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Incorporating corrigendum January 2017



BSI Standards Publication

Postal services — Quality of service — Measurement of the transit time of end-to-end services for bulk mail

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National foreword

This British Standard is the UK implementation of EN 14534:2016, incorporating corrigendum January 2017. It supersedes BS EN 14534:2003 and PD CEN/TR 15369:2006 which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee SVS/4, Postal services.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

Postal services - Quality of service - Measurement of the transit time of end-to-end services for bulk mail

Services postaux - Qualité de service - Mesure du délai
d'acheminement des services de bout en bout pour le
courrier en nombre

Postalische Dienstleistungen - Dienstqualität - Messung
der Durchlaufzeit von Massensendungen von Ende zu
Ende

This European Standard was approved by CEN on 4 February 2016.

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This document consolidates EN14534:2016 and the corrigendum EN14534:2016/AC:2017.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 14534:2016) has been prepared by Technical Committee CEN/TC 331 “Postal services”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2016, and conflicting national standards shall be withdrawn at the latest by November 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14534:2003+A1:2007 and CEN/TR 15369:2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Annex A to Annex G are normative.

Annex A to Annex C and Annex F are covering the measurement of a single bulk mail induction.

Annex D to Annex E and Annex G are covering additional requirements for the measurement of aggregated or continuous fields of study.

Annex H to Annex M are informative. They are the revised version of the Technical Report CEN/TR 15369:2006, *Postal Services – Quality of Service – Guidance for the implementation of EN 14534*. They cover both, a single bulk mailing as well as aggregated and continuous fields of study.

This document includes the corrigendum EN 14534:2016/AC:2017 which corrects the fifth Formula in A.3.2.2.

Introduction

The European Commission emphasizes the need to have common rules for the development of community postal services and the improvement of Quality-of-Service (QoS). The Commission has identified requirements for postal QoS-Measurement systems that include:

- independent end-to-end measurement capabilities;
- a focus on national and cross-border distribution service performance;
- a single, uniform and reliable system for monitoring distribution service performance within the European Union.

The Commission has acknowledged that the different postal traditions and cultures in Europe would not allow for the establishment of one common unified European measurement system and that national systems should have sufficient freedom to reflect needs and peculiarities of national markets. On the other hand, they should fulfil a defined set of minimum requirements to satisfy the information interests of the Commission, the regulatory authorities, postal customers and postal operators themselves.

The objective of this standard is to define a modular QoS measurement system in a competitive commercial context. The measurement is designed to estimate the end-to-end transit time quality of service given to the postal customer. The measurement can be set up domestically in each European country and cross-border between the European countries.

This European Standard refers to a number of principles and minimum requirements to be applied for the measurement of the end-to-end transit time service-level of bulk-mail services. It is widely applicable for single-induction as well as continuous measurement applications. It provides recommendations on the comparability of different bulk mail transit-time QoS measurement results and their use as key performance indicators.

This bulk mail standard has been developed from the requirements of EN 13850, *Postal services – Quality of service - Measurement of the transit time of end-to-end services for single piece priority mail and first class mail*. Both European Standards consider methods using a representative end-to-end sample of all types of addressed mail appropriate for their coverage. For the measurement of bulk mail services a separate standard is required for the following reasons:

- **Senders:** Members of the public posting single items are replaced by businesses, small in number – posting large volumes of mail. Third party agents (consolidators, mailing houses, letter shops) may also act on behalf of posting customers.
- **Contracted Services:** Mail posted in bulk will often be mailed under a contract between the customer and the postal operator. Typically, bulk services require customers to standardize format and weight of their mailing, undertake a level of pre-sortation or to present mail in different ways according to the contract conditions.
- **Volumes of mailings:** Bulk mailings are large. They may contain thousands or millions of items.
- **Performance Measures:** On-time performance measures are expanded to provide different types of (i) *on*, (ii) *by* or (iii) *between* specific-dates performance depending on what is agreed with the postal customers or is specified for this service.
- **Discriminant Characteristics:** Test items have to match the characteristics of customer mailings. The range of characteristics relevant for the performance varies by type of mail service, and a wider set of potential characteristics should be considered. Greater flexibility is required to define for what part of the real mail logistics the results are representative for.

- **Production of Test Mail:** For the inclusion of test mail in the customers bulk mailings a variety of methods may be appropriate. They include database-seeding methods used in different stages of the customer's mail production process as well as methods to include pre-produced test items in the customer's bulk mailing between production and induction of the customers' real mail.
- **Dates of induction:** The rules and requirements for bulk mail induction are more complex and may be specific to the contract between customer and postal operator.

1 Scope

This European Standard specifies methods for measuring the end-to-end transit-time of *domestic* and *cross-border* bulk mail, collected, processed and delivered by postal service operators. It considers methods using representative end-to-end samples for all types of bulk-mail services with defined transit-time service-levels as offered to the postal customer. It specifies a set of minimum requirements for the design of a quality-of-service measurement system for bulk mail, involving the selection and distribution of test mail sent by business senders and received by selected panellists.

This European Standard is applicable to the measurement of end-to-end *priority* and *non-priority* bulk-mail services. For the purpose of this standard, bulk mail services can include all types of addressed bulk mail including, but not limited to letter mail, direct mail, magazines and newspapers and encombrant-format mailings.

This European Standard relates to the measurement of bulk-mail services offered to businesses that have pick-ups at their offices or give their mail to postal service operators. If a third party agent acts for the postal operator, then the time the mail is handed over to the agent will form part of the measurement. Where a third party agent acts for the sending customer, the measurement will be from the point when mail is handed over to the postal operator.

This European Standard is of *modular structure*. It is designed to assess the service performance of postal operators for bulk mail services on the level of a single *bulk mailing* as defined by the postal customer or any aggregations thereof, including the performance of an individual customer / operator or the performance of a group of customers / operators or the performance at national level.

The standardized QoS measurement-method provides a uniform way for measuring the end-to-end transit time of postal items. Using a standardized measurement-method will ensure that the measurement will be done in an objective and equal way for all operators in accordance with the requirements of the Directive 97/67/EC and its amendments.

The end-to-end service measured may be provided by one operator or by a group of operators working either together in the same distribution chain or parallel in different distribution chains. The method for end-to-end measurement specified in this European Standard is not designed to provide results for the measurement of parts of the distribution chain.

This standard does not include other service performance indicators than those related to end-to-end transit time. In particular, this standard does not measure whether the timings of collections meet customers' requirements.

The transit-time quality-of-service result will be expressed as percentage of mail delivered *by, on or between* expected dates. These dates can be defined absolute as calendar-days or relative to the date of induction. The transit time calculation rule will be in whole days.

This quality of service indicator does not measure the postal operator's overall performance in a way, which provides direct comparison of postal service operators. This European Standard nevertheless provides minimum requirements for the comparability of end-to-end transit-time measurement results of specific bulk mailings.

This European Standard is not applicable for the measurement of end-to-end transit-times of single-piece mail services and hybrid mail, which require different measurement systems and methodologies (see, for example, EN 13850, *Postal Services - Quality of Services - Measurement of the transit time of end-to-end services for single piece priority mail and first class mail*).

In certain circumstances, this standard allows a choice between alternatives to be made subject to the approval of the regulator. This approval is only necessary if the service is within the universal service obligation.

This European Standard includes specifications for the quality control and auditing of the measurement system.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13850:2012, *Postal Services - Quality of Services - Measurement of the transit time of end-to-end services for single piece priority mail and first class mail*

ICC/ESOMAR, *International Code of Marketing and Social Research Practice (1995 revision)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

accuracy

closeness of agreement between a test result and the accepted reference value

Note 1 to entry: The term accuracy, when applied to a set of test results, involves a combination of random components and a common systematic error or bias component.

