USNWG on Taximeters

July 21 & 22, 2016

DRAFT Meeting Summary

# Colorado Department of Labor and Employment

# Division of Oil and Public Safety

# 633 17th St., Suite 500, Denver, CO.

# **Review of USNWG Proposed Changes to NIST Handbook 44**

## **Introductory Remarks**

The NIST Technical Advisor to the U.S. National Work Group (USNWG) on Taximeters provided the meeting participants with an overview of work group activities since the initial face-to-face meeting in September 2012. Included in these remarks were details about the structure and work plan of the USNWG and the formation of a GPS Subcommittee from within the larger group to concentrate on the issues presented by the emergence of transportation network companies (TNCs). These companies were those identified as using location services such as Global Positioning System or GPS as a source for measurement data and software applications that are installed on the systems user’s devices used as an interface between service provider and users.

The USNWG was told that during a GPS Subcommittee meeting held in October 2015, the participants supported work on the further development of a separate NIST Handbook 44 (HB44) Transportation Network Measurement Systems (TNMS) Code. This new HB44 code would be intended for use in the regulation of these systems operated by TNCs. Additionally, the development of a separate HB44 code for TNMS would take place concurrently with the development of additional changes to the existing HB44 Taximeters Code.

The USNWG was also informed about a decision made to turn over the work being performed by the GPS Subcommittee concerning the development of a new HB44 TNMS Code, to a small task group comprised of representatives of TNCs and regulatory officials. It was believed that this work could be expedited if it was focused on by a smaller group of individuals. The task group would be led by Ms. Kristin Macey and would meet on a regular basis with the intent of having a draft TNMS Code proposal prepared by June 2016. This draft could then be vetted through the larger group – the USNWG on Taximeters during their meeting in July 2016.

The participants of this meeting were told that the agenda for this meeting would be primarily to perform an initial review of the latest revision for the draft of the proposed TNMS Code as well as changes proposed to the existing HB44 Taximeters Code that were drafted primarily to eliminate any possible unfair advantages between the two competing business models (taxi service and TNMS). Due to the large volume of details that will be presented for review at this meeting, it was explained to the group that there would be a limitation of time spent on each individual item in order to complete a review of the entire proposals.

## **Development of Proposal for TNMS HB44 Code**

## Ms. Macey provided the USNWG members with background details regarding the formation of the task group and the initial stages of development of the proposed TNMS Code. Also shared with the USNWG members was general information regarding preliminary tests of TNMS performed by the state of California which was then referred to by the task group to establish baseline criteria for the development of a standard was.

The USNWG was reminded of the urgency surrounding the development of a regulatory standard for TNMS due to the lack of suitable requirements for these types of systems in the existing HB44 Taximeters Code.

## **Review and Comment on Proposed TNMS Code**

The proposal to establish a separate NIST Handbook 44 Code for Transportation Network Measurement Systems (TNMS) was presented to the U.S. National Work Group on Taximeters (USNWG) during the July 2016 meeting. The proposal as developed by the task group and vetted during this meeting would then be expected to be circulated for further review by the entire work group following the meeting.

The NIST Technical Advisor explained to the USNWG that portions of the draft proposal have been identified as being areas potentially in need of further development. The work group was asked to focus on those specific areas during the July 2016 meeting with the intent that a final draft could be completed and then distributed to the entire USNWG via email. Those specific issues and the USNWG’s discussions pertaining to them are listed below and are numbered in the sequence they appear in the draft proposal.

In order to make the best use of time available during the meeting, the work group members were asked to address each item for a limited time only, and if a resolution was not achieved within that time, further discussion would be tabled until after the work group had completed a first-round review of the entire document. Those areas that were determined to be in need of additional consideration would be addressed with any time remaining in this meeting or returned to the task group responsible for the development of the draft for this proposal. The discussion and conclusions of the July 2016 meeting for each topic are as follows.

### **Paragraphs A.1. General and A.2. Exceptions**

The current versions of these two paragraphs pertaining to the application of this proposed code are shown below.

**A.1. General.** – This code applies to a transportation network measurement system used in connection with a digital network that determine the actual time elapsed and/or distance travelled during a prearranged ride to calculate a fare for transportation services.

**A.2. Exceptions.** – This code does not apply to:

(a) any system that charges a flat rate or fixed charge, and/or does not use a measurement of actual time elapsed or distance travelled to calculate a fare for transportation services;

(b) odometers on vehicles that are rented or hired on a distance basis (for which see Section 5.53. Code for Odometers); or

(c) taximeters (for which see Section 5.54. Code for Taximeters).

Mr. Jesse Davis stated that he did not support the draft for the “Application” section of the proposed new code and believes that the draft proposal does not accurately define the TNMS. He expressed the notion that TMNS do not perform calculations of fare from within the vehicle or on one of the devices (driver’s or rider’s) present in the vehicle. Mr. Davis stated that a common characteristic of TNMS is that the calculation of fare is performed on a network computer server or “cloud-based” network. He added that the fare calculations are performed after the trip has concluded and are not done in a manner which permits the fare charges to be displayed incrementally as they accrue. Mr. Davis believes that these factors should be used as the defining characteristics of a TNMS and that the notion that trips are “prearranged” for TNMS service is a component of a business model and should not be considered as a definitive characteristic for a device or system.

Mr. Bob O’Leary disagreed with Mr. Davis citing differences between TNMS and taximeters in that TNMS perform the measurement of distance differently than do taximeters and that the user of these services will make contact with the Transportation Network Company (TNC) through an interface using their own devices. He added that in the TNMS, the app that the rider has installed on their phone and is using to obtain this service is communicating directly with the digital network which is performing the calculation of fare. Mr O’Leary believes this to be an important distinction.

Mr. David Paul restated his belief that the only relevant difference is the business model used in the two different types of service, and that this should not be used as the criterion in the development of separate HB44 codes.

The other members of the work group present at the meeting agreed that the best approach at this time is for the development of two separate codes. The majority of the participants agreed that the differences between these two types of services are significant enough to warrant separate codes. They also agreed however, that paragraph A.1 and A.2 should be developed further to provide a better distinction between TNMS and taximeters. The USNWG agreed to keep working through the review of the rest of the draft TNMS Code.

### **Paragraph S.1. Design of Indicating and Recording Elements**

The next section in the draft proposal addressed by the members at the July 2016 meeting was the specification requirement S.1. “Design of Indicating and Recording Elements.”

**S.1. Design of Indicating and Recording Elements. -** Indicating and recording elements shall provide indications and recorded representations that are clear, definite, accurate, and easily read under any conditions of normal operation of the device(s).

All indicating and recording elements used in a transportation network measurement system shall be capable of operating correctly while using the online-enabled technology application service furnished by the transportation network company.

Mr. O’Leary provided the work group with the rationale and history of the development of this requirement. He explained that paragraph S.1. specifies that indicating/recording elements in the TNMS are typically personally-owned devices however, to be functional for the use in TNMS they must perform as designed and be capable of using the software application interface to access the digital network. The work group generally agreed with the drafting of this requirement although some minor editorial changes (shown below) were made to improve the readability of the requirement.

**S.1. Design of Indicating and Recording Elements. -** Indicating and recording elements shall provide indications and recorded representations that are clear, definite, accurate, and easily read under any conditions of normal operation of the device(s).

All indicating and recording elements used in a transportation network measurement system shall **~~be capable of~~** operat**e ~~ing~~** correctly while using the online-enabled technology application service **~~furnished~~** **provided** by the transportation network company.

The minor changes shown above were supported by the work group, no further changes were recommended at this time.

### **Paragraph S.1.1. General Indicating Elements**

The USNWG was asked to provide comments regarding paragraph S.1.1. General Indicating Elements.

**S.1.1. General Indicating Elements.** – A transportation network measurement system shall include, as a minimum:

(a) an indicating element used by a transportation network company driver that displays information and facilitates the measurements during a prearranged ride to calculate a fare for transportation services; and

(b) an indicating element used by a transportation network company rider that displays information that allows the rider to review the current rate(s) for the transportation service and request a prearranged ride.

Mr. Paul commented that in some cases, the rider or the account holder would not necessarily use their device to make contact that will initiate the ride. In certain cases, a “third-party” (Application Program Interface or API) will make the initial contact on behalf of the rider/account holder to request the service of a TNMS. The current draft of this paragraph makes it mandatory that a user’s device be used as an indicating/recording element in the system however, n these cases, the rider’s device would not be used as the indicating element. There were several suggestions from the work group for ways to amend the paragraph to account for this atypical usage however, the group did not agree on a final solution to resolve those concerns at this time.

Another concern voiced by the USNWG members questioned whether the portion of this requirement in bullet (a) should be relocated to a more suitable position in the proposed code. The work group suggested that the wording “…and facilitates the measurements during a prearranged ride to calculate a fare for transportation services…” could be placed in a more appropriate location however, no final agreement was achieved among the members for this change.

The work group did agree that it would be necessary to return to this item at a later date to resolve those conflicts based on the use of a third-party to initiate the service.

### **Paragraph S.1.2. General Recording Elements**

The USNWG was asked to consider whether any further detail is needed to address the specification requirements for “recording elements” in TNMS.

**S.1.2. General Recording Elements.** – A transportation network measurement system shall be capable of:

1. recording all information necessary to generate a receipt specified in S.1.10. Receipt; and

(b) providing information to transportation network company drivers, including but not limited to a summary of rides given.

