

USNWG ON TAXIMETERS
SEPTEMBER 24 – 26, 2012
GAITHERSBURG, MD
MEETING SUMMARY

This document is a summary of the U.S. National Work Group on Taximeters (USNWG) September 24-26, 2012 meeting held at the National Institute of Standards and Technology (NIST) in Gaithersburg, MD. The meeting was held to discuss proposed amendments for the update of NIST Handbook 44 *Specifications, Tolerances and Other Technical Requirements for Weighing and Measuring Devices* (HB44), Section 5.54 (Taximeters Code) to address legal metrology requirements for emerging technologies in the taximeter industry.

This was the second meeting of the USNWG and the first opportunity for the members to meet face-to-face. In addition to those able to attend the meeting in person, the meeting was also attended by several USNWG members through web-conference.

Those in attendance included: regulatory officials from state and local weights and measures jurisdictions; representatives of the New York Taxi and Limousine Commission (transportation associations and legal counsel); manufacturing representatives of taximeters and associated equipment; taximeter related software developers; representatives from U.S. type evaluation laboratories; and technical advisors from NIST Office of Weights and Measures (OWM) and Time and Frequency Division.

The USNWG is being coordinated through the NIST Office of Weights and Measures. NIST, in an agreement with the National Conference on Weights and Measures (NCWM) has accepted the role as the sponsor and organizer of the USNWG.

Table of Contents

1	<i>General considerations (terminology and Handbook 44 definitions)</i>	3
1.1	HB44 Appendix D Definitions.....	3
1.1.1	Taximeter	3
1.1.2	Point of Sale Systems	3
1.1.3	Proposal for new terminology “Taximeter point-of-sale system”	4
1.1.4	Metrological [Integrity/ Effect]	4
1.2	Evaluation/Examination.....	5
2	<i>Meeting Agenda</i>	5
2.1	Item 4.1 – Proposed new paragraph A.2 Associated Equipment	6
2.2	Item 4.2 - Proposed new paragraph S.1.1.1 Point of Sale System.....	8
2.3	Item 4.3 – Amendment of S.1.2. Advancement of Indicating Elements.....	9
2.4	Item 4.4 – Proposal for new requirement S.1.3.3. Customer’s Indications.....	12
2.5	Item 4.6 – Proposed amendment to S.1.5.1. General and S.1.5.2. Time not Recording	14
2.6	Item 4.7. – Proposed addition of new paragraph S.1.7.1. Identification of Extras Charges.....	17
2.7	Item 4.8 – Proposal to amend paragraph S.1.8. Protection of Indications.....	19
2.8	Item 4.9 – Proposed changes to paragraph S.1.9. Recorded Representations	20
2.9	Item 4.13 – Proposal to amend paragraph S.5 Provision for Security Seals.	24
2.10	Items 4.5, 4.10, 4.11, and 4.12.....	28
2.11	Item: GPS as a distance/time measurement device	29
2.12	Item: Mobile (smart) Telephone Apps	32
3	<i>Meeting Conclusions:</i>	33

1 General considerations (terminology and Handbook 44 definitions)

The USNWG meeting began with a discussion regarding recommended changes to NIST Handbook 44, Section 5.54 (Taximeters Code). The group quickly realized that additional work not originally included as part of the agenda needed to be addressed. Preliminary work was necessary for the work group to agree on the meaning of certain terms specified in HB44 Appendix D and to identify and define any new terms as appropriate.

Many of the basic concepts and definitions that are understood and used routinely in the weights and measures community are not clearly defined and understood to those outside that circle. Some terminology, when used in context with taximeter systems must be clearly defined so that the meaning is understood by the entire USNWG. The work group initially identified at least three terms which will handicap the group's progress unless clearly understood by all members.

1.1 HB44 Appendix D Definitions

1.1.1 Taximeter

The definition of the term "taximeter" itself (as found in Appendix D in HB44) was challenged by industry when the group's discussions involved various types of accessory equipment being interfaced with a taximeter. Some of the associated equipment will perform functions that in the past that were solely performed by the taximeter. The concept of a taximeter from 15-20 years ago had been a stand-alone device however, in many instances taximeters are being interfaced with various accessory components to become integrated taximeter systems.

The USNWG agreed that the current definition for "taximeter" in Appendix D will suffice and did not elect to propose any amendment for the definition of "taximeter" at this time. However, the members clearly recognized that a number of HB44 requirements which are appropriate for stand-alone taximeters are in need of amendment to make them applicable to today's taximeter *systems*.

1.1.2 Point of Sale Systems

It became apparent to the USNWG that the definition for "point-of-sale" (POS) as it relates to a taximeter was not clearly understood by all. Although a definition for "point-of-sale system" already exists in HB44 Appendix D, the group devoted considerable attention and time to clearly define point-of-sale system as used in the context of taximeters. The work group deliberated on what components will comprise a point-of-sale system in relation to taximeters. The existing definition of point-of-sale system in Appendix D of HB44 reads as follows:

point-of-sale system. – An assembly of elements including a weighing or measuring element, an indicating element, and a recording element (and may also be equipped with a “scanner”) used to complete a direct sales transaction.

While an “assembly of elements” aptly describes systems that can be found in taxis today, this definition did not seem entirely appropriate in relation to taximeters. Typical taximeter systems will not include any type of scanner and contrary to the above definition, under the current requirements of HB44 taximeters are not required to have a recording element. It should be noted however, that other device codes in HB44 require that POS systems and devices that facilitate payment for a transaction provide a printed receipt.

Additionally, there are taximeters produced where multiple components are combined within a single housing and which provide indications of fare, extras, and other information and may also be equipped with an integrated printer. There was disagreement within the USNWG as to whether such a device could accurately be classified as a POS system.

1.1.3 Proposal for new terminology “Taximeter point-of-sale system”

The group did develop a draft definition for “Taximeter point-of-sale system” as follows:

Taximeter point-of-sale system. – An assembly of devices including, but not limited to a taximeter and any other interactive components connected (wired or wirelessly) that provide a means to accept electronic payment for charges, used to complete a sales transaction.

Considering that current taximeter systems comprised of multiple elements (taximeters, mobile data terminals, passenger/driver information monitors) but lacking a recording element have been appearing recently in a number of metropolitan areas, the group felt that a manufacturer could circumvent having their device classified as a POS system and thus avoid regulation if their device did not include a printer. In the case of some transportation services (e.g., those operating using mobile telephones and their “apps”), the passenger can be provided an electronic form of receipt on their mobile phone or email account and in those cases a printed receipt would not be necessary. This was the basis for the USNWG decision not to include a recording element as a required element in a POS system.

1.1.4 Metrological [Integrity/ Effect]

During further discussion regarding the specific components that are necessary for a system to be considered as a POS within the context of a taximeter, the group considered which components that are being attached to a taximeter would have metrological effects on the system. This led to additional discussion regarding the definition of the terms “metrological effect” or “metrological integrity.”

Currently, HB44, Appendix D only provides a definition for the term metrological integrity as shown below:

metrological integrity (of a device). – The design, features, operation, installation, or use of a device that facilitates (1) the accuracy and validity of a measurement or transaction, (2) compliance of the device with weights and measures requirements, or (3) the suitability of the device for a given application.

An explanation was given to the group that in the context of weights and measures, metrological features of a device refers not only to its ability to accurately perform that device's intended measurement but the term also encompasses the way that the measurement data is presented or displayed and how that may affect an associated transaction. Some examples of metrological effects not directly associated with performing the measurement would include (but are not limited to):

- the readability of the device's display and any recorded/printed receipts;
- the positive identification of measurement units;
- the suitability of the device for its intended purpose; and
- any feature of that device that would facilitate fraudulent use.

There was no further effort by the USNWG at this time to clarify or redefine these terms.

