

## **Executive Summary**

- The hazards of motor fuel dispensing facilities are very unique and questions related to their use (including this interpretation) are most appropriately interpreted by the Technical Committee on Automotive and Marine Service Stations. NFPA 70, for example, specifically defers the classification of specific hazardous locations to committees and organizations with expertise of the specific hazard.
- There are UL-listed motor fuel dispensers currently available in the marketplace that support payments made with immediately proximate personal electronic devices. Additionally, these dispensers are in use and have been permitted by the Authority Having Jurisdiction at numerous locations throughout the United States. Transactions made with these devices involve the use of mobile devices within the Class 1, Division 2 area associated with the dispensers.
- NFPA 70 and NFPA 497 would require mobile devices to be either intrinsically safe or have a PEP 2 classification in accordance with ANSI/ISA 12.12.03 – 2011 to be used in a Class 1 Division 2 area. Typical popular commercial mobile devices do not meet these requirements. NFPA 30A, however, modifies numerous other requirements in NFPA 70 and NFPA 497, to adapt the general requirements of these broader codes to the unique and specific conditions at vehicle fueling facilities.
- Numerous literature reviews and experimental studies have analyzed the likelihood of mobile phones being an ignition source for gasoline vapors. In terms of historical events, there appear to be no credible recorded cases in which mobile devices were linked to a fire at a service station. Additionally throughout numerous experimental studies, the likelihood of mobile phones igniting gasoline vapors has been determined to be negligible. Other studies opine that mobile phones do not create a risk higher than already exists at gasoline dispensing facilities.

## **Relevant Text of NFPA 30A**

The provision of NFPA 30A of concern here is Subsection 8.3.1, which reads as follows:

*“8.3.1 Where Class I liquids are stored, handled, or dispensed, electrical wiring and electrical utilization equipment shall be designed and installed in accordance with the requirements for Class I, Division 1 or Division 2 classified locations, as set forth in 8.3.2 and in NFPA 70, National Electrical Code.” NFPA 30A 2015, 8.3.1*

This is the charging statement that mandates the use of hazardous (classified) electrical utilization equipment where Class I liquids (i.e., gasoline) are used. Subsection 8.3.1 leads the user to Subsection 8.3.1, which reads as follows:

*“8.3.2\* Table 8.3.2 shall be used to delineate and classify areas for the purposes of installing electrical wiring and electrical utilization equipment where Class I liquids are stored, handled, or dispensed.” NFPA 30A 2015, 8.3.2*

Table 8.3.2 sets forth the specific distances that the classified locations extend outward from the source of the vapor.

## **Introduction**

Personal electronic devices, to include such items as cell phones, smart watches, and other wearable or handheld portable electronics, have the capability to serve as a means for electronic payments, and are currently being used for payment at the dispenser at some retail gas facilities. Additionally, multiple dispenser manufacturers offer the technology to allow for mobile payments at the dispenser. While codes for the use of mobile electronic devices at industrial facilities are well defined and controllable (i.e. refineries), there is no defined adaptation specifically oriented for retail facilities. Current industry guidance for refueling safety does not restrict mobile phone use at service stations. The Petroleum Equipment Institute (PEI) completed a study in 2010 (Attachment 2), that provides a study of static related fires at service stations. The study emphasized that cell phones have never been linked to any refueling fires. Also, guidance from the American Petroleum Institute (API) in Attachment 3, does not address mobile device use at motor fuel dispensing facilities. This request for interpretation identifies:

1. Why this question is most appropriately interpreted by the Technical Committee on Automotive and Marine Service Stations;
2. Fuel dispensing products currently in the marketplace that support mobile payment;
3. A summary of current applicable codes; and
4. A summary of current industry research.