With regard to the proposed paragraph S.1.2., Mr. Davis questioned why a driver’s summary is being required through HB44 standards. Ms. Macey explained that because these services will include three separate parties (TNC, driver, and rider) and that the driver is an integral component of the system as well as a “customer” of the TNC, there should be a record of trip information provided to the driver.

Mr. John Barton agreed to work with the TNCs in this task group to develop a more appropriate list of items to be included on the driver’s summary. No further comments were offered for this item; a revised draft to provide details regarding a driver’s summary is expected be provided to the USNWG at its next meeting.

### **Paragraph S.1.3. Identification**

The USNWG then began discussion regarding paragraph S.1.3. “Identification” in the proposal for a TMNS Code.

**S.1.3. Identification.** – All transportation network measurement system indicating elements shall display for the purposes of identification the following information:

1. the name, initials, or trademark of the manufacturer, distributor, or developer; and
2. the current version or revision identifier. The version of revision identifier shall be:
3. prefaced by words or an abbreviation that clearly identifies the number as the required version or revision.
4. Abbreviations for the word “Version” shall, as a minimum, begin with the letter “V” and may be followed by the word “Number”.
5. Abbreviations for the word “Revision” shall, as a minimum, begin with the letter “R” and may be followed by the word “Number.” The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.).

This requirement pertains to the primary components of the TNMS and the necessary information by which they can be identified. Mr. Barton expressed his concern that while it has been acknowledged by the TNCs that there are typically more than a single software program controlling the metrological features of TNMS, the draft requirements in this proposed code only ask for a single version number.

Mr. Percy Rajani stated that his company (Flywheel) has the ability to segregate all metrologically relevant software from other software programming in their device(s) and this isolation would result in only one software version number being of any interest to weights and measures officials. The TNCs present during the meeting stated that the segregation of software used in TNMS would be highly problematic and may not be possible. The difficulty in segregating portions of software for those systems is due to a reliance by the TNC’s on outside independent entities to provide some of the functions in the TNMS.

The USNWG agreed in principle that a version number to identify a software program used in a TNMS is a means to provide a regulatory official information needed to verify approved systems. Unable to arrive at a consensus on a resolution for this issue, the work group agreed to table this issue and on to the next section of the proposed TNMS Code.

### **Paragraph S.1.4. Location of Identification Information**

**S.1.4. Location of Identification Information.** – The information required by S.1.3. Identification shall be accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, “Help,” “About,” “System Identification,” “Weights and Measures Identification,” or “Identification.”

Editorial changes to the original draft of paragraph S.1.4. made by the work group were based on recommendations from the USNWG members during the July 2016 meeting.

**S.1.4. Location of Identification Information.** – The information required by S.1.3. Identification shall be accessible through **(but not limited to)** an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, “Help,” “About,” “System Identification,” “Weights and Measures Identification,” or “Identification.”

The changes are intended to permit the TNMS to display information required for identification of the TNMS using a “home” screen display on the indicating element rather than permitting this information only to be provided by way of a menu in the system. Work group members agreed to these edits made during the meeting.

### **Paragraph S.1.5. Display of Rates and Additional Charges**

**S.1.5. Display of Rates and Additional Charges.** – The transportation network measurement system shall be designed to make available to transportation network company riders the rate(s) for transportation services before the beginning of a prearranged ride, and the system shall be capable of providing an explanation of the basis for calculating a fare including, if applicable, the base fare, rates for time and distance, and the amount of a booking fee, platform fee, or other similar service fee, before a rider submits the request for a prearranged ride.

While considering the draft of paragraph S.1.5. Display of Rates and Additional Charges, the use of the term “prearranged ride” was questioned. Concerns were voiced for the use of this terminology because taxis are permitted (at least in some jurisdictions) to service customers that make arrangements prior to the execution of the service. Therefore, use of this term may conflict with other interpretations of “prearranged ride” and it would not be considered appropriate to use “prearranged ride” as a distinctive element when identifying a TNMS.

Other comments questioned whether a “prearranged ride” must consist of an arrangement that is made a minimum amount of time before the ride takes place and if so, what is the appropriate minimum amount of time? Also mentioned was the opinion that conducting business by only servicing riders that have made prior arrangements is a business model decision and should not be included as part of the definition in HB44 for TNMS.

Noting that this term and any possible changes to its use in paragraph S.1.5. can affect other portions of the proposed TNMS Code (primarily A.1. and A.2.), further discussion on this item was tabled until later. The work group did not arrive at a conclusion on what (if anything) should be done to address the use of “prearranged ride” in this proposed code.

### **Paragraph S.l.6. Fare Estimates**

**S.1.6. Fare Estimates.** The transportation network measurement system shall be capable of displaying a fare estimate to the transportation network company rider before a request for a prearranged ride is made

With regard to paragraph S.1.6. Fare Estimates, Mr. Davis asked the USNWG if it is appropriate to state that the TNMS shall only be *capable* of providing an up-front estimate for the fare and whether it would be more appropriately stated that this is required. Others in the meeting explained that an estimate may only be provided when a destination for the trip requested is given and that this is not always the case.

It was also suggested that a user requirement would be the proper location for a requirement stating that if a fare estimate is to be provided, then the rider must provide a destination for the trip. The work group agreed to amendments made at this time to paragraph UR.3. (see below) that will require an estimate to be provided when requested and when a destination is given. No further changes to S.1.6. were made at this time.

**UR.3. Fare Estimates. If a fare estimate is desired, t~~T~~**he Transportation network company rider must enter a final destination **and the system must then display the fare estimate**. **~~If a fare estimate from the transportation network measurement system is desired.~~**

Discussions regarding the up-front estimate for fare charges generated some thought by the work group on whether there should be a “tolerance” for this fare estimate. Some suggested that the estimates be held to an allowable variation from what the actual fare is calculated at the end of the trip.

The work group generally agreed that there should not be a tolerance placed on the estimates due to unforeseen events (road closures, rider changing destination, etc.) that will affect the calculation of fare. In addition, there was no consensus in the work group on what limits would be appropriate for any tolerance developed for fare estimation. The USNWG agreed that no additional changes are needed at this time and that this item could be revisited in the future if it is considered necessary to place some constraints on the estimation of fares.

### **Paragraph S.1.8. Fare Adjustment**

The next amendment to the initial draft proposal for a TNMS Code addressed by the USNWG at the July 2016 meeting pertained to paragraph S.1.8. Fare Adjustment.

**S.1.8. Fare Adjustment. –** A transportation network measurement system shall be designed with:

**(a)** a “time off” mechanism and means provided for the transportation network system driver to render the time mechanism either operative or inoperative during the ride; or

**(b)** the capability to make post-transaction fare adjustments to reduce the amount of the fare, provided that the system is able to record all location and time data from the time the ride request was accepted by the transportation network company driver.

Some members of the USNWG cited the existing requirement to provide a means to disable the time mechanism in the HB44 Taximeters Code and expressed their support to align the proposed TNMS Code with the Taximeters Code whenever possible. Reasoning that since taximeters are required to have a time-off feature, TNMS should not be exempt from also providing a means to disable the measurement of time (see also discussion regarding S.1.10. Receipt in the following meeting summary item).

The USNWG was also asked if the work group would support a requirement for a “distance-off” mechanism. This would provide a means to disable the the TNMS from accruing distance measurements once the mechanism was activated. If the work group did favor such a requirement, there may be justification to include such a requirement as a nonretroactive one. Making a requirement for a means to disable the measurement of distance would provide the TNCs whose systems are not currently designed to do so additional time to have this incorporated into the design of their system.

Other members commenting in support of such a requirement, stated their belief that it is more appropriate to include a control feature in the design of the TNMS to disable the distance or time measurement rather than relying on the driver to submit a post-trip request to the TNC for a reduction in fare due to circumstances that could warrant a dismissal of a portion of charges to the rider. Any adjustment to the fare charges by the latter method would occur after the trip has concluded and would be facilitated by the customer service department of the TNC.

A “distance-off” feature would be controlled by the operator and enable him/her to disable or suspend the measurements of distance by the TNMS. Some members voiced their support for this feature and others opposed it stating that the driver should not be provided with the control of a feature that would affect the calculation of fare. Others stated that this feature, since it would only disable the distance measurement, would have the effect on the fare that would only favor the rider and would not enable the driver to increase the payment he receives. Those supporting the idea maintained that since this feature would only operate in this manner, there should be no rationale to prohibit this.

While some members of the USNWG supported requirements for both time and distance measurements to be disabled, others stated that they would rather align the proposed TNMS Code with the Taximeters Code by deleting these requirements in both codes.

Due to the lack of any consensus among the work group members, this issue will also be tabled and addressed during future discussion

### **Paragraph S.1.10 Receipt**

The next item considered by the work group during the July 2016 meeting pertained to the information regarding the TNMS service provided that was considered to be necessary for the rider to receive and the requirement drafted to provide that information on a receipt.

**S.1.10. Receipt.** – A receipt issued to a transportation network company rider shall as a minimum, include the following:

(a) date;

(b) unique identifying information sufficient for the transportation network company to identify the transaction, or other identifying information as specified by the statutory authority;

(c) start and end time of trip, and total time of trip, maximum increment of one second;

(d) distance traveled, maximum increment of 0.01 kilometer or 0.01 mile;

(e) the associated fare in $;

(f) other charges where permitted;

(g) total charge in $;

(h) the start and end addresses or locations of the trip;

*(i)* *a map showing the route taken*, and

(j) a means to obtain customer assistance.