1.2 Evaluation/Examination

One other important topic that surfaced during this initial period of general discussion involved the distinction between the type evaluation of a device (primarily based on criteria found in NCWM Publication 14) and the field examination of the device primarily based on Handbook 44 specifications, tolerances, and other requirements. During this part of the discussion, the group was informed that type evaluation may include more extensive test procedures than that which are specified in HB44 in the device code Notes section. The reverse is also true in that a routine field examination will almost always involve applying requirements that are not appropriate in conditions present during a typical type evaluation. For example:

- a type evaluation may include analyzing the effects of temperature change upon the performance of a device or components of a system under controlled conditions (i.e. environmental chamber); and in contrast
- a field examination would most likely include verification that the device has been installed properly (typically as per manufacturer instructions).

2 Meeting Agenda

This meeting was the first where the USNWG addressed technical matters related to taximeters including:

- design, performance, installation, and use requirements;
- test procedures; and

- the basis for calculation of fares.

Although the meeting concluded before the entire planned agenda could be considered, the WG made substantial progress towards developing proposals to bring the existing HB44 Taximeters Code up to date. A number of items listed on the agenda were not considered during this meeting due to extended discussions which were not anticipated, and the time constraints imposed by the meeting schedule. Items that were not considered during this meeting and those that were considered at length but where no consensus was achieved will be carried over to subsequent meetings. These issues are listed at the end of this summary under “3 Meeting Conclusions.”

The comments, discussions, and conclusions (where applicable) of this meeting are listed below in the order which they appeared on the meeting agenda. Item numbers are assigned according to the numbering format used for the meeting’s agenda.

2.1 Item 4.1 – Proposed new paragraph A.2 Associated Equipment

The USNWG considered a proposal to include a new requirement to HB44 Taximeter Code, paragraph A.2. as shown:

A.2 Associated Equipment. – This code also applies to associated equipment that can be interfaced with taximeters and which has any metrological effect on a taximeter such as: POS systems; driver/passenger input devices and displays; and computing types of devices (i.e., Mobile Data Terminals).

(Added 201X)

The new paragraph shown above was proposed to recognize that requirements found in the HB44 Taximeters code should apply to accessory equipment used with a taximeter such as additional displays, keypads, Driver Information Monitors (DIMs), Passenger Information Monitors (PIMs), Mobile Data Terminals (MDTs), credit card readers, etc. which may affect the metrological integrity of a device (or system).

Discussion:

This proposal generated a great deal of discussion which revolved around the nature of the interaction between a taximeter and other associated equipment in a system, and what effect that interaction has on the accuracy and validity of a transaction.

Most members of the group also felt that it is important to recognize that interfaces between the equipment in a system may be accomplished through wired or wireless connections. A major concern was the significance of data on the measurement or transaction which was produced by various components and the direction of data flow (input/output) between the taximeter and the associated equipment within a system.

It was pointed out by some manufacturers of software-based devices that these devices (i.e., Driver Information Monitors or DIMs and Mobile Data Terminals or MDTs) were being installed in taximeter systems where they provide data input which would affect the transaction. In some cases the MDTs would serve as a proxy for the taximeter where they could be used for functions such as: the display of required transaction information; entering extras charges; providing total fare calculations; and providing a method of payment (credit/debit cards). Functions that have historically been performed by the taximeter could now be accomplished through the use of this type of equipment. The USNWG considered whether this type of equipment (MDTs) should be regulated under the HB44 Taximeters Code or rather the function and performance of the associated software should be the focus of regulation.

Another consideration that emerged during this discussion is that there are some circumstances where a taxi fare is charged that is not based on the distance/time measurement performed by the taximeter. Such is the case where the passenger is charged a flat rate not directly based upon time or distance. This type of charge is most often found where the trip is on frequently traveled, established routes (e.g., from an airport to a city's hotel district). The point was made that under these circumstances, the taximeter does not necessarily play a role in the transaction and, in this situation the system could not be appropriately classified as a taximeter point of sale system if the definition of the term developed by the USNWG is applied (see 1.1.2).

Another scenario was recognized by the USNWG where the service provider (taxi company/driver) uses a mobile telephone application (app) that operates as follows.

- The customer uses an "app" on their personal "smart" telephone to request a taxicab (or limousine).
- The driver receives a message (on a mobile telephone in his/her possession) to pick that passenger up and deliver the passenger to their destination.
- The fare for the service may be calculated by a taximeter located in the vehicle or, in some cases through the use of GPS technology incorporated in the driver's mobile telephone.
- The driver then manually enters the fare information (in cases where fare is determined by a taximeter) as well as additional charges (extras, tip, etc.) into the driver's mobile telephone through the application.
- The mobile telephone app calculates the total charge and, in some cases provides the customer with a method of electronic payment.

In these instances, the transaction involves the different elements of a typical POS system however there is no interface between the measuring device (taximeter) and the other components of the system.

Some members of the USNWG indicated that this proposed requirement would apply too broadly to equipment that is used in association with a taximeter during a transaction. Mr. Jesse Davis (Creative Mobile Technologies, LLC) suggested that instead of applying regulation to system

hardware (associated equipment); the interface protocol used by the taximeter to communicate to the other equipment should be the focus of any proposed regulation. Others in the group stated that if the requirements apply solely to the communications interface and protocol regulation of these equipment would be overly complex and too prescriptive.

Conclusions:

The USNWG did not reach consensus on this proposal and elected to table further discussion about this item until definitions for terms such as “point-of-sale”, “metrological effect”, etc. could be fully developed and agreed upon by the USNWG. A result of the USNWG’s discussions about associated accessory equipment was a draft of a new definition for “taximeter point-of-sale” as shown above in section 1.1.2. This item will be carried-over for further consideration during subsequent meetings of the work group.

2.2 Item 4.2 - Proposed new paragraph S.1.1.1 Point of Sale System

The USNWG considered a proposal for including a new Taximeters code requirement as shown below in paragraph S.1.1.1. that would require that a printed receipt be available when a taximeter is part of a POS system.

S.1.1.1 Point of Sale System. A printed receipt providing the required information in S.1.9. Recorded Representations shall be available through an integral or separate recording element for all transactions conducted with point-of-sale systems.

[Nonretroactive 20XX]

(Added 20XX)

As noted previously during the initial meeting discussions, the USNWG acknowledged that it may be necessary to redefine POS system as it applies specifically to taximeters.

Discussion:

Many of the USNWG members with regulatory backgrounds expressed the importance of the passenger/customer to have a printed receipt for the transaction as a record of charges and payments made. A notion expressed by some in the work group during the discussions was that in many instances the interchange between passenger and driver is brief and that the passenger may not immediately fully comprehend all details regarding the transaction. It is therefore important that the passenger be provided with a record of that transaction.

Some manufacturers expressed the notion that the adoption of this requirement would impose a hardship on their companies because not all of the models of equipment they currently produce are equipped with printers or they do not comply with the required itemization of all the information as required in HB44 Taximeters code, paragraph S.1.9.

This point led to a general discussion among the group regarding the terms “non-retroactive” and “retroactive” and the fact that only devices manufactured after the effective date of the requirement would be required to comply. The manufacturers present during the meeting acknowledged that they understood that any newly manufactured devices would need to comply with non-retroactive requirements. Some of these equipment manufacturers and transportation service providers expressed the notion however, that it is desirable for operators of multiple vehicles (i.e. taxicab companies/fleet managers) to maintain those vehicles with identical equipment and that this would be problematic if a specific model of taximeter (or associated equipment) becomes obsolete or unavailable as the fleet of vehicles expands or older vehicles are replaced.

It was also pointed out that, as written the requirement would only affect those taximeters associated with a POS system. This prompted yet even further discussion regarding the definition of POS systems and what constitutes those systems.

Conclusions:

Based on this meeting’s discussion regarding POS systems associated with taximeters, the WG concluded that it was more appropriate to take a device-specific approach when addressing the recording element. Therefore the title of the proposed requirement would more appropriately be modified to indicate that this requirement applies to “Taximeter Point-of-Sale System” recording element indications.

