CLASSIFICATION OF LOCATIONS FOR ELECTRICAL INSTALLATIONS IN GAS UTILITY AREAS

Revised by

Distribution & Transmission Engineering Committee



First Printing: December 1965 Revised: January 1977 Revised: November 1992 Revised: September 2010

Copyright 2010 © American Gas Association All Rights Reserved

Catalog # XL1001

DISCLAIMER AND COPYRIGHT

The American Gas Association's (AGA) Operating Section provides a forum for industry experts to bring collective knowledge together to improve the state of the art in the areas of operating, engineering and technological aspects of producing, gathering, transporting, storing, distributing, measuring and utilizing natural gas.

Through its publications, of which this is one, AGA provides for the exchange of information within the gas industry and scientific, trade and governmental organizations. Each publication is prepared or sponsored by an AGA Operating Section technical committee. While AGA may administer the process, neither AGA nor the technical committee independently tests, evaluates or verifies the accuracy of any information or the soundness of any judgments contained therein.

AGA 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 or reliance on AGA publications. AGA makes no guaranty or warranty as to the accuracy and completeness of any information published therein. The information contained therein is provided on an "as is" basis and AGA makes no representations or warranties including any expressed or implied warranty of merchantability or fitness for a particular purpose.

In issuing and making this document available, AGA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is AGA 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.

AGA has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does AGA list, certify, test or inspect products, designs or installations for compliance with this document. Any certification or other statement of compliance is solely the responsibility of the certifier or maker of the statement.

AGA does not take any position with respect to the validity of any patent rights asserted in connection with any items that are mentioned in or are the subject of AGA publications, and AGA disclaims liability for the infringement of any patent resulting from the use of or reliance on its publications. Users of these publications are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Users of this publication should consult applicable federal, state and local laws and regulations. AGA does not, through its publications intend to urge action that is not in compliance with applicable laws, and its publications may not be construed as doing so.

However, changes to this publication may become necessary from time to time. If changes to this report are believed appropriate by any manufacturer, individual or organization, such suggested changes should be communicated to AGA by completing the last page of this report titled, "Form for Proposal on Classification of Locations for Electrical Installations in Gas Utility Areas" and sending it to Operations & Engineering Services Group, American Gas Association, 400 North Capitol Street, NW, 4th Floor, Washington, DC 20001, U.S.A.

Copyright © 2010, American Gas Association, All Rights Reserved.

FOREWORD

In 1965, the original *Classification of Gas Utility Areas for Electrical Installations*, X-50765, was prepared by the Compressor Committee Task Group on National Electrical Code Classification, Operating Section, American Gas Association, Inc. In 1977, the document was revised and renumbered XF0277 in a joint effort of the Compressor and the Automation & Telecommunications committees, Operating Section, Division I, American Gas Association. A second revision was made in 1992. This third revision in 2010 was prepared by the Distribution and Transmission Engineering Committee due to the dissolution of the Automation & Telecommunications Committee, with review by the Supplemental Gas Committee, the Transmission Measurement Committee, the Underground Storage Committee, and several other interested parties.

This publication is the cumulative result of years of experience of many individuals and organizations acquainted with the natural gas industry. It is intended to serve as a general guide to non-electrical engineers when designing electrical installations in gas utility areas. **This publication does not constitute and should not be construed to be an official code of rules or regulations.** Unlike previous editions, this revision does not address LPG and LNG facilities, which are covered by NFPA 59 and NFPA 59A, respectively.

Consideration was given to the increasing application of centralized control with the consequent increase in unmanned or semi-attended facilities. It also includes statements and guidance for classification of locations based on experience of the gas industry.

This publication includes generalized statements and guidance on matters on which there are diverse opinions. It is important, therefore, that sound engineering judgment take precedence over a literal interpretation of the text.

The editors wish to acknowledge the use of the following documents as resources in the preparation of this publication:

- NFPA 30-Flammable and Combustible Liquids Code, 2003 edition
- NFPA 70-National Electrical Code, 2005
- NFPA 59-Utility LP-Gas Plant Code, 2004
- NFPA 59A-Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG), 2006
- NFPA 90A-Standard for the Installation of Air-Conditioning and Ventilation Systems, 2002 edition
- NFPA 91-Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids, 2004 edition
- NFPA 496-Standard for Purged and Pressurized Enclosures for Electrical Equipment, 2003 edition

NFPA 497-Recommended Practice for the Classification of Flammable Liquids, Gases, Vapors and Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, 2004 edition

- NFPA Fire Protection Guide To Hazardous Materials
- API RP500 Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class 1, Division 1 and Division 2
- API RP505 Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class 1, Zone 0, Zone 1, Zone 2

ACKNOWLEDGEMENTS

Classification of Locations for Electrical Installations in Gas Utility Areas, was revised by a Task Group of the American Gas Association's Distribution and Transmission Engineering Committee under the chairmanship of **Doug Stearns**, Atmos Energy, with substantial contributions from **Duane Henderson** and his **drafting staff** at the Puget Sound Energy.