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

To preface any discussion in the USNWG regarding requirements pertaining to the details that would be included on a receipt, Ms. Tina Butcher pointed out to the work group that there is no provision in the current draft version of this paragraph requiring a receipt be made available to the rider. Ms. Butcher stated that this would seem to be necessary and recommended that the USNWG amend the paragraph. The work group generally agreed to revise the draft version of the header paragraph in S.1.10. as shown below.

**S.1.10. Receipt. – System shall include a provision to issue a printed or electronic receipt to a transportation network measurement system company rider. This receipt shall as a minimum include the following** ~~A receipt issued to a transportation network company rider shall as a minimum, include the following~~:

Other comments from the work group indicated that information regarding “chargeable” time be included on the receipt. The work group agreed that this chargeable time should be distinguished from the total elapsed time during the service since there may be occasions when it would not be appropriate to include fare charges based on time (e.g., when the vehicle used is being refueled). This also generated a discussion about whether a “time-off” button or control mechanism would be required that would suspend the accrual of time used to calculate fare.

Some of the USNWG members pointed out this is something that is required in the current HB44 Taximeters Code and expressed their belief that these two codes should be aligned wherever possible. The S.1.10. paragraph was edited so that it was clear that any time-off period would also be required on the receipt provided. In addition, edits were made to paragraph S.1.8. to require that a “distance off” mechanism be provided as a nonretroactive requirement for TNMS.

Mr. Pere Tomas suggested to the group that it may be beneficial to include the date and time so that if there is a trip taking place during the transition of one date into the following date (i.e, during midnight), it would be clear the trip began but then concluded on the following day. In response to these recommendations from the members, the listed information required on the receipt under bullet item (a) was amended as follows.

(a) date **and time for start of trip and date and time for end of trip (maximum increment of one second and including any time-off period)**;

Mr. Davis recommended that any estimated fare provided to the rider also be recorded and presented on the receipt. Ms. Andrea Lobato stated that to do so would be problematic as well as pointing out that the rider has the ability to view fare estimates on-line. Others in the group questioned whether a customer would be able to view this information online and that this ability may be dependent upon the type of device being used.

Mr. Stan Toy suggested that since this would cause some difficulty for the TNCs to implement, perhaps a requirement for the pre-trip fare estimate could also be drafted as a nonretroactive requirement, providing additional time for the TNCs to work this into the design of their product.

Mr. Scott Binnings stated that if a pre-trip estimate is required on the receipt to provide a means for the rider to compare the estimate to the actual fare charged, some TNCs may provide the estimated fare in the form of an expanded the range of cost. This would result in a less accurate fare estimate since instead of an estimate given in a narrower range, it might instead be stated in a much wider range. This would give the TNCs additional latitude when quoting estimates however, the rider would receive less accurate estimates. The group did not come to any agreement to require that the pre-trip fare estimate be also listed on the rider’s receipt.

Another aspect considered by the USNWG related to this particular paragraph was whether or not the proposed TNMS Code should include a requirement stating that the driver also receive specific information about the trip. After a brief discussion about what information this would include, Mr. Barton agreed to draft a new paragraph that would address this issue and that the USNWG would be able to review that new language in the future (possibly during the second day of the scheduled July meeting). The USNWG members at the meeting agreed that no further revision to paragraph S.1.10. will be done at this time however, it was acknowledged that additional changes may be necessary and could be made during subsequent meetings.

### **Paragraph S.2. Provisions for Sealing**

**S.2. Provision for Sealing.**

**S.2.1. System Security.** – Adequate provision shall be made to provide security for a transportation network measurement system. The system shall be designed to:

(a) protect the integrity of metrological data against unauthorized modification using industry-standard technological protection mechanisms such as data encryption; and

(b) use software-based access controls or equivalent technological protections that limit access to metrological data only to authorized persons.

**S.2.2. System Audit.** – The transportation network measurement system shall be designed in a manner that permits weights and measures officials to verify compliance with this transportation network measurement system code.

Ms. Butcher began the discussion on this item by stating to the USNWG that she believes it would be helpful to develop the proposed language further so that it is clear what the requirement is stating. She believes the current language to be too vague and that it is not clearly stated what the application of this requirement would actually result in. Ms. Butcher recommended that more specific language be incorporated into this requirement to clarify what security measures are to be provided within the TNMS.

While some in the work group agreed with Ms. Butcher, Mr. Davis stated that the specifics of providing security for TNMS systems are not necessary since there is no actual metering device in these systems. Mr. Davis explained that because the “logic” of the system (metrological data and calculations) reside remotely (in the cloud) there is no practical means to verify that the metrological functions of the system are preserved. He further stated that a better means to verify that the system’s integrity is maintained would be to test the functionality of the TNMS and verify that measurements and calculations are accurate and correct.

Others in the USNWG meeting agreed that any comprehensive evaluation of the functionality of the software program(s) in the TNMS would be outside the capability of the typical field official. Most participants in the meeting agreed however, that metrologically significant software could be evaluated by software analysis experts working with type evaluation officials.

Mr. Percy Rajani stated that his company’s product is largely software-based and that the software can be segregated into metrologically significant and non-metrologically significant portions. This will simplify the job of an evaluator in that only a small portion of the software programming is relevant in the certification process. Mr. Barton added that this is a common practice adhered to in the international standards developed by the International Organization of Legal Metrology (OIML).

Ms. Macey suggested that principles followed in the Verified Conformity Assessment Program (VCAP) that is managed by the National Type Evaluation Program (NTEP) under the National Conference on Weights and Measures could possibly be referenced for the evaluation of software in TNMS. Ms. Butcher also suggested that there may be principles by which grain moisture meter devices are evaluated that may also be helpful in this effort since those types of devices rely heavily on software components as well.

Mr. O’Leary stated that his company (Uber) uses various means to ensure the integrity of the software programs used. He added that there are “handshakes” that are used between software elements which provide assurance that software programs have not undergone any unauthorized modification however, he admitted that there is no way to provide 100% assurance that any portion of the programming in any system is completely secure.

While there was no agreement to any major changes in the initial draft language, the work group members agreed to the following tentative changes to paragraph S.2.1. at this time to improve the clarity of this requirement.

**S.2.1. System Security.** – Adequate provision shall be made to provide security for a transportation network measurement system. The system shall be designed to:

(a) protect the integrity of metrological data **and algorithms used to compute fares from such data** against unauthorized modification using industry-standard technological protection mechanisms such as data encryption; and

(b) use software-based access controls or equivalent technological protections that limit access to metrological data **and algorithms used to compute fares from such data** only to authorized persons.

**S.2.2. System Audit.** – The transportation network measurement system shall be designed in a manner that permits ~~weights and measures officials~~ **regulatory authority** to verify compliance with this transportation network measurement system code.

The USNWG agreed that additional work is needed on the requirements pertaining to the security of the TNMS and that further development should be done during the next few days. Mr. O’Leary notified the group that Uber’s staff is working to draft additional content for the security requirements and is hopeful that this additional information will be available soon.

### **S.3. Provision for Trip Data Loss**

The USNWG discussed potential problems regarding the loss of signal from location services used by the TNMS.

**S.3. Provision for Trip Data Loss.** – In the event that a portion of the trip data is lost due to power or signal interruption by the transportation network company driver’s indicating element, the transportation network measurement system shall be capable of determining the information needed to complete any transaction in progress at the time of the power or signal loss.

The members noted possible sources contributing to the loss of location signals and considered the effects on the system’s ability to provide an accurate representation of the route taken during any trip. The work group agreed there will predictably be occasions where the vehicle will travel in certain locations or under certain conditions that will cause a loss of or the suspension of the data provided by location services.

Mr. Barton expressed concern about the use of mapping services that are reportedly used as a way to supplement location services when a loss of signal occurs. It was noted that the USNWG agreed during a meeting in September 2012 that the use of only a mapping service to provide a mileage based on the mapping of a route between points of origin and destination would not be considered as a type of service to be regulated using NIST HB44 requirements. This agreement was based on the interpretation that this means of determining a distance may or may not accurately represent the path travelled by the vehicle. This was simply a calculation of the mileage between two points on a map and an assumed route that would be taken.

Mr. Barton expressed concern that since the work group had determined that the use of mapping services to obtain a mileage, in the manner described above was not a concern of the weights and measures community, that the use of mapping services when location services signal is lost would also be considered inappropriate.

Many of the USNWG disagreed stating that using a mapping service to “fill-in” the gaps produced by a temporary loss of signal can be used and that this may actually increase the accuracy of determining the route followed by the vehicle.

The work group members did recognize that there could be an inaccurate calculation of actual distance travelled due to an inadequate frequency of acquiring the positions of the vehicle (establishment of “cookie crumbs” or “waypoints”) through location services that would not provide data for extended periods in between those points. In those cases, the road actually travelled may not follow a straight line and the “cookie crumbs” or “waypoints” established may not reflect any variations from a straight line between the vehicle’s position plotted by location services. Most USNWG members agreed that the use of mapping services in these cases will increase the accuracy of calculating the actual distance travelled.