The USNWG clarified the intent by stating that a system consisting of a taximeter and a means to accept electronic payment is the minimum criteria required for that system to be considered a POS system however, the intent of this requirement is not to exclude the ability for that same system to accept cash payment as well.

Changes were made to the original proposal based on additional input from the members of the WG. The WG agreed to those changes as shown below.

S.1.1.1. Taximeter Point of Sale System, Recorded Indications - A printed receipt providing the required information in S.1.9. Recorded Representations shall be available for all transactions conducted with a taximeter point-of-sale system. The customer may elect to receive an electronic version of the receipt in lieu of a printed receipt

[Nonretroactive 20XX]

(Added 20XX)

2.3 Item 4.3 – Amendment of S.1.2. Advancement of Indicating Elements

This proposal included amendments to paragraph S.1.2. as shown below.

S.1.2. Advancement of Indicating Elements. – Except when a taximeter is being cleared, the primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or by the time mechanism, **or by automatic entry of a predetermined fixed rate.**

(Amended 1988, **and 201X**)

Discussion:

The WG acknowledged that many taxicab companies will want alternative types of fare charges (e.g., flat rate based fares where permitted) to be entered into the taximeter as a way to document any transaction and revenue whether the charges are based on a metered distance/time or by other arrangements. Because some jurisdictions allow charges based on predetermined flat rates (as mentioned in the discussions for Agenda Item 4.1), it has been suggested the use of this type of fares should be reflected by appropriate HB44 references. Furthermore some jurisdictions permit the use of “negotiated flat rates” where an established charge for a flat rate may be negotiated by the passenger and driver.

There was considerable discussion among the USNWG regarding the way that these types of flat rates are entered into a taximeter/taximeter system. It was noted that in many instances where flat rates are allowed, the taximeter is equipped with multiple buttons/controls on the taximeter which when activated will increment the applied rate in predetermined monetary amounts thus facilitating the input of pre-established rates. These types of controls may be programmed to include the input of established flat rates as an option to any rates based on factors of time/distance.

Other controls, either located on the taximeter or associated equipment within a taximeter system may allow the input of a negotiated flat rate (in jurisdictions where permitted) that has been agreed upon by driver and passenger.

During the discussion, the point was made that a gap exists between the use of flat rates and the NIST HB44 Taximeters Code paragraph S.1.2. because the input of flat rates or negotiated flat rates would cause the meter indications (i.e., fare) to advance. This would not comply with existing requirement S.1.2. which states that indications are only allowed to advance by the movement of the vehicle while the input of any flat rate is not dependent on the movement of the vehicle.

Mr. Davis stated that his company’s device (MDT) did not receive approval through type evaluation due to the capability of that device to add extras charges to the taximeter display. During the type evaluation, the input of extras charges was considered to be an advancement of indications. While this particular MDT would display additional extra charges to the total transaction cost however; it does not have the ability to advance the display of fare indications on the taximeter. This prompted a discussion among the group regarding the definition for the term “primary display” as used in this requirement.

The group debated whether the two distinct areas (one for fare and one for extras) on the taximeter display on many different manufacturers’ models were both part of the primary display. These areas are typically separated into a “fare” display area and an “extras” within the display area.

While the primary display is generally considered as that area that displays the fare amount, the work group was undecided on whether or not the extras display in these types of taximeters is considered to be part of the “primary” display. In many taximeters these two charges are displayed adjacent to each other and are distinguished from each other simply by placing the identifying terms “fare” and “extras” in close proximity to the respective locations on the taximeter’s display face.

Because extras charges in some cases are added during the trip as they are incurred (e.g. charges for tolls), the USNWG considered whether this updating of the extras charges constituted an advancement of indications in the primary display.

Conclusions:

Following the discussions of the group on this item, further editorial work resulted in the following amendments to the proposal:

S.1.2. Advancement of Indicating Elements. – Except when a taximeter is being cleared, the **fare as displayed by the** primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or by the time mechanism, **a combination of both, or by the automatic or manual entry of a monetary amount as permitted by the activation of a flat or negotiated rate.**

Extras charges may be advanced by any means.

(Amended 1988, **and 201X**)

Additional consideration of this item is needed to review the definition of “primary display” and to clarify that term as it applies to taximeters. After the conclusion of the September 2012 meeting, the NIST Technical Advisor to the USNWG further modified this proposal in a draft for the group to consider as shown below:

S.1.2. Advancement of Indicating Elements. – Except when a taximeter is being cleared, the **fare charges displayed on the** primary indicating and recording elements shall be susceptible of advancement only by:

- a). the movement of the vehicle;
- b). by the time mechanism;
- c). **a combination of both a) and b); or**
- d). **the entry of a monetary amount associated with a flat rate or negotiated flat rate where permitted.**

Advancement of indications for charges not based on the measurement of distance and time (including extras charges) may occur by manual or automatic means.

(Amended 1988, **and 201X**)

Both alternative proposed modifications will be presented to the work group for consideration and further discussion at future USNWG meetings.

2.4 Item 4.4 – Proposal for new requirement S.1.3.3. Customer’s Indications

A proposal for a new requirement: S.1.3.3. Customer’s Indications was developed to require that certain indications be displayed as appropriate on devices that are located in the rear seat/customer area of the taxi.

The proposed new requirement is as follows:

S.1.3.3. Customer’s Indications. – A point-of-sale system’s indicating element positioned in the passenger compartment shall clearly display:

(a) indications for all fees; and

(b) values that are in agreement with indicated values on all other displays.

[Nonretroactive as of 20XX]

Discussion:

The USNWG discussions began with statements from manufacturers of associated devices pointing out the information that is required to be displayed may originate from sources other than the taximeter. Some computerized devices (i.e. MDTs) are capable of inputting data into a taximeter system they are associated with.

Mr. Davis raised the question that if the data displayed on a passenger display does not originate from the taximeter itself, is it appropriate to incorporate requirements that apply to the associated equipment (that does provide the data to a display) within the HB44 Taximeters Code? Some members of the group suggested the possibility of developing a separate code or section within HB44 for POS systems. The NIST Technical Advisor informed the group that a number of other specific codes in HB44 already contain requirements that pertain to POS systems in association with those devices and that creating a separate code for POS would be somewhat impractical. Because POS systems are commonly tailored to work with specific types of devices, it is advisable to evaluate the POS system in relation to its operation with the measuring device it is interfaced with.

A work group member asked if the indication of data on the passenger’s display does not originate from the taximeter, will this requirement apply. In response to that question Mr. Bill Fishman (retired NY Bureau of Weights and Measures) explained that the intent of the requirement is that the indications for all fees (fare and extras charges) must be displayed clearly in any customer display component and that those indications must be in agreement with similar indications presented on other components within that same system. Mr. Fishman also recommended the following additional changes to the original proposal:

S.1.3.3. Customer’s Indications. – A taximeter point-of-sale system’s indicating element or a remote display positioned in the passenger compartment shall clearly display:

(a) Indications for all incurred fees and charges and

(b) Values that are in agreement with ~~indicated~~ similar values on all other displays in the same systems.

[Nonretroactive as of 20XX]

Further comments were made by some group members that additional information such as the rate class should also be included on the passenger's display. Not all members were in agreement stating that the customer's limited display size may not be sufficient for the amount of information being required in the proposal.

Mr. David Paul (Taxi Magic) stated that the requirement should be limited to saying that if the system is configured to display information to the customer, then the display should agree with any associated information on a primary display. However, whether or not the system is configured to provide that information to the passenger display should remain optional.

