NOTICE AND DISCLAIMER

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

National Electrical Manufacturers Association (NEMA) standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While NEMA administers the process and establishes rules to promote fairness in the development of consensus, it does not write the document and it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

NEMA disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. NEMA disclaims and makes no guaranty or warranty, expressed or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of your particular purposes or needs. NEMA does not undertake to guarantee the performance of any individual manufacturer or seller’s products or services by virtue of this standard or guide.

In publishing and making this document available, NEMA is not undertaking to render professional or other services for or on behalf of any person or entity, nor is NEMA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

NEMA has no power, nor does it undertake to police or enforce compliance with the contents of this document. NEMA does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health or safety–related information in this document shall not be attributable to NEMA and is solely the responsibility of the certifier or maker of the statement.
3.3.16 Vehicle Detection ................................................................. 21
3.3.17 Time-of-Day Operation ...................................................... 21
3.3.18 Manual Operation ............................................................... 21
3.3.19 Clearance Intervals in Manual Mode ................................. 21
3.3.20 Timing Plan Modifications .................................................. 21
3.3.21 Programming Interface ...................................................... 21
3.3.22 Restricted Access ............................................................. 21
3.3.23 Battery Operation .............................................................. 21
3.3.24 Solar Charging ................................................................. 22
3.3.25 Operation without Supplemental Power ......................... 22
3.3.26 Onboard Power ............................................................... 22
3.4 Types of PTS ........................................................................... 22
3.4.1 Type TR1 ............................................................................ 22
3.4.2 Type TR2 ............................................................................ 22
3.5 Communication Subsystem Requirements .......................... 23
3.6 Remote Management and Notification .................................. 23

Section 4 Operating Performance Conditions ........................................... 24
4.1 Operating Voltage, Frequency, and Power Interruption ............ 24
4.2 Voltage Range ........................................................................ 24
4.3 Power Interruption .................................................................. 24
4.4 Temperature and Humidity .................................................... 24
4.5 Vibration ................................................................................ 24
4.6 Shock ..................................................................................... 24
4.7 Low-Battery Power ............................................................... 24

Section 5 Portable Traffic Signal System Controller Unit (PTSS-CU) and Controller Requirements .................................................. 26
5.1 Design .................................................................................... 26
5.2 Performance Standards .......................................................... 26
5.2.1 Startup Flash ....................................................................... 26
5.2.2 Diagnostics ......................................................................... 26
5.2.3 Mode of Operation .............................................................. 26
5.2.4 Programming Module ........................................................ 26
5.2.5 Signal Timing ................................................................. 27
5.2.6 Fault Modes ...................................................................... 27
5.2.7 Diagnostics ......................................................................... 27
5.2.8 Communication ............................................................... 27
5.3 Documentation ......................................................................... 27
5.4 Pre-Timed Control ................................................................. 27
5.4.1 Timing Plans ....................................................................... 28
5.4.2 Time-of-Day Programming .................................................. 28
5.4.3 Cycles ................................................................................ 28
5.4.4 Signal Plans ................................................................. 28
5.5 Manual Control ................................................................. 28
5.5.1 Transition to All Red Mode .................................................. 29
5.6 Initialization ........................................................................... 29
5.7 Actuated Movements ............................................................. 29
Section 8 Signal Head and Display Subsystem ..................................................................................... 39

8.1 Traffic Signals.......................................................................................................................... 39
  8.1.1 LED Signals...................................................................................................................... 39
  8.1.2 Visors.............................................................................................................................. 39

8.2 TR1 Physical............................................................................................................................ 39
  8.2.1 Placement of TR1 Signal Heads ..................................................................................... 39
  8.2.2 TR1 Vertical Clearance .................................................................................................... 39

8.3 TR2 Physical............................................................................................................................ 39
  8.3.1 Placement of TR2 Signal Heads ..................................................................................... 39

© 2017 National Electrical Manufacturers Association
Section 9 Communication Subsystem Requirements .................................................. 42

9.1 Communication .................................................................................................. 42
   9.1.1 Direct Wire Line ............................................................................................. 42
   9.1.2 Radio .............................................................................................................. 42

Section 10 Remote Management and Notification Subsystem Requirements ............. 43

10.1 Notification Subsystems Overview .................................................................... 43
    10.1.1 Fault Monitoring .......................................................................................... 43
    10.1.2 Battery Voltage Monitoring ......................................................................... 43

Section 11 Energy Subsystem Requirements .............................................................. 44

11.1 Physical ............................................................................................................ 44
    11.1.1 Material ....................................................................................................... 44
    11.1.2 Wiring ......................................................................................................... 44
    11.1.3 Dimensions ................................................................................................. 44

11.2 Power ................................................................................................................ 44
    11.2.1 Battery Systems .......................................................................................... 44
    11.2.2 Battery Autonomy ....................................................................................... 45
    11.2.3 External Charging ........................................................................................ 45
    11.2.4 Battery Charger Output Display ................................................................. 45

11.3 Energy Input Sources ........................................................................................ 45
    11.3.1 Solar Cells ................................................................................................... 46

Section 12 Portable Traffic Signal (PTS) Trailer/Pedestal Subsystem Requirements ...... 47

12.1 Overview .......................................................................................................... 47
    12.2 TR1 (Trailer-Mounted) PTS ............................................................................. 47
        12.2.1 TR1 Trailer Requirements ........................................................................ 47
        12.2.2 TR1 Wind Load ......................................................................................... 47
    12.3 TR2 (Pedestal-Mounted) PTS .......................................................................... 47
    12.4 Transportability ............................................................................................... 47
    12.5 Lift System ..................................................................................................... 48
        12.5.1 Avoid Shock Hazard ................................................................................ 48
        12.5.2 Hydraulic Lift Systems ............................................................................ 48
        12.5.3 Cable (Wire Rope) Lift Systems ................................................................. 48
        12.5.4 Screw Actuator Lift Systems .................................................................... 48
        12.5.5 Design Guidance for Lift Systems ............................................................ 48

