

Submitter Full Name: Michael Herron
Organization: Patterson Pump
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jan 08 13:31:25 EST 2016

NFPA Public Comment Form
(For Proposing Revisions to the First Draft)

NOTE: All Public Comments must be received by 5:00 pm EST/EDST on the published Public Comment Closing Date.

For further information on the standards-making process, please contact the Codes and Standards Administration at 617-984-7249 or visit www.nfpa.org/codes.

For technical assistance, please call NFPA at 1-800-344-3555

FOR OFFICE USE ONLY

Log #:

Date Rec'd:

Date 10-16-2015 **Name** Michael Herron **Tel. No.** 706-297-2855

Company Patterson Pump Company **Email** mherron@pattersonpumps.com

Street Address 2129 Ayersville Road **City** Toccoa **State** GA **Zip** 30577

Please indicate organization represented (if any)

1. (a) NFPA Document Title NFPA 20 **NFPA No. & Year** 2016

(b) Section/Paragraph A.4.13.1

2. Identify First Revision and/or Input to which Comment relates: No(s).

2. Public Comment Recommends (check one): ☐ new text ☒ revised text ☐ deleted text

3. Proposed Text of Public Comment (include proposed new or revised wording, or identification of wording to be deleted):
[Note: Proposed text should be in legislative format showing proposed changes to the First Draft; i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).]

A.4.13.1: A fire pump that is inoperative for any reason at any time constitutes an impairment to the fire protection system. It should be returned to service without delay.

Rain, ~~and~~ intense heat from the sun, ***blown freezing rain, blowing sand / dust, flood, rodents, insects and vandals*** are adverse conditions to equipment not installed in a completely protective enclosure ~~At a minimum, equipment installed outdoors should be shielded by a roof or deck.~~ ***Detached equipment shall be installed in an environmentally sound building as described in part 4.13.1.2.3*** (if the addition of 4.13.1.2.3 is adopted.)

4. Statement of Problem and Substantiation for Public Comment: (Note: State the problem that would be resolved by your recommendation; give the specific reason for your Public Comment, including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication.)

This would need to be reworded in the event that the proposed addition of part ***"4.13.1.2.3, Detached fire pump units shall be installed in an environmentally sound building / enclosure which meets or exceeds the requirements of 4.13.1, as well as the requirements of the International Building Code (IBC) for the location in which they are installed,"*** is adopted.

5. Copyright Assignment

(a) ☒ I am the author of the text or other material (such as illustrations, graphs) proposed in the Public Comment.

(b) ☐ Some or all of the text or other material proposed in this Public Comment was not authored by me. Its source is as follows: (please identify which material and provide complete information on its source)

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Signature (Required)

PLEASE USE SEPARATE FORM FOR EACH PUBLIC COMMENT

To: Secretary, Standards Council National Fire Protection Association
1 Batterymarch Park · Quincy, MA 02169-7471 OR

Public Input No. 165-NFPA 20-2016 [New Section after A.4.13.1.1.5]

A.4.13.2.1.1.2 Figure A.4.13.2.1.1.2 shows the intent of the body of the standard. The parking garage in this building is separated from the rest of the building by a 2-hr fire resistive rating and the fire sprinkler system is capable of being supplied from the city main without the fire pump, so if a fire occurs in the parking garage, no personnel need to be sent to the pump room.

<<Insert Figure A.4.13.2.1.1.2>>

Additional Proposed Changes

File Name	Description	Approved
20-access.docx	Shows whole section annex and figure working together	

Statement of Problem and Substantiation for Public Input

This is an explanation and figure to help understand the intent of the new paragraph that was submitted to the body of the standard to provide a reasonable exception to the rule for a protected path to the pump room while still protecting the person being sent to the pump room.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 163-NFPA 20-2016 [Section No. 4.13.2.1.1 [Excluding any Sub-Sections]]	This is the section that sets up the exception
Public Input No. 164-NFPA 20-2016 [New Section after 4.13.2.1.1.1]	This is the section that is being explained in the annex.

Submitter Information Verification

Submitter Full Name: Kenneth Isman
Organization: University of Maryland
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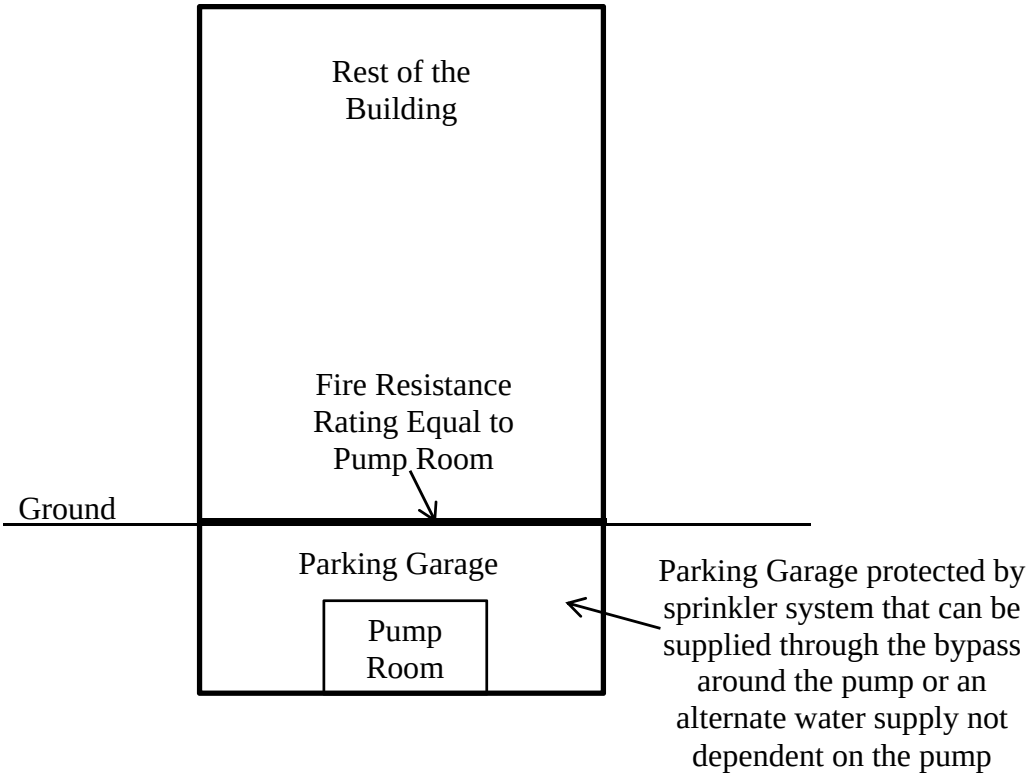
Submittal Date: Mon Jun 27 10:04:39 EDT 2016

4.13.2.1.1.2* Where a fire pump is installed in a parking garage or some other portion of a building separated from the rest of the building by fire rated construction equivalent to the pump room and the portion of the building containing the fire pump is protected by a sprinkler system that does not rely on the fire pump, the protected access to the pump room shall not be required.

A.4.13.2.1.1.2 Figure A.4.13.2.1.1.2 shows the intent of the body of the standard. The parking garage in this building is separated from the rest of the building by a 2-hr fire resistive rating and the fire sprinkler system is capable of being supplied from the city main without the fire pump, so if a fire occurs in the parking garage, no personnel need to be sent to the pump room.



Public Input No. 188-NFPA 20-2016 [Section No. A.9.3.2]

A.9.3.2

A reliable power source possesses the following characteristics:

(1) The source power plant has not experienced any shutdowns longer than 10 continuous hours in the year prior to plan submittal. NFPA 25 requires special undertakings (i.e., fire watches) when a water-based fire protection system is taken out of service for longer than 10 hours. If the normal source power plant has been intentionally shut down for longer than 10 hours in the past, it is reasonable to require a backup source of power.

(2) Power outages have not routinely been experienced in the area of the protected facility caused by failures in generation or transmission. This standard is not intended to require that the normal source of power be infallible to deem the power reliable. NFPA 20 does not intend to require a backup source of power for every installation using an electric motor–driven fire pump. ~~Note that should the normal source of power fail in a rare event, the impairment procedures of NFPA 25 could be followed to mitigate the fire risk. If a fire does occur during the power loss, the fire protection system could be supplied through the fire department connection.~~

(3) The normal source of power is not supplied by overhead conductors outside the protected facility. Fire departments responding to an incident at the protected facility will not operate aerial apparatus near live overhead power lines, without exception. A backup source of power is required in case this scenario occurs and the normal source of power must be shut off. Additionally, many utility providers will remove power to the protected facility by physically cutting the overhead conductors. If the normal source of power is provided by overhead conductors, which will not be identified, the utility provider could mistakenly cut the overhead conductor supplying the fire pump.

(4) Only the disconnect switches and overcurrent protection devices permitted by 9.2.3 are installed in the normal source of power. Power disconnection and activated overcurrent protection should occur only in the fire pump controller. The provisions of 9.2.2 for the disconnect switch and overcurrent protection essentially require disconnection and overcurrent protection to occur in the fire pump controller. If unanticipated disconnect switches or overcurrent protection devices are installed in the normal source of power that do not meet the requirements of 9.2.2, the normal source of power must be considered not reliable and a backup source of power is necessary.

Typical methods of routing power from the source to the motor are shown in Figure A.9.2. Other configurations are also acceptable. The determination of the reliability of a service is left up to the discretion of the authority having jurisdiction.

For more information on the determination of reliability, see the following publications:

(1) IEEE 493, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*

(2) "Reliability engineering applied to Critical Operations Power Systems (COPS)," a paper presented at the 2011 IEEE Industrial and Commercial Power Systems Conference (I&CPS)

(3) "Reliability analysis for power to fire pump using Fault Tree and RBD," in *IEEE Transactions on Industry Applications*

(4) "Risk analysis for NEC Article 708 Critical Operations Power Systems," paper presented at the 2009 Industry Applications Society Annual Meeting, and published by IEEE

(5) "NEC Article 708," in IEEE *Industry Application Magazine*, Jan-Feb 2011

Statement of Problem and Substantiation for Public Input

This new change in part (2) does not adequately address reliability. Areas prone to power outages due to a natural disaster such as earthquakes, hurricanes, ice storms, etc. are more likely to have a fire during this event and should absolutely be considered deemed unreliable if they have a history of being down more than 4 hours continuously. During a natural disaster, the fire department would be addressing all the emergencies and would

not be readily available for a fire watch for every building in the region. The building would absolutely need to be self-sufficient when it comes to reliability.

Areas experience outages for more than 4 hours continuously, whether man made or natural, would be considered unreliable.

Submitter Information Verification

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Submittal Date: Fri Jul 01 10:41:14 EDT 2016

Public Input No. 189-NFPA 20-2016 [Section No. A.9.3.2]

A.9.3.2

A reliable power source possesses the following characteristics:

(1) The source power plant has not experienced any shutdowns longer than ~~10~~ 4 continuous hours in the year prior to plan submittal. NFPA 25 requires special undertakings (i.e., fire watches) when a water-based fire protection system is taken out of service for longer than 10 hours. If the normal source power plant has been intentionally shut down for longer than ~~10 hours~~ 4 hours in the past, it is reasonable to require a backup source of power.

(2) Power outages have not routinely been experienced in the area of the protected facility caused by failures in generation or transmission. This standard is not intended to require that the normal source of power be infallible to deem the power reliable. NFPA 20 does not intend to require a backup source of power for every installation using an electric motor–driven fire pump. Note that should the normal source of power fail in a rare event, the impairment procedures of NFPA 25 could be followed to mitigate the fire risk. If a fire does occur during the power loss, the fire protection system could be supplied through the fire department connection.

(3) The normal source of power is not supplied by overhead conductors outside the protected facility. Fire departments responding to an incident at the protected facility will not operate aerial apparatus near live overhead power lines, without exception. A backup source of power is required in case this scenario occurs and the normal source of power must be shut off. Additionally, many utility providers will remove power to the protected facility by physically cutting the overhead conductors. If the normal source of power is provided by overhead conductors, which will not be identified, the utility provider could mistakenly cut the overhead conductor supplying the fire pump.

(4) Only the disconnect switches and overcurrent protection devices permitted by 9.2.3 are installed in the normal source of power. Power disconnection and activated overcurrent protection should occur only in the fire pump controller. The provisions of 9.2.2 for the disconnect switch and overcurrent protection essentially require disconnection and overcurrent protection to occur in the fire pump controller. If unanticipated disconnect switches or overcurrent protection devices are installed in the normal source of power that do not meet the requirements of 9.2.2, the normal source of power must be considered not reliable and a backup source of power is necessary.

Typical methods of routing power from the source to the motor are shown in Figure A.9.2. Other configurations are also acceptable. The determination of the reliability of a service is left up to the discretion of the authority having jurisdiction.

For more information on the determination of reliability, see the following publications:

(1) IEEE 493, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*

(2) "Reliability engineering applied to Critical Operations Power Systems (COPS)," a paper presented at the 2011 IEEE Industrial and Commercial Power Systems Conference (I&CPS)

(3) "Reliability analysis for power to fire pump using Fault Tree and RBD," in *IEEE Transactions on Industry Applications*

(4) "Risk analysis for NEC Article 708 Critical Operations Power Systems," paper presented at the 2009 Industry Applications Society Annual Meeting, and published by IEEE

(5) "NEC Article 708," in IEEE *Industry Application Magazine*, Jan-Feb 2011

Statement of Problem and Substantiation for Public Input

This was changed from the 2013 NFPA 20 which had the same statement as above, but instead of requiring 10 continuous hours it stated 4 continuous hours was considered unreliable.

It seems the change was made from a servicing perspective verse a building design perspective. NFPA 25 was

changed to allow for 10 hours continuously down, which is a planned event, before requiring a fire watch and this regulation was just pushed into NFPA 20 to make everything match. However, if an area has a history of losing power for more than 4 hours continuously, which is an unplanned event, then the area would be unreliable and should be designed for adequate back up.

This proposal returns the downtime hours back to 2013 NFPA 20 wording.

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Public Input No. 194-NFPA 20-2016 [New Section after A.11.4.4.6]

A.11.4.4.7

Paragraph 11.4.4.7 address a fuel shut off solenoid that is a part of the engine fuel supply plumbing that would be installed for the purpose of normal stopping of the engine by starving it for fuel. The manual mechanical operation or bypass that is required is to provide the ability to allow fuel to be delivered to the engine in the event of failure of the solenoid valve itself or the control circuitry to it. The solenoid valve in this paragraph would be a part of the third party listing of the engine and supplied by the engine supplier. Emergency stop is not the purpose for the solenoid valve in 11.4.4.7.

Statement of Problem and Substantiation for Public Input

This ANNEX paragraph is provided to add clarity. Confusion to the paragraph and purpose of the valve therein has been expressed in California.

Submitter Information Verification

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Submittal Date: Fri Jul 01 14:55:27 EDT 2016

Public Input No. 40-NFPA 20-2016 [Section No. A.14.2.6.5]

A.14.2.6.5

A sample procedure is as follows:

(1) Make a visual check of the unit. If hose and nozzles are used, see that they are securely tied down. See that the hose valves are closed. If a test meter is used, the valve on the discharge side of the meter should be closed.