Note 2 to entry: In this standard the accuracy is expressed as $\pm \varepsilon$, where 2ε is the length of the confidence interval at the confidence level 95 % for the parameter being estimated, namely the probability of attaining the transit time target.

[SOURCE: ISO 3534-1:2006]

3.2

aggregation

compounding of primary data into an aggregate for the purpose of expressing them in a summary form

3.3

audit

systematic and independent examination to determine whether activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives

Note 1 to entry: The organization carrying out the audit is called the *auditor*.

Note 2 to entry: A (full) audit may be carried out as an *initial audit* of a new or substantially changed system or as an initial audit by a new auditor. It may also be carried out as a *re-audit* of the same system by the same auditor in the next audit cycle.

Note 3 to entry: If an audit results in objections, then the auditor may require corrective actions until a defined deadline. A final check of these corrective actions is called *corrective audit*.

3.4

average (arithmetic mean)

sum of values divided by the number of values

[SOURCE: ISO 3534-1:2006]

3.5

bulk mail

large volume of mail having similar mail and induction characteristics

Note 1 to entry: Bulk mail items are usually from the same weight group and share the same size or shape characteristics.

Note 2 to entry: Bulk mail items have usually a common sender and share the same point(s) of induction.

Note 3 to entry: Bulk mail senders often share the outward processing of bulk mail by pre-sorting or segregating the mail to enable the postal operator to by-pass the first sortation stages.

Note 4 to entry: Regarding the volume and/or requirements of the induction process, bulk mail does not qualify as single piece mail.

3.6

bulk mailing

bulk mail posted by a single postal customer at the same induction point(s)

Note 1 to entry: A bulk mailing is defined by the postal customer, usually being a business.

Note 2 to entry: A bulk mailing usually covers one induction date or, in some cases, a small number of consecutive days of operation.

Note 3 to entry: Large bulk mailings may be inducted at more than one postal operator, depending on the areas of destination.

Note 4 to entry: Large bulk mailings may be inducted at two or three induction points, depending on the areas of destination.

3.7

bulk mail campaign

finite set of bulk mailings following a defined pattern

Note 1 to entry: A bulk mail campaign is defined by the postal customer, usually being a business.

Note 2 to entry: A bulk mail campaign may comprise bulk mailings with different types of bulk mail.

Note 3 to entry: A bulk mail campaign may consist of cycles or waves in time of bulk mailings of similar nature.

3.8

(bulk mail) sender

organization sending bulk mail, usually being a business

Note 1 to entry: The bulk mail sender can be the postal customer or his agent.

Note 2 to entry: The postal customer or the customer's agent can be a consolidator or a mailing house / letter shop

3.9

business panellist

panellist with an address other than a household address such as a company or an organisation

3.10**characteristic**

property, which helps to identify or differentiate between items of a given population

Note 1 to entry: The characteristics may be either quantitative - by variables, or qualitative - by attributes (ISO 3534-3:2013).

Note 2 to entry: In this standard the population is bulk mail items and the characteristics are related to type of senders, type of receivers, times and types of induction or delivery, physical aspects of test items, type of franking, etc.

3.11**continuous measurement**

measurement with mail allocated to all months of the year, and within the months to all weekdays of operation of the postal operator ('strictly continuous measurement')

Note 1 to entry: A measurement is also continuous in the context of this standard if bulk mailings are measured regularly with the same methodology for at least a calendar year ('continuous measurement').

Note 2 to entry: Relevant weekdays of operation are all possible weekdays of posting in accordance with the field of study and the chosen transit-time calculation rule (see Annex B)

3.12**corrective action**

action taken to eliminate the causes of an existing non-fulfilment of specified requirements, defect or other undesirable situation in order to prevent recurrence

3.13**country**

territory of a nation with its own government

3.14**cross-border mail**

mail distributed from one country to another country

3.15**customer**

natural or legal person purchasing a postal service from a postal operator

3.16**date of delivery**

date on which a postal item is delivered to the address or to the addressee

3.17**date of induction (j)**

starting date J for the transit-time calculation according to 5.2.2

Note 1 to entry: The term *date of induction* has the same meaning as the term *date of deposit* in the Directive 97/67/EC.

3.18**date of posting**

date on which a postal item is posted (irrespective of whether it is posted before the advertised last collection of that day)

3.19

delivery point

physical location at which delivery of a postal item by a postal operator takes place and where it leaves the operator's responsibility

3.20

design basis

structure in the field of study for which the design of the measurement is representative. The design basis should be defined before the start of the measurement

Note 1 to entry: If a design basis other than measured real mail flows is selected, then statements regarding the representativity of the measurement shall be made in relation to the chosen design basis.

[SOURCE: EN 13850:2012, 3.19]

3.21

design factor

ratio of the variance of the estimator of the QoS indicator in the given sample design by the variance of the estimator in an elementary sample design of the same size. The design factor is always related to a given sample design and estimator

[SOURCE: EN 13850:2012, 3.20]

3.22

dimension

mail characteristic with at least two modes, used to form subgroups of mail flows whose quality of service is to be compared

3.23

discriminant characteristic

characteristic affecting the outcome

Note 1 to entry: In this standard, a characteristic is discriminant when the transit time significantly differs according to the different modes of the characteristic (see 6.4).

3.24

distribution

process from collecting mail at collecting points through processing at the mail centre(s) to the delivery of mail items to the addressee

3.25

domestic mail

mail items sent and received within one country

3.26

effective sample size

total sample size divided by the design factor

3.27

end-to-end

routing from the access point thru the postal operators network up to the point of delivery to the addressee

3.28**estimate**

value of an estimator obtained as result of an estimation

[SOURCE: ISO 3534-1:2006]

3.29**estimator**

statistic used to estimate a population parameter

[SOURCE: ISO 3534-1:2006]

Note 1 to entry: In this European Standard, an estimator is a function of the observed values of test-item transit times allowing the estimation of the probability of attaining the transit time target.

3.30**field of study**

total bulk mail flow between defined postal areas

Note 1 to entry: Some examples for field of study could be:

- Domestic – one mailing;
- Domestic – one induction operator in one country for an individual customer or group of customers;
- Domestic – one induction operator in one country;
- Domestic – a group of operators in one country;
- Cross-border – one mailing;
- Cross-border – one induction operator on a country-to-country link;
- Cross-border – one induction operator to an individual delivery operator or group of delivery operators;
- Cross-border – one induction operator to one country;
- Cross-border – one induction operator to a group of countries;
- Cross-border – a group of countries to one delivery operator;
- Cross-border – one country to one country.

3.31**fixed date of induction**

contracted date, on which mail items that have been collected and put on hold, are to be distributed from their point of storage

Note 1 to entry: Contracted fixed dates of induction are to be accompanied by a last date of collection and a last collection time.

3.32**geographical coverage**

spread of postal services within a pre-defined geographical area

3.33

independent performance monitoring organisation

body charged with the monitoring of the QoS according to the methodology specified in this standard, which is external to, and having no links of ownership or control with the postal operator(s) thus monitored

3.34

induction

takeover of the responsibility concerning a postal item and its distribution by a postal service provider

Note 1 to entry: 'Induction' is equivalent to 'Posting' when the posting is done before the last collection time.

3.35

induction point

physical location at which postal items are placed into the collection / acceptance system that is under the responsibility of the induction postal operator

3.36

last collection time

advertised last time for collection or contracted latest time for collection

Note 1 to entry: The last collection time is often also called *last acceptance time* for which the postal operator states the transit-time target.

Note 2 to entry: This is often not equal to the actual collection time, because from the postal work-organization point of view, the collection usually happens some time later than the advertised last collection time (e.g. the collection routing timetable can only be defined with some tolerance).