The work group also agreed that the limited use of mapping services to fill-in data that is missing from location services used for “brief” periods should be permitted. The members could not agree on any specific limitations or what should be defined as “brief” periods. Additionally, the work group debated whether the use of mapping services to complete the calculation of distance travelled during a trip where the location services signal has been lost and not recovered prior to the end of the trip should be permissible. The USNWG was undecided on whether the initial draft language for this requirement is sufficient, particularly when location services signal is lost during a trip and not regained before the end of the trip.

One suggestion was that this requirement be split into two scenarios: a) when signal is regained before the trip ends; and b) when signal is not acquired again prior to the end of the trip. While there was general support for this idea, the group acknowledged that to draft the requirement in such a manner should be done in a deliberate fashion when additional time could be spent in developing appropriate language. It was decided to table this issue and to reconsider it at the work group’s next meeting.

No final determinations were made by the participants of this meeting regarding the loss of location services signal. The USNWG did agree that additional work was needed for completion of the requirements pertaining to this issue and that this item will need to be addressed further in a subsequent meeting.

### **Paragraph N.1. Distance Tests (sub-paragraphs N.1.1., N.1.1.1., and N.1.1.2.)**

Initial draft of requirements addressing the test procedures to verify compliance with the accuracy of distance measurements was presented to the USNWG members at the July 2016 meeting.

**N.1. Distance Tests.**

**N.1.1. Test Methods.** – To determine compliance with distance tolerances, a road test of a transportation network measurement system shall be conducted. The test shall consist of a specific distance test and may include a transfer standard test. At least one test shall be of a length sufficient to exceed the minimum fare.

**N.1.1.1. Road Test.** – The test consists of operating the conveyance over a precisely measured course calibrated to a traceable linear measure of at least one mile in length.

**N.1.1.2. Transfer Standard Test.** – The test consists of operating the conveyance over an unmeasured course while using a calibrated transfer standard, such as a fifth-wheel, to measure the distance travelled.

Recognizing that the testing procedures for systems using location services must be accomplished through the actual movement of the vehicle used, the USNWG agreed that simulated testing (i.e., use of a dynamometer) would not be possible. This would infer that a comparator must be used to determine if the calculated distance traveled by the vehicle is an accurate representation of a traceable measurement of distance. The work group agreed that the use of a fifth wheel device would be appropriate (provided that device had been certified as correct) and that it may be possible to use a recently certified taximeter as the comparator in the test of a TNMS.

Some members of the USNWG questioned the approach that regulatory officials would take in performing tests on TNMS and what the scope would be for those tests. USNWG members representing TNCs believed that a test of a TNMS would not necessarily require that each and every device be the subject of a separate test. Because the functional core component of the TNMS is a software program (or programs), it may be necessary to only test a small sampling of driver’s devices to prove that the system is operating correctly.

Most of the participants in the USNWG meeting agreed that because the TNMS is a “centralized system” (as opposed to a single device), it would be impractical (and perhaps impossible) to perform separate tests on all of the indicating elements used in the system. Since it is most frequently the driver’s device that initiates the transaction and that serves as the receiver for location services signal, it was generally agreed that a representative sample of devices used by TNMS drivers that would define the appropriate scope for testing these systems. Many of the USNWG members participating in the meeting also considered it appropriate to perform tests on various makes and models of devices that are used to connect to the TNMS.

Ms. Kristin Winningham pointed out the testing of taximeters requires that at least two tests are performed and she questions why the TNMS Code has been drafted requiring only a single test (when results are compliant with requirements). Ms. Macey stated that there is nothing that prevents running more than a single test and that in those tests performed on TNMS by the state of California, it was frequently necessary to run additional tests.

The participating members of the USNWG generally agreed that this new code should not indicate that only a single test is required and elected to make small editorial changes in paragraphs N.1.1 and N.1.1.1. to indicate that an official may run multiple tests. These recommended changes are shown in the following revised requirements.

**N.1.1. Test Methods.** – To determine compliance with distance tolerances, a road test of a transportation network measurement system shall be conducted. The **road** test shall consist of a specific distance test and may include a transfer standard test. At least one test shall be of a length sufficient to exceed the minimum fare.

**N.1.1.1. Road Test.** – The test consists **(as a minimum)** of operating the conveyance over a precisely measured course calibrated to a traceable linear measure of at least one mile in length.

**N.1.1.2. Transfer Standard Test.** – The test consists of operating the conveyance over an unmeasured course while using a calibrated transfer standard, such as a fifth-wheel, to measure the distance travelled.

Also during the USNWG meeting, it was suggested that an informative note be included in the draft that would indicate that the testing of TNMS need not be performed on all passenger/driver devices used in connection with the service provided. It was agreed that a draft of a note stating this point would be developed and inserted into the next revision of the TNMS Code proposal and reviewed by the USNWG at their next meeting.

Ms. Macey provided the work group with details about recent testing of TNMS performed in California. The meeting participants were told that this testing did use a taximeter as a comparator. A metrologist from the California Division of Measurement Standards had confirmed that particular taximeter as being appropriate for use in these tests. In addition, the test procedures followed included steps that were designed to expose the TNMS to various elements suspected as potential sources of error in the TNMS’s calculation of distance travelled.

Ms. Butcher stated that in any type of testing where a transfer standard is being used (i.e., taximeter or fifth-wheel device), there must be confirmation that the transfer standard used will follow the guidelines for traceability and that the error and uncertainty are not so large that they will take up a larger portion of the tolerances used. This is a responsibility of the jurisdiction using the transfer standard. While recognizing the importance of using a certifiable standard to conduct a test on TNMS, the USNWG did not conclude that any changes were needed to paragraph N.1.1.2. Transfer Standard Test at this time.

### **Paragraph N.1.2. Test Procedures (sub-paragraphs N.1.2.1. and N.1.2.2.)**

**N.1.2. Test Procedures.**

**N.1.2.1. Test Length.** – All tests must be at least one mile in length. If a measured course or testing equipment is not readily available that will enable a test of a length sufficient to exceed the minimum fare, after completing the testing specified in N.1.1. Test Methods, an additional unmeasured test may be conducted. The purpose of this additional unmeasured test is to verify compliance with S.1.10. Receipt.

**N.1.2.2. Additional Tests.** – If during testing a transportation network measurement system produces a measurement that does not comply with the tolerance values in T.1.1., the following additional tests shall be performed:

* 1. **Repeatability Tests.** – Tests for repeatability including a minimum of three consecutive tests of the same length conducted in the same location where all test variables are reduced to the greatest extent practicable; and
	2. **Variability Tests.** – Tests for variability including a minimum of three consecutive tests of varying lenths, locations, and/or environmental conditions.

The documented comments from the city of Cleveland, OH were read during this meeting which stated concerns regarding the required repetition of tests following an initial test result where the system is determined to be non-compliant. Those comments expressed the notion that this is a biased procedure and compared the mandatory repetition of tests for a TNMS to all other types of devices (including taximeters) where only a single test result may be considered sufficient to determine the status of a device.

An additional concern included in the city of Cleveland’s comments that pointed out wording stating that a minimum number of tests are to be performed provides a “loop hole” in the application of test procedures. The concern is that this can be interpreted that testing could be repeated as many times as needed until the system is found to be in compliance.

The minimum number of tests required in the most recent draft for the proposed TNMS Code was questioned by Mr. Stan Toy. Mr. Toy raised the question to the work group regarding N.1.2.1., asking what action is to be taken by a field inspector when running the additional tests specified if some of the tests are in compliance and the others are not? Ms. Macey suggested that no enforcement action be taken in this situation but that the TNC be contacted and an investigation be performed to identify the source of the problem. Once the problem had been identified, action must be taken to correct it.

Most of the work group members at the July 2016 meeting agreed that performing an additional six tests to confirm non-compliance of a TNMS can be considered onerous although the work group generally agreed that this testing would be necessary to determine if the entire TNMS system is malfunctioning or if the error was a result of a single device.

Other comments voiced during the meeting suggested that it may be appropriate to allow additional tolerance values to devices that are found to be in an error in the direction of overregistration. Ms. Angela Godwin noted that regulatory officials are given a degree of latitude in a decision of what type of enforcement action is to be taken and that it may be prudent to simply record the test results and provide a period of time for corrective action to be taken.

Mr. Davis stated that regulatory officials will be faced with the problem of what action is appropriate when a TNMS if found to be non-compliant. The challenge will be the determination of whether the non-compliant issue is generated from the user’s device (i.e., driver’s telephone or tablet) or from the TNMS computing/calculating operation. It must be recognized what impact any enforcement action taken would have. For instance, if the source of the error is found to be the TNMS calculations of fare performed on servers or in the “cloud,” then the entire TNMS is likely affected and any enforcement action would then be appropriately applied to the TNMS and all devices connected to the system.

The work group generally agreed that the consideration of enforcement issues are the concerns of the jurisdiction performing the tests and that no further changes are needed at this time (due to the tentative status of a new code if and when adopted).

### **Paragraph N.1.3. Test Conditions (sub-paragraphs N.1.3.1. and N.1.3.2.)**

The draft proposal for requirements pertaining to test conditions as shown were reviewed by the USNWG members at the July 2016 meeting.

**N.1.3. Test Conditions.**

**N.1.3.1. General.** – Except during type evaluation, all tests shall be conducted under conditions that are usual and customary with respect to the location and manner in which the transportation network measurement system is operated.