## **Why this question is most appropriately interpreted by the Technical Committee on Automotive and Marine Service Stations**

NFPA 30A applies and interprets the requirements and recommendations from NFPA 70 and NFPA 497 regarding hazardous location requirements appropriate in a service station/fueling facility environment. Some analogous language and examples of this 30A specific interpretation are:

1. In an industrial environment, motor vehicle use in a hazardous location is generally prohibited, whereas NFPA 30A specifically exempts motor vehicles from being considered an ignition source at motor fuel dispensing facilities. (NFPA 30A Handbook 2015, 8.3.1)
2. Under the requirements of NFPA 70, 500.6, methanol storage and distribution systems drive the need for a hazardous location. NFPA 30A specifically exempts the requirement for a hazardous location around methanol based windshield washer systems, realizing that windshield washer fluid concentrates are available with formulations with as much as 98% methanol. (NFPA 30A Handbook 2015, 8.3.1)
3. While NFPA 70 provides requirements and overarching guidance for equipment located within classified areas, it defers to other specialized committees when analysis is required of specific hazardous areas. The NEC handbook says:

*“The NEC does not specify Class I, II, and III locations. Other standards and recommended practices of NFPA technical committees and the American Petroleum Institute (API), among other organizations with experience and expertise in working with flammable liquids, gases, vapors, dusts, fibers, and flyings inherent to a process or present under abnormal conditions of operation, determine the parameters, distances, and degrees of hazard associated with classified locations. Some of this information has been extracted from other NFPA and API documents and is included in Articles 511 through 516.” NFPA 70 Handbook 2014, 500.5 (A)*

As such, the determination of suitability of devices within hazardous locations specifically at motor fuel dispensing facilities is most appropriately considered by this committee.

### **Fuel Dispensing Products Currently in the Marketplace**

Multiple UL listed dispensers are currently available that include mobile payment technology that would involve a user placing their device within the hazardous location. These dispensers have been approved for use by the Authority Having Jurisdiction at a variety of locations in the US. Examples include:

- The Wayne NFC Reader and Wayne iX T5 and T7 Secure Payment Terminals (Attachments 4 and 5)
- Gilbarco Mobile Payments and Encore 700 NFC contactless reader (Attachments 6 and 7)

Although dispensing equipment must be UL listed, portable electronic devices (for example the Apple iPhone and Samsung Galaxy) that are used with these types of systems are typically not explicitly approved or listed for use in hazardous locations. These devices are not UL listed for hazardous environments and are not marked per ANSI 12.12.03-2011. Some devices do not including any warnings related to their use while dispensing fuel (Attachment 8), while others warn users to not to use their devices at refueling stations (Attachments 9).

As part of this analysis, a selection of Fire Officials from city to state level was contacted in states known to have dispensers compatible with mobile devices. The purpose of the contact was to

locate published interpretation or advisories related to the use of mobile devices at gasoline dispensers. However, no published guidance related to this topic was available with the jurisdictions contacted. A few highlights of the calls are provided below:

- The majority of Fire Officials contacted stated that they were not aware mobile devices could be used for payment at gasoline dispensers. However, they did not indicate an issue with the concept of mobile phone use at gasoline dispensers for payment.
- An Ohio state fire official stated he knew that there was no guidance on mobile phone use at gasoline dispensers and that this was a question that should be brought up to the committee that oversees motor fuel facilities.
- A Fire Official from Illinois indicated that he was aware of mobile devices being used for payment at gasoline dispensers in his state. He mentioned that if the dispenser manufacturers have certified the systems as being safe and they are UL-approved, he did not have any issues with their use.

### **A Summary of Current Applicable Codes**

#### **NIST Handbook 44 - 2016, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices**

NIST Handbook 44, which regulates meters mounted on fuel dispensers, was amended in 2012, to allow the use of personal or vehicle-mounted electronic equipment to view and select unit prices on dispensers (Attachment 10). It now includes the following statement:

“When a product is offered at more than one unit price, display of the unit price information may be through the deliberate action of the customer: 1) using controls on the device; 2) through the customer's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer.”

NIST HB 44 2016, S.1.6.4.1

#### **NFPA 30A - 2015, Code for Motor Fuel Dispensing Facilities and Repair Garages**

NFPA 30A, paragraph 8.3.1 states

*“Where Class I liquids are stored, handled, or dispensed, electrical wiring and electrical utilization equipment shall be designed and installed in accordance with the requirements for Class I, Division 1 or Division 2 classified locations, as set for the in 8.3.2 and in NFPA 70, the National Electrical Code.” NFPA 30A 2015 8.3.1*

NFPA 30A, Table 8.3.2 describes the classification for installing electrical wiring and electrical utilization equipment. This Interpretation request addresses the portion of the table associated with the Class I, Division 2 areas surrounding the dispensing devices.