3.37

last date of collection

contracted latest date for posting / collection for bulk mailings with a fixed date of induction

3.38

measurement period

period under which measurement has been carried out and for which the results are presented in a separate report

3.39

metered mail

mail franked by franking machines

3.40

non-priority item

letter post item sent without priority, typically by surface, and receiving slower processing compared to items classified as priority as defined nationally

3.41

office of exchange

place where a postal operator accepts cross-border mail from a postal operator of another country and prepares mail for the transfer to other countries

3.42

on-time performance

proportion of postal items within a given period-of-time with transit times meeting the specification

3.43**on-time probability**

probability of the event that the transit time T of a mail item meets the transit time target

3.44**one-operator field of study**

field of study with exactly one induction operator

Note 1 to entry: A one-operator field of study may be defined in a multi-operator postal environment.

Note 2 to entry: End-to-end postal operation in a one-operator field of study may include several postal operators for processing and / or delivery.

3.45**panel turnover**

permanent exchange of established panellists with new panellists

3.46**panel rotation**

active change in the subset of established panellists, which are chosen for participation in a study, or in their tasks in the study from one period to the other

3.47**pick-up time**

published time by which the postal operator commits to ensuring that the day's post is available in the P.O. Box for collection by the receiver

3.48**postal area**

one of the parts into which a postal operator's whole territory is divided and which is suitable for characterising postal distribution peculiarities

3.49**postal catchment area**

postal area served by a domestic sorting centre or by an office of exchange for cross border mail outbound or inbound. Catchment areas may be different for outbound and inbound mail or for different fields of study

[SOURCE: EN 13850:2012, 3.43]

3.50**postal item**

item addressed in the final form in which it is to be carried by a postal service provider

3.51**postal performance indicator**

expression used to characterise the performance of a postal operator

Note 1 to entry: In this European Standard, the performance indicator is derived from postal transit-time statistics.

3.52**postal service**

services involving the clearance, sorting, transport and delivery of postal items

3.53

posting

handover of mail to a postal operator or his agent

3.54

priority item, first class item, a-class item

postal item sent with priority as defined nationally

3.55

private panellist

panellist with a household address

3.56

quality

totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs

3.57

quality assurance

all the planned and systematic activities implemented within the quality system and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality

3.58

quality control

operational techniques and activities that are used to fulfil requirements for quality

[SOURCE: ISO 3534-1:2006, ISO 3534-2:2006, ISO 3534-3:2013, ISO 3534-4:2014, modified]

3.59

real mail flow

number of postal items of a given type on a given link within the postal network

3.60

real mail study

studies on real mail flows or real mail characteristics involving sampling of real mail items

3.61

rural

geographical entity with less than a specified number of inhabitants

3.62

service standard

standard that specifies requirements to be fulfilled by a service, to establish its fitness for purpose

3.63

single piece mail

postal items posted and distributed via a postal service for which a 'single piece tariff' for individual postal items is set in the general terms and conditions of the postal service provider that receives the payment

Note 1 to entry: Single piece mail may be inducted using different modes of payment as long as the induction of individual postal items is not restricted.

Note 2 to entry: Excluded are all postal services that contain further requirements on the induction like, for example, the registration of items, minimum induction volumes, equal contents or a pre-sortation of the inducted mail.

3.64**sorting centre**

place where the main sorting of mail is done

3.65**split induction**

bulk mailing with more than one induction date

Note 1 to entry: It may be possible to assign to each delivery destination of a split induction exactly one induction date.

3.66**stratification**

division of a population into mutually exclusive and exhaustive subpopulations (called strata), which are thought to be more homogeneous with respect to the characteristics investigated than the total population

[SOURCE: ISO 3534-1:2006, ISO 3534-2:2006, ISO 3534-3:2013, ISO 3534-4:2014, modified]

3.67**study domain**

subpopulations for which separate results may be appropriate

Note 1 to entry: Study domains could be defined for example by geographic segmentation or by product

3.68**test item**

postal item produced in the test measurement system with the purpose of measuring transit time Quality-of-Service. A test item should be assigned to a stratum in the field of study. It should be manufactured, inducted and delivered according to the discriminant mail characteristics defining the stratum

[SOURCE: EN 13850:2012, 3.63]

3.69**time of delivery**

time when a postal item is delivered at its delivery point

3.70**time of posting**

time when a postal item is posted at its induction point

Note 1 to entry: The time of posting may be before or after the actual last time of collection.

Note 2 to entry: The time of posting may be the contracted time of collection, for all contracted bulk mail that is ready for handover at this time.

3.71**transit time**

number of days elapsed between date of induction and date of delivery of a mail item

Note 1 to entry: The transit time is calculated according to Annex B.

3.72**urban**

geographical entity with not less than a specified number of inhabitants

3.73

user

any natural or legal person benefitting from postal service provision as a sender or as an addressee

3.74

weighting

compensation for the difference between the distributions of characteristics in the measurement system compared to the chosen design basis

4 Symbols and abbreviations

CMS	Continuous Measurement System
CMW	Calculated Mode Weights
df	Design factor
DMC	Discriminant Mail Characteristic
EC	European Commission
ESS	Effective Sample Size
EtE	End-to-End
IFW	Individual Final Weight
IRV	Intra-Relation Variation
IT	Information Technology
J	Date of induction
LDC	Last Date of Collection
MSS	Minimum Sample Size
P	Date of Posting
QoS	Quality of Service
RMW	Real mail Mode-Weights
RMS	Real Mail Studies
RSW	Real mail Strata-Weights
RtT	Relation-to-Total Variation
SCMS	Strictly Continuous Measurement System
SIP	Single Induction Point
SRS	Simple Random Sample
StrRS	Stratified Random Sample
StrEtE	Stratified End-to-End Sample
SWB	Standard Weighting Basis
USO	Universal Service Obligation
WB	Weighting Basis

5 Transit time as a Quality-of-Service indicator

5.1 General

The bulk mail *transit-time Quality-of-Service (QoS)* is usually to be expressed as the percentage of mail distributed within the end-to-end transit-time target. All performance indicators shall refer to the *on-time performance*, i.e. either the bulk mail end-to-end transit time or the percentage of mail delivered (i) by, (ii) on or (iii) between expected dates. These dates shall be defined absolute as calendar-days or relative to the date of induction ($J + n$).

The measurement process involves the selection and distribution of test items sent by selected businesses and received by selected panellists. The sample design gives the specifications for the businesses sender, receiver panellists and items to be representative of the chosen design basis. The *design basis* is the most appropriate structural information available to characterize all real mail distributed in the field of study.

The sample design shall be representative of the chosen design basis. The design basis shall be selected according to its ability to characterize all real mail distributed in the field of study. If the field of study is composed of several study domains, it is the QoS measurement for the overall field, which shall comply with the requirements of this European standard.

The system for measuring the distribution of the end-to-end transit time of bulk mail items shall be robust and shall give a statistical measurement at a defined level of accuracy. The measurement methodology shall be objective and shall be auditable.

5.2 Transit time calculation

5.2.1 Measurement unit

The transit time of a postal item shall be measured in units of days and expressed as ($J + n$) days with J being the date of induction. The method for establishing the date of induction shall be agreed between the organization commissioning the measurement system and the independent performance monitoring organization. For measurement purposes, the date of induction J is when the postal operator takes responsibility for starting the distribution process of the posted mail in accordance with a QoS target. The handover to the postal operator may be made by the business sender or an agent acting on behalf of the business sender.

5.2.2 Establishing the date of induction

It is the responsibility of the independent performance-monitoring organization to put in place an inclusion method, which provides for consistent, accurate dates and times of posting. The method(s) used to obtain accurate dates and times of posting shall be agreed between the sending bulk-mail customer and the independent performance-monitoring organization before a method of inclusion is implemented.

The agreed inclusion method(s) shall facilitate the identification of the date of induction based on:

- the date and time of posting; and
- the last collection date and time;

for each individual test item in the sample, keeping in mind the postal logistics of the service provider.