(2) Start the pump.

(3) Partially open one or two hose valves, or slightly open the meter discharge valve.

(4) Check the general operation of the unit. Watch for vibration, leaks (oil or water), unusual noises, and general operation. Adjust packing glands.

(5) Measure water discharge. The steps to do so are as follows:

(a) Where a test valve header is used, regulate the discharge by means of the hose valves and a selection of the nozzle tips. It will be noticed that the play pipe has a removable tip. This tip has a 1⅛ in. (28.6 mm) nozzle, and when the tip is removed, the play pipe has a 1¾ in. (44.4 mm) nozzle. Hose valves should be shut off before removing or putting on the 1⅛ in. (28.6 mm) tip.

(b) Where a test meter is used, regulate the discharge valve to achieve various flow readings.

(c) Important test points are at 150 percent rated capacity, rated capacity, and shutoff. Intermediate points can be taken if desired to help develop the performance curve.

(6) Record the following data at each test point *[see the sample form shown in Figure A.14.2.6.5(a)]*:

(a) Pump rpm

(b) Suction pressure

(c) Discharge pressure

(d) Number and size of hose nozzles, pitot pressure for each nozzle, and total gpm (L/min); for test meter, simply a record of gpm (L/min)

(e) Amperes (each phase for electric motor–driven pump)

(f) Volts (phase to phase for electric motor–driven pump)

(g) Engine back pressure (for diesel engine drive pump)

(h) Oil pressure (for diesel engine drive pump)

(i) Cooling loop water pressure (for diesel engine drive pump)

(j) Engine temperature (for diesel engine drive pump)

(k) Steam pressure (for steam drive pump)

(7) Evaluate test results as follows:

(a) *Discharge Flow and Pressure.* Verify that the discharge flow and pressure is adequate to supply the fire protection demand.

(b) *Rated Speed.* Verify whether the pump is operating at or close to rated rpm. Pump speeds that vary significantly from the original pump design speed(s) should be investigated and corrected.

(c) *Capacity.* For the hose valve header, using appropriate formulas or a fire stream table that matches the orifice characteristics, determine the gpm (L/min) for each nozzle at each pitot reading. For example, 16 psi (1.1 bar) pitot pressure with 1¾ in. (44.4 mm) nozzle with a coefficient of 0.975 indicates 356 gpm (1348 L/min). Add the gpm for each hose line to determine total volume. For the test meter, the total gpm (L/min) is read directly. The formula for calculating a flow from a pitot pressure is:

Flow:

$$Q = 29.83CD^2P^{0.5} \quad \textbf{[A.14.2.6.5a]}$$

where:

Q = flow through the orifice in gpm

C = orifice discharge coefficient

D = orifice diameter in inches

P = pitot pressure in inches

(d) *Total Head for Horizontal Pump*. Total head is the sum of the following:

i. Pressure measured by the discharge gauge at pump discharge flange

ii. Velocity head difference, pump discharge, and pump suction

iii. Gauge elevation corrections to pump centerline (plus or minus)

iv. Pressure measured by suction gauge at pump suction flange — negative value when pressure is above 0

(e) *Total Head for Vertical Pump.* Total head is the sum of the following:

i. Pressure measured by the discharge gauge at pump discharge flange

ii. Velocity head at the discharge flange

iii. Distance to the supply water level

iv. Discharge gauge elevation correction to centerline of discharge

(f) *Electrical Input.* Voltage and amperes are read directly from the volt/ammeter. This reading is compared to the motor nameplate full-load amperes. The only general calculation is to determine the maximum amperes allowed due to the motor service factor. In the case of 1.15 service factor, the maximum amperes are approximately 1.15 times motor amperes, because changes in power factor and efficiency are not considered. If the maximum amperes recorded on the test do not exceed this figure, the motor and pump will be judged satisfactory. It is most important to measure voltage and amperes accurately on each phase should the maximum amperes logged on the test exceed the calculated maximum amperes. This measurement is important because a poor power supply with low voltage will cause a high ampere reading. This condition can be corrected only by improvement in the power supply. There is nothing that can be done to the motor or the pump.

(g) *Correction to Rated Speed.* For purposes of evaluation and plotting, the capacity, head, and power should be corrected from the test values at test speed to the rated speed of the pump. The corrections are made as follows.

Capacity:

$$Q_2 = \left(\frac{N_2}{N_1}\right) Q_1 \qquad \textbf{[A.14.2.6.5b]}$$

where:

Q_1 = capacity at test speed in gpm (L/min)

Q_2 = capacity at rated speed in gpm (L/min)

N_1 = test speed in rpm

N_2 = rated speed in rpm

Head:

$$H_2 = \left(\frac{N_2}{N_1}\right)^2 H_1 \qquad \textbf{[A.14.2.6.5c]}$$

where:

H_1 = head at test speed in ft (m)

H_2 = head at rated speed in ft (m)

Horsepower:

$$hp_2 = \left(\frac{N_2}{N_1}\right)^3 hp_1 \qquad \textbf{[A.14.2.6.5d]}$$

where:

hp_1 = kW (horsepower) at test speed

hp_2 = kW (horsepower) at rated speed

(h) In general, a head-capacity curve*[see Figure A.14.2.6.5(b) and Figure A.14.2.6.5(c)]* and an ampere-capacity curve *[see Figure A.14.2.6.5(d)]* should be plotted. A study of these curves will show the performance picture of the pump as it was tested.

(i) The final step of the evaluation is to document and notify the appropriate authorities of the fire pump status, which includes whether the fire pump passed or failed, if the fire pump was left in service, and any issues that were identified. Any outstanding issues should be addressed and a retest scheduled if necessary.

Figure A.14.2.6.5(a) Centrifugal Fire Pump Acceptance Test Form.

Sample Centrifugal Fire Pump Acceptance Test Form

Information on this form covers the minimum requirements of NFPA 20 for performing acceptance tests on centrigual fire pumps with electric motor or diesel engine drivers. A separate form is required for each pump operating simultaneously. This form does not cover periodic inspection, testing, and maintenance required by NFPA 25.

Owner: _____
Owner's address: _____
_____
Pump location: _____
Property address: _____
_____

Date of test:
Maximum demand(s) of fire protection system(s) _____ gpm at _____ psi for _____ minutes at fire pump discharge.
System demand information supplied by: _____
Pump type: Horizontal ❑ Vertical ❑ Inline ❑ Other (specify) _____
Manufacturer: _____ Model or type: _____ Shop/Serial number _____
Pump rated for _____ gpm at _____ psi at _____ RPM, net discharge pressure _____ psi at 150% _____ psi at churn
Pump suction size _____ in., discharge size _____ in., suction from _____
If suction from tank, tank diameter _____ ft, height _____ ft, net capacity _____ gpm
Driver: _____ Electric motor _____ Diesel engine _____ Steam turbine
Manufacturer: _____ Shop/Serial number: _____ Model or type: _____
Rated horsepower: _____ Rated speed: _____ If electric motor, rated voltage _____ Operating voltage _____
Rated amps _____ Phase cycles _____ Service factor _____
Controller manufacturer: _____
Shop/Serial number: _____ Model or type: _____
Controller rated _____ HP _____ VAC
Does controller rated HP & VAC match motor? ❑ Yes ❑ No
Transfer switch? ❑ Yes ❑ No
Transfer switch rated _____ HP _____ VAC
Does controller rate HP & VAC match motor? ❑ Yes ❑ No ❑ N/A
Pressure maintenance (jockey) pump on system? ❑ Yes ❑ No ❑ Manual ❑ Automatic
Manufacturer: _____ Shop/Serial number: _____
Model or type: _____ ❑ Centrifugal or ❑ Positive displacement?
Pressure relief valve provided on jockey pump discharge? ❑ Yes ❑ No ❑ N/A
Jockey pump rated for _____ gpm at _____ psi at _____ RPM _____ HP
Jockey pump suction size _____ in., discharge size _____ in.
Jockey pump controller manufacturer: _____
Shop/Serial number: _____ Model or type: _____
Jockey pump controller rated _____ HP _____ VAC
Does jockey pump controller rated HP & VAC match motor? ❑ Yes ❑ No

Note: All blanks are to be filled in. All questions are to be answered Yes, No, or Not Applicable. All "No" answers are to be explained in the comments portion of this form.

I. Flush Test *(Table 14.1.1.1 — Conduct before hydrostatic test)*
A. Suction supply from ground level storage tank or reservoir ❑ Yes ❑ N/A
B. Suction piping was flushed at _____ gpm? (See Table 14.1.1.1) ❑ Yes ❑ No ❑ N/A
C. Was pipe from tank discharge to pump suction visually inspected? ❑ Yes ❑ No ❑ N/A
D. Copy of Contractor's Material and Test Certificate for Underground Piping attached? [See Figures A.14.1.3(c) and A.14.1.3(d)] ❑ Yes ❑ No ❑ N/A

II. Hydrostatic Test (14.1.2)
A. Maximum pump discharge pressure at rated speed and nonflow (churn) condition _____ psi
B. Piping tested at _____ psi for 2 hours? ❑ Yes ❑ No ❑ N/A
C. Piping passed test? ❑ Yes ❑ No ❑ N/A
D. Copy of Contractor's Material and Test Certificate for Fire Pump Systems attached? [See Figures A.14.1.3(a) and A.14.1.3(b)] ❑ Yes ❑ No ❑ N/A

III. People Present (14.2.1)
Were the following present to witness the test:
A. Pump manufacturer/representative? ❑ Yes ❑ No
B. Engine manufacturer/representative? ❑ Yes ❑ No ❑ N/A
C. Controller manufacturer/representative? ❑ Yes ❑ No
D. Transfer switch manufacturer/representative? ❑ Yes ❑ No ❑ N/A
E. Authority having jurisdiction/representative? ❑ Yes ❑ No
F. Owner or owner's representative? ❑ Yes ❑ No

 (NFPA 20, p. 1 of 4)

IV. Electric Wiring
A. Was all electric wiring including control interwiring for multiple pumps emergency power supply and the jockey pump completed and checked by the electrical contractor prior to the initial start-up and acceptance test? ❑ Yes ❑ No ❑ N/A

V. Flow Test
A. Is a copy of the manufacturer's certified pump test curve attached? ❑ Yes ❑ No
B. Test results compared to the manufacturer's certified pump test curve? ❑ Yes ❑ No
C. Gauges and other test equipment calibrated? ❑ Yes ❑ No
D. No vibrations that could potentially damage any fire pump component? ❑ Yes ❑ No ❑ N/A
E. The fire pump performed at all conditions without objectionable overheating of any component? ❑ Yes ❑ No ❑ N/A
F. For each test, record the required information for each load condition using the following formulas (or other acceptable methods) and tables:

$$P_{Net} = P_{Discharge} - P_{Suction}$$
$$Q = 29.83\,cd^2p^{0.5}$$
$$Pv = 0.433523^2/(2g) = (Q^2)/(890.472D^4)$$

Where
P_{Net} = Net pump pressure (psi)
$P_{Discharge}$ = Total pressure at the pump discharge (psi)
$P_{Suction}$ = Total pressure at the pump suction (psi)
Q = Flow through a circular orifice (gpm)
c = Nozzle discharge coefficient
d = Nozzle orifice diameter (in.)
p = Pressure measured on gauge (pitot)
Pv = Velocity pressure (psi)
V = Velocity of liquid (ft/sec)
g = Gravitational constant (32.174 ft/sec)
D = Internal pipe diameter (in.)

Test	Pump speed (rpm)	Suction pressure (psi)	Discharge pressure (psi)	Nozzle size (in.)_____ Nozzle coef. _____ Pitot readings (psi) 1	2	3	4	5	6	Flow (gpm)	Net pressure (psi)	Rpm adjusted net pressure	Rpm adjusted flow (psi)	Suction velocity pressure (psi)[1]	Discharge velocity pressure (psi)[1]	Velocity adjusted pressure (psi)[1]	Oil pressure (psi)[2]	Exhaust back pressure (in. Hg)[2]	Diesel water jacket temp.[2]	Cooling loop pressure (psi)[2]
0%																				
25%																				
50%																				
75%																				
100%																				
125%																				
150%																				
0%																				
100%																				
150%																				

Pump is ❑ Constant speed ❑ Variable speed

Notes:
[1]Velocity pressure adjustments provide a more accurate analysis in most cases and as a minimum should be included whenever the pump suction and discharge diameters are different and the pump fails by a narrow margin. The actual internal diameter of the pump suction and discharge should be obtained from the manufacturer.
[2]These readings are applicable to diesel engine pumps only. Recording these readings is not specifically required in Chapter 14.

For electric motor–driven pumps also record:

Test	Voltage			Amperes		
	L1-L2	L2-L3	L1-L3	L1	L2	L3
0%						
25%						
50%						
75%						
100%						
125%						
150%						
0%						
100%						
150%						

G. For electric motors operating at rated voltage and frequency, is the ampere demand less than or equal to the product of the full load ampere rating times the allowable service factor as stamped on the motor name plate? ❑ Yes ❑ No ❑ N/A

 (NFPA 20, p. 2 of 4)

H. For electric motors operating under varying voltage:
1. Was the product of the actual voltage and current demand less than or equal to the product of the rated full load current times the rated voltage times the allowable service factor? ❑ Yes ❑ No ❑ N/A
2. Was the voltage always less than 5% above the rated voltage during the test? ❑ Yes ❑ No ❑ N/A
3. Was the voltage always less than 10% above the rated voltage during the test? ❑ Yes ❑ No ❑ N/A
I. Did engine-driven units operate without any signs of overload or stress? ❑ Yes ❑ No ❑ N/A
J. Was the engine overspeed emergency shutdown tested? ❑ Yes ❑ No ❑ N/A
K. Was the governor set to properly regulate the engine speed at rated pump speed? ❑ Yes ❑ No ❑ N/A
L. Did the gear drive assembly operate without excessive objectionable noise, vibration, or heating? ❑ Yes ❑ No ❑ N/A
M. Was the fire pump unit started and brought up to rated speed without interruption under the conditions of a discharge equal to peak load? ❑ Yes ❑ No ❑ N/A
N. Did the fire pump performance equal the manufacturer's factory curve within the accuracy limits of the test equipment? ❑ Yes ❑ No ❑ N/A
O. Did the electric motor pumps pass phase reversal test on normal and alternate (if provided) power? ❑ Yes ❑ No ❑ N/A

VI. Multiple Pump Operation

A. _____ fire pumps are required to operate ❑ in series ❑ in parallel ❑ N/A to meet the maximum fire protection demand.
B. Record the following information for each of the _____ pumps operating simultaneously.