Mr. Paul also offered an alternative to the original proposal where the existing paragraph S.1.3. would remain as is, with the exception of making the title of the paragraph specific to stand alone taximeters. A paragraph (S.1.4.) would then be added to address the requirements pertaining to the visibility of indications displayed on a taximeter point of sale system.*

S.1.3. Taximeter Visibility of Indications. – The indications of fare, including extras, and the mode of operation, such as “time” or “hired,” shall be constantly displayed whenever the meter is in operation. All indications of passenger interest shall be easily read from a distance of 1.2 m (4 ft) under any condition of normal operation.
(Amended 1977, 1986, and 1988)

S.1.4. Taximeter Point of Sale System Visibility of Indications. – *When a taximeter point of sale system includes one or more displays other than the face of the taximeter, any values indicated on those other displays for fare, extras, additional charges and/or total, when and if displayed, must be at all times in agreement with the indicated values on the primary face of the taximeter.*

[Nonretroactive as of 20XX]

**[NIST Technical Advisor's note: The numbering of any additional paragraph(s) may be subject to further review and adjustments made as needed.]*

Some members of the group contended that the backseat display was initially intended to be used for advertisement of other services/products available to the customer (e.g. theater tickets) and not for displaying fare, extras, and other relevant transaction information for the passenger.

Mr. Matthew Daus (Windels Marx Lane & Mittendorf, LLP) pointed out that not providing the customer with relevant information to the transaction will provide an opportunity for the driver/taxi company to commit fraud. He further stated that he supports a requirement that would require the taximeter system to provide an obvious notification to the passenger through some type of alert that the fare is being calculated based on a specific rate. Additionally, he stated that he is aware of two manufacturers of taximeter POS systems which have already designed this type of alert in their products.

Ms. Juana Williams (NIST) also pointed out that the HB44 General Code (applicable to all types of devices) already requires that primary indications are visible to the customer, and that [digital values] like values in a system must agree.

Recognizing Mr. Daus' experience and familiarity with the taxi industry in New York City, Mr. Fishman pointed out that the taxi industry in that particular jurisdiction (and well as others) has a very complex rate structure. This is in contrast to other jurisdictions where rate structures are very simple. Mr. Fishman further stated that HB44 should not be excessively prescriptive so as to be developed based on specifics of any particular local jurisdiction's method of enforcement, but rather simply provide the minimum standard that any regulatory jurisdiction may use as a foundation for legal metrology regulation.

General group discussions that followed included consideration regarding Certificates of Conformance (CC) that are issued upon type evaluation approval for taximeters. The group considered that some of these CCs were issued while the initial evaluations did not include any evaluation of associated equipment attached to the taximeter and what the implications may be when those taximeters are interfaced with other equipment (i.e. point-of-sale system). Mr. Fishman indicated that if and when those taximeters become a component in a taximeter POS, the CCs for those taximeters would need to be amended.

Conclusions:

The group did not arrive at any consensus on the location, visibility, and agreement of indications when the equipment within a system includes a separate (primary) display for the passenger. Future meetings/conferences will revisit this item for additional consideration.

2.5 Item 4.6 – Proposed amendment to S.1.5.1. General and S.1.5.2. Time not Recording

The USNWG considered a proposal to amend S.1.5.1. General and S.1.5.2. Time not Recording as shown:

S.1.5. Operating Condition.

S.1.5.1. General. – When a taximeter is cleared **and not registering fare**, the **primary** indication **shall display** “Not Registering,” “Vacant,” or an equivalent expression ~~shall be shown~~. Whenever a taximeter is set to register charges, it shall indicate “Registering,” “Hired,” or an equivalent expression and the rate at which it is set shall be automatically indicated, **and the required display information shall not be obscured** (Rate 1 or Rate A, for example).

(Amended 1988)

S.1.5.2. Time not Recording. – When a taximeter is set for fare registration with the time mechanism inoperative, it shall indicate “Time Not Recording” or an equivalent expression.

A taximeter set for fare registration with the time mechanism operating shall provide a clear display (e.g., “Time Recording”, “Time Mechanism On”) to the passenger indicating the status of the time mechanism.

[Nonretroactive as of January 1, 20XX]

(Amended 1988, **and 20XX**)

S.1.5.1.: The changes proposed to current paragraph S.1.5.1. were made to clarify that the operational status of the meter must be indicated on a primary display. The recommendation is also intended to specify that non-fare information that may be displayed (e.g. advertisements, maps, etc.) should not obscure the required fare information.

S.1.5.2.: These proposed changes to current paragraph S.1.5.2. will require that the status (the basis by which a fare may be calculated) of the meter when “hired” to be identified. The “Time not recording” statement (or equivalent) is required in the existing Code. This indication denotes that fare will be based only on distance traveled and not on time. This proposal however, would require a statement of “Time recording” or similar statement to be displayed, indicating that fare may be based on elapsed time as well as distance traveled.

Discussion:

An initial question from the members of the USNWG asked whether the proposed changes under paragraph S.1.5.1. would apply to only a stand-alone taximeter or to all displays within a taximeter POS. Concerns were expressed by several group members that the displayed information that this proposal requires does not seem appropriate for all displays within a system.

Mr. Fishman explained that the amendments would only apply to a stand-alone taximeter as the proposal is drafted. Mr. Paul replied that he was not comfortable with the recommended changes if the requirement would be extended to cover POS systems.

A number of group members expressed concerns regarding the interpretation for a primary display when the existing definition for “primary indicating and recording elements” in HB44 Appendix D was referred to. This definition for “primary indicating and recording elements” when applied to a taximeter POS system is ambiguous and can be interpreted as applicable to multiple components within a system. The question was asked by some group members if there could be more than one primary display within a POS system. The work group did not arrive at a definitive answer for this question.

Regarding the changes suggested for S.1.5.2., the USNWG discussed the implications of the changes based on the retroactive/nonretroactive status of the device. Some clarification was provided by Ms. Juana Williams on what conditions are used to classify a requirement as retroactive or

nonretroactive. Ms. Williams referred to paragraphs from G-A.5. and G-A.6. found in HB44 General code while explaining that nonretroactive requirements are those that will apply to devices that are manufactured, brought into a state, or placed into service on or after the effective date for that requirement. Those that were in service prior to that date are “grandfathered” and are not required to comply with the requirement.

Mr. Fishman explained that historically the “time off” button was used to discontinue the advancement of the timing mechanism during instances such as: time needed to complete a transaction (payment process at the conclusion of a trip); stopping to fuel up the vehicle during a trip; etc. This typically allowed the total charges of fare and extras displays to remain visible and on “hold”. On some systems however, when the meter is placed in a vacant or un-hired mode the indications are cleared.

Further amendments by Mr. Fishman to the proposed changes were offered to the group as shown below:

S.1.5. Operating Condition.

S.1.5.1. General. – When a taximeter is cleared **and not registering fare**, the **primary** indication **shall display** “Not Registering,” “Vacant,” or an equivalent expression ~~shall be shown~~. Whenever a taximeter is set to register charges, it shall indicate “Registering,” “Hired,” or an equivalent expression and the rate at which it is set shall be automatically **and continuously** indicated. **All required display information such as: Fare, Extras, Rate and time status shall not be obscured in any manner from the passenger.**

(Amended 1988)

S.1.5.2. Time not Recording. – When a taximeter is set for fare registration with the time mechanism inoperative, it shall indicate “Time Not Recording” or an equivalent expression. **Status of Time Mechanism. -When a taximeter is set for fare registration in the Hired mode, the status of the time mechanism must be clearly displayed on the meter’s face. (e.g., “Time Recording”, “Time On” or “Time Not recording”, “Time Off”.**

[Nonretroactive as of January 1, 20XX](Amended 1988, **and 20XX**)

Mr. Byron Corcoran (Centrodyne) advised the USNWG that this type of change would require hardware changes to existing devices and that those changes would be costly for the manufacturers.

The USNWG was asked to consider if the perceived value for adopting either of the two sets of proposed amendments shown above is justified while considering the potential cost to the manufacturers in order to make the necessary changes.

Conclusion:

The WG did not arrive at any consensus on changes to these requirements and agreed to carry the item over into the group’s next meeting.