Individuals who made considerable contributions to the revision of this document are:

Brad Massey, Southern Star Central Gas Pipeline David Searles, Dominion Resources Ed Ostrovich, Atmos Energy Ed Sawicki, Woodard & Curran George Rowland, Pacific Gas & Electric Glenn P LaBorde, WGP Jim Bognan, National Fuel Gas Supply Corp. John Groppetti, G-T-S, Inc. Kevin Ritz, Baltimore Gas & Electric Mark Kazimirsk, Pacific Gas & Electric Michael Lyons, PECO Energy Paul Hiller, Southern Star Central Gas Pipeline Pieter Ouwerkerk, PECO Energy Raymond Snyder, Philadelphia Gas Works Richard Losey, NiSource Ron Stiger, Basic Systems, Inc. Scott Besmer, Montana-Dakota Utilities Co. Ted Lemoff, National Fire Protection Association Tom Brunelle, ConEd Tom Stemmer, Basic Systems, Inc. Tushar Shah, Eagle Research Corp.

AGA acknowledges the contributions of the above individuals and thanks them for their time and effort in getting this document revised.

Christina Sames Vice President Operations and Engineering Section Ali Quraishi, Staff Executive Director, Engineering Services Operations and Engineering Section

TABLE OF CONTENTS

DISCLAIMER AND COPYRIGHT	II
FOREWORD	
ACKNOWLEDGEMENTS	IV
TABLE OF CONTENTS	V
1. GENERAL	
1.1 Introduction 1.2 Scope	1
2. THE NATIONAL ELECTRICAL CODE (NEC)	
 2.1 National Electrical Code Considerations	3 3 4
3. CONDITIONS NECESSARY FOR IGNITION	5
3.1 Basic Conditions3.2 Dispersion	5 5
4. DETERMINATION OF THE EXISTENCE OF A CLASSIFIED LOCATION	6
 4.1 General 4.2 Combustible and Flammable Liquids 4.3 Flammable Gases, Vapors and Liquids in the Atmosphere 4.4 Area of Release 	6 6 7 7
5. DETERMINATION OF THE DEGREE OF CLASSIFICATION	
5.1 Division 1 vs. Division 25.2 Ventilation	9 9
6. DETERMINATION OF THE EXTENT OF THE CLASSIFIED LOCATION	
 6.1 Extent of Classified Location For Flammable Gases	10 10 10 11 11
7. DETERMINATION OF DEGREE AND EXTENT OF CLASSIFIED LOCATIONS	
7.1 Procedure	12
APPENDIX A	
APPENDIX B	
APPENDIX C	

This is a preview of "AGA XL1001". Click here to purchase the full version from the ANSI store.

1. General

1.1 Introduction

It is the intent of this publication to provide guidance for classification of areas for electrical installations in gas utilities, under the provisions of the National Electrical Code (NEC) or other applicable codes or regulations providing a similar basis for defining "Classified Locations." It must be understood that this publication is a guide only and should be used with sound engineering judgment.

It is the responsibility of each individual or organization to determine its appropriate area classification using this guide and other pertinent data. This publication has endeavored to consider the available information on all the factors concerned and properly evaluate them in order to develop a consistent basis of classification to be used in the selection and location of electrical equipment.

Equipment to be used, such as explosion-proof, vapor tight, hermetically sealed, intrinsically safe, non-incendive, oil-immersed, purged or general purpose, must be approved and marked for the degree of hazard that has been defined. The equipment must be correctly designed, manufactured, installed and maintained to ensure safety. It is essential to recognize cases in which experience has shown that the occurrence of a hazardous condition caused by the release of flammable gases from any source has been so infrequent that its likelihood under similar conditions can be ignored.

There has been considerable confusion in interpreting the NEC classification of "Classified Locations" in gas utilities; i.e., those areas where there may be some hazard from release of flammable gases, vapors or liquids. Gas utility electrical installations must be designed to avoid contributing to the probability of accidental ignition of flammable gases, vapors or liquids released to the atmosphere.

Before any design can begin, the areas of potential hazard must be clearly defined as to Class, Group and Division or Zone. A properly designed installation would protect the area to a degree commensurate with the risk. It would provide special equipment wherever required for safety but would also include general purpose equipment wherever possible in order to save installation and maintenance costs.