Test	Pump speed (rpm)	Suction pressure (psi)	Discharge pressure (psi)	Nozzle size (in.)_____ Nozzle coef. _____ Pitot readings (psi) 1 2 3 4 5 6 7 8 9 10 11 12	Net pressure (psi)	Total flow (gpm)	Flow through this portion (gpm)	Rpm adjusted net pressure	RPM adjusted flow (gpm)	Suction velocity pressure (psi)	Suction velocity pressure (psi)	Velocity adjusted net pressure (psi)
0%												
25%												
50%												
75%												
100%												
125%												
150%												
0%												
100%												
150%												

Pump is ❑ Constant speed ❑ Variable speed

C. Did the fire pump performance equal the manufacturer's factory curve within the accuracy limits of the test equipment during the multiple test? ❑ Yes ❑ No ❑ N/A

VII. Main Pressure Relief Valve

A. Is a main pressure relief valve installed on the fire pump discharge? ❑ Yes ❑ No
B. During variable speed performance testing, what was the flow rate through the main pressure relief valve at churn?
❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
C. During variable speed performance testing, what was the flow rate through the main pressure relief valve at rated flow?
❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
D. During constant speed performance testing, what was the flow rate through the main pressure relief valve at churn?
❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
E. During constant speed performance testing, what was the flow rate through the main pressure relief valve at rated flow?
❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
F. After resetting the pressure relief valve after performance testing, under variable speed operation, what was the flow rate through the main pressure relief valve at churn? ❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
G. After resetting the pressure relief valve after performance testing, under constant speed operation, what was the flow rate through the main pressure relief valve at churn? ❑ No flow ❑ Weeping flow ❑ More than weeping flow ❑ Substantial flow ❑ N/A
What was the fire pump discharge pressure?_____ psi.
H. After resetting the pressure relief valve after performance testing, under constant speed operation, at what flow rate did the pressure relief valve substantially close?_____ gpm. What was the fire pump discharge pressure when the pressure relief valve was substantially closed? _____ psi.
I. Is the maximum discharge pressure adjusted for elevation, and with the pressure relief operational, less than the pressure rating of the system components for elevation? ❑ Yes ❑ No ❑ N/A

VIII. Controller Test

A. Did the pump start at least 6 times from automatic sources? ❑ Yes ❑ No ❑ N/A
B. Was each automatic starting feature tested at least once? ❑ Yes ❑ No ❑ N/A
C. Did the pump start at least 6 times manually? ❑ Yes ❑ No ❑ N/A
D. Was the pump run for at least 5 minutes during each of the operations in Parts A, B, and C above? ❑ Yes ❑ No ❑ N/A
(Note: An engine driver is not required to run for 5 minutes at full speed between successive starts until the cumulative cranking time of successive starts reaches 45 seconds.)
E. Were the starting operations divided between both sets of batteries for engine-driven controllers? ❑ Yes ❑ No ❑ N/A

F. Were both ECMs tested if supported? ❑ Yes ❑ No ❑ N/A
G. Was the engine tested and rpm set on both ECMs at rated flow and full load? ❑ Yes ❑ No ❑ N/A
H. Were all alarm functions including ECM alarms for fuel injection failure, low fuel pressure, and any primary sensor failure tested at the engine? ❑ Yes ❑ No ❑ N/A
I. Electric Driven Pump Controllers
1. Were all overcurrent protective devices (including the controller circuit breaker) selected, sized, and set in accordance with NFPA 20? ❑ Yes ❑ No ❑ N/A
2. Was the fire pump started at least once from each power service and run for at least 5 minutes? ❑ Yes ❑ No ❑ N/A
3. Upon simulation of a power failure, while the pump is operating at peak load, did the transfer switch transfer from the normal to the emergency source without opening overcurrent protection devices on either line? ❑ Yes ❑ No ❑ N/A
4. When normal power was restored, did retransfer from emergency to normal power occur without overcurrent protection devices opening on either line? ❑ Yes ❑ No ❑ N/A
5. Were at least half of the automatic and manual starts required by Parts A and C performed with the pump connected to the alternate source? ❑ Yes ❑ No ❑ N/A
J. Were all signal conditions simulated demonstrating satisfactory operation? ❑ Yes ❑ No ❑ N/A
K. Did the pump run for at least 1 hour during the tests? ❑ Yes ❑ No ❑ N/A
NOTE: Run time includes all time the driver was turning the impeller — i.e., no-flow and flow conditions.

IX. Water Storage Tank ❑ Yes ❑ No

A. Tank capacity _____ gallons, height _____ ft, diameter _____ ft.
B. Break tank ❑ Yes ❑ No ❑ N/A Required break tank fill rate _____ gpm ❑ N/A
C. Did refill rate maintain tank level when flowing 150% of rated capacity? ❑ Yes ❑ No ❑ N/A
D. A water refill rate of _____ gpm was: ❑ field verified by flowing _____ gpm through the fire pump with a starting water level of _____ ft _____ in. and an ending water level of _____ ft _____ in. after flowing for _____ minutes, ❑ field verified by raising the water level from _____ ft _____ in. to _____ ft _____ in. in _____ minutes, ❑ field verified by other means (specify) _____
E. Was the automatic refill assembly operated a minimum of 5 times? ❑ Yes ❑ No ❑ N/A

X. Test Evaluation

A. Did the pump performance equal that indicated on the manufacturer's certified shop test under all load conditions? ❑ Yes ❑ No
B. Did the pump discharge equal or exceed the maximum fire protection system demand? ❑ Yes ❑ No
C. Did the pump installation and performance meet the requirements of NFPA 20? ❑ Yes ❑ No

XI. Tester Information

Tester: _____
Company: _____
Company address: _____

I state that the information on this form is correct at the time and place of my test, and that all equipment tested was left in operational condition upon completion of this test except as noted in the comments section below.
Signature of tester: _____ Date: _____ License or certification number if applicable: _____

XII. Comments *(Any "No" answers, test failures, or other problems must be explained — use additional sheets if necessary.)*

Figure A.14.2.6.5(b) 1000 gpm at 100 psi Fire Pump Acceptance Test -- Constant Speed Operation.

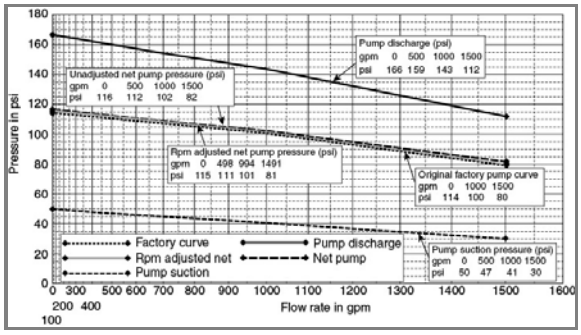


Figure A.14.2.6.5(c) Variable Speed Fire Pump Acceptance Test – Variable Speed Operation 1000 gpm at 100 psi Fire Pump.

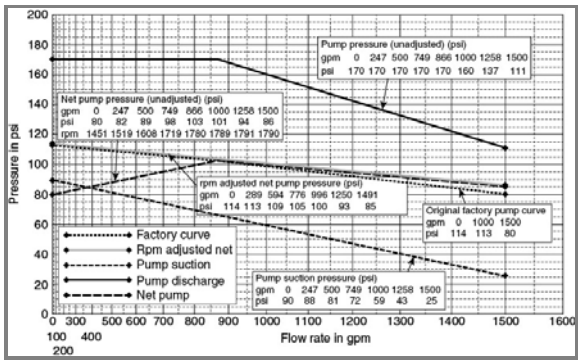
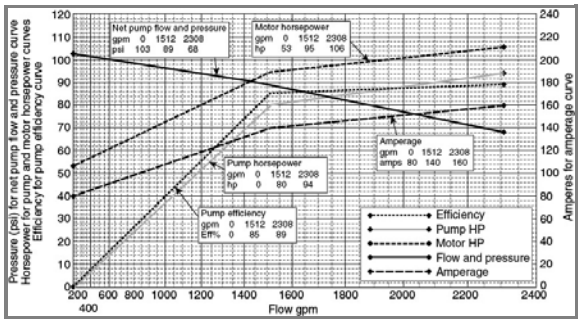


Figure A.14.2.6.5(d) Horsepower and Amperage Sample Curve -- Underperforming 1500 gpm at 105 psi Fire Pump.



Additional Proposed Changes

File Name	Description	Approved
Figure_A.14.2.6.5_a_Centrifugal_Fire_Pump_Acceptance_Test_Form_Changes..docx	Changes to Figure A.14.2.6.5a	

Statement of Problem and Substantiation for Public Input

Alternate power is not necessarily emergency power

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 37-NFPA 20-2016 [Section No. 3.3.39]	

Submitter Information Verification

Submitter Full Name: Gayle Pennel
Organization: Aon Fire Protection Engineerin
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jan 18 18:58:05 EST 2016

IV. Electric Wiring

A. Was all electric wiring including control interwiring for multiple pumps alternate ~~emergency~~ power supply, and the jockey pump completed and checked by the electrical contractor prior to the initial start-up and acceptance test? ..... ☐Yes☐No☐N/A

VIII. Controller Test

A. Did the pump start at least 6 times from automatic sources? ..... ☐Yes☐No☐N/A

B. Was each automatic starting feature tested at least once? ..... ☐Yes☐No☐N/A

C. Did the pump start a least 6 times manually? ..... ☐Yes☐No☐N/A

D. Was the pump run for at least 5 minutes during each of the operations in Parts A, B and C above? ☐Yes☐No☐N/A

A. (*Note: An engine driver is not required to run for 5 minutes at full speed between Successive starts until the cumulative cranking time of successive starts reaches 45 seconds.)*

E. Were the starting operations divided between both sets of batteries for engine- driven controllers? ..... ☐Yes☐No☐N/A

F. Were both ECM's tested if supported? ..... ☐Yes☐No☐N/A

G. Was the engine tested & RPM set on both ECM's at rated flow & full load? ..... ☐Yes☐No☐N/A

H. Were all alarm functions including ECM alarms for fuel injection failure, low fuel pressure & any primary sensor failure tested at the engine? .....☐Yes☐No☐N/A

I. Electric Driven Pump Controllers

1. Were all overcurrent protective devices (including the controller circuit-breaker) selected, sized and set in accordance with NFPA 20? .....☐Yes☐No☐N/A

2. Was the fire pump started at least once from each power service and run for at least 5 minutes? ..... ☐Yes☐No☐N/A

3. Upon simulation of a power failure, while the pump is operating at peak load, did the transfer switch transfer from the normal to the alternate ~~emergency~~ source without opening overcurrent protection devices on either line? ..... ☐Yes☐No☐N/A

4. When normal power was restored, did retransfer from alternate ~~emergency~~ to normal power occur without overcurrent protection devices opening on either line? ..... ☐Yes☐No☐N/A

5. Were at least half of the automatic and manual starts required by Parts A and C performed with the pump connected to the alternate source? .....☐Yes☐No☐N/A

J. Were all signal conditions simulated demonstrating satisfactory operation? ..... ☐Yes☐No☐N/A

K. Did the pump run for at least 1 hour during the tests? ..... ☐Yes☐No☐N/A

NOTE: Run time includes all time the driver was turning the impellar, i.e. no-flow and flow conditions.

Public Input No. 41-NFPA 20-2016 [Section No. C.8.2.9.1]

C.8.2.9.1

Table C.8.2.9.1(a) through Table C.8.2.9.1(c) are recommended Modbus register usage for controllers.

Table C.8.2.9.1(a) Recommended Standardized Electric Motor Controller Modbus Register Definitions

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42001	ac volts L1-L2	NA	xxxxx	D
42002	ac volts L2-L3	NA	xxxxx	D
42003	ac volts L1-L3	NA	xxxxx	D
42004	ac amps L1	NA	xxxxx	D
42005	ac amps L2	NA	xxxxx	D
42006	ac amps L3	NA	xxxxx	D
42007	System pressure (psi or bars)	NA	xxxx.x or xxx.xx*	D
42008	Suction pressure (psi or bars)	NA	xxxx.x or xxx.xx*	D
42009	VFD speed (HZ)	NA	xxxxx	D
42010	Aux input #1, 0–100%	NA	xxxxx	D
42011	Aux input #2, 0–100%	NA	xxxxx	D
	Modbus Register Description Alarm On State			
42012	Alarm register #1	NA		D
	Minimum run delay timing high	NA	bit-0	D
	Accelerate delay timing high	NA	bit-1	D
	High zone delay timing high	NA	bit-2	D
	Sequence delay timing high	NA	bit-3	D
	Load shed active high	NA	bit-4	D
	Low discharge pressure alarm high	NA	bit-5	D
	Low suction alarm high	NA	bit-6	D
	Low suction shutdown active high	NA	bit-7	D
	System over pressure alarm high	NA	bit-8	D
	Restart delay timing high	NA	bit-9	D
	Weekly test demand active high	NA	bit-10	D
	Failure to start alarm high	NA	bit-11	D
	Lockout active high	NA	bit-12	D
	VFD ready high	NA	bit-13	D
	VFD forward command active high	NA	bit-14	D
	VFD reverse command active high	NA	bit-15	D
42013	Alarm register #2	NA		D
	Pressure start demand high	NA	bit-0	D
	Remote start demand high	NA	bit-1	D
	Deluge start demand high	NA	bit-2	D
	Weekly test start demand high	NA	bit-3	D
	Local start PB demand high	NA	bit-4	D
	Manual operator start demand high	NA	bit-5	D
	Audible alarm high	NA	bit-6	D

Modbus Register	Registry Use	Flow (%)	Format	Data Type
	Weekly/monthly test setup error high	NA	bit-7	D
	Minimum run timed out high	NA	bit-8	D
	Load shed delay timing high	NA	bit-9	D
	Mod SP1/2 power OK high	NA	bit-10	D
	Mod SP1/2 power loss start high	NA	bit-11	D
	Pressure transducer fault high	NA	bit-12	D
	Pressure transducer test OK high	NA	bit-13	D
	VFD failure high	NA	bit-14	D
	Controller in bypass mode, soft start/VFD only high	NA	bit-15	D
42014	Alarm register #3	NA		D
	Timed trip timing high	NA	bit-0	D
	Motor running high	NA	bit-1	D
	Motor overload alarm high	NA	bit-2	D
	Motor single phasing alarm high	NA	bit-3	D
	Phase reversal alarm high	NA	bit-4	D
	ac voltage low alarm high	NA	bit-5	D
	Phase smart protection lockout high	NA	bit-6	D
	Transfer switch in normal position high	NA	bit-7	D
	Transfer switch in ~~emergency~~ alternate power position high	NA	bit-8	D
	ac power available high	NA	bit-9	D
	Transfer switch normal power available high	NA	bit-10	D
	Transfer switch ~~emergency~~ alternate power available high	NA	bit-11	D
	Emergency CB open high	NA	bit-12	D
	CB tripped high	NA	bit-13	D
	Engine start signal low	NA	bit-14	D
	Unused	NA	bit-15	D
42015	Alarm register #4	NA		D
	Pump trouble #1 input high	NA	bit-0	D
	Pump trouble #2 input high	NA	bit-1	D
	Pump trouble #3 input high	NA	bit-2	D
	Pump trouble #4 input high	NA	bit-3	D
	Pump trouble #5 input high	NA	bit-4	D
	Pump trouble #6 input high	NA	bit-5	D
	Pump trouble #7 input high	NA	bit-6	D
	Pump trouble #8 input high	NA	bit-7	D
	Pump trouble group alarm high	NA	bit-8	D
	Unused	NA	bit-9-15	D
	Other Information	NA		D
42016	Start count	NA	xxxxx	D
42017	Run time hours	NA	xxxx.x	D
42018	Hours since last run	NA	xxxx.x	D