This classified area found in NFPA 30A is referenced, but not fully explained in the NEC. The following exemption to classified areas from Table 8.3.2 is found in the NFPA 30A handbook. Without this exemption automobiles would not be permitted to enter this area.

“Table 8.3.2 in effect designates the types of permanently installed electrical wiring and utilization equipment that can be installed in the areas listed in the column ‘Extent of Classified Location.’ **It does not apply to the electrical system of an automobile, nor does it apply to or restrict the presence of other nonelectrical equipment, such as the hot surfaces of an automobile.** It also does not apply to the inside of any dispensing device; this is governed by UL 87, Standard for Power-Operated Dispensing Devices for Petroleum Products.” NFPA 30A Handbook 2015, 8.3.1 (bold is our emphasis)

This clarification in the NFPA 30A handbook states that this classified area only applies to permanently installed equipment and specifically exempts vehicle electrical systems and hot surfaces of automobiles.

### **NFPA 70 - 2014, National Electrical Code**

NFPA 70 has a somewhat similar statement in that it does not apply to portable equipment, but instead of exempting this equipment as noted in NFPA 30A, includes the provision that equipment should be suitable for the specific location.

“Some portable devices — cameras, multimeters, and flashlights — have the capacity to cause ignition of a hazardous location. **Although this electrical equipment is outside the scope of the Code,** all equipment used should be **suitable for the specific hazardous location.**” NFPA 70 Handbook 2014, 500.8 (B).1 (bold is our emphasis)

Additionally, section 7.4.1 of the NEC clarifies that fixed electrical utilization equipment, fixtures, and wiring must be properly installed in Class I areas. It does not indicate that the requirements in the code extend to portable equipment. The NEC handbook provides this additional explanation that only fixed equipment is regulated:

“Subsection 7.4.1 is new to the 2015 edition of the Code and is intended to explain the purpose of proper area classification. **The important word here is “fixed”;** **Chapter 7 of the Code does not attempt to regulate,** nor does it apply to, mobile motorized equipment or vehicles, such as industrial trucks or automobiles. NFPA 70 2014, 7.4.1 (bold is our emphasis)

Although portable electronics are outside of the scope of the NEC, an informational reference to an ANSI/ISA standard is provided for these products.

“Portable or transportable equipment having self-contained power supplies, such as battery operated equipment, could potentially become an ignition source in hazardous (classified) locations. See ANSI/ISA 12.12.03-2011, Standard for Portable Electronic Products Suitable for Use in Class I and II, Division 2, Class I Zone 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations.” NFPA 70 2015, 505.2

## **ANSI/ISA 12.12.03 - 2011, Standard for Portable Electronic Products Suitable for Use in Class I and II, Division 2, Class I Zone 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations**

ANSI/ISA 12.12.03-2011, the Standard for Portable Electronic Products Suitable for Use in Class I and II, Division 2, Class I Zone 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations, has the following purpose

“The purpose of this standard is to provide guidance for the use of selected general-purpose portable electronic products in certain hazardous (classified) locations and is primarily intended for use by an owner/operator of the Hazardous Classified Location.”  
ANSI/ISA 12.12.03-2011, Section 1.

The scope of the document further explains that the document applies to body-worn and hand-held portable electronic products for use in Class I, Division II hazardous locations which are not available listed or labeled for such location. Although the information provided may be regulatory at certain facilities, it is stated as guidance for owners and operators and does not appear regulatory per NFPA 30A or NFPA 70.