2.6 Item 4.7. – Proposed addition of new paragraph S.1.7.1. Identification of Extras Charges

The intent of the proposal for the new paragraph S.1.7.1. and existing paragraph S.1.7.1. (to be renumbered as S.1.7.2.) is to require identification and itemization of specific extras charges for the passenger's benefit. While some jurisdictions with simple rate plans may not be greatly affected, those jurisdictions with more complex rate plans would be more profoundly affected. These proposed changes are shown below:

S.1.7.1. – Identification of Extra charges – For extras other than those charges for additional passengers or luggage, these charges shall be identified and provide a clear indication of the nature of the charge. These charges shall be itemized as necessary on the statement of charges as provided for in UR.3. Statement of Rates and also on a printed receipt for the transaction.

[Nonretroactive as of January 1, 20XX]

(Added 20XX)

S.1.7.12. Nonuse of Extras. – If and when taximeter extras are prohibited by legal authority or are discontinued by a vehicle operator, the extras mechanisms **or function** shall be rendered inoperable or the extras indications shall be **disabled or** effectively obscured by permanent means.

Discussion:

Ms. Joanne Rausen (NYC Taxi and Limousine Commission) offered the opinion that this requirement (like others that have been discussed) may best be approached if the paragraph were split into two parts: one section for stand-alone taximeters and a separate section for taximeter POS systems. Mr. Paul responded to the suggestion stating that it may be a means to arriving at a solution however, that approach would not solve all of the issues that concern his company's products. Taxi Magic's POS system receives input from the taximeter it is attached to and will display that data. If the taximeter does not itemize the extras charges then the alternative means to display those itemized extras charges would be to manually input them through other components in the POS system (i.e., MDT). The WG generally acknowledged that according to their understanding, there are currently no type approved taximeters that will meet the requirement by providing an itemized description of the charge. Mr. Paul further added that there should be some cause for concern for any manufacturer regarding the design of a system that would allow the driver to input charges into that system.

Mr. Bob McGrath (City of Boston Weights & Measures) stated that since this proposal applies to a printed receipt, that the content of this requirement would be placed more appropriately under requirement S.1.9. Recorded Representation instead. He added that this will definitely be a

problem for most if not all taximeters because they don't have the capability to itemize the extras charges. The group was undecided whether this proposed new paragraph should remain or be stricken because it could be considered redundant to paragraph S.1.9.

Mr. Davis reminded the group about a complication (mentioned earlier under 2.3) that surfaced during the type evaluation of a taximeter POS system developed by his company. Because the requirement S.1.2. Advancement of Indicating Elements does not permit the primary indicating (and recording) element to advance except by the movement of the vehicle, the ability to advance the indication of extras charges through another source of input (i.e. manual entering of charges for various extras charges) that was observed during the type evaluation process, was determined to not be in compliance. The rejection for type approval of this POS system through the National Type Evaluation Program (NTEP) was based on an interpretation of paragraph S.1.2. whereby the primary display of the system is considered to be inclusive of the indications of extras charges on the taximeter.

The USNWG was offered further amendments to the proposal by Mr. Fishman as shown below:

S.1.7.1. – Identification of Extra charges – ~~For extras other than those charges for additional passengers or luggage, these~~ All extras displayed on a taxi point of sale system or printed on a receipt or transmitted on an electronic version of a receipt shall be itemized and identified and provide a clear indication of the nature of the charge. Those charges for additional passengers or luggage may be excluded from those being required to be itemized or identified.

Information such as abbreviations used must be stated and explained on the receipt and on the Statement of Rates. [Nonretroactive as of January 1, 20XX]

(Added 20XX)

S.1.7.12. Nonuse of Extras. – If and when a taximeter's extras are prohibited by legal authority or are discontinued by a vehicle operator, the extras mechanisms **or function** shall be rendered inoperable ~~or the extras indications shall be disabled or effectively obscured by permanent means.~~

Mr. Fishman added that under S.1.7.1. it may be preferable rather than to exclude extras charges for additional passengers and luggage, to simply require that all extras be identified and itemized.

Further discussion points from the group included the notion that any specific requirements that would address charges for extras and the method used to identify those charges would be omitted from HB44. This suggestion would only including generally stated requirements in HB44 regarding the identification of extras and would include a statement that placed the responsibility of regulating how these charges are to be displayed upon the local jurisdictions and authorities. If this approach is agreed upon by the group, language will need to be developed for that purpose. Ms. Williams cautioned the work group against drafting requirements of this type by pointing out that the requirements in the Specification section of the HB44 Codes apply to design criteria of the device and are highly significant to the manufacturer's design specifications for that device. Since

many manufacturers base (at least to some extent) the design of commercial devices on the requirements in HB44, it is important to provide the manufacturers with design criteria by ensuring that all appropriate specification requirements are included in HB44 Taximeters Code. Ms. Williams suggested that if a system will be required to meet certain criteria in a jurisdiction, then it may be prudent to include those criteria within any specification requirements proposed. A manufacturer would not likely choose to produce multiple variations of a product in order to tailor the product for compliance in different jurisdictions. Therefore, it may not be advisable to draft requirements that would promote different interpretations and enforcement policies for those requirements. Additionally, this is a critical consideration if the device will undergo NTEP evaluation because this process would provide an evaluation for approval on a national level and would not accommodate variations in different jurisdictions.

Conclusions:

The USNWG did not arrive at any consensus or definite conclusions regarding the recommended changes. This item will carry over to the group's next meeting.

2.7 Item 4.8 – Proposal to amend paragraph S.1.8. Protection of Indications.

This requirement was originally developed for application to mechanical type meters, and the proposed amendments would bring the requirement up to date with current technology. Paragraph S.1.8. requires that taximeter indications should be protected from manipulation which had been more easily accomplished on mechanical-type indications. Electronic/digital type indications are much less subject to alteration or adjustment through physical manipulation of the indications/displays however, those indications could potentially be manipulated through microprocessors or any software that provides the display with input. The recommended changes are shown below:

S.1.8. Protection of Indications. –Indications of fare and extras shall be ~~displayed through and entirely protected by glass or other suitable transparent material securely attached to the housing of the taximeter~~ **protected from unauthorized alteration or manipulation.**

(Amended 20XX)

Discussion:

The WG recommends adding the word “all” to the beginning of the paragraph.

Conclusion:

The USNWG agreed to support an alternative proposal to modify paragraph S.1.8. as shown below.

S.1.8. Protection of Indications. – ~~All~~ Indications of fare and extras shall be displayed through and entirely protected by glass or other suitable transparent material securely attached to the housing of the taximeter **protected from unauthorized alteration or manipulation.**
(Amended 20XX)

2.8 Item 4.9 – Proposed changes to paragraph S.1.9. Recorded Representations

S.1.9. Recorded Representation. – A printed receipt issued from a taximeter, whether through an integral or separate recording element, shall include the following:

- (a) date;
- (b) unique vehicle identification number, such as the medallion number, taxi number, vehicle identification number (VIN) or permit number;*
- (c) start and end time of trip;*
- (d) distance traveled, maximum increment of 0.1 kilometer (0.1 mile);*
- (e) fare in \$;
- (f) for multi-rate taximeters, each rate at which fare was computed and the associated fare at that rate;*
- (g) additional charges where permitted such as extras, surcharge, telephone use, tip and tax shall be identified and itemized;* and
- (h) total fare in \$ (total charge).*
- (j) **any credits or discounts applied to the fare****
- (k) **the name of the taxicab company or owner****

The customer may elect to receive this information in the form of an electronic receipt made available to the customer's personal device.

[Nonretroactive as of January 1, 1989]

*[Nonretroactive as of January 1, 2000]

[Nonretroactive as of January 1, 20XX**]

[Technical Advisors note: It was pointed out during the USNWG's discussion that the numbering format of this requirement does not follow a correct alphabetic sequence by omitting a lettered item "i". This error in the sequence has been amended in the most current version of the proposal as shown under "Conclusions" section of this item.]

The proposed changes to paragraph S.1.9. as shown above are recommended to require that additional information be included on a printed receipt which may provide additional information

that could be of use to the passenger in verifying charges and for contact information for the owner/operator of the taximeter (or taxicab service). The USNWG acknowledges that newer technology offers alternate means for providing receipts; therefore, this proposal includes amendments to recognize the device's ability to receive transaction information electronically.