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42019	Hours since last DVS test	NA	xxxx.x	D
42020-42029	Unused	NA		
	Pump Curve Data			
	Present Data	**% Flow**		
42030	Measured flow (gpm or L/min)	0	xxxxx	S
42031	Year (4-digit)	0	xxxxx	S
42032	Month 1–12	0	xxxxx	S
42033	Day 1–31	0	xxxxx	S
42034	SYS – SUCT pressure (psi or bar)	0	xxxx.x or xxx.xx*	S
42035	rpm	0	xxxxx	S
42036	Suction pressure (psi or bar)	0	xxxx.x or xxx.xx*	S
42037	System pressure (psi or bar)	0	xxxx.x or xxx.xx*	S
42038	Amps L1	0	xxxxx	S
42039	Amps L2	0	xxxxx	S
42040	Amps L3	0	xxxxx	S
42041	Volts L1-L2	0	xxxxx	S
42042	Volts L2-L3	0	xxxxx	S
42043	Volts L1-L3	0	xxxxx	S
42044	Measured flow (gpm or L/min)	25	xxxxx	S
42045	Year (4-digit)	25	xxxxx	S
42046	Month 1–12	25	xxxxx	S
42047	Day 1–31	25	xxxxx	S
42048	SYS – SUCT pressure (psi or bar)	25	xxxx.x or xxx.xx*	S
42049	rpm	25	xxxxx	S
42050	Suction pressure (psi or bar)	25	xxxx.x or xxx.xx*	S
42051	System pressure (psi or bar)	25	xxxx.x or xxx.xx*	S
42052	Amps L1	25	xxxxx	S
42053	Amps L2	25	xxxxx	S
42054	Amps L3	25	xxxxx	S
42055	Volts L1-L2	25	xxxxx	S
42056	Volts L2-L3	25	xxxxx	S
42057	Volts L1-L3	25	xxxxx	S
42058	Measured flow (gpm or L/min)	50	xxxxx	S
42059	Year (4-digit)	50	xxxxx	S
42060	Month 1–12	50	xxxxx	S
42061	Day 1–31	50	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42062	SYS – SUCT pressure (psi or bar)	50	xxxx.x or xxx.xx*	S
42063	rpm	50	xxxxx	S
42064	Suction pressure (psi or bar)	50	xxxx.x or xxx.xx*	S
42065	System pressure (psi or bar)	50	xxxx.x or xxx.xx*	S
42066	Amps L1	50	xxxxx	S
42067	Amps L2	50	xxxxx	S
42068	Amps L3	50	xxxxx	S
42069	Volts L1-L2	50	xxxxx	S
42070	Volts L2-L3	50	xxxxx	S
42071	Volts L1-L3	50	xxxxx	S
42072	Measured flow (gpm or L/min)	75	xxxxx	S
42073	Year (4-digit)	75	xxxxx	S
42074	Month 1–12	75	xxxxx	S
42075	Day 1–31	75	xxxxx	S
42076	SYS – SUCT pressure (psi or bar)	75	xxxx.x or xxx.xx*	S
42077	rpm	75	xxxxx	S
42078	Suction pressure (psi or bar)	75	xxxx.x or xxx.xx*	S
42079	System pressure (psi or bar)	75	xxxx.x or xxx.xx*	S
42080	Amps L1	75	xxxxx	S
42081	Amps L2	75	xxxxx	S
42082	Amps L3	75	xxxxx	S
42083	Volts L1-L2	75	xxxxx	S
42084	Volts L2-L3	75	xxxxx	S
42085	Volts L1-L3	75	xxxxx	S
42086	Measured flow (gpm or L/min)	100	xxxxx	S
42087	Year (4-digit)	100	xxxxx	S
42088	Month 1–12	100	xxxxx	S
42089	Day 1–31	100	xxxxx	S
42090	SYS – SUCT pressure (psi or bar)	100	xxxx.x or xxx.xx*	S
42091	rpm	100	xxxxx	S
42092	Suction pressure (psi or bar)	100	xxxx.x or xxx.xx*	S
42093	System pressure (psi or bar)	100	xxxx.x or xxx.xx*	S
42094	Amps L1	100	xxxxx	S
42095	Amps L2	100	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42096	Amps L3	100	xxxxx	S
42097	Volts L1-L2	100	xxxxx	S
42098	Volts L2-L3	100	xxxxx	S
42099	Volts L1-L3	100	xxxxx	S
42100	Measured flow (gpm or L/min)	125	xxxxx	S
42101	Year (4-digit)	125	xxxxx	S
42102	Month 1–12	125	xxxxx	S
42103	Day 1–31	125	xxxxx	S
42104	SYS – SUCT pressure (psi or bar)	125	xxxx.x or xxx.xx*	S
42105	rpm	125	xxxxx	S
42106	Suction pressure (psi or bar)	125	xxxx.x or xxx.xx*	S
42107	System pressure (psi or bar)	125	xxxx.x or xxx.xx*	S
42108	Amps L1	125	xxxxx	S
42109	Amps L2	125	xxxxx	S
42110	Amps L3	125	xxxxx	S
42111	Volts L1-L2	125	xxxxx	S
42112	Volts L2-L3	125	xxxxx	S
42113	Volts L1-L3	125	xxxxx	S
42114	Measured flow (gpm or L/min)	150	xxxxx	S
42115	Year (4-digit)	150	xxxxx	S
42116	Month 1–12	150	xxxxx	S
42117	Day 1–31	150	xxxxx	S
42118	SYS – SUCT pressure (psi or bar)	150	xxxx.x or xxx.xx*	S
42119	rpm	150	xxxxx	S
42120	Suction pressure (psi or bar)	150	xxxx.x or xxx.xx*	S
42121	System pressure (psi or bar)	150	xxxx.x or xxx.xx*	S
42122	Amps L1	150	xxxxx	S
42123	Amps L2	150	xxxxx	S
42124	Amps L3	150	xxxxx	S
42125	Volts L1-L2	150	xxxxx	S
42126	Volts L2-L3	150	xxxxx	S
42127	Volts L1-L3	150	xxxxx	S
	Previous Data	**%Flow**		
42128	Measured flow (gpm or L/min)	0	xxxxx	S
42129	Year (4-digit)	0	xxxxx	S
42130	Month 1–12	0	xxxxx	S
42131	Day 1–31	0	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42132	SYS – SUCT pressure (psi or bar)	0	xxxx.x or xxx.xx*	S
42133	rpm	0	xxxxx	S
42134	Suction pressure (psi or bar)	0	xxxx.x or xxx.xx*	S
42135	System pressure (psi or bar)	0	xxxx.x or xxx.xx*	S
42136	Amps L1	0	xxxxx	S
42137	Amps L2	0	xxxxx	S
42138	Amps L3	0	xxxxx	S
42139	Volts L1-L2	0	xxxxx	S
42140	Volts L2-L3	0	xxxxx	S
42141	Volts L1-L3	0	xxxxx	S
42142	Measured flow (gpm or L/min)	25	xxxxx	S
42143	Year (4-digit)	25	xxxxx	S
42144	Month 1–12	25	xxxxx	S
42145	Day 1–31	25	xxxxx	S
42146	SYS – SUCT Pressure (psi or bar)	25	xxxx.x or xxx.xx*	S
42147	rpm	25	xxxxx	S
42148	Suction pressure (psi or bar)	25	xxxx.x or xxx.xx*	S
42149	System pressure (psi or bar)	25	xxxx.x or xxx.xx*	S
42150	Amps L1	25	xxxxx	S
42151	Amps L2	25	xxxxx	S
42152	Amps L3	25	xxxxx	S
42153	Volts L1-L2	25	xxxxx	S
42154	Volts L2-L3	25	xxxxx	S
42155	Volts L1-L3	25	xxxxx	S
42156	Measured flow (gpm or L/min)	50	xxxxx	S
42157	Year (4-digit)	50	xxxxx	S
42158	Month 1–12	50	xxxxx	S
42159	Day 1–31	50	xxxxx	S
42160	SYS – SUCT pressure (psi or bar)	50	xxxx.x or xxx.xx*	S
42161	rpm	50	xxxxx	S
42162	Suction pressure (psi or bar)	50	xxxx.x or xxx.xx*	S
42163	System pressure (psi or bar)	50	xxxx.x or xxx.xx*	S
42164	Amps L1	50	xxxxx	S
42165	Amps L2	50	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42166	Amps L3	50	xxxxx	S
42167	Volts L1-L2	50	xxxxx	S
42168	Volts L2-L3	50	xxxxx	S
42169	Volts L1-L3	50	xxxxx	S
42170	Measured flow (gpm or L/min)	75	xxxxx	S
42171	Year (4-digit)	75	xxxxx	S
42172	Month 1–12	75	xxxxx	S
42173	Day 1–31	75	xxxxx	S
42174	SYS – SUCT pressure (psi or bar)	75	xxxx.x or xxx.xx*	S
42175	rpm	75	xxxxx	S
42176	Suction pressure (psi or bar)	75	xxxx.x or xxx.xx*	S
42177	System pressure (psi or bar)	75	xxxx.x or xxx.xx*	S
42178	Amps L1	75	xxxxx	S
42179	Amps L2	75	xxxxx	S
42180	Amps L3	75	xxxxx	S
42181	Volts L1-L2	75	xxxxx	S
42182	Volts L2-L3	75	xxxxx	S
42183	Volts L1-L3	75	xxxxx	S
42184	Measured flow (gpm or L/min)	100	xxxxx	S
42185	Year (4-digit)	100	xxxxx	S
42186	Month 1–12	100	xxxxx	S
42187	Day 1–31	100	xxxxx	S
42188	SYS – SUCT pressure (psi or bar)	100	xxxx.x or xxx.xx*	S
42189	rpm	100	xxxxx	S
42190	Suction pressure (psi or bar)	100	xxxx.x or xxx.xx*	S
42191	System pressure (psi or bar)	100	xxxx.x or xxx.xx*	S
42192	Amps L1	100	xxxxx	S
42193	Amps L2	100	xxxxx	S
42194	Amps L3	100	xxxxx	S
42195	Volts L1-L2	100	xxxxx	S
42196	Volts L2-L3	100	xxxxx	S
42197	Volts L1-L3	100	xxxxx	S
42198	Measured flow – (gpm or L/min)	125	xxxxx	S
42199	Year (4-digit)	125	xxxxx	S
42200	Month 1–12	125	xxxxx	S
42201	Day 1–31	125	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42202	SYS – SUCT pressure (psi or bar)	125	xxxx.x or xxx.xx*	S
42203	rpm	125	xxxxx	S
42204	Suction pressure (psi or bar)	125	xxxx.x or xxx.xx*	S
42205	System pressure (psi or bar)	125	xxxx.x or xxx.xx*	S
42206	Amps L1	125	xxxxx	S
42207	Amps L2	125	xxxxx	S
42208	Amps L3	125	xxxxx	S
42209	Volts L1-L2	125	xxxxx	S
42210	Volts L2-L3	125	xxxxx	S
42211	Volts L1-L3	125	xxxxx	S
42212	Measured flow (gpm or L/min)	150	xxxxx	S
42213	Year (4-digit)	150	xxxxx	S
42214	Month 1–12	150	xxxxx	S
42215	Day 1–31	150	xxxxx	S
42216	SYS – SUCT pressure (psi or bar)	150	xxxx.x or xxx.xx*	S
42217	rpm	150	xxxxx	S
42218	Suction pressure (psi or bar)	150	xxxx.x or xxx.xx*	S
42219	System pressure (psi or bar)	150	xxxx.x or xxx.xx*	S
42220	Amps L1	150	xxxxx	S
42221	Amps L2	150	xxxxx	S
42222	Amps L3	150	xxxxx	S
42223	Volts L1-L2	150	xxxxx	S
42224	Volts L2-L3	150	xxxxx	S
42225	Volts L1-L3	150	xxxxx	S
	Acceptance Data	**% Flow**		
42226	Measured flow (gpm or L/min)	0	xxxxx	P
42227	Year (4-digit)	0	xxxxx	P
42228	Month 1–12	0	xxxxx	P
42229	Day 1–31	0	xxxxx	P
42230	SYS – SUCT pressure (psi or bar)	0	xxxx.x or xxx.xx*	P
42231	rpm	0	xxxxx	P
42232	Suction pressure (psi or bar)	0	xxxx.x or xxx.xx*	P
42233	System pressure (psi or bar)	0	xxxx.x or xxx.xx*	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42234	Amps L1	0	xxxxx	P
42235	Amps L2	0	xxxxx	P
42236	Amps L3	0	xxxxx	P
42237	Volts L1-L2	0	xxxxx	P
42238	Volts L2-L3	0	xxxxx	P
42239	Volts L1-L3	0	xxxxx	P
42240	Measured flow (gpm or L/min)	25	xxxxx	P
42241	Year (4-digit)	25	xxxxx	P
42242	Month 1–12	25	xxxxx	P
42243	Day 1–31	25	xxxxx	P
42244	SYS – SUCT pressure (psi or bar)	25	xxxx.x or xxx.xx*	P
42245	rpm	25	xxxxx	P
42246	Suction pressure (psi or bar)	25	xxxx.x or xxx.xx*	P
42247	System pressure (psi or bar)	25	xxxx.x or xxx.xx*	P
42248	Amps L1	25	xxxxx	P
42249	Amps L2	25	xxxxx	P
42250	Amps L3	25	xxxxx	P
42251	Volts L1-L2	25	xxxxx	P
42252	Volts L2-L3	25	xxxxx	P
42253	Volts L1-L3	25	xxxxx	P
42254	Measured flow (gpm or L/min)	50	xxxxx	P
42255	Year (4-digit)	50	xxxxx	P
42256	Month 1–12	50	xxxxx	P
42257	Day 1–31	50	xxxxx	P
42258	SYS – SUCT pressure (psi or bar)	50	xxxx.x or xxx.xx*	P
42259	rpm	50	xxxxx	P
42260	Suction pressure (psi or bar)	50	xxxx.x or xxx.xx*	P
42261	System pressure (psi or bar)	50	xxxx.x or xxx.xx*	P
42262	Amps L1	50	xxxxx	P
42263	Amps L2	50	xxxxx	P
42264	Amps L3	50	xxxxx	P
42265	Volts L1-L2	50	xxxxx	P
42266	Volts L2-L3	50	xxxxx	P
42267	Volts L1-L3	50	xxxxx	P
42268	Measured flow (gpm or L/min)	75	xxxxx	P
42269	Year (4-digit)	75	xxxxx	P
42270	Month 1–12	75	xxxxx	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42271	Day 1–31	75	xxxxx	P
42272	SYS – SUCT pressure (psi or bar)	75	xxxx.x or xxx.xx*	P
42273	RPM	75	xxxxx	P
42274	Suction pressure (psi or bar)	75	xxxx.x or xxx.xx*	P
42275	System pressure (psi or bar)	75	xxxx.x or xxx.xx*	P
42276	Amps L1	75	xxxxx	P
42277	Amps L2	75	xxxxx	P
42278	Amps L3	75	xxxxx	P
42279	Volts L1-L2	75	xxxxx	P
42280	Volts L2-L3	75	xxxxx	P
42281	Volts L1-L3	75	xxxxx	P
42282	Measured flow (gpm or L/min)	100	xxxxx	P
42283	Year (4-digit)	100	xxxxx	P
42284	Month 1–12	100	xxxxx	P
42285	Day 1–31	100	xxxxx	P
42286	SYS – SUCT pressure (psi or bar)	100	xxxx.x or xxx.xx*	P
42287	rpm	100	xxxxx	P
42288	Suction pressure (psi or bar)	100	xxxx.x or xxx.xx*	P
42289	System pressure (psi or bar)	100	xxxx.x or xxx.xx*	P
42290	Amps L1	100	xxxxx	P
42291	Amps L2	100	xxxxx	P
42292	Amps L3	100	xxxxx	P
42293	Volts L1	100	xxxxx	P
42294	Volts L2	100	xxxxx	P
42295	Volts L3	100	xxxxx	P
42296	Measured flow (gpm or L/min)	125	xxxxx	P
42297	Year (4-digit)	125	xxxxx	P
42298	Month 1–12	125	xxxxx	P
42299	Day 1–31	125	xxxxx	P
42300	SYS – SUCT pressure (psi or bar)	125	xxxx.x or xxx.xx*	P
42301	rpm	125	xxxxx	P
42302	Suction pressure (psi or bar)	125	xxxx.x or xxx.xx*	P
42303	System pressure (psi or bar)	125	xxxx.x or xxx.xx*	P
42304	Amps L1	125	xxxxx	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42305	Amps L2	125	xxxxx	P
42306	Amps L3	125	xxxxx	P
42307	Volts L1-L2	125	xxxxx	P
42308	Volts L2-L3	125	xxxxx	P
42309	Volts L1-L3	125	xxxxx	P
42310	Measured flow (gpm or L/min)	150	xxxxx	P
42311	Year (4-digit)	150	xxxxx	P
42312	Month 1–12	150	xxxxx	P
42313	Day 1–31	150	xxxxx	P
42314	SYS – SUCT pressure (psi or bar)	150	xxxx.x or xxx.xx*	P
42315	rpm	150	xxxxx	P
42316	Suction pressure (psi or bar)	150	xxxx.x or xxx.xx*	P
42317	System pressure (psi or bar)	150	xxxx.x or xxx.xx*	P
42318	Amps L1	150	xxxxx	P
42319	Amps L2	150	xxxxx	P
42320	Amps L3	150	xxxxx	P
42321	Volts L1-L2	150	xxxxx	P
42322	Volts L2-L3	150	xxxxx	P
42323	Volts L1-L3	150	xxxxx	P
	Jockey Pump Operation			
42500	Last jockey pump monitoring reset date (year)	NA	xxxxx	S
42501	Last jockey pump monitoring reset date (month)	NA	xxxxx	S
42502	Last jockey pump monitoring reset date (day)	NA	xxxxx	S
42503	Last jockey pump monitoring reset time (hr)	NA	xxxxx	S
42504	Last jockey pump monitoring reset time (min)	NA	xxxxx	S
42505	Last jockey pump monitoring reset time (sec)	NA	xxxxx	S
42506	Total number of starts (since reset)	NA	xxxxx	S
42507	Total jockey pump run time (min. since last reset)	NA	xxxxx	S
42508	Jockey pump start pressure (most recent)	NA	xxxxx	S
42509	Jockey pump stop pressure	NA	xxxxx	S
42510	Most recent run time (sec)	NA	xxxxx	S