**N.1.3.2. Roads.** – All tests shall be conducted on public roads which are in good repair.

Mr. Barton asked the work group to consider whether the test procedures listed in this section should mirror the newly proposed language for the HB44 Taximeters Code. Paragraph N.1.3.2. in the proposed amendments for the Taximeters Code lists specific conditions that should be incorporated in the tests performed which may affect the reception of data from location services. Most participants in the meeting agreed with this.

Mr. Stan Toy stated that he did not believe that the specific conditions listed in the proposed amended version of N.1.3.2. in the Taximeters Code should be included because not all test locations will have these conditions present. Ms. Macey suggested that only what is required for a minimum should be included in the requirements since all jurisdictions will not be able to perform tests under all of the conditions listed in the Taximeters Code requirement.

Mr. Barton pointed out that there is a difference in test procedures that would be expected under a type evaluation and those that would be adhered to in a routine field examination and that paragraph N.1.3.2. in the proposed changes to the Taximeters Code specify that these conditions are required for a type evaluation. A type evaluation of TNMS would be expected to be comprehensive enough to certify the device (or system) for use in any conditions that could be anticipated. Whereas, a field examination of the device would most likely be performed under conditions that are customarily found only in a location where the device is used.

Mr. Toy added that to require that field tests be performed under the conditions that are usual and customary where the system will be used could be problematic. Traditionally, it is preferred that testing of taximeters be performed on roadways and locations where the conditions facilitate the ease of conducting uninterrupted tests and provide safe conditions. Roadways that involve frequent stopping and include large volumes of traffic are prohibitive of orderly and uncorrupted testing however, the TNMS would be expected to be used in practically any type of environment.

USNWG members present at the meeting generally agreed that these specific test conditions should be included in the TNMS Code. It was also agreed that the TNMS Code, if adopted would be placed in HB44 as a tentative code not intended to be used immediately for enforcement measures. With this being acknowledged, the members agreed that any necessary modifications to the requirements in this tentative code could be identified and drafted prior to the code becoming a permanent one.

### **Paragraph T.1. Tolerance Values (sub-paragraphs T.1.1. and T.1.2.)**

**T.1. Tolerance Values.** – The following proposed tolerance values will be confirmed based on performance data evaluated by the U.S. National Work Group before the transportation network measurement systems code becomes a permanent code in HB44.

**T.1.1. Distance Tests.** – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 2.5%

(b) On Underregistration: 2.5%

**T.1.2. Time Tests.** – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 5 seconds or 0.5%, whichever is greater

(b) On Underregistration: 5 seconds or 0.5%, whichever is greater

The USNWG considered the tolerance values stated in T.1.1. Distance Tests and debated whether these values are appropriate since they do not mirror those corresponding values in the HB44 Taximeters Code. The work group discussed the rationale for the distance test tolerances applicable to taximeters to be asymmetric (unequal when comparing overregistration to underregistration). With the understanding of why taximeter tolerances are not the same for overregistration and underregistration, the group indicated its support of establishing tolerance values for TNMS that are symmetric.

Additionally, Ms. Macey stated that during the testing performed on TNMS by the state of California, these tolerance values listed in T.1.1. seemed to be appropriate in that those systems tested were able to comply with this portion of the tests.

The group was asked to comment on the values listed in the proposed code for tolerances provided for time tests. Mr. O’Leary stated that at first glance the tolerances provided in the proposed TNMS Code are less stringent that what is permitted for taximeters. He went on to explain that due to the manner in which TNMS are tested (i.e., the length of time under test is typically much longer that performed for taximeters), the tolerances provided for TNMS are actually more stringent.

The group was asked if the tolerances for time tests of TNMS should be amended so that they would better align with the corresponding tolerances in the Taximeters Code. Most responses were that just the opposite should be done (i.e., amend the tolerances in the Taximeters Code to mirror those in the TNMS Code). Mr. Tomas stated that doing so would also move U.S. standards closer to those in the OIML standard – R21.

It was agreed that the USNWG would table this issue for now but likely revisit this item in the future.

### **Paragraph T.2. Tests Using Transfer Standards**

**T.2. Tests Using Transfer Standards.** – To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.

Mr. Barton explained to the work group that this paragraph was inserted in the TNMS Code to be consistent with other codes that permit the use of transfer standards. Ms. Butcher explained also that this issue (in the context of being used in other HB44 Codes) is under consideration to determine whether the use of the factor (two times the standard deviation) is appropriate.

The USNWG agreed that if it is determined that the factor stated above is not appropriate in the future, then that would indicate a change is needed.

### **Paragraph UR.3 Fare Estimates.**

The members of the USNWG were told that the following draft of a user’s requirement will clarify that the rider must provide a destination when arranging the service before an estimate of fare charges can be provided.

**UR.3. Fare Estimates.** The Transportation network company rider must enter a final destination if a fare estimate from the transportation network measurement system is desired.

The work group was asked to comment on changes made to this user’s requirement however, no additional comments were offered.

## **Review of HB44 Taximeters Code Draft Proposed Changes**

*[NIST Technical Advisor’s note: The “items for consideration” for the July 2016 NCWM Annual Meeting regarding the HB44 Taximeters Code had been listed on the agenda as items to be addressed during this meeting. Due to time constraints and the adjustment of priority considerations by the USNWG, these items were not covered during the July 2016 meeting.]*

Changes to the existing HB44 Taximeters Code that have been developed but that have not yet been considered by the USNWG were developed with the intent to establish a parity of regulatory standards between TNMS and the traditional-type taximeters. To provide an opportunity for USNWG members to review those proposed changes in advance of the meeting scheduled for July 21, 2016 a copy of the proposed amendments for the existing HB44 Taximeters Code was circulated via email to the USNWG on June 8, 2016.

The drafting of these changes was based on the evaluation of the requirements included in the proposed TNMS Code and comparing those requirements to requirements found in the existing HB44 Taximeters Code. Whenever possible inequities were identified (in a comparison of the two separate codes , changes were drafted to better achieve a balance in the requirements that are to be applied to these two types of devices/systems.

The following sections of HB44 were considered by the participants of the July 2016 meeting of the USNWG as part of a review process. This process would include the circulation of proposed changes to the USNWG membership following this, and any necessary subsequent meetings. All discussions and any conclusions arrived at by the participating members of the July 2016 meeting are listed in the sequence that the items were presented at that meeting.

### **Paragraph A.2. Exceptions.**

**A.2. Exceptions.** – This code does not apply to:

1. **Odometers ~~odometers~~** on vehicles that are rented on a distance basis (for which see Section 5.53. Code for Odometers).
2. **Entities that only charge a flat rate or negotiated rate.**

(Amended 1977 **and 201X**)

A discussion among the participants of the July 2016 meeting included some of the meeting participants reiterating their objections to the development of a separate HB44 device code for TNMS. Their position is largely based on the perception that there is no technical difference between the services provided by TNMS and taxi services and they are distinguished solely by the business models used.

Mr. Rajani expressed his disappointment with the work group’s progress so far, pointing out that the USNWG has spent much of the time allotted for this meeting addressing only the proposed new TNMS Code and has not discussed in any detail the changes being proposed for the Taximeters Code. This lack of progress is causing a great deal of concern for those companies (like Mr. Rajani’s) that will presumably be affected by changes which may occur in the Taximeters Code.

Mr. Barton explained to the members that while the efforts of the USNWG have been focused on two distinct goals (working towards the development of a new TNMS Code and a revision of the existing Taximeters Code), there is a potential that at some point in the future there will be one code to cover both types of systems. Because the taxi industry is rapidly incorporating the types of technologies that had originally been indicative of TNMS and the rapid evolution of for-hire transportation services, the distinction between these types of systems becomes more difficult to define. Therefore, it is somewhat likely that there may be an intersection of the two separate codes resulting in a single HB44 Code for all types of transportation services.

Asking the work group members to recognize this possibility, Mr. Barton urged the meeting participants to proceed with a discussion on the remaining agenda items. The USNWG agreed to review the remainder of those portions of the existing Taximeters Code that had been recommended for revision. There were no further comments on paragraph A.2.

### **Paragraph S.1.2.1. Time Mechanism**

The USNWG members were informed that the “new” paragraph S.1.2.1. (as shown below) is not actually a recently drafted requirement but is instead a portion of the existing paragraph; S.1.4. that is being recommended to be relocated within this Taximeters Code. The proposal to reposition this requirement as a subparagraph to S.1.2. “Advancement of Indicating Elements” is believed to be a more appropriate location based upon the content and context of these specifications.

**S.1.2.1. Time Mechanism.** - **Means shall be provided on all taximeters designed to calculate fares upon the basis of a combination of distance traveled and time elapsed for the vehicle operator to render the time mechanism either operative or inoperative with respect to the fare‑indicating mechanism.**

**(Added 20XX)**

The USNWG meeting participants agreed with this proposed change and did not offer any further comments.

### **Paragraphs S.1.3. Visability of Indications, S.1.3.1. Taximeter Indications, and S.1.3.2. Passenger-Owned Devices**

### The meeting participants were informed that the proposed changes in this series of requirements are all associated with the use of personally-owned devices by passengers who have requested taxi service. The changes proposed were suggested as a means to exclude a device owned and operated by a TNMS passenger from most requirements intended for application to “primary” indicating elements in a taximeter system.