For most bulk mailings, *one* date of induction will suffice for all items that are posted. In some cases, however, a posting may be spread over two or more days (*multi-day induction*) and knowledge of where each item is within the bulk mailing will be key to determining accurate dates of induction. In a measurement of a multi-day induction different times or even dates of posting might be applied to the same delivery destinations (*split induction*). The information needed for handling split-inductions is often more complex and systems feasible for verification, if they exist at all, more extensive than in the one-day induction case.

One way of overcoming some of these problems is to adapt the inclusion method to the type of mailing in question (see 6.6). Different inclusion methods may help the sending customer to provide accurate date(s) and time(s) of posting.

Depending on the contract between business sender and postal operator, the date of induction for each mail item is – alternatively – the date of the:

- (i) *Actual collection* from the sender's or agent's premises;
- (ii) *Contracted collection* from the sender's or agent's premises, provided the contracted bulk mailing is ready for handover on the contracted date;
- (iii) *Advertised collection* time after posting by the sender at a postal induction point;
- (iv) *Final collection* or posting in a series of collections / postings to cover a delivery destination;
- (v) Contracted fixed start of the distribution process after the mail items have been collected / posted, put on hold and stored for a time at a defined location in the postal network (*interim storage*)

under the condition that the posting takes place before the agreed last collection date and time. For items with a time of posting later than the last collection time, the date of induction is set to the next valid date of induction for this type of mail (for details see B.2).

It is essential that a common understanding of the determination of the date of induction is reached between all concerned parties before the start of the measurement. This shall be documented.

The following steps shall be undertaken to minimize the recording errors for date and time of posting:

- The date and time of posting shall be provided to the independent performance monitoring organization by the sending bulk-mail customer or the sending customer's agent, e.g. a mailing house. This information may be provided electronically, by manual observation or by written documentation.
- Where practicable, the actual production of all test items shall be verifiable, in cases where address seeding by the customer or his agent (see also 6.6.4) is the preferred mode of test mail production and placement.
- Where practicable, the date and time of posting shall be verifiable using information from the postal operator.
- In multi-day bulk mailings, the business sender and the independent performance measuring organization shall agree on a method to verify the exact date and time of posting of the relevant mailing(s) to all delivery destinations.

NOTE 1 This may be done, for example, by using existing electronic or logistic information or by deploying personnel of the performance-monitoring organization.

Delivery destinations should be derived from the organizational structure of the postal operator or any other structure, which determines the sorting, packing and routing order of the mailing.

Table 1 — One and Multi-Day Inductions

Options	Required Information	Possible info from postal operator
All mail has the same induction date	Date and time of posting of the total bulk mailing	Postal operator may be able to confirm the date of induction
Split induction type I: More than one induction date, with each delivery destination posted completely on one induction date	Date and time of posting is required for each delivery unit	If information on each delivery unit is captured, the postal operator may be able to confirm the date of induction for each destination
Split induction type II At least one delivery destination with more than one possible induction date.	Date and time of posting is required for individual items	The postal operator is unlikely to be able to confirm the date of induction

NOTE 2 To reduce the likelihood of type II splits, it is advisable to decide for the smallest identifiable logistic entity (e.g. postal destination documented on the tray or palette) to serve as delivery destination in the context of this standard.

If type II split inductions are likely to appear there is a risk that, for some items, it is not possible to determine a distinct induction date. In these cases, the postal operator and the business customer shall agree on a procedure how to deal with these items.

EXAMPLE 1 These items will be declared invalid, because the date of induction cannot be determined.

EXAMPLE 2 The date of induction associated with the last of the split postings per delivery unit will be taken.

The following minimum requirements for the recording of the date and time of posting shall apply:

- Recording errors shall be small enough so that they do not affect the survey results, taking into account the accuracy claimed for them.
- The method of seeding shall be the one which leaves least scope for error and which provides dates of induction sufficient to meet the above requirements.
- Tests shall be made by the independent performance monitoring organization to monitor the level of inaccuracy in recording dates of induction.

Each sending customer may require a unique approach from the independent performance monitoring organization.

5.2.3 Calculation of the transit time

For the purpose of this European Standard, transit times for domestic and cross-border mail shall be calculated according to the calculation rule as presented in B.3. Published regional holidays may be subtracted in the calculation of transit time.

The calculation of the transit time takes into account test items posted before the last collection time of the day for the type of mail in the field of study. The last collection time is taken preferably as stated in the induction documentation (actual collection time of the postal collection service) or otherwise as announced by the postal operator (planned collection / latest acceptance time at a postal point of induction). If a test item is posted after the last collection time, then the date of induction *J* should be adjusted to the next induction date for this type of mail.

The transit-time calculation rule shall be agreed, fixed and documented before the start of the measurement. This includes the type of last collection times to be applied.

It is necessary to ensure that panellists can identify the delivery of the item to the address or the receipt of the item to a named individual. If P.O. Boxes are to be included in the sample, panellists will need to be able

to confirm that they collect the mail daily after the published pick-up time. If there are items included in the survey, which are not letterbox-friendly or for some other reason cannot be delivered without the presence of the panellist, it is the first attempt to deliver that should count as the day of delivery if the date of the first attempt to deliver can be retrieved from a written notification.

Only valid test mail items shall be included in the calculations (see also F.7). All postal items required for cumulative reporting according to 7.2.1 shall be considered in the calculations. Postal items not delivered within this timeframe may be excluded, because they may be deemed as lost or are not detectable in the system any more within the reporting period.

6 Methodology

6.1 Representative sample design

The measurement shall be based on a defined methodology. It shall be carried out by an independent performance monitoring organization.

The methodology shall be based on test mail volumes representative of the chosen design basis. It shall define indicators that are representative of the transit-time QoS provided in the measurement period. The design basis shall be defined before the start of the measurement in accordance with the field of study. Statements regarding the representativity of the measurement shall be made in relation to the chosen design basis.

The European Standard is designed to be able to monitor an individual bulk mailing. However, the field of study may also be defined as all bulk mail items of an individual customer or a small group of customers or – more generally – of a representative sample of a postal operator's or a country's bulk mail customers.

The test mail method shall consist of a process in which businesses act as senders and panellists act as receivers. Senders induct test items into the postal operator's mail network and register date and time of posting; receivers register the date of delivery. Receivers shall be spread all over the field of study in order to fulfil the specifications of minimum sample size, maximum panellist workload, stratification and geographical coverage.

The sending and receiving process shall be organized properly in order to fulfil the specifications of the sample design. The test mail shall be selected or manufactured in such a way as to fulfil the specifications of the discriminant mail characteristics. A representative sample design may be realized either by a strict proportionality of the test mail flows with respect to the design basis, or by an over-representation or an under-representation of some strata. The latter requires corrective weighting, which allows restoring the proportionality.

6.2 Minimum Sample Size (MSS)

250 test items shall be the Minimum Sample Size (MSS) for a single bulk mailing. With this MSS, reliable¹ results can be achieved for performance levels above 85 %.

A maximum of one test item per bulk mailing shall be allocated to any receiver.

6.3 The design basis

6.3.1 General

The design basis may be determined in different ways. The standard design basis is based on real mail volumes.

The design basis shall be provided by the stakeholder(s) commissioning the measurement.

¹ Accuracy of ± 5 % (design factor =1; Agresti-Coull Interval)

6.3.2 Choice of the design basis

Depending on the availability of real mail volume data at the planning stage, each of the two types of design bases may be an appropriate choice:

- *1st choice:* Measured or registered real mail volumes (standard design basis, historical data);
- *2nd choice:* Estimates via logistic or management data (alternative design basis, historical data).

It is possible that the type of design basis varies between the discriminant mail-characteristics, for example if real mail data are only available for some of the discriminant mail characteristics but not for all. For each discriminant mail characteristic the most reliable design basis available shall be chosen.