ANSI/ISA 12.12.03-2011 provides categories of portable products that may be used at hazardous locations. In this document, products are suitable for Class I, Division 2 environments if they are one of the following:

1. Listed for use in that location: For example, UL 913, Intrinsically Safe Apparatus and Associated Apparatus for use in Class I, II, and III, Division I Hazardous locations or ISA 12.12.01-2015, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations
2. Portable Electronic Product 1 (PEP 1): These products are defined as body-worn portable electronic products, in direct contact with the skin, that are deemed incapable of causing an ignition under normal conditions. PEP 1 devices are button cell powered by a maximum of two cells and do not have external electrical connections. Examples of these are wristwatches and hearing aids.
3. Portable Electronic Product 2 (PEP 2): Portable electronic products that are deemed incapable of causing an ignition under normal circumstances. These are products that meet certain criteria and have been labeled as being PEP 2. Some criteria include: battery secured so that it does not fall out during a drop test, no wired accessories or external electrical connections used in hazardous areas, and recessed or protected terminals. May include medical devices, calculators, and some cell phones.

Both PEP 1 and 2 products also have other requirements such as no sparks or excessive temperatures in normal operations, no camera flashes unless they can be disabled, no arcing motors, and no visible damage. Also PEP products are limited the power of any radio frequency transmissions. Personal electronic devices used by the public are not typically UL listed or certified as PEP 2 devices. As shown earlier with Attachments 8 and 9, typical cell phones and other portable electronic devices are not UL 913 or PEP 2 listed.

## **NFPA 497 - 2017, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas**

NFPA 497 also references ANSI/ISA-12.12.03. This document provides guidance for electrically installations in hazardous locations, specifically chemical process facilities as indicated by its scope in NFPA 497, Section 1.1. This document uses more direct language in the use of portable electronics at these facilities:

“Portable electronic products (PEPs) meeting the requirements for PEP-1 or PEP-2 of ISA-RP12.12.03, Standard for Portable Electronic Products Suitable for Use in Class I and II, Division 2, Class I, Zone 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations, are considered suitable for use in Division 2 and Zone 2 locations.” NFPA 497 2017, 5.1.4.3

Although this code does provide requirements for portable equipment in hazardous locations, it does not appear it that it is intended for full implementation at motor fuel dispensing facilities. NFPA 497 may not take the unique considerations of motor fuel dispensing facilities into account. NFPA 497 makes the following statement as well that it is not intended to supersede requirements found in NFPA 30:

“This recommended practice is not intended to supersede or conflict with NFPA 30.”  
NFPA 497 2017, 1.3

The NFPA 30A handbook provides unique exemption to motor fuel dispensing facility by indicating the classified area around a dispenser does not apply to the electrical system of an automobile. As discussed in the next section, the suitability of personal electronic devices at motor fuel dispensing facilities may be different than that of hazardous areas associated with chemical process areas as found in NFPA 497.

### **A Summary of Current Research**

Cell phone use at motor fuel dispensing facilities has been the alleged ignition source of a number of fire incidents found on the internet and sent through email. The website in Attachment 11 includes a collection of stories and hoaxes that may have created caution around the issue of cell phones and gasoline dispenser when use of such electronic devices were just entering the marketplace. This reference is not intended as a credible technical substantiation, but rather an example of the stories circulated on the topic.

Similarly, there have been numerous incidents where cell phone use was initially suspected as the cause of an ignition, but were subsequently ruled out. Although many of these stories date back to the early 2000's, a recent review of news releases did not reveal incidents where cell phones could be conclusively linked to any fires at fuel dispensing facilities by a credible investigative source.

A 2006 study and subsequence IEEE conference paper (Attachment 12) analyzed the risks of cell phones in Class I, Division 2 hazardous locations. The hazardous locations in this study were not limited to fueling stations and encompassed petrochemical facilities as well. In the study, the authors determined cell phones had a very low probability of causing an ignition even under

ideal conditions. The study included a number of experimental methods to generate a spark from cell phones. Such actions included: removing vibration motors from a selection of phones and energizing them in a flammable atmosphere (no ignition events occurred), intentionally shorting out battery terminals in a darkened environment to monitor for visible sparks (no sparks were seen), and short circuited a battery for ten minutes to monitor temperature rise (no measurable increase in temperature). The greatest risk in this study was proposed that if a cell phone was dropped on a hard surface the battery may disconnect and cause an impact spark from the mechanical impact. The authors determined the risks of a cell phone causing a fire in a Class I, Division 2 environment to be negligible, but noted that there will always be a minimal hazard.