**S.1.3. Visibility of Indications.** – **Unless the transaction indications are presented through a device that is operated and owned by the customer, the** **~~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.

**Indications provided to the passenger that are displayed on a personally-owned (not built-for-purpose) device shall be presented in a clear, easily read, and readily interpreted manner.**

(Amended 1977, 1986, **~~and~~** 1988**, and 20XX**)

**S.1.3.1. Minimum Height of Figures, Words, and Symbols.** – **When displayed by a taximeter, t~~T~~**he minimum height of the figures used to indicate the fare shall be 10 mm and for extras, 8 mm. The minimum height of the figures, words, or symbols used for other indications, including those used to identify or define, shall be 3.5 mm.

(Added 1986) **(Amended 20XX)**

Mr. Barton explained that some taxi services are reportedly developing their own software applications (apps) to be used by passengers when requesting service and/or used to view details of a transaction. Since these devices are not under the control of the service provider it would not be considered appropriate (and may perhaps be impossible) to require that they be compliant with requirements intended for those devices that are specifically designed or maintained by the taxi service provider.

Those work group members present at the meeting generally agreed that it is sufficient to state that the information presented to the passenger in such fashion that they be easily read and interpreted. No further changes to these paragraphs were recommended.

The meeting participants were then asked for their comment on a recommendation to delete paragraph S.1.3.2. since there seems to be some redundancy between this requirement and S.1.3. were the indications are required to be easily read under any condition of normal operation.

***~~S.1.3.2. Lighting of Indications.~~***~~–~~ *~~Integral lighting shall be provided to illuminate the fare, extras, the rate or rate code, and the taximeter status (i.e., vacant, hired, and time off).~~*

*~~[Nonretroactive as of January 1, 1989]~~*

~~(Added 1988) (Amended 1990~~

Ms. Butcher cautioned the group about removing this requirement believing that there is merit in retaining the specifications related to the illumination of fare indications. The group generally agreed however, it was decided by the USNWG that those requirements could be incorporated into S.1.3.

The USNWG also deliberated on the difference in applying requirements to “built for purpose” devices that would be installed in a taxi and indications that would be presented on a “not built for purpose” device that is owned and operated by the passenger. The members agreed that these requirements should be revised by splitting them into two categories: one category for taximeters installed in a taxi and another category to apply to passenger-owned devices. It was agreed that this section be revised and presented to the USNWG in the next meeting for review.

### **Paragraphs S.1.3.3., S.1.3.3.1., and S.1.3.3.2.**

Mr. Barton told the work group that the changes presented in paragraphs S.1.3.3. through S.1.3.3.2 are believed to be minor changes and are being proposed to make a distinction between personally-owned devices and supplemental indicating elements (i.e, Passenger Information Monitors or PIMs) that are installed in the taxi.

***S.1.3.3. Passenger’s Indications*.** – *A supplementary indicating element installed in a taxi to provide information regarding the taxi service to the passenger* ***(i.e., Passenger Information Monitor or P.I.M.)****, shall clearly display the current total of all charges incurred for the transaction. The accruing total of all charges must remain clearly visible on the passenger’s display (unless disabled by the passenger) at all times during the transaction.*

*[Nonretroactive as of January 1, 2016]*

(Added 2015) **(Amended 20XX)**

***S.1.3.3.1. Additional Information.*** *– Additional information shall be displayed or made available through a passenger’s indicating element* ***installed in a taxi*** *(as described in S.1.3.3. Passenger’s Indications) and shall be current and reflect any charges that have accrued. This additional information shall include:*

1. *an itemized account of all charges incurred including fare, extras, and other additional charges; and*
2. *the rate(s) in use at which any fare is calculated.*

*Any additional information made available must not obscure the accruing total of charges for the taxi service. This additional information may be made accessible through clearly identified operational controls (e.g., keypad, button, menu, touch-screen).*

*[Non retroactive as of January 1, 2016]*

(Added 2015) **(Amended 20XX)**

***S.1.3.3.2. Fare and Extras Charges.*** *– The indication of fare and extras charges on a passenger’s indicating element* ***installed in a taxi*** *shall agree with similar indications displayed on all other indicating elements in the system.*

*[Nonretroactive as of January 1, 2016]*

(Added 2015) **(Amended 20XX)**

The meeting participants acknowledged the difficulties involved in attempting to apply regulatory controls to passenger-owned devices and generally agreed with the changes as shown. No further changes were suggested.

### **Paragraph S.1.4.**

It was explained to the USNWG that the changes proposed to S.1.4. were recommended to reflect the proposed change to permit taximeters to calculate fare charges using time and distance concurrently. Also that the final sentence as shown being deleted in S.1.4. is that statement which was mentioned previously (under item D.2. in this summary) and has been relocated in these proposed changes to paragraph S.1.2.

**S.1.4. Actuation of Fare‑Indicating Mechanism.** – When a taximeter designed to calculate fares upon the basis of a combination of distance traveled and time elapsed **but not both time and distance used concurrently,** is operative with respect to fare indication, the fare‑indicating mechanism shall be actuated by the distance mechanism whenever the vehicle is in motion at such a speed that the rate of distance revenue equals or exceeds the time rate, and may be actuated by the time mechanism whenever the vehicle speed is less than this and when the vehicle is not in motion. ~~Means shall be provided on all taximeters for the vehicle operator to render the time mechanism either operative or inoperative with respect to the fare‑indicating mechanism.~~

(Amended 1977 **and 20XX**)

The work group agreed with the changes, no further comments were heard.

### **Paragraph S.1.9.**

The work group was presented with changes to paragraph S.1.9. that would add two items on the receipt provided to the passenger.

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

*(a) date;*

*(b) unique vehicle identification number, such as the medallion number, taxi number, vehicle identification number (VIN), permit number, or other identifying information as specified by the statutory authority;\**

*(c) start and end time of trip;\**

*(d) distance traveled, maximum increment of 0.1 km (0.1 mi);\**

*(e) fare in $;*

*(f) each rate at which fare was computed and the associated fare at that rate;\**

*(g) additional charges in $ where permitted such as extras any surcharges, telecommunication charges, and taxes shall be identified and itemized;\**

*(h) total charge for service in $ (inclusive of fare, extras, and all additional charges);\**

1. *trip number, if available;\*\**

*(j) telephone number (or other contract information for customer assistance****;****\*\**

***(k) a statement of chargeable time for taximeters that calculate fare using time and distance concurrently; and\*\****

***(l) a version number for any software applications used in a system which have a metrological effect on the transaction.\*\****

**Note:** When processed through the taximeter or taximeter system, any adjustments (in $) to the total charge for service including discounts, credits, and tips shall also be included on the receipt.\*\*

*[Nonretroactive as of January 1, 1989] \*[Nonretroactive as of January 1, 2000]*

*\*\*[Nonretroactive as of January 1, 2016]*

(Added 1988) (Amended 1999 and 2015)

In the changes shown above, items “k” and “l” have been added to the list of elements required on a receipt provided to the passenger. The meeting participants agreed that these items are appropriate and should be on the receipt. No further changes were suggested.

### **Paragraphs S.2.1. and S.4.**

The proposed changes for these two requirements were presented to the USNWG members. The changes are similar to those proposed in item D.5. (paragraph S.1.4.) being recommended to reflect that taximeters would be permitted to calculate fares using time and distance measurement at the same time, for the same portion of the trip.

**S.2.1. Initial Time and Distance Intervals.** – The time and distance intervals of a taximeter **that does not calculate fares based on distance travelled and time elapsed used concurrently** shall be directly proportional as expressed in the following formula:



(Added 1990) **(Amended 20XX)**

**S.4. Interference.** – The design of a taximeter shall be such that **when a fare is calculated by using time and/or by using distance (but not used concurrently)** there will be no interference between the time and the distance portions of the mechanism device at any speed of operation.

(Amended 1977**,** 1988 **and 20XX**)

The work group members agreed with the changes as shown, and that no further changes are necessary.

### **Paragraph S.5.1.**

The work group members were shown the proposed recommendations that would allow an electronic form of sealing for taximeters recommended as a change. The drafting of this requirement was done based upon discussions in previous USNWG meetings where there seemed to be opportunity for a compromise that would permit taximeters to use electronic means for the sealing of configuration parameters. It was also pointed out that the draft did not permit electronic sealing methods to be used for calibration parameters. The work group was also informed that the associated table was based on similar tables found in other HB44 device codes.