NA: Not applicable. P: Permanent. S: Static. D: Dynamic

*One decimal place assumed if psi and two decimal places assumed if bar.

Table C.8.2.9.1(b) Recommended Standardized Diesel Controller Modbus Register Definitions

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42001	Battery #1 volts	NA	Xxxxx*	D
42002	Battery #2 volts	NA	Xxxxx*	D
42003	Unused	NA		D

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42004	Battery #1 amps	NA	Xxxxx*	D
42005	Battery #2 amps	NA	Xxxxx*	D
42006	Unused	NA		D
42007	System pressure (psi or bars)	NA	xxxx.x or xxx.xx†	D
42008	Suction pressure (psi or bars)	NA	xxxx.x or xxx.xx†	D
42009	Unused	NA		D
42010	Aux. Input #1 user defined	NA	xxxxx	D
42011	Aux. Input #2 user defined	NA	xxxxx	D
	Modbus Register Description Alarm on State	NA		
42012	Alarm register #1	NA		D
	Minimum run delay timing high	NA	bit-0	D
	Power fail start delay timing high	NA	bit-1	D
	High zone delay timing high	NA	bit-2	D
	Sequence delay timing high	NA	bit-3	D
	Engine running high	NA	bit-4	D
	High water temp alarm high	NA	bit-5	D
	Low suction alarm high	NA	bit-6	D
	Low suction shutdown active high	NA	bit-7	D
	System over pressure alarm high	NA	bit-8	D
	Overspeed alarm high	NA	bit-9	D
	Weekly test demand active high	NA	bit-10	D
	Failure to start alarm high	NA	bit-11	D
	Lockout active high	NA	bit-12	D
	Crank on battery #1 high	NA	bit-13	D
	Crank on battery #2 high	NA	bit-14	D
	Resting high	NA	bit-15	D
42013	Alarm register #2	NA		D
	Pressure start demand high	NA	bit-0	D
	Remote start demand high	NA	bit-1	D
	Deluge start demand high	NA	bit-2	D
	Weekly test start demand high	NA	bit-3	D
	Start contactor #1 fail high	NA	bit-4	D
	Start contactor #2 fail high	NA	bit-5	D
	Audible alarm high	NA	bit-6	D
	Weekly/monthly test setup error high	NA	bit-7	D
	Minimum run timed out high	NA	bit-8	D
	Pump demand high	NA	bit-9	D
	Control switch in auto high	NA	bit-10	D
	Control switch in manual high	NA	bit-11	D
	Pressure transducer fault high	NA	bit-12	D

Modbus Register	Registry Use	Flow (%)	Format	Data Type
	Pressure transducer test OK high	NA	bit-13	D
	ac power fail start high	NA	bit-14	D
	Low discharge pressure alarm high	NA	bit-15	D
42014	Alarm register #3	NA		D
	Battery #1 failure alarm high	NA	bit-0	D
	Battery #2 failure alarm high	NA	bit-1	D
	Pump trouble group alarm high	NA	bit-2	D
	System trouble #1 alarm high	NA	bit-3	D
	ac power fail alarm high	NA	bit-4	D
	Battery #1 over voltage alarm high	NA	bit-5	D
	Battery #2 over voltage alarm high	NA	bit-6	D
	Term 301, ECMS high	NA	bit-7	D
	Term 302, FIM high	NA	bit-8	D
	Term 303, ECMW high	NA	bit-9	D
	Term 304, ECMF high	NA	bit-10	D
	Term 310, RWHIT high	NA	bit-11	D
	Term 311, CRWCLS high	NA	bit-12	D
	Term 312, LET high	NA	bit-13	D
	Low oil pressure alarm high	NA	bit-14	D
	Unused	NA	bit-15	D
42015	Alarm register #4	NA		D
	Pump trouble #1 input high	NA	bit-0	D
	Pump trouble #2 input high	NA	bit-1	D
	Pump trouble #3 input high	NA	bit-2	D
	Pump trouble #4 input high	NA	bit-3	D
	Pump trouble #5 input high	NA	bit-4	D
	Pump trouble #6 input high	NA	bit-5	D
	Pump trouble #7 input high	NA	bit-6	D
	Pump trouble #8 input high	NA	bit-7	D
	Battery #1 in equalize high	NA	bit-8	D
	Battery #2 in equalize high	NA	bit-9	D
	Battery #1 OK high	NA	bit-10	D
	Battery #2 OK high	NA	bit-11	D
	Charger #1 fail alarm high	NA	bit-12	D
	Charger #2 fail alarm high	NA	bit-13	D
	System trouble #2 alarm high	NA	bit-14	D
	Unused	NA	bit-15	D
	Other Information	NA		D
42016	Start count	NA	xxxxx	D
42017	Run time hours	NA	xxxxx	D
42018	Hours since last run	NA	xxxx.x*	D
42019	Hours since last DVS test	NA	xxxx.x*	D