The provision of the distribution of the following real mail characteristics as a minimum is mandatory:

- the discriminant characteristics according to 6.4.2;
- the geographical stratification according to 6.4.3.

6.3.3 Evaluation of the design basis

6.3.3.1 Real mail evaluations

If available and reliable, the results of real mail evaluations shall be used as the standard design basis.

Real mail evaluations shall be done before or parallel to the *set up* of the measurement system in order to gain real mail volume information and to obtain the structural information needed for the determination of the sample design. For a data-update, further evaluations may be run before or parallel to the *measurement period*.

The real mail evaluations shall:

- consider all bulk mail volumes of a given field of study;
- collect statistics on bulk real mail volumes and bulk real mail characteristics according to the minimum information requirements of the statistical design.

6.3.3.2 Logistic / management data

If data from real mail evaluations is not available or reliable, the distribution of real mail volumes corresponding to certain mail characteristics may be determined using existing logistic or management data that is available out of regular operation.

EXAMPLE 1 The total mail flow on a certain link can be estimated via the number of registered pallets.

EXAMPLE 2 For the measurement of an individual bulk mail customer, the customer itself may have statistics on the regional mail volumes he distributes in general or via a selected postal operator.

The type of logistic or management data on which the design is based shall be stated in the report.

6.4 Discriminant Mail Characteristics (DMC)

6.4.1 General

Outward appearance of test items as well as sending and receiving processes shall not deviate from real mail, and it shall not be possible for postal operators at any stage in their operations to identify them as test items. The test items shall have correctly written addresses.

NOTE For certain bulk mail products, the minimum requirements for correct addressing include minimum requirements on the machine-readability of the printed address (concerning font, size, spacing, etc.).

The geographical network of possible induction and delivery points in the field of study is regarded as discriminant for the transit time of all letters distributed within the network. Discriminant geographical mail characteristics include the location of the induction point, the location of the delivery point or logistic differences related to geography.

Geographical stratification shall be based on *postal areas* and shall be the basis of the sample design. It shall be replaced by other geographical parameters only if it is demonstrated by auditable proof, that these are more discriminant. The proof would most likely come from the results of a QoS survey.

It shall be checked, if the *type of delivery* is discriminant. Possible types of delivery are: (i) street address (ii) P.O. box or (iii) delivery to receivers' premises. If some or all of the existing types of delivery prove to be discriminant, they have to be included into the stratification of the sample design.

6.4.2 DMC in aggregated fields of study

In *aggregated fields of study* further discriminant mail characteristics may occur. In aggregated fields of study the list of further discriminant mail characteristics shall be reviewed before the start of the measurement. The scope of the review is to check each element on a list of potential candidates for DMCs if they are discriminant or not. Only those elements of the list that prove to be discriminant have to be included into the stratification. The proof again would most likely come from the results of a QoS survey.

In case no reliable background information is available for the review before the start of the measurement, the following list of possible characteristics shall be included in the measurement if applicable in the aggregated field of study. These characteristics shall be evaluated at the end of the measurement period as a minimum at least in the modes as listed below:

1. Mail characteristic referring to the induction point:
 - *Type of geographical delivery area* by (i) urban or (ii) rural;
 - *Use of a mailing agent* (mailing house, letter shop) by agent;
 - *Volume of mail per mailing* by at least two modes;
 - *Degree of pre-sortation* by at least two modes;
 - *Type of induction* by (i) collection from sender's premises; (ii) induction in sorting centres, (iii) induction in post offices;
2. Mail characteristics referring to the test letter itself:
 - *Formats* by at least two modes;
 - *Weight steps* by at least two modes;
 - *Type of envelope* by (i) none, (ii) paper, (iii) welded;
 - *Addressing method* by (i) printed, (ii) window (iii) labelled;
 - *Level of automation* by (i) none, (iii) machine readable address, (iii) delivery region specification (iv) bar/QR-coded;
 - *Induction weekday* by (i) Monday (ii) Tuesday (iii) Wednesday (iv) Thursday (v) Friday (vi) Saturday.

It may turn out that some characteristics are only discriminant in certain modes.

'Mailing agent' may only be discriminant as 'Agent D' versus 'other agents'.

For each discriminant characteristic, at minimum the two main modes shall be represented.

The revised set of discriminant mail characteristics shall determine the stratification of the design.

The revision has to be completed before the calculation of the report.

6.4.3 Geographical stratification

- The relation between the induction point and the delivery point characterizes each letter geographically. Both points together represent a certain (group of) induction point(s), a certain delivery area, a certain distance and the complexity of the geographical postal logistics between them.
- The stratification by geographical mail characteristics shall mirror possible logistic differences in mail distribution between different induction points / delivery areas and distribution distances. The geographical stratification is therefore based on the postal logistic structure used in the field of study.
- For the delivery, the field of study shall be divided into at least three mutually exclusive postal areas. The postal areas shall be derived from the logistic structure of the postal operators. They shall provide complete coverage of the geography in the field of study.
- The grid of all possible relations between the chosen postal areas shall form the geographical stratification. With at least one point of induction and at least three delivery areas, there shall be **at least 3 strata** (relations). Postcode/zip code areas may be used as a tool to define postal areas.

NOTE 1 The postal areas used for different fields of study may differ from each other.

NOTE 2 For cross-border measurement systems possible postal areas can be related to offices of exchange (cross-border mail exchange points). A postal area may be the catchment area, i.e. the postal area, which is served by one office of exchange.

6.5 Geographical distribution of the receiver panel

The geographical distribution of the receiver panel shall be done according to random sampling. The whole of the geographical area defined in the field of study shall be eligible.

The panel of receivers shall be dispersed over a geographical recruitment grid based on postal areas served by the operators. The dispersion of the panel shall guarantee that all postal areas defining the geographical stratification (see 6.4.3) are covered. The geographical recruitment grid however may be different from the geographical stratification.

For example, the stratification may be based on the catchment areas of the delivery mail centres. A delivery office is usually linked to a delivery mail centre, which in turn serves several delivery offices. The catchment areas of the postal delivery offices may serve as a (finer) geographical recruitment grid. In this example, the panellists shall be dispersed over a high number of delivery offices covering all delivery mail centres included in the stratification.

The minimal number of postal areas in the grid to be covered by the panel will be linked to the size of the panel.

If on average three or more panellists could be recruited in each geographical zone, all postal areas in the field of study shall be included into the measurement. Otherwise the minimum percentages of Table 2 apply.

EXAMPLE 1 Suppose that to measure a bulk mailing 250 panellists are required and these are to be distributed over 170 postal areas by random sampling. Then there are on average 1,47 panellists per area. The minimum number of areas to be covered is 67 % of 170 equals 113,3 areas, which should be rounded up to 114 areas. Thus, the panellists should be distributed so that 114 up to 170 areas are covered.

EXAMPLE 2 Suppose that 300 panellists have to be recruited and that these are to be distributed over 150 areas by random sampling. Then there are on average 2 panellists per area (between 1,47 and 2,1 in the table); the minimum percentage of areas to be covered is then 67 %. The minimum number of areas to be covered is 67 % of 150 = 100 areas. Thus, the panellists should be distributed so that at maximum 50 areas are omitted.

Table 2— Minimal number of postal areas to be covered

Average Number of Panellists per Area	Minimum Percentage of Areas to be Covered
0,25	25 %
0,36	30 %
0,51	37 %
0,72	45 %
1,03	55 %
1,47	67 %
2,10	82 %
3,00	100 %

EXAMPLE 3 Suppose that 300 panellists have to be recruited and that these are to be distributed over 75 areas by random sampling. Then there are on average 4 panellists per area. All 75 areas are to be covered.

6.6 Creation of test mail

6.6.1 General

Test mail shall usually be sent within a sender's mailing and form part of the mailing and shall comply in all discriminatory aspects with the sender's mailing. It shall respect the requirements of the bulk mail service and the contract between business sender and postal service provider.