**S.5.1. For Taximeters Capable of Remote Access to Configuration and/or Calibration. – Means shall be provided for the security of a taximeter capable of remote access to metrological functions and features. Access to metrological adjustments may be permitted through means described in S.5. (a) or (b) or through the use of the following methods.**

1. **Sealing of Calibration Factors. – The sealing of adjustments to device calibration (affecting the measurement accuracy) shall include the use of a physical seal that when removed will permit the device to be placed in a mode that will allow remote access to calibration adjustments. Changes made to the calibration of the device following the removal of the physical seal must be recorded in an event logger.**
2. **Sealing of Configuration Parameters. – Adjustments affecting device configuration parameters (features and functions that may increase the potential for fraudulent use including changes to: rate structure; displayed indications; recorded indications; etc.) may be made through remote access without the need to break a physical seal. Any changes made to configuration parameters having a metrological effect on the device shall be recorded in an event logger.**

 ***[Audit trails shall use the format set forth in Table S.5.1. Categories of Device and Methods of Sealing]***

|  |
| --- |
| ***Categories of Devices and Methods of Sealing*** |
| ***Categories of Device*** | ***Methods of Sealing*** |
| ***Category 1:  No remote configuration capability.*** | ***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).*** |
| ***Category 2:  Remote access to calibration function, but access is controlled by physical hardware.******Remote access to configuration parameters only may be unlimited or controlled through a software switch (e.g., password).******The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.*** | ***The hardware enabling access for remote access to calibration functions must be at the device and sealed using a physical seal and include an event logger.******An event logger must also be used to record changes to configuration parameters made through remote access.******The event loggers 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.)*** |

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

**(Added 20XX)**

Mr. Jeff Garber recommends that the sealing requirements for taximeters be aligned with those that are being recommended for transportation network measurement systems as drafted in the proposed TNMS Code. Other members in the work group agreed and stated that they would support permitting electronic sealing to be used for taximeters.

Mr. Tomas added that under the international standard; OIML R21 physical sealing is not mandatory however, it is required that changes to tariffs and calibration factors be recorded on an event logger.

Mr. Jimmy Cassidy stated his concerns about allowing sealing methods other than physical seals for taximeters. He reiterated his reluctance to support electronic sealing for taximeters stating that the nature of the taxi business and the frequency of official inspections could result in fraudulent practices to go undetected for extended periods of time. Mr. Cassidy added however, that he would welcome discussion about how electronic forms of sealing could be applied to taximeters in ways that would provide confidence in the integrity of these devices.

Mr. Rajani informed the work group that his company’s system provides the regulatory official the ability to access an event log for the system and that this will provide a means to verify that the device is secure. His company would provide the statutory authority with a password enabling this access. He recommended to the group that the metrologically significant software used in taximeters should be “sealed” along with any other appropriate functions/features included on the device. Mr. Rajani also stated that an alert could be sent to the regulatory authority informing them that an electronic seal had been compromised.

Most of the regulatory members in the work group were supportive of the suggestion regarding an alert provided to the regulatory officials and questioned whether this is something that could be used universally on all makes of taximeter systems.

Mr. Martin Grindley also asked if it was possible to cause the device/system to be shut down if an electronic seal was compromised. Mr. Rajani stated that this would be possible but cautioned that appropriate measures would need to be implemented to avoid a system shutting down in accidental cases such as could occur if a password is forgotten or a mistake is made when entering a password.

When asked if this is something that would be supported if drafted into the proposed changes, the USNWG indicated that it would be. Mr. Rajani offered to draft specific language for the revision of the sealing requirements to address this topic.

While there were a few additional comments from the work group members about administrative rights for taximeter systems, no further changes were recommended.

### **Paragraph S.7.**

Mr. Barton presented the draft for a new paragraph to the work group that addresses the loss of location services signals. He explained that the intent of this proposed change is to clearly indicate that it is permissible for taximeters to use location services (e.g., GPS) for measurement of distance and time.

**S.7. Signal Loss for Systems Using Location Services. – For taximeters using location services (e.g., GPS, cellular networks) for measurement of distance and time. When the measurement of distance or time is obtained from a location service, any interruption of the signal from the location service shall not result in an incorrect calculation of fare. A loss or interruption of signal that would affect the calculation of fare must be compensated for by supplemental or auxiliary means, or fare charges shall cease to advance for the remainder of the transaction in progress.**

**Note: If the meter ceases to increment fare based on distance, the taximeter may continue to increment fare based on elapsed time if the time mechanism is not affect by signal loss.**

**(Added 20XX)**

Mr. Garber restated his preference that the Taximeters Code and the proposed new TNMS Code are aligned and suggested that this proposed new paragraph mirror the corresponding paragraph in the TNMS Code. Others in the USNWG agreed and indicated their support for a comparison to be done of this proposed requirement and similar requirements in the TNMS Code. A revision of the above paragraph could then be done to align the proposed changes in each code.

### **Paragraph S.8.**

The USNWG members present at the meeting were told that based upon the intent of the current requirement; S.7. Anti-Fraud Provisions, Electronic Taximeters in the existing Taximeters Code, it was presumed that there may also be a need to prevent the input of incorrect data into a taximeter system from the information received from location services such as GPS. This presumption was the basis for the proposed changes to what would become paragraph S.8. (due to additional changes in previous portions of the existing code).

**S.8. Anti‑Fraud Provisions, Electronic Taximeters. –** An electronic taximeter may have provisions to detect and eliminate distance input that is inconsistent with the **taximeter’s source(s) of distance measurement data**. When a taximeter equipped with this feature detects input inconsistent with the **distance measurement data source**:

(a) The meter shall either filter out the inconsistent distance input signals or cease to increment fare based on distance until the distance input signal returns to normal. If the meter ceases to increment fare based on distance, the taximeter may continue to increment fare based on elapsed time **if the time mechanism is not affected by inconsistent signals**;

(b) The taximeter shall provide a visible or audible signal that inconsistent input signals are being detected; and

(c) The taximeter shall record the occurrence in an event logger. The event logger shall include an event counter (000 to 999), the date, and the time of at least the last 1000 occurrences.

(Added 2001) **(Amended 20XX)**

Some concerns were expressed by members of the work group regarding the use of time measurements in place of distances measurements when the data for distance has been compromised. Mr. Stan Toy questions what impact these proposed changes will have if a taximeter is used in a jurisdiction where the fare rates are based on distance only. Mr. Grindley had additional questions about how a taximeter would respond to a change of vehicle speed in relation to the crossover speed when it is detected that measurement data is found to be corrupted.

While no definite answers were available for these questions, it was agreed that the draft changes to S.8.(a) proposed be revised (as shown below) to state that following the termination of fare calculation based on distance, fare can be calculated on time elapsed only if the jurisdictional authority will permit this.

(a) The meter shall either filter out the inconsistent distance input signals or cease to increment fare based on distance until the distance input signal returns to normal. If the meter ceases to increment fare based on distance, the taximeter may continue to increment fare based on elapsed time **where permitted by jurisdiction having statutory authority, and if the time mechanism is not affected by inconsistent signals**;

Other comments raised during the meeting included questions about the use of event loggers and event counters. An explanation of the difference between these two types of electronic records was provided to the work group. Mr. O’Leary informed the USNWG that Uber is exploring the idea of creating a form of event log although, it may not closely resemble the event loggers typically used in other weights and measures devices. Ms. Butcher suggested that the reference to an event logger in S.8.(c) could be enhanced by the addition of language describing what details are to be included in the event log. Mr. Barton agreed to review other device codes in HB44 and then make further amendments to align this paragraph with similar requirements in those other device codes.

### **Paragraph N.1.1.(c)**

**N.1.1. Test Methods. –** To determine compliance with distance tolerances, a distance test of a taximeter shall be conducted utilizing one or more of the following test methods:

(a) **Road Test.** – A road test consists of driving the vehicle over a precisely measured road course.

(b) **Fifth‑Wheel Test.** – A fifth‑wheel test consists of driving the vehicle over any reasonable road course and determining the distance actually traveled through the use of a mechanism known as a “fifth wheel” that is attached to the vehicle and that independently measures and indicates the distance.

(c) **Simulated‑Road Test\*.** – A simulated road test consists of determining the distance traveled by use of a roller device, or by computation from rolling circumference and wheel‑turn data.

**\* Simulated-road testing is not appropriate for taximeters using location services as a source for measurement data.**

(Amended 1977 **and 20XX**)

The work group was provided with an explanation of the changes being proposed for the existing paragraph N.1.1.(c). Mr. Barton stated that because the use of GPS or other types of location services would not be possible to verify if the vehicle (and the receiver component for GPS signals) does not change its geographic location, it is not possible to perform a test using a simulated-road test (i.e., a dynamometer). No further changes were suggested, and no additional comments were made.

### **Paragraph N.1.2.**

Mr. Garber suggested that the requirement pertaining to test procedures found in the Taximeters Code should be revised so that the test procedures are equivalent to those that are required in the proposed TNMS Code. Mr. Barton edited the Taximeters Code as it was being presented to the work group members in the meeting.

The USNWG members participating in the meeting were then asked to comment on the addition of a new paragraph, N.1.2.1. now drafted into the Taximeters Code that mirrors those requirements developed for the proposed new TNMS Code.

**N.1.2.1. Additional Tests for Taximeters Using Location Services.** – If during testing, a taximeter that uses location services for distance measurement produces a measurement that does not comply with the tolerance values in T.1.1., the following additional tests shall be performed:

1. **Repeatability Tests.** – Tests for repeatability including a minimum of three consecutive tests of the same length conducted in the same location where all test variables are reduced to the greatest extent practicable; and
2. **Variability Tests.** – Tests for variability including a minimum of three consecutive tests of varying lenths, locations, and/or environmental conditions.

Mr. O’Leary explained that the rationale for including these requirements in the TNMS Code was to help identify whether an anomaly observed during a test of a TNMS was a problem confined to a specific device, or a system-wide error. To be able to narrow the possible causes of a problem is particularly important a determination of enforcement actions to be taken. He explained further that if the problem observed can be attributed to a single device, then it would be unreasonable for the regulatory authority to require that the entire TNMS system be shut-down. He further stated that this does not correlate with the way in which taximeters operate and therefore questions if aligning this requirement between the TNMS and Taximeters Codes is appropriate.