Mr. Fishman offered further changes to the initial proposal as shown below, stating that he believes it would be beneficial to also require an additional item requiring the taxi company's contact information on the receipt in the event that the passenger has any questions regarding billing or the service provided. Another change that Mr. Fishman suggested would be clarification that it is permissible to receive a receipt through the customer's electronic personal device (i.e., mobile telephone, electronic tablet, email, etc.).

***S.1.9. Recorded Representation.** – A printed receipt issued from a taximeter, whether through an integral or separate recording element, shall include the following:*

(a) date ...

*(j) any credits or discounts applied to the fare***

*(k) the name of the taxicab company or owner***

*(l) Active contact information, such as a telephone number or computer web-site, in which a passenger can contact the company ***

If agreed upon by the passenger, the passenger may elect to receive receipt information in the form of an electronic receipt made available to the passenger's personal device.

[Nonretroactive as of January 1, 1989]

**[Nonretroactive as of January 1, 2000]*

*****[Nonretroactive as of January 1, 20XX]***

Discussion:

Some USNWG members expressed the belief that bullet points "k" and "l" shown above would not be necessary and would simply take up valuable space on the printed receipt. In addition, this type of information is available if the medallion number (already required) is provided, although not all jurisdictions require taxi companies to purchase medallions. USNWG members noted that other information already required would be sufficient for the passenger to readily make contact with the responsible party.

Mr. Corcoran pointed out that the formatting of printed receipts may be limited to a certain number of data lines on the receipt and that by adding these additional items, the available number of data

lines could be exceeded. He suggested that some of the bullet points could possibly be combined to satisfy the intent of the requirement.

Mr. Corcoran also made the point that although at least one model of taximeter which has already been evaluated and has received a type approval through NTEP, will not comply with the requirement's provisions under subparagraph "g" for itemization of the extras. The existing requirement states that "additional charges where permitted such as extras, surcharge, telephone use, tip and tax shall be identified and itemized". Mr. Corcoran informed the group that he is unaware of any currently type approved taximeters that will meet this section of the requirement for itemized description of the charge.

The group raised other issues regarding the proposal which included the question of whether or not this requirement should be applicable to stand-alone taximeters or only to taximeter POS systems. Another issue that surfaced during the group's discussions is a difference in interpretation of the term "extras". While some in the group held the belief that all charges excluding the charge for fare are considered extras, others did not believe that the term extras included charges such as purchasing unrelated products or services (e.g. theater tickets) that may be promoted through the passenger's display in a POS system. It was apparent that this interpretation may vary from one jurisdiction to another.

Mr. Paul indicated that, as he had stated earlier, unless the taximeter provides the data for the itemization of charges, his company's product (Taxi Magic's POS) will not have the input needed to display the itemization of charges on their equipment.

Conclusions:

These additional changes shown below are recommended by the USNWG:

S.1.9. Recorded Representation. – A printed receipt issued from a taximeter, whether through an integral or separate recording element, shall include the following:

- (a) date;
- (b) unique vehicle identification number, such as the medallion number, taxi number, vehicle identification number (VIN) or permit number; **and current contact information***
- (c) start and end time of trip;*
- (d) distance traveled, maximum increment of 0.1 kilometer (0.1 mile);*
- (e) fare in \$;
- (f) for multi rate taximeters, each rate at which fare was computed and the associated fare at that rate;*
- (g) additional charges where permitted such as **extras in \$**, surcharge, telephone use, tip and tax shall be identified and **may be** itemized **when required under local jurisdiction;*** and
- (h) total fare in \$ (total charge).*
- (i) **any credits or discounts applied to the fare****
- ~~(m) **the name of the taxicab company or owner****~~
- ~~(n) **Active contact information, such as a telephone number or computer web site, in which a passenger can contact the company****~~

As previously mentioned, clarification of the types of charges associated with the NIST HB44 Appendix D definition of the term “extras” is needed. Following the conclusion of the USNWG meeting, Mr. Paul submitted a proposal that modifies the current HB44 definition of extras and also includes a newly proposed definition of the term “additional charges” as shown below for the USNWG to consider.

extras. - **Any charge or** ~~charges~~ to be paid by a passenger in addition to the fare, including any charge at a flat rate for the transportation of passengers in excess of a stated number and any charge for the transportation of baggage that are directly related to the transportation service provided. Examples include but are not limited to charges for the transportation of baggage, fuel surcharges, bridge/tunnel/toll fees, telephone or dispatch surcharges/fees, and additional passenger fees.[5.54]

additional charges. - **Any charge or charges to be paid by the passenger in addition to the fare and any extra(s) that are not directly related to the transportation services provided. Examples include but are not limited to purchase of items other than transportation services, tip, and taxes. [5.54]**

Along with these definitions, Mr. Paul also recommended further revision (shown below) to paragraph S.1.9. Recorded Representation. These recommended changes would replace

subparagraph “g” and insert a new subparagraph “h” into the proposal. The existing subparagraphs “h” and “i” as shown in the proposal above would remain although they would need to be renumbered.

(g) extras in \$*; where required by the local regulation, the extras shall be itemized in a manner consistent with such regulation**;

(h) itemized additional charges in \$:**

[Nonretroactive as of January 1, 1989] *[Nonretroactive as of January 1,
2000] **[Nonretroactive as of January 1, 201X]

(Added 1988) (Amended 1999, 201X)

This item will be carried over to the USNWG’s next meeting where it will receive further review.

2.9 Item 4.13 – Proposal to amend paragraph S.5 Provision for Security Seals.

As is the case with many other types of commercial weighing and measuring devices; the advances in taximeter design and enhancement of its functions have reached a stage where it is possible to change metrologically relevant features through programming (e.g., software). Having this capability for these electronic features is in sharp contrast to manually making changes or adjustment to these features using some physical means or mechanism on the device.

This proposal would add a new provision for sealing the device to the existing requirement S.5. Provision for Security Seals. This proposal would allow electronic means for providing security to the metrological features of the device.

The proposal recognizes a third new option for securing the device as shown below:

S.5. Provision for Security Seals. – Adequate provision shall be made to provide security for a taximeter. Security may be provided either by:

- (a) Affixing **physical** security seals to the taximeter and to all other components required for service operation of a complete installation on a vehicle, so that no adjustments, alterations, or replacements affecting accuracy or indications of the device or the assembly can be made without mutilating the seal or seals; ~~or~~
- (b) Using a combination of security seals described in paragraph (a) and, in the case of a component that may be removed from a vehicle (e.g., slide mounting the taximeter), providing a physical or electronic link between components affecting accuracy or indications of the device to ensure that its performance is not affected and operation is permitted only with those components having the same unique properties; **or**

(c) For taximeters that are interfaced with enhanced software driven (POS) systems and that are capable of remote configuration, the sealing of calibration and configuration parameters shall be performed through the use of a physical seal that when removed may allow remote configuration. Any changes made after the removal of this physical seal must be recorded in an event logger.

(Added 20XX)

The sealing means shall be such that it is not necessary to disassemble or remove any part of the device or of the vehicle to apply or inspect the seals.

(Amended 1988, 2000, **and 20XX**)

[Audit trails shall use the format set forth in Table S.5. Categories of Device and Methods of Sealing]*

[*Nonretroactive as of January 1, 20XX]

The proposal also includes a recommendation for a table corresponding to paragraph S.5 that categorizes the device or system based on its configuration capability and specifies the method of sealing each category of device as shown below:

<u><i>Table S.5. Categories of Device and Methods of Sealing</i></u>	
<u><i>Categories of Device</i></u>	<u><i>Methods of Sealing</i></u>
<u><i>Category 1: No remote configuration capability.</i></u>	<u><i>Seal by physical seal or a combination of physical seals and for components that may be removed from the vehicle, a physical or electronic link as described in S.5.(b) above.</i></u>
<u><i>Category 2: Remote configuration capability, but access is controlled by physical hardware.</i></u> <u><i>The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.</i></u>	<u><i>The hardware enabling access for remote communication must be at the device and sealed using a physical seal and two event loggers: one for calibration parameters and one for configuration parameters. The event loggers are required in the device; they must include event counters (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device. The event loggers shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)</i></u>

[Nonretroactive as of January 1, 20XX]

(Table added 20XX)

Discussion:

The members of the USNWG were not in agreement regarding this proposal in that some expressed opposition for adopting the proposal while others expressed their support.