The independent performance monitoring organization shall have a contact person at the business customer and (if applicable) at his sending agent.

An approach shall be used which ensures that the independent performance monitoring organization:

- is able to document the production and inclusion of test items into the bulk mailing;
- knows the correct date and time of posting of each individual item.

The two main approaches are:

- seeding of mailing lists (*address seeding*); and
- the *pre-fabrication* of test items to be manually inserted into a bulk mailing.

The independent performance monitoring organization shall decide if a certain bulk mailing and induction approach is suitable for measurement and is not endangering the integrity of the measurement.

6.6.2 Logistic structure of a bulk mailing

Each bulk mailing has a logistic structure beyond the level of a single item. This structure is usually agreed between sender and postal operator. It is based on the logistic requirements of the postal bulk mail product or service. The structure is usually defined by the following characteristics (if applicable):

- *Transport unit(s)* (tray, palette etc., in which bulk mail items are aggregated);
- *Sortation within the transport unit* (unsorted, sorted by postcode, bundle, etc.);
- *Accessibility of the transport unit* (open, tied, welded, etc.);
- *Label of the transport unit* (type, description, number, bar-code, etc.);
- *Means of transport* (van, lorry, train, etc.).

Each bulk mail test item or group of test items shall comply with the contracted / agreed logistic structure. This includes, in particular, that test mail shall respect the sortation sequence of the sender's mailing. The logistic structure shall be known to and respected by the independent performance monitoring organization.

A bundle of test letters shall have the correct labelling, if required by the bulk mail service.

On the lowest level of the logistic structure test items should be randomly distributed.

The independent performance monitoring organization shall take care that test items:

- are *not detectable* by the postal operator;
- *do not trigger wrong routing processes*

due to any obvious neglect of the logistic structure of the bulk mailing with regard to the positioning or grouping or packing of the test items. It shall respect all information requirements of the business sender in relation to address seeding, production and inclusion of test items.

6.6.3 Separate production and manual inclusion methods

6.6.3.1 General

One approach is to produce the test mail separately and include each item afterwards according to the logistic structure of the bulk mailing. The test items are produced either by the independent performance monitoring organization or by the sender.

A bulk mail sender may be an associated company of the postal induction operator, as long as measures are in place that safeguard the integrity of the measurement (see 6.8).

In many cases the best point of inclusion is directly at the end of production before additional packaging has taken place and test items can still be inserted.

6.6.3.2 Test item production by the performance monitoring organization

The independent performance monitoring organization shall take care that all information on the bulk mail mailing for which the test items are to be produced is as up-to-date as possible.

The layout of the test mail items shall be as similar as possible to the real mail items and shall be agreed together with the business sender. In case of existing discrepancies, the business sender shall contact the independent performance monitoring organization. In case of late layout changes, the business sender shall inform the performance monitoring organization before the production of the bulk mailing to enable appropriate actions.

In some cases, one may need to respect special design requirements of the envelope or packaging. These may include *fonts, logos, layout*, but also specific *types of payment*. The business sender and the independent performance monitoring organization shall then agree if an acceptable layout can be re-produced or if original envelopes or packaging have to be used.

The test items shall be produced by the independent performance monitoring organization and be distributed to the business sender or his mailing agent in due time to enable the sender or agent to perform the test item inclusion.

6.6.3.3 Test item production by the sender

All test addresses of the bulk mail sample are forwarded to the business sender or his mailing agent to enable him to produce the according bulk mail items together with instructions on how to include the produced items in the bulk mailing.

The production result shall be documented by the sender and be checked by the independent performance monitoring organization.

6.6.3.4 Test item inclusion

The test item inclusion shall be performed by a named individual at the sender's or agent's premises according to the inclusion instructions provided by the independent performance monitoring organization.

In large mailings, the named individual may be commissioned by the independent performance monitoring organization and may also be used to confirm the date and time of posting for all delivery destinations.

Manual insertion may involve more work for the business sender and/or the independent performance-monitoring organization; however, it can help control the merging of test items with the bulk posting.

The successful inclusion shall be documented in an inclusion protocol to be checked by the independent performance monitoring organization.

6.6.4 Address seeding methods

Address seeding is an inclusion method where all test item receiver-addresses are included in the total address database of the bulk mailing prior to production of the total mailing.

In large bulk mailings, the test addresses may be seeded into a sub-group of the total mailing. This subgroup is then considered to be the relevant mailing in the context of the measurement.

The test mail addresses are to be provided to the business sender prior to production. The business sender or his agent shall define a last date of provision for each address seeding. After seeding he shall report to the independent performance monitoring organization, whether all test addresses could be fully incorporated / imported without alterations.

The business sender shall guarantee that the panellists' address information is kept confidential and is:

- not included into the regular customer database;
- not handed over to third parties (*data privacy protection*).

The measurement should be implemented in a way that panellists are not regular customers of the bulk mail sender, too.

The mailing shall have a specific characteristic that enables the receiver panellists to identify the bulk mail items as being the announced test mail.

Address seeding may be a rather simple task for the business sender but it can cause problems in practice regarding the verification of production and identification of the dates of induction, particularly for large multi-day mailings.

6.7 Documentation of date and time of posting

After the inclusion of test items into the bulk mailing manually (6.6.3) or by address seeding (6.6.4), the exact date and time of posting shall be recorded and documented by a named individual at the sender's or agent's premises for all delivery destinations.

In large mailings, the named individual may be commissioned by the performance monitoring organization.

For documentation purposes the following material may be used apart from the recordings of the named individual:

— *Collection:*

Order management output, collection announcements by the postal operator, transport documents provided at handover, electronic readings (e.g. from barcodes, RFID) or any other accompanying material or software solutions made available by the postal service provider.

— *Posting:*

Senders order, electronic readings (e.g. from barcodes, RFID) or any other accompanying material or software solutions made available by the business sender.

In case of address seeding, the time and date of posting shall be recorded for the whole relevant bulk mailing.

The independent performance monitoring organization shall be responsible that the implemented inclusion methods enable a sufficiently detailed documentation of date and time of posting, together with a full documentation of all requirements of the chosen inclusion method relevant for correct transit-time calculation.

6.8 Integrity of the measurement

For the integrity of the measurement, it is essential to secure that no improper influence is exercised on the measurement. Therefore, it has to be guaranteed that:

- persons who might be able to influence the measurement results are not recruited, for example persons connected to the measurement (e.g. staff of postal operators);
- which bulk mailings are included in the measurement and their exact date(s) of posting of shall not be known to the operational staff of the postal operator prior to reporting;
- the test letters shall have an outward appearance that shows no differences from other letters in the mailing;
- the test mail shall not form a sub-unit to be posted separately by the business sender. Instead it shall follow completely the logistic structure of the bulk mailing in which it is included;

In measurement designs, where the test mail sample is designed to form an own mailing, the field of study shall not differ from the mix of bulk mailings usually handed over to the induction operator by the business sender.

- the panel of receivers shall not be known to the staff of the postal operators.

The active group of senders for bulk mail surveys may be known to the postal operator as these senders will be some of the postal operator's largest customers and a close working relationship is likely to have developed.

The panel of receivers shall therefore be independent of postal operators and shall be managed according to the ICC/ESOMAR *"International Code of Marketing and Social Research Practice"* including its attachments. This requires, among other things, that the identity of participants in research or measurement shall not be revealed to third parties outside the independent performance-monitoring organization and the auditing body. This applies both to individuals and to organisations. Together with the identity of the panellists, the exact location of delivery points of the active panel shall remain unknown to the postal operator.

This requirement shall ensure that a postal operator cannot influence either the behaviour or reporting of the panellists, or the QoS provided specifically to them, thus introducing bias. If their identity is kept secret, there can be no opportunity for influencing behaviour.