A study published by Exponent Failure Analysis Associates in 1999 (Attachment 13) provided a similar conclusion as the IEEE study mentioned previously. This paper stated that cell phone use at gasoline stations represents a negligible hazard. The authors reasoned that there would need to be both a flammable atmosphere present and a malfunctioning cell phone to create an ignition. The paper concludes that numerous ignition sources on automobiles that are within the hazard area and static discharges from personnel pose a greater hazard than cell phones.

The Federal Communications Commission (FCC) has also published guidance that echoes the papers noted above (Attachment 14). The FCC stated that a number of studies were completed and that although theoretically possible, there is no documented incident where a cell phone has caused a fire or explosion. Also the FCC stated that although the potential of ignition by wireless devices is remote, automobiles and static electricity are present and will always be potential ignition sources.

A 2011 paper by NFPA highlights some of the same findings (Attachment 15). It provides reference to a study from Australia that reported that 243 fire reports from 1993 to 2004 were initially suspected to be caused by cell phones. Subsequent investigation revealed that none of the reports could be linked to cell phone use. The report also stated that many researchers have attempted in laboratory conditions to ignite fuel vapors with cell phones but were unsuccessful.

Mobile phones use at fuel stations in the UK has been heavily debated. A narrative of some of the inconsistencies with cell phone policies and risks is provided in Attachment 16, "An Example of Everyday Risk Assessment". Although the author does not believe cell phones provide a risk of ignition at petrol stations, laws in the UK originally written for banning CB radio use at service stations also ban mobile phone use.

A University of Kent case study in Attachment 17, provides a thorough review of alleged hazards of mobile phones at service stations. The study provides an overview of the issues and laws related to motor fuel dispensing facilities at a variety of locations. The author concludes that there is a phantom risk that results in precautionary health and safety measures. The author also notes that there is a confusion of blaming fires on mobile phones which disguises the real causes of the fires which are typically static.

A statement by the GSM Association, an organization that represents worldwide mobile operators (Attachment 18) provides their position on mobile phone use at fueling station. This

paper also noted that in 2003, the UK Institute of Petroleum hosted a seminar on mobile phones and petroleum vapors. The seminar came to the following conclusion:

"The seminar showed the findings of research undertaken to date demonstrating that although the majority of mobile phones are not specifically designed and constructed to prevent them igniting a flammable atmosphere (in accordance with standards for 'protected equipment'), the risk they present as a source of ignition is negligible. The Institute of Petroleum is not aware of any fire incident that has been substantiated as having been caused by a mobile phone anywhere in the world. Presenters indicated that all of the reported incidents are either hoaxes or have been incorrectly attributed to having been caused by a mobile phone." UK Institute of Petroleum, 2013.

A recent investigation by the German Society for Petroleum and Coal Science and Technology (summary provided in attachment 19) performed many of the experiments done almost a decade earlier in the 2006 IEEE study with modern smart phones. This study came to the same consensus as other studies and concluded that cellular phones in normal use are not an ignition danger. Also no special ignition dangers above that which already exist are created from the use of cellular phones at gasoline dispensers.

### **Summary**

Personal electronic devices and mobile electronic payment systems on dispensers are an emerging market and are in use today. Although there have not been any credible and documented incidents of mobile phones causing a fire, there is no clear guidance if their use is permitted at fuel dispensing facilities in accordance with current codes. This Formal Interpretation Request seeks to clarify whether or not the use of personal electronic devices is prohibited for payment and payment-related activities at motor fuel dispensing facilities by asking the following question:

Does NFPA 30A paragraph 8.3.1 prohibit the use of personal electronic devices within the Class I, Division II hazardous location associated with a fuel dispenser, for the purpose of communicating with the fuel dispenser for payment, transaction, and other related business communications?