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42020-42029	Unused	NA		
	Pump Curve Data			
	Present Data	**% Flow**		
42030	Measured flow (gpm or L/min)	0	xxxxx	S
42031	Year (4-digit)	0	xxxxx	S
42032	Month 1–12	0	xxxxx	S
42033	Day 1–31	0	xxxxx	S
42034	SYS – SUCT pressure (psi or bar)	0	xxxx.x or xxx.xx†	S
42035	RPM	0	xxxxx	S
42036	Suction pressure (psi or bar)	0	xxxx.x or xxx.xx†	S
42037	System pressure (psi or bar)	0	xxxx.x or xxx.xx†	S
42038	Amps battery 1	0	xxxxx	S
42039	Amps battery 2	0	xxxxx	S
42040	Volts battery 1	0	xxxxx	S
42041	Volts battery 2	0	xxxxx	S
42042	Unused	0	xxxxx	S
42043	Unused	0	xxxxx	S
42044	Measured flow (gpm or L/min)	25	xxxxx	S
42045	Year (4-digit)	25	xxxxx	S
42046	Month 1–12	25	xxxxx	S
42047	Day 1–31	25	xxxxx	S
42048	SYS – SUCT pressure (psi or bar)	25	xxxx.x or xxx.xx†	S
42049	rpm	25	xxxxx	S
42050	Suction pressure (psi or bar)	25	xxxx.x or xxx.xx†	S
42051	System pressure (psi or bar)	25	xxxx.x or xxx.xx†	S
42052	Amps battery 1	25	xxxxx	S
42053	Amps battery 2	25	xxxxx	S
42054	Volts battery 1	25	xxxxx	S
42055	Volts battery 2	25	xxxxx	S
42056	Unused	25	xxxxx	S
42057	Unused	25	xxxxx	S
42058	Measured flow (gpm or L/min)	50	xxxxx	S
42059	Year (4-digit)	50	xxxxx	S
42060	Month 1–12	50	xxxxx	S
42061	Day 1–31	50	xxxxx	S
42062	SYS – SUCT pressure (psi or bar)	50	xxxx.x or xxx.xx†	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42063	rpm	50	xxxxx	S
42064	Suction pressure (psi or bar)	50	xxxx.x or xxx.xx†	S
42065	System pressure (psi or bar)	50	xxxx.x or xxx.xx†	S
42066	Amps battery 1	50	xxxxx	S
42067	Amps battery 2	50	xxxxx	S
42068	Volts battery 1	50	xxxxx	S
42069	Volts battery 2	50	xxxxx	S
42070	Unused	50	xxxxx	S
42071	Unused	50	xxxxx	S
42072	Measured flow (gpm or L/min)	75	xxxxx	S
42073	Year (4-digit)	75	xxxxx	S
42074	Month 1–12	75	xxxxx	S
42075	Day 1–31	75	xxxxx	S
42076	SYS – SUCT pressure (psi or bar)	75	xxxx.x or xxx.xx†	S
42077	rpm	75	xxxxx	S
42078	Suction pressure (psi or bar)	75	xxxx.x or xxx.xx†	S
42079	System Pressure (psi or bar)	75	xxxx.x or xxx.xx†	S
42080	Amps battery 1	75	xxxxx	S
42081	Amps battery 2	75	xxxxx	S
42082	Volts battery 1	75	xxxxx	S
42083	Volts battery 2	75	xxxxx	S
42084	Unused	75	xxxxx	S
42085	Unused	75	xxxxx	S
42086	Measured flow (gpm or L/min)	100	xxxxx	S
42087	Year (4-digit)	100	xxxxx	S
42088	Month 1–12	100	xxxxx	S
42089	Day 1–31	100	xxxxx	S
42090	SYS – SUCT pressure (psi or bar)	100	xxxx.x or xxx.xx†	S
42091	rpm	100	xxxxx	S
42092	Suction pressure (psi or bar)	100	xxxx.x or xxx.xx†	S
42093	System pressure (psi or bar)	100	xxxx.x or xxx.xx†	S
42094	Amps battery 1	100	xxxxx	S
42095	Amps battery 2	100	xxxxx	S
42096	Volts battery 1	100	xxxxx	S
42097	Volts battery 2	100	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42098	Unused	100	xxxxx	S
42099	Unused	100	xxxxx	S
42100	Measured flow (gpm or L/min)	125	xxxxx	S
42101	Year (4-digit)	125	xxxxx	S
42102	Month 1–12	125	xxxxx	S
42103	Day 1–31	125	xxxxx	S
42104	SYS – SUCT pressure (psi or bar)	125	xxxx.x or xxx.xx†	S
42105	rpm	125	xxxxx	S
42106	Suction pressure (psi or bar)	125	xxxx.x or xxx.xx†	S
42107	System pressure (psi or bar)	125	xxxx.x or xxx.xx†	S
42108	Amps battery 1	125	xxxxx	S
42109	Amps battery 2	125	xxxxx	S
42110	Volts battery 1	125	xxxxx	S
42111	Volts battery 2	125	xxxxx	S
42112	Unused	125	xxxxx	S
42113	Unused	125	xxxxx	S
42114	Measured flow (gpm or L/min)	150	xxxxx	S
42115	Year (4-digit)	150	xxxxx	S
42116	Month 1–12	150	xxxxx	S
42117	Day 1–31	150	xxxxx	S
42118	SYS – SUCT pressure (psi or bar)	150	xxxx.x or xxx.xx†	S
42119	rpm	150	xxxxx	S
42120	Suction pressure (psi or bar)	150	xxxx.x or xxx.xx†	S
42121	System pressure (psi or bar)	150	xxxx.x or xxx.xx†	S
42122	Amps battery 1	150	xxxxx	S
42123	Amps battery 2	150	xxxxx	S
42124	Volts battery 1	150	xxxxx	S
42125	Volts battery 2	150	xxxxx	S
42126	Unused	150	xxxxx	S
42127	Unused	150	xxxxx	S
	Previous Data	**%FLOW**		
42128	Measured flow (gpm or L/min)	0	xxxxx	S
42129	Year (4-digit)	0	xxxxx	S
42130	Month 1–12	0	xxxxx	S
42131	Day 1–31	0	xxxxx	S
42132	SYS – SUCT pressure (psi or bar)	0	xxxx.x or xxx.xx†	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42133	rpm	0	xxxxx	S
42134	Suction pressure (psi or bar)	0	xxxx.x or xxx.xx†	S
42135	System pressure (psi or bar)	0	xxxx.x or xxx.xx†	S
42136	Amps battery 1	0	xxxxx	S
42137	Amps battery 2	0	xxxxx	S
42138	Volts battery 1	0	xxxxx	S
42139	Volts battery 2	0	xxxxx	S
42140	Unused	0	xxxxx	S
42141	Unused	0	xxxxx	S
42142	Measured flow (gpm or L/min)	25	xxxxx	S
42143	Year (4-digit)	25	xxxxx	S
42144	Month 1–12	25	xxxxx	S
42145	Day 1–31	25	xxxxx	S
42146	SYS – SUCT pressure (psi or bar)	25	xxxx.x or xxx.xx†	S
42147	rpm	25	xxxxx	S
42148	Suction pressure (psi or bar)	25	xxxx.x or xxx.xx†	S
42149	System pressure (psi or bar)	25	xxxx.x or xxx.xx†	S
42150	Amps battery 1	25	xxxxx	S
42151	Amps battery 2	25	xxxxx	S
42152	Volts battery 1	25	xxxxx	S
42153	Volts battery 2	25	xxxxx	S
42154	Unused	25	xxxxx	S
42155	Unused	25	xxxxx	S
42156	Measured flow (gpm or L/min)	50	xxxxx	S
42157	Year (4-digit)	50	xxxxx	S
42158	Month 1–12	50	xxxxx	S
42159	Day 1–31	50	xxxxx	S
42160	SYS – SUCT pressure (psi or bar)	50	xxxx.x or xxx.xx†	S
42161	rpm	50	xxxxx	S
42162	Suction pressure (psi or bar)	50	xxxx.x or xxx.xx†	S
42163	System pressure (psi or bar)	50	xxxx.x or xxx.xx†	S
42164	Amps battery 1	50	xxxxx	S
42165	Amps battery 2	50	xxxxx	S
42166	Volts battery 1	50	xxxxx	S
42167	Volts battery 2	50	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42168	Unused	50	xxxxx	S
42169	Unused	50	xxxxx	S
42170	Measured flow (gpm or L/min)	75	xxxxx	S
42171	Year (4-digit)	75	xxxxx	S
42172	Month 1– 12	75	xxxxx	S
42173	Day 1–31	75	xxxxx	S
42174	SYS – SUCT pressure (psi or bar)	75	xxxx.x or xxx.xx†	S
42175	rpm	75	xxxxx	S
42176	Suction pressure (psi or bar)	75	xxxx.x or xxx.xx†	S
42177	System pressure (psi or bar)	75	xxxx.x or xxx.xx†	S
42178	Amps battery 1	75	xxxxx	S
42179	Amps battery 2	75	xxxxx	S
42180	Volts battery 1	75	xxxxx	S
42181	Volts battery 2	75	xxxxx	S
42182	Unused	75	xxxxx	S
42183	Unused	75	xxxxx	S
42184	Measured flow (gpm or L/min)	100	xxxxx	S
42185	Year (4-digit)	100	xxxxx	S
42186	Month 1–12	100	xxxxx	S
42187	Day 1–31	100	xxxxx	S
42188	SYS – SUCT pressure (psi or bar)	100	xxxx.x or xxx.xx†	S
42189	rpm	100	xxxxx	S
42190	Suction pressure (psi or bar)	100	xxxx.x or xxx.xx†	S
42191	System pressure (psi or bar)	100	xxxx.x or xxx.xx†	S
42192	Amps battery 1	100	xxxxx	S
42193	Amps battery 2	100	xxxxx	S
42194	Volts battery 1	100	xxxxx	S
42195	Volts battery 2	100	xxxxx	S
42196	Unused	100	xxxxx	S
42197	Unused	100	xxxxx	S
42198	Measured flow (gpm or L/min)	125	xxxxx	S
42199	Year (4-digit)	125	xxxxx	S
42200	Month 1–12	125	xxxxx	S
42201	Day 1–31	125	xxxxx	S
42202	SYS – SUCT pressure (psi or bar)	125	xxxx.x or xxx.xx†	S
42203	rpm	125	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42204	Suction pressure (psi or bar)	125	xxxx.x or xxx.xx†	S
42205	System pressure (psi or bar)	125	xxxx.x or xxx.xx†	S
42206	Amps battery 1	125	xxxxx	S
42207	Amps battery 2	125	xxxxx	S
42208	Volts battery 1	125	xxxxx	S
42209	Volts battery 2	125	xxxxx	S
42210	Unused	125	xxxxx	S
42211	Unused	125	xxxxx	S
42212	Measured flow (gpm or L/min)	150	xxxxx	S
42213	Year (4-digit)	150	xxxxx	S
42214	Month 1–12	150	xxxxx	S
42215	Day 1–31	150	xxxxx	S
42216	SYS – SUCT pressure (psi or bar)	150	xxxx.x or xxx.xx†	S
42217	rpm	150	xxxxx	S
42218	Suction pressure (psi or bar)	150	xxxx.x or xxx.xx†	S
42219	System pressure (psi or bar)	150	xxxx.x or xxx.xx†	S
42220	Amps battery 1	150	xxxxx	S
42221	Amps battery 2	150	xxxxx	S
42222	Volts battery 1	150	xxxxx	S
42223	Volts battery 2	150	xxxxx	S
42224	Unused	150	xxxxx	S
42225	Unused	150	xxxxx	S
	Acceptance Data	**% FLOW**		
42226	Measured flow (gpm or L/min)	0	xxxxx	P
42227	Year (4-digit)	0	xxxxx	P
42228	Month 1–12	0	xxxxx	P
42229	Day 1–31	0	xxxxx	P
42230	SYS – SUCT pressure (psi or bar)	0	xxxx.x or xxx.xx†	P
42231	rpm	0	xxxxx	P
42232	Suction pressure (psi or bar)	0	xxxx.x or xxx.xx†	P
42233	System pressure (psi or bar)	0	xxxx.x or xxx.xx†	P
42234	Amps battery 1	0	xxxxx	P
42235	Amps battery 2	0	xxxxx	P
42236	Volts battery 1	0	xxxxx	P
42237	Volts battery 2	0	xxxxx	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42238	Unused	0	xxxxx	P
42239	Unused	0	xxxxx	P
42240	Measured flow (gpm or L/min)	25	xxxxx	P
42241	Year (4-digit)	25	xxxxx	P
42242	Month 1–12	25	xxxxx	P
42243	Day 1–31	25	xxxxx	P
42244	SYS – SUCT pressure (psi or bar)	25	xxxx.x or xxx.xx†	P
42245	rpm	25	xxxxx	P
42246	Suction pressure (psi or bar)	25	xxxx.x or xxx.xx†	P
42247	System pressure (psi or bar)	25	xxxx.x or xxx.xx†	P
42248	Amps battery 1	25	xxxxx	P
42249	Amps battery 2	25	xxxxx	P
42250	Volts battery 1	25	xxxxx	P
42251	Volts battery 2	25	xxxxx	P
42252	Unused	25	xxxxx	P
42253	Unused	25	xxxxx	P
42254	Measured flow (gpm or L/minM)	50	xxxxx	P
42255	Year (4-digit)	50	xxxxx	P
42256	Month 1–12	50	xxxxx	P
42257	Day 1–31	50	xxxxx	P
42258	SYS – SUCT pressure (psi or bar)	50	xxxx.x or xxx.xx†	P
42259	rpm	50	xxxxx	P
42260	Suction pressure (psi or bar)	50	xxxx.x or xxx.xx†	P
42261	System pressure (psi or bar)	50	xxxx.x or xxx.xx†	P
42262	Amps battery 1	50	xxxxx	P
42263	Amps battery 2	50	xxxxx	P
42264	Volts battery 1	50	xxxxx	P
42265	Volts battery 2	50	xxxxx	P
42266	Unused	50	xxxxx	P
42267	Unused	50	xxxxx	P
42268	Measured flow (gpm or L/min)	75	xxxxx	P
42269	Year (4-digit)	75	xxxxx	P
42270	Month 1–12	75	xxxxx	P
42271	Day 1–31	75	xxxxx	P
42272	SYS – SUCT pressure (psi or bar)	75	xxxx.x or xxx.xx†	P
42273	rpm	75	xxxxx	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42274	Suction pressure (psi or bar)	75	xxxx.x or xxx.xx†	P
42275	System pressure (psi or bar)	75	xxxx.x or xxx.xx†	P
42276	Amps battery 1	75	xxxxx	P
42277	Amps battery 2	75	xxxxx	P
42278	Volts battery 1	75	xxxxx	P
42279	Volts battery 2	75	xxxxx	P
42280	Unused	75	xxxxx	P
42281	Unused	75	xxxxx	P
42282	Measured flow (gpm or L/min)	100	xxxxx	P
42283	Year (4-digit)	100	xxxxx	P
42284	Month 1–12	100	xxxxx	P
42285	Day 1–31	100	xxxxx	P
42286	SYS – SUCT pressure (psi or bar)	100	xxxx.x or xxx.xx†	P
42287	rpm	100	xxxxx	P
42288	Suction pressure (psi or bar)	100	xxxx.x or xxx.xx†	P
42289	System pressure (psi or bar)	100	xxxx.x or xxx.xx†	P
42290	Amps battery 1	100	xxxxx	P
42291	Amps battery 2	100	xxxxx	P
42292	Volts battery 1	100	xxxxx	P
42293	Volts battery 2	100	xxxxx	P
42294	Unused	100	xxxxx	P
42295	Unused	100	xxxxx	P
42296	Measured flow (gpm or L/min)	125	xxxxx	P
42297	Year (4-digit)	125	xxxxx	P
42298	Month 1–12	125	xxxxx	P
42299	Day 1–31	125	xxxxx	P
42300	SYS – SUCT pressure (psi or bar)	125	xxxx.x or xxx.xx†	P
42301	rpm	125	xxxxx	P
42302	Suction pressure (psi or bar)	125	xxxx.x or xxx.xx†	P
42303	System pressure (psi or bar)	125	xxxx.x or xxx.xx†	P
42304	Amps battery 1	125	xxxxx	P
42305	Amps battery 2	125	xxxxx	P
42306	Volts battery 1	125	xxxxx	P
42307	Volts battery 2	125	xxxxx	P
42308	Unused	125	xxxxx	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
42309	Unused	125	xxxxx	P
42310	Measured flow (gpm or L/min)	150	xxxxx	P
42311	Year (4-digit)	150	xxxxx	P
42312	Month 1–12	150	xxxxx	P
42313	Day 1–31	150	xxxxx	P
42314	SYS – SUCT pressure (psi or bar)	150	xxxx.x or xxx.xx†	P
42315	rpm	150	xxxxx	P
42316	Suction pressure (psi or bar)	150	xxxx.x or xxx.xx†	P
42317	System pressure (psi or bar)	150	xxxx.x or xxx.xx†	P
42318	Amps battery 1	150	xxxxx	P
42319	Amps battery 2	150	xxxxx	P
42320	Volts battery 1	150	xxxxx	P
42321	Volts battery 2	150	xxxxx	P
42322	Unused	150	xxxxx	P
42323	Unused	150	xxxxx	P
	Jockey Pump Operation			
42500	Last jockey pump monitoring reset date (year)	NA	xxxxx	S
42501	Last jockey pump monitoring reset date (month)	NA	xxxxx	S
42502	Last jockey pump monitoring reset date (day)	NA	xxxxx	S
42503	Last jockey pump monitoring reset time (hr)	NA	xxxxx	S
42504	Last jockey pump monitoring reset time (min)	NA	xxxxx	S
42505	Last jockey pump monitoring reset time (sec)	NA	xxxxx	S
42506	Total number of starts (since reset)	NA	xxxxx	S
42507	Total jockey pump run time (minutes since last reset)	NA	xxxxx	S
42508	Jockey pump start pressure (most recent)	NA	xxxxx	S
42509	Jockey pump stop pressure	NA	xxxxx	S
42510	Most recent run time (sec)	NA	xxxxx	S

NA: Not applicable. P: Permanent. S: Static. D: Dynamic

*One decimal place assumed for battery voltage, amperes, and hours.

†One decimal place assumed if psi and two decimal place assumed if bar.

Table C.8.2.9.1(c) Recommended Additional Standardized Controller Modbus Register Definitions