To keep the identity of panellists concealed, a series of measures has to be taken:

- Single-item results, which may be used for quality improvement procedures by the operator, shall omit any information on the exact location of the delivery points.

It shall not be possible to identify any receiver.

It shall not be possible to identify delivery areas in the field of study, which are not covered by the measurement due to panel allocation.

- The weekly workload for any household receiver shall be kept at an inconspicuous level. The maximum weekly workload that shall be allocated to a household receiver shall be 12 letters.

In case the panellist takes part in more than one test mail measurement system, this workload cap shall apply to the total amount of test mail received from all test mail measurement systems.

The workload should in most cases be well below 12 letters.

- Furthermore, the independent performance monitoring organization has to consider for every receiver:
 - the weekly amount of international mail that may plausibly be received without raising suspicion;
 - the weekly amount of larger than standard mail formats that may pass as plausible, too;
 - if there exist other test letter formats which might increase the risk of identification.

Based on these factors and the requirements of 6.2, a system of workload caps shall be developed and respected that guarantees that the risk of receiver identification is kept low in the panel.

To secure measurement integrity, the design of the measurement shall neutralize biases that may occur with:

- deliveries at P.O. boxes, by bring services or other special delivery services;

P.O. boxes may be excluded from the measurement system, for example if an inclusion would jeopardize the validation of the delivery of the test items.

- mail room effects;
- deliveries on non-working days in companies (for instance Saturdays).

If the survey design is changed during the measurement period then checks shall be made that the results of the survey before and after the design change shall be combined in a way, which is representative of the design basis in the measurement period.

7 Report

7.1 Measurement results

The measurement system shall provide one result for the overall transit time QoS-level (“on-time performance”) in the field of study in accordance with the design basis.

The measured transit time QoS-level shall be an estimate of the probability that the transit time of a randomly selected item has attained the end-to-end transit time target (service standard) as specified in the field of study.

The transit time QoS shall be measured by defined service performance indicators.

7.2 Service Performance Indicators

7.2.1 Available types of indicators

The service performance indicators to be used depend on the agreed or published and documented service standard of the bulk mail service in the field of study.

The following indicators shall be used in the presentation of the transit-time service level result. They refer to a service standard either relating to the date of induction or relating to a calendar day:

- *On-time performance*: The percentage of postal items delivered within the defined service standard. All reports shall state the level of on-time performance accuracy achieved in the measurement period.
- *Service Standard Type I, relating to the date of induction J* :
 The result shall be presented as the percentage of postal items arriving (i) by or (ii) with a transit time $(J + n)$ or (iii) between transit times $J + n_1$ and $J + n_2$ (inclusive), where n, n_1, n_2 represent the number of qualifying transit-time days for the service standard.
- *Service Standard Type II, relating to a calendar day D* :
 The result shall be presented as the percentage of postal items arriving (i) by or (ii) on a defined calendar day D or (iii) between two calendar days D_1 and D_2 (inclusive), where D, D_1, D_2 represent the delivery dates qualifying for the service standard.
- *Cumulative distribution of delivery days*: The cumulative percentage of mail delivered within a given period shall be reported.
- *Service Standard Type I, relating to the date of induction J* :
 From $J+1$ to $J+10$ (with respect to days qualifying as transit-time relevant, see B.3).
- *Service Standard Type II, relating to a calendar day D* :
 From a calendar day D^* ($J < D^* \leq D$), from which on the first deliveries are to be expected, up to $D+10$ (with respect to calendar days)

or alternatively the percentages delivered *early*, *on time* and *late* with relation to the service standard.

7.2.2 Accuracy

The chosen service performance indicators estimate the QoS in question, including the probability for attaining the transit time target. The accuracy of each QoS estimate is described by the width of its

confidence interval. The confidence interval covers the true QoS with a given confidence level of $(1-\alpha)=95\%$.

NOTE 1 The QoS estimate is the most probable position within the interval.

For a symmetrical confidence interval its width can be described in the form $(+x\%)$. For an unsymmetrical interval the width is $(-x_1, +x_2)$. It is possible to define lower bounds for the accuracy in form of a tolerable *maximal width* of the confidence interval in the form $\pm\epsilon:=2\epsilon\geq 2x$ (symmetrical) or $2\epsilon\geq x_1+x_2$ (unsymmetrical).

The minimum sample size MSS required by this standard (see 6.2) is set up to tolerate an epsilon of 5 % for the measurement of a single bulk mailing.

NOTE 2 This accuracy calculation is based on the Agresti-Coull approximation (see A.5.3).

NOTE 3 A measurement of a single bulk mailing produces no correlation effects, since only one point of induction is included and no receiver receives more than one test letter.

The accuracy of the service performance indicators shall be assessed by calculating their *variance* (see A.1.3) and the corresponding *design factor* (A.1.4). This calculation shall take into account for each test letter as a minimum:

- the induction / delivery point and date;
- all discriminant mail characteristics;
- an indication if the transit time target has been attained or not

in accordance with Annex A.

7.3 Weighting of the results

7.3.1 Reasons for implementing a weighting system

7.3.1.1 Weighting according to the sample design

For most discriminant mail-characteristics, the sample design shall be based on a proportional model where the test mail flows for each stratum are proportional to the chosen design basis. Some discriminant mail characteristics may be based on a disproportional model. In a disproportional model, an aggregated result can only be achieved as a sum of weighted strata results.

7.3.1.2 Weighting due to non-response and invalid test items

The sample design defines the target proportions of the modes of all discriminant mail characteristics. In the test sample, these target proportions will usually not be achieved due to cases of non-response or invalid test items. Corrective weighting of the strata shall therefore always be implemented in the calculation to restore proportionality. The discriminant mail-characteristic modes shall be weighted in reference to the chosen design basis, usually being the correct real mail proportions. The strata weights shall be determined in accordance with the design basis (see A.4.3).

7.3.2 Weighting caps

7.3.2.1 General

A system of controls is necessary to avoid overall results that are based on an extreme weighting of some of the measured strata results. This standard uses two types of controls, one at the level of each discriminant characteristic and one at the stratum level.

7.3.2.2 Weighting caps for each discriminant characteristic

The proportions of valid mail per mode shall not differ relatively by more than 20 % of the target proportions set for the modes of each discriminant characteristics at the beginning of the measurement period.

(characteristic: Weekday, mode: Monday): A sample requirement that 20 % of test items shall be posted on Monday shall be fulfilled with a margin of $\pm 20 \% \cdot 20 \% = \pm 4 \%$.

The weighting caps as defined above shall apply only to the following *capping-relevant modes*:

- the two main modes of each discriminant characteristic (including geography), e.g. the modes with the highest real mail proportions (the highest *Real mail Mode Weights* RMW); and
- all other modes with a target proportion not smaller than 20 %.

7.3.2.3 Weighting caps for each individual item

For the aggregation of results, each test mail item is assigned its Individual Final Weight (IFW). The IFW depends on both, the proportion of valid mail and the target proportion of the stratum to which the test mail item belongs.

It has the form of a corrective factor for the stratum, divided by the overall sample size.

The IFW for each valid test item shall not be smaller than 20 % or higher than 500 % of the value 1/sample size.

With a sample size of 100 test letters each weight shall be within the interval [0,20 % ; 5,00 %].

The weighting caps as defined above shall as a minimum apply to strata *completely characterized* by capping-relevant modes as defined in 7.3.2.2.

7.4 Content

All reports shall state the level of on-time performance achieved in the test period, measured by service performance indicators as defined in 7.2.1. All reports shall include at least the following information:

- *Name and address* of (i) the independent performance monitoring organization, (ii) the monitored postal operator(s), (iii) the involved business sender and (iv) its agent(s) performing the induction (if applicable);

Agents of the business sender may be involved in the production, commissioning and induction of the bulk mailing. They may also be the contract partner of the postal service provider on behalf of the bulk mail customer.