It is often possible to limit the installation of electrical facilities in areas where the atmosphere may be hazardous. Careful definition of the extent of the potentially hazardous area will often permit the use of general purpose circuit-breakers, transformers and starters in adjacent non-classified locations at a reasonable cost.

Historically, in the United States, hazardous locations were classified as Division 1 or Division 2. A significant percentage of new electrical equipment for hazardous locations is designed to be marketed worldwide and thus must be labeled under the international Zone 0-2 classification system. The NEC has adopted the Zone classification system as an alternative to the Division classification system. The NEC Article 505 should be consulted to determine conditions for installation of Zone equipment in Division locations and installation of Division equipment in Zone locations. The rest of this document will only refer to the division designations for clarity of concepts.

1.2 Scope

The gas utility areas to which this publication applies are those in which flammable gases are produced, manufactured, stored, transmitted and distributed. It is not intended to include plants of a refinery nature, such as natural gas stripping plants or gasoline plants.

In establishing the limits of classified locations, it is assumed that the gases of concern to this publication are materials classified under NFPA70-2005, as Group B or D in Article 500.6 or as Group IIA, IIB or IIC in Article 505.6 (see Appendix A).

Factors such as corrosion, maintenance, equipment standardization, and interchangeability and possible process changes or expansion frequently dictate the use of special enclosures or installations for electrical systems. Such factors are outside the scope of this publication, which is entirely concerned with the proper application of electrical equipment to avoid ignition of flammable vapors and gases. This publication further recognizes that certain environmental aspects of an installation, such as prevailing winds, site topography, proximity of other installations and climatic conditions, may exert sufficient influence to merit a classification other than that which would have been made had these conditions not existed.

All areas and distances indicated herein are guidance for a minimum level of safety and may be exceeded at the discretion of those responsible for the installation design.

2. The National Electrical Code (NEC)

2.1 National Electrical Code Considerations

The NEC (NFPA 70) is widely used as a set of minimum requirements for safe electrical installations and has been adopted as law at various federal, state and local levels. OSHA mandates its use in appropriate facilities. Many installations, even if not legally required, conform to NEC as a matter of good practice. The NEC-90.1(C) very clearly states that the NFPA 70 is not a design specification. It is also not an operating or maintenance manual.

Therefore, the guidance provided herein is not an attempt to rewrite or otherwise supersede the NEC or other applicable codes or ordinances. It is intended, rather, to serve as a supplement.

2.2 Classes and Divisions

Classified Areas. Article 500 of the NEC defines three classes of locations and two divisions within each class. Class I locations are those locations in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Class II (combustible dust) and Class III (easily ignitable fibers or filings) are not generally applicable to the natural gas industry. This publication, therefore, is limited to Class I locations.

The intent of Article 500 of the NEC is that electrical equipment and systems in classified locations should not provide a means of ignition for an explosive or ignitable mixture that may be present.

Within each Class, Article 500 recognizes two degrees of hazard: Division 1 and Division 2. In Division 1 locations, an ignitable mixture is likely to be present continuously or intermittently under <u>normal</u> conditions of operation, repair, maintenance or leakage. Normally expected conditions may include the release of gas from a pipeline blow-down vent or release of gas from an instrument vent. In Division 2 locations, an ignitable mixture is normally handled and processed in closed piping systems or vessels. However, due to an <u>abnormal</u> condition, an ignitable mixture is likely to be present. Abnormal conditions may include gas leakage from a pipe flange or threaded pipe fitting.

Unclassified locations are those that are not classified as Division 1, Division 2. These areas are sometimes referred to as "General Purpose" or Non-classified.

2.3 Division 1 Design Conditions

Wiring methods, electrical equipment and materials installed in Division 1 or Division 2 locations must be as specified by NEC Article 501 – Class I Locations.

Electrical installations in Division 1 locations are designed so that normal operation or failure of any part of the electrical system will not release flames, sparks or hot gases and will not result in surface temperatures high enough to ignite the surrounding hazardous atmosphere.

Electrical installations for Division 1 locations may be designed in a number of ways. No single method is best in all respects for all types of equipment used in gas utility areas. Types X and Y purged electrical equipment, intrinsically safe equipment and explosion-proof apparatus are used primarily in Division 1 locations but can be used in Division 2 locations as well.

Explosion-proof apparatus is enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it. Explosion-proof apparatus will also prevent the ignition of a specified gas or vapor surrounding the enclosure caused by sparks, flashes or explosion of the gas or vapor within it. The equipment must operate such that the external temperature of the enclosure will not ignite the surrounding flammable atmosphere.