Modbus Register	Registry Use	Flow (%)	Format	Data Type
	Basic Information (should be supplied by the fire pump package Integrator)			
43001	Recording units	NA	Xxxxx[a]	P
43002-43021	Fire pump type	NA	String(40)	P
43022	Rated flow	NA	xxxxx	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
43023	Rated pressure	NA	xxxxx	P
43024	Rated speed	NA	xxxxx	P
43025	Rated horsepower	NA	xxxxx	P
43026	Factory test pressure	NA	xxxxx	P
43027	Design net churn pressure	NA	xxxxx	P
43028	Design net 150% pressure	NA	xxxxx	P
43029	Pump start pressure	NA	xxxxx	S
43030	Pump reset pressure	NA	xxxxx	S
43031	Design suction pressure	NA	xxxxx	S
43032	Design discharge pressure	NA	xxxxx	S
43101-43120	Electric motor manufacturer	NA	String(40)	P
43121-43140	Electric motor type	NA	String(40)	P
43141-43160	Electric motor serial number	NA	String(40)	P
43161-43180	Electric motor model number	NA	String(40)	P
43181-43183	Electric motor date in service	NA	xxxxx	P
43184	Nominal system voltage	NA	xxxxx	P
43185	Electric motor rated horsepower	NA	xxxxx	P
43186	Electric motor rated speed	NA	xxxxx	P
43187	Motor rated FLA at the system nominal voltage	NA	xxxxx	P
43188	Motor service factor	NA	x.xxxx[b]	P
43189	Motor starting code	NA	ASCII	P
43190	Name plate full load amps	NA	xxxxx	P
43251-43270	Diesel engine manufacturer	NA	String(40)	P
43271-43290	Diesel engine serial number	NA	String(40)	P
43291-43310	Diesel engine model number	NA	String(40)	P
43311-43313	Diesel engine date in service	NA	xxxxx	P
43314	Diesel engine rated horsepower	NA	xxxxx	P
43315	Diesel engine rated speed	NA	xxxxx	P
43351-43370	Controller manufacturer	NA	String(40)	P
43371-43390	Controller type	NA	String(40)	P
43391-43410	Controller serial number	NA	String(40)	P
43411-43430	Controller model number	NA	String(40)	P
43431-43433	Controller date in service	NA	xxxxx	P
43501-43520	Jockey pump manufacturer	NA	String(40)	P
43521-43540	Jockey pump type	NA	String(40)	P
43541-43560	Jockey pump serial number	NA	String(40)	P
43561-43580	Jockey pump model number	NA	String(40)	P
43581-43583	Jockey pump date in service	NA	xxxxx	S
43584	Jockey pump horsepower	NA	xxxxx	P
43585	Jockey pump start pressure	NA	xxxxx	S
43586	Jockey pump reset pressure	NA	xxxxx	S
43651-43670	Jockey pump controller manufacturer	NA	String(40)	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
43671-43690	Jockey pump controller type	NA	String(40)	P
43691-43710	Jockey pump controller serial number	NA	String(40)	P
43711-43730	Jockey pump controller model number	NA	String(40)	P
43731-43733	Jockey pump controller date in service	NA	xxxxx	P
43801	Maximum system flow demand (at pump discharge flange)	NA	xxxxx	P
43802	Maximum system pressure demand (at pump discharge flange)	NA	xxxx.x or xxx.xx[c]	P
	Continuously Monitored Data	NA		
43851	Fire pump power status	NA	xxxxx	D
43852	Fire pump running status	NA	xxxxx	D
43853	Fire pump test running	NA	xxxxx	D
43854	Suction Pressure (psi or bar)	NA	xxxx.x or xxx.xx[c]	D
43855	System pressure (psi or bar)	NA	xxxx.x or xxx.xx[c]	D
43856	Pump discharge pressure (psi or bar)	NA	xxxx.x or xxx.xx[c]	D
43857	Water temperature in pump casing	NA	xxxxx	D
43858	Room temperature	NA	xxxxx	D
43859-43861	Last pump start date	NA	xxxxx	S
43862-43864	Last pump start time	NA	xxxxx	S
43865	Pressure at pump start	NA	xxxx.x or xxx.xx[c]	S
43866-43871	Type of start (1-automatic demand, 2-automatic test, 3-manual)	NA	xxxxx	S
43872-43874	Last pump shutdown date	NA	xxxxx	S
43875-43877	Last pump shutdown time	NA		
43878	System pressure at pump shutdown	NA	xxxx.x or xxx.xx[c]	S
43879	Type of shutdown (1-automatic demand, 2-automatic test, 3-manual, 4-overspeed, 5-other trouble)	NA	xxxxx	S
43880	Loss of power	NA	xxxxx	S
43881	Transfer of power	NA	xxxxx	S
43901	Fuel tank level (0-above 2/3, 1-below 2/3)	NA	xxxxx	S
43902	Fuel tank level (% full)	NA	xxx.xx[d]	
43903	Fuel maintenance system status	NA	xxxxx	S
	Nonflow Test Data Sets — 10 sets	NA		
43951-43953	Last nonflow monitoring reset date (day month year)	NA	xxxxx	S
43954-43956	Last nonflow monitoring reset time (hour(s) minutes seconds)	NA	xxxxx	
43957	Total number of nonflow tests during monitored period	NA	xxxxx	S
43958	Total pump test run time during monitored period (minutes)	NA	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
43959-43988	Nonflow test date start (day month year)	NA	xxxxx	S
43989-44018	Nonflow test time start (hr min sec)	NA	xxxxx	S
44019-44048	Nonflow test date end (day month year)	NA	xxxxx	S
44049-44078	Nonflow test time end (hr min sec)	NA	xxxxx	S
44079-44088	Nonflow test reference identifier	NA	xxxxx	S
44089-44098	Nonflow test data set reference identifier	NA	xxxxx	S
44099-44108	Nonflow test suction pressure (psi or bar)	NA	xxxx.x or xxx.xx[C]	S
44109-44118	Nonflow test system pressure (psi or bar)	NA	xxxx.x or xxx.xx[C]	S
44119-44128	Nonflow test pump discharge pressure (psi or bar)	NA	xxxx.x or xxx.xx[C]	S
44129-44138	Nonflow test net pressure (psi or bar)	NA	xxxx.x or xxx.xx[C]	S
44139-44148	Nonflow test water temperature in pump casing	NA	xxxxx	S
44149-44158	Nonflow test room temperature	NA	xxxxx	S
44159-44188	Nonflow test pump start date (day month year)	NA	xxxxx	S
44189-44218	Nonflow test pump start time (hr min sec)	NA	xxxxx	
44219-44228	Nonflow test pressure at pump start	NA	xxxx.x or xxx.xx[C]	S
44229-44238	Nonflow test minimum transducer pressure	NA	xxxx.x or xxx.xx[C]	S
44239-44248	Nonflow test type of start (1-automatic demand, 2-automatic test, 3-manual)	NA	xxxxx	S
44249-44278	Nonflow test pump shutdown time	NA	xxxxx	S
44279-44288	Nonflow test system pressure at pump shutdown	NA	xxxx.x or xxx.xx[C]	S
44289-44298	Nonflow test type of shutdown (1-automatic demand, 2-automatic test, 3-manual, 4-overspeed, 5-other trouble)	NA	xxxxx	S
44299-44308	Nonflow test rpm	NA	xxxxx	S
44309-44318	Non-flow test voltage phase A–B	NA	xxxxx	S
44319-44328	Nonflow test voltage phase B –C	NA	xxxxx	S
44329-44338	Nonflow test voltage phase C–A	NA	xxxxx	S
44339-44348	Nonflow test amperage phase 1	NA	xxxxx	S
44349-44358	Nonflow test amperage phase 2	NA	xxxxx	S
44359-44368	Nonflow test amperage phase 3	NA	xxxxx	S
	Acceptance Test Data Set – Permanent – 0%, 25%, 50%, 75%, 100%, 125%, & 150%	NA		
44601-44603	Test date acceptance test (day month year)	NA	xxxxx	P
44604	Test reference identifier acceptance test	NA	xxxxx	P
44605-44611	Data set reference identifier acceptance test	Yes	xxxxx	P
44612-44618	Suction pressure acceptance test	Yes	xxxx.x or xxx.xx[C]	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
44619-44625	System pressure acceptance test	Yes	xxxx.x or xxx.xx[c]	P
44626-44632	Discharge pressure acceptance test	Yes	xxxx.x or xxx.xx[c]	P
44633-44639	Net pressure	Yes	xxxx.x or xxx.xx[c]	P
44661-44667	Water temperature in pump casing acceptance test	Yes	xxxxx	P
44668-44674	Room temperature acceptance test	Yes	xxxxx	P
44675-44677	Initial pump start date acceptance test	NA	xxxxx	P
44678-44680	Initial pump start time acceptance test	NA	xxxxx	P
44681-44683	Final pump stop date acceptance test	NA	xxxxx	P
44684-44686	Final pump stop time acceptance test	NA	xxxxx	P
44687-44716	Pump start dates acceptance test (record up to 10)	NA	xxxxx	P
44717-44746	Pump start times acceptance test (record up to 10)	NA	xxxxx	P
44747-44776	Pump stop dates - acceptance test (record up to 10)	NA	xxxxx	P
44777-44806	Pump stop times acceptance test (record up to 10)	NA	xxxxx	P
44821-44841	Pressure at pump start acceptance test	NA	xxxx.x or xxx.xx[c]	P
44842-44848	Type of start acceptance test (1-automatic demand, 2-automatic test, 3-manual)	NA	xxxxx	P
44849-44855	Minimum transducer pressure at startup acceptance test	NA	xxxxx	P
44856	Number of start and stops during acceptance test	NA	xxxxx	P
44857-44859	Final pump shutdown time acceptance test	NA	xxxxx	P
44860	System pressure at final pump shutdown	NA	xxxx.x or xxx.xx[c]	P
44861	Type of shutdown (1-automatic demand, 2-automatic test, 3-manual, 4-overspeed, 5-other trouble)	NA	xxxxx	P
44881-44901	Loss of power (for transfer) date (day month year)	NA	xxxxx	
44902-44922	Loss of power (for transfer) time (hr min sec)	NA	xxxxx	P
44923-44943	Transfer of power date (day month year)	NA	xxxxx	
44944-44964	Transfer of power time (hr min sec)	NA	xxxxx	P
44965-44985	Day power restored to normal (day month year)	NA	xxxxx	P
44986-45006	Time power restored to normal (hr min sec)	NA	xxxxx	P
45007-45027	Date readings recorded (day month year)	NA	xxxxx	P
45028-45048	Time readings recorded (hr min sec)	NA	xxxxx	P
45061-45067	rpm	Yes	xxxxx	P
45068-45074	Voltage phase A–B acceptance test	Yes	xxxxx	P
45075-45081	Voltage phase B–C acceptance test	Yes	xxxxx	P
45082-45088	Voltage phase C–A acceptance test	Yes	xxxxx	P
45089-45095	Amperage phase 1 acceptance test	Yes	xxxxx	P
45096-45102	Amperage phase 2 acceptance test	Yes	xxxxx	P
45103-45109	Amperage phase 3 acceptance test	Yes	xxxxx	P
45151-45170	Nozzle coefficient acceptance test, up to 20 per test	NA	x.xxxx[b]	P