Section 13 Test Procedures ....................................................................................... 49

13.1 Portable Traffic Signal System Controller Unit (PTSS-CU) Tests ....................... 49
    13.1.1 Test Facilities ............................................................................................. 49
    13.1.2 Test Unit .................................................................................................... 49
    13.1.3 Procedure: Temperature, Voltage, and Humidity ........................................ 49
    13.1.4 Vibration Test ............................................................................................. 52
    13.1.5 Shock (Impact) Test .................................................................................. 53
    13.1.6 Low-Battery Power Test ............................................................................ 54
    13.1.7 Timing Accuracy Tests ............................................................................... 55
    13.1.8 Malfunction Management System (MMS) Tests ....................................... 55
Annex A FHWA Interpretation [Informative]........................................................................................................57

Figures
Figure 1 PTSS Subsystems........................................................................................................................................8
Figure 2 Type TR1 PTS—Example TR1 Deployment ..........................................................................................9
Figure 3 Type TR1 PTS—Example TR1 Deployment at Intersection .................................................................9
Figure 4 Type TR2 PTS—Example TR2 Deployment ......................................................................................10
Figure 5 Test Profile........................................................................................................................................50

Tables
Table 1 Conformance Symbols...........................................................................................................................13
Table 2 Support Column Options.......................................................................................................................13
Table 3 Requirements List (RL)........................................................................................................................15
Table 4 PTS Type Designations.........................................................................................................................23
Table 5 Programmable Signal Timing Ranges....................................................................................................27
Table 6 Programmable Signal Function Timing Ranges ................................................................................31
Table 7 Examples of Allowable Deviations and Interval Ranges........................................................................55
Acknowledgments

At the time that NEMA TS 5-2017 was prepared, the following NEMA members and their representatives were active voting members of the NEMA 3TS Portable Traffic Systems Technical Committee (3TS PTS TC):

- Horizon Signal Technologies, Inc. www.horizonsignal.com (Chair)
- Ver-Mac, Inc. www.ver-mac.com
- OMJC Signal, Inc. www.omjcsignal.com
- John Thomas, Inc. www.jtitraffic.com

Previous 3TS PTS TC participants include:

- North America Traffic, Inc. www.northamericatraffic.com
- Tower Sign & Signal, Inc. www.portabletrafficsignalstss.com

At the time that NEMA TS 5-2017 was balloted, the following were members of the NEMA Transportation (3TS) Section:

- Applied Information, Inc. appinfoinc.com
- Daktronics, Inc. www.daktronics.com
- Eberle Design Inc. www.editraffic.com
- Horizon Signal Technologies, Inc. www.horizonsignal.com
- Intelight Inc. www.intelight-its.com
- John Thomas, Inc. www.jtitraffic.com
- OMJC Signal, Inc. www.omjcsignal.com
- Parsons delcantechnologies.com
- Peek Traffic Corporation www.peektraffic.com
- SES America sesamerica.com
- Siemens Industry, Inc. www.usa.siemens.com/Industry
- Skyline Products, Inc. www.skylineproducts.com
- TransCore, ITS, LLC www.transcore.com
- Ver-Mac, Inc. www.ver-mac.com
Foreword

NEMA TS 5-2017, this standard, was prepared by NEMA’s Portable Traffic Signal (PTS) Technical Committee (TC), which is a technical committee of NEMA’s 3TS (Transportation Management Systems and Associated Control Devices) Section.

User Comment Instructions

The term "User Comment" includes any type of written inquiry, comment, question, or proposed revision, from an individual person or organization, about any part of this standards publication's content. A “request for interpretation” of this standards publication is also classified as a User Comment. User Comments are welcome at any time. In preparation of this NTCIP standards publication, input of users and other interested parties was sought and evaluated.

A User Comment should be submitted to this address:

    Senior Technical Director, Operations
    National Electrical Manufacturers Association
    1300 North 17th Street, Suite 900
    Rosslyn, Virginia 22209

A User Comment should be submitted in the following form:

    Standards Publication Number and Version:
    Page:
    Section and Paragraph, Figure, or Table:
    Comment:
    Editorial or Substantive?:
    Suggested Alternative Language:

Please include your name, organization, and address in your correspondence.
Section 1
General [Informative]

1.1 Scope

NEMA TS 5-2017 covers traffic signaling equipment used to facilitate and expedite the safe movement of vehicular traffic and the work that goes on in the respective work zone. Portable Traffic Signal Systems (PTSS) are commonly used to supersede flagger use during roadway construction. While PTSS are used most commonly for single-lane road closures, PTSS are also used during or after times of emergencies, planned events, and non-normative vehicular signalization needs. PTSS are also used before or while permanent signals are being installed to lessen traffic bottlenecks and improve intersection safety during these transition times. PTSS are designed to enable critical movement of traffic using the implementation of appropriate new and existing standards.

Manual on Uniform Traffic Control Devices (MUTCD) Section 6F.01 states:

All traffic control devices used for construction, maintenance, utility, or incident management operations on a street, highway, or private road open to public travel (see definition in Section 1A.13) shall comply with the applicable provisions of this Manual.

In addition, PTSS address many of the factors related to the design and application of temporary traffic control systems and provide much of the functionality, described in MUTCD 6F.84(08).

Also see an FHWA Official Interpretation concerning "Conflict Monitoring of Temporary and Portable Signals" in Annex A.