Some of the members noted that the ability to attach a physical seal is limited to the design of the device. The point was made that some of the emerging technologies now being used (e.g. smart phone apps) are housed in compact devices and that it would not be practical to affix a cumbersome physical seal to a smaller devices or system components. The members in support of the proposal also pointed out that if taximeters were designed so that metrological changes to the configuration and calibration of the device could be accomplished by remote access, the proposal would facilitate these processes by enabling the technician(s) making those changes to perform many calibrations very quickly.

As an example, to change the schedule of rates at which the fares are calculated could be done on a fleet of vehicles in a short time and without the need for the taxis to physically be taken to one

central site where changes would otherwise be performed. Reportedly, these types of systems could be protected by limiting access and control through the use of passwords. Additionally the proposal would require the use of an audit trail that would maintain a record of changes performed.

Others in the USNWG (including most, if not all members representing regulatory agencies) expressed the notion that a physical seal is the only means that is practical in deterring unauthorized adjustments. Those group members endorsing this view explained that their support is largely due to the “transitory” nature of the taxi industry. In many cases the drivers are not likely to be classified as permanent, full-time employees. Many times the vehicles within a fleet are leased on a short-term basis or operated by different drivers during to their respective shifts within a 24 hour period.

Some USNWG members opposed to allowing alternate, electronic methods of sealing believe that some drivers would not be deterred from tampering with the taximeter unless a physical obstacle is in place preventing access to adjustments. In cases where one taxi is operated by several different drivers working in alternating shifts, it becomes much more difficult to ascertain which shift any unauthorized tampering had taken place. Therefore it would be preferable to prevent the tampering through the use of a physical seal rather than detect and record the event after the tampering has taken place. It should be noted however, that an event logger as part of an audit trail will provide a time stamp for which any change was made along with information to indicate what parameter(s) had been changed.

Maintaining the required use of a physical seal is also supported by the notion that an unbroken physical seal provides a simple means to expedite the process of verification that the meter has not been tampered with. This is important to many field officials and their administrators when inspections are performed because it enables an inspector to quickly determine if adjustment mechanisms have been accessed. This is contrasted by what is perceived as a time consuming practice of accessing and analyzing the content of an audit trail for the device.

As drafted into the proposal, an additional option which would add a layer of security to the metrological features of the taximeter was based on a design where adjustments to these features were controlled by placing the device in or out of a calibration or adjustment mode. While in the calibration/adjustment mode (when changes could be made) the device would not operate as normal or perform any measurements. Only when the device was returned to an operational mode would it be able to carry out its intended measuring capabilities. Similar to other devices, the ability to place the taximeter in a calibration mode and then return it to an operational mode could be controlled by the use of a physical switch whose operation could be only accessed by breaking a security seal. With this type of design, remote configuration could be permitted but would only be allowed if the physical seal was broken and the switch placed in the calibration position.

An alternate proposal for a new paragraph S.5.(c) was offered by Mr. Fishman as shown below. This proposal specifies that any metrological changes to the taximeter would only be permitted after the

removal of a physical seal, and that the device could not be returned to a “hired” mode until the physical seal is replaced.

(c) Taximeters that are interfaced with enhanced software driven (POS) systems or that are capable of remote configuration, may allow the calibration and configuration parameters to be changed through the use of a physical seal that when removed allow remote, wired or wireless configuration. Any changes made after the removal of the physical seal must be recorded in an event logger.

(New)

A taximeter with this feature must automatically prevent the meter from accessing the hired mode until the physical seal is replaced.

Conclusions:

Mr. James Wisniewski (Frias Transportation) stated his belief that the emergence of software controlled devices will eventually make it necessary that security on these devices will be in the electronic format of passwords, encryption, and audit trails.

Mr. McGrath stated that until that time arrives, the regulators are performing inspections that include a verification that unauthorized tampering with adjustments is not taking place, and that this is more easily and efficiently done by visually confirming that a physical seal is intact.

No consensus was reached by the group at this time; this issue will carry over to the next USNWG meeting.

2.10 Items 4.5, 4.10, 4.11, and 4.12

Due to time constraints that were encountered at the September 24-26, 2012 meeting, the USNWG did not have an opportunity to consider the following items that appeared on the meeting’s agenda:

Item 4.5 A proposal to add new paragraph S.1.4.1 Multiple Rate Taximeters and two subparagraphs: S.1.4.1.1. Manual Rate Changes; and S.1.4.1.2. Automatic Rate Changes

This proposed change would require that changes to rates affecting the calculation of fares be accessed only by breaking a physical security seal. In addition, it would allow only manual changes to predetermined flat rates.

Item 4.10 Proposal to amend paragraph S.1.10 Non-fare Information

These proposed amendments are intended to clarify what displays (in the case of multiple displays) are covered in this requirement. In addition the proposal would limit the length of time “non-essential” information is permitted to be displayed.

Item 4.11 Proposed amendment to paragraph S.2 Basis of Fare Calculations.

This proposal would add subparagraph S.2.(d) “a negotiated flat rate” in recognition that fare charges may include flat rates and/or negotiated flat rates where they are permitted.

Item 4.12 Proposed amendment of paragraph S.3.2. Flag.

This existing requirement was written to apply to devices utilizing mechanical mechanisms which are considered obsolete and may not be found in service today. The proposed amendment would serve to update the paragraph by changing the language to relate to current technology while maintaining the intent of the original requirement.

These items will be carried-over to the next meeting of the USNWG for consideration.

2.11 Item: GPS as a distance/time measurement device

Mr. Michael Lombardi from the NIST Time and Frequency Division gave the USNWG a presentation about Global Positioning Satellite (GPS) systems and navigational positioning satellite systems in general. His presentation provided the USNWG members with fundamental technical information about the design, operation, and capabilities of the GPS system which provides location and time information to users world-wide. This important information is critical for consideration when developing any standards for time and distance measurement devices/systems based on this technology.

There were a number of questions from the group after the presentation was made which are summarized below in a question and answer (Q and A) format.

Q How is the GPS system calibrated?

A The GPS system is really self-calibrating. There would be no need to establish a routine other than to verify that the system is receiving the satellite data correctly.

Q How would you know if signal is being manipulated?

A “Jamming” is the term used when the signal is blocked. This would simply result in an absence of signal. This would seem to be more of a problem when the cab is moving unless the jamming signal is coming from within the cab. If the jamming is caused by an outside stationary source (e.g. radio/television transmissions, neon signs, etc.) and the taxi is moving past that point, it is unlikely that the momentary interruption would result in lack of service from the GPS. If the source of the jamming is present in the cab (i.e., passenger carrying a personal privacy device) then it would likely be an obvious condition where the GPS device would simply indicate a loss of signal.

Q What are possible sources of errors in GPS signals?

A GPS signal could possibly encounter errors in basically two ways.

One source of error may be “user equivalent range error”. This type of error could occur due to a lack of quality in the broadcast signal in space, instability in a particular satellite’s clock, and an incorrect prediction of the satellite’s orbit.

The second source of error in a GPS signal could occur due to “dilution of precision” (DOP). This could take place when the satellites that are accessed by a receiver are not in an optimal position in relation to the receiver’s location on the earth. This would be the case where the receiver’s line of sight to the available satellites is limited due to obstructions and those satellites that are used in determination of the receiver’s position are concentrated somewhat in a direct overhead position relative to the receiver. Accuracy is enhanced when the receiver accesses satellites that are spread over a wide area of space above and somewhat lateral to the receiver.