## **List of Attachments**

- 1) "Use of Personal Electronic Devices for Payment Activities at Motor Fuel Dispensing Facilities"
- 2) "Fires at Refueling Sites That Appear To Be Static Related – Summary" Petroleum Equipment Institute. 2010. Retrieved Aug. 2016 from <http://www.pei.org/sites/default/files/PDF/Refueling%20Fire%20Incidents.pdf>
- 3) "Staying Safe at the Pump." American Petroleum Institute. 2016. Retrieved Aug. 2016, from <http://www.api.org/oil-and-natural-gas/consumer-information/consumer-resources/staying-safe-pump>.
- 4) Wayne TAP Contactless/NFC Reader. Wayne 2014. Retrieved Jul. 2016, from <https://wayne.com/media/1186/wayne-waynetap.pdf>.
- 5) Wayne iX Pay T5 and T7 Secure Payment Terminal. Wayne 2015. Retrieved Jul. 2016 from [https://www.wayne.com/media/1545/wayne-ix-pay-secure-payment-terminal-en\\_2015-10-06.pdf](https://www.wayne.com/media/1545/wayne-ix-pay-secure-payment-terminal-en_2015-10-06.pdf).
- 6) Gilbarco Veeder-Root Mobile Payment at the C-Store. Gilbarco 2016. Retrieved Jul. 2016, from <http://www.gilbarco.com/us/products/flexpay-payment-systems/payment-options/mobile-payment>.
- 7) Gilbarco Veeder-Root Encore 700 S Dispensers. Gilbarco 2016. Retrieved Jul. 2016, from [http://www.gilbarco.com/gold/download.cfm?doc\\_id=411](http://www.gilbarco.com/gold/download.cfm?doc_id=411).
- 8) "Important Safety Information." iPhone User Guide. Apple 2016. Retrieved Jul. 2016 from <http://help.apple.com/iphone/9/#/iph301fc905>.
- 9) "Health and Safety Information." Galaxy S6 User Manual. March 2015. Retrieved. Jul. 2016 from [http://downloadcenter.samsung.com/content/UM/201503/20150303094626458/SM-G920F\\_UM\\_EU\\_Lollipop\\_Eng\\_Rev.1.0\\_150302.pdf](http://downloadcenter.samsung.com/content/UM/201503/20150303094626458/SM-G920F_UM_EU_Lollipop_Eng_Rev.1.0_150302.pdf).
- 10) "Liquid-Measuring Devices." National Institute of Standards Handbook 44. 2016.
- 11) "Cell Phone Use at the Gas Pump." Snopes. Aug 2014. Retrieved Jul. 2016 from <http://www.snopes.com/autos/hazards/gasvapor.asp>.
- 12) Bozek, Allan, Martin, Ken, Cole, Marty. "Cellular Phones in Class I, Division 2/Zone 2 Hazardous Locations." IEEE, Paper No. PCIC-2006-4.
- 13) "Cell Phone Usage at Gasoline Stations." Report to Motorola by Exponent Failure Analysis Associates, Menlo Park, California USA. December 1999.
- 14) "Wireless Devices at Gas Stations" Federal Communications Commission. May 2011. Retrieved Jul. 2016, from <https://www.fcc.gov/consumers/guides/wireless-devices-gas-stations>.
- 15) Evarts, Ben. "Fires at U.S. Service Stations" NFPA, Quincy. 2011.
- 16) Ladkin, P.B. "An Example of Everyday Risk Assessment." Bielefeld, University of Bielefeld. 2001.

17) Burgess, Adam. "Real and Phantom Risks at the Petrol Station: The Curious Case of Mobile Phones, Fires, and Body Static." University of Kent. 2007.

18) "Mobile Phones Usage at Petrol Stations" GSM Association. Aug. 2012. Retrieved Jul. 2016, from [http://www.gsma.com/publicpolicy/wp-content/uploads/2006/03/gsma\\_mobile\\_phones\\_fuels1.pdf](http://www.gsma.com/publicpolicy/wp-content/uploads/2006/03/gsma_mobile_phones_fuels1.pdf).

19) "Safety Related Investigation of the Ignition Danger Caused by the use of Mobile Phones at Petrol Filling Stations" German Society for Petroleum and Coal Science and Technology. Jun. 2016.