Further discussion among the work group members resulted in an agreement to leave the recently added N.1.2.1. in the Taximeters Code however, this should be made optional rather than mandatory. Edits were made to amend the first sentence of the requirement to state that “…the following additional tests **~~shall~~** **may** be performed:…” The USNWG agreed with this change, no further comments were made.

### **Paragraphs N.1.3.1. and N.1.3.2.**

Mr. Barton explained to the work group members that the changes presented to them are copied from the language that was developed for the proposed TNMS Code and has been pasted into this section of the existing Taximeters Code to account for taximeters that may use GPS or other location services for measuring distance.

**N.1.3. Test Conditions.**

**N.1.3.1. Pulse-Based Taximeters. – For taximeters receiving distance measurement data from the vehicle’s components (e.g., transmission, on-board diagnostic computer, anti-lock brake system) the test of the taximeter shall be performed under the following conditions.**

**N.1.3.1.1 Vehicle Lading.** – During the distance test of a taximeter, the vehicle shall carry two persons, or in the case of a simulated‑road test, 70 kg or 150 lb of test weights may be substituted in lieu of the second person.

**N.1.3.1.2. Tire Pressure.** – At the completion of test run or runs, the tires of the vehicle under test shall be checked to determine that the tire pressure is that operating tire pressure posted in the vehicle. If not, the tire pressure should be adjusted to the posted tire pressure and further tests may be conducted to determine the operating characteristics of the taximeter.

(Amended 1977)

**N.1.3.2. For Systems Using Location Services. – During type evaluation, the distance test shall include a route traveled by the vehicle that will expose the system to conditions that may contribute to the loss of, or interference with the location service’s signal. Field examinations shall be performed as deemed necessary by the statutory authority under the environmental conditions that are considered usual and customary within the location(s) where the system is normally operated.**

**This may include but not be limited to:**

1. **Objects that may obstruct or reflect signals such as tall buildings/structures, forestation, tunnels, etc.;**
2. **Routes that do not follow a straight-line path; and**
3. **Significant changes in altitude.**

**(Added 20XX)**

Following a minimal amount of discussion, the work group agreed with the edits shown and no further changes were recommended.

### **Paragraph N.3.**

The discussion regarding the requirement for test procedures pertaining to interference (i.e., crossover between calculation of fare based on time or based on distance) began with a suggestion that this test is more easily performed as a laboratory test.

**N.3. Interference Test.** – **For taximeters that calculate fares based on time and/or distance but not simultaneously**, a test shall be conducted to determine whether there is interference between the time and distance elements. During the interference test, the vehicle’s operating speed shall be 3 km/h or 4 km/h **(**2 mi/h or 3 mi/h**)** faster**, and then 3 km/h or 4 km/h (2 mi/h or 3 mi/h) slower** than the speed at which the basic distance rate equals the basic time rate. The basic rate per hour divided by the basic rate per mile is the speed (km/h or mi/h) at which the basic time rate and basic distance rate are equal.

(Amended 1988)

The changes being proposed to this to the first sentence of this paragraph were being suggested to state that this requirement would only apply to taximeters that will calculate fare based on time and distance but not both used simultaneously.

Just prior to the July 2016 USNWG meeting, Mr. Bill Fishman suggested that this paragraph be amended to state that a taximeter’s ability to be compliant with the requirement on interference should also be verified by conducting this test at speeds less than the crossover speed. Mr. Fishman recommended this change an questioned why the test procedure had only required the vehicle to be driven at speeds greater than the crossover speed in the past. Others in the work group agreed with this point and supported the change as shown above.

Another point considered by the work group during the meeting in regard to this requirement was the difficulty some officials experience while attempting to perform this test in the field. Reportedly, some field officials consider the performance of this test to be a challenge while trying to maintain the appropriate speed(s) during the test. Work group members agreed and added that while the driver is concentrating on the vehicle’s speedometer trying to maintain the speed necessary less attention is being given to safely operating the vehicle in traffic.

Considering these points, the work group agreed that the following statement, provided as an informational note associated with this requirement should be included in the proposed changes to the HB44 Taximeters Code. No further changes were recommended.

**Note: Performance of the interference test may not be considered appropriate as a field test while travelling in a vehicle equipped with a taximeter. This test may be performed during type evaluation under controlled conditions for practicality as well as for safety concerns.**

### **Taximeter Code - Tolerance Requirements**

The consideration of aligning tolerances applied to taximeters with those applied to the proposed TNMS Code were discussed at length during the July 2016 meeting of the USNWG. Many of the work group members in attendance voiced their belief that the existing tolerances for taximeters are, in general easily met by today’s taximeters.

The members were provided with an explanation for the rationale applied when distance test tolerance values for overregistration and underregistration were established as being different from each other. This was primarily due to consideration with the manner in which taximeters indicate charges and because the charge for the initial distance interval is indicated prior to actually being traveled. This accepted practice results in the passenger charges for an entire interval or “money drop” accruing before the distance or time associated with the interval has been reached. This causes the passenger to pay in advance for the entire portion of the interval whether or not the distance/time associated with that interval is consumed.

The meeting participants were asked to consider the possible outcome if tolerances for overregistration were the same as underregistration. In a situation where a taximeter performs at the tolerance limit in the direction of overregistration, a potential exists where the passenger could be charged for an additional interval before receiving the value of the interval for which the charge is already registered on the taximeter.

Mr. Rajani stated that it is his understanding that the existing tolerances allowed for time tests have been established primarily to account for the human reaction time involved in activating the timing device at the appropriate time. Others in the work group agreed and added that it is very rare occurrence that a taximeter would not comply with the existing time test tolerances.

Mr. Garber added that similar to comments made regarding other proposed changes to the existing Taximeters Code, he believes it appropriate to align the Taximeters Code with the proposed TNMS Code wherever possible. While most work group members at the meeting agreed, they also stated that it may not be an appropriate time to propose major changes to the Taximeters Code.

The consensus of those attending the meeting was that the tolerances for taximeters could be amended to be more stringent based on advancements in technology used in taximeters. however, the USNWG declined to advocate any changes to the tolerance values at this time. The members agreed that changes may be appropriate in the future when “real-life” data is available to base any revisions upon.

The participants were directed to consider the change proposed to paragraph T.1.3. “On Interference Tests” where a statement has been added to indicate that this requirement is applicable only to taximeters that will calculate fare on time and distance but not both simultaneously.

**T.1.3. On Interference Tests. – For distance and time-based taximeters designed to calculate fares upon the basis of a combination of distance traveled and time elapsed, but not using both simultaneously**

**T.1.3.1.** The registration of a taximeter in the “time on” position shall agree within 1 % of its performance in the “time off” position.

(Added 1988)

**(Amended 20XX)**

The work group indicated their support for this change and no further changes were recommended.

### **Paragraph UR.1.**

**UR.1. Inflation of Vehicle Tires.** – **For pulse-based devices only.** The operational tire pressure of passenger vehicles and truck tires shall be posted in the vehicle and shall be maintained at the posted pressure.

(Amended 1977 **and 20XX)**

The USNWG was asked to comment on the change being proposed in this paragraph to indicate that it is not applicable to taximeters using location services such as GPS for measurement of distances. Recognizing that the condition of tires or any other part of the vehicle had no bearing on determining the distance traveled when measured in this manner, the work group agreed that this is an appropriate change.

### **Paragraph UR.2.**

**UR.2. Position and Illumination of Taximeter**. – A taximeter shall be so positioned and illuminated that its indications, operational markings, and controls of passenger interest can be conveniently read by a passenger seated **~~in the back seat of the vehicle~~ in a position of up to 1.2 meters (4 ft.) away from the taximeter under any condition of normal operation**.

(Amended 1985**,** ~~and~~ 1986, **and 20XX)**

Presenting the proposed changes shown above to the participants of the July 2016 meeting, Mr. Barton asked for comments from the work group. Mr. David Paul stated that he did not support a statement using a specific distance in the requirement believing that this is open to interpretation and may be difficult to comply with when passenger displays could be installed in various locations within the vehicle.

Others agreed and also noted that it is not always only one particular type of vehicle (e.g., sedan) being used as taxis. In many instances multi-passenger vehicles such as vans and sport utility vehicles are being used as taxis and this presents many options available for the passenger to be seated. The differences in seating configurations in various types of vehicles could lead to problems in clearly defining the installation of indicating elements and the visibility of indications for the passenger(s). The USNWG members also noted that there is already a specification requirement (S.1.3. Visibility of Indications) that addresses this design of taximeters by requiring indications to be easily read from a distance of 1.2m (4ft) away.

Mr. Barton suggested using language similar to that found in the HB44 Scales Code where it is stated that scale indications must be visible from a “reasonable” customer position. Mr. Tomas also pointed out that the operator must also be able to see the indications.

In general, the USNWG agreed to support the following revision of proposed changes to UR.2.

**UR.2. Position and Illumination of Taximeter.** – A taximeter shall be so positioned and illuminated that its indications, operational markings, and controls of passenger interest can be conveniently read by a passenger seated in **~~the back seat of the vehicle~~** **a reasonable customer position.**

(Amended 1985, 1986, **and 20XX**)

## **Attendance**

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|  |
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