Modbus Register	Registry Use	Flow (%)	Format	Data Type
45171-45190	Nozzle size acceptance test, up to 20 per test (in. or cm)	NA	xx.xxx[e]	P
45191-45330	Nozzle pitot pressure acceptance test, up to 20 per test	Yes	xxxx.x or xxx.xx[c]	P
45361-45367	Fuel tank level acceptance test (0-above 2/3, 1-below 2/3)	Yes	xxxxx	P
45368-45374	Fuel tank level acceptance test (% full)	Yes	xxxxx	P
45375-45381	Flow through pump acceptance test	Yes	xxxxx	P
45382-45388	rpm adjusted net pressure acceptance test	Yes	xxxx.x or xxx.xx[c]	P
45389-45395	rpm adjusted flow acceptance test (gpm or L/min)	Yes	xxxxx	P
45396-45402	% of factory certified curve acceptance test	Yes	xxxxx	P
45421-45422	Hours on diesel engine or electric motor at start of acceptance test	NA	xxxxxxxx.xx[d]	P
45423-45424	Hours on diesel engine or electric motor at conclusion of acceptance test	NA	xxxxxxxx.xx[d]	P
45425	Pump passed initial acceptance test	NA	Y/N	P
45426	Pump could supply maximum system demand acceptance test (1-Yes, 2-No, 3-Demand not known)	NA	xxxxx	P
45427	Pump was significantly impaired acceptance test	NA	Y/N	P
45428	Pump was partially impaired acceptance test	NA	Y/N	P
45429	Pump passed after adjustments acceptance test	NA	Y/N	P
45430	Failure mode acceptance test (See standardize list)	NA	xxxxx	P
45431-45470	Explanation of failure acceptance test	NA	String(80)	P
	Fire Pump Operation	NA	xxxxx	S
45501-45503	Last fire pump monitoring reset date	NA	xxxxx	S
45504-45506	Last fire pump monitoring reset time	NA		
45507-45566	Fire pump start date and time (last 10 times)	NA	xxxxx	S
45567-45626	Fire pump stop date and time (last 10 times)	NA	xxxxx	S
45627	Fire pump start pressure (most recent)	NA	xxxxx	S
45628	Fire pump stop pressure (most recent)	NA	xxxxx	S
45629	Stop automatic or manual (most recent)	NA	xxxxx	S
45630	Total number of starts since reset	NA	xxxxx	S
45631-45632	Total run time since reset (minutes)	NA	xxxxx	S
45661-45810	Date loss of electrical power with switch in on position since last reset (50 sets)	NA	xxxxx	S
45811-45960	Time loss of electrical power with switch in on position since last reset (50 sets)	NA	xxxxx	S
45961-46110	Date power restored after loss of power with switch in on position since last reset (50 sets)	NA	xxxxx	S
46111-46260	Time power restored after loss of power with switch in on position since last reset (50 sets)	NA	xxxxx	S
46261-46410	Date power switch turned off (50 sets)	NA	xxxxx	S
46411-46560	Time power switch turned off (50 sets)	NA	xxxxx	S
46561-46710	Date power switch turned back on (50 sets)	NA	xxxxx	S
46711-46860	Time power switch turned back on (50 sets)	NA	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
	Current Performance Test Data Set – Permanent – 0%, 25%, 50%, 75%, 100%, 125%, & 150%			
47001-47003	Test date current performance test (day month year)	NA	xxxxx	S
47004	Test reference identifier current performance test	NA	xxxxx	S
47005-47011	Data set reference identifier current performance test	Yes	xxxxx	S
47012-47018	Suction pressure current performance test	Yes	xxxx.x or xxx.xx[C]	S
47019-47025	System pressure current performance test	Yes	xxxx.x or xxx.xx[C]	S
47026-47032	Discharge pressure current performance est	YES	xxxx.x or xxx.xx[C]	S
47033-47039	Net pressure	YES	xxxx.x or xxx.xx[C]	S
47061-47067	Water temperature in pump casing current performance test	YES	xxxxx	S
47068-47074	Room temperature current performance test	YES	xxxxx	S
47075-47077	Initial pump start date current performance test	NA	xxxxx	S
47078-47080	Initial pump start time current performance test	NA	xxxxx	S
47081-47083	Final pump stop date current performance test	NA	xxxxx	S
47084-47086	Final pump stop time current performance test	NA	xxxxx	S
47087-47116	Pump start dates current performance test (record up to 10)	NA	xxxxx	S
47117-47146	Pump start times current performance test (record up to 10)	NA	xxxxx	S
47147-47176	Pump stop dates current performance test (record up to 10)	NA	xxxxx	S
47177-47206	Pump stop times current performance test (record up to 10)	NA	xxxxx	S
47221-47241	Pressure at pump start current performance test	NA	xxxx.x or xxx.xx[C]	S
47242-47248	Type of start current performance test (1-automatic demand, 2-automatic test, 3-manual) (up to 7 startups)	NA	xxxxx	S
47249-47255	Minimum transducer pressure at startup current performance test (up to 7 startups)	NA	xxxxx	S
47256	Number of start and stops during current performance test	NA	xxxxx	S
47257-47259	Final pump shutdown time current performance test	NA	xxxxx	S
47260	System pressure at final pump shutdown	NA	xxxx.x or xxx.xx[C]	S
47261	Type of shutdown (1-automatic demand, 2-automatic test, 3-manual, 4-overspeed, 5-other trouble)	NA	xxxxx	S
47281-47301	Loss of power (for transfer or shutdown, up to 7) date (day month year)	NA	xxxxx	
47302-47322	Loss of power (for transfer or shutdown, up to 7) time (hr min sec)	NA	xxxxx	S
47323-47343	Transfer of power date, up to 7 (day month year)	NA	xxxxx	
47344-47364	Transfer of power time, up to 7 (hr min sec)	NA	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
47365-47385	Day power restored to normal, up to 7 (day month year)	NA	xxxxx	
47386-47406	Time power restored to normal, up to 7 (hr min sec)	NA	xxxxx	
47407-47427	Date readings recorded (day month year)	Yes	xxxxx	S
47428-47448	Time readings recorded (hr min sec)	Yes	xxxxx	S
47461-47467	rpm	Yes	xxxxx	S
47468-47474	Voltage phase A–B current performance test	Yes	xxxxx	S
47475-47481	Voltage phase B–C current performance test	Yes	xxxxx	S
47482-47488	Voltage phase C–A current performance test	Yes	xxxxx	S
47489-47495	Amperage phase 1, current performance test	Yes	xxxxx	S
47496-47502	Amperage phase 2, current performance test	Yes	xxxxx	S
47503-47509	Amperage Phase 3, current performance test	Yes	xxxxx	S
47551-47570	Nozzle coefficient current performance test, up to 20 per test	NA	x.xxxx[b]	S
47571-47590	Nozzle size current performance test, up to 20 per test (inch or cm)	NA	xx.xxx[e]	S
47591-47730	Nozzle pitot pressure current performance test, up to 20 per test	Yes	xxxx.x or xxx.xx[c]	S
47761-47767	Fuel tank level current performance test (0-above 2/3, 1-below 2/3)	Yes	xxxxx	S
47768-47774	Fuel tank level current performance test (% full)	Yes	xxxxx	S
47775-47781	Flow through pump current performance test	Yes	xxxxx	S
47782-47788	rpm adjusted net pressure current performance test	Yes	xxxx.x or xxx.xx[c]	S
47789-47795	rpm adjusted flow current performance test (gpm or L/min)	Yes	xxxxx	S
47796-47802	% of factory certified curve current performance test	Yes	xxxxx	S
47821-47822	Hours on diesel engine or electric motor at start of current performance test	NA	xxxxxxxx.xx[d]	S
47823-47824	Hours on diesel engine or electric motor at conclusion of current performance test	NA	xxxxxxxx.xx[d]	S
47825	Pump passed initial current performance test	NA	Y/N	S
47826	Pump could supply maximum system demand current performance test (1-Yes, 2-No, 3-Demand not known)	NA	xxxxx	S
47827	Pump was significantly impaired current performance test	NA	Y/N	S
47828	Pump was partially impaired current performance test	NA	Y/N	S
47829	Pump passed after adjustments current performance test	NA	Y/N	S
47830	Failure mode current performance test (see standardize list)	NA	xxxxx	S
47831-47870	Explanation of failure current performance test	NA	String(80)	S
	Previous Performance Test Data Set – Static – 0%, 25%, 50%, 75%, 100%, 125%, & 150%	NA		
48001-48003	Test date previous performance test (day month year)	NA	xxxxx	S
48004	Test reference identifier previous performance test	NA	xxxxx	S
48005-48011	Data set reference identifier previous performance test	Yes	xxxxx	S
48012-48018	Suction pressure previous performance test	Yes	xxxx.x or xxx.xx[c]	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
48019-48025	System pressure previous performance test	Yes	xxxx.x or xxx.xx[C]	S
48026-48032	Discharge pressure previous performance test	Yes	xxxx.x or xxx.xx[C]	S
48033-48039	Net pressure	Yes	xxxx.x or xxx.xx[C]	S
48061-48067	Water temperature in pump casing previous performance test	Yes	xxxxx	S
48068-48074	Room temperature previous performance test	Yes	xxxxx	S
48075-48077	Initial pump start date previous performance test	NA	xxxxx	S
48078-48080	Initial pump start time previous performance test	NA	xxxxx	S
48081-48083	Final pump stop date previous performance test	NA	xxxxx	S
48084-48086	Final pump stop time previous performance test	NA	xxxxx	S
48087-48116	Pump start dates previous performance test (record up to 10)	NA	xxxxx	S
48117-48146	Pump start times previous performance test (record up to 10)	NA	xxxxx	S
48147-48176	Pump stop dates previous performance test (record up to 10)	NA	xxxxx	S
48177-48206	Pump stop times previous performance test (record up to 10)	NA	xxxxx	S
48221-48241	Pressure at pump start previous performance test	NA	xxxx.x or xxx.xx[C]	S
48242-48248	Type of start previous performance test, up to 7 (1-automatic demand, 2-automatic test, 3-manual)	NA	xxxxx	S
48249-48255	Minimum transducer pressure at startup previous performance test, up to 7	NA	xxxxx	S
48256	Number of start and stops during previous performance test	NA	xxxxx	S
48257-48259	Final pump shutdown time previous performance test	NA	xxxxx	S
48260	System pressure at final pump shutdown	NA	xxxx.x or xxx.xx[C]	S
48261	Type of shutdown (1-automatic demand, 2-automatic test, 3-manual, 4-overspeed, 5-other trouble)	NA	xxxxx	S
48281-48301	Loss of power (for transfer or shutdown, up to 7) date (day month year)	NA	xxxxx	
48302-48322	Loss of power (for transfer or shutdown, up to 7) time (hr min sec)	NA	xxxxx	S
48323-48343	Transfer of power date, up to 7 (day month year)	NA	xxxxx	
48344-48364	Transfer of power time, up to 7 (hr min sec)	NA	xxxxx	S
48365-48385	Day power restored to normal, up to 7 (day month year)	NA	xxxxx	
48386-48406	Time power restored to normal, up to 7 (hr min sec)	NA	xxxxx	
48407-48427	Date readings recorded (day month year)	Yes	xxxxx	S
48428-48448	Time readings recorded (hr min sec)	Yes	xxxxx	S
48461-48467	rpm	Yes	xxxxx	S
48468-48474	Voltage Phase A–B, previous performance test	Yes	xxxxx	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
48475-48481	Voltage Phase B–C, previous performance test	Yes	xxxxx	S
48482-48488	Voltage Phase C–A, previous performance test	Yes	xxxxx	S
48489-48495	Amperage Phase 1, previous performance test	Yes	xxxxx	S
48496-48502	Amperage Phase 2, previous performance test	Yes	xxxxx	S
48503-48509	Amperage Phase 3, previous performance test	Yes	xxxxx	S
48551-48570	Nozzle coefficient previous performance pest, up to 20 per test	NA	x.xxxx[b]	S
48571-48590	Nozzle size previous performance test, up to 20 per test (in. or cm)	NA	xx.xxx3	S
48591-48730	Nozzle pitot pressure previous performance test, up to 20 per test	Yes	xxxx.x or xxx.xx[c]	S
48761-48767	Fuel tank level, previous performance test (0-above 2/3, 1-below 2/3)	Yes	xxxxx	S
48768-48774	Fuel tank level, previous performance test (% full)	Yes	xxxxx	S
48775-48781	Flow through pump, previous performance test	Yes	xxxxx	S
48782-48788	rpm adjusted net pressure, previous performance test	Yes	xxxx.x or xxx.xx[c]	S
48789-48795	rpm adjusted flow, previous performance test (gpm or L/min)	Yes	xxxxx	S
48796-48802	% of factory certified curve, previous performance test	Yes	xxxxx	S
48821-48822	Hours on diesel engine or electric motor at start of previous performance test	NA	xxxxxxxx.xx[d]	S
48823-48824	Hours on diesel engine or electric motor at conclusion of previous performance test	NA	xxxxxxxx.xx[d]	S
48825	Pump passed initial previous performance test	NA	Y/N	S
48826	Pump could supply maximum system demand previous performance test (1-Yes, 2-No, 3-Demand not known)	NA	xxxxx	S
48827	Pump was significantly impaired previous performance test	NA	Y/N	S
48828	Pump was partially impaired previous performance test	NA	Y/N	S
48829	Pump passed after adjustments previous performance test	NA	Y/N	S
48830	Failure mode previous performance test (see standardize list)	NA	xxxxx	S
48831-48870	Explanation of failure previous performance test	NA	String(80)	S
	Repair Maintenance Data (20 sets)			S
48901-48903	Date of maintenance/repair	NA	xxxxx	S
48904	Maintenance/repair identifier	NA	xxxxx	S
48905	Routine maintenance or repair	NA	Y/N	S
48906	Pump out of service during maintenance/repair	NA	Y/N	S
48907-48909	Date pump out of service (day month year)	NA	xxxxx	S
48910-48912	Time pump out of service (hour min sec)	NA	xxxxx	S
48913-48915	Date pump restored to service (day month year)	NA	xxxxx	S
48916-48918	Time pump restored to service (hour min sec)	NA	xxxxx	S
48919-48921	Date pump maintenance/repair completed	NA	xxxxx	S
48922-48941	Part replaced (1)	NA	String(40)	S

Modbus Register	Registry Use	Flow (%)	Format	Data Type
48942-48981	Description of maintenance, repair, and/or Part 1 replacement	NA	String(80)	S
48982-49001	Part replaced (2)	NA	String(40)	S
49002-49041	Description of maintenance, repair, and/or Part 2 replacement	NA	String(80)	S
49042-49061	Part replaced (3)	NA	String(40)	S
49062-49101	Description of maintenance, repair, and/or Part 3 replacement	NA	String(80)	S
49102-49121	Part replaced (4)	NA	String(40)	S
49122-49161	Description of maintenance, repair, and/or Part 4 replacement	NA	String(80)	S
49162-49201	Routine maintenance or repair	NA	String(40)	S
49202-49204	Date repair completed	NA	xxxxx	S
49205	Fuel tank level current performance test (0-above 2/3, 1-below 2/3)	NA	xxxxx	S
49206	Fuel tank level current performance test (% full)	NA	xxxxx	S
49207	Fuel maintenance system status	NA	xxxxx	S
49208-49300	Unused	NA		S
49301-56900	19 additional repair maintenance data sets	NA	See 48901-49207	S

NA: Not applicable. P: Permanent. S: Static. D: Dynamic

[a]A value of 0 is psi, gpm, in., and °F; a value of 1 is bar, L/min cm and °C.

[b]Four decimal places assumed.

[c]One decimal place assumed if psi, two decimal places assumed if bar.

[d]Two decimal places assumed.

[e]Three decimal places assumed.

Statement of Problem and Substantiation for Public Input

Alternate power may not be emergency power

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 37-NFPA 20-2016 [Section No. 3.3.39]	

Submitter Information Verification

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Public Input No. 4-NFPA 20-2015 [Chapter D]

Annex D Informational References

D.1 Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

D.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1, *Fire Code*, 2015 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2016 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2013 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 2012 edition.

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*, 2015 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2016 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2014 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, 2011 edition.

NFPA 70 ®, *National Electrical Code* ®, 2014 edition.

NFPA 77, *Recommended Practice on Static Electricity*, 2014 edition.

NFPA 750, *Standard on Water Mist Fire Protection Systems*, 2015 edition.

D.1.2 Other Publications.

D.1.2.1 ANSI Publications.

American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI/IEEE C62.11, *IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits,* 2012.

D.1.2.2 ASCE Publications.

American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20190-4400.

SEI/ASCE 7, *Minimum Design Loads for Buildings and Other Structures*, 2010.

D.1.2.3 AWWA Publications.

American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.

AWWA C104, *Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water*, 2013.

D.1.2.4 HI Publications.

Hydraulic Institute, 6 Campus Drive, First Floor North, Parsippany, NJ 07054-4406.

Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps

ANSI/HI **3. 1-** 3. 5, *Standard for Rotary Pumps for Nomenclature, Design, Application and Operation*, **2015.**

ANSI/HI 3.6, *Rotary Pump Tests*, 2010.

ANSI/HI 9.6.4, *Rotodynamic (Centrifugal and Vertical) Pumps for Vibration Measurement and Allowable Values*, 2009.

D.1.2.5 IEEE Publications.

Institute of Electrical and Electronics Engineers, Three Park Avenue, 17th Floor, New York, NY 10016-5997.

IEEE 141, *Electric Power Distribution for Industrial Plants*, ~~1986~~ **1993, reaffirmed 1999** .

IEEE 241, *Electric Systems for Commercial Buildings*, 1990**, reaffirmed 1997** .

IEEE 493, *Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems*, 2007.

IEEE 802.3, *Standard for Ethernet*, ~~2012~~ **2015, Amendment 1, 2015** .

IEEE 802.11, *Standard for Information technology -- Telecommunications and information exchange between systems Local and metropolitan area networks -- Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications*, 2012**, Amendment 5, 2013** .

Anthony, M., et al, "Reliability Analysis for Power to Fire Pump Using Fault Tree and RBD," *IEEE Transactions on Industry Applications*, Vol. 49, No. 2, March-April 2013, pp. 997–1003.

Anthony, M., et al, "Reliability engineering applied to Critical Operations Power Systems (COPS)," *Proc. 2011 Industrial and Commercial Power Systems Technical Conference (I&CPS)*, 1-5 May 2011, pp.1–8.

Arno, R.G., E. Stoyas, and R. Schuerger, "NEC Article 708," *Industry Application Magazine*, IEEE, Vol.17, No.1, Jan.-Feb. 2011, pp. 20–25.

Arno, R.G., E. Stoyas, and R. Schuerger, "Risk Analysis for NEC Article 708 Critical Operations Power Systems," Industry Applications Society Annual Meeting, IEEE, 4-8 Oct. 2009, pp. 1–7.

D.1.2.6 NEMA Publications.

National Electrical Manufacturers Association, 1300 North 17th Street, Suite ~~1847~~ **900** , ~~Rosslyn~~ **Arlington** , VA 22209.

NEMA ICS 14, *Application Guide for Electric Fire Pump Controllers*, ~~2010~~ **2015** .

NEMA 250, *Enclosures for Electrical Equipment* **(1000 Volts Maximum)** , ~~2008~~ **2014** .

D.1.2.7 SAE Publications.

~~Society of Automotive Engineers~~ **SAE International** , 400 Commonwealth Drive, Warrendale, PA 15096.

SAE J-1349, *Engine Power Test Code — Spark Ignition and Compression Engine*, 2011.

D.1.2.8 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

~~ANSI/~~ UL 508, *Standard for Industrial Control Equipment*, **1999, revised** 2013.

~~ANSI/~~ UL 1008, *Standard for Transfer Switch Equipment*, 2011**, revised 2015** .

D.2 Informational References.

The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

D.2.1 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

~~ANSI/~~ UL 80, *Standard for Steel Tanks for Oil~~-~~ Burner Fuels and Other Combustible Liquids,* 2007, Revised ~~2009~~ **2014** .

UL 2080, *Standard for Fire Resistant Tanks for Flammable and Combustible Liquids,* 2000.

~~ANSI/~~ UL 2085, *Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids,* 1997, Revised 2010.

D.3 References for Extracts in Informational Sections. (Reserved)

Statement of Problem and Substantiation for Public Input

Referenced current SDO names, addresses, standard names, numbers, and editions.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3-NFPA 20-2015 [Chapter 2]	Referenced current SDO names, addresses, standard names, numbers, and editions.

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Public Input No. 168-NFPA 20-2016 [Section No. D.1.2.8]

D.1.2.8 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 508, *Standard for Industrial Control Equipment*, 2013 .

ANSI/UL 1008, *Standard for Transfer Switch Equipment*, 2011, Revised 2015 .

Statement of Problem and Substantiation for Public Input

This proposal updates the referenced UL Standards to the referenced edition.

Submitter Information Verification

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D.2.1 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 80, *Standard for Steel Tanks for Oil Burner Fuels and Other Combustible Liquids,* 2007, Revised ~~2009~~ 2014 .

UL 2080, *Standard for Fire Resistant Tanks for Flammable and Combustible Liquids,* 2000.

ANSI/UL 2085, *Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids,* 1997, Revised 2010.

Statement of Problem and Substantiation for Public Input

This proposal updates the referenced UL Standards to the referenced edition.

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