Other errors could possibly occur in the translation of the GPS signal, most likely as a fault or corruption of the software used.

Q Are there any standards documented for GPS devices?

A There are some standards for receivers but it is not known what they would be.

Q What method(s) could be used for verification of a measurement made by GPS?

A Possibly a measured test course for distance. For time measurement it would be a matter of verification by using a calibrated stopwatch.

Q What is the level of accuracy that can be achieved from a GPS distance measurement?

A The typical error is limited to approximately 1 meter. If GPS were used to measure a distance traveled based on a starting point and the end point you could expect that measurement to be within 1 meter regardless of the actual distance.

To measure the progress of a continuously moving vehicle, a position would be located each time the GPS signal updates. Mr. Lombardi estimated that typically a commercially available system will update 5 times every second. Every measurement (or update of the receiver’s position) would be expected to be within 1 meter of the actual location. A taxi trip of 1 mile could be expected to be measured to within 1 meter, and a taxi trip of 100 miles could be expected to be measured to within 1 meter of the actual distance as well.

The more frequently the signal updates, the more precise the relative distance measurement will be.

Q How long does the GPS system take to respond with a position?

A Almost instantaneous. If a receiver is started cold it could take several minutes and depends whether or not on the receiver has an almanac programmed into it.

Q How does the GPS account for distance that includes a change in altitude?

A GPS does have considerable limitations to accurately distinguish a change in altitude. However, it is doubtful that within the length of a typical cab ride that it would make any difference. It would only seem relevant when you are talking about an extreme change in altitude within a short ride where it would it make any difference, and then probably only a minimal difference.

Q Has anyone ever compared it to a traditional type of taximeter?

A Not as far as anyone in this work group knows.

Q It is apparently a very accurate means to make a distance and time measurement however it seems that a major concern is the loss of signal due to various obstructions. Are there any means to predict what will affect the readings?

A If the GPS signal is interrupted that would be a problem that is not predictable. When the signal is lost, the distance measurement capability is disabled however the time measurement would still continue.

Q What types of technical issues could be expected for a company that uses smartphone apps to facilitate GPS measurement of distance?

A It could be a potential problem if two different mobile phones (passenger and driver) come up with conflicting measurements.

Q Is there a way to fill in data for that portion of a taxi ride if the signal is lost?

A There is software that provides "dead reckoning" which serves that purpose. (Additional information is needed on this software and what potential it would have if used in this context)

Q Can the GPS measurement be manipulated through the software application that the taximeter system uses?

A Software (any software) could be manipulated; it would be a concern of computer security for that equipment. To change the measurement provided by the satellite positioning, it would be necessary to alter the signal (spoofing). This is very difficult to accomplish.

Mr. Lombardi shared his opinion that it would not be difficult to establish traceability to the GPS's distance measurements because the time measurements are based on the SI time standard already established.

Although there are multiple navigational positioning systems available or currently under development, (e.g., GLONASS, GPS, Galileo, etc.) and receivers on the earth could potentially access any of them, only two are currently operational – GPS and GLONASS. GPS is operated by the U.S. government and is free to use worldwide, however access to the system may be terminated by the U.S. government in cases of national emergency.

It became apparent to the USNWG that the most vulnerable component of the GPS system is the software employed to process the satellite signals and perform calculations of distance and time. The group recognized that this would be a challenge to secure. Mr. Lombardi informed the group that the signal used by the satellites is encrypted and only those with a high level of security clearance have access to it.

The group questioned whether or not requirements addressing GPS's capability for determining distance and/or time could be incorporated into the existing HB44 Taximeters Code. A point was made by Mr. Paul that there is only an indirect mention of "pulse" in the existing Taximeters Code. Since pulse is the term used for the measurement source generated from mechanisms used on traditional taximeters, there may not be any need to specifically mention GPS as a source (for the distance measurement). It may be possible to include GPS in the code without a large amount of editorial changes.

The work group did note however that HB44 Taximeters Code, paragraph S.1.2. only allows for the advancement of indications by way of the movement of the vehicle and that this will need to be amended if it is decided that GPS will be regulated under the HB44 Taximeters Code.

Conclusion:

NIST Technical Advisor, Mr. John Barton, polled the USNWG to determine if the group would support undertaking the work necessary to develop the necessary standards and test procedures needed to adequately assess a distance/time measuring device utilizing the GPS system as a basis for its operation. The entire group indicated that they would support the effort.

Mr. Barton also polled the group to gauge their opinion on whether the standards and requirements needed for this type of device could be incorporated into NIST HB44 Taximeters Code or would it be necessary to develop a separate code for GPS based devices. After some discussion, there was general agreement within the group that requirements applicable to GPS devices could be incorporated into the existing Taximeters Code.

2.12 Item: Mobile (smart) Telephone Apps

While this agenda item was not specifically addressed in any detail during the September 2012 meeting, these devices were considered during the discussions involving other agenda items.

Mobile telephone “apps” are being developed as a means for potential customers to request taxi or limousine services. Also available through the use of mobile telephones is a feature allowing a passenger to submit electronic payment for taxi service through their personal mobile telephone. Additionally, mobile telephones are being issued to drivers (taxi/sedan) by a service provider where these telephones function as the “receiver” component in a GPS-based system used for determining distance/time measurements to base a fare charges upon.

These applications of mobile telephones apps raise a number of questions which, much like those regarding GPS systems noted above will require some level of expertise in this type of software to properly assess the necessary requirements and practices for regulation by weights and measures authorities.

On behalf of International Association of Transportation Regulators (IATR), Mr. Matthew Daus expressed the hope that the USNWG will address the use of these systems in place of traditional type taximeters and also stated that he believes it would not be in the public’s best interest if this issue is ignored. Mr. Daus stated that the IATR is also working towards the development of model regulations that address these systems and is asking for any help that this work group may provide.

Mr. Barton stated that the objectives of the USNWG include this issue and that it will be the work group’s decision on what approach to take when this issue can be discussed in detail. In addition, Mr. Barton expressed the desire to work in cooperation with the IATR whenever possible and that it is in the best interest of the public to collaborate in producing useful regulation for this type of technology.

3 Meeting Conclusions:

It was apparent that some of this meeting’s agenda would not be able to be considered by the work group due to time constraints of the September 2012 meeting. The group did come to agreement on three items considered during the meeting, they are:

- a proposed new definition for “Taximeter Point-of-Sale System” (see item 1.1.3);
- further amendments to Section S.1.1.1. Point of Sale System (see item 2.2); and
- changes to amend current HB44 Section 5.54 paragraph S.1.8. Protection of Indications (see item 2.7)

Mr. Barton noted there is additional work that remains for the USNWG to complete and indicated that subsequent meetings of the USNWG will be necessary. The group was informed that the USNWG’s objectives can basically be divided into two areas. The first area is to fully develop the proposed amendments to the existing NIST HB44 Taximeters Code (listed as individual items on this meeting’s agenda). The group would then follow up by submitting these proposals to the National Conference on Weights and Measures with a recommendation for their adoption into NIST HB44.

The other area of the group's objectives would be to adequately address both the commercial use of GPS as a distance/time measurement device and mobile (smart) telephones as "virtual" taximeters.

Mr. Barton shared the idea of forming a subcommittee from within the membership of the USNWG to work specifically on the issues related to GPS use and mobile "smart" phone software application. The members were informed that this approach would include the continuing development of the proposed amendments to HB44 Taximeters Code through the USNWG as a whole, and proceeding with work targeted toward the issues of GPS and mobile phone apps through this smaller subcommittee. The members were then polled to gauge what level of support the group has for that approach. The USNWG acknowledged the large amount of work needed on this project and indicated support for the two pronged approach of the suggested plan.

This meeting has "set the stage" for future meetings of the USNWG and has served to bring into focus the additional work that is needed for the USNWG to meet its objectives. The NIST Technical Advisor will contact the members of the USNWG to schedule subsequent meetings.

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