- *Field of study* including (i) mail types (categories of bulk mail measured), (ii) geography and the (iii) service performance indicator(s);
- *Period* of the test mail measurement, stating whether it is an (i) ad hoc or a (ii) continuous measurement and whether it is based on items posted or delivered within the period;
- *Weekdays* of the induction and delivery service offered by the postal operator;
- National as well as regional *public holidays* excluded from transit-time calculation as well as approved incidents of *Force Majeure* during the measurement period;
- The bulk mail service and information about additional agreements regarding the logistic structure, which are not already covered by the general terms and conditions of the bulk mail service;

- Methodology used, by reference to this standard including the chosen stratification and the chosen test mail production and inclusion approach;
- Type and details of the chosen *design basis*, on which the stratification and the sampling plan are based, including a reference for the *source*, where specific information on the sample design and the design basis (including public data) is documented and may be obtained;
- Consistency of the:
 - field of study, especially regarding geography;
 - methodology, especially regarding the chosen stratification and the design basis;
- Total sample size;
- Rules for transit time calculation according to 5.2 including:
 - the type of last collection time used: actual or planned or collection by the operator;
 - the implemented calculation method(s) of the transit time according to Annex B;
- Assessment of the degree to which the weighting caps are respected;

The weighting caps are ideally fully respected. If not all caps are respected, the report shall show to what proportion the caps are respected and how strong possible violations of individual caps are.
- Accuracy of the results;
- Failures, if any, to meet standard requirements.

8 Quality control

Quality control procedures shall be applied through all phases and activities of the measurement system according to Annex F.

Validation of the test mail shall be applied through all phases and activities of the measurement system.

9 The Annexes

The following annexes will provide guidance for the implementation of bulk mail end-to-end measurement systems that comply with this standard. Annex A to Annex G are mandatory; Annex H to Annex M are informative. Annex I to Annex L follow a process view on the implementation and maintenance processes from the planning stage up to the report.

Annex H puts this standard in the context of other postal Quality of Service standards including details on the benefits of its application and its connection to quality improvement efforts.

The Annex I describes the planning stage of the measurement including the measurement design and its limitations. Annex I concludes with recommendations for selecting an independent performance monitoring organization (contractor) based on the chosen design approach.

For the exact definition of the sample design, decisions have to be made on the structure for which the sample should provide representative results. This structure is the design basis. Annex J gives guidance on how to determine the set of discriminant mail characteristics for the field of study. It shows the choices one has to decide for an appropriate and reliable design basis including real mail studies results as well as alternative design bases for each discriminant mail characteristic. Annex J gives further insights into the connection between design basis and test mail sample design. It provides recommendations on how often the design basis should be updated.

After the sample design is fixed and the planning stage is completed, the test mail survey can go into its implementation phase. Important guidance for the implementation of the test mail measurement system is given in Annex K. Since the survey is panel based, details on all panellist-related issues are given, including the recruitment and postal characteristics of the panel. Data recorded by the panellists has to be validated. A list of possible validation issues is provided. Only valid data can be used for transit-time calculation.

The transit-time calculation rules are defined in Annex B. Since the sample is usually stratified, rules for the calculation of a weighted transit-time result are given. The calculation rule for the transit-time result and its accuracy can be found in Annex A. Further statistical background to these rules is laid down in Annex L.

All results are laid down in the report, which is given further attention in K.8.

The measurements of individual bulk mail inductions and campaigns according to this EN may suggest a comparability of the results. The extent to which one may rely on the comparability of these results is evaluated in Annex C.

The measurement of individual bulk mailings may be aggregated into more general fields of study. The design requirements that have to be followed here are detailed in Annex D for different possible scenarios.

Certain aggregations lead to continuous measurement systems which cover more than one bulk mail induction over an extended period of time. These include measurements of the Universal Service. Continuous systems have to follow an additional set of minimum requirements as laid down in Annex E. All issues connected to continuous bulk mail transit-time measurement systems are laid down in this annex. Informative annexes referring to continuous or strictly continuous measurement systems are marked as [CMS] or [SCMS].

In planning and operation of the measurement system strict quality control procedures have to be followed as laid down in Annex F.

After the report, a continuous measurement system has to be audited as specified. All requirements related to quality control and auditing can be found in Annex G.

Finally, Annex M gives an overview over the major changes in relation to the 2003 version of EN 14534.

Annex A (normative)

Accuracy calculation

A.1 Scope

A.1.1 General

The main scope of this annex is to provide an *accuracy calculation method* for the probability p for attaining the end-to-end transit-time target.

The annex covers all mathematical detail necessary for an independent performance-monitoring organization to implement a comprehensive system for accuracy calculation.

The annex provides the general methodology for accuracy calculation as well as variants for special applications. Examples and explanations of the underlying methodology can be found in Annex L.

A.1.2 Two stage sampling approach

The sampling process is based on a two stage sampling approach. In stage one:

- possible bulk mailings are chosen from all those available by participating postal bulk mail customers;
- receiver panellists are sampled from all postal users in the field of study according to the stratification.

In stage two, the test letters are allocated to:

- the included bulk mailings;
- the receiver panellists, grouped by their discriminant user characteristics; and
- all discriminant mail characteristics that do not refer to the bulk mailing or the receiver panellists themselves.

Each test letter is characterized by:

- both, the induction point α and the mailing. This characterization includes the induction point and the bulk characteristics specific for the mailing.

If several mailings are being inducted at the same place then each of these mailings shall be treated in the calculation as a separate induction point α .

- the delivery point b and the receiver using it, including his receiver characteristics; and
- all other discriminant mail characteristics defined in the included bulk mailings (see also 6.4.2).

A.1.3 Covariance / Stratification / Accuracy calculation

The calculation for the on-time probability is governed by three design principles:

- the incorporation of induction/delivery point effects on the measured variation (co-variance),
- the incorporation of the stratification via a weighting system,
- the use of the appropriate probability distribution for the accuracy calculation.

Annex A, A.3 presents a variance calculation method that deals with the covariances. This method will be imbedded into a weighted system in A.4. A.5 defines the final accuracy calculation method using the variances and including the optimal choice for the underlying probability distribution.

A.1.4 The design factor

In case of a *Simple Random Sample* (SRS), it is straightforward to calculate the minimum sample size based on the expected or required accuracy of the design.

The incorporation of the design principles of A.1.3 leads to a more complex sample design that in most cases also has a higher degree of variation.

The *design factor* (df) is a measure for the added variation. It is defined as the ratio of the variance of the on-time estimator $\hat{p}$ in the given sample design by the variance of the on-time estimator $\hat{p}$ in a SRS of the same size. The design factor is always related to a given sample design and probability estimator.

EXAMPLE A design factor of the size 2 implies that the given design varies twice as much as a SRS.

The accuracy of any end-to-end sample design is not only improved by an increased number of items, but also by an increased number of bulk mailings and/or receivers. It is advisable to strive for a low number of test letters per mailing and per delivery point in order to reduce correlation effects.

A.1.5 Single mailing versus continuous measurement

In the simplest case, the field of study is a single bulk mailing. Within one mailing, one usually has one induction point and each receiver is allocated exactly one test-letter. In this case, there exist no correlation effects, and the variance of the measurement is the variance of a simple random sample resulting in a df of 1.

In an aggregated field of study, mail is allocated to several bulk mailings/campaigns. In this case, especially correlation effects *within* the bulk mailings have to be taken into account, and the variance calculation rule gets more complex.

In a continuous measurement system, the choice of the number and type of included mailings has a determining influence on the design factor. Bulk mailings with heterogeneous QoS-results lead to higher design factors.

A.2 Symbols

The following list is an overview of all mathematical symbols used in the annex together with a definition of each symbol: